omnia NUTRIOLOGY

NUTRIOLOGY®
SOLUTIONS DEVELOPMENT

Real-time data for on-time decision making.

www.nutriology.co.za

OMNIA Nutriology®

A holistic approach to crop production

www.nutriology.co.za

omnia NUTRIOLOGY

Nutriology® Solutions Development

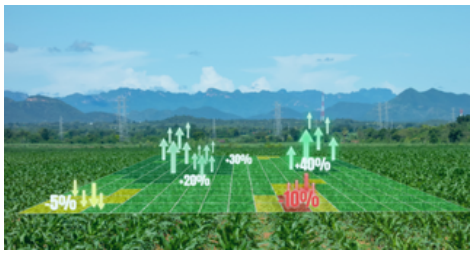
Omnia Nutriology® is based on twelve core principles that, in our opinion, will ensure the future success of all parties involved in our business, from our suppliers to our shareholders and customers. It is supported by the OMNIA Nutriology® Solutions Development department whose members constantly strive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

OMNI-PRECISE®

OMNI-PRECISE® enables farmers to make informed decisions by preventing under-fertilizing on high potential areas and over-fertilizing on low potential areas

OMNIRISK-IQ™

OMNIRISK-IQ™ is a risk management solution that models the cumulative probability or certainty of obtaining a specific yield in each zone of an OMNIZONE™ map.

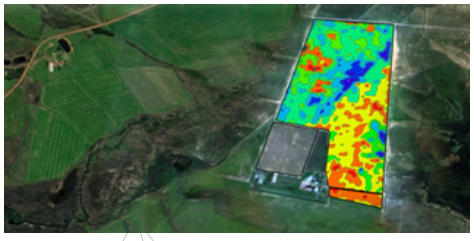


SUPER-5™

SUPER-5™ offer is a solution for monitoring fields and directing resources. The trend analysis will indicate which zones/ fields/ orchards pose a potential problem.

OMNIZONE™

Yield data, either from combine harvester yield monitors or satellite derived yield estimates, is the most reliable method to identify in-field variation



OMNIPIVOT™

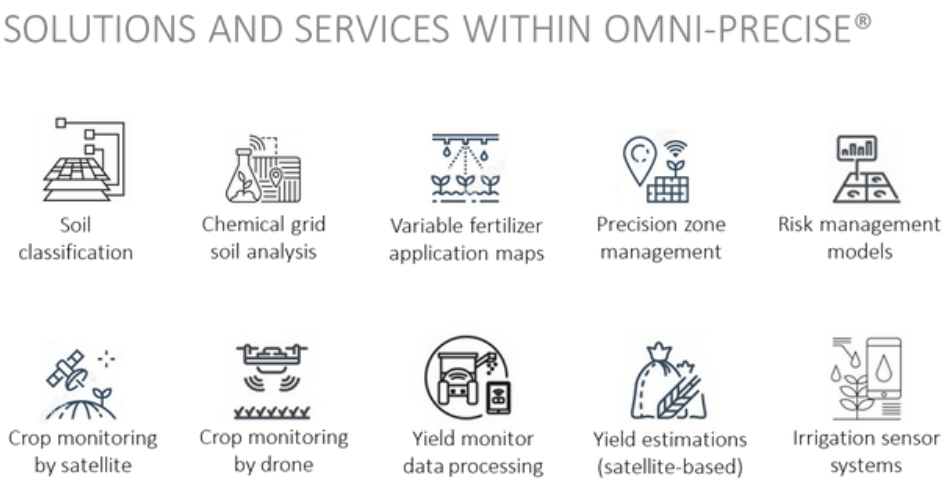
An irrigation scheduling solution that will enable farmers to make informed decisions when it comes to when and how much water to apply to their crops.

OMNI-PRECISE®

In an environment with rising production costs and shrinking profit margins, it is important for the farmer to optimise the management of all the resources at his disposal. OMNI-PRECISE® offers the solution. Using soil physical and chemical analyses, variable rate technology, zone management, proximal and remote sensing, OMNI-PRECISE®, 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.



