



PRECISION AG INSIGHTS FROM FREQUENT IMAGING

SMARTER FARMING THROUGHOUT THE SEASON

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1. A NEW ERA OF HIGH-FREQUENCY SATELLITE IMAGERY

Of all the inputs that can help farmers maximize yields, the most critical is information. Both agronomists and growers understand that access to the right data is essential to support informed crop management decisions. With the reliance on data increasing, high-frequency satellite imagery is emerging as a key source of reliable information for precision agriculture, providing the ability to:

- Cover large growing areas across the globe
- Deliver field-level detail to observe spatial variability
- Ensure data is up-to-date across the season
- Inform decisions at key stages of the crop production cycle

1. A NEW ERA OF HIGH-FREQUENCY SATELLITE IMAGERY



1.1 ENABLING ADVANCES IN PRECISION AG

The combination of broad-area coverage, field-level detail, frequent in-season revisit rates, and rapid availability has not always been possible.

With today's advances in computing and satellite technology, it is now becoming a reality. The result is a continual stream of satellite data that can provide valuable input at each stage of the farm management workflow.

The result is more sustainable, efficient, and productive agriculture at every step of the crop cycle.





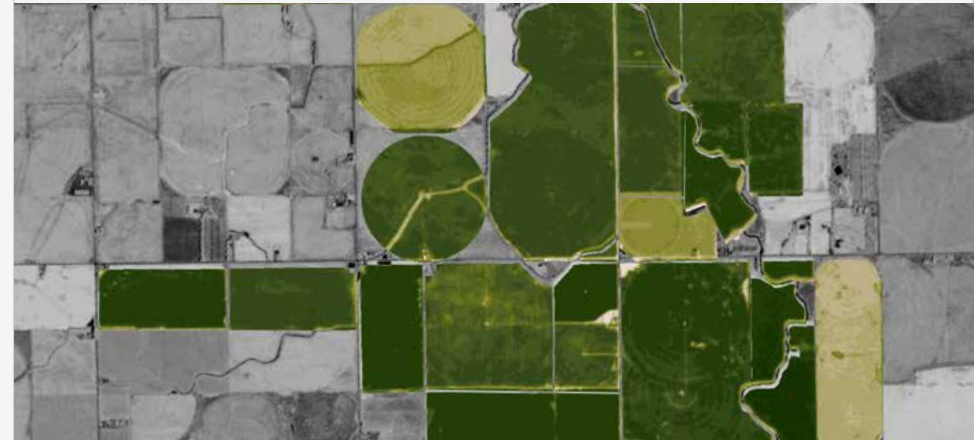
1. A NEW ERA OF HIGH-FREQUENCY SATELLITE IMAGERY

1.2 TURNING IMAGERY INTO INSIGHTS

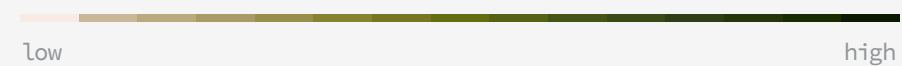
Satellite imagery captures light reflected from farmers' fields. Crops reflect specific spectral signatures at different stages of the season which serve as a baseline for crop health and can indicate anomalies in the growing cycle.

If vegetation is damaged or loses vitality, the amount of reflected light changes. Those changes can be detected and mapped, helping farmers to target scouting, localize treatment, and optimize inputs for those areas.

Light reflected in different wavelengths is used to create vegetation indices such as vitality, biomass, or chlorophyll content, among others.



Vitality index (measure of vegetation cover and health)





