pairwise®

Company Introduction

Who is Pairwise?

Pairwise is a six-year-old health-focused food and agriculture company transforming how we produce and consume food.

We use CRISPR to help solve the pressing problems in our food system that we are facing today: sustainability and adapting to climate change while delivering benefits to consumers and growers.

TIME

Pairwise Named one of America's Top GreenTech Companies 2024

We are founded and led by food, agriculture & genomics experts

ABOUT US

CO- FOUNDERS

Tom Adams, PhD
Chief Executive Officer

Haven Baker, PhD
Co-founder

Feng Zhang, PhD
MIT, Broad Institute

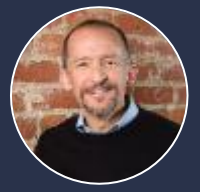
David Liu, PhD
Harvard

J. Keith Joung, PhD
Arena Bioworks

LEADERSHIP

Tom Adams, PhD
Chief Executive Officer

Lynsey Wenger, MBA
Chief Financial Officer



Ian Miller, JD
Chief Operating Officer

Ryan Bartlett, PhD
Chief Technology Officer

- Headquartered in Durham, North Carolina, USA
- Employs 100+ people across the nation
- Approximately 3,000 m^2 of greenhouse space

Our FULCRUM™ PLATFORM

Our innovative platform of solutions allows us to focus on achieving real results for our partners.

TRAITS

Agronomic expertise in over 60 crops
Successful edits in 14 crops

Our deep knowledge of plant biology guides us along the most efficient and effective path to trait identification.

TOOLS

SHARC™
REDRAW™

Our proprietary tools enable us to apply gene editing technology (e.g., CRISPR) in a manner that no one else in the world can.

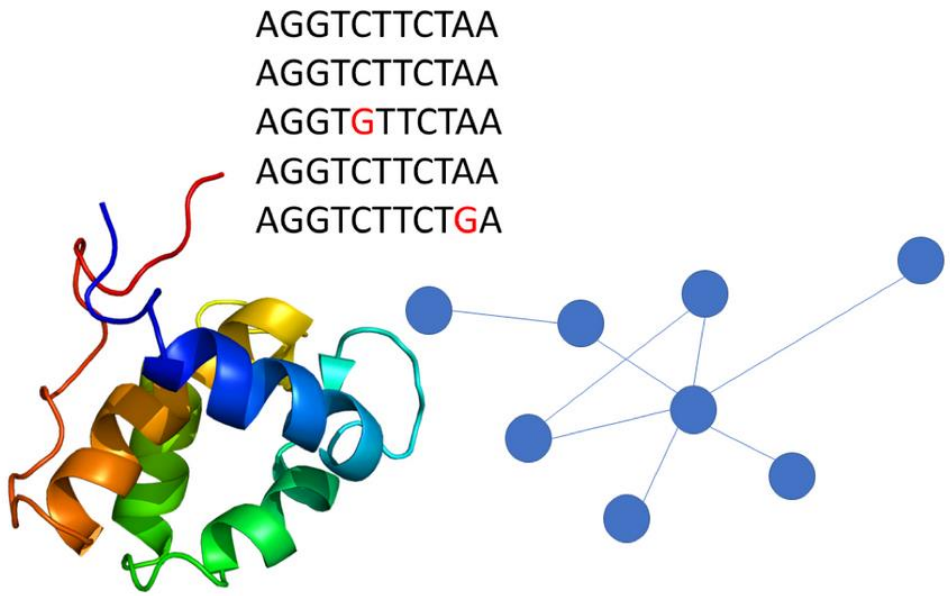
SCALE

Results-oriented ability to home in on the benefits that matter most, and pivot as needed

