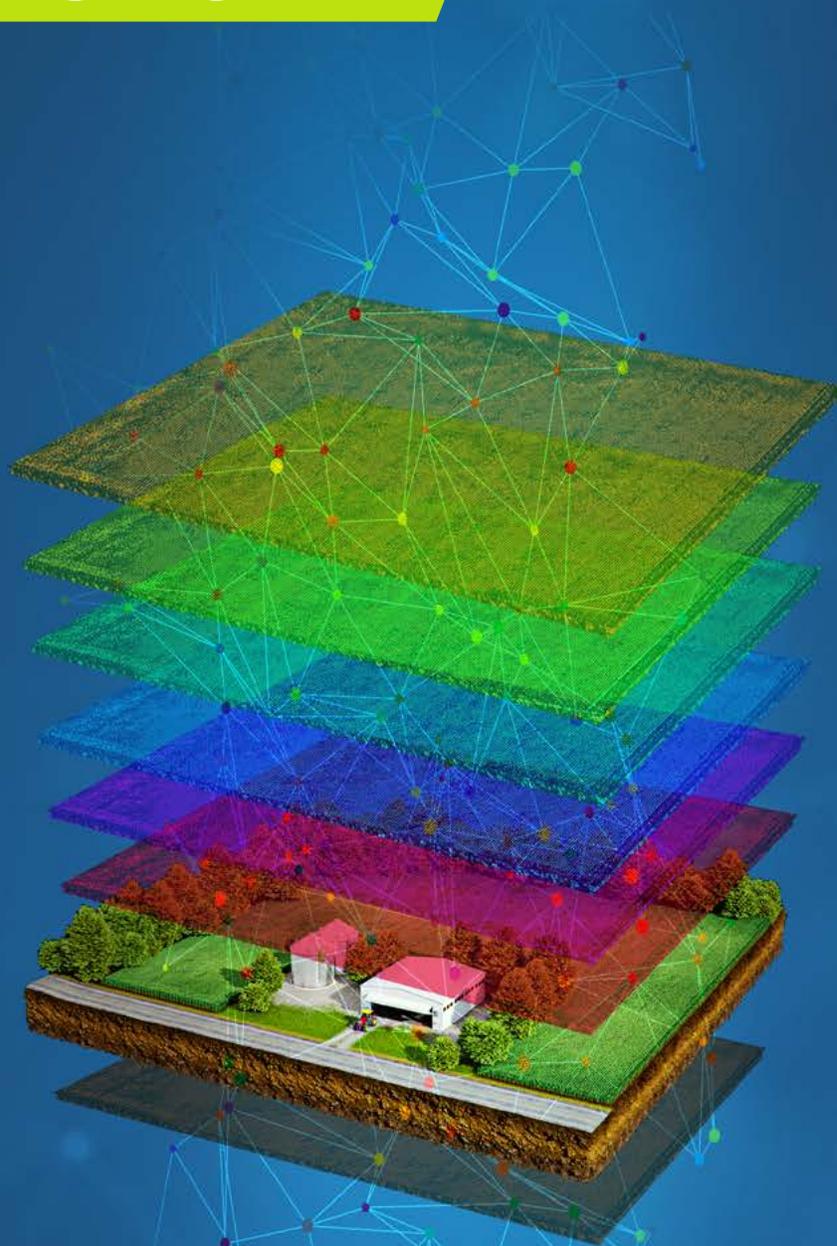


CASE STUDY



DOUBLING DOWN ON FUNGICIDE

Ag Intelligence in the New Age of Crop Disease



Crop disease is a constant threat to farmers' well-being. In 2018 alone, the Crop Protection Network reported that disease destroyed an astonishing 10.9% of all corn yields across the United States and Ontario, adding up to hundreds of millions of bushels and billions of dollars in losses. And the problem is only getting worse.

Between 2020 and 2021, two new diseases known as Southern Rust and Tar Spot rapidly expanded their reach across the state of Illinois, firmly establishing themselves as persistent threats to corn for the foreseeable future. Both of these are especially deadly to the corn crop, with Southern Rust regularly destroying 20-40 bu/ac and Tar Spot capable of a staggering 50-100 bu/ac. Finding effective ways to combat these diseases is now more important than ever.