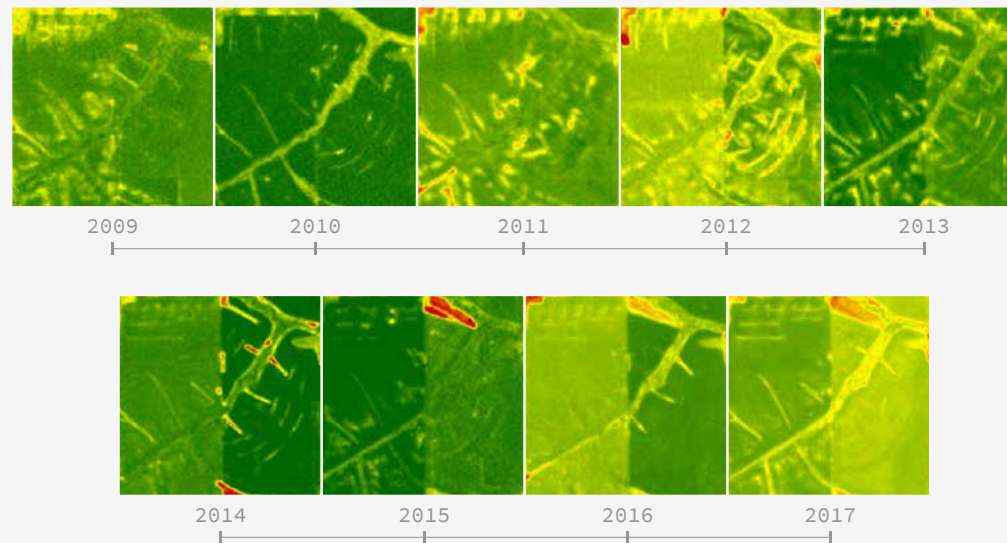
2. PLANNING

At the planning stage, access to crop productivity maps derived from satellite imagery collections over a multi-year period can be helpful. When mined for predictive insights, these annual maps can help growers optimize field productivity by identifying in-field patterns and localized trends.

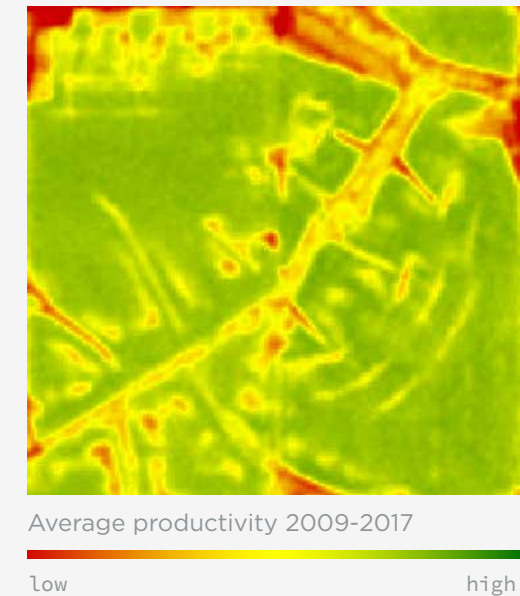


2.1 PRODUCTIVITY ANALYSIS

Delineating management zones in fields is an essential first step in planning the application of inputs. Vegetation indices calculated from historical imagery can be used to create baselines for in-field variation of crop productivity. Site characteristics such as topography or soil properties affect productivity and can be identified to improve planning and practices.



Average annual NDVI productivity showing historical field output.



