

HARVESTLAB™ 3000 GRAIN SENSING

BETTER DATA FOR BETTER DECISIONS



JOHN DEERE

NOTHING RUNS LIKE A DEERE

BETTER SITE-SPECIFIC ARABLE FARMING
WITH SOUND DATA

MORE SPECIFIC PLANNING OF CULTIVATION AND FERTILIZATION



Grain Sensing makes it possible to continuously monitor the harvest quantity and product quality of the threshed crop in real time during the harvest using the HarvestLab 3000 sensor.

The new solution from John Deere provides insights into the work done, supports better nutrient management, helps with variety selection and facilitates storage and targeted marketing of the crop.



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BETTER SITE-SPECIFIC ARABLE FARMING WITH SOUND DATA

MORE SPECIFIC PLANNING OF CULTIVATION AND FERTILIZATION

A combine harvester is the first step to begin your journey to more sustainable farming solutions. It provides yield maps and, with the addition of near infrared grain sensing technology, it can measure protein content as well. Together, this helps to plan other actions throughout the agricultural cycle.

Political directives for more sustainability, such as the Green Deal and the EU Commission's Farm-to-Fork strategy, make additional demands on farm managers. They therefore have to optimize yield, quality and production, ensure high nitrogen efficiency and avoid costly management errors.

Conventional yield maps of threshed crops provide no information as to whether the quality potential of a site is also exploited, even if they show uniform yields across the field, because site-specific analyses often show large deviations in yield and constituents across the field. This means, a lot of profit is at stake.

With Grain Sensing from John Deere, the site-specific quantity and product quality of important threshed crops can now be determined in real time during the harvest. The system provides high-quality data that clearly shows the distribution of the measured yields and constituents in the field. Indications of possible management errors can also be derived from this data. With Grain Sensing, the combine thus becomes not only an advanced data harvester, but also a fault finder.

Grain sensing represents an important further development for combine harvesting — from pure yield measurement to the additional measurement of constituents. In this way, farming practices can be corrected and high qualities can be achieved more uniformly across the field. The knowledge gained also makes it possible to store and market harvest batches more selectively, to choose the most suitable varieties for the site and to better plan nitrogen fertilization in subsequent years. In this way, Grain Sensing provides a more sound basis for decision-making. The data helps farmers to exploit additional potentials, to save money or earn more money through higher qualities, and to achieve an even better balance between profitability and sustainability.

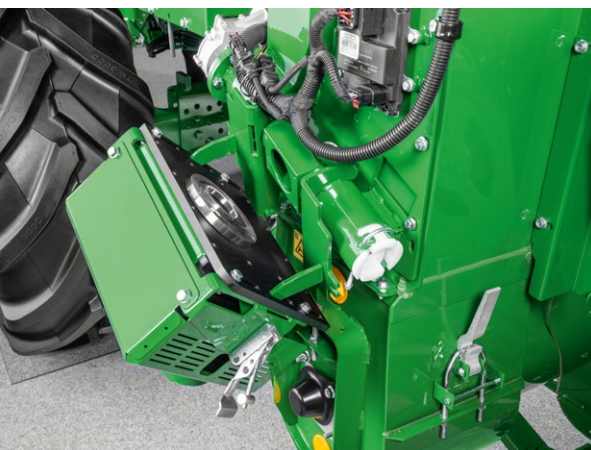




REAL-TIME MEASUREMENT OF CONSTITUENTS ON THE COMBINE

MEASURING PRODUCT QUALITY DURING THRESHING ...

With Grain Sensing, relevant constituents of important crops are measured directly on the combine during the harvest. At the John Deere Operations Center™, the site-specific data is then analyzed and visualized. Continuous sampling in real time provides information that can be used immediately.



The sensor is installed
at the bottom of the
grain tank elevator

HARVESTLAB™ 3000 AT THE HEART

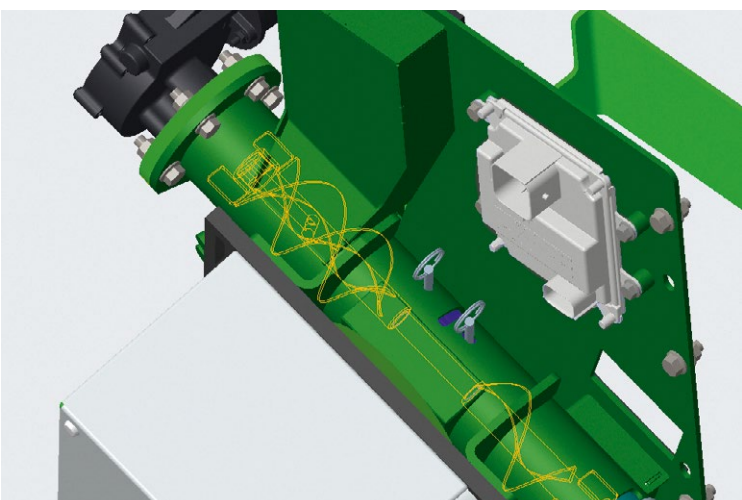
Grain Sensing is based on the measurement of constituents using very precise near-infrared spectroscopy (NIR). The heart of the system is the highly sensitive HarvestLab™ 3000 sensor which measures the near-infrared light reflected by the crop and provides one data point per second. A calibration is prepared for individual crops on the basis of the measured spectra and reference analyses, so that the sensor does not have to be recalibrated for each crop.

