JaNeth Onshitsu Robotto

Opportunities for Japan-Netherlands collaboration in greenhouse robotics

From Seed Project (SMP) to Public Private Partnership (PPP)

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with Erik Pekkeriet (WUR), Rick van de Zedde (WUR), Annie van de Riet (AVAG)

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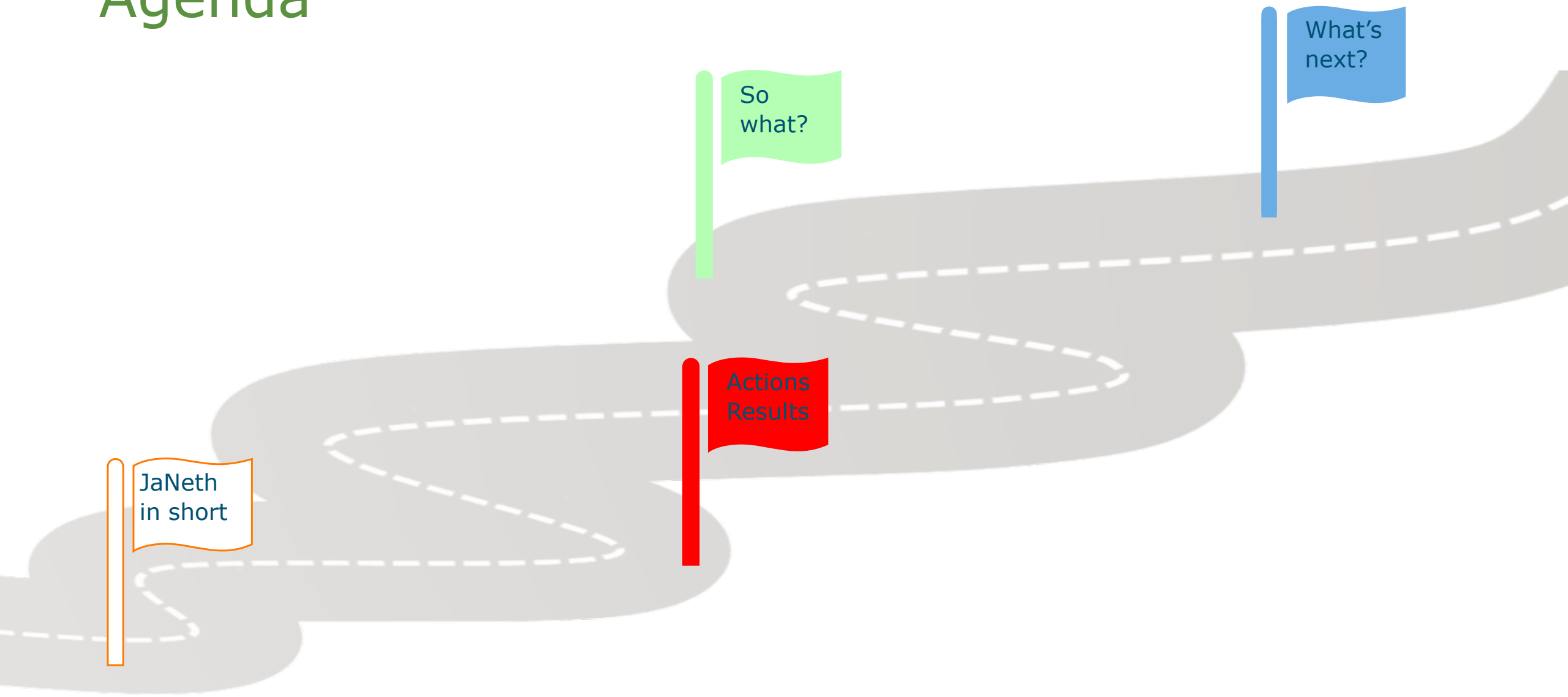
15 December 2022

Agenda



JaNeth in short

- Greenhouse horticulture is under pressure
    - Working conditions (warm, humid, short cycles, dull, repetitive tasks, heavy, unpleasant work)
    - Aging farm population (labour shortage)
    - Demand for safe and quality food produced sustainably
- Robotics can be solution
    - More sustainable way of producing
    - High precision
    - Year round and 24/7 functionality

