

Technology solutions for future proofing fruit cultivation

Orchard of the Future



College of Agricultural, Human, and Natural Resource Sciences
Washington State University

Delphy

hoogendoorn
growth management

QING

AUREA IMAGING
the crop intelligence company

nfo

Agromanager

Hectre

DAVIS

Oregon State University

AgWeatherNet
Washington State University

FRUITCONSULT

FME

POWERED BY DUTCH TECHNOLOGY

innov8.ag
EMPOWERING GROWERS WITH DATA

BODATA
automatisering voor de fruitteelt

Ministerie van Landbouw, Natuur en Voedselkwaliteit

WAGENINGEN
UNIVERSITY & RESEARCH

DEMCON

VRIDDER

MUNCKHOF
Fruit Tech Innovators

NLWORKS

WASHINGTON TREE FRUIT RESEARCH COMMISSION

WSDA
Washington State Department of Agriculture

UNIVERSITY OF CALIFORNIA
Agriculture and Natural Resources

Automated Ag

RedRooster
CONSULTING



ANNUAL PARTNER MEETING 2023

4/11/2023

Agenda

1. Update highlights 2022 + upcoming activities 2023
2. Pitches new validations projects
3. Presentation The Next Fruit 4.0
4. Presentation new joint research project Wageningen University – Oregon State university
5. Website preview
6. Funding opportunities

We will record the meeting for internal use only (to share with project partners)

Objectives: Orchard of the Future



Sustainability of production by development of smart machinery to manage fruit trees on a single-plant level (or lower) to optimize crop protection, leaf fertilization or use of plant hormones.



Maximizing yields and reducing food losses by optimizing production and storage through growth optimization at the level of individual trees with the help of AI decision models.



Minimizing costs and consolidating profitability through the development of resource-efficient multifunctional robots, solving the current problem of labor availability for the less attractive tasks and improving working conditions leading to new attractive jobs.

Tech for sustainability, yield improvements & profitability

We aim to reach our goals through partnership activities:

- Innovation and technology adoption to overcome common challenges
- Building a strong connected business network
- Connecting field labs and research
- Creating access to support and funding
- Crafting government policies

How far are we on achieving our goals?

For 2022 we planned the following activities*

	Status
• Developing bilateral innovation projects for technology development and application (“BIS”)	Ongoing
• Set up student exchanges and internships	In development
• Attract additional funding and support	In development
• Organize a webinar on doing (agtech) business in Washington State	To be planned
• Plan visits between Washington State and the Netherlands for project development and match-making	
• Visit Washington State 2nd part May/ June	Multiple company visits
• Greentech 14-16 June Amsterdam (NL)	Presence of Dutch PLT & companies
• Interpera 2022 28 -30 June Rotterdam (NL)	Presence of Dutch companies
• Openday fieldlab Randwijk August (NL)	Presence of Dutch and WA partners
• International Horticulture Congress (IHC) 14-20 August (F)	Presence WA PLT & companies
• Develop communication strategy	Ongoing

* Activities presented during partner meeting March 2022

Highlights 2022

- Online consortium partner event (WA-NL) in March
- Online pitch event (WA-NL) in June
- 3 funding proposals for bilateral innovation projects (BIS) for technology development and application:
 - Full automatic homogeneous blossom thinning and yield regulation
 - Automated spraying of fruit orchards
 - Fresco Handheld for fruit quality assessment
- Successful visits between WA and NL
- Presence & presentations of our collaboration and The Next Fruit 4.0 project during (international) events:
 - International Horticulture Congress (IHC) 14-20 August (F)
 - FIRA 18-20 October (US)
 - WTFRC Technology Review 1st of December (US)
- Worked on 3 research & funding proposals.
- Dutch SMM funding have become operational for partnership activities
- Communication strategy developed including a logo and a website
- Publication 'Good to Know: Progress for the Orchard of the Future' & 'Team approach combines orchard technologies' in GoodFruit Grower magazine
- Washington State Department of Commerce participation during the NW Hort Expo to develop more tree fruit specific programming

In 2023 we plan to work on....

