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NUTRIOLOGY® SOLUTION DEVELOPMENT

REAL-TIME DATA FOR ON-TIME DECISION MAKING

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NUTRIOLOGY® SOLUTION DEVELOPMENT

Omnia Nutriology® is based on twelve core principles that, in our opinion, will ensure the future success of all parties involved in our business, from our suppliers to our shareholders and customers. It is supported by the OMNIA Nutriology® Solution Development department whose members constantly strive to develop specialized solutions and products with the use of integrated technology, knowledge, and innovative ideas.

Nutriology® Solution Development offers innovative commercial solutions by leveraging knowledge in:

- Digital farming and remote/proximal sensing (OMNI-PRECISE®),
- Plant physiology (OMNISAP®),
- Agronomy (DEVELOPMENT & INNOVATION),
- Specialised fertilizer products (SPECIALITY PRODUCT MARKETING) and,
- Soil biology (OMNIBIO®)

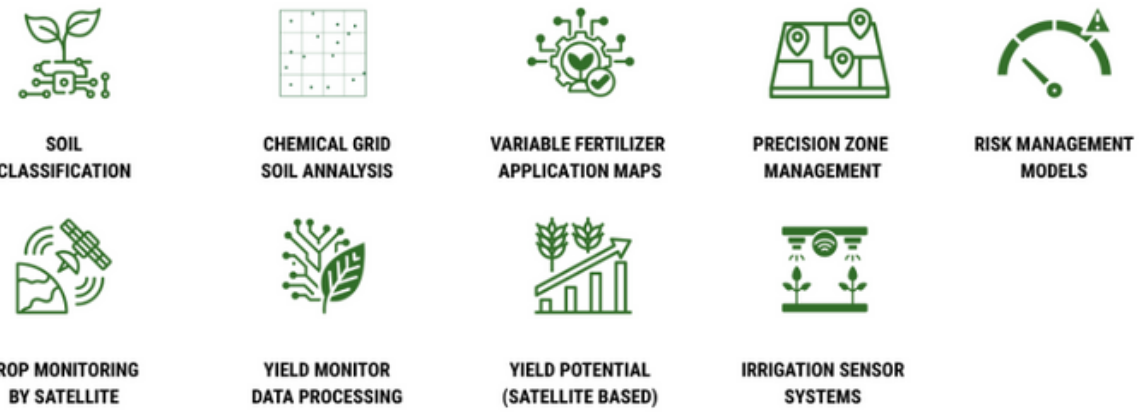
OMNI-PRECISE®

In an environment with rising production costs and shrinking profit margins, it is important for the farmer to optimize the management of all the resources at his disposal. OMNI-PRECISE® offers the solution. Using soil physical properties, soil nutrient analyses, variable rate technology, zone management, proximal and remote sensing, OMNIPRECISE®, together with the Omnia agronomist, can bring about a significant improvement in efficiency and thereby lowering the risks associated with production.

It is of the utmost importance to identify variation within fields, to quantify the level of risk associated within each zone and to manage it accordingly. OMNI-PRECISE® offers several solutions and models that assist the farmer to manage the risks and opportunities that the season might offer by running different scenarios and to select the best fertilizer strategy according to his specific circumstances and risk appetite.

The solutions offered by OMNI-PRECISE® enables farmers to make informed decisions by preventing under-fertilizing on high potential areas and over-fertilizing on low potential areas – in other words the right product, at the right time, in the right place, at the right rate.

SOLUTIONS AND SERVICES WITHIN OMNI-PRECISE®



SOIL NUTRIENT ANALYSIS:

Soil nutrient maps are used as a baseline for identifying areas where nutrient levels are critical for crop growth. To create these maps, topsoil (0-250 mm) and subsoil (300 – 600 mm) samples are taken on a grid pattern. The grid size varies from 0.25 hectares for intensive crops to 1.0 or 2.0 hectares for extensive crops. These samples are analyzed by Chemtech Laboratories, and Geographic Information Systems (GIS) specialists within the OMNIPRECISE® team then create maps of the spatial distribution of different soil nutrients.

Samples are routinely analyzed for calcium (Ca), magnesium (Mg), potassium (K), sodium (Na), pH, sulphur (S), and phosphorus (P), with non-routine options for organic carbon (C), nitrogen (N), iron (Fe), manganese (Mn), zinc (Zn), copper (Cu), nickel (Ni), molybdenum (Mo), boron (B), soil texture as well as volumetric stone fraction.
These chemical maps are then used to create prescription maps for variable rate application (VRA) of soil amendments and fertilizer. This process is repeated every 2 to 3 years, depending on the type of crop.

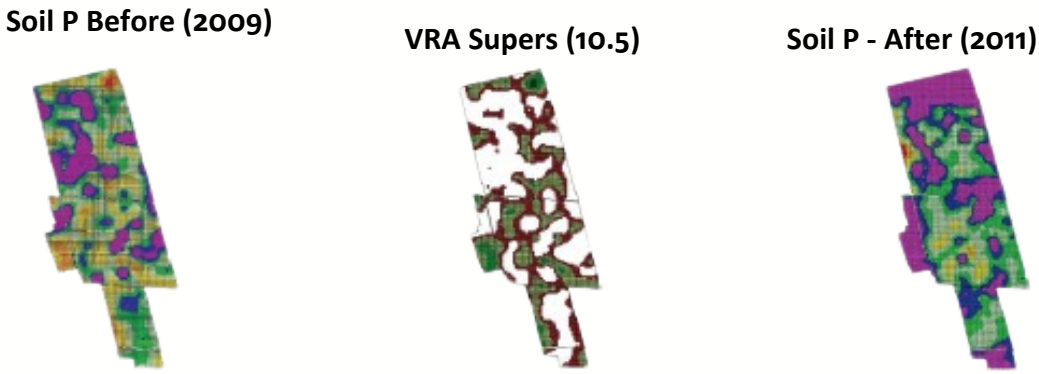


Figure 1. Example of a soil chemical map before and after variable application of fertilizer

SOIL CLASSIFICATION:

Soil classification is a once-off survey that is conducted according to a fixed grid or based on predetermined management zones. Soil augers (hand or mechanical) are used to take soil cores from which soil physical properties are described at every observation point. These observations are used to compile maps of soil forms, effective soil depth, soil texture, plant available water, long term soil potential, and topography. Soil maps, together with inputs from Omnia agronomists and irrigation equipment suppliers, are also used for planning and development of new irrigation fields and orchards.

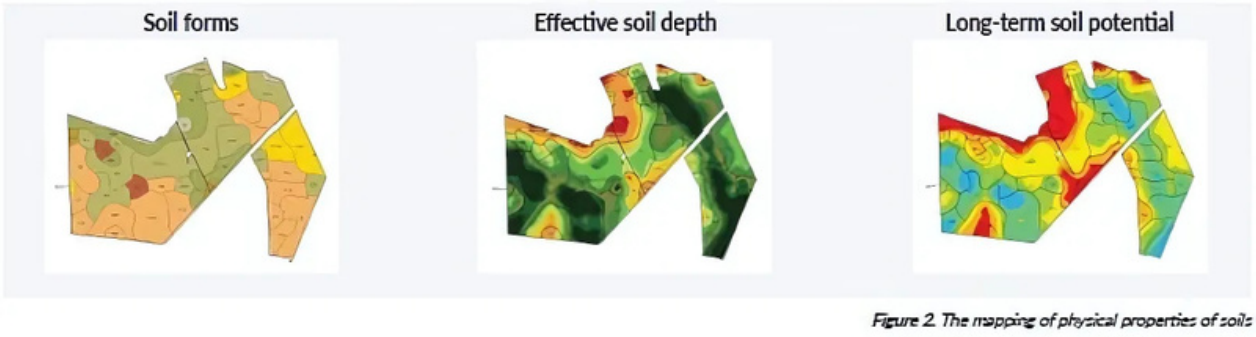


Figure 2. The mapping of physical properties of soils

VARIABLE RATE APPLICATION: (VRA)

VRA prescription maps are based on selected soil physical and soil chemical properties and generated according to the Agronomist instructions. Prescriptions include variable rate maps for seed, fertilizer, lime, gypsum, chemicals, and other soil amendments. VRA maps are exported in the specific format required by the farmer's precision farming equipment.

