New Zealand Apples and Pears Conference

The WG CENTER for Innovation & Technology®

August 24-26, 2022

About Walt Duflock

5th Generation Family Farmer

South Monterey County – cattle, wine grapes, and specialty crops

30 years at Silicon Valley startups and tech companies

eBay and 3 others that were acquired (marketing / sales / BD roles)

7 years in AgTech

Built the #1 AgTech Accelerator at SVG-THRIVE and joined Western Growers as VP of Innovation in 2020

Founder and Advocate

Founded Monterey County 501(c)(3) and 501(c)(6) for rural advocacy and community development

eBay

braga fresh FOODS

SVG VENTURES — Advancing the Future of Agriculture and Food Through Innovation

THRIVE

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The WG CENTER for Innovation & Technology®

SAN BERNARDO RANCHO — EST. 1871

ROBERT MONDAVI ESTD WINERY 1966

Rava RANCHES INC.

AGENDA

- **Why Specialty Crops Need Automation**
- **State Of AgTech Automation**
- **Western Growers is taking a new, collaborative approach**
  - Global Harvest Automation Initiative
  - Next Gen Ag Worker
- **Global Collaboration Opportunities**

Why Specialty Crops Need Automation

- Domestic labor force is decreasing and aging
- Available labor cost increase accelerating due to regulatory costs
- Significant increase in immigrant labor
- New risks – what if you can't get a timely permit for immigrant labor?
- COVID lockdowns and immigration restrictions made the problem worse

Labor Problems – Harder to Find, Higher Cost

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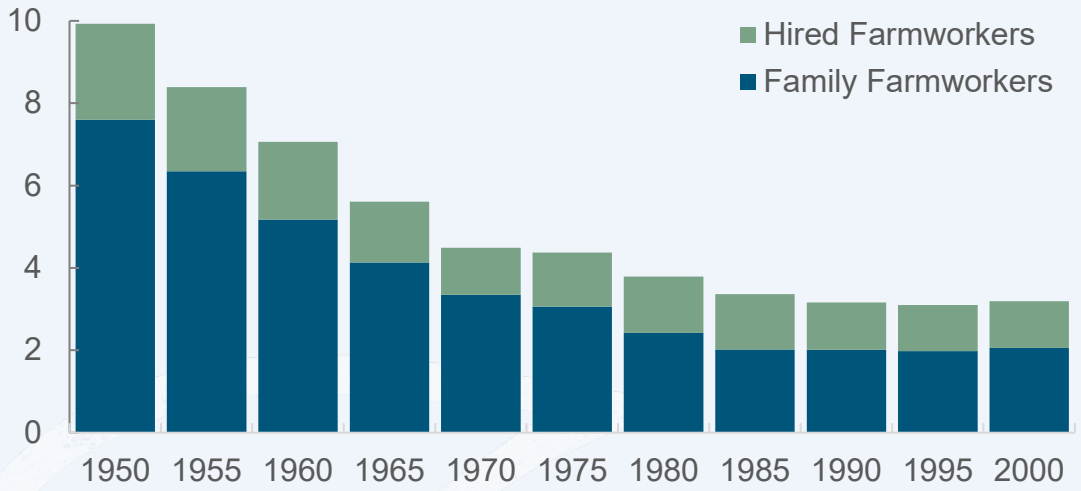
Family and Hired Farmworkers on U.S. Farms, 1950-2000

Number of farmworkers (millions)