Partners and sponsors

NARO
National Agriculture and Food Research Organization

NTT

Bom Group

hoogendoorn
growth management

全農
ZEN-NOH

DENSO

CERTHON

VAN DER HOEVEN
Horticultural projects

OnePlanet
Research Center

愛媛大学
EHIME UNIVERSITY

PLANT DATA

YASKAWA

oost nl

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HORTIVATION
TECHNICAL GREEN INNOVATION HOLLAND

RIJDER
Helping you grow
your way

TOYOHASHI
UNIVERSITY OF TECHNOLOGY

True to nature, the flavor of
KAGOME

sojitz

Shibuya

Panasonic

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Sponsors

Rijksdienst voor Ondernemend Nederland

AVAG
GREENHOUSE TECHNOLOGY CENTER

Ministerie van Landbouw, Natuur en Voedselkwaliteit

TOPSECTOR
TUINBOUW & UITGANGSMATERIALEN

Embassy of Japan

JaNeth actions and results

- About 20 interviews
- Terminology paper (In English and Japanese)
- Desk study
- 5 Webinars: 17 June, 1 July, 6 October (AVAG) 31 October, 16 November
- Innovation Mission in Japan in July
- Use cases defined
- Survey to Japanese partners
- SMP JaNeth 2.0 - 2023

Netherlands

Innovation mission Japan
Greenhouse Robotics


Assembly point

Overview travel route mission

Networking

NARO

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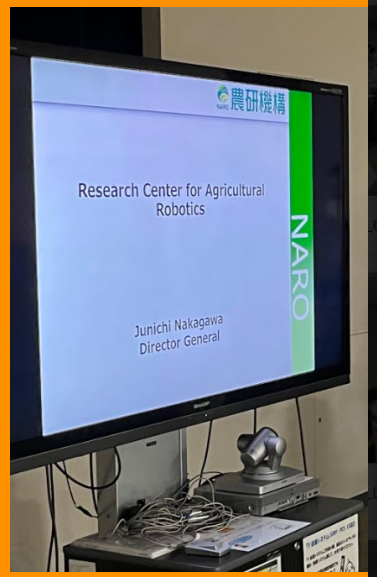

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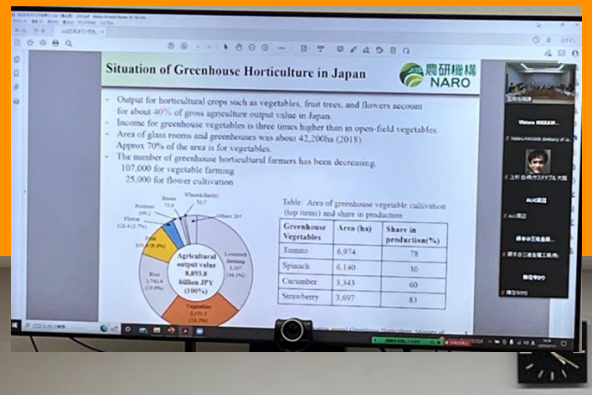