FOR S-SERIES AND T-SERIES COMBINES

The HarvestLab™ 3000 sensor is available for selected John Deere combines. For use on the combine it requires not only the sensor and a hardware kit for mounting, but also the Grain Sensing calibration, the Combine Display, the JDLink™ connectivity agricultural management system solution for synchronization of the automatic data transfer to the John Deere Operations Center™ and a StarFire™ receiver.



**GRAIN SENSING STANDS
FOR REAL-TIME MEASUREMENT
OF YIELD AND CONSTITUENTS
EVEN DURING THRESHING.**



The kernels are transported directly in front of the sensor using an auger.

KERNELS ARE TRANSPORTED PAST THE SENSOR

The sensor is installed at the bottom of the grain tank elevator. Before the kernels enter the grain tank, they are transported directly in front of the sensor using a motor-driven auger. Together with the StarFire™ receiver, site-specific data can be created on the Combine Display and automatically synchronized with the John Deere Operations Center™ in real time via JDLink™. There, the results of the harvest can be checked with functions such as Analyze and Field Analyzer.

REAL-TIME MEASUREMENT OF CONSTITUENTS ON THE COMBINE

... INTUITIVE AND INFORMATIVE

COMBINE DISPLAY AS AN INFORMATION CENTER

The easy-to-use, intuitive Combine Display is the combine's information center. A wealth of data is available on the display, including real-time measured values for yield and constituents, totals and averages for each field and field load, and mapping during the harvest.

VISUALIZATION THANKS TO THE OPERATIONS CENTER

The Operations Center is John Deere's farming management portal for collecting and visualizing agronomic and machine-specific information. Here, farmers have an overview of all the essential information and can take fact-based decisions quickly and easily.

The Operations Center connects farmers to their machines and fields from one central location. It can also be connected to partner software using standard interfaces such as John Deere API to gain further information or create prescriptions for future fertilization.

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**THE SITE-SPECIFIC DATA
CAN BE READ OFF DIRECTLY
FROM THE COMBINE DISPLAY
EVEN DURING THRESHING.**



Work Totals ? i				
Field Totals				
F12 C Fa				
Canola Crop				
	7.93 %	4.57 t/ha	19.49 %	
	Moisture	Dry Yield	Protein	
Load				
Moisture Dry Yield Protein				
#1 7.93 % 4.57 t/ha 19.49 %				
Custom Totals				
Edit Columns				

Work Monitor				
09:54				
Current				
#1				
Moisture				
7.93 %				
Dry Yield				
4.57 t/ha				
Protein				
19.49 %				
Canola				
Dry Weight 17.25 t				
Protein Avg 19.5 %				
Oil Avg 37.8 %				
Variety ---				
Area Worked 3.70 ha				
Moisture Avg 7.93 %				
Dry Yield Avg 4.57 t/ha				
Dry Weight 17.25 t				
1122.8 ha				
56.8 ha/h				
0.0 t/ha				

PRACTICE-ORIENTED SOLUTION

What is the difference between NIR analysis on the combine and that in the laboratory? A laboratory analysis cannot measure field-specific differences because it only gives one data point per 2 to 4 hectares on a 20-tonne trailer, based on a yield per hectare of 5 to 10 tonnes. That is not a sufficient data basis for precision farming measures. NIR analysis on the combine harvester has a completely different significance. By contrast, with manual sampling, NIR analysis samples are taken and measured continuously. One data point per second allows data to be measured every 8 to 30 square meters, depending on the ground speed and cutterbar width. The heterogeneity of product qualities in the field can thus be reliably documented.



COMPARING YIELD AND QUALITY MAPS

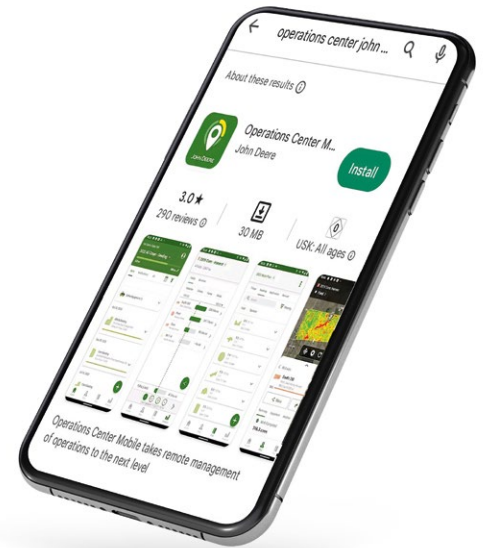
In the Operations Center, the farmer can view and download yield, moisture, oil, protein and starch maps and compare or overlay the maps. In addition to access via a web browser, the platform can also be accessed with a mobile device. The farmer can therefore access the maps via his smartphone and make harvest-relevant decisions already in the field.

The Combine Display shows a wealth of data including real-time measured values for yield and constituents

SITE-SPECIFIC INFORMATION ON THE HARVEST QUALITY

MEASURE CONSTITUENTS OF IMPORTANT CROPS

Grain Sensing provides information on the site-specific crop quality of the individual fields. The data forms an important basis for optimized crop production and improved marketing and documentation. Last but not least, the farmer gets clarity about the work done, such as the effect of fertilization.



