

# Vertical farms give farmers precise control for optimal growth



KEVIN MA/St. Albert Gazette

**PLANTS ON RACKS** — Bob Holm of Strawman Farm has been doing vertical farming since 2013 using homemade racks. He switched to his current commercial-grade system in 2019 and now produces about 600 pounds of fruit a year.



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**MADE IN SINGAPORE** — Designed by Jack Ng of Singapore, Holm's vertical garden setup pumps irrigation water through waterwheels like this one to slowly rotate planters at low energy cost.

BY KEVIN MA  
Staff Writer

About nine years ago, Sturgeon County farmer Bob Holm looked up at the roof of his two-storey converted riding arena and had an idea.

Holm said to work for John Deere, and built condo warehouses on Circle Drive in St. Albert during the early 2000s. Seeing a crash coming in real estate and noticing that food was the next big thing, he started Strawman Farm in 2011 to grow local food for himself and his family.

"My motto is feed your family and sell the difference," he said.

Holm said he started growing fodder for his bison inside the converted riding arena on his farm in around 2013, figuring it would be cheaper to do so than pay \$200 per bale.

He soon realized those fodder trays were all at ground level — the two storeys above them were empty, wasted space.

"We're heating the whole building. Why aren't we using this?" Holm said of his thinking at the time.

So began Holm's journey into vertical farming — an emerging agricultural practice in Alberta which sees farmers grow crops on tall indoor surfaces instead of wide outdoor fields.

Today, he and his crew of 10 people and many bumblebees grow up to 270 kilograms (600 pounds) of strawberries, arugula, spinach, beets, and other fresh greens in rotating trays hung from about a hundred two-storey-tall metal towers housed in that riding arena.

"It's snowing but we're growing strawberries!" Holm said.

## Straight up farmers

Vertical farming refers to indoor agriculture where plants are grown in a vertical system, said Nick Savidov, a senior research scientist at Lethbridge College who studies such farms.

This can include towers and living walls, and may involve hydroponics (plants grown in liquid instead of soil), aquaponics (where plants float in water and have fish swimming underneath), and aeroponics (plants grown with exposed roots fed by sprays).

Vertical farms are still very rare in Alberta, Savidov said — he estimates there are fewer than 10 commercial-scale operations in the province.

One of them is NuLeaf Farms, a 10,000-square-foot facility which started operations in Calgary just a few months prior to the 2020 pandemic.

Co-founder Ryan Wright said he and his team have backgrounds in oil and gas, industrial automation, and agriculture, and saw vertical farming as a way

to diversify the economy.

Vertical farms come in many shapes and sizes.

Wright said NuLeaf's system secures plants in a mesh and has them grow perpendicular to the ground, and uses LED lights, sensors, and computers to control the amount of water, light and nutrients piped to each plant.

Swiss Leaf Farms near Busby puts its plants in rotating, illuminated racks housed inside climate-controlled shipping containers.

Holm said he started out growing crops in truck-length pipes attached to tall wooden A-frames. Those were a pain to use without a ladder, so he switched to a commercial system made by Sky Greens of Singapore in 2019.

Holm's farm now consists of 100 two-storey-tall aluminum towers housed in that aforementioned converted riding arena — a hot, humid place suffused with whirring fans, rushing water, and yellow light from high-pressure sodium bulbs.

Each tower has a dozen trays for plants and a number of LED grow lights. The roughly 68,000 plants in the facility sit in a proprietary mix of soil which contains biochar — a charcoal-like substance which acts as a light-weight sponge for nutrients.

Powered by an on-site natural gas generator (which Holm uses to reduce his electricity costs), the farm pumps water through waterwheels hooked to the towers to rotate the trays up and down throughout the day, ensuring even light exposure and airflow. The water then flows down channels in each tray for the plants to drink.

Domesticated bumblebees pollinate the plants, and workers in lab coats harvest the crops.

## Why grow up?

Vertical farming has been around since about the 1970s and came out of Japan as a way to reduce the amount of land used for farms, Savidov said.