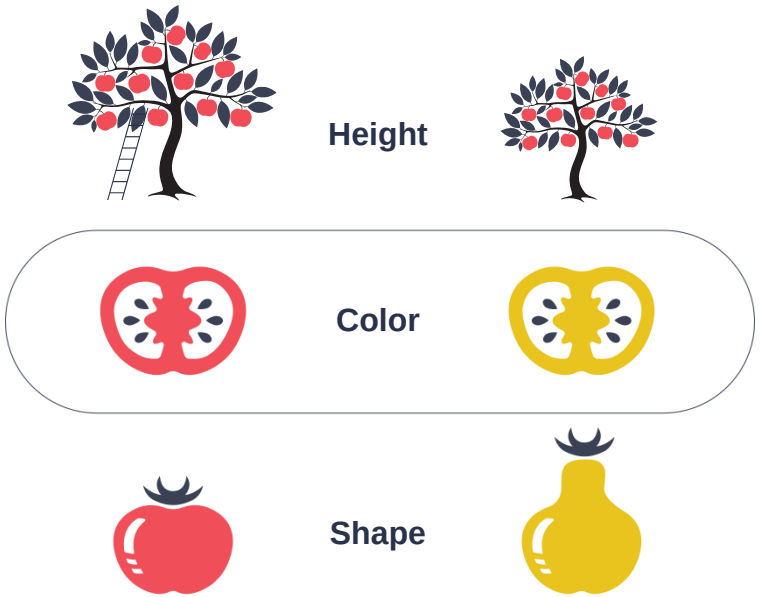
Our enterprise scale process provides the best chance for achieving the desired effect in just one generation.

Editing enables fast, precise genetic changes, making investment in specialty crops possible

Data science and computational biology methods inform the process



Gene editing dramatically accelerates the plant breeding process

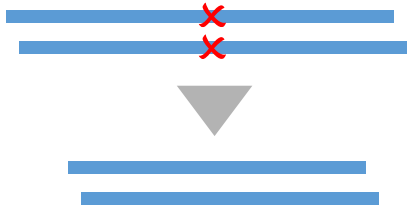
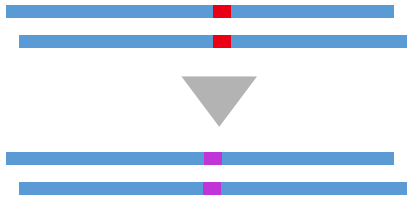
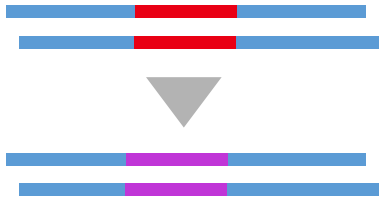


Conventional Crossing = 10–12 generations
Gene editing = 1–3 generations

CRISPR and Gene Editing Tool Overview

In the gene editing landscape, three main types of tools exist, each of which can make different types of changes to the genome

Sentence examples are intended to illustrate adjustments that can be made in DNA using each tool

1 **Traditional CRISPR Nucleases (e.g., Cas9, Cas12a)**	Ability to remove a word		It was the worst of times ▼ It was the of times
2 **Base Editing**	Ability to find a misspelled word and change a letter		It was the wurst of times ▼ It was the worst of times
3 **Templated Editing**	Ability to find a misspelled word and change the entire word		It was the worst of times ▼ It was the best of times

Editing opens up diverse opportunities where genetics have previously driven market growth and share capture

Produce and large acre row crops both present tremendous financial opportunities

>$72bn

is spent annually on produce in the Retail channel in the US[(1)], and the Food Service market is roughly equivalent

>$100bn

is the US market size of corn alone[(2)]; other big acre row crops (soy, wheat, cotton, etc.) and global footprint also represent meaningful markets

and Pairwise has selected particularly large and/or fast-growing categories as areas of focus

While additional products are being explored, the majority of our current pipeline is in these four crops

$1.5bn, growing at 8+% yoy[(4)]