Figure 3. Variable rate application map and equipment

YIELD MONITORING

Precision farming is globally regarded as the most promising agronomic approach towards sustainability. A direct correlation exists between soil potential and actual yield and therefore crop yield data not only assists in the evaluation of soil properties, but it is also used to support management decisions regarding variable applications of inputs.

With the use of yield monitoring technology producers can easily detect which aspects to focus on to ensure optimal performance of assets and inputs. It is universally proven that variable rate applications of inputs, also known as site-specific management (or zone management), can improve farm profits and soil health. OMNI-PRECISE® offers a unique solution to assist farmers with identifying and managing variability within fields to increase efficiency of fertilizer applications and thereby lowering their risk.

Figure 4. Correlation between soil potential and actual yield

OMNIZONE® AND OMNIRISK-IQ®

A management zone is defined as an area within a field that responds much in the same way to certain inputs such as fertilizer or water. Yield data, either from yield monitors or satellite derived yield estimates, is the most reliable method to identify in-field variation. By normalizing and combining at least three years of yield data, fields are divided into management zones with similar yield potential and presented as an OMNIZONE® map (Figure5).

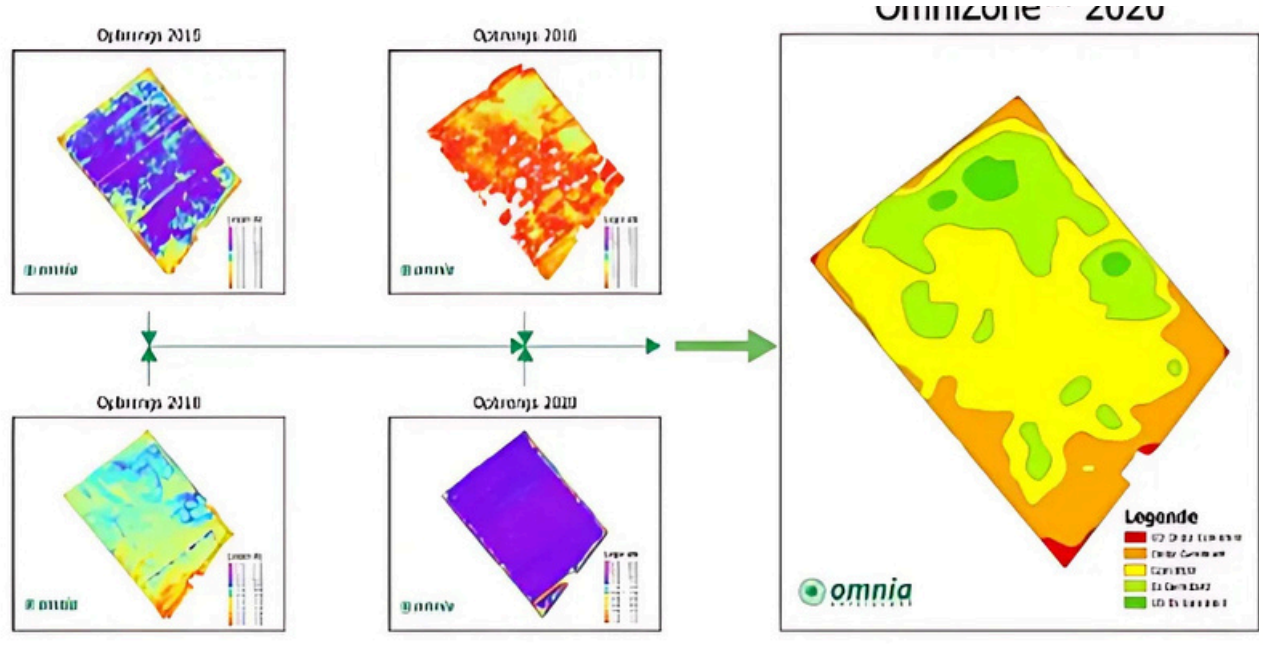


Figure 5. Example of an OMNIZONE™ map

OMNIRISK-IQ® is a risk management solution unique to Omnia Nutriology® that models the cumulative probability or certainty of obtaining a specific yield in each management zone. These probabilities are statistically derived from yield data obtained during previous crop seasons. For crops that are harvested with combines that are not equipped with yield monitoring technology, crop yield is derived from satellite-based yield estimates. The more information (seasons) used in this analysis; the more seasonal variation is taken into consideration to better quantify the risk.

OMNIRISK-IQ® assists farmers by spatially identifying how and where yield risk is distributed over a certain farm to prevent under-fertilization on high-potential areas and over-fertilization on low potential areas. Furthermore, when the economic aspects are taken into consideration, the farmer can quantify profitability per management zone and adjust his fertilizing strategy where appropriate. For example, Figure 6 presents the probability of realizing a profit in each management zone when a conventional fertilization approach is followed, compared to a scenario where a variable fertilizer approach is followed (Figure 7.)

Every season should be carefully considered, especially under drought conditions. The risks and opportunities that the season might offer, should be accurately identified and managed to the benefit of the farmer, according to his specific circumstances and risk appetite.

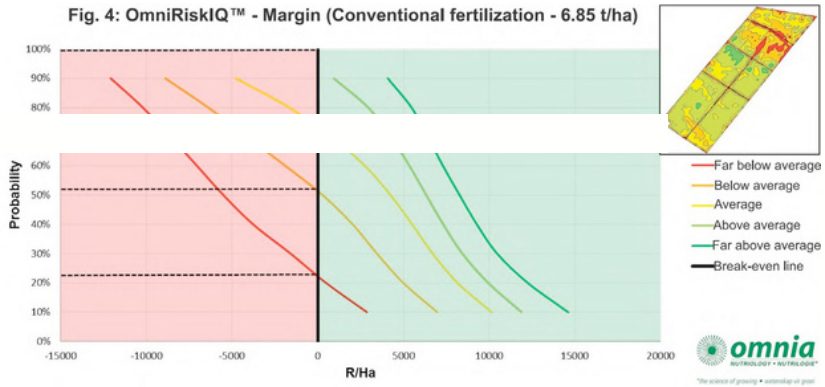


Fig 6: OmniRiskIQ™M - Margin (Conventional fertilization - 6.85 t/ha)

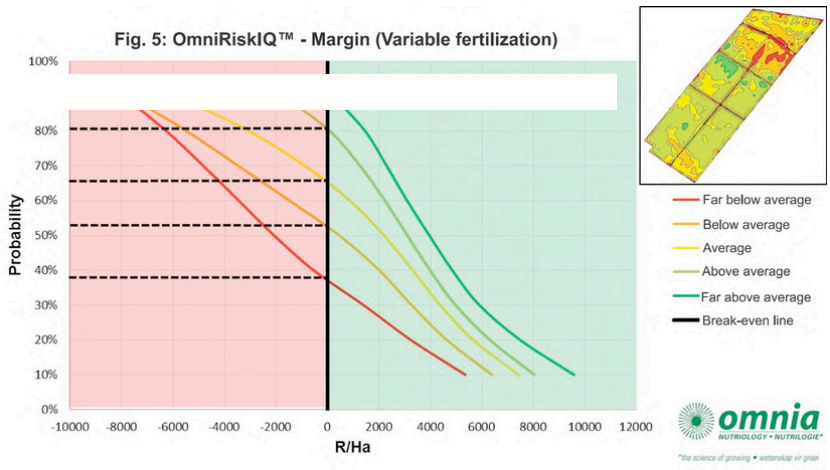


Fig 7: OmniRiskIQ™M - Margin (Variable fertilization)

Several facets of the OMNIRISK-IQ® model, such as the gradient of the cumulative probability curves, are quantified and then deliberately monitored year after year to measure whether the applied strategy in different management zones caused a real improvement and whether it was profitable. By using different scenarios in the OMNIRISK-IQ® model, planning and risk management can therefore be managed more effectively.

SUPER-5™

Satellite remote sensing has become an integral part of precision farming for real-time assessment of crop growth, crop health, and potential agronomic issues throughout the season. High resolution satellite sensors with red edge bandwidths allow for the calculation of exciting new indices (different combinations of absorbed and reflected wavelengths of light) that provide insights into crop development. By analyzing trends and different combinations of these indicators, users can spatially identify various agronomic issues and direct resources accordingly.

