# Tasmanian Agriculture Technology Guide
## September 2023

## Director's Foreword

Over the years, Tasmanian farmers have shown remarkable resilience and adaptability, overcoming challenges and consistently producing high-quality agricultural products that are valued both locally and internationally. The last few years in particular have seen challenges from rising input costs, labour shortages and climate variability putting increasing pressure on farmers.

In order to reach the Tasmanian Government's ambitious goal of $10b in farm gate value by 2050, Tasmanian production will need to grow at more than double the rate experienced over the past 20 years. Innovation and research are key levers in achieving this goal and providing the productivity gains needed for a sustainable and future-proofed Tasmanian agricultural industry.

This report exploring Tasmanian agricultural technology has been developed by Beanstalk AgTech and the TAS Farm Innovation Hub with funding through the Federal Government's Future Drought Fund and research and development corporation AgriFutures Australia.

In developing this report, we have completed extensive research and had many conversations with farmers and service providers from across Tasmania to understand some of the biggest challenges facing the industry today, and the role technology can play in solving those challenges. We aimed to build an accessible resource that empowers farmers to explore the world of agricultural technology, from precision farming and smart irrigation systems to advanced data analytics and automation. This report gives an overview of some key features, benefits, and considerations associated with each technology, providing insights and guidance to aid in the decision-making process.

Whilst we couldn't cover all solutions in the market, we hope this provides a starting point to understand and recognise some of the benefits technology can play in supporting priority challenges across our key sectors today.


Sandra Knowles
Director
TAS Farm Innovation Hub


*We acknowledge the traditional owners of this Country and recognise Aboriginal people's continuing connection to Land, Sea, Waterways, Sky and Culture. We pay our respects to Elders, past, present and emerging.*

# Contents

# Challenges for Tasmanian Agriculture

Over the following pages we have canvassed 100+ tech solutions to key challenges within the dairy, livestock, vegetable and fruit industries in Tasmania which were highlighted during conversations with farmers and service providers.

Of course, this isn't all the tech that is available, but just a selection of ones that are relevant to Tasmania. As we couldn't canvass every piece of technology out there, we have also developed an overview of four key resources that could be useful to find a tech solution for you. These are on the next page.

**Key challenges and opportunities across major agricultural industries in Tasmania**

## Vegetables

4 Reducing input usage to improve margins.

5 Optimising drainage.

## Fruit
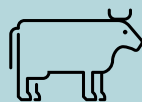
10 Improve harvest record keeping.

11 Manage risks in growing environment.

## Shared Challenges

1 Making data more accessible.

2 Reducing time managing irrigation.

3 Enhancing connectivity across farms.

## Dairy

6 Managing cost of cow feed.

7 Increasing labour-efficiency.

## Livestock

8 Using animal data to drive better decisions.

9 Supporting intensive grazing methods.

# Want to know more?

Here are some resources to help you search for an AgTech solution that solves your farm challenges

Search AgriFutures grow$^{AG}$ is an online platform for agrifood innovation. Explore, find and connect with expertise, research and investment opportunities from Australia and around the world in one, easy to use location.

https://www.growag.com/

AgTech finder's product directory contains hundred of solutions across broadacre, horticulture and livestock. Solutions are searchable by focus area and solution type.

https://agtechfinder.com/product-directory

Australian Agritech Association's ecosystem map showcases organisations of all sizes participating in the AgTech ecosystem. This map is updated on a monthly basis.

https://ausagritech.org/ecosystem-map-updated-may/

NSW Gov's Farms of the Future AgTech Catalogue consists of suppliers, products, dashboard & connectivity solutions. Create an account to save favourites to your tech list.

https://www.dpi.nsw.gov.au/dpi/climate/farms-of-the-future

# 5 Key Principles for Successful AgTech Adoption

The boom in the AgTech landscape is still relatively recent so it's very important to apply best practises when adopting any new technology. We've covered five of these best practices in more detail below.

## 1 Conduct a quick cost-benefit analysis

Assess the potential return on investment (ROI) before implementing any solution. This is calculated by: (expected benefits-costs)/costs. Consider the upfront and maintenance costs, and the long-term benefits across increased productivity, labour efficiency, optimised inputs and improved product quality and yield.

## 2 Check if support needed is available

Find out if the AgTech solution is available to provide support in your region, particularly if there is a hardware component in the solution. Ensure at minimum over-the-phone support is available if you encounter any product issues.