Projects & Working groups

- The Next Fruit 4.0: outreach plan to keep US partners up to date and to foster new collaboration
- Technology validation: start (BIS) projects
- Student exchange WA<->NL: increase number of exchanges (2-5)
- Define new working groups & write new proposals

Funding & Finance

- SCBG funding application to enable outreach and travel for US partners
- Continue to apply for US funding to link with focus on postharvest, picking, spraying and to be able to start collaboration on digital twinning
- Additional funding to increase research & validation activities (The Next Fruit 4.0)

Events & Visits

- US: Ag AID in Corvallis, FIRA in Salinas, Dutch Embassy visit to WA State
- Netherlands: Visit Karen Ross & Agtech leaders California (April), Postharvest Unlimited in Wageningen (May), ...
- Other locations: FIRA Toulouse (February) Precision Agriculture in Bologna/Italy (July)
- Consortium partner events (first online partner meeting in Feb/Mar)
- Company / research visits?

Communication

- Fully develop website including maintenance & content
- Involving partners through a frequent newsletter – including the Next Fruit 4.0 updates

Governance

- Actively involve advisory board
- Individual leadership of PLT-members focused on certain aspects of our collaboration
- Lower frequency of PLT-meetings
- Exploring new partners to involve in our partnership (tree nursery companies for example)
- Onboarding process new partners

Timeline 2023

2 meetings

- Next Fruit 4.0 outreach
- Website
- Advisory Board Meeting
- BIS projects start
- SCBG application

2 meetings

- SCBG application
- BIS projects
- Newsletter
- Online partner meeting planning
- Website

1 meeting

- Postharvest Unlimited in Wageningen
- Finalize website
- Planning for fall/winter visits

February

April

June

January

March

May

2 meetings

- US funding: WTFRC
- Website
- Advisory board
- Student exchange
- AgAID event planning
- FIRA Toulouse
- Planning potential visit from NL Embassy and Dutch delegation WA

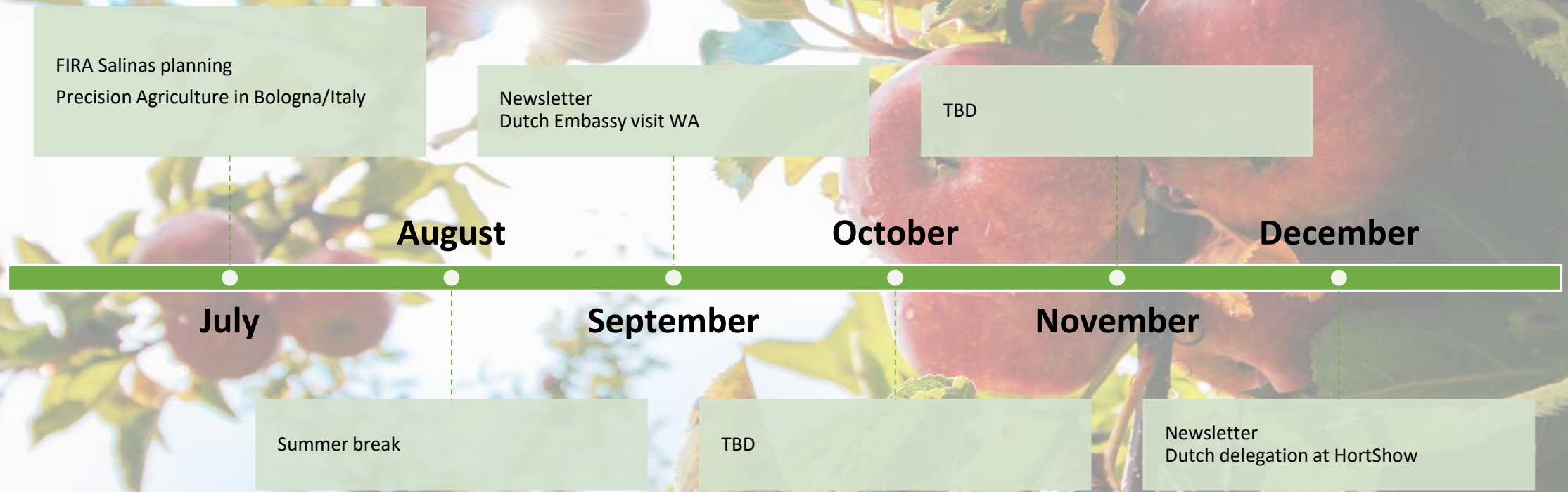
1 meeting

- Online Partner meeting
- Visit Karen Ross & AgTech leaders (California) to the Netherlands