- Society 5.0

Startups: Agrist & Ginzafarm

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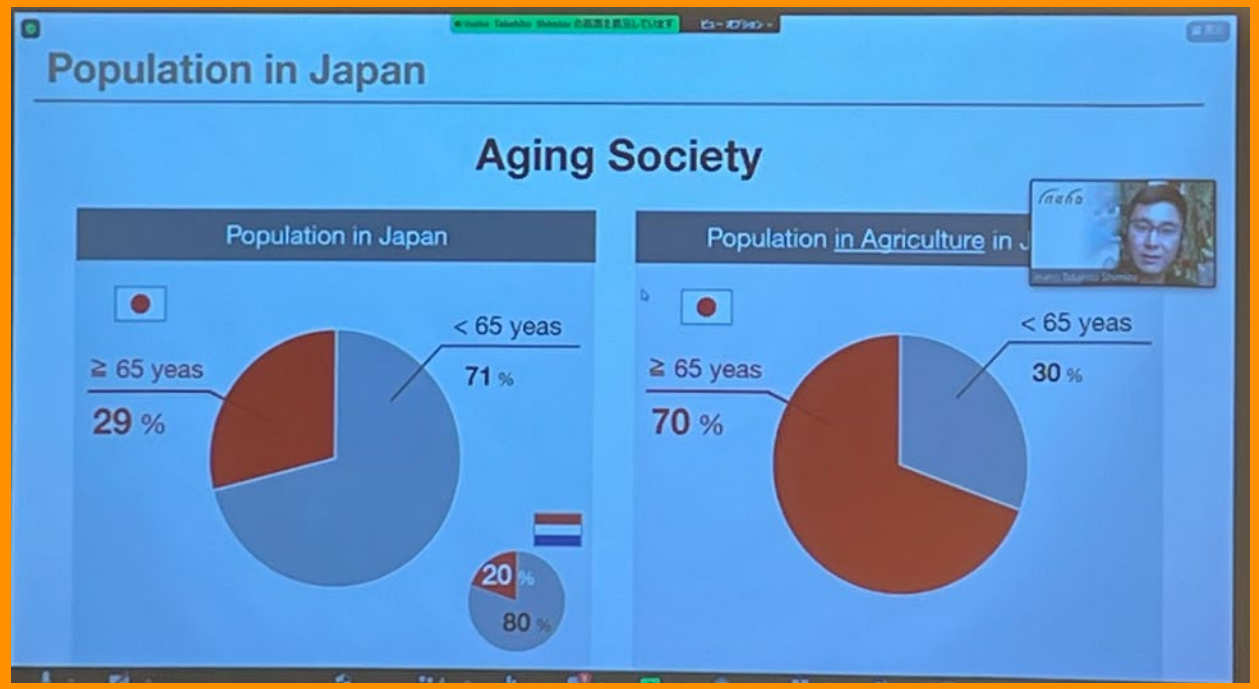
Startups: i-eat(*) & inaho



(*) In October 2022, i-eat Co., Ltd. changed its name to REACT Co., Ltd.

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AEON Agri Create

NTT AgriTechnology

NTT AgriTechnology

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5G

Asai Nursery

AgriD

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"Harvest Robot"

Introducing DENSO's FA technology to agriculture to realize the world's first 24-hour farm

Value for customer

Total Labor Cost Reduction by Day & Night Harvest Robot Consecutive Operation

AI judges maturity and harvests crops of the same quality	Contribute to stable crop quality
Able to harvest day-night consecutive operation	- Day-time Labor work reduction due to night time robot operation - Work support to compensate for daytime production fluctuations

Technology Characteristics

Vine recognition by AI

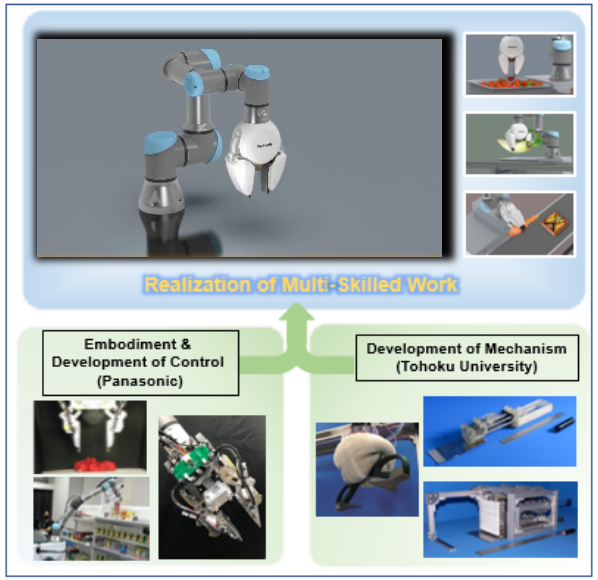
Detect Vine (night) | Detect Maturity (night) | Detect vine and cut parts (daytime)

Panasonic

iREX 2022 INTERNATIONAL ROBOT EXHIBITION

NEDO

End Effectors Equipped with Sensing That Enables Variable Multi-Skilled Work



- Capable of various end effector operations such as grasping, pinch grasping, and scooping
- Capable of grasping and pinch grasping without deforming flexible and/or fragile objects by using visual feedback
- Capable of scooping workpieces whose complex shapes make them hard to pick up and whose surfaces are slippery by simple operation