SITE-SPECIFIC KNOWLEDGE OF THE PRODUCT QUALITY

With Grain Sensing, the protein, oil and starch content and the moisture of selected crops can be measured within defined spectra. This means farmers get site-specific information on the harvest quality of individual fields, enabling them to do the following:

- They know whether the wheat is of bread or fodder quality and can thus store batches separately according to quality.
- They get better documentation of the harvest, as the grain quality is recorded at every single point in the field and farmers can decide directly where their grain is to go.
- They gain new information for comparing varieties or validating machine settings.
- They get an overview of the areas of the field where nutrients (e.g. nitrogen) have been successfully converted into yield and protein or oil in order to better plan the fertilization for the next season.
- They can market qualities better, for example according to the protein content in wheat, the starch content in barley or the oil content in rape seed. Farmers can take this decision already during the harvest.

- They can determine whether they are meeting their yield and quality targets by looking at the absolute quantity or distribution in the field and can make comparisons with previous years.

CROP	CONSTITUENT	RANGE (%)*
Wheat	Moisture	7 – 25
	Protein	7 – 20
	Starch	57 – 73
Barley	Moisture	8 – 20
	Protein	8 – 17
	Starch	56 – 67
Canola	Moisture	3 – 20
	Protein	37 – 53
	Oil	13 – 28
Corn	Moisture	13 – 45
	Protein	6 – 16
	Starch	50 – 76
	Oil	2.5 – 16
Soy	Moisture	7 – 26
	Protein	28 – 55
	Oil	13 – 27

* Based on John Deere internal data set (Status 2023), calibration performs outside of the ranges but values are not validated. Performance can be improved with calibration updates.



This provides farmers with useful site-specific information on the harvest quality of the individual fields.



The measuring accuracy of the HarvestLab™ 3000 sensor can be validated with a single sample.

CHECK THE MEASUREMENT ACCURACY YOURSELF

There can always be deviations in the measured values. Even laboratory analyses based on different analytical solutions and methods may show small differences in the results. In order to validate the measurement accuracy of the HarvestLab™ 3000 sensor, the farmer or contractor can take an individual sample at the combine. To do this, a bottle is attached to the auger to take a sample and at the same moment the data on the HarvestLab™ 3000 sensor is saved. The sampling function collects high quality and accurate samples. The samples can then be compared with a reference or laboratory device and the values corrected on the machine display, if necessary.

BETTER STORAGE AND MARKETING OF THE HARVEST

With the Grain Sensing data, the farmer can already take important decisions in the field.

BENEFIT FROM KNOWLEDGE WORTH ITS WEIGHT IN GOLD

Grain Sensing provides important insights for better marketing of grain and oilseed crops, for example through targeted sorting and mixing of batches. There is also a quantifiable benefit for storage management, because with Grain Sensing, optimum use can be made of the storage capacities on the farm.

INCREASING REVENUES WITH THE RIGHT MEASURES

In many countries, quality parameters such as the protein content of wheat or the starch content of barley are rewarded with premiums or subject to discounts, depending on the intended use. For quality wheat, a minimum protein content is required to receive the full price, while for malting barley, too high a protein content results in price reductions. Grain Sensing provides the farmer with the necessary information already during the harvest. With this knowledge, he can increase his revenues by, for example, blending batches so that they have the required qualities.

A TIME ADVANTAGE THAT PAYS OFF

With Grain Sensing, the qualities of the crop are transmitted to the Combine Display in real time during threshing, and the farmer doesn't have to wait for them until the analysis by the agricultural trader. This gives him an important time advantage. With Grain Sensing, the farmer immediately gets an impression of the quality of the threshed crop, can act specifically in the field and market the crop better or store it optimally.

STRAIGHT FROM THE FIELD TO THE RIGHT UNLOADING POINT

Many farmer uses the data from the Grain Sensing system for optimum rape seed marketing. By knowing the oil content, it is possible to already decide at harvest time which contract can be best served. The loaded trailers are then sent straight from the field to the right unloading point.

With knowledge of the constituents, batches of the same quality can be stored on the farm.





BETTER MARKETING AND STORAGE

The advantages of knowing the quality of the crop already during the harvest are obvious:

- The farmer can separate batches already in the field to get a better price or store the kernels according to quality.
- He knows what is on the trailer or truck when it leaves the field for the grain dealer or warehouse.
- He can deliver batches to the agricultural trade in the required quality and to take advantage of quality bonuses to get a higher price.
- He doesn't have to separate batches in the warehouse on suspicion and can make optimum use of his storage capacities.
- He can store batches of the same quality – according to oil content in the case of rape seed and according to protein content in the case of wheat.
- Last but not least, he gets more confidence in his decisions.