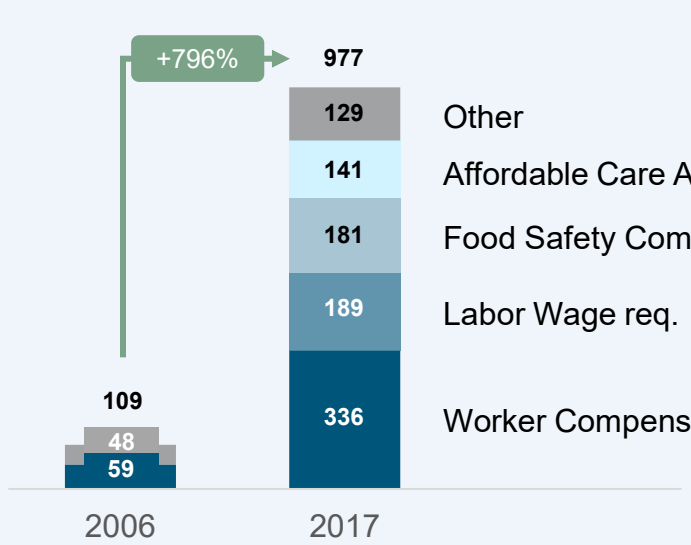


Note: Family farmworkers include self-employed farmers and unpaid family members. Hired farmworkers include direct hires and agricultural service workers employed by farm labor contractors.

Source: USDA, Economic Research Service using data from USDA, National Agricultural Statistics Service, Farm Labor Survey (FLS). The FLS stopped estimating the number of family farmworkers beginning in 2001. As of 2012, the survey no longer counts contracted agricultural service workers.

A Decade of Change

A case study of regulatory compliance costs in the produce industry (2018)
Regulatory Cost Changes for Salinas Valley Lettuce Growers, 2006 to 2017 (USD per acre)

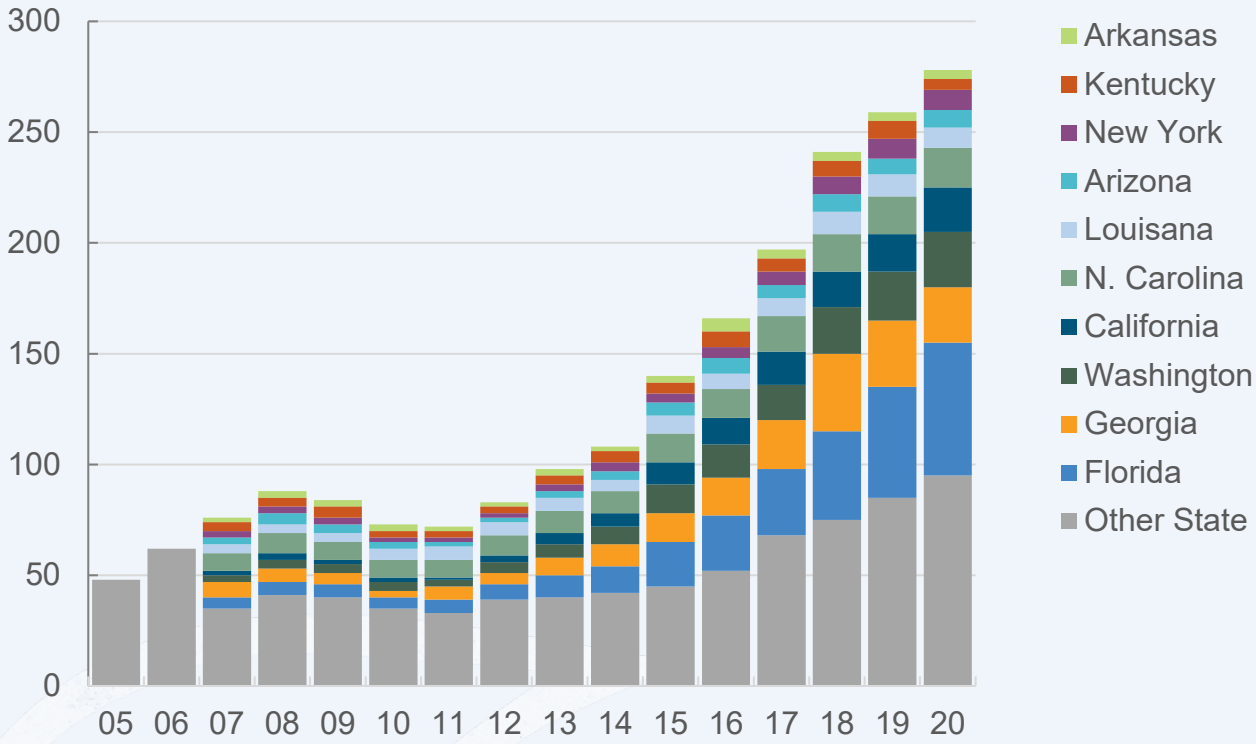


	Total % Change
Other	168%
Affordable Care Act	n/a
Food Safety Compliance	n/a
Labor Wage req.	n/a
Worker Compensation	471%