1 meeting

- Newsletter
- International growers event Delphy (28 Jun)
- Apple Day Randwijk (29 Jun)

Timeline 2023



FIRA Salinas planning
Precision Agriculture in Bologna/Italy

Newsletter
Dutch Embassy visit WA

TBD

August

October

December

July

September

November

Summer break

TBD

Newsletter
Dutch delegation at HortShow

The Next Fruit 4.0

Peter Frans de Jong, with many colleagues from WUR and Delphy

Tuesday, April 11, 2023



Goal

- **Improving the sustainability** of cultivation and the supply chain
- **Maximising yields** by optimising cultivation and storage through the optimisation of individual tree growth.
- **Minimising costs** by developing multifunctional robots to replace human labour and ensure the efficient use of inputs.

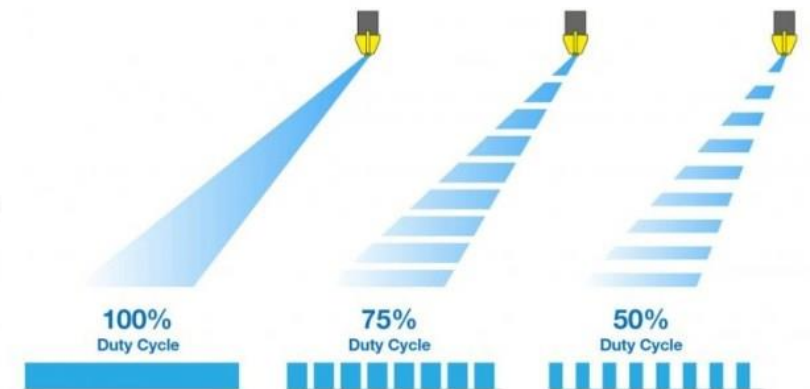
4 Case studies

- *Case study 1: Precision sprayer on nozzle level based on sensor input*
- *Case study 2: Advanced crop management and yield registration*
- *Case study 3: Cool data*
- *Case study 4: Multifunctional robot*



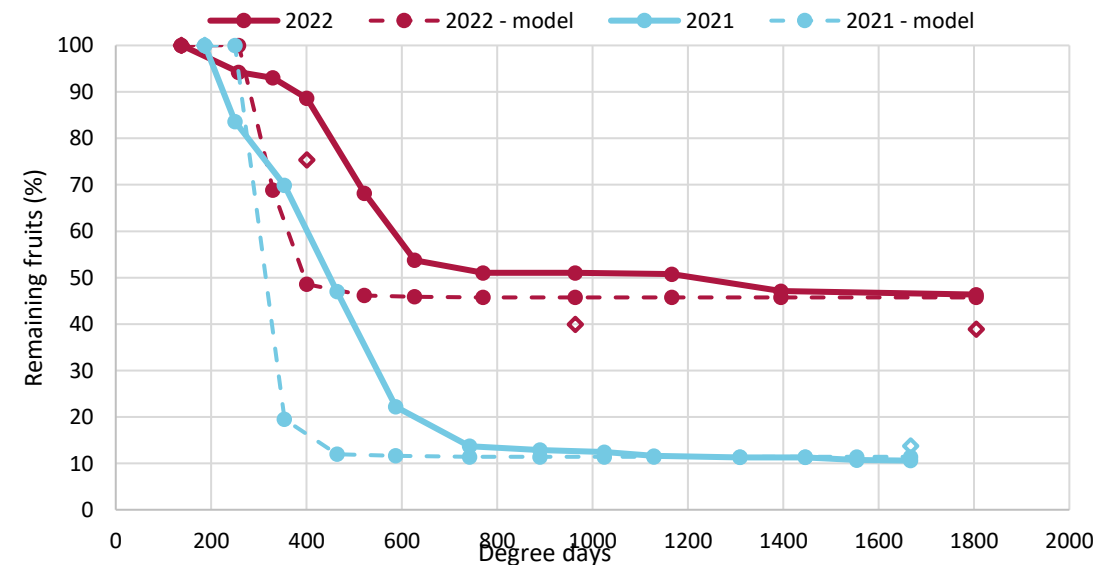
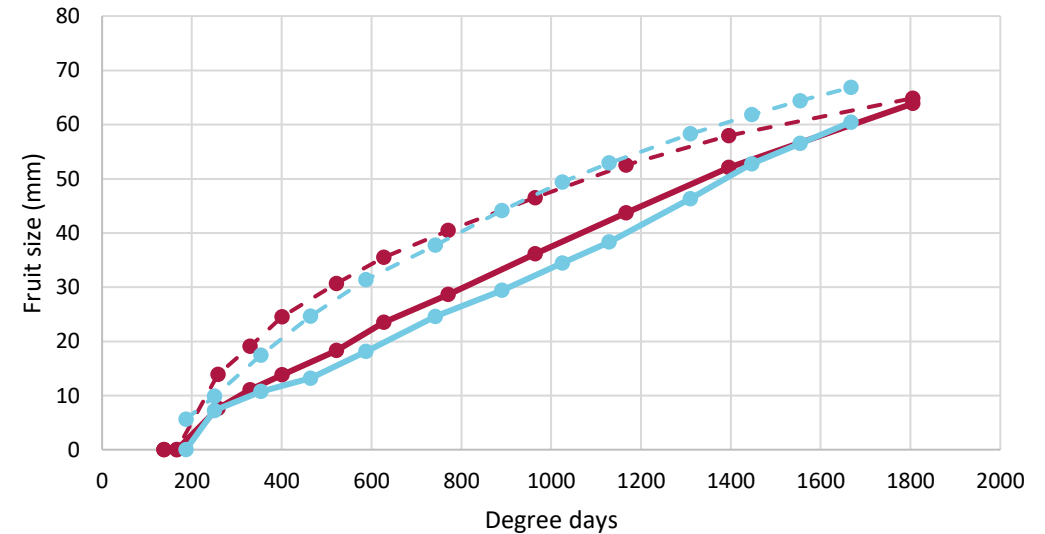
Case 1: Precision sprayer

