The Newton includes a compressed air-driven jack with a mechanical interface between it and a strain gauge (wave or load cell).

Weigh Scale Helps Fight Soil Compaction

Swedish researchers, with the advice of farmers, have modified a jack to weigh equipment as it lifts it. The Newton, with its integrated scale, was designed to help farmers reduce soil compaction. Put to work under a tractor axle or other heavy equipment, the weight is shown on a nearby digital display.

"The Newton is designed to help farmers adopt strategies to reduce soil compaction before they pull into the field," says Per Frankelius, Linköping University. "It makes checking axle weights fast and easy. It also fills a need farmers have to know the weights of different equipment or parts of equipment before using."

As part of Agtech 2030, Frankelius works with a farmer panel to develop and apply technology, including sensors and artificial intelligence, to agriculture. The effort involves around 90 organizations and is funded by the Swedish innovation agency Vinnova, the regional government, and Linköping University.

"Controlling soil compaction is a core research and innovation element of Agtech 2030," says Frankelius. "Research has shown that more than 6 percent of agricultural crops are lost due to soil compaction, and in sensitive areas, it's estimated at more than 15 percent."

The Newton includes a compressed air-driven jack with a mechanical interface between it and a strain gauge (wave or load cell). The digital display is hardwired to the strain gauge. The jacks, with a cost of $2,500, are the most expensive component.

"We've developed two prototypes based on discussions with our farmers," says Frankelius. "The jacks can handle up to 30 tons with the space for the interface. We looked at lower cost jacks, but they didn't have a hole at the top for adding electronics (load cells)."

Frankelius reports that the Newton has an accuracy of one kilogram (2.2 lbs.). "We wanted a system that offered high precision and was safe to use," he says. "We'd have preferred to buy a commercial system, but nothing existed."

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300-gal. tote was the starting point. From there, Davis went to Amazon and picked out what he needed, such as an 8-roller, pto-driven pump with 100 gpm flow.

Home-Made IBC Sprayer Tote

Set an IBC tote on a carry-all, add a spray pump and a boom, and you have a 300-gal. 3-pt. mounted sprayer. While Seth Davis didn't need a spray tank that big, the price was right.

"We have a small farm with about 7 to 8 acres of pasture," says Davis. "I've been spraying multiple products with a 25-gal. sprayer on an ATV. I was doing a lot of fill, spray and refill."

When he bought a bigger tractor, he decided it was time to upgrade his sprayer. "I wanted a 150-gal. sprayer, but when I found one, the seller wanted $4,000," recalls Davis. "I looked at pictures of sprayers and decided to gather the components and make one."

The 300-gal. tote was the starting point. From there, he went to Amazon and picked out what he needed, such as an 8-roller, pto-driven pump with 100 gpm flow. He also ordered a pressure regulator and a couple of valves, as well as a 4-way splitter.

"I got pressure gauges for the relief valve and the sprayer," says Davis. "My hoses are all 3/4-in. contractor grade and I went with a TeeJet Boominator wide coverage nozzle."

Davis slipped a piece of wood inside the rear side of the metal cage on the tote and screwed the nozzle to it. While most components came together easily, the pump was a learning experience.

"I had to double up hose clamps on the pto pump the first time I used it," he says. "To secure the pump, I first tried zip ties, which snapped immediately. My second attempt included adding bolts in holes on the pump and clipping them to the pto cover with a carabiner clip."

When he finished, Davis' costs were well under $4,000. The tote was $100, and the other parts totaled about $850. The carry-all was another $450.

"I went with a carry-all instead of a dedicated frame," says Davis. "I only use the sprayer a few times a year, but I can use the carry-all other times too."

Davis plans to add a smaller 15-gal. tank to the top of the tote for spot spraying. "I will power it with a 12-volt pump," he says. "It'll be handy for spot spraying with weed killer when I'm using the tote for foliar fertilizer."

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Derecho downed corn (right), Stine shorter stature corn (left).

Shorter Corn Boosts Yield Potential

Shorter stature corn can produce 10 percent higher yields than taller hybrids when managed correctly, according to Myron Stine, Stine Seed Co. Even without the increased yield, the shorter corn stands up to environmental stress better than taller hybrids. Company claims include a compact structure with strong roots and stalks for a sturdier plant better able to withstand high winds as well as higher populations.

"The number one benefit is improved standability, which everyone sees," says Stine. "They also do better in higher population environments, which has a direct impact on yield."

He points out that increased per acre yields aren't more grain per plant as much as more plants per acre, each producing about the same amount of grain."

Stine points to the gradual increase in per-acre populations over the past 60 years. Iowa farmers averaged around 15,000 plants per acre in the early 1960's versus more than 30,000 plants in recent years. Yield per acre in Iowa averaged slightly more than 60 bushels per acre in 1960 versus 200 bushels per acre in 2021.

"Corn plants produce about a third of a pound of grain," says Stine. "As you increase plant populations, yield goes up. Our shorter plant types can be planted at much higher populations with at-harvest goals as high as 44,000 plants per acre."

How much higher depends on soils and other variables, including the particular hybrid. Stine gives the example of one central Iowa farmer who was recommended three high-yield, short-stature hybrids.

"Recommended at-harvest goals ranged from 39,000 to 42,000 plants per acre for maximum potential yields," says Stine. "However, they require a higher level of management and more inputs."

Stine mentions spoon-feeding nitrogen and applying sulfur as two key aspects of needed management to maximize yields. Company researchers have also found that narrower rows are beneficial.

"We have looked at twin rows and row spacing as close as 10 in.," says Stine. "We feel 15-in. row spacing is optimum, but for much of the Midwest, a 30-in. spacing will do for at-harvest goals of less than 40,000 plants."

Stine notes that increased yields with the higher population, shorter stature hybrids are most readily obtained in lower quality soils. This is where the greatest response to the increased management is seen.

"Highly productive soils may already be at their limit in yield potential, with micronutrients or other factors being the weak link," says Stine. "In less productive soils, simply increase the population and the application of nitrogen. You'll see a big bump."

Stine notes that in recent years other seed companies have jumped on the short stature bandwagon. However, Stine Seed breeders started paying attention to plant height in the mid-1990's.

"Ever since we started breeding corn in the 1970's, our hybrids have been slightly shorter than others in the industry," says Stine. "As we started gathering data on plant height, we began to understand the concept and what it would bring."

As they bred for high population, shorter stature hybrids, the company noted an extended silking period that starts ahead of pollen shed and continues throughout pollen shed. Traditionally corn hybrids began to silk after pollen shed starts.

"Sometimes with late silking, you can miss the window," says Stine. "Higher populations increase plant stress, and the shorter stature hybrids handle it better."

Placement of the ear on the shorter stature hybrid may also play a role, suggests Stine. He notes that at least one short-stature competitor is experiencing ears closer to the ground.

"Ears on our shorter stature hybrids are a favorable height if not necessarily the same distance from the ground as our taller hybrids," he says. "However, the distance between the ear and the tassel is less. We've selected to move the ear closer to the tassel to improve pollination."

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