Tohoku University

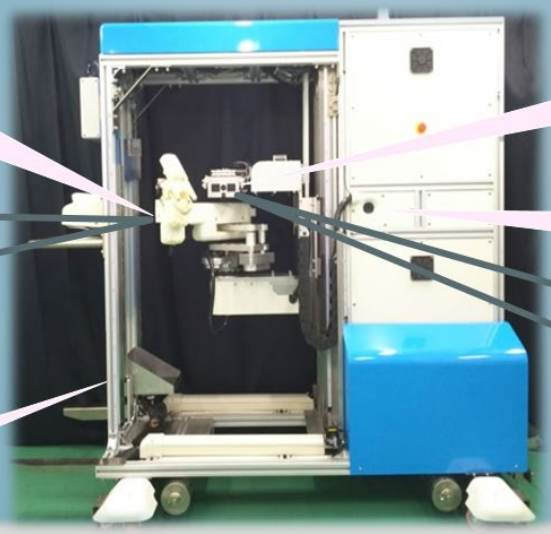
Panasonic Corporation

Design of tomato harvesting robot

Robot arm :reaching to tomato fruit
Robot hand (End effector)
:Picking tomato

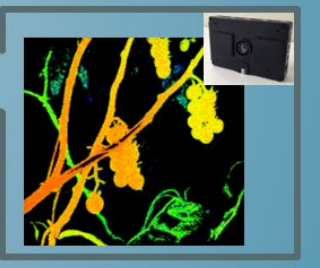
Manipulation preventing the scratches of the fruits

Basket
:Transferring tomato fruit to the basket



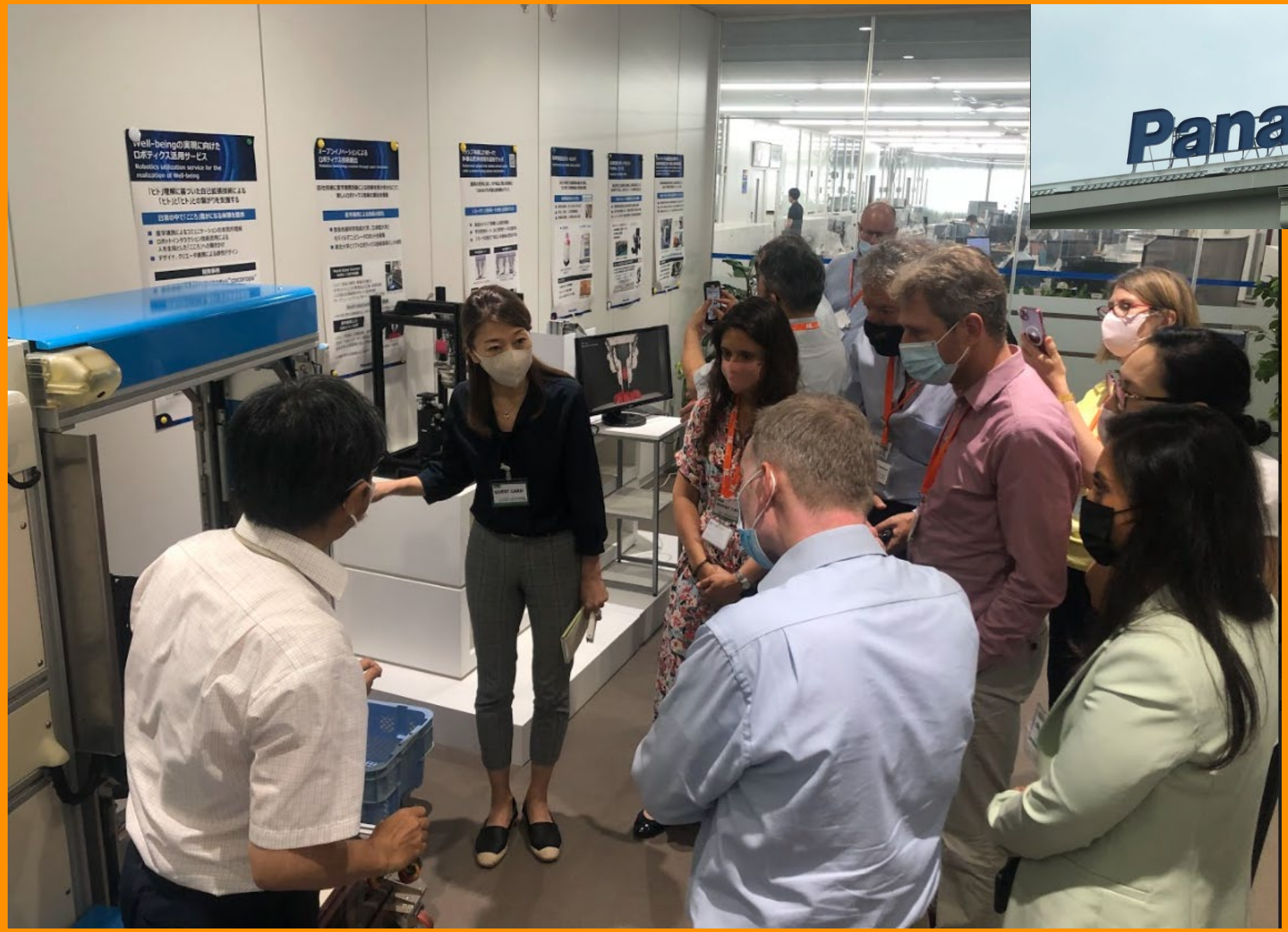
TOF sensor: Detecting distance and color of tomato.