## 3 Consider collaborating with others

Collaborate with others including farmers and industry associations to receive insights and guidance in order to make an informed decision about adopting new technologies. These networks and partnerships can help accelerate learning and provide support throughout the adoption journey.

## 4 Start with a small-scale trial first

Starting small allows you to test the technology and evaluate the effectiveness and adaptability to your farm before investing time and money in it. This minimises risks that come with adopting new solutions and ensures there is interoperability between any new technology and your existing systems.
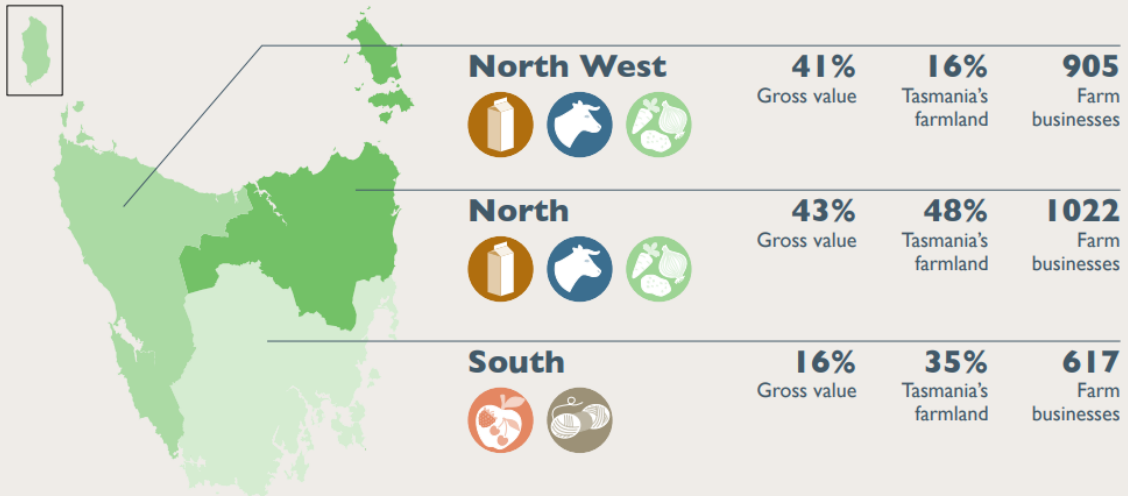
## 5 Consider the foundations you need

Effective use of AgTech is often reliant on other foundations being in place. These include sufficient connectivity, training and digital literacy to make use of the data and tech, as well as having the right processes in place to make timely decisions from what the data and tech is telling you.

# Overview of Tasmanian agriculture sector

## Overview[1]

### Tasmanian agricultural production - quick facts[9]

| Region | Gross value | Tasmania's farmland | Farm businesses |
|---|---|---|---|
| **North West** | 41% | 16% | 905 |
| **North** | 43% | 48% | 1022 |
| **South** | 16% | 35% | 617 |

Source: ABS

- The agricultural sector is a key pillar of Tasmania's economy, contributing 5.6% of Gross State Product ($2.34b in FY21) and sustaining jobs and economic activity in our rural and regional areas, with livestock, dairy, fruit and vegetables accounting for most of the production today.

- The Tasmanian Government has an ambitious goal to increase the annual value of the agricultural sector to $10 billion by 2050. To reach $10 billion, the sector will need to grow at more than double the rate experienced over the past 20 years. Technology will play a role in unlocking this additional value.