SUPER-5™ is a digital satellite monitoring solution offered through a user-friendly web dashboard containing high resolution images with related pixel data, as well as graphs showing trends of five different crop growth indices, namely Normalized Difference Vegetation Index (NDVI), Leaf Area Index (LAI), Photosynthetic Activity Index (PAI), Senescence Onset Index (SOI), and Moisture Stress Index (MSI). It includes climatic indicators such as daily temperature, precipitation, humidity, evaporation and soil moisture.

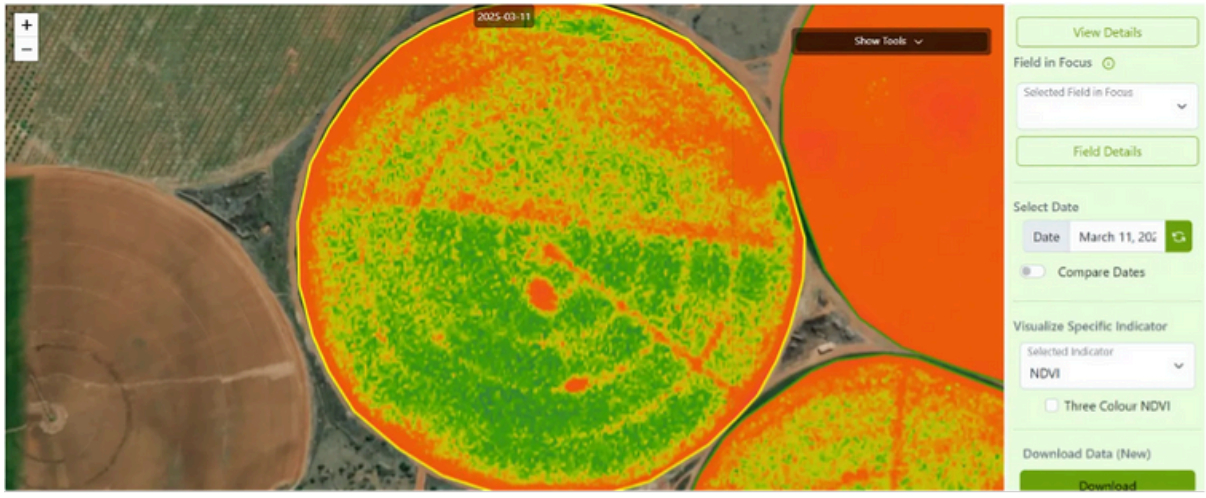


Figure 8. Example of SUPER-5™ satellite image

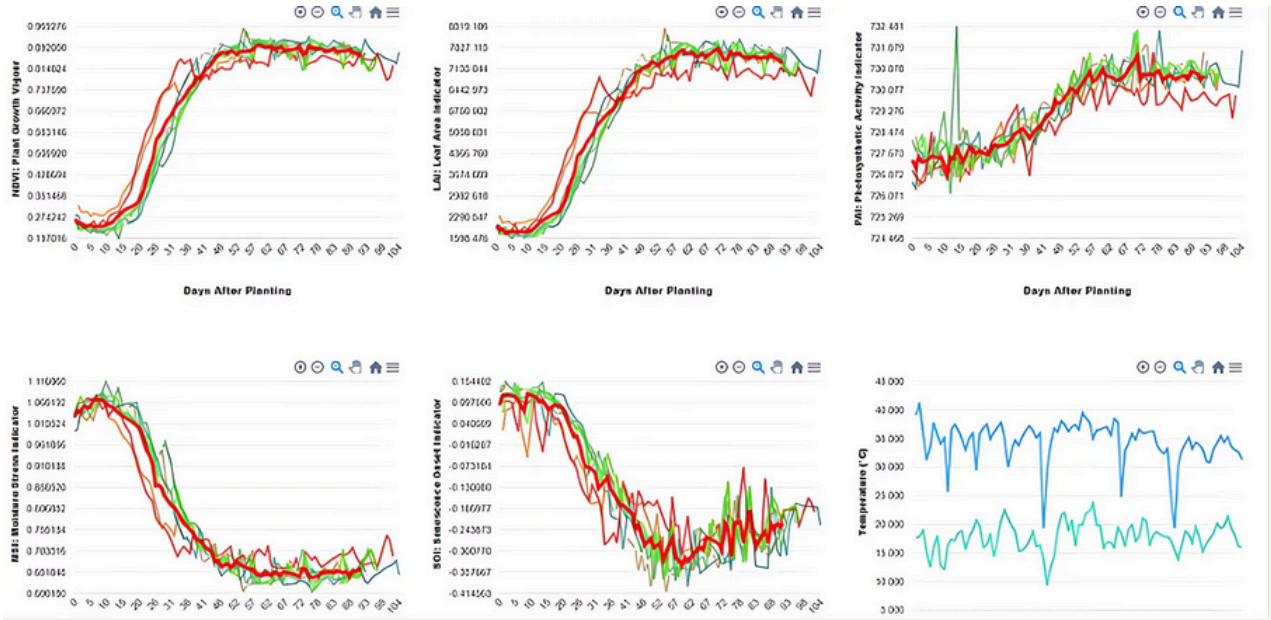


Figure 9. Example of SUPER-5™ crop indicator graphs

NSD's crop norms are uniquely developed using extensive historical crop data, providing a reliable benchmark for assessing crop health and growth. These norms serve as a critical reference point during the vegetative growth stages, where continuous monitoring of SUPER-5™ indicators is essential to ensure optimal crop development. By analyzing each new satellite data set, users can detect deviations from expected growth trends early in the season, allowing for timely corrective actions. The sooner an anomaly is identified, the higher the likelihood of addressing underlying field-level issues such as nutrient deficiencies, pest infestations, or irrigation inefficiencies, ultimately safeguarding yield potential.

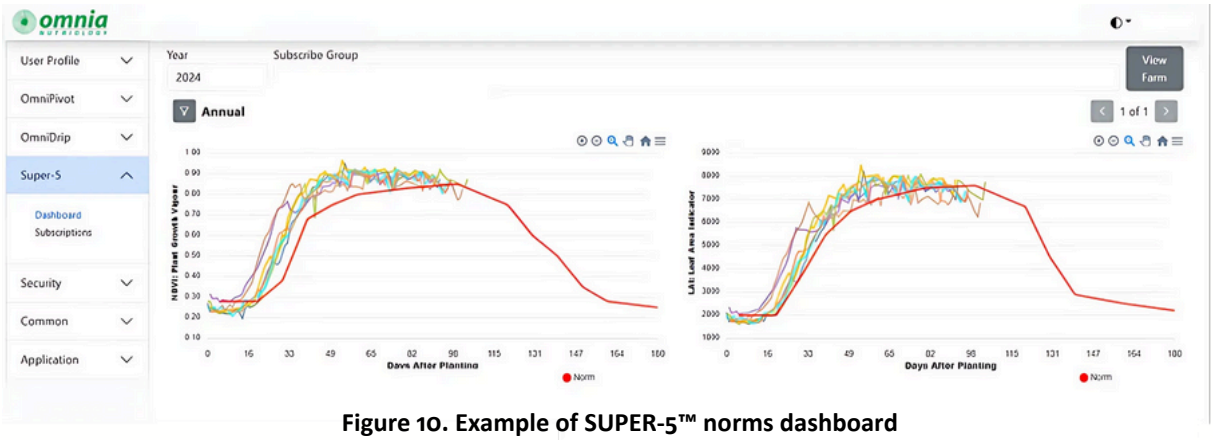


Figure 10. Example of SUPER-5™ norms dashboard

Nitrogen is one of the most essential nutrients for plant growth and plays a critical role in photosynthesis and protein synthesis. However, excessive or insufficient nitrogen application can cause severe yield losses and environmental damage. SUPER-5 integrates satellite imagery to provide precise nitrogen (N) recommendations for certain crops. By analyzing key vegetation indices, it calculates SPAD values from satellite data, which estimates chlorophyll content and nitrogen availability in plants. It supports variable-rate nitrogen application, optimizing nutrient distribution while minimizing waste and environmental impact.