- Goal: Improve deposition to save 50% of plant protection products
- Combination of laser scanner and PWM nozzles
- Spraying according tree volume
- First prototypes ready for testing



Case 2: Advanced crop management

- Development of **prediction models** for **fruit size** and **June drop** for pear
- Model predictions compared with ground truth measurements
- June drop model in the beginning over predicting June drop but in the end in line with measurements



Case 3: Cooldata

- Non destructive ways to measure quality of harvested fruits
 - By sensors (for example firmness and brix)
 - NIR (Kubota)
 - Microwave (Vertigo)
 - By storage bin analysis with RGB camera
 - Apple is working
 - Pear in development



TP

FP

FN



Case 4: Multifunctional robot

- No development on pear picking in the world
- End effector development for pear





ADAMA



VAN WAMEL BV

VERTIGO TECHNOLOGIES



RIWO



FME



BODATA automatisering voor de fruitteelt

Een consortium van fruittelers, het LTO Noord Innovatiefonds, het Innovatiefonds Hagelunie & Interpolis, worden in het consortium vertegenwoordigd door de NFO

Het innovatiefonds Hagelunie (Interpolis) financiert het project "snoeirobot voor rode bessenteelt" dat NFO inbrengt als co-financiering van de PPS The Next Fruit 4.0

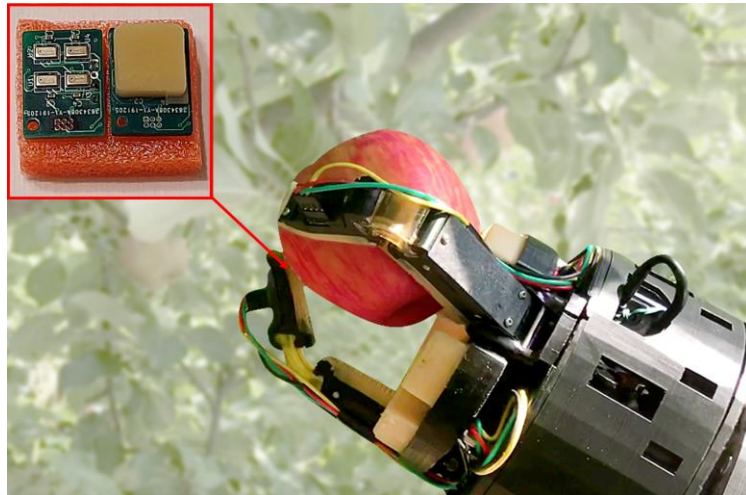


New research project: Integrated sensing and real time control for intelligent fruit picking

Funding agency: Washington Tree Fruit Research Commission

Research Objectives:

1. Develop a prototype picking end-effector with integrated vision, force, & tactile sensors
2. Design i) algorithms for fusing multiple sensor streams during the pick; & ii) novel, closed-loop tactile picking controllers
3. Evaluate the end-effector in preliminary lab/field trials



Primary Investigators:



Jochen Hemming,
WUR



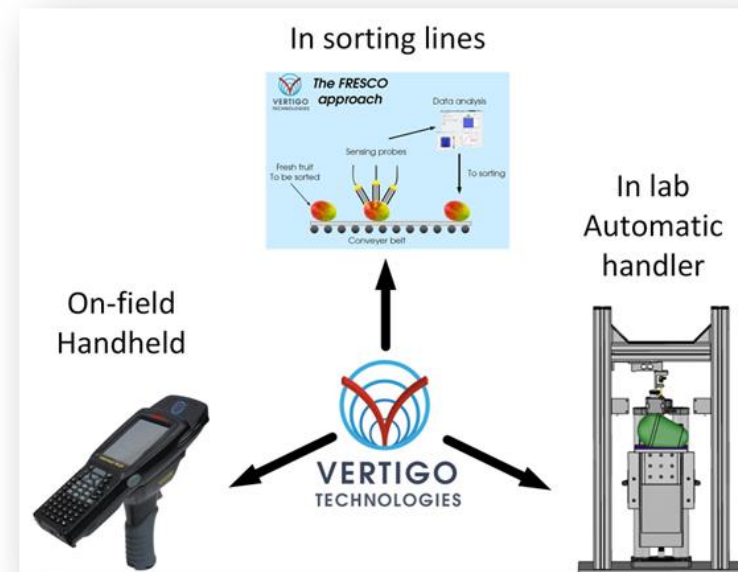
Cindy Grimm,
OSU



Joe Davidson,
OSU

Joint research project – WA Tree Fruit Research Commission Internal Program & Vertigo (potential BIS project & WUR collab.)

- Microwave-based handheld sensor
 - non-invasive inspection of quality attributes of fresh fruit (ripening, flavor, defects, etc..)
 - pre-harvest and post-harvest
- Start: fall 2023



Website preview



smart farming with innovative technology



smart farming with innovative technology



smart farming with innovative technology



smart farming with innovative technology



smart farming with innovative technology



smart farming with innovative technology



smart farming with innovative technology

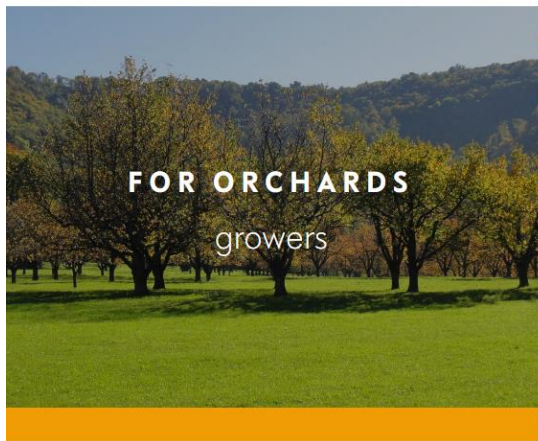


WE GET **NEW TECHNOLOGY** INTO THE TREE ORCHARD...

*...by bringing knowledge, technology and
funding together, to make the orchard...*

INDUSTRY
FUTURE
PROOF

SEARCH



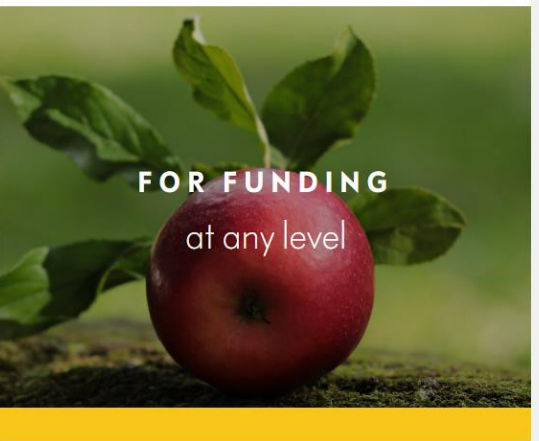
FOR ORCHARDS
growers



FOR TECH
companies



FOR RESEARCH
institutes



FOR FUNDING
at any level



About Orchard of the Future

ABOUT US

GETTING NEW TECHNOLOGY INTO THE TREE ORCHARD

With Orchard of the Future we get new technology into the orchard by bringing knowledge, technology and funding together, to make the orchard industry future proof. For that we pull resources from both sides of the sea, Western US and The Netherlands, to create a pool of experts that can help accelerate this innovation.

