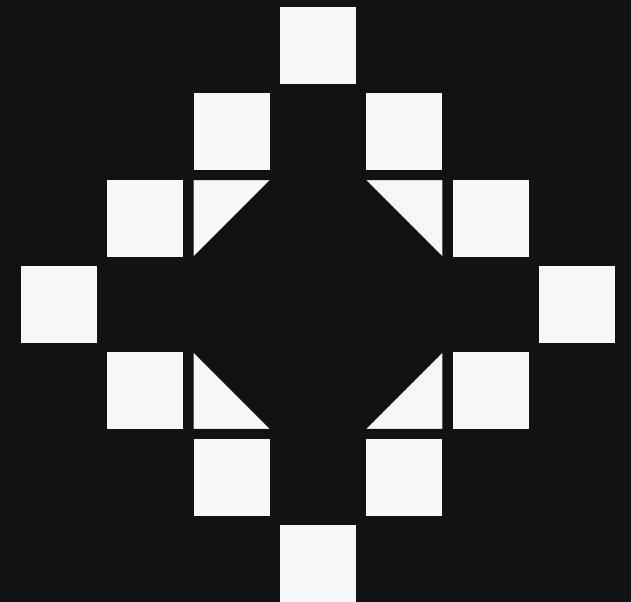


VINEA

Vinea turns the way greenhouse crews work into robot skills, and runs them on one platform inside the greenhouses growers already have.



STILL DONE BY HAND

Greenhouses still run on hands. A hectare of greenhouse tomatoes takes about 9,450 hours of work a year. Of the six main crop jobs, harvesting takes 29% of the hours, removing old leaves 26%, and de-shooting and twisting the plants another 21%. Scouting for pests comes on top. Crews do all of it, all season, and every one of those hours is paid.

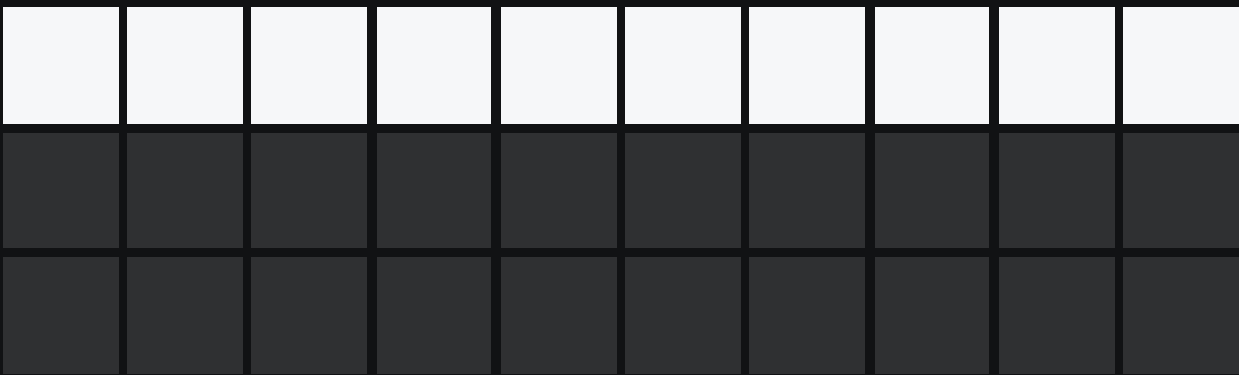


■ Harvesting	BLUSH	29%
■ Removing old leaves	SHEAR	26%
■ De-shooting and twisting		21%
■ Clipping, lowering, truss pruning		24%

HOURS ACROSS THE SIX MAIN CROP JOBS, TOMATO

A THIRD OF THE BILL

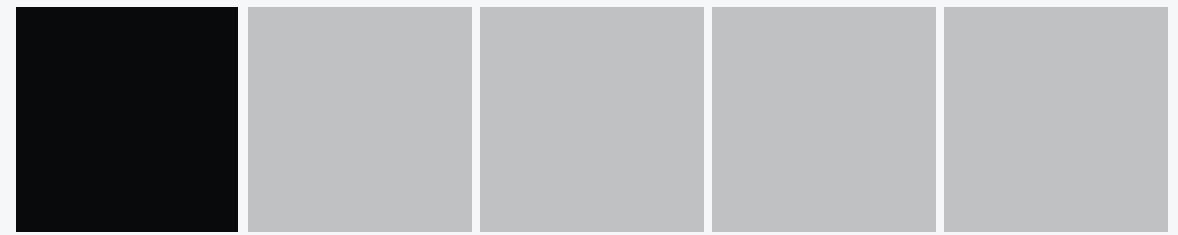
In 2021 the average Dutch greenhouse vegetable farm paid almost €975,000 in wages, out of almost €2.9 million in total costs. One Westland tomato grower told us that harvesting alone costs €5 per m² every year. Since then, costs have risen faster than what growers earn.