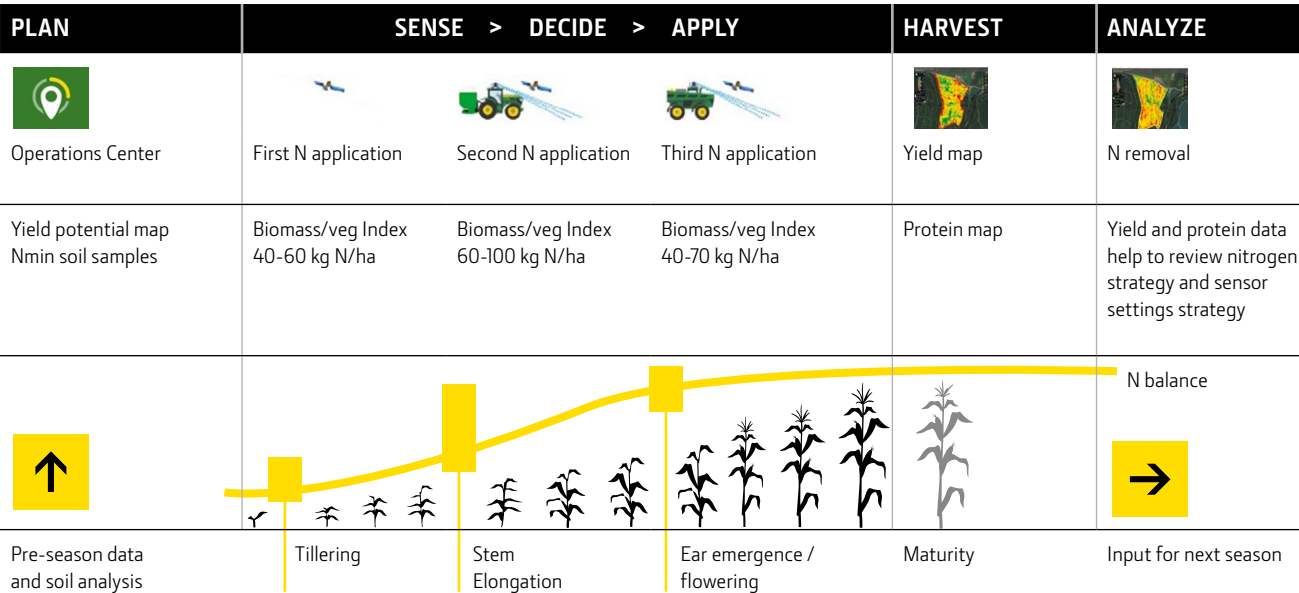


Batches can be delivered to the agricultural trade in the required quality in order to take advantage of quality bonuses.

BETTER PRODUCTION THANKS TO BETTER
NUTRIENT MANAGEMENT

ADAPT YOUR FERTILIZER
STRATEGY – ON THE BASIS
OF DATA AND WITH CONFIDENCE

Grain Sensing not only reveals optima and deficits in yield and quality within the field. With the new solution from John Deere, the farmer also gets an overview of the amount of nutrients removed, especially nitrogen.



Great attention is paid to nitrogen
fertilization in arable farming.

Nitrogen fertilization is in the spotlight in arable farming, not only with a view to higher yields and better qualities. Stricter EU regulations to reduce nitrate concentrations in soil and water and to avoid ammonia emissions must also be observed. The consequences of climate change are adding to this, as they are also narrowing the time windows for the application of fertilizers and liquid manure.

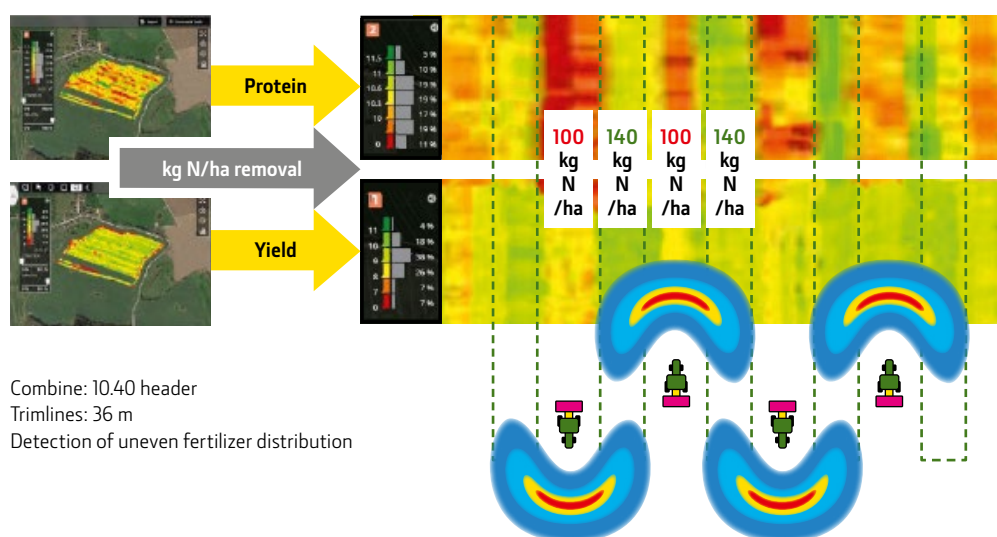




NITROGEN EFFICIENCY IS BECOMING INCREASINGLY IMPORTANT

A central parameter for adapted fertilization is nitrogen efficiency. It provides information as to how much yield is achieved per unit of nitrogen. Knowing the nitrogen efficiency is becoming increasingly important, all the more so when you consider the dynamic fertilizer markets. Every percentage improvement in nitrogen efficiency means an additional profit per hectare by saving fertilizer. The aim is to apply the right amount of fertilizer at the right time to every part of the field. The result is not only more yield and better qualities, but also lower emissions of climate-damaging greenhouse gases.

**SETTING ERRORS
ON FERTILIZER SPREADERS
CAN LEAD TO LARGE
DIFFERENCES IN QUALITY
IN THE FIELD, WHICH ARE
OFTEN NOT APPARENT
FROM YIELD MAPS.**



ACHIEVE HOMOGENEOUS QUALITIES

Fertilizing can still be more efficient on many farms. In many places, setting errors on fertilizer spreaders and slurry tankers as well as management errors lead to large differences in quality in the field, which are often not apparent from yield maps. Yield and quality maps obtained with Grain Sensing show that high-yield areas of the field do not necessarily also produce high quality. The goal is homogeneous quality over the entire field. Grain Sensing helps achieve this goal.

