YOUR Ultimate Guide TO Precision Ag

Simplify precision ag on your farm with these practical steps you can take today to maximize productivity and profitability

Table of Contents

Precision Ag: How can it benefit me? 3

Getting Started 4

Key Benefit: Profitability 6

Key Benefit: Interoperability 9

Key Benefit: Sustainability 10

1 Precision Ag: How can it benefit me?

As the saying goes, the only constant in life is change, and this is particularly true in agriculture. As farmers well know, no two fields are alike—in fact, no two zones in a field are alike. Productivity ebbs and flows across fields, due to changes in soil type, pH levels, topography, crop residue, and localized disease and pest infestations.

Precision ag can't fix these differences, but it can help farmers turn them into strengths. Consider a classroom of students where each child has their own unique learning style. Tailoring a custom teaching approach to each student is going to yield better results than treating them all the same. The same is true for the different productivity zones in every field on farms around the world.

Field variability has been driving widespread integration of precision ag tools and solutions on progressive farms for over a decade. By treating each zone in each field according to its own unique needs, overall farm productivity and profitability increases. The more precise the treatment, the better the results. Put simply, the job of precision ag is to help farmers make more money on the same—or even fewer—parcels of land.

In this exclusive eBook, we will demystify precision ag for farmers looking for practical, objective, and actionable strategies that will maximize their ROI, simplify farm workflows, reduce technology headaches, and drive profitability across the entire farm operation. First, we will discuss how precision agriculture can benefit you and your farm operation. Then walk you through our step-by-step guide on getting started and explore three key benefits of precision ag that are driving rapid adoption: profitability, interoperability, and sustainability.

2 Ready to Get Started? Follow this Step-By-Step Guide

FIRST, LET'S LOOK AT THIS RUNDOWN OF THE MOST IMPORTANT PRECISION AG TOOLS IN THE MARKET TODAY:

- **Guidance and Steering** – This is the biggest precision ag tool used today that is providing the most immediate and positive benefits to farmers today.

  WHY IT'S IMPORTANT TO FARM PRODUCTION:

  - As farmers know, machines don't drive in a perfectly straight line because of errors in the steering column, errors in some of the hydraulics, etc. These may seem like miniscule errors but they add up over time!
  - When a machine tries to follow a straight line, it ends up snaking its way across it vs. following it perfectly straight...due to the inconsistencies mentioned above.
  - When this happens, farmers can't predict where that seed has been planted, therefore they can't come back and do things like nutrient banding, cultivation, etc., without damaging plants.

- **Correction Services** – Accuracy matters
  - As a quick rule: The less you pay for guidance, the more deviation you're getting across that line.
  - The repeatable, controlled performance of precision agriculture solutions means you'll run on the same, reliable rows year-over-year.
  - High accuracy reduces input costs, soil compaction, and crop damage, increasing your operation's bottom line.

- **Yield Monitoring** – Yield monitoring helps farmers break their fields into smaller pieces and start to manage that field by zones. Then, they can start to make educated decisions based on that yield map. If there is soil analysis...even better! It's a compounding process: the more data you have, the more value-add decisions you can make. At the end of the day, yield monitoring is an important foundational step, and made easier as this is mostly factory-installed on equipment.

- **Water Management** – Adoption is region-specific, and depends on if your focus is removing water, retaining water, removing high and low spots in a field, or other land forming needs.
- **Variable Rate** – Though not immediately apparent (you usually have to wait until the crop comes up), the benefits will be measurable. From the mapping we can do analysis and create prescription maps to address the differences in zones through variable rate applications.
- **Software Management** – This step is often described as being required because a yield monitor can generate data for you, but that data on its own is of little value to a farmer. Software is an integral piece of the puzzle because it can actually extract value from that data. In order to use that data to make profitable, in-season decisions, farmers need to be able to access and act on it in a quick, streamlined, and intuitive manner.
- **Spot Spraying** – Using intelligent sensors, precision ag tools such as the **WeedSeeker 2**® system identify and eradicate weeds with targeted bursts of herbicide. The new system automatically adjust on the run to changing temperature, ambient light, and backgrounds like soil or stubble, ensuring sensor accuracy in all conditions.
- **Crop Health Imagery** – **This technology** allows farmers to compare crop health at each growing stage for more targeted crop scouting. This enables smart in-season application decisions, helping farmers maximize yields and drive profits.