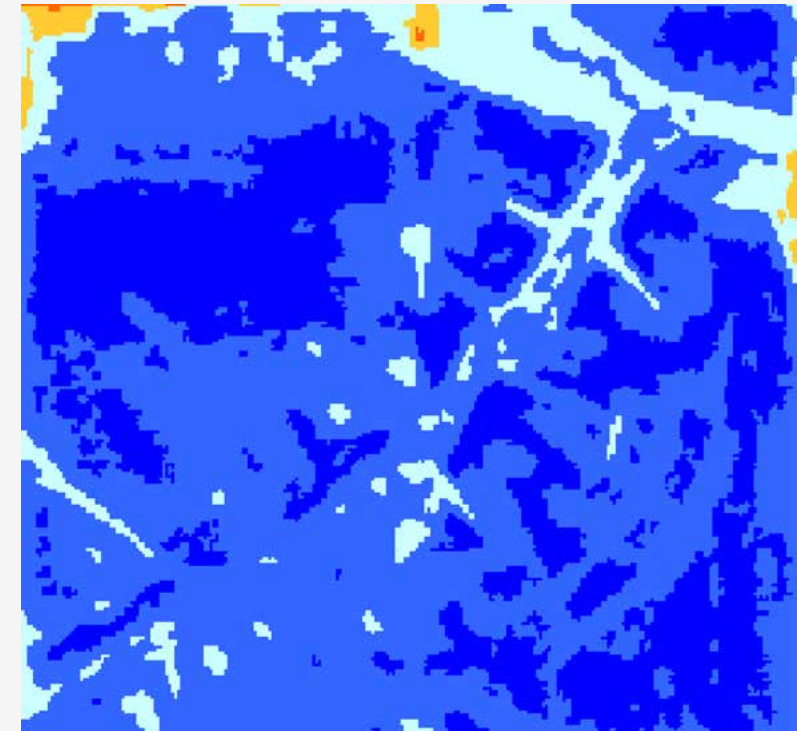


2.2 MANAGEMENT ZONE DELINEATION

With this information, agronomists can set site-specific crop production goals and recommend addressing different parts of the field in appropriate ways. If crop performance is historically lower in one management zone due to nutrient deficiency or water scarcity, planning for fertilization or watering can take that information into account.

This practice not only improves yield and output prediction, but also helps farmers avoid over-application and save costs.

Management zones derived from historical productivity



Average output





3. EARLY SEASON OPERATIONS

Growers must determine the optimum amount of seed to apply in the different parts of their fields to establish healthy and productive crops. Data derived from imagery can provide insights into soil properties, past crop production, and other factors that inform seeding decisions.





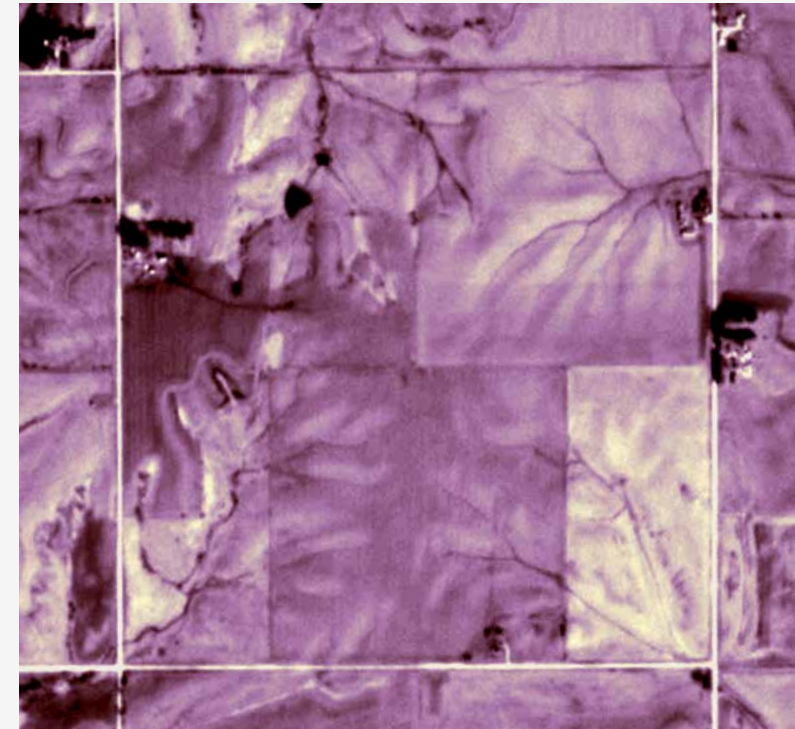
3.1 SOIL PREPARATION

Access to recent archives of satellite imagery helps agronomists and their customers design seeding strategies according to historical productivity and stable soil zones.

Spectral indices derived from imagery of bare soil fields describe the combined effects of soil type, organic matter content, and soil moisture to provide a relative measure of average water holding capacity.

Darker soil readings may indicate greater nutrient and moisture retention where light regions may suggest areas in need of targeted fertilization for nascent crops.

Soil brightness derived from bare ground imagery indicates moisture, texture, and organic content



Soil brightness

dark

bright



3.2 SELECTIVE SEEDING

With productivity and soil data, agronomists can decide what to seed and where. These maps help the farmer precisely apply the proper amounts per zone, ensuring efficient seeding at the onset of the growing season.

Seed zoning can also inform growers and crop advisors as to which breeds and seed types might be most effective in given areas, and ensure the dispersion of seeding matches soil conditions.