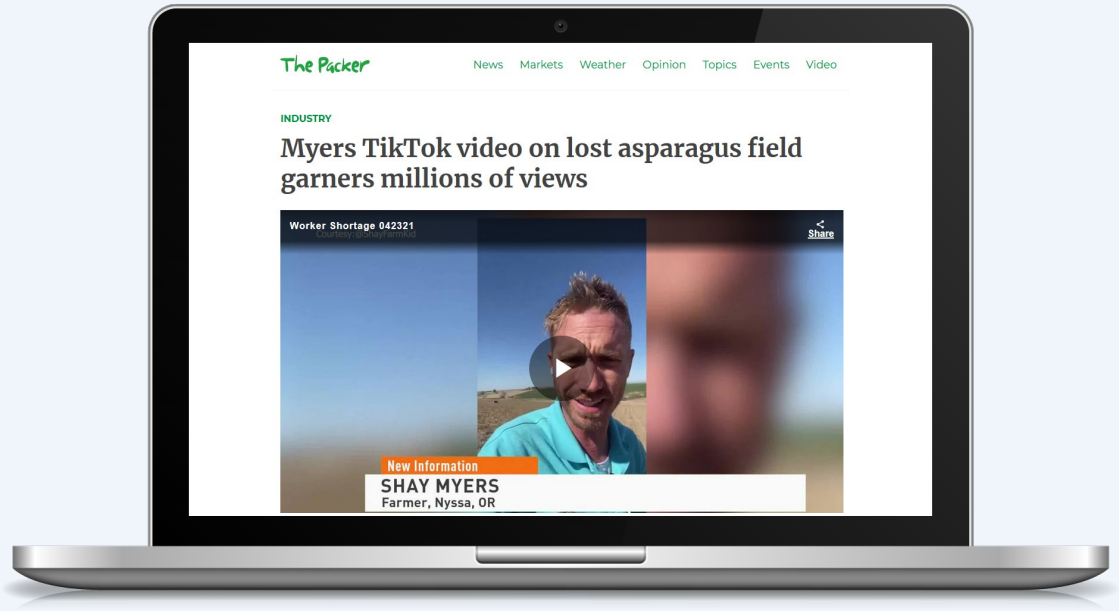
Key Takeaways

- Assessment of regulatory costs for lettuce growers in California found that regulatory costs increased by 795% between 2006-2017, while total production costs increased by 25% over the observed period
- As a result, share of regulatory costs rose from approximately 1% to 9% of total production costs between 2006-2017
- Notable regulatory changes include food safety, air and water quality, labor health and safety, and worker compensation

5x Lift in H-2A Immigrant Labor Usage (new risks)



Note: State-level data are not available for fiscal years 2005-06. The individual States included in the chart had more than 2,000 H-2A positions certified in fiscal year 2010. Source: USDA, Economic Research Servicing using data from U.S. Department of Labor, Office of Foreign Labor Certification.



