SABANTO

CASE STUDY

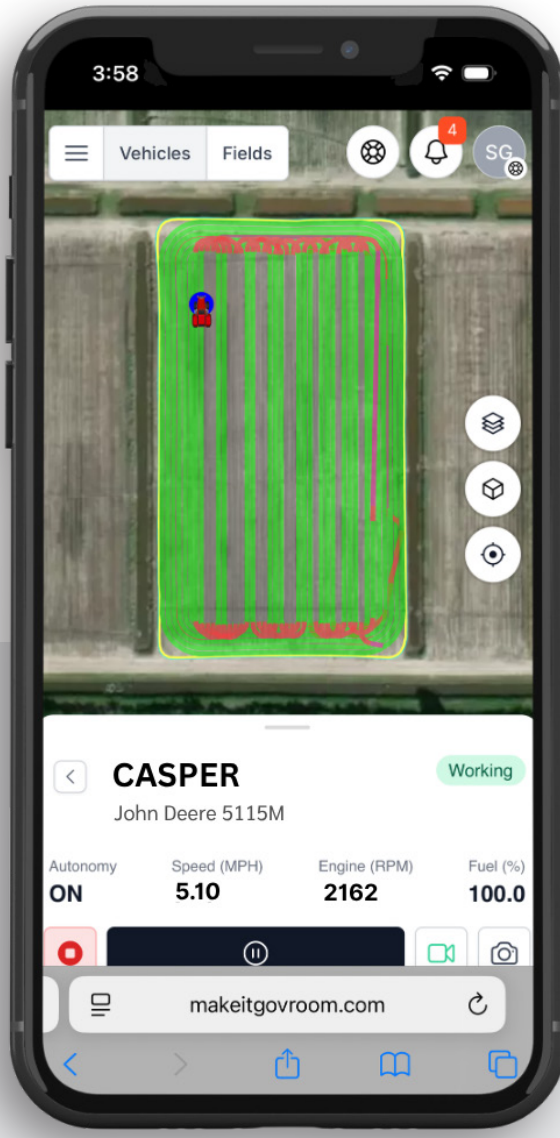
SABANTO AUTONOMY SYSTEM

SAVING **$12.61 (67%)** PER ACRE BROAD ACRE SEEDING

INTRODUCTION

SMART SCALING: SABANTO REDUCES YIRSA FARMS' CAPITAL EXPENSES

Capital expenditures for large farm equipment have soared to record highs. For growers like Justin Yirsa of Yirsa Farms in Big Sandy, Montana, investing over $2M to replace aging equipment was not only cost-prohibitive, but it also didn't align with his long-term financial strategy. Justin Yirsa chose to allocate his capital toward appreciating assets like land, rather than pouring it into massive depreciating machines.



TRANSFORMING AG EQUIPMENT STRATEGY IN SEEDING

This case study explores how Yirsa Farms deployed a cost-effective autonomous solution for seeding wheat, highlighting the decision-making process, performance metrics, and the broader implications for capital efficiency and scalability in modern agriculture.

IMPLEMENTATION PROCESS

STEP 1: EQUIPMENT SIZING

The first step in implementing Sabanto's autonomous system at Yirsa Farms was an extensive equipment sizing study, aimed at aligning horsepower, drill width, and tendering efficiency with the farm's operational goals. With a target of planting **the entire operation in 20 days**, and a minimum **6-hour interval between tendering**, our objective was clear: maximize productivity without overcapitalization.

The analysis began with a broad review of tractor options, from **33 HP to 350 HP**, mapping horsepower to the number of seeder shanks it could pull based on a **4.1 HP-per-shank benchmark** and standard **10-inch shank spacing**. Simultaneously, we evaluated industry averages of **$3,000 per shank** to estimate implement costs at each configuration.

Next, we layered in agronomic requirements, specifically a **5 mph target planting speed** and a **68% efficiency rate** based on Yirsa Farms' historical operations. To meet these requirements across a large-scale operation, three Sabanto autonomous systems would be needed.