WAGES AGAINST TOTAL COSTS, AVERAGE
DUTCH GREENHOUSE VEGETABLE FARM, 2021

ONE IN FIVE AT A LOSS

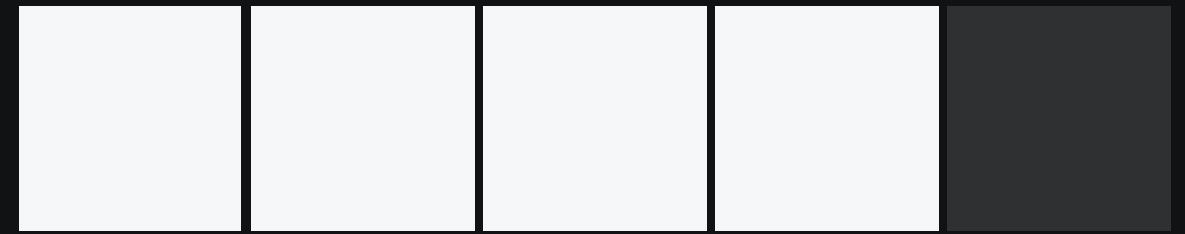
In 2025, 20% of Dutch greenhouse vegetable farms made a loss, the first time in more than ten years. Across Dutch greenhouse horticulture, revenue rose 8% while costs and depreciation rose 13%. A grower can't fix that by hiring fewer people, because the crop still needs the same hours.



FARMS WITH NEGATIVE INCOME, 2025

FOUR IN FIVE FROM ABROAD

About 67,000 people work in Dutch greenhouses, and an estimated 80% of them come from abroad, increasingly from Romania and Bulgaria rather than Poland. The area one worker looks after has barely changed since 2000, so a bigger greenhouse still means more people, hired from the same agencies every grower is competing for.



GREENHOUSE WORKERS FROM ABROAD,
ESTIMATED

YEARS IN. MILLIONS IN.

Robots were meant to fix this, and the money has been there for years.

COMPANY	SINCE	RAISED
MetoMotion (GRoW)	2016	A \$5M round led by Ridder in 2021
SAIA Agrobotics	2017	Over €20M. The greenhouse is rebuilt around a fixed robot
Four Growers	2018	\$15M, with Y Combinator among the backers
eternal.ag	2025	€8M in 2026
Tortuga AgTech	–	\$50M over eight years, then its assets went to Oishii in 2025

STILL IN TRIALS

In a 2019 survey of over 1,400 Dutch growers, 11% of glasshouse growers used a robot of any kind, mostly for spraying, and 2.6% planned to invest in robotics. In a 2025 WUR test, GRow picked half the trusses staff marked ripe; 40% of ripe trusses failed its picking conditions, and in 1.5 hours it stopped twice and needed a person six times.

eternal.ag has run one robot at Van Noord Growers since September 2025 and planned three for summer 2026. Four Growers reports up to 50% labour savings at Westburg. Each robot does one job, and the crop has to fit the machine.

SKILL LIVES IN THE CREW

What these robots get wrong are judgement calls: which truss is ready, which leaf comes off, where the whitefly starts. Crews make those calls all day, from experience built up on the job. That judgement lives in the crew, and the crew is the part growers can no longer hire. When a crew leaves at the end of the season, its know-how leaves with it.

LEARNING FROM PEOPLE

That judgement can now be taught. Robot foundation models learn a new task from recorded demonstrations, and Physical Intelligence alone raised \$400 million in 2024 to build them. What these models lack is data from inside working greenhouses, and nobody records it there, because the people with the skill are out on the crop rows.

