

CASE STUDY

# Powering High-Throughput Plant Genetics to Cultivate the Fruits and Vegetables of Tomorrow



## GOAL

# Use CRISPR and gene editing to develop new varieties of fruits and vegetables for consumer purchase

Pairwise's mission is to build a healthier world through better fruits and vegetables. Each new innovation, whether a pitless cherry or a more nutritious leafy green, starts as an idea. The team uses CRISPR to turn these ideas into plants, which are grown in a greenhouse, then molecularly tested for the desired phenotype and genotype. Throughout this process, the team has to manage high complexity workflows and high throughput data generation.

## CHALLENGES

- Plants don't generate genetically identical progeny. Each plant has its own phenotypic and genotypic characteristics, and must be tracked as an individual. Thus, sample sets often contain hundreds of entities, each with its own optimization needs and custom steps — two orders of magnitude larger than a typical biopharma sample set.
- Compared to cell-based workflows, plant-based workflows require more complex infrastructure, more team handoffs, and longer timelines. Pairwise needed a centralized, easily-accessible way to organize and communicate experiment data to every team, from discovery to development.
- Program leaders needed to turn thousands of data points into insights to drive decision making. They needed pre-computed reports aggregating metrics for successful plants each week to move forward with.

## RESULTS

> 78,800

plants registered into the inventory

4,728

plasmids designed with Benchling

100%

user adoption



“We can look at a plant and simultaneously know not only the plasmid we used, but it’s exact sequence and dozens of aspects about it. This fact takes us from using Benchling as a plant inventory system to Benchling as a fully integrated biotechnology pipeline.”



Nathaniel Graham, Molecular Biology Scientist



# The Story

**# of employees:** 51-250

**Industry:** Agriculture, Plant Tech, Food

**Offices:** Durham, NC

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Uniquely situated between agriculture and biotech, Pairwise applies cutting-edge technologies such as CRISPR gene editing and next-generation sequencing (NGS) to one of the oldest human technologies: food cultivation.

Pioneering this field presents a particular set of technical challenges. Their tools must be customizable to fit agriculture-focused experiments and workflows, while also supporting the cutting-edge scientific techniques that they're applying to agriculture for the first time. They turned to Benchling for a flexible, cloud-based platform that could track and streamline both the agricultural and biotechnological aspects of their R&D.

Benchling began by building a robust plant registry — tying actions like

inventory tracking, data collection, and seed retrieval to the plant in question. This Registry provides a convenient system within which Pairwise can track their entire plant development pipeline.

The pipeline begins with an idea for a potentially beneficial gene edit. Researchers then design plasmids and check the gene edit's sequencing results using Benchling Molecular Biology. Once a plasmid has been selected and validated, transformations into plants happen on a large scale. Templated Benchling Notebook entries and workflows help standardize data collection during large-scale gene editing and plant growth. As plants move from the wet lab to the greenhouse, Benchling Requests provides a single communication point, ensuring that every handoff takes place under identical conditions.

Plants are molecularly screened using NGS, and seeds are only collected from



those capable of passing on the desired trait. The subsequent generation is then screened to confirm the trait has been inherited. Benchling associates each plant's database entry with these experimental results, making it easy to identify candidate plants and seeds, and discard undesirable ones. API access allows Pairwise to pull data directly from specialized instruments and to build customized report views.

Pairwise is excited to expand Benchling usage even further by rolling out Benchling to their scientists in the field. They know that using the right tools in their R&D pipeline is critical to reaching their goal of bringing new fruits and vegetables into the market in the next five years. At first, Pairwise may just make a difference in what we see on our grocery shelves, but ultimately, they will change the way we incorporate fruits and vegetables into our lives.

“Benchling is our R&D database, so the goal is that everything comes from Benchling when we make any R&D decisions.”

Brigitte Hofmeister, Bioinformatics Software Engineer



# Benchling Solutions

## A customized registry tracks a high volume of plants, providing objective data verification and tracking

- ✓ Benchling's robust Registry handles hundreds of plants per sample set, with standardized data and metadata collection spanning the entire plant life cycle.
- ✓ All R&D is centralized on Benchling's platform, enabling quick viewing of all data associated with each plant, from transformation media to NGS confirmation of desired traits.
- ✓ Benchling's data warehouse and APIs enable direct sourcing of data from specialized instruments, eliminating transfer errors and delays.

## Data transparency ensures handoffs between wet lab and greenhouse take place under consistent conditions

- ✓ Experiments can be designed and carried out across multiple locations without information loss. For example, greenhouse workers know which plants to pollinate in order to achieve the requested plant cross.
- ✓ Global search allows every team member to immediately see where a plant or plasmid has been documented, even from experiments years prior.
- ✓ Entry witnessing ensures data integrity and accuracy to support the growth of Pairwise's patent portfolio.

## Real-time reporting in customized dashboards drives informed decision making

- ✓ Decisions about which plants to keep, or which groups need more headcount can be made in a transparent and data-driven way.
- ✓ Department heads can quickly pull out trend-forecasting insights to inform leadership decision making.
- ✓ Through Benchling's APIs, Pairwise can easily integrate standard data types with custom data types specific to agriculture, enabling comprehensive analytics.





[www.benchling.com](http://www.benchling.com)