These metrics helped model **effective work rates (acres/hour)** for various horsepower bands.

We then integrated **logistical constraints**, including the drill's seed capacity (52.5 bushels at 1.1 bu/ac) and fertilizer capacity (320 gallons at 4 gal/ac) to ensure that tendering schedules would meet the 6-hour window.

This analysis revealed two critical thresholds:

1. **Low-HP Limitations**: Below 100 HP, autonomy hardware became disproportionately expensive and weight capacity limited productivity.

2. **High-HP Plateau**: Above 120 HP, costs spiked due to larger machines and the lack of open station tractor configurations.

The sweet spot emerged at **100–120 HP**. This range enabled Yirsa Farms to operate **three autonomous tractors around the clock**, each pulling a **15-foot wide box drill**, a standard, widely available implement in the industry. This configuration struck the ideal balance of **cost, performance, and scalability**, laying the groundwork for a cost-effective autonomous deployment.

STEP 2: SYSTEM DESIGN

With the equipment sizing complete, the next step was to design a system that balanced **performance, cost-efficiency, and real-world logistics**.

Instead of purchasing a new tractor, Yirsa Farms repurposed a **2013 John Deere 5115M** that had been sitting idle, occasionally used as a forklift. This 115 HP machine, already supported by Sabanto, was a perfect match for the autonomy retrofit, enabling the farm to avoid new capital outlay altogether.

For the implement, Yirsa Farms purchased a **15-foot 2008 John Deere 1590 No-Till Drill**, the most common box drill on the market. Its compact width made it easy to transport on narrow roads, and the abundance of used units made it both **affordable and replaceable**.

To optimize seeding performance while extending time between refills, a **320-gallon liquid fertilizer tank** was mounted on the drill's tongue.

This dedicated the entire seed box to seed, reducing stops. With an application rate of 4 gallons/acre, this setup enabled 60-acre runs between fertilizer refills.

Monitoring was critical. Productivity gains would be lost if flow stopped and no one noticed. To prevent downtime:

- We installed a DICKEY-john Vanguard VM-5600 monitor and Recon blockage sensors to monitor seed flow in real-time.
- We added a Raven RFM 15P flow meter to track fertilizer flow and application consistency.

Every decision in this design phase followed a clear principle: **low-cost, off-the-shelf components** that worked without fault. The result was a reliable, self-contained autonomous seeding unit, built with discipline and common sense.

> *"We were coming up to full capacity on our seeding equipment. You have to add another whole person and another million dollar setup, and then you're way over capacity. I thought, what could we do to incrementally increase?"*
>
> **- Justin Yirsa**

Equipment	Cost
John Deere 5115M	$55,000
John Deere 1590 No-Till Drill	$30,000
Autonomy	
Sabanto Autonomy System	$70,000
Equipment Add-ons	
Blockage & Flow Monitoring	$5,200
Front Weights	$1,500
320-gallon Tank	$1,000
Starlink Mini Device	$550
Total Investment	**$163,250**

STEP 3: INSTALLATION

With the design finalized, installation began on the John Deere 5115M and 1590 drill. While both were well-built machines, the smaller tractor and heavy drill required some engineering to ensure a reliable integration.

Initially, weight distribution was a factor. With a fully loaded drill, the tractor's front slightly lifted, making steering unreliable. To combat this, 1,400 lbs. of cast iron weights were added to the front of the tractor.

Some fine tuning on the equipment allowed the system to spend less time turning, eliminating costly underlap and overlap of seed and fertilizer.

On the implement side, full visibility into seed and fertilizer delivery was paramount.

All seed tubes were fitted with **DICKEY-john Recon blockage sensors**, and a **Raven RFM 15P** liquid flow meter to track the fertilizer flow rate. These sensors were linked to a **DICKEY-john Vanguard® VM-5600** monitor.

Cellular coverage across Yirsa Farms was a known challenge. A **Starlink Mini** device was added to the autonomy system, delivering consistent, reliable satellite connectivity.