> At the end of the day, each farmer will make their own decision on which precision ag technology to adopt, and when.

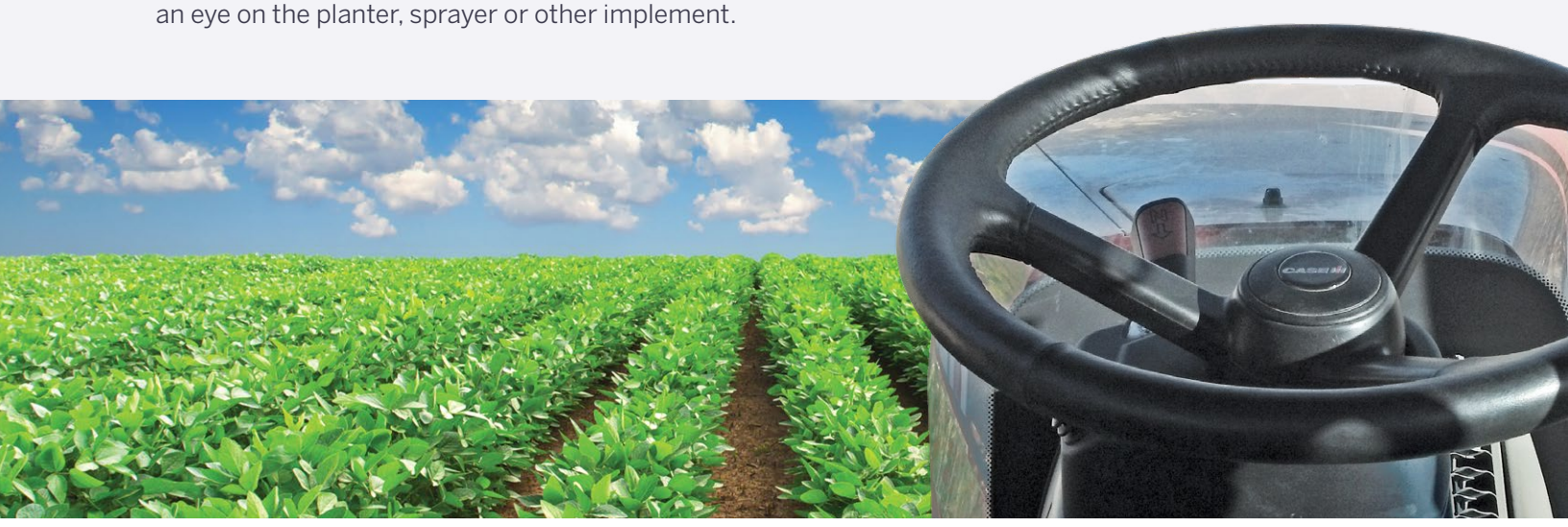
3 Key Benefit: Farm Profitability

Precision ag increases productivity and profitability by streamlining farm workflows, reducing over-application of farm inputs, and leveraging quality farm data to make smart, profitable in-season decisions.

The most popular precision ag technology used on farms today is **Guidance and Steering Systems**. These solutions help farmers complete field applications quickly and efficiently while also accurately mapping and monitoring field information in real-time. Precision guidance and steering give farmers a high degree of accuracy when completing a field task, reducing the amount of overlap and/or skips within the field, saving on input costs and lowering operator stress. In short, adding a steering system is one of the fastest and easiest ways to boost productivity and experience immediate ROI.

HERE ARE SOME OF THE MOST COMMON GUIDANCE AND STEERING SYSTEMS IN THE MARKET TODAY:

- Automated steering systems are in full control of the steering wheel, allowing you to take your hands off the wheel during trips down the row and keep an eye on the planter, sprayer or other implement. For example, the **Autopilot™ automated steering system** can help you complete your field applications quickly and accurately. By using terrain-compensation technology, it remains highly accurate, even on sloped and rolling terrain.
- Intelligent guidance systems provide different steering patterns depending on the shape of the field and can be used in combination with the above systems. These are extremely helpful systems when working on an irregularly-shaped field.
- Implement guidance systems ensure that your tractor and implement are working together, even when your hands aren't on the wheel. The implement is able to correct its position without input from the tractor and keeps them both on the same guidance line.