Current AgTech Automation Situation

Capital intensive segment

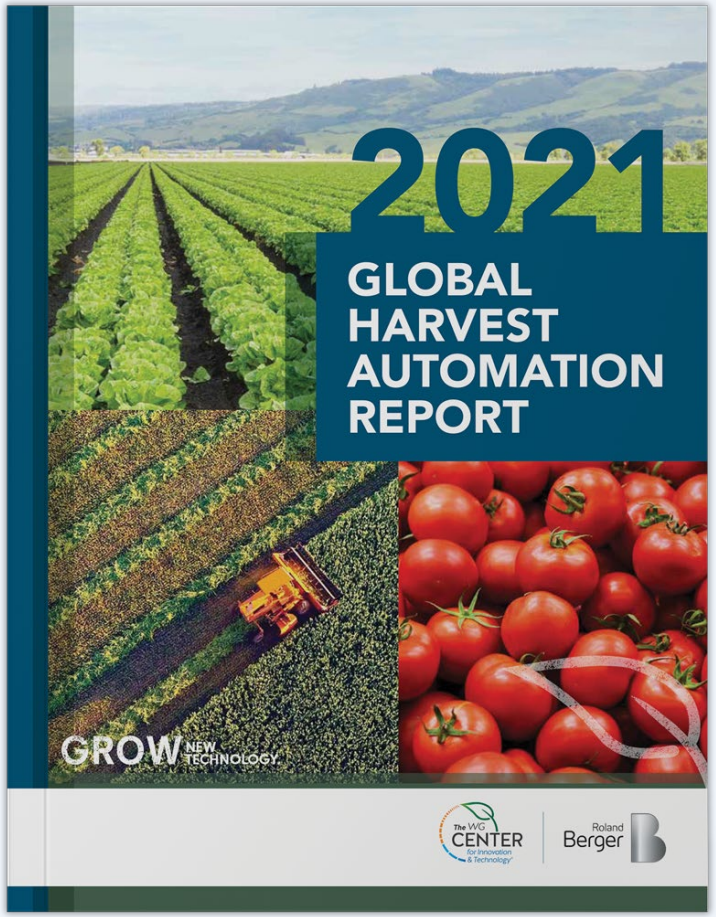
- $50-$100M/startup to build product and scale
- Limited exits (more M&A than IPO)

Most startups are early stage

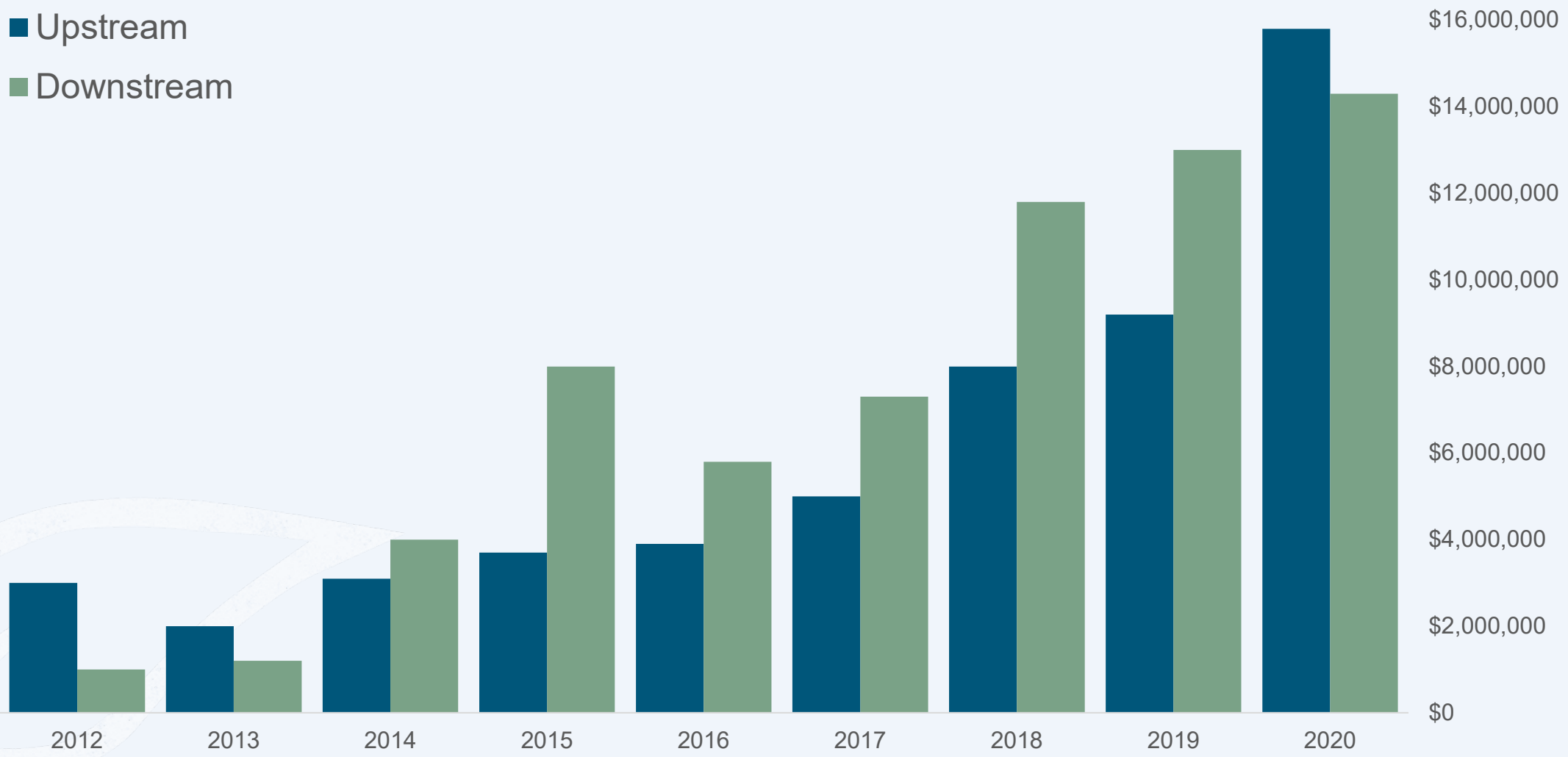
- 75% pre-A round with <5 customers and <5 robots in service
- 25% are A or B round and not yet scaling