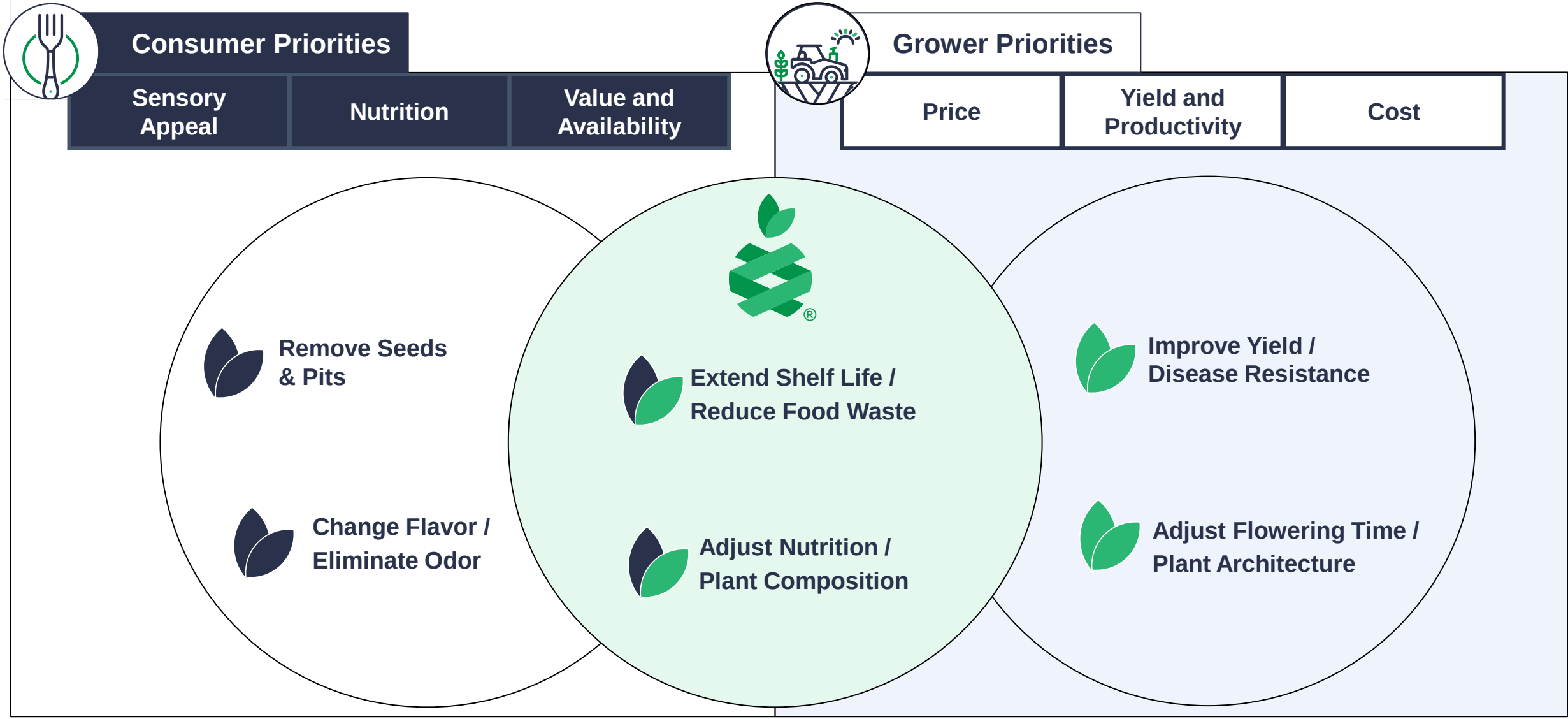
$1.5bn → ~$7bn value at retail[(5)]

160+mm acre market[(3)]

235+mm acre market[(3)]

1. IRI, Integrated Fresh, Total US. | 2. USDA Economic Research Service Feed Outlook, April 2023. | 3. Corn and soy acreage represents estimated acres in North and South America per USDA Foreign Agricultural Service (FAS) and World Agricultural Supply and Demand Estimates (WASDE) | 4. Estimated blackberry retail and food service sales in US and Canada per Company Analysis referencing data from Byzzer Nielsen, The Food Industry Association's "The State of Fresh Foods", Agriculture and Agri-Food Canada's Statistical Overview of the Canadian Fruit Industry, and Costco's 2023 10-K | 5. Estimated cherry retail sales only per Nielsen; shows illustration of future growth potential that could be enabled by season expansion and premiumization through stonelessness.

Our technology and expertise address issues for growers and consumers alike



Creating value across crop families with conserved traits

Crops

Canola, Corn, Soy, Wheat

Leafy Greens

Potato

Blackberry, Black Raspberry

Cherry

And More!