SOIL NUTRIENT ANALYSIS

Topsoil (0-250 mm) and subsoil (300 – 600 mm) samples are taken on a grid pattern. The size varies from 0.25 hectares for intensive crops to 1.0 or 2.0 hectares for extensive crops. These samples are analysed by Omnia's Chemtech Laboratories and maps of the spatial distribution of the different soil attributes are generated. Samples are routinely analysed for soil cations, pH, sulphur (S), and phosphorus (P), with non-routine options for total N (nitrate-N and ammonium-N), micro-nutrients (Fe, Mn, Zn, Cu, Ni, Mo, B), organic carbon (C), 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. An example of chemical nutrient maps

SOIL CLASSIFICATION

Soil classification is done 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, suggested production withdrawal 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.

Soil mapping is a once-off process as the soil physical properties of soils only change over very long periods.

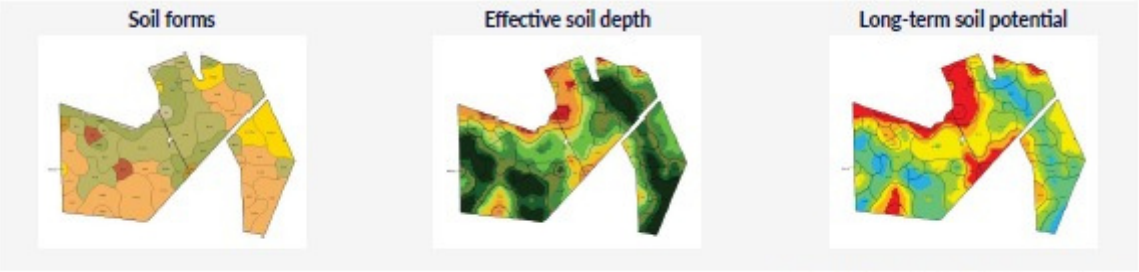


Figure 2. The mapping of physical properties of soils

VARIABLE RATE APPLICATION (VRA)

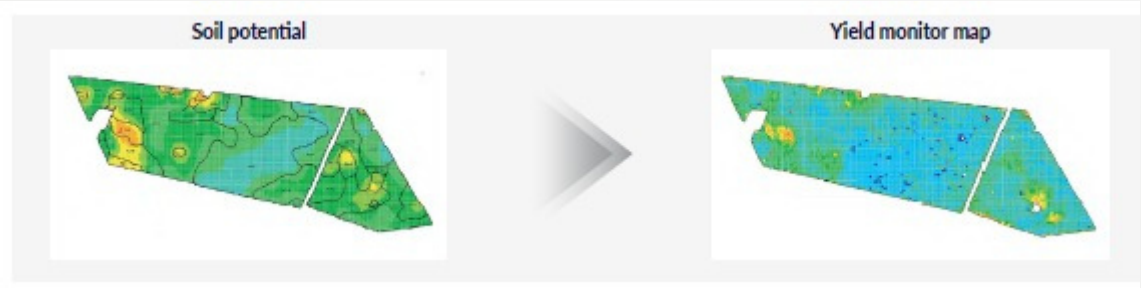
VRA prescription maps are based on selected soil physical and soil chemical properties and generated according to the Agronomist instructions. Prescriptions include variable rate maps for seed, fertilizer, lime, chemicals, and other soil amendments. VRA maps are exported in the specific format required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

YIELD MONITORING

Precision farming is currently regarded as the most promising agronomic approach towards sustainability. A direct correlation exists between soil potential and actual yield and therefore yield monitor data not only assists in the evaluation of soil properties,

but it is also used to support management decisions regarding variable application. 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.

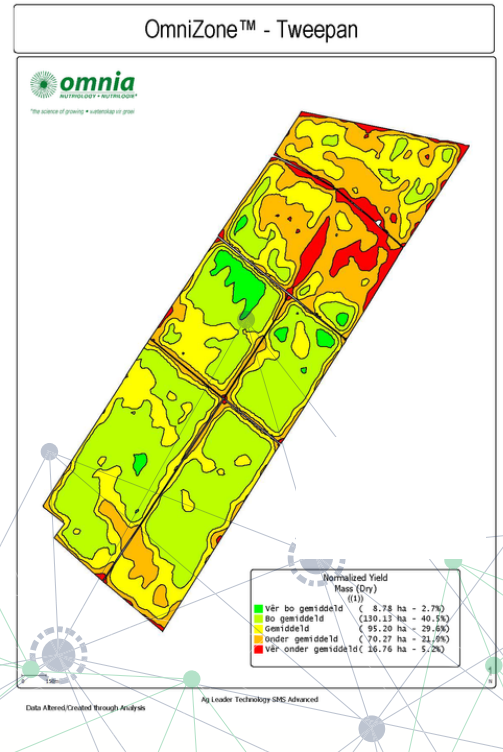


OMNIZONE™

A zone is an area within a field that responds much in the same way to certain inputs such as fertilizer or water. Yield data, either from combine harvester 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 multiple areas (or zones) with similar yield potential. OMNI-ZONE™ typically classifies the data into three (Above average, Average and Below average) or five (Far above average, Above average, Average, Below average and Far below average) management zones, according to the farmers preference.