Fungicide is one such way. Its effective use can mean the difference between a full harvest and a crippled field. However, fungicide applications are no longer as simple as they once were. According to Dennis Kopp, a Certified Crop Advisor with over 26 years of experience, a single application at the start of the season is often not enough to counter these new diseases. Many diseases, including Tar Spot and Southern Rust, can show up later in the growing season or survive an initial application, making them incredibly difficult to counter. But what if you could predict, with incredible accuracy, exactly where disease will appear, weeks before it starts damaging yields? This case study will examine a field in which the powerful disease detection capabilities of Intelinair's AGMRI platform accurately predicted the spread of Tar Spot, giving the farmer the opportunity to stop it cleanly and efficiently in its tracks.

AN UPHILL BATTLE

The farmer in this case study owns a 156-acre corn field in central Illinois. Up until 2021, Tar Spot was of no concern to him, as it was a strange new disease that really only affected the northern tip of his state. But he would soon find out that the season's abnormally wet conditions would allow the disease to move rapidly south, finding its way to many new fields including his own.

This farmer is no stranger to fungicide, but was understandably hesitant to apply it twice to try to stop a disease he had barely heard of. Fungicide applications are expensive, costing up to \$30 an acre, which can quickly add up across larger fields or multiple applications. Applying it twice can be unaffordable, especially if it does not provide a reliable return on investment.



Tar Spot, which was only discovered in 2015, is capable of destroying up to 100 bu/ac of corn.

Additionally, fungicides are primarily a preventative measure, rather than a curative one. The timing of the application is critical to ensuring that it has a significant effect on the crops it is supposed to protect. If applied too soon, it can be washed off by wind or rain before disease comes in, wasting the application. But apply too late, and little to no damage from the disease will be prevented, and the field will still suffer significant loss. Applying a two week mode-of-action fungicide in the R1 stage of crop growth is generally quite effective, but with some diseases appearing later in the growth cycle, it is not always enough. Timing a second application is much more difficult, as these diseases can appear with little to no prior warning.

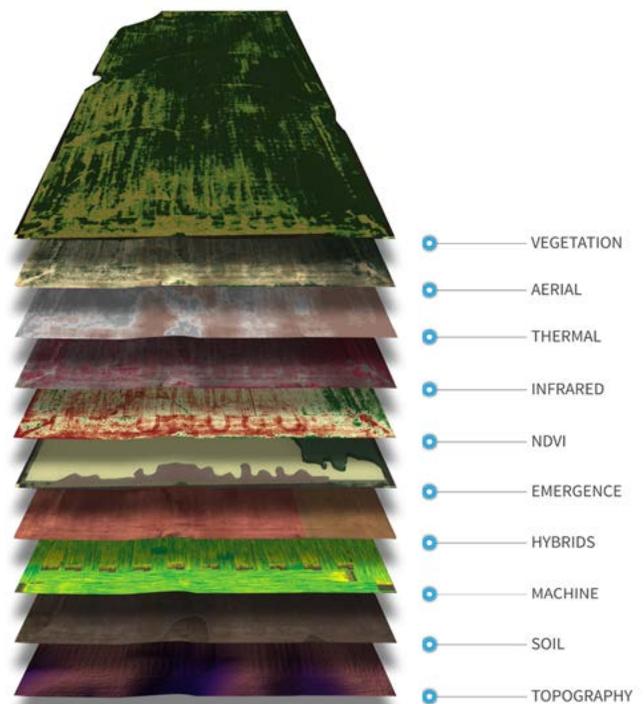
The high price tag coupled with the uncertainty of the applications leads many to understandably forgo a second application, but this can lead to significant losses later in the season that can completely undo the work of an R1 treatment. Initially, this was the position of our farmer, but once the AGMRI platform showed him how to predict disease outbreaks, he realized just how much more he could do to stop them.

A TALE OF TWO APPLICATIONS

This farmer had already subscribed to Intelinair's AGMRI service. AGMRI is the revolutionary decision support platform for Ag that uses machine learning, computer vision, and high-resolution imagery to construct a "digital twin" of any field under its purview. This digital twin is an exact copy of the field in digital space, including information such as soil composition, field topography, and color, thermal, and infrared images taken by plane, drone, and satellite. All together, this provides an uninterrupted view of every acre from planting to harvest. This is all processed by a series of powerful machine learning algorithms that produce multiple vegetative health indices, and are capable of detecting everything from emergence to disease to weeds.