"We cannot stretch the surface of our planet any more," he said. "In order to maximize your output per square metre, you need a vertical system."

Holm said vertical farms let greenhouse operators grow more product in the same amount of space. A typical greenhouse manages up to 12 plants per square metre, he said, citing research from the University of Florida.

"We get 216 plants per square metre," he said.

"That's how you make your money."

Holm said vertical farms give the farmer precise control over the amount of light, water, and nutrients plants receive for optimal growth, which means greater yields and less waste from runoff and evaporation.



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**JUST A TRIM** — Liam Holm trims some strawberry plants at the Strawman Farm vertical farm on March 3, 2022. The farm employs about 10 people.

He said he can get about 10 harvests a year from his towers, compared to maybe two a year in a greenhouse, for about 75 per cent less water and fertilizer and 70 per cent less labour.

There are also potential environmental benefits.

Savidov said vertical farms can reduce energy use by transportation by putting crops closer to their customers, and can enhance biosecurity by isolating crops from most pathogens. Indoor farming means Holm can grow his crops without pesticides, relying instead on sticky traps and other non-chemical controls instead.

Wright said NuLeaf uses an HVAC system which recovers and recycles 90 per cent of the water exhaled by crops, reducing their water requirements.

"We always harvest and deliver our food on the same day," he added, which means a fresher product with a longer shelf life.

Vertical farms can bolster food security.

Holm and Wright said vertical farms let Albertans grow crops year-round and can break our reliance on long, fragile supply chains.

Savidov said these systems can be

a boon to remote communities, allowing them to grow nutritious food they otherwise would have to fly in at great cost.

Alberta used to have tons of gardens, but now imports almost all its fruits and vegetables, Holm said.

"They stop the border because of COVID, we're eating grain," he said.

"We need to get our food back in our own country."

**Yet to catch on?**

Cost is the main reason why vertical farms have yet to take off in Alberta, advocates told *The Gazette*.

It costs way more to grow a plant in a vertical farm than a greenhouse or a field because you aren't getting free light and water from the sky, Savidov explained.

You also have to manage the often-considerable heat and humidity created by your plants and lights — Holm said his farm's sodium lamps are hot enough to heat his facility all winter.

Most vertical farms can't compete with greenhouses on costs as a result, unless they target niche markets.

Upfront capital costs are another barrier.

Holm said his operation cost

several million dollars, while Wright said many American vertical farms weigh in at \$50 million to \$60 million — you have to sell an awful lot of lettuce to recover that kind of investment.

You also need considerable knowledge of food safety, instrumentation, electrical engineering, and plant science to run the equipment, which not all farmers have.

Savidov said provincial grants and regulations could help more farmers get into vertical farming.

Holm called on the province to promote vertical farms as a way to diversify the economy.

"Every gas plant we're shutting down, there should be a greenhouse there producing food for Albertans," he argued.

Holm said he hopes to add more towers to his farm in the days ahead, as well as renewable power and a system to recycle the waste CO2 from his generator to boost plant growth.

For now, he's enjoying the benefits of growing and eating his own food.

"Our family is eating off our farm and you can see the difference in our health," he said.

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**HARD AT WORK** — A domesticated bumblebee investigates a flower at the Strawman Farm indoor farm in Sturgeon County March 3, 2022.



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**INDOOR BUZZ** — Bob Holm uses domesticated bumblebees to pollinate his indoor crops. The bees come in a box and enter and leave through the small opening shown here.



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**FRESH YEAR ROUND** — Bob Holm examines one of the strawberries growing at his indoor vertical farm in Sturgeon County on March 3, 2022. Vertical farm technology lets farmers grow greenhouse-style crops all year, even during Alberta's winters, Holm said.



RYAN WRIGHT/Photo

**SALAD WALL** — Vertical farming often involves growing plants without soil. Shown here are kale and chard growing out of a wall at the NuLeaf Farms facility in Calgary.



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**OLD SCHOOL** — Bob Holm says he used to use handmade racks such as this one to do vertical farming but found them cumbersome to use. He switched to a professionally designed system in 2019 but has kept this old rack as a keepsake.