Significant AgTech VC growth

- But Q1 presented a troubling potential trend



Projected Annual Financings 2012-2020



Current Trends in AgTech Automation

- Acquire innovation – evolve with R&D
- Autonomy (Deere – CES) mindshare up
- AI and s/w valuations increasing
- Multi-crop solutions (weeding, thinning, harvest assist) outperforming harvest automation (few exits; 1 crop/startup; RIP Abundant)
- Notable recent investments – Burro ($10.9M), Tortuga ($20M), Advanced Farm ($25M), Carbon Robotics ($27M), Farmwise ($14.5M)

CNH INDUSTRIAL

RAVEN

JOHN DEERE

BEAR FLAG ROBOTICS

FarmWise

BLUE RIVER TECHNOLOGY

Tortuga AgTech

BURRO

advanced.farm®

CARBON ROBOTICS

AgTech Investing Slowdown (automation hardest hit)

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Q1 2022 – 195 AgTech startups raised $2.7B

- 27% decrease in funding and 21% decrease in deals YoY
- 6 exits (all M&A; none in automation) – 54% decrease YoY
- Top 4 – CEA ($686M), alt protein ($540M), supply chain ($268M), biologicals ($237M)
- Robotics ($69M) = 2.5% of $s invested

Result – 3 priorities

1. New capital needed (still)
2. Collaboration for capital efficiency
3. Help global players enter US market

Market Focus	Q2 2022 Deals	Q2 2022 Dollars Raised
Alternative Protein, Processing, Food Tech, Feed Production, Food Upcycling & Ingredients	44	$540,630,026
Animal Health, Nutrition, Production, Breeding, & Monitoring	10	$136,824,863
Aquaculture Management & Inputs	4	$9,886,092
Biological, Pollination, Novel Crop Inputs & Protection	15	$237,359,490
Climate Monitoring, Crop Insurance, Farmer Credit, Financial Services & Carbon Trading Initiatives	25	$410,402,362
Controlled Environment Agriculture	15	$686,658,105
Digital Agronomy, In Field Sensors, Decision Support & Farm Management Software	28	$213,031,400
Farm Robotics, Automation & Labor Planning	9	$69,150,569
Food Preservation, Safety, Shelf-Life Extension, Waste Reduction & Reprocessing	8	$34,261,102
New Crops & Genetics	4	$151,661,084
Supply Chain, Trading, Tracking, Traceability & eCommerce	27	$268,598,008
Other	1	$19,936,679
TOTAL	193	**$2,778,399,779**

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  - Next Gen Ag Worker
- **Global Collaboration Opportunities**

WG Global Collaboration Campaigns

- WG membership – 2,000+ growers (over half of the US specialty crops: fruits nuts, veg)
- WG Innovation – helps accelerate R&D and commercialization in key challenge areas
- Global Harvest Automation Initiative