1. AgriGrowth Tasmania, Department of Natural Resources and Environment, Tasmanian Agri-Food Scorecard 2020-21

Dairy

Fruit

Shared Challenges

Livestock

Vegetables
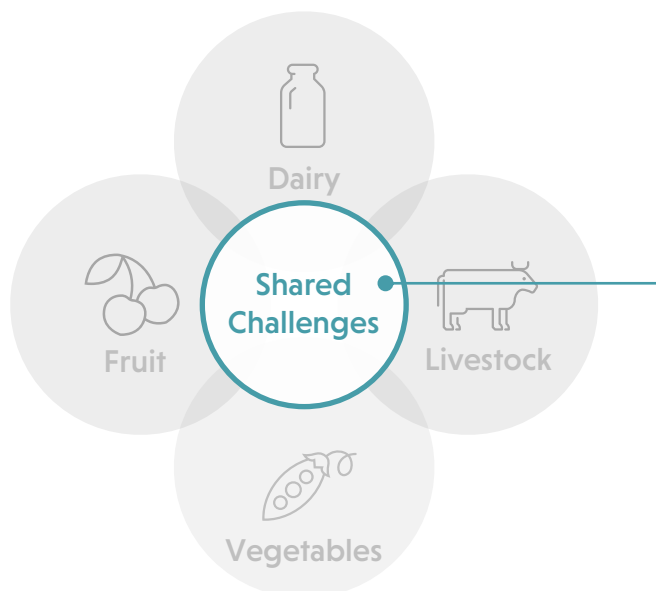
## Challenges & Opportunities

1. Make data more accessible.

2. Reduce time managing irrigation.

3. Enhance connectivity across farms.

# Top three opportunities where tech has a role to play

## ① Making data more accessible

### What is the problem?

- Data is often stored across both physical and digital files, and typically on a local computer instead of using cloud storage.
- This can lead to a lack of transparency and collaboration on business operations as a single user has ownership of files.

### Why is it important?

- Many farms are run across multiple generations making transparency important.
- Quality data is becoming increasingly important in most agricultural operations as consumers demand more transparency.

### What does success look like?

- All relevant users can access critical farm data anytime from anywhere.
- Critical data is backed up and any risks of losing data are removed or significantly reduced.

## ② Reducing time managing irrigation

### What is the problem?

- Monitoring pumps can be mundane and time-consuming.
- Pending conditions, irrigation may need to be turned on/off at night or on the weekend causing a negative impact on work life balance.

### Why is it important?

- Reducing time spent doing mundane, repeatable task frees up a farmer's time for higher impact work, or leisure.
- Remote control of irrigation allows a farmer to leave the property whilst still managing some daily tasks.

### What does success look like?

- Free up time.
- Able to remotely turn on and off irrigation from anywhere.

## ③ Enhancing connectivity across farms

### What is the problem?

- Some farms across Tasmania do not have reliable, if any, phone service or connectivity making it difficult to communicate, upload data or remotely manage operations.

### Why is it important?

- Many digital tools and other AgTech require connectivity to operate and upload data making this a foundational element of AgTech adoption.
- Additionally, a lack of connectivity raises safety concerns when working alone.

### What does success look like?

- Minimum requirement is connectivity at offices and homes, but true success is connectivity across the whole of farm.

# ① Making data more accessible

Data that is stored across both physical and digital files makes it difficult for multiple users to access and work on files. This can often make transparency and collaboration across business operations more difficult.

## Why is it important?
- Many farms are run across multiple generations making transparency important.
- Additionally, better data storage provides security, backup and potential extension of critical farm data.

## Value chain step

### Management
Business IQ, HR and Safety

## What does success look like?
- All relevant users can access critical farm data anytime from anywhere.
- Critical data is backed up and risks of losing data are removed or significantly reduced.