Alongside Guidance and Steering systems, profitable precision ag systems often include Correction Services. Correction Services provide you with a satellite-guided path to follow in the field. Typically indicated by lights or other signals that tell you which direction to turn, this results in more accurate driving.

High accuracy reduces input costs, soil compaction, and crop damage, increasing the farm's bottom line. Also, the days of moving a local base station from field to field or switching network IDs are over!

> Today's solutions typically work over large geographic areas and in remote locations.

HERE IS HOW TRIMBLE CORRECTION SERVICES CAN ENHANCE YOUR FARM OPERATION:

	CenterPoint® VRS	CenterPoint RTX	RangePoint® RTX	ViewPoint RTX™
BENEFIT	Instant access to high accuracy real time kinematic (RTK) corrections for automated guidance operations	High accuracy GNSS corrections accessible worldwide, ideal when working in remote locations, across large geographic areas, no local base station or VRS network required	Affordable, entry-level broad accuracy GNSS corrections	Affordable, entry-level broad accuracy GNSS corrections
DELIVERY				
HORIZONTAL ACCURACY	< 2.5 cm (1")	< 2.5 cm (1")	50 cm (20") repeatable 15 cm (6") pass to pass	30 cm (12") pass to pass
APPLICATIONS	Drainage, drip irrigation, land leveling	Strip tiling, planting and seeding, spraying, spreading and more	Broad-acre applications	
COMPATIBLE DEVICES	CMRx, CMR+, RTCM v2.3, RTCM v3.1 or RTCM v3.2 MSM via NTRIP			GFX-750™ / GFX-350™ with the NAV-500™
	Trimble® AG-372, Trimble® CFX-750™, Trimble® FmX®, Trimble® TMX-2050™, Trimble® GFX-750™ / NAV-900			
INITIALIZATION TIME	Instant	< 2 min (in selected regions) | < 20 min	< 5 min	< 5 min

Farmers deserve a clear explanation on what precision ag investments will do, and a realistic expectation on when they can expect results.

The longer term ROI is undisputed, but you'll be setting yourself up for frustration if you expect short-term results. At the end of the day, your goal is to get the most out of every piece of land. In some cases, this is going to require you to spend more upfront, e.g. you may be able to cut your applications in certain zones, but have to increase them in others. In the end, you'll see the upside, but it's good to keep in mind that your precision ag systems won't pay for themselves in the first year. Having said that, an investment in autosteer will be apparent immediately. Even variable rate or section control practices should yield a measurable improvement in the first year.

4 Key Benefit: Interoperability

On today's farms, interoperability puts control of the farm in the hands of the farm manager. When all precision ag tools and equipment can 'talk to' or 'work with' each other, farm managers get all the information needed to monitor operations, make quick adjustments, and troubleshoot in real time.

A central concept in smart precision ag systems is connectivity. For precision ag to work at its full potential and achieve significant savings in time, money, and effort, you have to connect data across your entire operation. Connectivity allows farmers to integrate data from multiple sources so their entire system can be managed as one connected whole. The result? Less stress and better outcomes.

To explain how it works, let's use the **Trimble® Connected Farm®** as an example. This unified suite of precision ag solutions—comprised of software, hardware, and correction services—simplifies workflows, improves efficiency, and drives profitability in farm operations. Trimble's ag software solution, Farmer Core, complements farmers' existing Trimble precision ag solutions (guidance and steering, flow and application control, water management, and more) to help farmers easily manage precision ag data and simplify display setup to capture the most value from every piece of land. Trimble's software helps farmers plan their crops, execute farm work, track everything that happens in the field, and have a reliable record of the entire crop year.

A key requirement for farm software today is automatic syncing of all guidance lines, field names, boundaries, materials, implements, vehicles, and operator information across all devices on the farm. This means the data is available everywhere, at all times. Another advantage are features that allow farm managers to set up work orders, or instructions for completing in-field tasks that are created on the web, that will then sync to the vehicle displays to facilitate remote task setup.