Trait Areas: Productivity Sustainability Consumer

Sample Traits

- Yield per Plant
- Plants per Acre
- Flowering Control
- Fruit Size
- Plant Architecture
- Disease Resistance
- Reduced Inputs
- Thornless-ness
- Shelf Life
- Flavor
- Seedless/ Pitless
- Fruit Size
- Sweetness
- Nutrition

Historically, adaptations that makes fruits and vegetables more convenient and available have driven consumption

BLUEBERRY
available year-round

- **Blueberries grew the market by 4x**

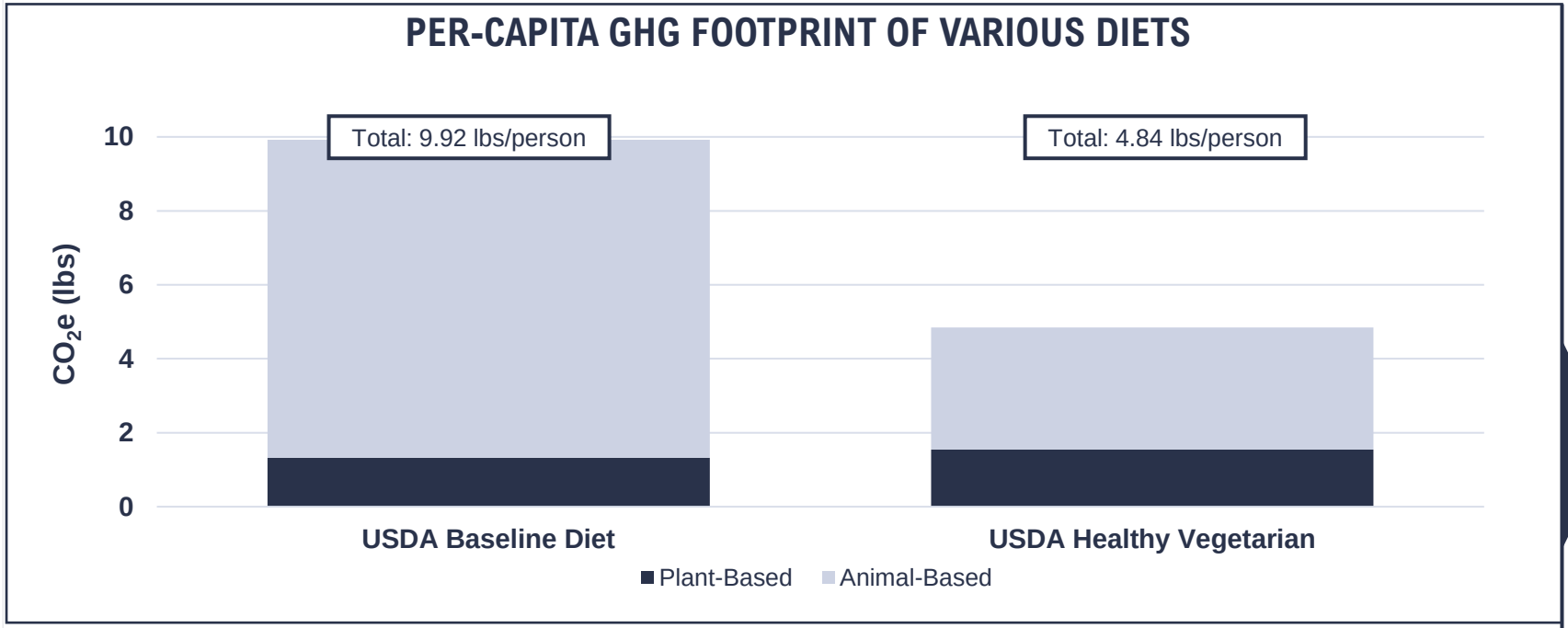
BABY CARROT
snack size, convenient

- Today: **80% of retail carrot sales are baby carrots**
- Increased U.S. fresh carrot consumption by:
  - 30% after 1 year
  - 100% within 10 years

HALOS MANDARIN
seedless, easy peel

- **Captured 50%+ of U.S. mandarin market in 5 years**
- Increased total citrus consumption by 30%
- Ranked #1 healthy snack brand by parents and kids

Where shifting diets are concerned, even incremental moves toward plant-based eating can be meaningful



Americans produce almost **10 lbs of CO_2 equivalents per day to provide for the Baseline Diet**, attributable to the significant GHG footprint of animal products, which account for 36% of total food consumed by weight but more than 80% of associated emissions.