## Encompassed technologies:

| | Value add/impact | Technology | Example solutions |
|---|---|---|---|
| **Data storage** | • Improved recordkeeping.<br>• Traceability in the supply chain.<br>• Secure back-up of critical farm data.<br>• Remove key person risk for data access.<br>• Multiple users can access and edit documents at the same time. | Cloud storage and computer apps<br><br>Microsoft<br><br>Google | **Microsoft 365 (Global)**<br>• Full suite of online and desktop-based apps including emails, excel, word, cloud-based data storage and collaboration tools.<br>• Different size subscriptions available to suit needs |
| | | | **Google Workspace (Global)**<br>• Full suite of online based programs including emails, sheets, docs, cloud-based data storage and collaboration tools.<br>• Different size subscriptions available to suit needs |
| | | Cloud storage<br><br>Dropbox | **Dropbox (Global)**<br>• Simple to use, cloud-based file storage-only solution.<br>• Generally, requires users to have a Microsoft or Google product suite to create documents and run emails. |
| **Integration** | • Enable better decision making through translating data from multiple sources and bringing it together to get a whole farm view.<br>• Some integration solutions manage the coding and background dataflow work making it much easier to use for most farmers. | Middleware<br><br>PAIRTREE | **Pairtree Intelligence (Aus - NSW)**<br>• Maximise benefits from digital farm assets by making it possible to access, visualise and interpret data from various providers together.<br>• Pairtree collaborates with over 90 AgTech providers. |
| | | | **Farm Pulse (Aus - TAS)**<br>• Design Internet of Things network to provide cost effective, reliable data transfer from a wide range of sensros.<br>• Additionally, provide secure cloud based data storage, analytics and user interfaces for desktop and mobile |
| | | Object storage<br><br>Microsoft | **Microsoft Azure (Global)**<br>• Azure Blob Storage helps you create and store data lakes to bring together disparate, unstructured data sources at scale.<br>• Requires knowledge of data engineering to set up. |
| **Visualisation** | • Simplify large sets of data and gain a fuller picture of what the data is telling us.<br>• Turn data into information.<br>• Track key metrics and trends for better decision making.<br>• Increase transparency. | Visualisation tool<br><br>Microsoft | **Microsoft Power BI (Global)**<br>• Interactive data analytics and visualisation tool.<br>• It can connect to, integrate with, excel and many other data sources.<br>• Helpful for visualising data to create customised business intelligence dashboards. |
| | | tableau | **Tableau (Global)**<br>• Data visualisation and business intelligence tool that enables users to connect, visualise and share data in an interactive way.<br>• Tableau has supporting products to prepare and clean data. |

# 2 Reducing time managing irrigation

Monitoring pumps and irrigation can be a mundane and time-consuming task and pending conditions, may need to be completed at night or on the weekend often negatively impacting work life balance.

## Why is it important?
- Reducing time spent doing mundane, repeatable task frees up a farmer's time for higher impact work, or leisure.
- Remote control of irrigation allows a farmer to leave the property whilst still managing some daily tasks.

## Value chain step

**Land Management**
Irrigation and cropping

## What does success look like?
- Free up time.
- Able to remotely turn on and off irrigation from anywhere.

## Encompassed technologies:

| | Value add/impact | Technology | Example solutions |
|---|---|---|---|
| **Remotely monitor** | • Detect leaks, faults and other issues in near real-time to minimise negative impacts.<br>• Reduce time taken to manually check troughs, tanks, pumps etc.<br>• Optimise irrigation through better understanding of soil moisture and weather conditions. | Remote water sensors and probes<br><br>FARMBOT MONITORING SOLUTIONS<br><br>wildeye<br><br>Sentek | **Farmbot** (Aus - QLD)<br>• Remote monitoring for trough, tank, bore and dams water levels, line pressure, diesel levels, flow, rain gauge and cameras.<br>• Remote and automated pump control linked to tank water levels.<br><br>**Wildeye** (Global)<br>• Comprehensive suite of battery or rechargeable sensors including flow rates, pressure, water levels, weather and soil moisture.<br>• Corresponding management dashboards and app.<br><br>**Sentek** (Aus - SA)<br>• Designs and manufactures technologies for measuring and managing soil moisture, salinity and temperature<br>• Tools pair for with their irrigation decision aiding software. |
| **Remotely control systems** | • Reduce labour time turning off and on irrigation and pumps.<br>• Save water by being able to remotely turn on/off quickly when weather or other conditions change.<br>• Improve work life balance by being able to manage from anywhere. | Remote monitoring and control<br><br>MAIT Industries<br><br>FIELDNET BY LINDSAY<br><br>OBSERVANT A JAIN IRRIGATION COMPANY | **Mait Industries** (Aus - VIC)<br>• Dual function system that is both a universal monitoring system that can read a wide range of sensors as well as a PC based remote irrigation control system.<br><br>**Lindsay FieldNET** (Global)<br>• Monitor, control, schedule, analyse and optimise irrigation systems from your computer, phone or tablet.<br>• Integrates with every component of irrigation equipment.<br><br>**Observant** (VIC & Global)<br>• Scheduling application that allows remote operation of valves and pumps for pivot irrigation, drop and sprinkler irrigation, flood irrigation and stock water management. |
| **Data-driven decisions** | • Optimise water use through bringing together important weather, soil and irrigation data.<br>• Understand the impact of different production decisions and make more data-backed decisions. | Data aggregator<br><br>SWAN systems<br><br>Trimble | **Swan Systems** (Aus - WA)<br>• Irrigation and input management software designed to work with any hardware (e.g. weather stations, flow meters, soil moisture probes, irrigation control) enabling whole farm irrigation management.<br><br>**Trimble** (Global)<br>• Suite of products and software to support water management decisions and data collection including optimal drainage placement, field surveys and land forming design. |

# ③ Enhancing connectivity across farms

Some farms across Tasmania do not have reliable, if any, phone service or internet connectivity making it difficult to communicate, upload data or remotely manage operations.