IT MEANS:

- In-field setup time is reduced
- Operator errors are minimized as there is far less in-cab work
- Record keeping is simplified and more accurate as job records and reports are automatically generated

Overall, farm management software replaces pens and notepads, USB sticks, countless hours and annoying headaches. Farmers can digitally track operational, agronomic, and financial aspects of a farm throughout the entire growing season.

> **A final point on interoperability:**
> When you purchase any new software or hardware for your farm, make sure it's compatible with what you're already using. If the systems don't work together, then it won't give you the results you're looking for.

If you're using ISOBUS technology, you won't need to worry. **ISOBUS** is the industry-standard to achieving compatibility between tractors and implements by following a 'plug and play' mandate so machines and displays can 'speak' to each other, regardless of brand or age.

5 Key Benefit: Environmental and Soil Sustainability

A huge advantage of investing in precision ag technology and equipment is the long-term preservation of your soil's health, and the local environment.

SPECIFIC SUSTAINABILITY BENEFITS INCLUDE:

- Reduced need for fertilizer and harmful chemicals
- Water preservation
- Land preservation (by reducing top-soil disturbance)
- Elimination of unnecessary input costs through accurate application of seed, granular fertilizer, liquid or anhydrous ammonia, and more.

By managing the flow and application of inputs, farmers can precisely apply inputs where needed on their fields—and only where they're needed. Seed monitoring systems are especially helpful during planting, to alert operators of planting issues such as skips, doubles, and failed unit rows.

> But keep in mind, you can't fix what you don't know. Fortunately, a seed monitoring system, like the **Field-IQ™ Crop Input Control System**, sees what you can't.

- You can monitor your seeding information or fertilizer delivery lines in real-time. It allows you to control your variable-rate application and helps you keep an eye on your automatic section control. It also prevents costly planter problems by catching them early before they impact your yields. When used in conjunction with a **guidance display system**, farmers can accurately monitor and map their fields in real-time and correct problems as they arise.
- Reducing applications in low productivity areas reduces money spent on inputs. Typically, around 10-20 percent of a field under-performs, so why spend precious time and money on an area that isn't giving the results you want?
- At a single glance, farmers should be able to see where their fields are making them money, and where inputs are not paying off.
- Solutions such as **Trimble's WeedSeeker 2** spot spray system use advanced optics and processing power to detect and eliminate resistant weeds. When a weed passes underneath the sensor it signals its linked spray nozzle to precisely deliver herbicide and kill the weed, reducing the amount of chemical applied by up to 90%.

Another key aspect of environmental sustainability and soil health is water management. When managing water, factors like precipitation, irrigation, and soil moisture contribute to the amount of plant-available water, which in turn impacts yields. But yields are also affected by additional factors such as topography and soil type. Visual surveys of your field can easily identify any obvious red flags such as erosion and depressions where ponding occurs. Using GPS tools such as **WM-Survey with RTK accuracy** are crucial for identifying steep slopes, rises and low spots that can impact yields.

ANOTHER OPTION IS EQUIPMENT SUCH AS THE TRIMBLE FIELDLEVEL II SYSTEM:

The **Trimble® FieldLevel™ II** system streamlines the surveying, designing, and leveling steps required for land leveling projects. It helps farmers remove high and low spots in their field to keep water evenly distributed and improve overall crop yields.

Always keep in mind that the path to proper water management and higher crop yields begins with your soil. Soil type can heavily impact its ability to retain moisture and deliver it to the crop. While clay soils are great at retaining water, they are also heavy and sticky. On the other hand, sandy soil drains well with high hydraulic activity and percolation. But if you want to produce consistent yields throughout your field, you need to appropriately space tile laterals throughout the entire field in order for it to drain properly.

Input efficiency and environmental sustainability are at the core of one of the most common precision ag practices today, VRT. Variable Rate Technology is the ability to adapt parameters on a machine to apply seed, chemical or fertilizer according to the exact variations in plant growth or soil nutrients and type. So, instead of applying a uniform amount of seed on one field, VRT allows you to apply the optimum type and amount of seed in a specific area of any field—either automatically or manually right from the cab. You can also avoid double coverage and eliminate wasted inputs.