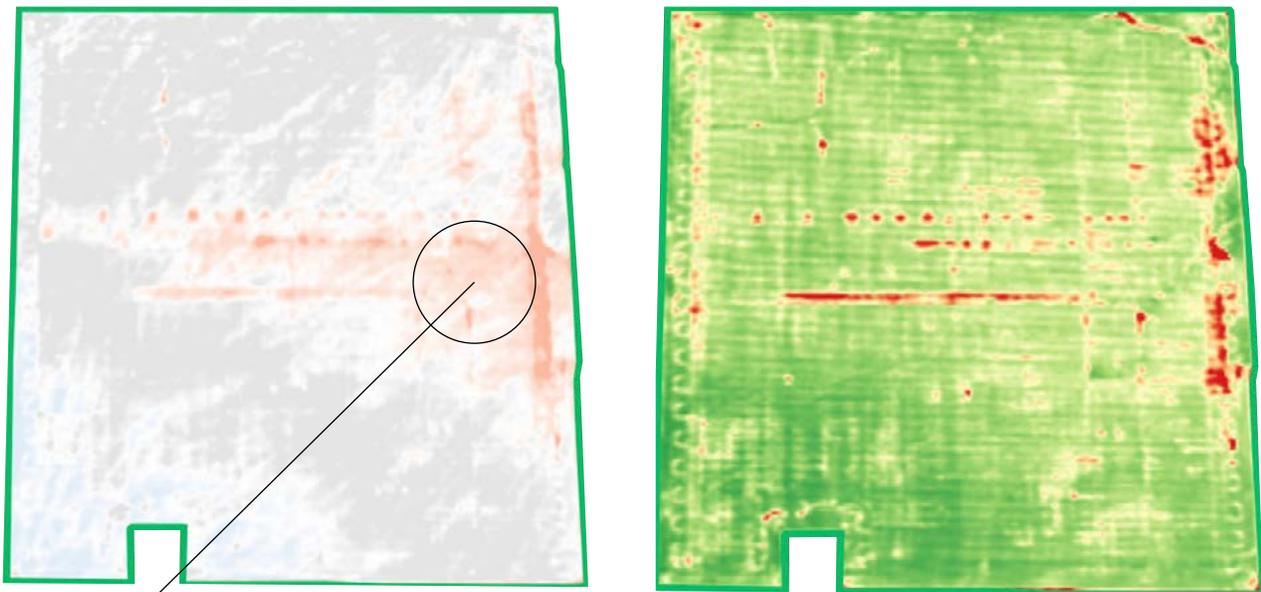
All of these issues can be immediately viewed and acted upon via alerts and visualizations that appear right on the user's smartphone. AGMRI can even wirelessly export custom prescriptions to machinery in the field, connecting these big-picture insights to the day-to-day work on the farm.

So how do these analytics allow AGMRI to detect disease? First of all, it is important to know that like humans or animals, plants develop fever-like symptoms when under stress from disease—and part of that means raising their internal temperature. AGMRI's thermal analytics are capable of detecting these temperature spikes, and by correlating them with additional analytics, can remove false positives such as bare soil or tire ruts.



When an area of unusual heat like this is detected, AGMRI can flag it as a disease risk and immediately alert the farmer. Detection like this can warn farmers about crop disease as early as two weeks before significant visual symptoms, and the losses that come with them, appear.