By eliminating meat and increasing other dietary inputs, the **Healthy Vegetarian diet more than cuts our per-capita GHG footprint in half** to under 5 lbs of CO_2e per person per day.

30M metric tons CO_2e emissions per year

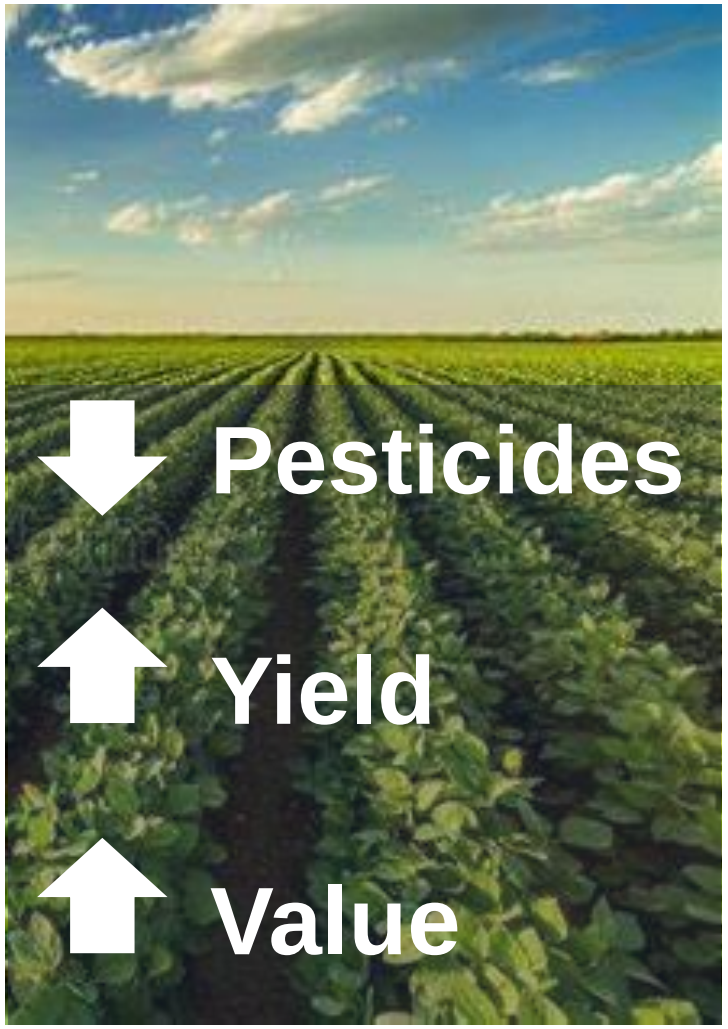
By shifting 10% of our diets to vegetarian, **we could avoid roughly 30M metric tons of CO_2e emissions per year by 2030**.

That's equivalent to the CO_2e sequestered by about **35M acres of U.S. forest** – more than the total amount of forest in California[1] – in a year.

Sources | https://pubs.acs.org/doi/full/10.1021/acs.est.8b06828, Boundless Impact Analysis. 1 | https://ucanr.edu/sites/forestry/California_forests/

Our technology platform at work

Asian Soy Rust:
Solving for a multi-billion-dollar disease problen



Using new genomic techniques, we can rapidly achieve improvement

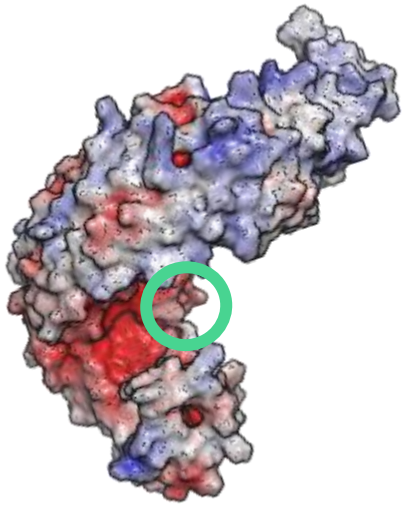
Doing in months what takes breeders decades to do

Overview

- High value traits typically have a sweet spot for optimal performance that is between gene expression being fully “on” and “off”
- Fulcrum™ Platform creates targeted diversity to determine identify and execute the best edit
- Creating a range of phenotypes enables selection of an optimized variety quickly

1. Find the sweet spot

Use data science and computational biology to identify the right segment of the gene to change