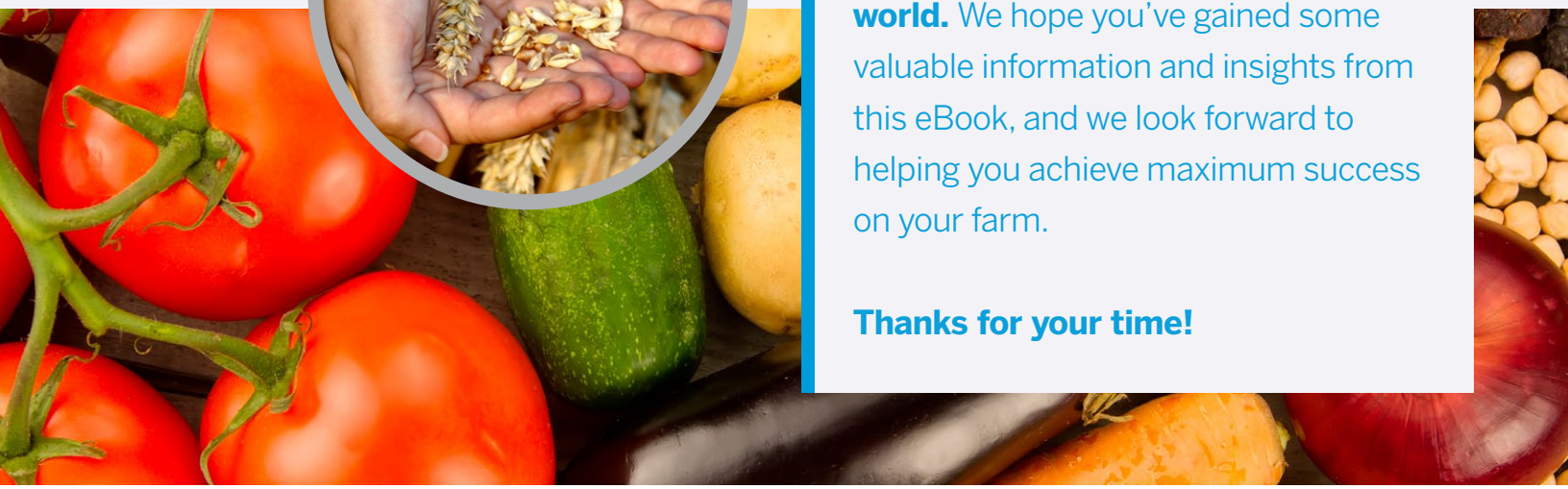
Another huge bonus is that you'll have a complete record of all inputs used in your operation, helping you make future decisions.

Also known as Variable Rate Application (VRA), this strategy is essentially about applying the right amount of a product to the right areas of a field. VRT allows you to apply seed, fertilizer and other materials at different rates to different areas of a field based off of a prescription map. These maps can be created using data including soil test results, yield, imagery and other field data.

VRT leverages yield maps, which help farmers make in-the-moment decisions in the field that might not be apparent with the naked eye. Yield maps are powerful tools that can inform all your operational decisions going forward. Combined with your cost of production and application maps, a yield map will show you what areas of your farm are more profitable than others and should help you bring other areas of your field up to par. You can go one step further with farm management software that provides 'Profit Maps,' so you can deep-dive into each field and see what strategies are working.

In conclusion, consider that these benefits aren't the only reason farmers should invest in precision ag. Soon, it may not be an option. Consumers today are becoming more and more demanding in terms of the information they want about the food they buy. As food companies continue to invest in traceability measures to provide the right information, farmers need to do the same. **Eventually, it may simply be a cost of doing business with top food manufacturers around the world.** We hope you've gained some valuable information and insights from this eBook, and we look forward to helping you achieve maximum success on your farm.

Thanks for your time!



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If you'd like more information on any of these products or strategies, please contact your local Vantage and Trimble Reseller: **agriculture.trimble.com/reseller-locator**

Unsure of which solution is best for your farm operation?
Try Trimble's **FAST** solution to find the right precision ag system for you.

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