## Why is it important?
- Many digital tools and other AgTech require connectivity to operate and upload data making this a foundational element of AgTech adoption.
- A lack of connectivity raises safety concerns when working alone.

## Value chain step

### Management
Business IQ, HR and Safety

## What does success look like?
- The minimum requirement is connectivity at offices, homes/and workshops, but true success is a level of connectivity across the whole of farm.

## Encompassed technologies:

| | Value add/impact | Technology | Example solutions |
|---|---|---|---|
| **Cellular and Internet access (backhaul)** | • Ability to access and use decision support tools, farm management software, remote control and other AgTech tools whilst travelling around the farm. | Optical fibre — nbn | **NBN** (AUS)<br>• National broadband network delivering optical fibre technology, fixed wireless towers and Sky Muster Satellites to deliver the NBN network to regional and remote Australia. |
| | | Satellite — STARLINK | **Starlink** (Global)<br>• Low-earth orbit satellite that offers high-speed internet access across all of Tasmania and Australia.<br>• Various hardware available including for vehicles while in-motion. |
| | • Increases safety of workers with ability to call for help if needed. | Hardware — UBIQUITI NETWORKS | **Ubiquiti** (Global)<br>• Affordable ecosystem of connectivity hardware including wireless access points, routers, switches, security cameras, controller appliances, VoIP phones and access control products. |
| | • Establishing connectivity is the first step in a journey to incorporate digital agricultural practices into their farm business. | Hardware and service — CONNECTED FARMS ENABLING DIGITAL AGRICULTURE | **Connected Farms (Aus -** NSW)<br>• Offer a range of voice and data communication solutions to enable voice and mobile data as well as IoT connectivity infrastructure.<br>• Offer portable connectivity solution utilising Starlink. |
| | | zetifi | **Zetifi** (Aus - NSW)<br>• ZetiRover and ZetiCell products provide reliable broadband.<br>• Long-range Wi-Fi technology eliminates coverage gaps by extending the use of existing LTE (4G) and satellite networks. |
| **Wireless IoT network** | • Enables the ability to connect agricultural sensors, such as water storage meters, to make data available from a phone or another device, giving farmers feedback about what's happening on farm. | Hardware and service providers — YBM INTEGRATED TECHNOLOGY | **YBMit (Aus - TAS)**<br>• Tasmanian owned and operated service and hardware provider building solutions for automation, remote access, data transfer, CCTV and connecting a farm. |
| | | Definium Technologies | **Definium** (Aus - TAS)<br>• Manufacture and supply LoRaWAN hardware including gateways and devices (nodes).<br>• Own and operate a Tasmanian-made state-wide LoRaWAN network. |
| | • Typically have small data limits and power usage resulting in long battery life and lower data costs. | NATIONAL NARROWBAND NETWORK Co. | **National Narrowband Network** (Aus - NSW)<br>• Provide a shared, and scalable IoT network service and platform, using LoRaWAN technology to enable IoT solutions using any device, any network, and any platform. |
| | | FIELD SOLUTIONS | **Field Solutions** (Aus - NSW)<br>• Licensed telecommunications carrier that provides connectivity, hardware and training solutions for building a LoRaWAN network to connect IoT devices across a farm. |

Additional resources: National Farmers Federation On-farm Connectivity guide Nov 22

# Connecting a farm



**Will Bowden**
Owner/Manager, Bothwell

Will Bowden is a fifth-generation farmer currently managing his family farm which covers 15,000 hectares of land across Tasmania's Central Highlands, running 23,000 merino ewes and a herd of 600 Angus and Wagyu cattle. Investment in irrigation has meant they can now grow potatoes as well.



## What was the challenge?

- Slow internet connection at the property was making it hard to do research, pay the bills, complete BAS statements and complete any work that required connectivity.
- A presentation by Jason Shore on how telemetry wifi networks could benefit farmers sparked Will's imagination on what this sort of technology could be used for and how it could solve an ongoing and time-consuming challenge of managing irrigators.