The benefits include:

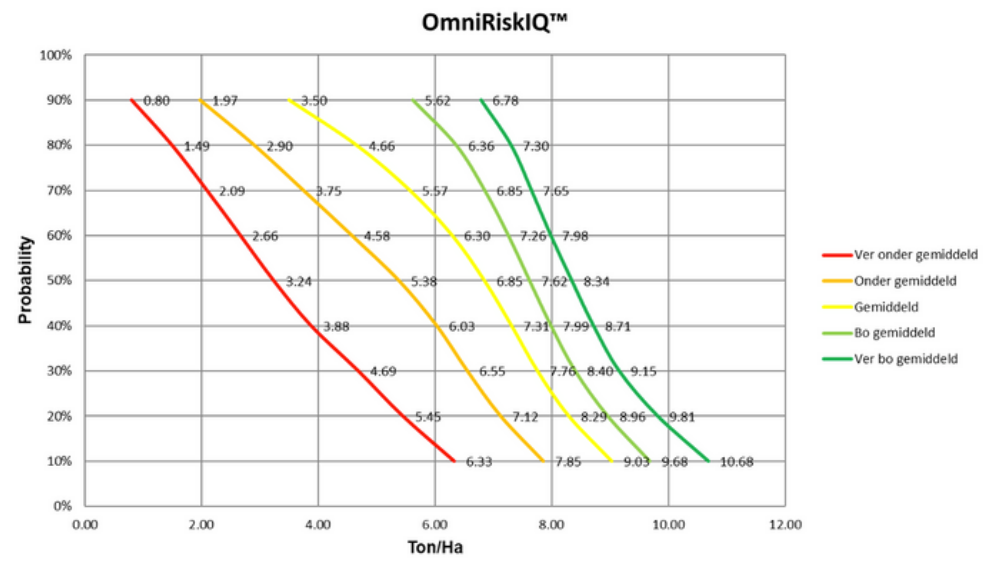
- Increased efficiency as inputs are only applied in the most effective zones
- Improved productivity of fertility limited soils
- Lowered input costs on low potential soils
- Reduced risk and increased profits
- Improved soil health and protected natural resources



OMNIRISK-IQ™

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 zone of an OMNIZONE™ map. These probabilities are statistically derived from yield data obtained during previous seasons. For crops that are harvested with combines that are not equipped with yield monitoring technology, crop yield is estimated using NDVI based algorithms.

This model shows the producer for instance which yield has a 50% probability of realising in each zone. In the "Far below average" yield zone (red), the yield potential according to the graph will be 3.24 t/ha, while for the "Average" zone (yellow) it will be 6.85 and for the "Far above average" zone (green)it will be 8.34 t/ha. The more information (seasons) used in this analysis, the more seasonal variation is taken into consideration to better quantify the risk. This information will assist farmers in preventing under-fertilization on high-potential areas and overfertilization on low-potential areas - in other words the right product, at the right time, in the right place, at the right rate. 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 management zones caused a real improvement and whether it was profitable.