Color camera : Searching cluster of tomatoes.



3D recognition using distance and image sensors(TOF sensor)

Size : 950mm(W) × 1600mm(D) × 1800mm(H)
Weight : 150kg
Continuous moving time : 4hour ※depending on situation
Moving speed : max 30cm/sec
Speed of harvesting : 10s／each tomato


well-beingの実現に向けた
ロボティクス活用サービス
Robotics utilization service for the realization of well-being


Panasonic

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Kubota

Yaskawa

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ZEN-NOH

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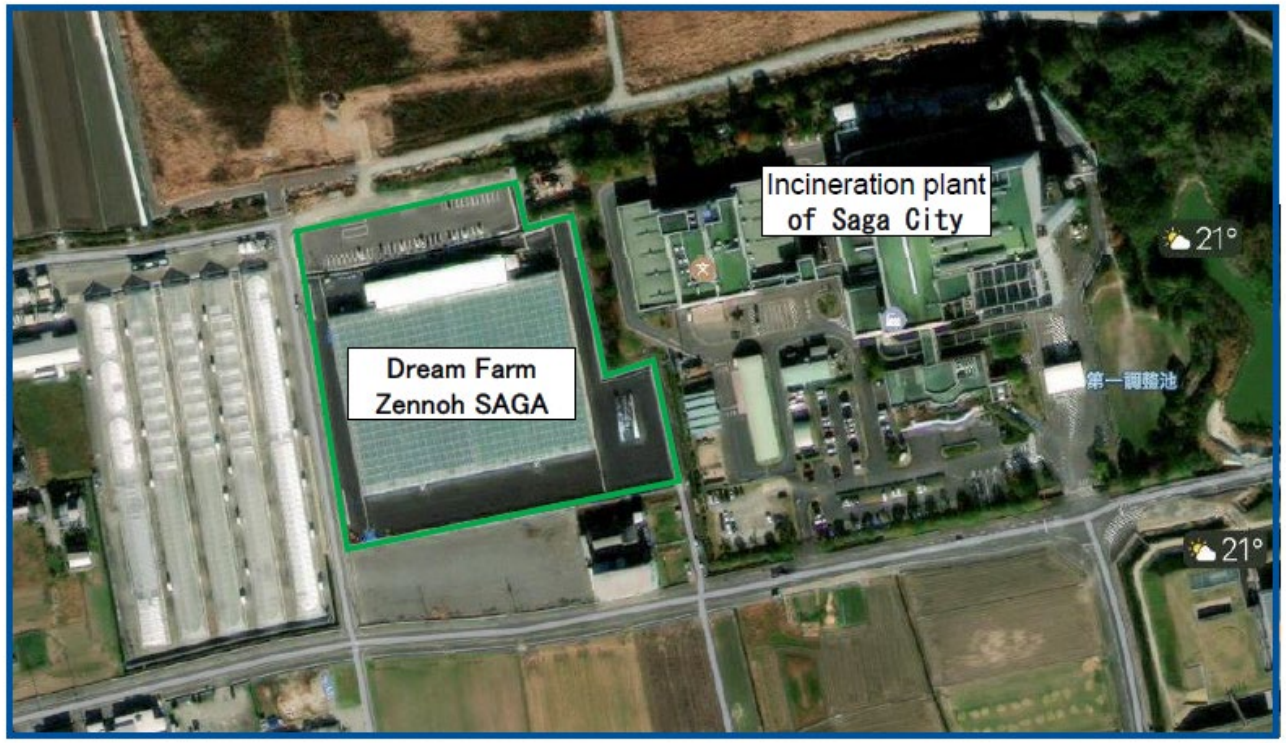
Environmentally friendly greenhouse