1) Improving the interface between growers and innovators – grower discovery conversations, field trials, and case studies
2) Reduce the capital and time to MVP, commercialization, and scale
3) Collaboration with global AgTech and technology companies to prioritize what to build and provide progress reports (Global Harvest Automation Report)

- Next Gen Ag Worker

1) Increase the supply of AgTech-enabled potential employees
2) Focus on key skills gap areas identified by growers

New Zealand – Callaghan – Western Growers Partnership

- New Zealand has supported multiple US delegations since 2016 (events and meetings with key ag and agtech ecosystems players)
- New Zealand among the leaders in AgTech automation (US, Netherlands, Israel, England, Australia)
- Callaghan – WG Partnership – NZ startups working with WGCIT (grower discovery, field trials, case studies)
- Global Harvest Automation Initiative – Callaghan and NZ Startups (Robotics Plus) engaged pre-launch, supported launch, feedback on startup readiness

Global Harvest Automation Initiative (GHAI)

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Type of Innovator	Key Objective	Tactics
Early stage innovator	Accelerate R&D / early product development	• '80-10-10' model – open source re-usable components (startups focus on IP target-rich areas – end effectors, AI) • Collaborative approach – optimize labor portfolio with pre-harvest, harvest, harvest aid, genetics, and farm practices
Mid-stage innovator	Accelerate commercialization and market entry	• Market entry strategies for international innovators (target launch for OEM/grower/WG alliance model – Q4) • Field trials and case studies (Radicle, AgLaunch, and others)

Goal is to automate 50% of fresh produce harvest in 10 years

Next Gen Ag Worker

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NGAW – part engineer, agronomist, biologist, computer scientist, and data analyst.

$750K CDFA grant to identify skills gap, identify modules to close the gap, and roll them out system-wide

- Goal – 3,000+ AgTech-certified students in 4 years
- $3K scholarships for up to 60 interns

Collaboration of WG, CDFA, 30+ CA ag-focused CCs; non-profits; AgTech HS

- Key to success – growers ID skills gap and help track placements and results

Initial skills gaps (grower feedback)

- Automation, food safety, water, supply chain

Key AgTech Collaboration Players

- Growers – key player with multiple required inputs
- Industry groups – key interface between growers, government, and Universities
- Investors – key enabler for growth and scale
- Government – key source of capital and policies
- Universities – key developer of startup and AgTech talent

AgTech Collaboration – Key Players

	Key Player	Objective	Collaboration
1	Growers	Interface with startups – grower discovery calls, field trials, case studies	Growers, WG, Global partners (field trial network)
		Define skills gap for Next Gen Ag Worker	Growers, WG, CDFA
2	Industry Groups	Increase capital efficiency by building platforms to help all startups accelerate R&D / MVP Product Development	Growers, SMEs (AgTech, Ag, Tech) – Tech Stack
		Increase effectiveness of grower-startup interactions with canned “grower information” (HarvestWiki)	Growers, Universities, trade groups (Cal Poly, Strawberry Commission)
		Support individual innovators with investment, field trials, and case studies	Growers, Trade Groups, Government (private-public model – US and AZ semiconductors)
		Develop global events to increase targeted grower-startup interactions (FIRA USA – Oct – Fresno; Biologicals event – June 2023 – Salinas)	WG, FIRA (GOFAR), UC ANR WG, Wharf42, UC ANR, TBD
3	Investors	Build Reward challenges with growers	Investors, Grower Partners (top 5 global berry producer Challenge on top 3 initiative; Radicle Challenge)
		Corporate VCs increase investments to drive strategy forward	Yamaha and Kubota (automation)
		Continue to develop new models – Foundry, Venture Studio, Crowd-funding (WeFunder – GroGuru)	Investors, Platforms, Growers