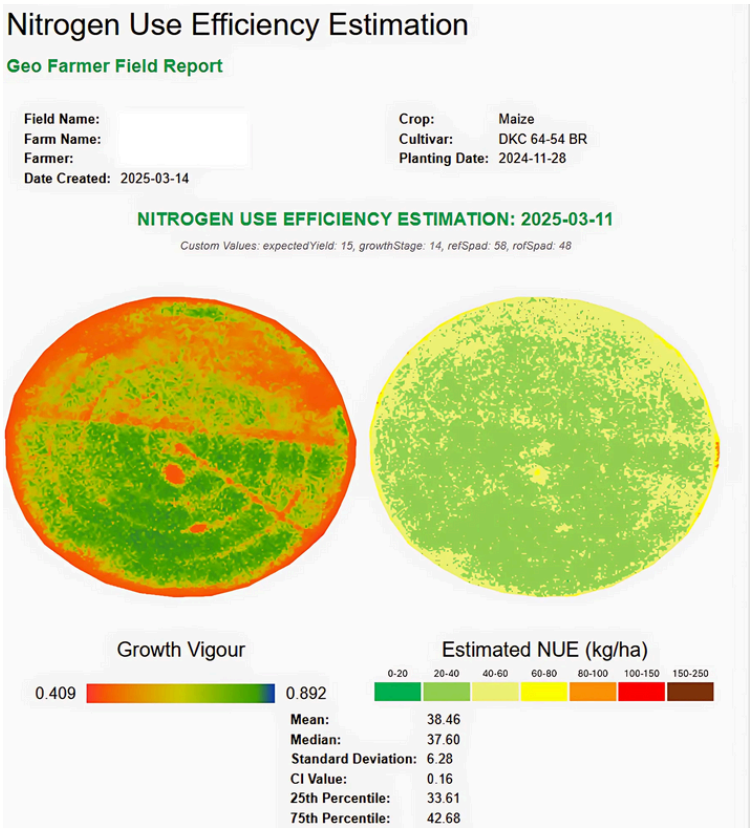


Figure 11. Example of Super-5™ Nitrogen Management report

By analyzing growth patterns and biomass development SUPER-5™ further enables in-season estimates of crop yield. This data-driven approach allows farmers to identify underperforming areas, optimize input applications, and make informed decisions on harvesting, storing, transport and marketing strategies.

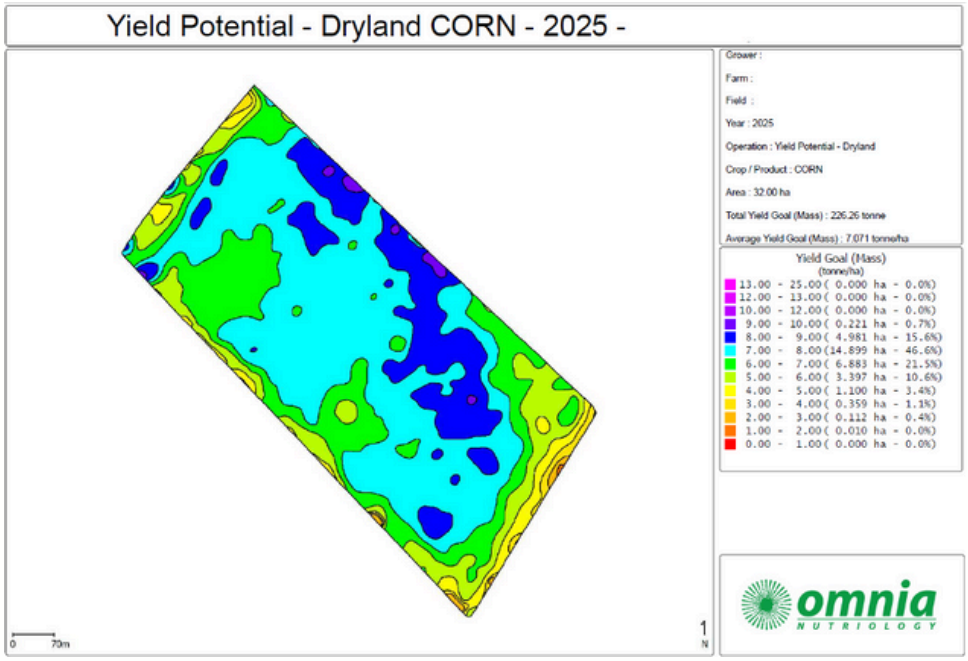
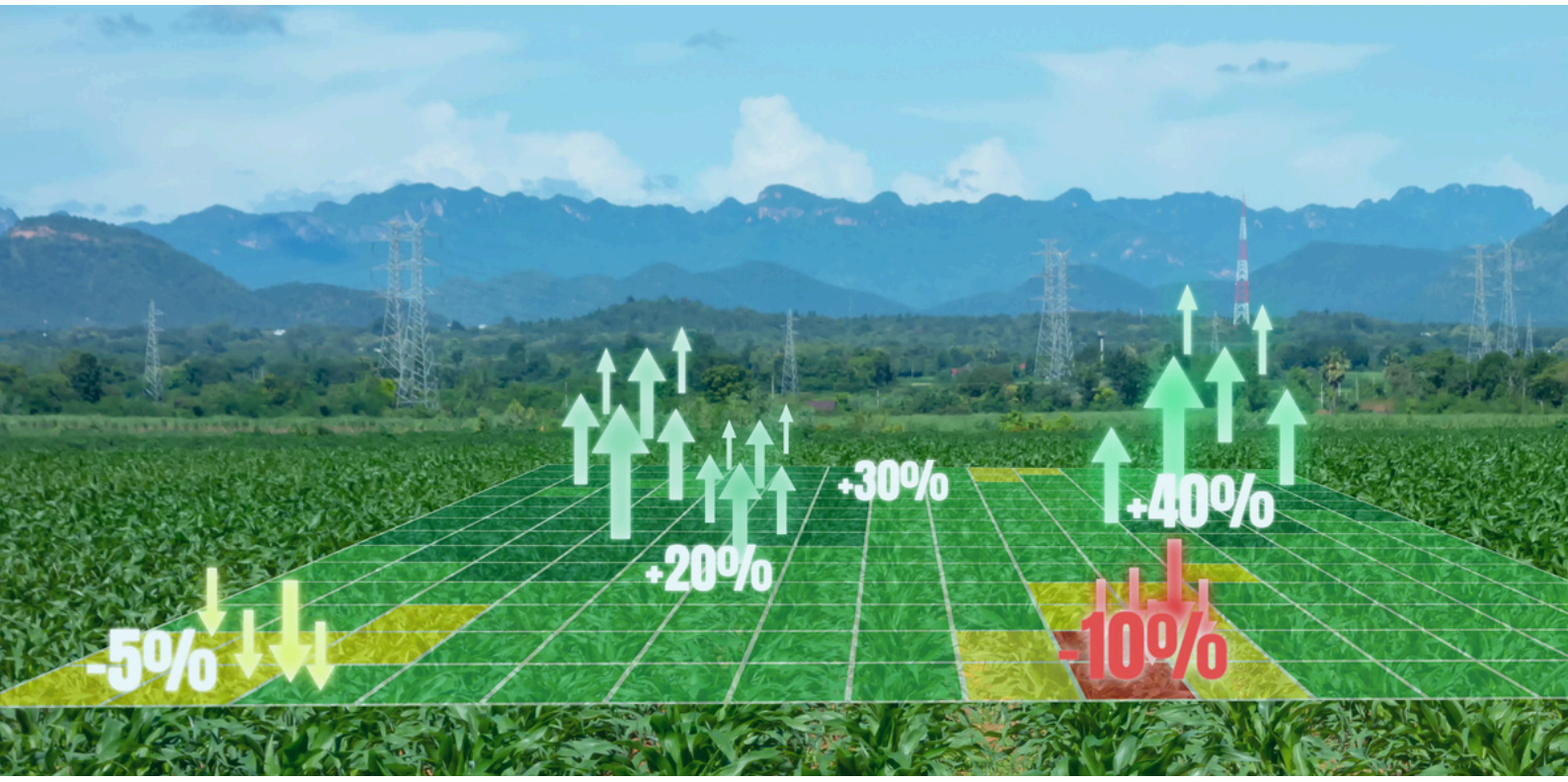


Figure 12. Example of a SUPER-5™ yield potential map



OMNIPIVOT™

OMNIPIVOT™ is an advanced irrigation monitoring system specifically designed for center pivot irrigation. This solution enables farmers to make data-driven decisions on water application, enhancing crop yield, quality and water productivity. By providing real-time data, OMNIPIVOT™ helps monitor and adjust irrigation based on crop water needs, ensuring efficient water usage. The system is accessible through a user-friendly, web-based dashboard that can be customized and accessed from any device, allowing farmers to manage pivot location, speed, water application rate, and travel direction with ease.