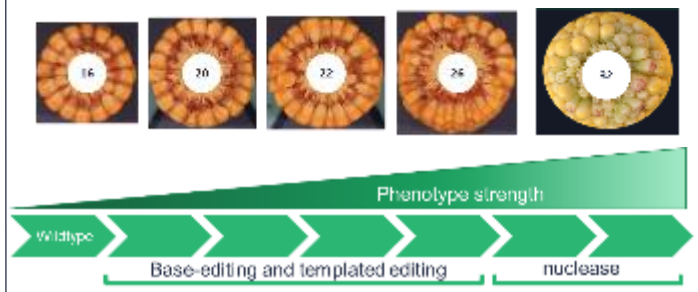


2. Create diversity in a single generation

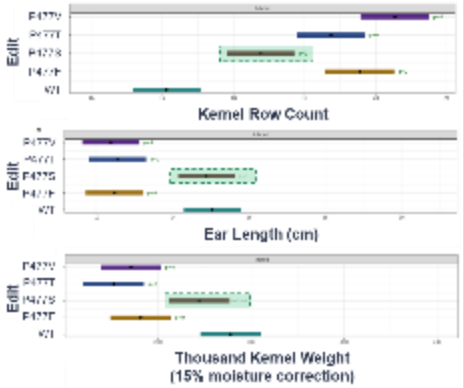
Knockout

Not optimal; no value

Base editing



3. Pick the winner based on real performance



10%

in Yield

$B

in Value

Pairwise partners with non-profit to improve staple crop in Africa

- **The Partners:** The International Institute of Tropical Agriculture (IITA) and Pairwise
- **The Details:** Grant of US $3.8M from the Bill & Melinda Gates Foundation.

- In Nigeria, yam is an important staple food crop.
- Supports the “Yam Optimized Architecture through Gene Editing (YOAGE)” project, an innovative project aimed at delivering novel genetic variation to yam (*Dioscorea spp*.)
- Focus on improved plant architecture: reduce labor and environmental impact and enable mechanized farming.

IITA and Pairwise Secure $3.8M to Boost Yam Production Through Gene Editing

Introducing a new variety of blackberry

A primocane fruiting variety with excellent taste and proven PSI base genetics

A New, Primocane Fruiting Blackberry

Flexibility: Very flexible cultivar that can be easily manipulated for year-round production in Mexico/Latin America

Floricane Crop: High yielding and fast time to fruiting

Production: 3 years of commercial production in California and Mexico with excellent yield and fruit quality

Specs

- **Appearance**: Good for 7-day hold
- **Firmness:** Good firmness in storage
- **Color:** Good deep color – low red drupelet reversion
- **Flavor:**
  - Great aromatics
  - 10% SS or more
  - 1% acidity
- **Size:** >7 g
- **Storage:** Store adequately for 14 days

Blackberries are edited for several traits of value to growers and consumers

A

Seedless/Pitless

What is it?

Edited to have **smaller, softer seeds** – consumer experience is expected to be similar to a seedless grape or watermelon

How does it add value?

As with other fruit like mandarins, seedless/ pitless is a consumer benefit expected to grow household penetration and drive price premium

Volume growth + Price premium

B

Architecture

What is it?

Edited plants are small and early-fruiting, allowing for **higher yield per acre** and potentially reducing chill hours

How does it add value?

More plants per acre means more fruit per acre, and changes to fruiting time extend season and may open up new growing geos

Yield improvement

C

Thornless

What is it?