AgTech Collaboration – Key Players

	Key Player	Objective	Collaboration
4	Federal Government	Primary research funding	University, growers, startups ($20M AI grant – UC Merced)
		Invest in economic development	NSF Economic Engines grant – 5 $160M 10 year grants (huge collaboration – UC ANR, UCOP, UC Davis, Merced), WG, VC
5	State Government	Provide incentives for grower AgTech investment (tax credit or accelerated amortization)	Growers (trade groups – i.e. WG) identify incentive priorities
		Grant funding (block grant) focused on grower needs	Growers help evaluate proposals and recommend solution priorities (trade groups)
		Focus on innovation (not regulation) – autonomous	Arizona leading CA in ride sharing and autonomous vehicles
6	University System	Cross-disciplinary AgTech founder teams (Ag + Business + Engineering) (4-year Universities)	Growers and Universities work together to determine cross-disciplinary mix
		AgTech-ready workforce (2-year and 4-year) – develop Next Gen Ag workers and track results (placements)	Growers define skills gap and colleges develop modules
7	University Professors	Increased metrics focused on commercialization and licensing/revenue metrics	University, OTL, Professors, Growers

THANK YOU

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Appendix

Fundraising Collaboration Increasing

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UC ANR + WG Commercialization

- $2.2M (50% supporting image library) (awarded)

UC Merced (+ WSU/OSU/UVa)

- $20M AI grant (awarded)

USDA NIFA + WG

- $25-30M private-public fundraise (not picked for 2022 budget)

NSF Engine

- $160M, 10-year grant (5 awards given – spring 2023)
- Make 3 CA areas into NSF Economic Engines focused on Ag and AgTech to drive jobs and GDP (desert, central valley, central coast)
- Coalition – UC ANR, UCOP, UC Davis / Riverside / Merced, WG, VC

Investing $15-25M Can Save $8-12M per Automation Startup

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Roadmap Element	Resources Required	CMA Approach	Result	Impact / Savings (per startup)
Image Library	**$250-$500k 6-12 months**	**Shared image database with tags (all crops)**	**Startups can leverage industry-standard images**	**$500k and 9 months**
AI / ML	$3-5M 1-2 years	Shared AI and ML source code repository	Startups can build off of open-source code repository	$1-2M (50% of D&T – development and time)
Sensors and Controller	**$2-4M 12-18 months**	**Open-source controller (all crops and standard sensors/equipment)**	**Standard controller for all platform elements**	**$2M+ (75% of D&T)**
Software Architecture	$2-4M 6-12 months	Open-source AgOS (leverage Linux and/or ROS)	Startups use industry-standard open-source OS	$1-2M (50% of D&T)
Robot Arm / End Effector	$3-5M 3-5 years	Integration specification and open documentation	Startups have clear specs for standard arms and can still protect end effector IP	$1M+ (30% of D&T)
Mobility / Integration	$1-2M 2-3 years	Integration options for existing tractors/ag equipment	Startups can plug into John Deere, AgCo, CNHi, others	$3-5M (30-50% of D&T)
Total	**$15-25M+**			**Save $8-12M+ and 2-4 years per startup**

Global AgTech Collaboration Opportunity Overview

9 things that should change today

	Ecosystem Item	Current Role (US)	Emerging Opportunity (Global)
1	University Professors	Optimize for research	Optimize for commercialization (licensing / revenue)
2	University System		Right-sized investment in OTL (with goals set on commercialization)
3	University Cross-Department Teams	Limited cross-department collaboration before leaving campus	Entrepreneurial programs should force engineering / business / agriculture group interaction at start of project
4	Investors	Accelerators, VC firms, angels SBA (SBIR – non-equity grants)	Add collaborative private-public grants (US and AZ semiconductors as model)
5	Industry Groups	Support individual innovators with investment and field trials	Build platforms to help all startups develop case studies after field trials
6	Global Market Access	Limited investment to ease startup entry into new markets	Focus on large global markets with programs that decrease risk of large market entry
7	Early-Stage Support Vehicle	Preference for horizontal Accelerator (all ag product segments) reduces synergy	More Reward Challenges driven by grower needs that create synergy across entire cohort (Radicle)
8	State Government	Tax credits for AgTech purchases	Aggressive policies can push emerging ecosystems (ride share and autonomous) to new states (AZ)
9	Federal Government	Large funding for primary research	Large funding for economic development (NSF)