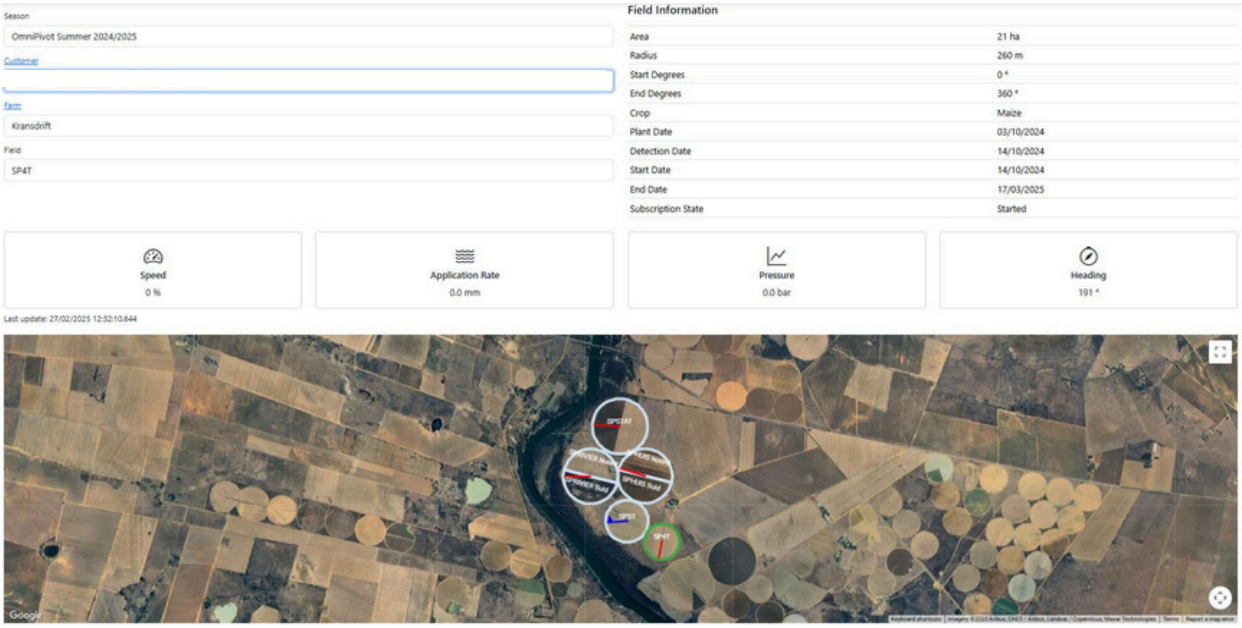
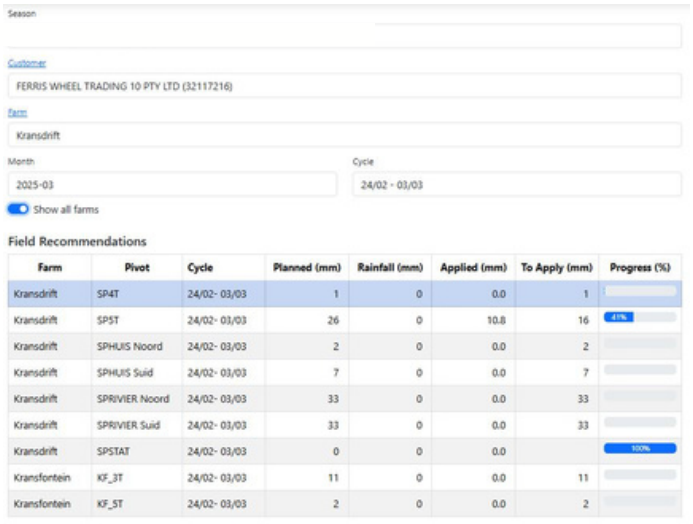


Figure 13. OMNIPIVOT™ web-based dashboard

In addition to real-time monitoring, OMNIPIVOT™ offers early warning alerts, sending instant SMS notifications in case of irregularities or system failures, which can help prevent potential equipment damages or crop losses. The system also includes secure cloud-based storage for historical analysis, benchmarking, and detailed irrigation reports, helping farmers track performance and efficiency over time. OMNIPIVOT™ is universally compatible with any pivot model and operates independently of manufacturer software, requiring only a stable cellular network. It integrates advanced telemetry technology, including irrigation and rainfall nodes, which provide real-time data transmission.



Farm	Pivot	Cycle	Planned (mm)	Rainfall (mm)	Applied (mm)	To Apply (mm)	Progress (%)
Kransdrift	SP4T	24/02- 03/03	1	0	0.0	1	
Kransdrift	SP5T	24/02- 03/03	26	0	10.8	16	41%
Kransdrift	SPHUIS Noord	24/02- 03/03	2	0	0.0	2	
Kransdrift	SPHUIS Suid	24/02- 03/03	7	0	0.0	7	
Kransdrift	SPRIVIER Noord	24/02- 03/03	33	0	0.0	33	
Kransdrift	SPRIVIER Suid	24/02- 03/03	33	0	0.0	33	
Kransdrift	SPSTAT	24/02- 03/03	0	0	0.0		100%
Kransfontein	KF_3T	24/02- 03/03	11	0	0.0	11	
Kransfontein	KF_5T	24/02- 03/03	2	0	0.0	2	

Figure 14. Example of the OMNIPIVOT™ recommendation dashboard

OMNIPIVOT™ is offered through a cost-effective subscription model, with a one-time hardware installation fee and a per-hectare subscription that covers dashboard access, recommendations, early warnings, and analytics. This solution is designed to maximize water use efficiency, increase crop yield, reduce wastage and input costs, and improve decision-making through accurate, real-time insights.

OMNISAP®

Omnia is well-known as leaders in plant sap analysis for the last 30 years. Plant sap analysis is like a blood test for plants, giving valuable insight into nutrient levels, uptake ability and crop health and vitality. This enables early detection of deficiencies or imbalances and timeous corrections to maximise yield and reduce risk through the season.

Nutrient Analysis

Plant sap analysis is a real-time in-season measurement of the uptake and availability of nutrients used by the plant for growth. An OmniSap® analysis can detect deficiencies three to six weeks earlier than conventional dry tissue analysis, and even before visual deficiency symptoms appear, and yield loss ensues. Chemtech, Omnia's state of the art laboratory, is the only analytical lab worldwide with ISO17025 accreditation specifically for sap analysis. Omnia offers the OmniSap® service in South Africa, Australia, Namibia, Kenya, Zimbabwe, Zambia and Mozambique.