OIL	45%	38%
PROTEIN (at 9% moisture)	15%	22%
YIELD (at 9% moisture)		
3.0 t/ha	70 kg N/ha	103 kg N/ha
4.5 t/ha	105 kg N/ha	154 kg N/ha

Changed according to LTZ Augustenberg

PROTEIN in DM	10%	15%
YIELD (at 14% moisture)		
6.0 t/ha	91 kg N/ha	136 kg N/ha
9.0 t/ha	136 kg N/ha	203 kg N/ha

Changed according to LTZ Augustenberg

Depending on the yield and the protein and oil content of the fruit, different amounts of nitrogen are removed with the harvest.

BETTER PRODUCTION THANKS TO BETTER NUTRIENT MANAGEMENT

PROTEIN AS AN INDICATOR FOR NITROGEN FERTILIZATION

The yield is only a first step in assessing the nitrogen supply. The protein content of the crop is also highly significant, as it is an indicator of nitrogen saturation and thus also of the nitrogen fertilization. On this basis, the nitrogen removal by the crop can be determined in kilograms per hectare.

AVERAGE FIGURES ARE NOT ENOUGH

The data obtained with Grain Sensing provide site-specific information on the nutritional status of the crops. But if you only know the average qualities of a field, you cannot fully optimize the ingredients through site-specific fertilization. By precisely determining the constituents with Grain Sensing, the nitrogen removal from the field can be calculated for each site. The farmer can also use the data to assess whether his nitrogen applications have brought the desired results. Not only can the figures be used to derive an environmentally sound, site-specific quality fertilization – they are so accurate that they can also indicate errors in fertilization.

NITROGEN SURPLUS TABLE

FIELD DETAILS	FIELD AVERAGE	80% RANGE
Yield (14% moisture)	6.9 t/ha	4.1 – 8.9 t/ha
Protein (in DM)	13%	12.2 – 14.2%
Nitrogen removal (kg N/ha)	135 kg N/ha	85 – 170 kg N/ha
Fertilisation (kg N/ha)	175 kg N/ha	160 – 190 kg N/ha
N balance (kg N/ha)	+40 kg N/ha	20 – 75 kg N/ha
NUE (N removal / N feed)	77%	53 – 90%

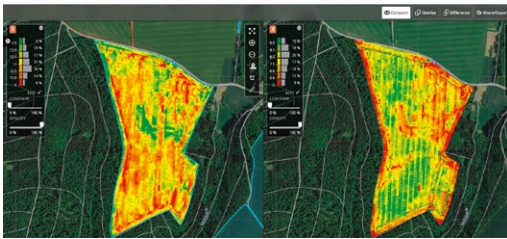
Grain Sensing reveals not only differences in yield and quality, but also gives indications of nitrogen surpluses.

Sometimes it may be sufficient to place the fertilizer closer to the plant.



DATA HELPS TO TAKE THE RIGHT DECISIONS

The reliable and precise Grain Sensing data are important tools for the farmer in making the right decisions and adapting fertilization and other management measures even more precisely to the site-specific conditions. The result can be, among other things, spreading the fertilizer closer to the plant or the best possible adaptation of the application time and the dosage of nitrogen to the nutrient requirements of the plants, the soil conditions or the yield potential.



SUSTAINABLY OPTIMIZING YIELD AND QUALITY

In order to know exactly how much nitrogen has been removed by the kernels and how much needs to be replaced, the site-specific yield and protein or oil content must be known. Only with knowledge of this data can the fertilizer application be sustainably optimized for the next harvest. If you know and understand the trends on your own land, you can apply coordinated amounts of fertilizer to achieve your yield and quality targets.



DERIVING THE RIGHT FERTILIZATION STRATEGY

Why is knowledge of the nitrogen efficiency so important? The data is an important basis for the farmer and his advisor to realistically assess yield and quality and to determine the actual amount of nitrogen to be applied. The Grain Sensing data also support the farmer in planning the crop for the following season. Now he can objectively assess the nitrogen efficiency of his fertilization and derive a site-specific fertilization strategy adapted to yield, protein or oil content.

IDENTIFY FAVORABLE AREAS AND REALLOCATE FERTILIZER TO AREAS WITH YIELD & QUALITY POTENTIAL

Variable, site-specific nitrogen application produces higher yields and better qualities and is efficient, environmentally sound and economical. To achieve this, the zones in the field where the crops respond insufficiently to nitrogen must be identified. There, the application rate can be reduced without significant yield risk. The nitrogen saved can then be applied in areas that respond positively to fertilizer application, thus increasing yield and qualities across the field.

OPTIMIZE YIELD AND QUALITY THROUGH
SITE-SPECIFIC MAPPING

UNDERSTANDING
AND PRODUCING QUALITY

Farmers who know the constituents of their crop at every point in the field have a clear advantage. This is because they can use site-specific fertilization to specifically promote those constituents that bring the best financial reward.