Edited so that **the berry plants (canes) do not have thorns**

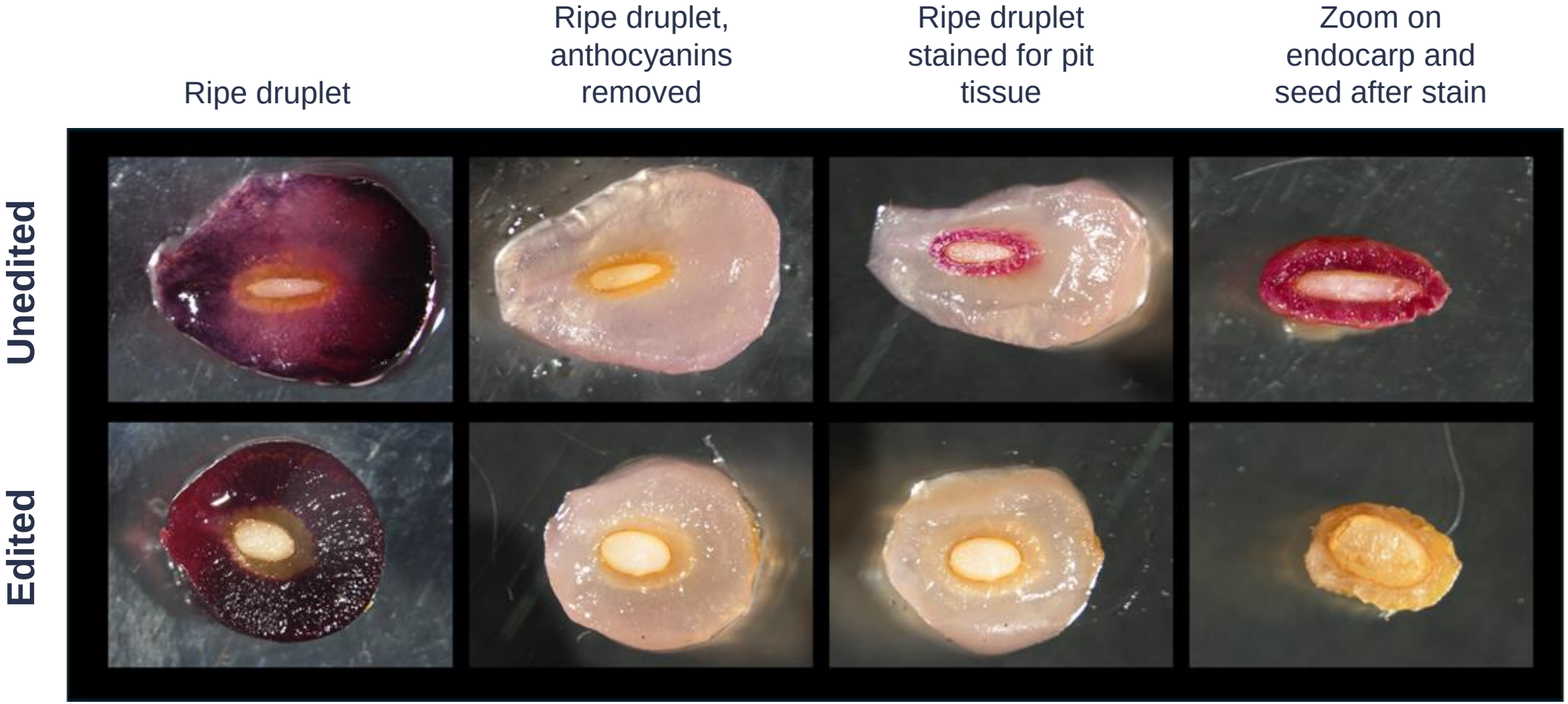
How does it add value?

Absence of thorns is safer for harvest labor and makes fruit more accessible on plants, increasing harvest speed and reducing waste

Labor cost + Fruit waste reduction

A

Pitless berries create a “seedless” eating experience similar to other fruits like grapes



B

Compact plants in blackberry may improve sustainability and yield in critical growing regions

Edited Compact

Unedited Control

Plant architecture edits can impact

- Increased plant density
- Days to fruiting
- Chill hour requirements
- Water use

Thornlessness improves worker protection, harvesting efficiency, and food safety

Thorny Blackberry

Edited Thornless Blackberry

Thornlessness is becoming table stakes because it:

Improves worker safety and decreases risk of bloodborne pathogens in berries

5 FDA recalls in 2022-2023 for berries or products containing berries related to virus, bacteria, etc.[1]

- In one recall in February 2023, frozen strawberries sold nationwide in 13 different products had to be removed/destroyed
- Same recall impacted fresh strawberries

Makes it easier for growers to recruit labor and manage picking costs

- Harvesters prefer working with thornless varieties, and this preference in California (where there are harvest labor shortages) means California growers can face high costs to get fruit picked
- Harvesting thorny varieties is materially slower, which creates worse economics for the harvester and the grower
- California minimum wage increased 48% from $11 in 2012 to $16 in 2024, making incremental time and recruiting even more burdensome