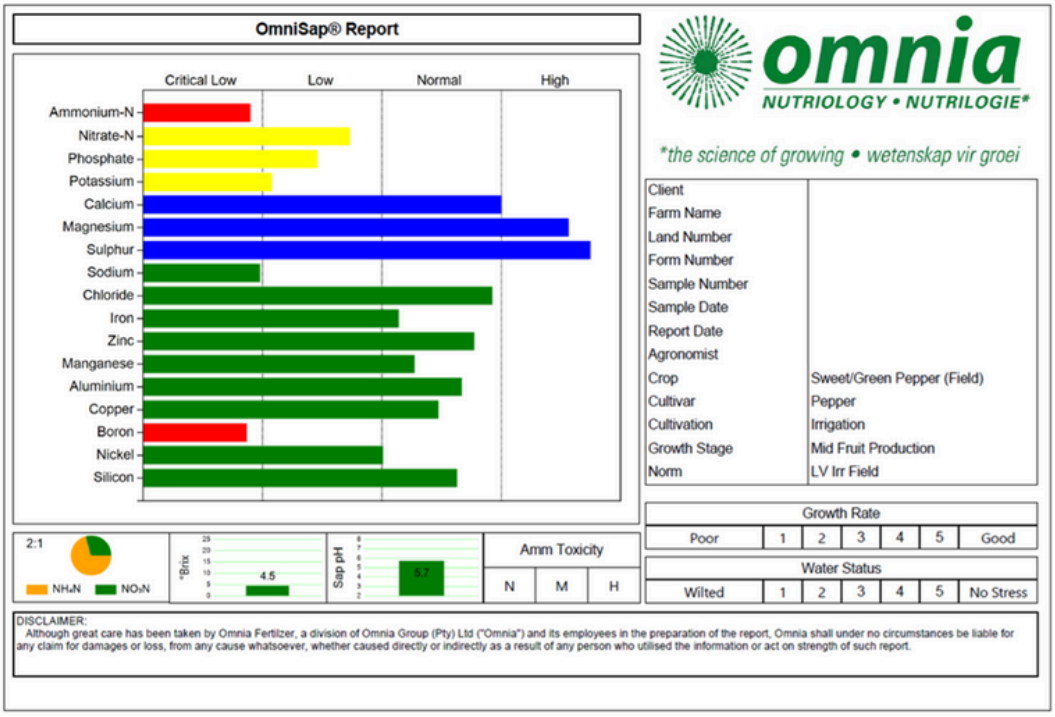


Figure 15.: An example of the OmniSap® analysis report

Energy Management

A new addition is the monitoring of crop energy or sugar levels by means of pH and Brix measurements in the sap. This is of particular importance in permanent crops, where carbohydrate stress causes alternating yields and poor quality. By monitoring carbohydrate levels through the season, timeous corrections can be made to sustain high sugar levels and stabilise yields from season to season. Omnia's innovative gel products, Twilight™, Starlight™ and Midnight™ are particularly well suited to enhance crop sugar and energy levels.

Pattern Identification

Nutrient uptake is governed by many external factors such as irrigation, soil structure and environmental conditions to name just a few. With OmniSap's new Pattern Identification Software, underlying physiological limitations can be identified. More than 20 different conditions can be identified and corrected. These include, amongst others, soil compaction, root development, herbicide damage and over- or under-irrigation.

Therefore OmniSap® can be seen as the missing link between soil and conventional tissue analysis and an invaluable tool for crop management during the season. Unlike many competitors, norms are available for most crops and for all the growth stages, enabling continuous monitoring throughout the crop's growth cycle.

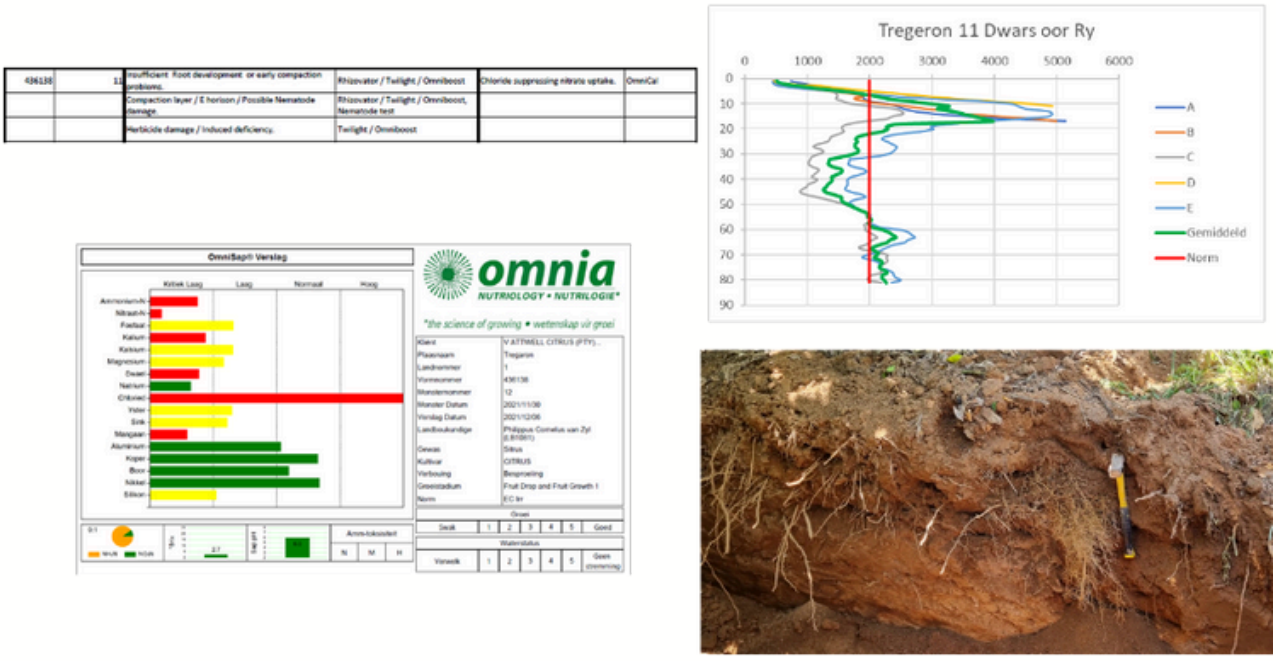


Figure 16. Example of OMNISAP® pattern identification output

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DEVELOPMENT & INNOVATION

Development and Innovation bridges science, technology, and practical field experience to drive fertilizer innovation. Our department plays a role in shaping the future of farming by ensuring that every fertilizer solution is backed by rigorous research, technology, and real-world agronomic validation. Here's how we make an impact:

Agronomic Field Trials:

Field trials are the backbone of effective fertilizer product development. By testing our products under real farming conditions, we ensure that every solution meets the highest standards of efficacy and sustainability.

Our extensive network of trials provides:

- Scientific Validation – Ensuring product effectiveness under various climatic and soil conditions.
- Data-Driven Insights – Capturing critical agronomic responses to fine-tune fertilizer recommendations.
- Optimised Performance – Enhancing nutrient efficiency to maximize yield potential.

Figure 17. Example of a typical field trial

Data Management & Trial Progress Tracking

Data Management is key to unlocking actionable agronomic intelligence. Our database and dashboard system streamline:

- Trial Data Collection & Analysis – Ensuring every data point contributes to informed decision-making.
- Progress Tracking – Real-time monitoring of ongoing trials to ensure seamless execution.
- Performance Benchmarking – Comparing historical and current data to refine and enhance product formulations and product performance.

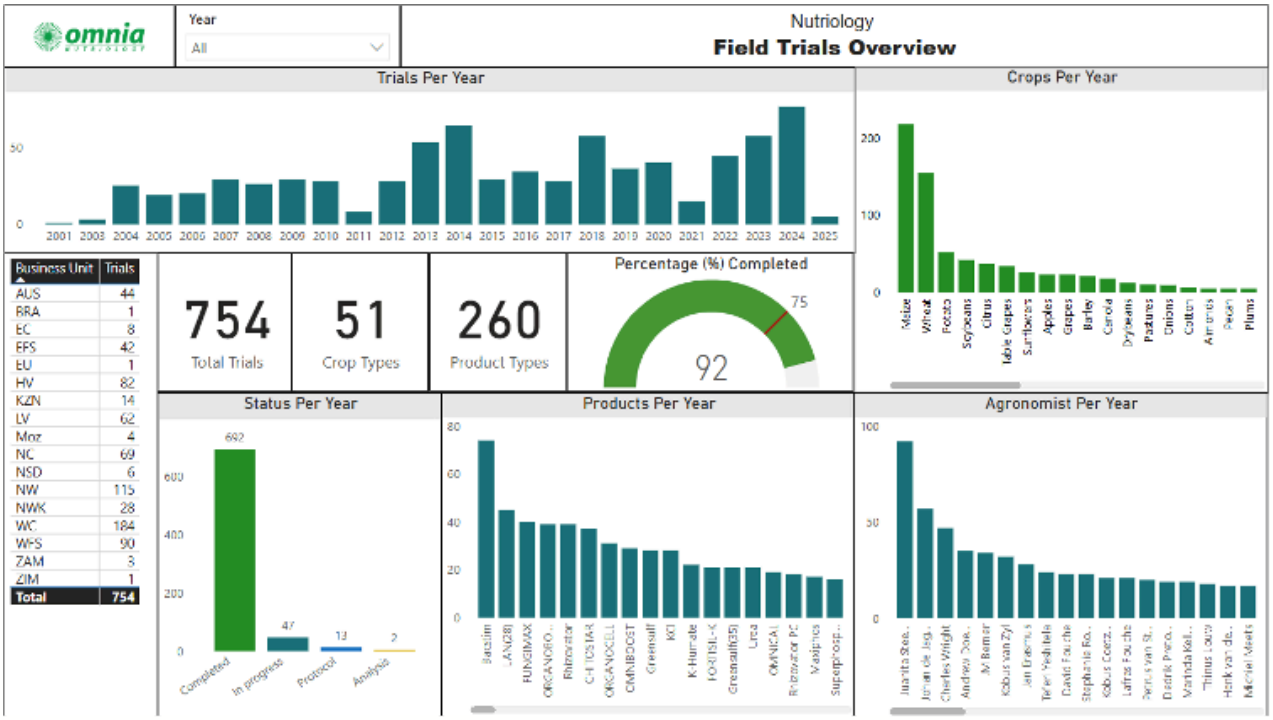


Figure 18. Field trials overview dashboard

AgTech Innovation: Developing Agronomic Solutions

Development and Innovation is dedicated to integrating advanced technologies into agronomy. Our AgTech solutions help farmers make smarter, data-backed decisions by leveraging:

- Remote Sensing & Satellite Monitoring – Providing real-time field insights for proactive nutrient management.
- Precision Application Technologies – Enabling targeted nutrient application for maximum efficiency.
- Digital Agronomy Platforms – Offering predictive modelling to support better farm management practices.

Solution Support for Agronomists

Our expertise extends beyond product development—we empower agronomists with the tools and knowledge they need to succeed. We provide:

- Technical Training & Knowledge Transfer – Ensuring agronomists stay ahead with the latest research and product advancements.
- Field & Digital Support – Delivering insights through digital dashboards and real-time agronomic guidance.
- Customised Nutrient Strategies – Helping agronomists tailor solutions for specific crop and soil conditions.

Driving Fertilizer Sales through R&D Excellence

At the core of our efforts is a direct impact on fertilizer sales. By integrating agronomic research with business objectives, we ensure:

- Market-Ready Solutions – Delivering validated fertilizer products that meet farmer needs.
- Stronger Value Propositions – Providing scientifically backed solutions that enhance customer confidence.
- Competitive Advantage – Setting our products apart with research-driven innovation.

Agronomic Development & Innovation combines scientific field trials, data management, AgTech innovations and agronomic support to ultimately drive fertilizer sales through impactful, research-backed solutions.

CENTRALISED INSIGHTS FOR AGRONOMISTS

The Nutriology®hub is the centralised dashboard where agronomists can access their solutions. These solutions come from our centralised database where all related data is integrated and securely stored. This allows our agronomists to track farmers progress against industry norms and implement necessary changes if they start deviating from the norm.

Fig 19: Nutriology® HUB dashboard

Monitoring dashboard

The custom-built mobile applications used by our agronomist to capture in field data feeds directly to our centralised database. Allowing our agronomists to generate a report for the farmer as they leave the farm. Furthermore, our agronomists use these interactive dashboards to show farmers how their nutrients have improved in the soil and the leaves over the years. This visual representation makes planning for the next season quick and easy.

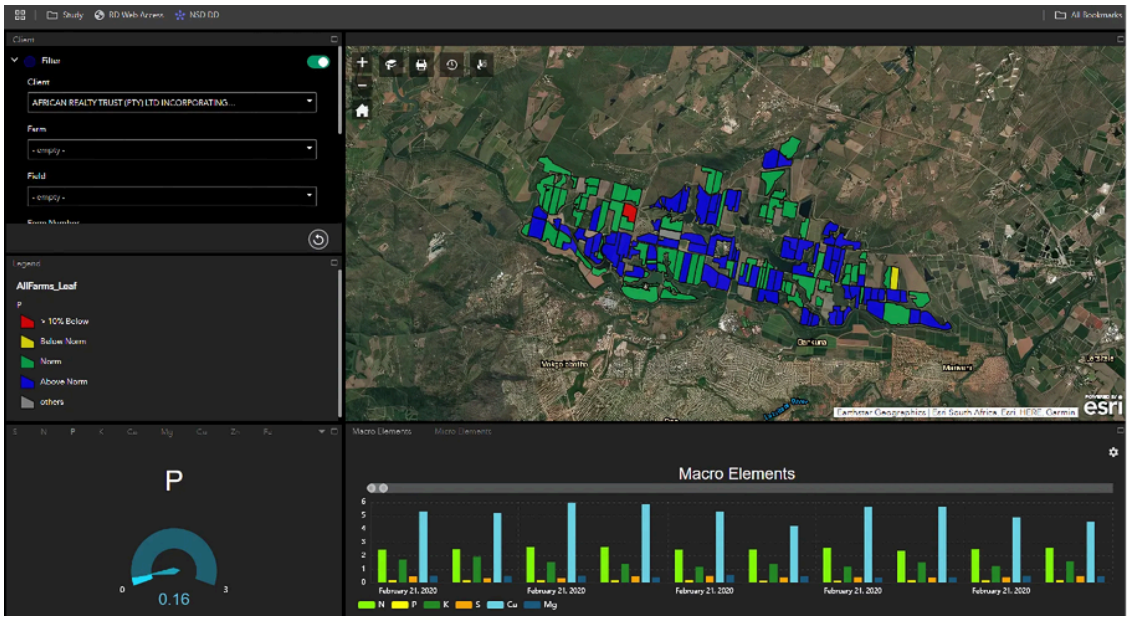


Fig 20: Example of leaf analysis dashboard

SPECIALITY PRODUCT MARKETING

At Omnia, the Nutriology Solutions Department (NSD) team is up to date and aware of the growing trends with a variety of products in most of the worldwide trending categories that reach our growers and farmers, especially during times of high crop demand. Among our very diverse Speciality Fertilizer product ranges are the OFOS® (Omnia's Optimized Fertigation System) specialised products, Gel Prisma® and OmniBio® ranges.

NSD's product development for Speciality Fertilizers is mainly driven by understanding the many challenges experienced on-farm, understanding the dynamics of those challenges and ultimately creating products that are scientifically sound to address those challenges. Besides identifying the challenges and addressing them, it is imperative for us to research, develop and bring innovative products to the market, where gaps are identified.

With the above-mentioned, products are formulated or sourced and tested rigorously for any stability and quality related issues. Once the product is stable, trials are performed at our greenhouse facility situated just outside of Omnia's Sasolburg South Factory. In addition, trials are also done on commercial farms in different regions of the country and on a wide variety of crops to better understand the functionality of the products developed. Once the NSD team is satisfied with the performance of the product, the product is then registered with the Department of Land Reform and Rural Development (DALRRD), ongoing training and more trials are performed on the product which forms part of our marketing campaign to launch the product into the market.

Figure 21: Representation of Trials at Omnia's greenhouse facility on Speciality fertilizer products: (a.) Microbial-based products on wheat (front) and maize (back) & (b.) Rhizovator PC on groundnuts.

OFOS® (OMNIA OPTIMIZED FERTIGATION SYSTEM):

OVERVIEW:

- OFOS® is a software-based system to optimize the use efficiency of plant nutrients under fertigation.
- The system is based on scientific principles (Michaelis-Menton) that allows specific concentrations of nutrients to be delivered to the plant at specific times.
- In relation to the software systems, there are also specific products that are added to two or three irrigation tanks as shown below