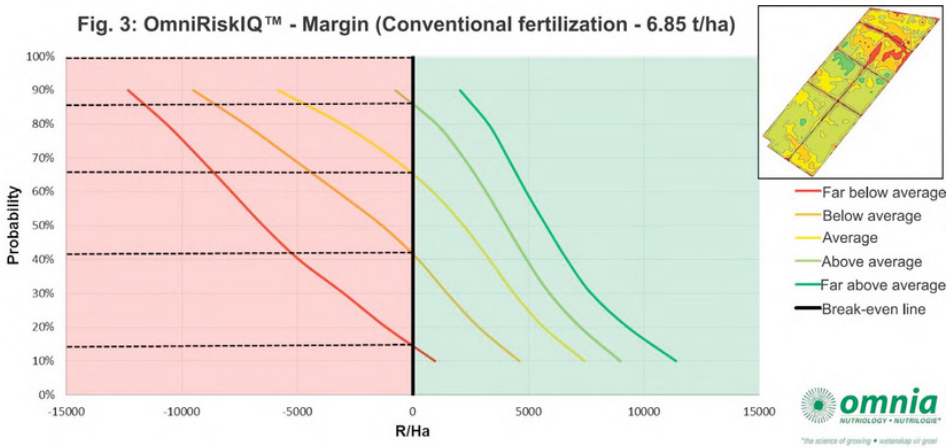
ECONOMIC ANALYSIS USING OMNIRISK-IQ™

From this example, it is clear how the OMNIRISK-IQ™ solution can assist farmers by spatially identifying how and where yield risk is distributed over a certain farm. The OMNIRISK-IQ™ model subsequently illustrates the various risks based on yield and the probability of realising it in a specific management zone. Everything that happens in the planning phase is necessary, but it doesn't take the prevailing economic aspects into consideration. This is surely one of the most determining factors in crop production. When the economic aspects are taken into consideration, the producer can calculate profitability per management zone and make final adjustments to the planning.

Two practices will be compared: variable fertilization (according to management zones) and conventional fertilization (based on average yield per farm). In this example, the average yield for maize over the last five years points to 6.85 t/ha. This will be the target yield for the conventional fertilization, whereas the target yield for the variable fertilization will be calculated by using OMNIZONE™ and OMNIRISK-IQ™. These two management strategies for maize will be compared by using two grain prices and different input costs where applicable.

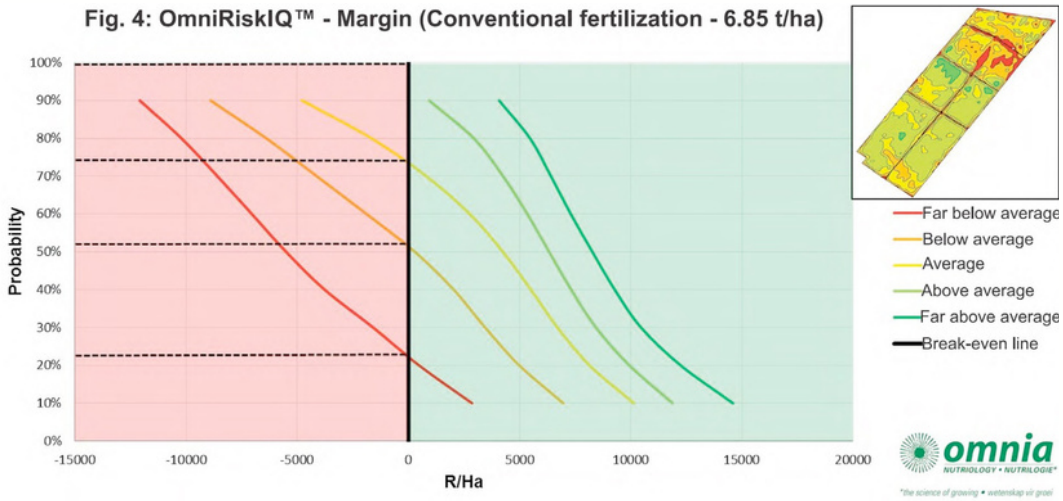
CONVENTIONAL FERTILIZATION

Figure 3 shows the margins for every management zone if all the management zones are fertilized using the same rate (conventional). The fertilizer rate was based on a yield of 6.85 t/ha across the entire farm. The total costs associated with this yield amounted to R14 245/ha or R2 080/tonne. The grain price, which was used to calculate income, was R2 400/tonne in the farmer's pocket, in other words a SAFEX price of approximately R2 650/tonne.



The black line on the graph represents the break-even point. The coloured lines represent the actual yields converted to income per hectare. Any part of a coloured line that lies to the left of the break-even point, means that losses will be incurred at those yields at the given input cost and grain price. Therefore, where the break-even line and the specific management zone cross, will be the minimum income that should be earned in that management zone to start making a profit. Where these two lines cross, a straight line can be drawn to the Y-axis to obtain a percentage. This percentage is an indication of the probability of making a profit in a specific zone, given the fixed input cost of R14 245/ha and a R2 400/tonne maize price. Figure 3 therefore shows the "Far below average" zone (red) has a 15% probability, the "Below average" zone (orange) has a 42% probability, the "Average" zone (yellow) has a 66% probability and the "Above and Far above" zones (light and dark green) have an 87% and 100% probability respectively to generate a profit at the specified input cost and grain price.