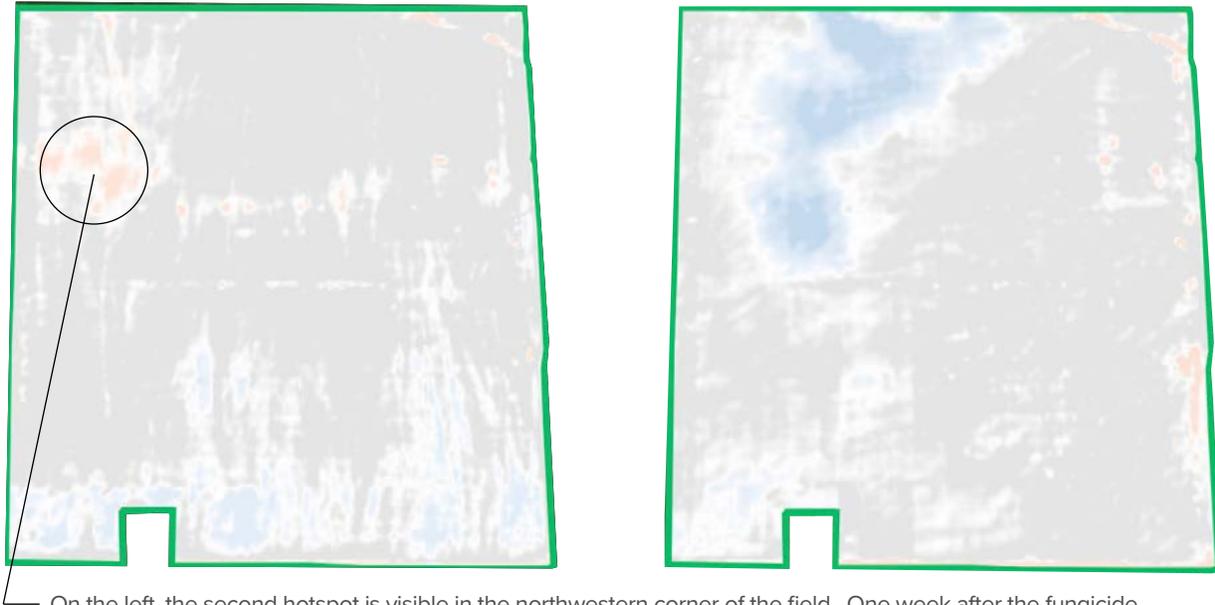
Our farmer received an alert like this, showing a growing area of abnormal heat in the eastern portion of his field. He sent a scout to the area, and sure enough, on a couple of the leaves they found tiny blotches of tar spot. These symptoms were extremely minor and would have been impossible to catch on their own, but they hid a massive potential loss. Tar spot can spread across dozens of acres rapidly, destroying up to 100 bu/ac of corn in a matter of weeks. The scout uploaded the report to AGMRI and the farmer was able to immediately order an application, and within a week, the problem area disappeared, and no crops were lost to the disease.



The diseased area, as seen in both Thermal and NDVI imagery. While some of the heat can be explained as areas with low foliage, the central zone is almost certainly disease stress on living crops.

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The farmer understandably thought he was in the clear for the season. He had taken out the area of disease early, before any damage had been done, and was ready to move on with the rest of the season. But unfortunately, tar spot is a difficult disease to cure. Two weeks later, another hotspot appeared, this time in the northwest corner of the field. Just like the last one, this also showed early signs of the disease. The farmer scouted the area and applied fungicide a second time. Once again, the thermal signature cleared up and the symptoms progressed no further.



On the left, the second hotspot is visible in the northwestern corner of the field. One week after the fungicide application the disease dissappeared yet again (right).

THE NEW WORLD

One shudders to think of what would have happened to this farmer's field had he not been able to detect and prevent that second outbreak. Tar spot spreads rapidly, and had the farmer waited for visible symptoms, he could have lost dozens of acres worth of yield. Unfortunately, that is the story for many who are unable to predict these new and deadly diseases. Currently, few if any hybrids are significantly resistant to them, and preventative fungicide is one of the only options available for prevention.

Eventually, new hybrids will be developed and new strategies will be formed, but in the meantime, there will be many rough seasons. But with the power of crop intelligence, there is no need to wait for the storm to pass. AGMRI's disease detection analytics can keep your fields ahead of the most dangerous diseases, and any new threats that may come in the future. Those who use the platform are the first to know of any threats to their yields, which allows them to react before any losses occur. If you want to take advantage of these powerful analytics to take full control of your own fields, AGMRI may be right for you.

ABOUT INTELINAIR

Intelinair is spearheading the digital Ag revolution through AI, focusing on improving in-season crop performance and providing off-season logistical insights through our innovative digital twin technology and AGMRI machine learning platform. We are committed to boosting efficiency, driving higher yields, and increasing productivity all while maintaining sustainable farming practices in the ever-changing world of Ag tech. You can find out more about our mission and how we can help you get the most out of your fields at www.intelinair.com or by calling **1-833-692-4674**.

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