Despite being over a decade old, the tractor and drill were transformed into a modern, fully autonomous seeding system capable of running 24/7 with real-time monitoring, remote access, and seamless field performance. We proved that **retrofit practicality beats new iron hype**.

STEP 4: VERIFICATION

Before turning the system loose in the field, Sabanto worked closely with Yirsa Farms to verify all aspects of the autonomous setup. The process began with **standard calibrations** on the setup of the 5115M tractor.

From there, attention turned to field movement. **End-of-row turn sequences** were rehearsed, ensuring the tractor exited and re-entered passes with minimal overlap. This meant planning for sufficient headland space and refining settings to match the terrain.

Sensors were tested under blocked and unblocked conditions. The liquid fertilizer system was closely monitored to confirm injection rates. The flow meter, paired with custom pump logic, was validated for accurate start/stop timing, ensuring stable pressure and flow.

When field operations began, Yirsa Farms had a system that didn't just move autonomously, it ran with confidence. Every component had been tested under real-world conditions, giving the team the assurance they needed before going live.

STEP 5: FIELD OPERATIONS

Seeding operations at Yirsa Farms officially began in mid-April. The Sabanto Autonomy System covered **872 acres**, logging **113.5 hours** of operating time. Average speed held steady at **4.74 mph**, with peak efficiency hitting nearly 9 acres/hour on headland passes.

A consistent 5 mph pass speed and 4 mph turn speed allowed the system to cover about **8 acres/hour** while maintaining uniform seed depth.

While the system proved capable, field deployment wasn't without hiccups, each one providing valuable lessons in real-world autonomy.

Despite minor setbacks, the system performed excellent, showing that autonomy isn't about perfection, but resilience. With each pause, the team responded, adapted, and moved forward. By the end of the run, what started as a retrofit experiment had proven itself a legitimate, **scalable alternative to traditional big iron**.

STEP 6: VALIDATION

By season's end, Yirsa Farms had completed more than a field trial. They proved that autonomy can outperform big iron in cost and efficiency. Using a single Sabanto Autonomy System, the system logged over **872 acres**, **113.5 hours**, used **0.46 gal/acre of diesel**, and placed seed and fertilizer with precision across varying Montana terrain.

For comparison, according to Nebraska Tractor Test Lab data, a traditional setup like a **Case IH Steiger 715** and a **Bourgault 3725 QDA** would typically burn **1.2 gal/acre**—more than **twice the fuel**. But the bigger story is capital efficiency.

COST COMPARISON PER ACRE (10,000 ACRES)

ASABE Methodology

Used Big Iron Setup
1 - Used Case IH Steiger 715: $600,000
1 - Bourgault Seeder: $875,000
Total equipment cost: $1.475M
Residual (20%): $295,000
Depreciable amount: $1.18M
Annual depreciation (10 years): $118,000
Per-acre depreciation: $11.80/acre
60% ops. (fuel, repairs, interest): $7.08/acre
Total cost per acre: $18.88

Sabanto Autonomy Setup
3 - Used John Deere 5115M: $165,000
3 - Used John Deere 1590 No-Till Drill: $90,000
3 - Sabanto Autonomy Systems: $210,000
3 - Equipment add-ons: $24,750
Total equipment cost: $489,750
Residual (20%): $97,950
Depreciable amount: $391,800
Annual depreciation (10 years): $39,180
Per-acre depreciation: $3.92/acre
60% ops. (fuel, repairs, interest): $2.35/acre
Total cost per acre: $6.27

OUTCOME

Yirsa Farms' autonomous system **cost 67% less per acre** than the big iron option, **$6.27 vs. $18.88/acre**, while using **less than half the fuel**. Because the system used affordable, off-the-shelf components, downtime was manageable - not catastrophic. The autonomy system planted, monitored, and adapted to real-world conditions, issues were addressed, and progress continued.

By replacing $1.475M worth of conventional equipment with three Sabanto autonomous systems, Yirsa Farms didn't just validate autonomy—they proved that a **smarter, leaner model of farming is already here**.