Together we create a future proof tree orchard industry

TO ENSURE THE FUTURE OF THE ORCHARD

With the help of these new technologies tree orchards can work more efficient, cheaper with better quality and more capacity. This change ensures an increase in exports, employment, sustainability and earning capacity, now and in the future.

Representatives Advisory Board

WHO WE ARE

We are an international consortium of knowledge centers, government, tech-companies and fruit companies from the Western US and The Netherlands who combine their knowledge to help the orchard industry by innovating their business models with automation and robotization to secure working capacity, efficiency, environment, sustainability and food safety for the whole tree fruit supply chain, now and in de future.



Check here various upcoming events

EVENTS

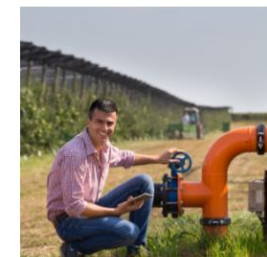
MAY 2023

14 - 17 May 2023 - All Day

SUN - WED
14 - 17

POSTHARVEST UNLIMITED CONFERENCE & POSTHARVEST ORNAMENTALS SYMPOSIUM

The Postharvest Unlimited Conference and the Postharvest Ornamentals Symposium will ...



PROJECTS



MULTIFUNCTIONAL ROBOT WORK PACKAGE

In this picture you see a proof-of-concept setup with the ABB robotic arm on a mobile truck. This setup has now been built at Proeftuin Randwijk and will allow the...

thomas
December 14, 2022



CROP & QUALITY MANAGEMENT WORK PACKAGE

In this work package, we focus on the practical application of data for fruit growing. The objective is to create a clear and well-organized data dashboard that fruit growers can...

thomas
December 14, 2022

Archives

[2022](#)

Categories

[Uncategorized](#)

Funding opportunities NL

- BIS (Bilateral Innovation Cooperation) is a subsidy opportunity for Dutch SMEs
- BIS projects have a focus on collaborative innovation activities after prototype, but before market introduction. You can think of:
 - Practical experiments in field labs
 - Further development of Dutch technology in cooperation with an US (technology) partner, either to develop new products by combining existing technologies or to further improve existing technology
 - Testing or validation of technology in cooperation with US growers, farmers, researchers
- BIS is a pilot subsidy. The projects to be selected are within the scope of two programs:
 - Orchard of the Future – Washington State
 - Controlled Environment Agriculture - California (GCEAC)
- Budget: about 3 to 4 projects can be financially supported per collaborative initiative for 50% of the project costs. An average of € 110,000 has been reserved per project
- Projects ideas for the second round must be submitted to RVO before **14th of May 2023**. Start in 2023. Project duration of max. 3 years

The background of the slide is a photograph of an apple tree. It features several green leaves with prominent veins and a few ripe, red apples. The lighting is bright, suggesting a sunny day, and the overall tone is natural and agricultural.

Funding opportunities US

- August: WTFRC Request for Proposals for Technology
- January: Specialty Crop Block Grant
- WA Dept. Of Commerce

A photograph of an apple tree branch with several red apples and green leaves. The background is a bright, clear sky. A white rectangular box with an orange border is centered over the image, containing the text "Thank you!" and "Any questions?".

Thank you!

Any questions?

Program Leadership Team



Ines Hanrahan – WTFRC
hanrahan@treefruitresearch.com



Joe Davidson - Oregon State University
joseph.davidson@oregonstate.edu



Peter Frans de Jong - WUR
peterfrans.dejong@wur.nl



Maureen de Haan - FME
maureen.de.haan@fme.nl



Rianne Perry - Washington State Department of Agriculture
RPerry@agr.wa.gov



Caroline Feitel - Netherlands Embassy Washington DC
caroline.feitel@minbuza.nl



Joke Vroegop - NLWorks
Joke.Vroegop@nl-works.com



Karin Louzada - Consulate General San Francisco
karin.louzada@minbuza.nl



Tammy Deets - Washington State Department of Commerce
tammy.deets@commerce.wa.gov