	OIL	45%	38%
	PROTEIN (at 9% moisture)	15%	22%
YIELD (at 9% moisture)			
3.0 t/ha		70 kg N/ha	103 kg N/ha
4.5 t/ha		105 kg N/ha	154 kg N/ha

Changed according to LTZ Augustenberg

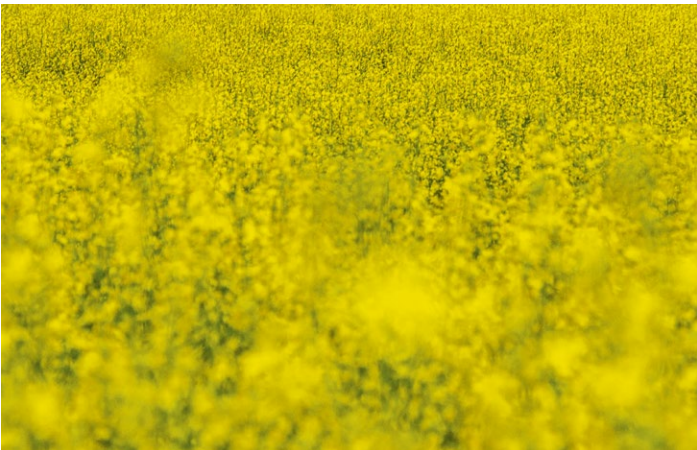
In oil crops, such as rape seed, the protein and oil content have a negative correlation.

FOCUS ON NITROGEN

All nutrients and other environmental factors have an influence on the yield and quality of crops. However, no other nutrient influences quality as much as nitrogen. Nitrogen fertilization, for example, increases the protein content in every crop. Many farmers see a high protein content as a measure of successful nitrogen fertilization. This is not always true, because a higher protein content can easily go hand in hand with a lower content of another important constituent like oil in rape seed.

RAPE SEED: NITROGEN CONTENT
DETERMINES PROTEIN
AND OIL CONTENT

What many farmers are not aware of is that in oil crops, such as rape seed and sunflower, the protein and oil content have a negative correlation. This means that a higher protein content causes a lower oil content. If the yield and thus also the protein content are increased in these crops through fertilization, the additional application of nitrogen can be disadvantageous because it reduces the oil content. Lower payout prices for the oil crop are then the result.

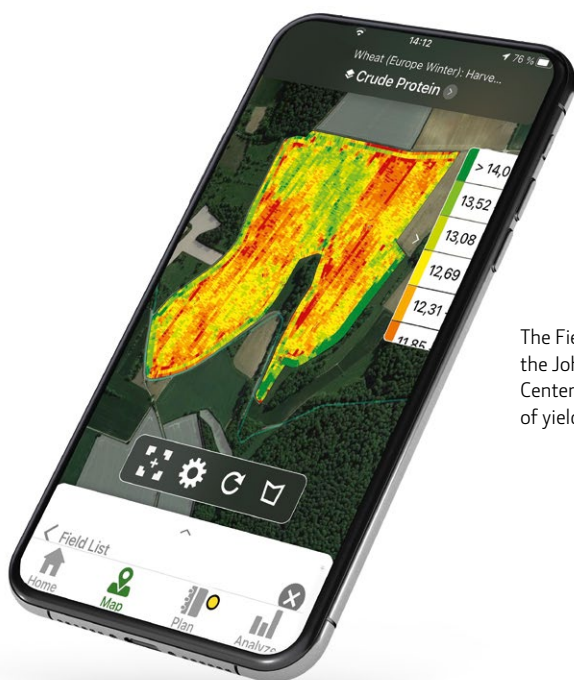




No other nutrient influences quality as much as nitrogen, increasing for example the protein content in every crop

MALTING BARLEY: TOO MUCH FERTILIZER CAN COST MONEY

Sometimes a lot of nitrogen is also given to the malting barley. But here, too, too much nitrogen can be detrimental to the yield, because too high protein content reduces the extract yield of the malt. During brewing, cloudiness can form in the beer, which is undesirable for lighter beers.



The Field Analyzer in the John Deere Operations Center allows the comparison of yield and quality data

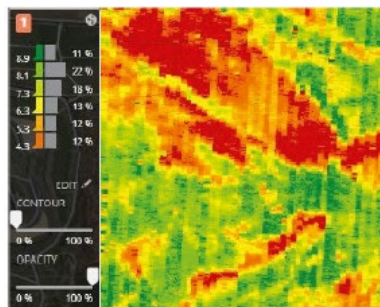
USEFUL ANALYSIS TOOLS IN THE JOHN DEERE OPERATIONS CENTER™

The John Deere Operations Center™ provides analysis tools for viewing field zones. Yield and quality data can be compared using the comparison function in the Field Analyzer. Based on this, the map legend scales are adjusted and the data analysis is split between high and low yield or quality.

OPTIMIZE YIELD AND QUALITY THROUGH SITE-SPECIFIC MAPPING

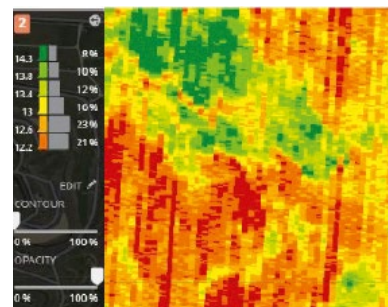
IN A WHEAT FIELD, THE YIELD AND QUALITY DIFFERENCES CAN FLUCTUATE WIDELY

YIELD DOCUMENTATION



Average yield (6.9 t/ha)
Yield range (4.1 – 8.9 t/ha)*

PROTEIN DOCUMENTATION



Average protein (13%)
Range of protein (12.2 – 14.2%)

YIELD AND QUALITY MAPS REVEAL DIFFERENCES

Nitrogen efficiency therefore also plays a central role when it comes to quality. Yield, protein and oil maps produced with Grain Sensing show clear differences in yield and quality across the area in many fields. Site-specific quality measurement with Grain Sensing can show where too much or too little fertilizer has been applied in the field and where the farmer should adjust or counteract. Mapping with Grain Sensing enables site-specific optimization not only of yield, but also of protein and oil content, and also allows statements to be made about possible fertilization and management errors.