Figure 22. Typical OFOS™ product combinations

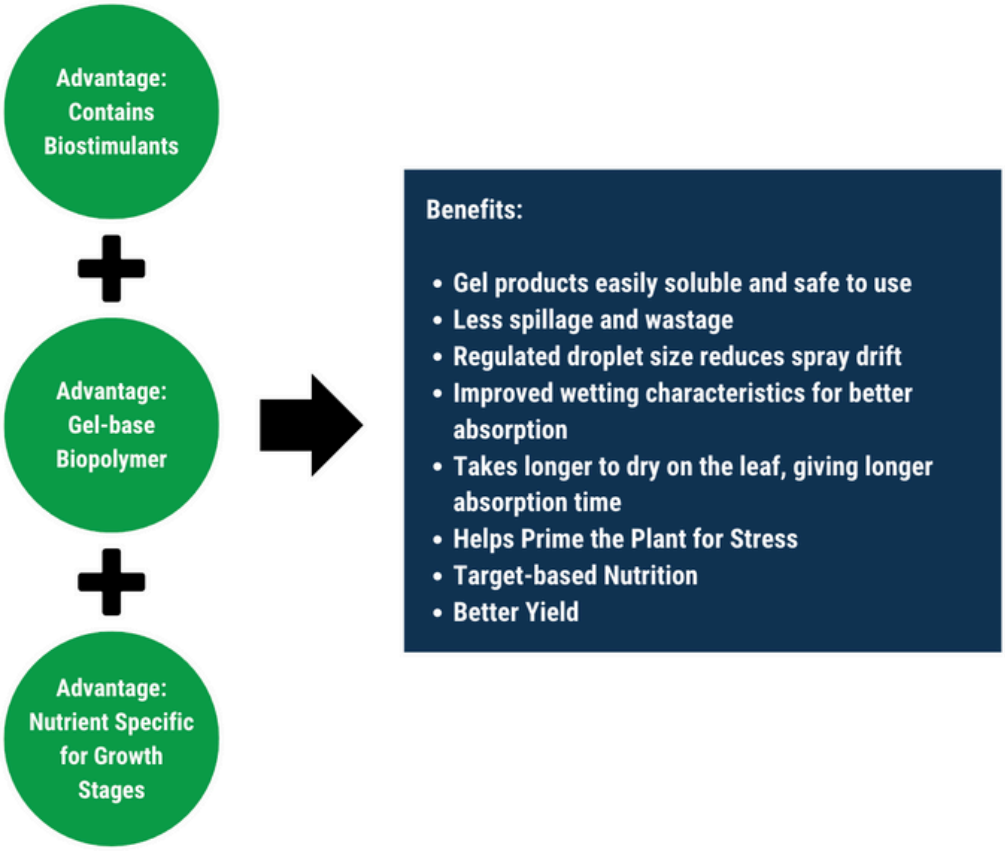
ADVANTAGES & BENEFITS OF OFOS®:

FOLIAR SPRAY INNOVATION:

OVERVIEW:

- The Gel Prisma® Range consist of unique foliar spray products that focus on targeted nutrition, specific growth stages and stress situations to ensure specific outcomes.
- The products originate from current solid-based products that are converted to gel using a biopolymer.
- In addition to the gel, biostimulants are also added to the Gel Prisma Range to prime the plant against abiotic stress that may be experienced during the season.
- After enormous efforts in formulating these products and performing trials, the Gel Prisma® Range was actively marketed and sold in the Summer of 2023.
- After only three seasons, there has been a huge success in the sales volumes as represented in the graph below.

ADVANTAGES & BENEFITS

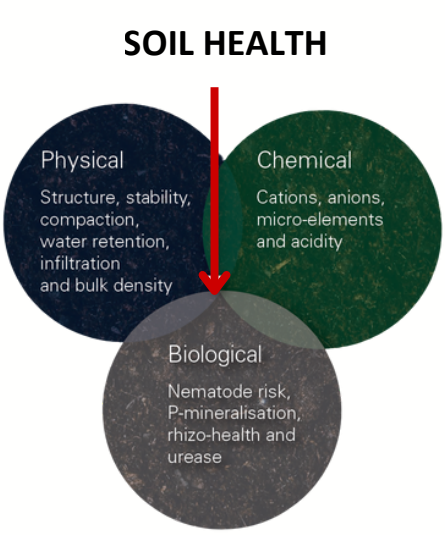


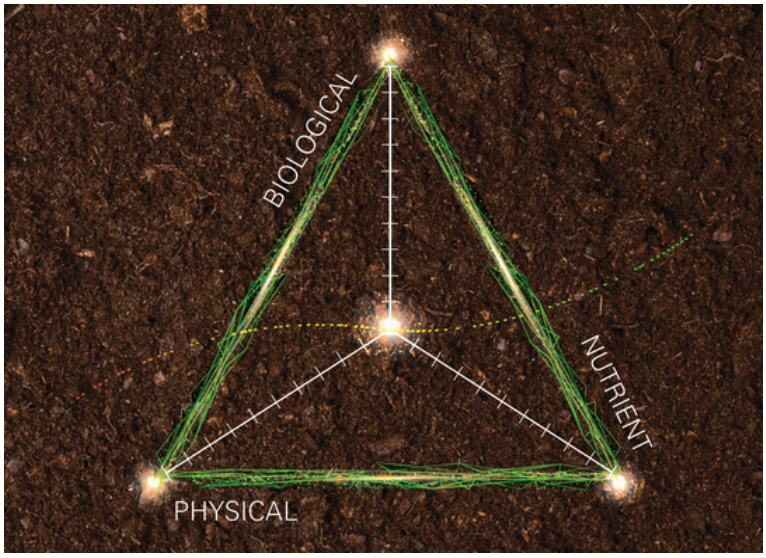
OMNIBIO®

SOIL HEALTH PRISM

Omnia's Soil Health Prism is a tool that has been developed to provide a holistic approach to soil health. The soil health prism is split into three main soil components i.e. physical, nutrient and biological. The NUTRIENT and PHYSICAL components have been widely studied, documented and accepted.

The BIOLOGICAL aspect of soil is not very well understood. However, Omnia's OMNIBIO® division has been researching this aspect for well over a decade to determine the most critical parameters to develop our biological component through the OMNIBIO® Index. The OMNIBIO® Index's biological component deals with critical factors that contribute to soil health. These factors (described below) in combination gives a good indication of the biological health of the soil.





OMNIBIO® INDEX ANALYSIS:

The OmniBio® laboratory analyses soil for key biological quality indicators, using various technologies to measure and interpret results in a simple report.

The following aspects are considered:

- **Nematode Risk Score**

Nematodes (type of eelworm) perform many functions at different levels of the soil food web. They may be beneficial or parasitic in the soil and to the crop. OmniBio® identifies and quantifies all nematodes extracted from soil and roots, determining the ratio of beneficial nematodes to pathogenic nematodes: a tool used to assess the risk. The score is based on the quantity and economical importance of plant parasitic nematodes.

- **Urease Score**

Urease is an enzyme that breaks down urea fertilizer into ammonium, providing plants with easily accessible N needed for growth.

A high urease score in the OmniBio® Index is an indication of a well-managed soil with high levels of organic compounds that can be converted to essential nutrients needed for higher yields. A high urease score is linked to good urea conversion and a healthy nitrogen and carbon count.

- **Phosphorous(P)-Mineralization Score:**

Phosphorous is an essential nutrient that is required in large amounts to ensure high yields and a healthy crop.

Phosphatase, an enzyme released by microbes and plants, converts phosphorous that is unavailable to the crop to plant available phosphorous. At OMNIBIO®, we can measure the phosphatase is in soil. A high Phosphorous-Mineralization score indicates high activity of phosphatase, creating soluble P needed for plant growth.

RHIZO-HEALTH SCORE:

A score is generated on general rhizosphere health which include the health of the roots and surrounding soil. Components that contribute to the rhizo-health score are enzymes indicative of the carbon, phosphorus and nitrogen cycles, the nematode risk score and, very importantly, active carbon.

The carbon aspect is measured by:

- **β-Glucosidase**

β-Glucosidase is an enzyme responsible for the breakdown of organic matter into simple glucose. This process plays an important role in the carbon cycle, providing carbon to help sustain a healthy microbial diversity.

- **Active Carbon**

Active carbon is a food and energy source for the soil microbial community and is positively correlated with the percentage organic matter, aggregate stability, and biological activity. High active carbon levels lead to an increased and balanced microbial community creating a healthy rhizosphere, therefore increasing the rhizo-health score.

- **Organic Carbon**

Soil organic carbon is known to improve physical structure as it forms aggregates that aid in water and nutrient retention. Therefore, it is the foundation of healthy and productive soils.

OMNIBIO® aims to protect soil health and biodiversity with the use of analytical services, microbial products, soil conditioners and biostimulants. OmniBio® determines the type and quantities of microorganisms present in the soil. This analysis not only leads to recommendations regarding the restoration of imbalances, using Omnia Nutriology's tailor-made products, but it also provides a baseline to monitor soils over time to determine whether sustainable practices are effective. Correction of imbalances and continuous monitoring lead to a more productive and sustainable soil environment.

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