Apple mapより

Summary of "Dream Farm Zennoh project"

Yield result of Dream Farms (kg/m2)

	Stone wool	Soil	Average
Tomato	50	40	15
Eggplant	35	30	12
Cucumber	56	55	15

- All of three Dream Farms achieved target yield
  ＜Facility＞
  We can get high yield of tomato, eggplant and cucumber with high wire and stone wool hydroponic system. We confirmed common specification of greenhouse for tomato, eggplant and cucumber.
  ＜Cultivation technique＞
  We decided main branch cultivation as our cultivation standard. We can measure growth point at the top (crop registration), and control climate, irrigation, labor based on data. This method is also helpful to standardize labor work.(Continuous pinching cultivation is difficult to standardize labor work)

- Remote Cultivation consultation "Cockpit"
  Zennoh give cultivation consultation based on Dream Farm result to greenhouses all over the Japan. Covid-19 made it difficult to visit greenhouses, therefore NTT EAST and Zennoh developed "cockpit" to try give remote consultation to our customers by using smart device.

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Aeon Kyushu

Learnings from Innovation Mission

- Similar High-tech Greenhouses - Similar Challenges
- Active robotic skills and minds and research initiatives, yet tendency to focus on domestic market
- Caring for workers and worker conditions
- Harsh working conditions due to humid climate
- Japanese high-tech industry show first steps of interest in high-tech greenhouses
- Focus on local agricultural issues, less awareness of developments in high-tech greenhouse production internationally

Three main themes

- Demonstration Greenhouses of the Future (NL and Japan)
    - State of the art robotics and data-driven horticulture
    - 5G and 5G applications
    - Empowerment of a vital workforce with new enabling technologies
- Plant sensor validation and development
- Robotics for
    - Harvest
    - Bin picking and packaging

6 Potential use cases

Use Case 1	Showcase Greenhouse of the Future data infrastructure for autonomous growing and robotic operations	
Use Case 2	5G greenhouses	
Use Case 3	Empowerment of a vital workforce with new enabling technologies	
Use Case 4	Plant Data sensor systems to be validated in NL	
Use Case 5	Robotic logistics in the greenhouse	
Use Case 6	Bin picking in greenhouses	

Use for AVAG

- JaNeth SMP helped the sector to get a better insights in the current status of technology developments in Japan.
- Therefore, a better view and knowledge of commercial opportunities.
- These insights have become decisive factor for some companies to visit Japan in 2022 and establish first commercial contacts.

Learnings from Innovation Mission

- Similar High-tech Greenhouses - Similar Challenges
- Caring for workers and worker conditions (empowering)
- Harsh working conditions due to humid climate, aging population
- Japanese high-tech industry show first steps of interest in high-tech greenhouses
- Focus on local agricultural issues, less awareness of developments in high-tech greenhouse production internationally

- **Establishing collaboration with Japan requires cautious diplomatic approach, time and often relies on informal trust relationships.**
- **Japanese want to be sure collaboration is sustainable and will continue long.**

Follow-up actions

- Dec 2022 | **Survey sent to Japanese partners**
- January 2022 | Survey results will be translated for Dutch partners to further explore the match
- Feb 2022 | **individual interviews and exploration of commitments with NL partners**
- March – April | 6 webinars with 6 potential use cases
- **May-June 2023 | *SMP 2.0* Incoming mission from Japan to The Netherlands (LNV support)**

  Around Green-tech event 13-15 June Amsterdam

- June- July 2023 | individual and group meeting per partner and per use case to define commitments
- May-Jul 2023 | PPS idea approved in 2022, resubmit idea?, submit draft full project plan
- Sep 2023 | Modify and submit full PPP Proposal
- 1 Jan 2024 | Starting date of PPP project

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Thank you

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