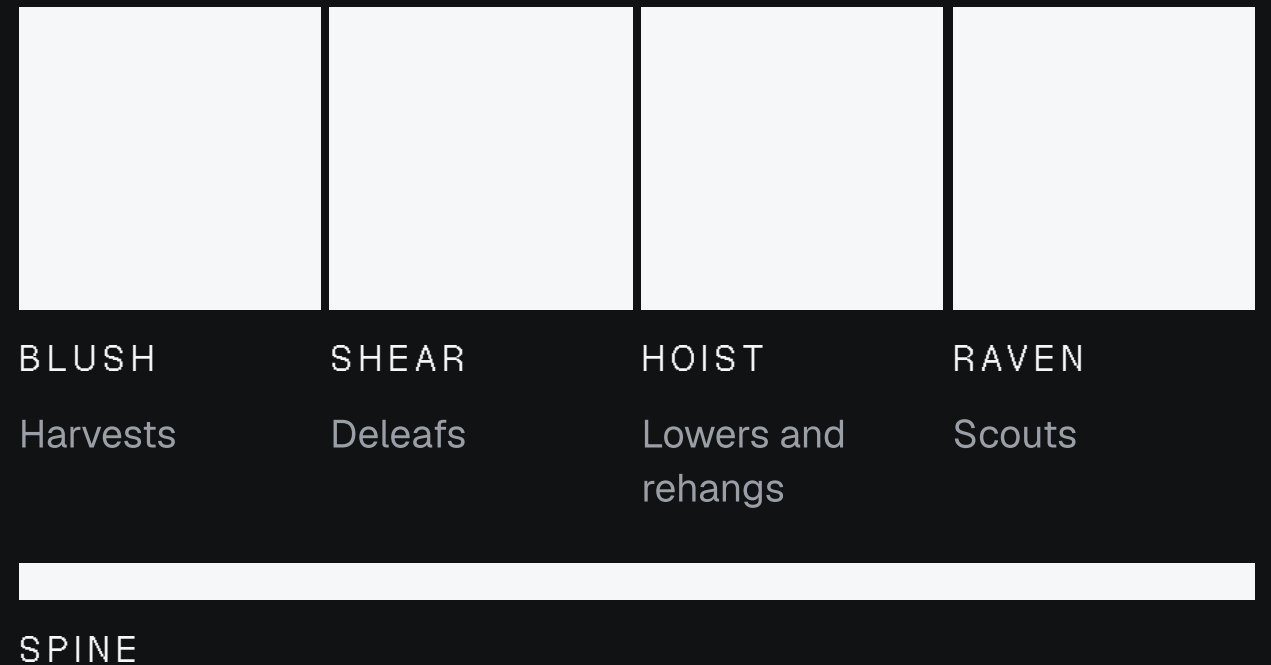
CREWS TEACH THE ROBOTS

Vinea records crews on their normal shifts, and the work itself doesn't change. For picking, deleafing and rehanging, the crew uses a handheld tool with the same soft fin-ray jaws as the robot and a camera looking along them, so every grip and cut is recorded from the robot's point of view.

For scouting, eye-tracking glasses and a microphone record where an experienced scout looks and what they say they see, so the recording labels itself. Each job's recordings train a robot skill on top of an open robot foundation model.

MODULES FOR EVERY JOB

Every skill runs on SPINE, a base that rides the heating pipes already laid between the crop rows. On top sits the module for the job: BLUSH harvests, SHEAR deleafs, HOIST lowers and rehangs, and RAVEN scouts. A new job means recording the crew doing it and shipping a module. The greenhouse stays as it is, and the grower deals with one platform for the whole crew's work.



HOW BLUSH PICKS

BLUSH is the first module. A camera above the row finds a ripe tomato within reach and marks it. The picking model, trained on crew recordings, steers the arm to that fruit. Just before the jaws close, a second camera on the gripper checks the colour around the stem and calls off the pick if the fruit isn't ready. The soft fin-ray jaws wrap around the tomato instead of squeezing it.

- Find
- Steer
- Check
- Wrap

FROM SIM TO REAL

I built a simulation where a robot harvests a whole greenhouse. Now it's becoming real: a robot arm learns from demonstrations I record, and a camera model tells ripe from unripe tomatoes live, on real fruit. Next come ripeness checks on the gripper and a test greenhouse where the arm picks cherry tomatoes. Today I teach the arm by hand; at scale, crews teach it as they work.

IT LEARNS AS IT WORKS

Once deployed, every robot records its own work: each pick, each miss and each time a person steps in, so the whole fleet keeps improving. Each new crop starts from what earlier crops taught it, because picking a pepper has a lot in common with picking a tomato. The more greenhouses Vinea runs in, the less new data each new crop and each new greenhouse needs.

DUTCH GLASS FIRST

We start where the crop, the pipe rails and the crews are the same, and widen from there. Dutch tomatoes cover 1,767 hectares, over half of it farmed by the ten largest growers. Dutch peppers and cucumbers add another 2,213 hectares on the same pipe rails.

Europe has 33,637 hectares of high-tech greenhouses, about half of the world's 70,000. Dutch builders put up glasshouses everywhere, and SPINE follows the ones with pipe rails.

- Dutch tomatoes
- Dutch peppers and cucumbers
- Europe
- The world

WORLD VS NETHERLANDS

Harvesting alone costs a Westland grower €5 per m², or €50,000 per hectare a year. The world has 3.72 million hectares of greenhouses of every kind. Deleafing, lowering and scouting come on top: in tomatoes, harvesting is under a third of the hours.

MARKET	AREA	HARVESTING, PER YEAR
TAM · World, high-tech glass	About 70,000 ha	€3.5 billion at Dutch cost
SAM · Dutch tomatoes, peppers, cucumbers	3,980 ha	€199 million
SOM · The ten largest Dutch tomato growers	More than 880 ha	Over €44 million

RENT IT LIKE A CREW

Growers rent Vinea the way they would hire a crew: a pilot season, then a monthly fee per robot with service included, always priced below the labour it replaces. Pricing stays provisional until after the pilot.

Work out what it saves you →

KRISHAANTH RAMARAJ

At Degla AI, a YC-backed drone startup, I built and tuned drones, precision work of the kind Vinea needs. I made the harvest simulation and I'm building the real robot myself, while studying Electrical Engineering at TU/e and bartending on the side. I've interviewed tomato growers on what labour costs them and why they haven't bought a robot yet, and built Vinea around their answers.

LET'S TALK

Connect with me on LinkedIn, or write to me directly.

Connect on LinkedIn →

Book a call →

THANK YOU

Book a call →

Run your numbers →