Figure 4 indicates the margins where the input costs were kept at the same level for the 6.85 t/ha fertilization, but where the grain price was calculated at R2 700 in the farmer's pocket. The higher grain price increased the probability of making a profit in the "Far below average" zone (red) from 15% to 21%, the "Below average" zone (orange)from 42% to 52% and the probability of the "Average" zone (yellow)to show a profit moved up from 66% to 74%. The "Above average" and "Far above average" zones both showed a probability of 100% to generate a profit. The OMNIRISK-IQ™ model also indicates that a R300/tonne increase in the grain price increased the profitability of the farm by between 6% and 10%. In this way, the target yield of 6.85 t/ha can also be adjusted in the OMNIRISK-IQ™ model to suit the farmer's risk appetite.



VARIABLE FERTILIZATION

In the case of variable fertilization, the input cost is calculated per management zone. These management zones will be tested against a grain price of R2 400/tonne. Figure 5 again shows the margins that can be reached given specific input costs and a grain price of R2 400/ tonne in the farmer's pocket. In this case, the probability of the lower yield zones to generate a profit is considerably higher than in the case of the conventional fertilizer approach. The reverse where the conventional approach stood a better chance to generate a profit, because the input costs were calculated according to the conventional approach at a much lower yield target of 6.85 t/ha, while the input costs for the variable fertilizer was calculated at yield targets of 7.62 t/ha and 8.34 t/ha (see Table 1). However, it is the lower yield zones that create a better opportunity for risk management, as these are the areas where greater financial losses are suffered. The higher yield zones are more of an opportunity for the producer than a risk.

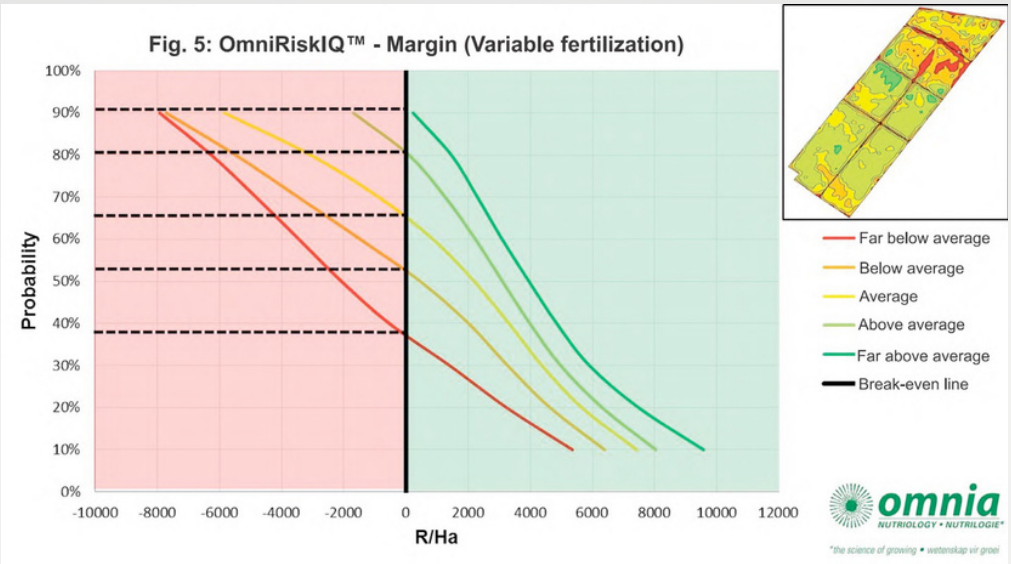


Table 1: Input costs and probability for profit with two fertilization strategies

	Conventional fertilization		Variable fertilization	
OmniZone™	Yield target	Probability for profit @R2 400/tonne	Yield target	Probability for profit @R2 400/tonne
Far below average	6.85 t/ha	15%	3.24 t/ha	38%
Below average	6.85 t/ha	42%	5.38 t/ha	52%
Average	6.85 t/ha	66%	6.85 t/ha	66%
Above average	6.85 t/ha	87%	7.62 t/ha	80%
Far above average	6.85 t/ha	100%	8.34 t/ha	92%

By using different scenarios in the OMNIRISK-IQ™ model, planning and risk management can be carried out more effectively. Every season should be carefully considered, especially under drought conditions. The risks and opportunities that the particular season might offer, should be accurately identified and managed to the benefit of the producer, according to his specific circumstances and risk appetite. Speak to your Omnia agronomist. Maybe your historic yield data can add real value to your business by making use of the OMNIRISK-IQ™ model.