1. *FDA Outbreaks and Foodborne Illness website.*
2. *Outbreak Investigation of Hepatitis A Virus Infection: Frozen Strawberries (February 2023), FDA website.*

Many of these edits are also relevant in stone fruits, where they can drive consumption and create more adaptable production systems

- Currently, cherries are available during a limited season; **we can significantly expand the season**
- **Compact fruit trees are more adaptable to changing or challenging growing conditions** and could improve yield, quality, input demands and supply chain reliability.
- The fruit we will produce will be without pits; **A pitless cherry would take at least a century to develop though cross-breeding** with naturally occurring pitless plum.
- We also see **transferability to other stone fruits** (nectarines, peaches, plums).

We have already demonstrated early flowering in cherry

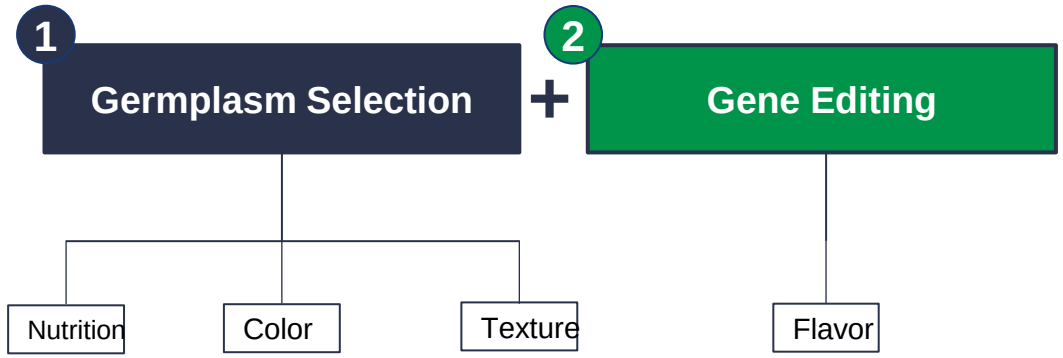
Early flowering edits have implications for:

- Season extension
- Chill requirements
- Plant architecture
- Climate adaptability
- R&D cycle times to improve further innovations

The first CRISPR food introduced into consumer end markets in N. America

Overview

The combination of expert germplasm selection and industry-leading gene editing resulted in a truly optimized product



Mustard Greens Case Study

pairwise®

Pre-Pairwise Intervention	✕ Pungent and bitter ✕ Nutrient-dense, but unpleasant to eat ✓ Grown commercially, but only consumed cooked ✓ Lettuce-like texture
Pairwise's Technical Capabilities	1 Edit 17-copy myrosinase genes in highly nutritious but low palatability (pungent) mustard greens 2 Myrosinase knockout eliminates pungency
Post-Pairwise Intervention	✓ Highly nutritious and flavorful mustard greens, unlike anything else on the market with up to double the nutrition of romaine ✓ Superfood greens that eat like lettuce
Commercial Success	✓ First gene-edited product to reach market in the US ✓ Successfully licensed greens to Bayer's vegetable seeds business for wider reach

We sampled our leafy greens in three U.S. cities

Seattle, WA

Palo Alto, CA

Austin, TX

We shared information about our technology in three ways

Wall Signage

Table Tents with QR Codes Linked to Our Website

Brand Ambassadors Shared Verbally with each Guest

Voice of the consumer

Favorable consumer sentiment is created through authenticity and positive consumption experience

What if anything did you dislike about the Greens?

Only 1%

of sampling consumers who completed a survey about our leafy greens cited the technology as a component of their experience

Summary

- Gene editing is **revolutionizing agriculture**.
- The precision and efficacy of the technology allows us to **vastly accelerate the benefits of plant breeding,** opening up opportunities for investment in specialty crops**.**
- **These benefits can create a widespread positive impact**, including climate change adaptation, better grower economics, and improved human nutrition.
- **Consumer perceptions to date have been positive,** positive sentiment occurs when people experience a product they enjoy.
- Alongside our partners, **Pairwise is putting the most sophisticated toolbox in the world to work** solving problems and creating value in a range of crops

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linkedin.com/company/pairwise-plants

THANK YOU