4. CROP MANAGEMENT

Management of crops during the growing season is a crucial activity for every farming operation and is also where satellite imagery can provide the greatest value. Imagery enables agronomists and growers to:

- Detect crop health issues
- Map and direct scouting
- Localize prescription treatments
- Monitor crop development

4. CROP MANAGEMENT



4.1 HEALTH MONITORING

Growers need to make critical decisions throughout the growing season, and these decisions need to be made in real time, as conditions change. For instance, unanticipated weather variations such as a wet or dry spring can affect crop development and alter the periods during which pest infestations or disease outbreaks are likely to occur.

Monitoring can improve health analysis by crop or fields of interest. Consistent and complete imagery coverage of vital areas enables timely and informed decision making.





4. CROP MANAGEMENT

4.2 ISSUE DETECTION AND ALERTING

Frequent data means farmers can address problems early, before large-scale damage is done. A steady supply of satellite imagery can help detect vegetation issues as soon as they occur, letting farmers know precisely when and where to act.

With imagery updates and vitality alerts, growers can quickly identify affected areas, assess field issues, and respond.



26 January 2016 – Issue detected



4. CROP MANAGEMENT

4.3 DIRECTED SCOUTING

In the past, farmers often spent hours conducting systematic surveys of entire fields to locate and identify problems. The spatial resolution and global coverage of modern satellite imaging enables directed field scouting that saves time and reduces costs.

Using precision ag techniques, agronomists can create detailed maps to quickly and accurately guide farmers to affected areas. Downloading maps and analysis onto GPS-enabled devices allows growers to go directly to the source of in-field issues with the necessary information at hand.



Late January 2016 – An infestation of slugs was discovered and treatment is planned



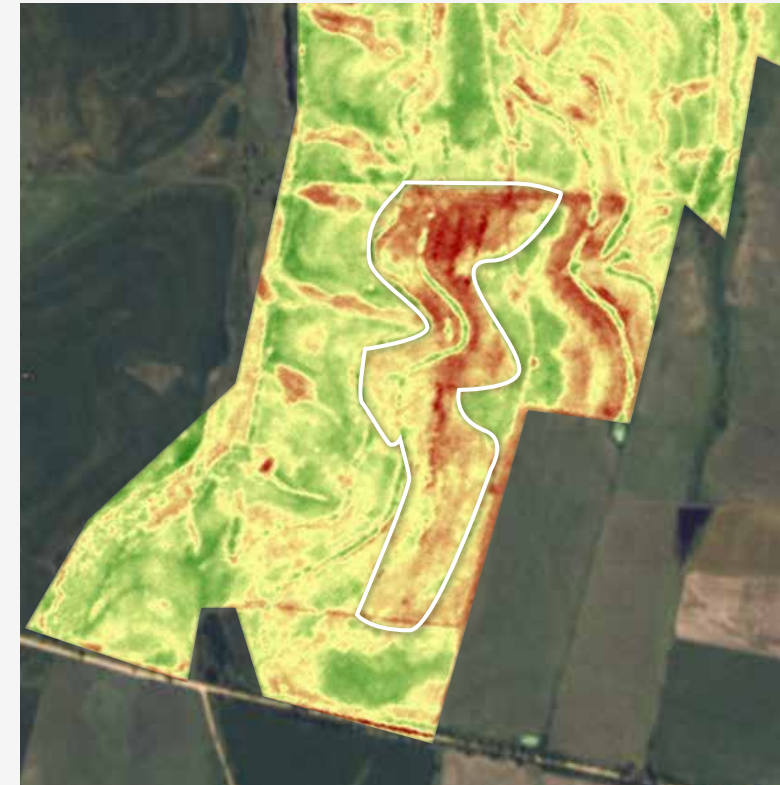
4. CROP MANAGEMENT

4.4 TARGETED AND PRESCRIPTION TREATMENT

Important in-season crop management activities such as watering and fertilization require location-specific treatment decisions at specific growth stages. Predicting when crops will reach these stages is difficult because growth is highly dependent on changing conditions.

With satellite imagery, growers have a comprehensive overview of their fields that allows them to detect, compare, and verify health issues or growth stages in need of treatment — including side-dress application of nitrogen, watering, fertilization, or pesticide application.