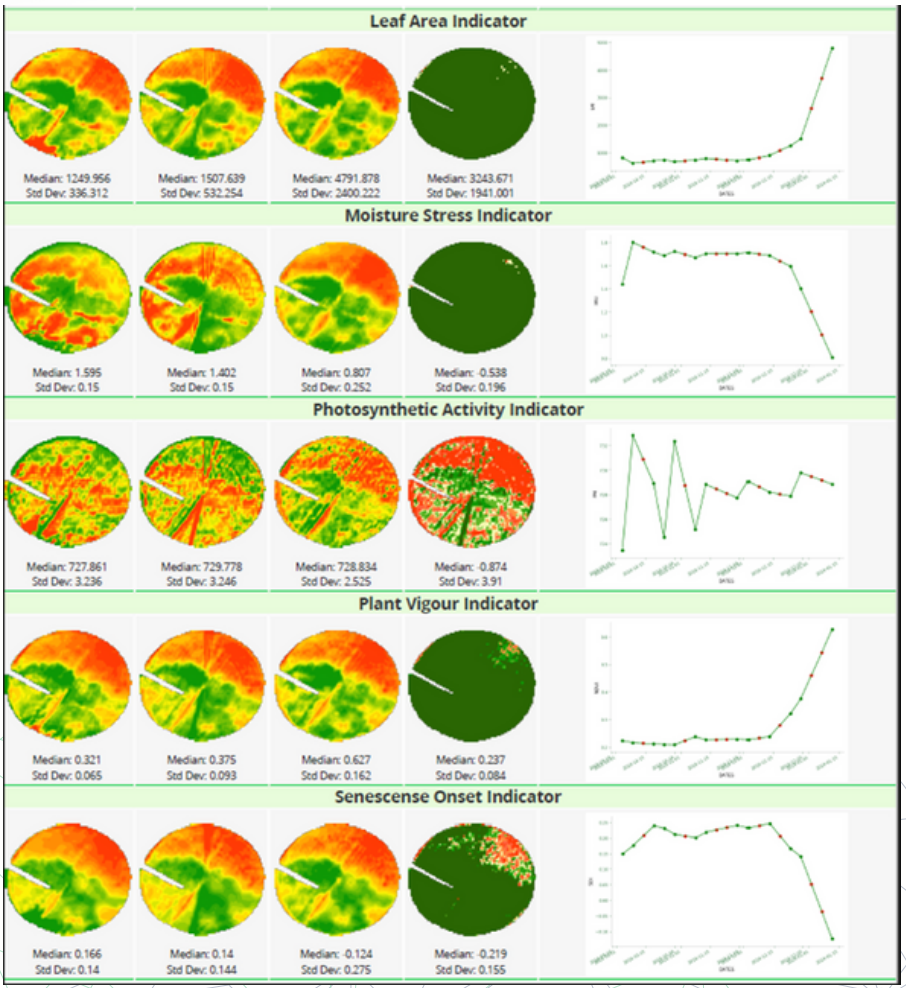
SUPER-5™

Remote sensing, especially satellite remote sensing, has become an integral and often prioritised part of precision farming. However, getting hold of relevant, contributing remotely sensed images and data in a specific, understandable, and affordable format is not always easy. The new Sentinel 2 satellite sensor with its red edge bandwidths, makes exciting new indicators (combinations of sensed absorbed and reflected wavelengths of light) available that adds hugely to interpreting specific types of plant stress.

Omnia Nutriology® and its remote sensing specialist partner, GeoTerra Image™, have developed a practical dashboard of five images and related pixel data to monitor plant stress during the growing season. It is readily available, easy to understand and quite affordable.