CORRELATION OF OIL CONTENTS & PROTEIN

Winter oilseed rape, example Northern and Eastern Germany

CRUDE PROTEIN (%)	OIL (%)
Ø 15	Ø 44.7
17.3	42.7
16.3	43.6
15.6	44.1
15.1	44.6

WHEN YIELD MAXIMISES, ADDITIONAL USE OF NITROGEN

PAY ATTENTION ALSO TO THE PRE-CROP

The previous crop can also have an influence on quality parameters. For example, rape seed: the previous crop, winter wheat, can remove more nitrogen from the soil than the previous crop winter barley due to a longer standing time. This can result in rape seed having a lower oil content after winter barley than after winter wheat, as more nitrogen was available in the soil. If the farmer applied additional nitrogen fertilizer here, this was at the expense of his revenue.

* 80% of the values are in these ranges

IMPORTANT CONCLUSIONS FOR OPTIMIZATION

The yield and protein maps allow important conclusions to be drawn for optimizing the management:

- If the crop does not show a response to nitrogen fertilization, either in yield or in protein content, other stress factors such as limited moisture or poor soil may be the reason.
- Low yield and high protein content may be due to excessive late nitrogen application. To achieve a higher yield, the amount or timing of nitrogen fertilization should be adapted.
- A high yield with low protein content indicates medium-late to late nitrogen stress. The amount of nitrogen or the fertilization timing should be changed to get a higher protein content.
- A high yield and protein content do not have to be the optimum in all cases. Adapted nitrogen application can improve yields and qualities or safeguard potentials.

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THE GRAIN SENSING MAPS SHOW THAT IN RAPE SEED, THE PROTEIN AND OIL CONTENT HAVE A NEGATIVE CORRELATION.



INTENSITY	REVENUE (€/ha)	N COSTS (€/ha)	N COST-FREE revenue (€/ha)
High (4 t/ha, 42% oil)	3.200	459	2.741
High (3.86 t/ha, 42.6% oil)	3.116	324	2.792

Scenario 2023: rape seed 800 €/t at 42% oil, nitrogen 2.7 €/kg, yield expectation 4 t/ha; rapool study (www.rapool.com)

The example proves that a high intensity of nitrogen fertilization in rape seed does not always pay off.

Oil in %

Pre-crop:
Barley

Pre-crop:
Wheat

Loads		Field Totals	
Current		Field	
#1		Canola	
Moisture		Dry Weight	7.77 t
Avg 7.90		Protein	Avg 19.3 %
%		Oil	Avg 38.0 %
Dry Yield		Variety ---	
Avg 3.10		Area	Worked 2.51 ha
t/ha		Moisture	Avg 7.90 %
Wet Weight		Dry Yield	Avg 3.10 t/ha
7.77		Dry Weight	7.77 t
t			
SETUP	AUTO WORK ON	AUTOTRAC OFF	GUIDANCE VIDEO SWAP TRACK SYNC

THE PREVIOUS CROP, HERE WINTER BARLEY OR WINTER WHEAT, CAN ALSO INFLUENCE IN THE OIL CONTENT OF RAPE SEED.



MAPPING HELPS IN SELECTING THE RIGHT VARIETY FOR THE SITE

The new variety produces unsatisfactory results. What could be the reasons?

FINDING THE RIGHT VARIETY

The new wheat variety does not produce the desired yields. Is the variety the reason for the unsatisfactory results? Here, too, it may be worth taking a look at the yield maps obtained with Grain Sensing, because they may indicate completely different reasons than the variety.

WHAT CAN YOU DO IF THE VARIETY IS UNSATISFACTORY?

On paper, the wheat or rape seed variety delivers first-class results. In the variety trials of the official advisory service, it can shine with above-average yields and qualities. On your own fields, however, it does not fulfil the expectations. Why? Is it the variety or other factors, such as site characteristics or management errors?

ONLY SITE-SPECIFIC ANALYSES CAN PROVIDE THE ANSWER

A wheat or rape seed sample taken from a trailer cannot be used to answer this question. That is because you often don't know from which part of the field the kernels originate. Such a sample therefore also does not allow any statement to be made as to whether the variety can exploit its genetic potential on the entire field or only on parts of the field. This is even more true if the field has a high degree of heterogeneity with many different soil types. Only the site-specific analysis of yield and constituents with Grain Sensing shows where the variety performs below or above average in the field.

THERE CAN BE VARIOUS REASONS

Such an analysis can give clues as to why the variety shows unsatisfactory results and whether these may not be due to the variety at all. The reason can be over-fertilization or under-fertilization, too high or too low seed density, lack of water or other reasons. The results of the analysis make it possible to assess the potential of the variety more realistically and to identify possible reasons for the poorer yields.

FINDING THE RIGHT VARIETY WITH GRAIN SENSING

How can a farmer use this knowledge? With the help of the John Deere Operations Center™, he can evaluate different varieties he grows on his land in terms of yield, protein, starch or oil. Based on this knowledge, he can then select the right variety that will give him the best yield and quality for his site.



**GRAIN SENSING CAN HELP
IN FINDING THE RIGHT
VARIETY FOR THE SITE**



PRECISE DATA FOR SOUND DECISIONS

CARRYING OUT AND EVALUATING YOUR OWN FIELD TRIALS

Many farmers carry out their own field trials to compare varieties, fertilizers or tillage on their land. The analysis of the field trials with Grain Sensing helps farmers to optimize the management of their land on a site-specific basis.