By referencing in-field imagery data throughout the season, growers can gain an in-depth understanding of how certain actions affected crop production outcomes that year.



Early February 2016 – Treatment areas delineated



4. CROP MANAGEMENT

4.5 LATE SEASON CROP MAINTENANCE

Over the course of the agricultural season, continued monitoring provides invaluable data to assess the effectiveness of different crop treatments and growing practices.

Monitoring allows growers to not only detect and respond to issues, but to refine management techniques that are proven to succeed and optimize accordingly. Farmers can use these results to feed their models and improve output.

The result is continuous crop management that is responsive, accurate, and cost-efficient.



28 February 2016 – Post-treatment recovery



5. HARVESTING

Determining the right harvest date presents a challenge for growers. Often, the window for harvesting is narrow and farmers must make trade-offs between two competing factors: the need to start later to harvest dryer crops, and the risk of bad weather at the end of the season, which might negatively affect yield.

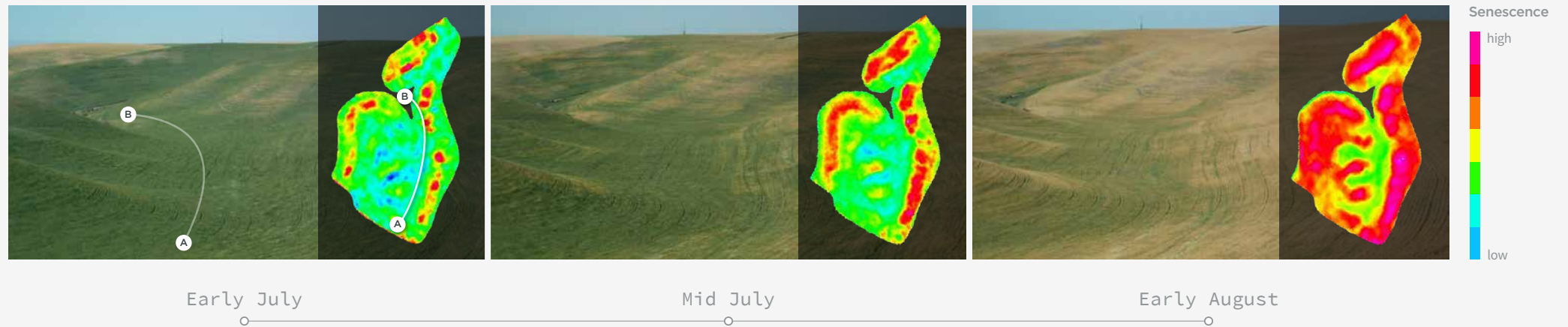
5. HARVESTING

5.1 HARVEST PLANNING AND MANAGEMENT

Satellite imagery data can inform effective assessment of kernel moisture content—the key measure for specifying the harvesting start for many crops. Vegetation indices sensitive to variations in crop senescence also provide the ability to map crop drying patterns in fields, helping to guide site-specific harvesting.

With satellite imagery, operations managers can ensure that harvesting plans are being executed and update harvest priorities in real time to address pertinent developments detected in the imagery.

High senescence indicates the optimal time to harvest, improving production.





6. THE NEW FOUNDATION FOR PRECISION AGRICULTURE

Satellite imagery is undergoing rapid adoption as a foundational information layer for precision ag, especially by forward-thinking agronomists and other industry innovators.

Planet is the only satellite imagery provider that delivers both high frequency and high resolution data at a global scale with Planet Monitoring for Precision Ag.



6.1 PLANET MONITORING FOR PRECISION AG



Global Coverage

Broad-area coverage
of global agricultural regions



Providing field-level detail

0.8 and 3-5 m resolution to provide
field-level detail



High Frequency

Daily in-season revisit rates powered
by 175+ satellites



Cloud Storage & Processing

Swift data access within 48 hours
after acquisition via Planet's
automated pipeline



Easy & Efficient Access

Seamless integration of imagery into
applications via Planet's Platform
and APIs



Extensive Archive

Imagery dating
back to 2009

SMARTER FARMING. EVERY FIELD. EVERY DAY.

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