Figure 1 depicts an example of the SUPER-5™ satellite remote sensing monitoring solution report. The report is updated every 5 days and available via an online portal. Each report contains five indicators:

- The well-known NDVI as plant vigour indicator;
- Photosynthetic activity indicator (chlorophyll based);
- An indicator of leaf area index;
- A moisture stress indicator; and
- An indicator of early senescence (any early stress).



The online portal contains graphs showing the trends of all fields overlayed. This makes it possible to quickly identify fields that are falling behind the rest. The area's climatic conditions are also included to correlate whether certain trends or changes are attributed to climatic conditions.

The SUPER-5™ monitoring solution also includes a SPAD, nitrogen deficiency and yield estimation for certain crops.

The SUPER-5™ offer is an excellent solution for monitoring fields and directing resources. Within a moment the trend analysis will indicate which zones/fields/ orchards pose a potential problem. Detail is then on hand to drill down to the actual probable cause by cross referencing indicators. For instance, the increase of the early senescence indicator with the increase of the moisture stress indicator indicates moisture stress, while a combination of decreased leaf area, photosynthetic activity and an increase in the early senescence indicator is a sure indication of the presence of disease stress. Historical data is always available to use in correlation studies and even to develop site specific algorithms.

OMNIPIVOT™

The primary objective of irrigation scheduling (i.e., when to irrigate and how much water to apply) is to maximise plant growth, crop quality and crop yield. Advanced irrigation scheduling is a method of analysing real-time data to optimise irrigation and nutrient application decisions. Maintaining optimal soil moisture and nutrients throughout the growing season is critical to crop yield. This can only be achieved if irrigation management decisions integrate all variables in the irrigation system. These variables include factors such as rooting depth, root zone health, available soil moisture, fertilizing strategy, crop growth, crop health, irrigation system efficiency and weather conditions.

Omnia is proud to offer an irrigation scheduling solution that will enable farmers to make informed decisions when it comes to when and how much water to apply to their crops. The OMNIPIVOT™ system was developed for a vast range of crops grown specifically under centre pivot irrigation systems. This system can be installed on any pivot make or model and operates independently from the manufacturers software. The only prerequisite is access to a reliable cell phone network.

Irrigation recommendations are published on a customised web-based dashboard easily accessible from any computer, tablet, or smartphone. The dashboard's graphical interface is easy to use and provides additional information such as the geographical position of each centre pivot, as well as it's speed, water application rate and direction of travel. It also shows the cumulative amount of water applied against the recommendation and can also be filtered for specific irrigation cycles or crop growth stages.

The OMNIPIVOT™ system also includes an early warning function that gives farmers real-time warnings in case of irrigation system irregularities or failures. These warnings are sent via standard SMS communication protocols. The early warning systems can be customized according to the farmer's specific needs.
All the data captured by sensor nodes during the growing season is stored on a secure Omnia server. This data can be accessed for benchmarking, as well as to generate numerous irrigation reports, for example total amount of water irrigated (spatial and temporal) and water use efficiency (WUE).

The sensor network will be unique to each farm since the specific layout will be determined by the number of pivots and the number of Gateway Nodes and/or Rain Nodes that might be required. The cost for the sensor network (hardware) is a once-off investment and client will be invoiced once installation is completed. All sensor nodes and components have a limited one-month warranty after which the client will be responsible for maintenance costs and/or replacement. In addition to the sensor network, the client will be invoiced for a subscription fee per hectare per crop season for the solution itself.

This fee includes the following services:

- User access to a web-based dashboard;
- Irrigation recommendations for the selected irrigation cycle;
- Real-time early warning via SMS;
- Soil water content analysis at four sampling points per pivot; and
- The SUPER-5™ satellite solution, including 3 nitrogen recommendations during the growing season as well as a once-off crop yield estimate.

Our most valuable resource in South Africa today is water. And due to factors, such as climate change, the availability of this resource is steadily declining. As moisture levels in the soil is one of the biggest risk factors in crop production, it makes sense to use the technology available to ensure that the right amount of water is given at the right time. This will optimise yield and quality sustainably and make our most valuable resource last a little while longer.

CONTACT DETAILS

T: +27 (0)11 709 8888
E: fertilizer@omnia.co.za

OMNIA House
Building H, Monte Circle,
178 Montecasino Boulevard,
Fourways


Visit our website for
more information
www.nutriology.co.za

www.nutriology.co.za