***MANY FARMERS CARRY OUT
FIELD TRIALS IN ORDER
TO BE ABLE TO DRAW
COMPARISONS.***

CARRY OUT YOUR OWN FIELD TRIALS

Farmers carry out their own field trials for a variety of reasons: to test a new variety, to get clarity on a promising fertilizer strategy, to determine the appropriate seeding density or before deciding on a new tillage method. It is often farmers who use precision farming technologies. They hope that the field trials will provide them with the necessary site-specific knowledge to obtain an optimum yield of high quality from their fields.



**FIELD TRIALS WITH HIGH SIGNIFICANCE
CAN BE CARRIED OUT WITH GRAIN SENSING.**

RELIABLE INFORMATION FOR RELEVANT DECISIONS

Structured planning of the field trials is crucial. The more precise the data obtained, the more reliable the information and the more suitable it is for making sound, farm-relevant decisions. Often the farmer does not take the decisions alone, but is supported by a crop advisor who, like the farmer, is grateful for precise and meaningful data.

GRAIN SENSING ALLOWS MEANINGFUL FIELD-SPECIFIC STATEMENTS

Grain Sensing supports farmers with precise site-specific information on yield and crop qualities when evaluating and interpreting the data. The data can be for example, to prove how much the protein content reacts to nitrogen fertilization or what content of constituents a new variety has compared to a variety that has proven itself in the field. This allows valid statements to be made about management on a field-specific basis. Through the John Deere Operations Center™, farmers are also offered the opportunity to connect to external software from a partner company that can support them in setting up and analyzing field trials.

FAQ

GRAIN SENSING AT A GLANCE

FOR WHICH COMBINES IS GRAIN SENSING AVAILABLE?

Grain Sensing is currently available for selected John Deere combines*.

WHAT TECHNOLOGY IS NECESSARY ON THE COMBINE?

Apart from the HarvestLab™ 3000 sensor, a hardware kit for installation, the Grain Sensing calibration, the Combine Display, the JDLink™ connectivity agricultural management system solution and a StarFire™ receiver are needed.

HOW DIFFICULT IS THE INSTALLATION OF THE SENSOR HARDWARE ON THE COMBINE?

Installation of the equipment is not difficult and can be done in a few hours.

HOW ACCURATE ARE THE MEASURED VALUES OF THE CONSTITUENTS?

The HarvestLab™ 3000 sensor measures one value every second. The measurements are correlated with calibration curves for the measured constituents. The quality curves were validated with wet chemical analyses to guarantee the correlation between the NIR sensor and the laboratory process. The sensor is highly precise and provides consistent values during threshing as it continuously measures the harvested kernels, as opposed to randomly taken samples on the trailer.

HOW DOES THE SENSOR MEASURE THE CONSTITUENTS?

HarvestLab™ 3000 uses the near-infrared technology to measure the light reflection of the threshed crop. The values obtained are correlated using calibration curves to determine the values of the constituents.

CAN THE SYSTEM MEASURE CONSTITUENTS OVER A BROAD SPECTRUM?

With Grain Sensing, the protein, oil and starch content and the moisture of selected crops are measured within defined spectra. The sensor can also measure outside the specified ranges, but John Deere cannot guarantee accuracy as it has not been validated for this.

WHAT ADVANTAGES DOES THE GRAIN SENSING DATA HAVE OVER A LABORATORY SAMPLE?

The Grain Sensing data has a much higher significance because it also captures site-specific differences in the constituents. While a laboratory analysis of each trailer only records one data point per 2 to 4 hectares, Grain Sensing measures data every 8 to 30 square meters.



WHAT GENERAL BENEFITS DOES GRAIN SENSING OFFER THE FARMER?

The farmer can make better decisions based on the better data.

MY LABORATORY RESULT OR REFERENCE ANALYSIS IS DIFFERENT FROM THAT WITH GRAIN SENSING. HOW CAN THAT HAPPEN?

Each measuring device has its own accuracy, which depends on the method and the available data. Laboratories can perform complex and highly accurate wet chemical analyses, while other instruments such as the Perten and Foss instruments use NIRS. The time required for calibration and software updates can also lead to small differences between reference methods. To compensate for these small differences, it is possible to add an offset factor on the G5 CommandCenter display.

ARE MAPS AVAILABLE WITH THE YIELD AND QUALITY DATA MEASURED ON THE INDIVIDUAL FIELDS?

The data is stored in the John Deere Operations Center™ and is available for viewing, printing, analysis and sharing with advisors.

WHO HAS ACCESS TO THE INFORMATION ON THE MONITOR?

The farmer has control over the data in the John Deere Operations Center™. The display data can be uploaded to the Operations Centre, where the farmer determines who has access to the data. All Deere Data privacy policies also apply to this solution.

WHAT BENEFITS DOES THE SITE-SPECIFIC INFORMATION ON THE HARVEST QUALITY OF THE INDIVIDUAL FIELDS HAVE FOR THE FARMER?

The farmer benefits in many ways:

- He can store batches separately according to quality and market them in a more targeted way.
- The harvest is better documented, as the kernel quality is recorded at each individual point in the field.
- He gains new information for comparing varieties or adjusting machine settings.
- He gets an overview of the areas of the field where nitrogen has been successfully converted into yield, protein, oil and starch and can thus better plan fertilization for the next season.



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