*"If one pivot shuts down and I haven't been to it in 24 hours, that's 24 hours of lost irrigation. During the peak evaporation periods that can be hugely detrimental to the crop."*

## What was the process?

1. Firstly, Will identified the areas that take up the most time and where the most efficiencies could be gained. He prioritised automating and remotely controlling these areas.

2. Will built a battery powered wifi tower to enable an NBN and LoRaWaN gateway to allow data transmitting of sensors and remote controlling of irrigators and pumps

3. Working with YBM IT, Will set up sensors and remote-control systems across the property.

**LoRa Alliance®**

**YBM** INTEGRATED TECHNOLOGY

## Results

*"Running the irrigation from a smart phone app has been a game changer, saving countless hours during the irrigation season"*

Will can now remotely control **17** centre pivot irrigators and change watering rates via an app on his mobile phone using Valley BaseStation 3.



Using the bespoke YBM platform, Will can remotely control and monitor his pumps and release valves for reservoirs, water controlling, control gates and security cameras.

Together with YBM IT, they are building a system that allows data from moisture produces to control the pivots.
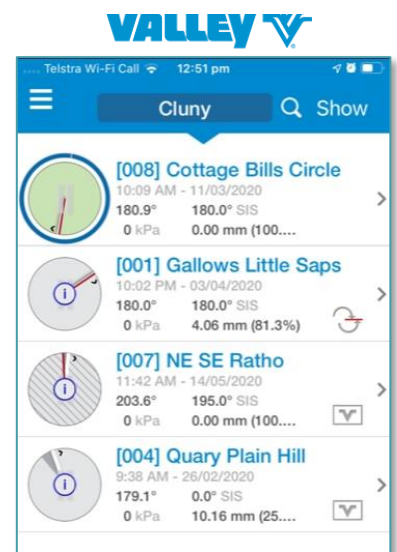
# Vegetables in Tasmania

## Overview[1]

### Vegetable production quick facts



- Vegetable processor

| | | | |
|---|---|---|---|
| **North West** | **48%** Gross value | **7,457** Hectares | **254** Farm businesses |
| **North** | **48%** Gross value | **6,444** Hectares | **173** Farm businesses |
| **South** | **4%** Gross value | **635** Hectares | **33** Farm businesses |

*Source: ABS*
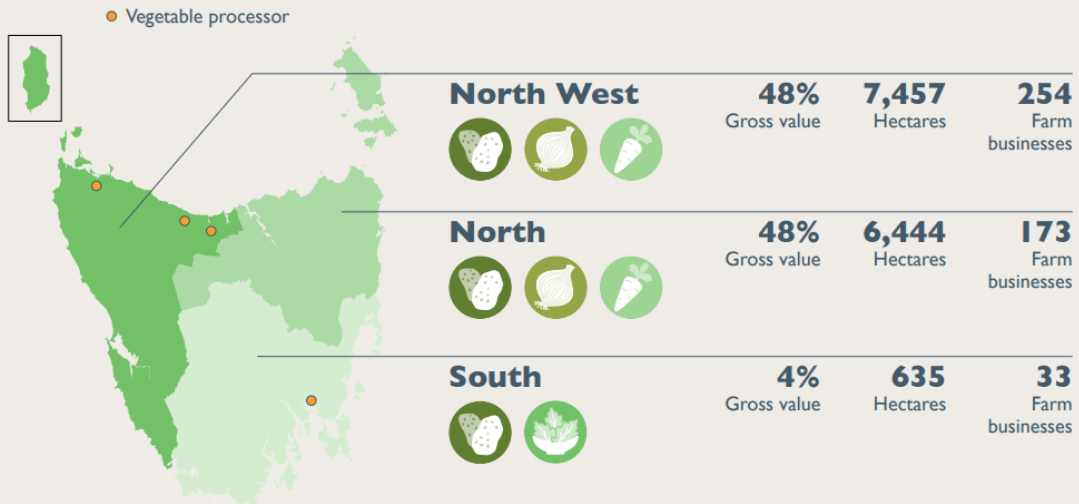
- Potatoes are the state's highest value vegetable with Tasmania accounting for 31.3% of national production, followed by salad crops (e.g. lettuce, rocket, and baby spinach), with interstate markets the primary destination for vegetables.

- Tasmania is a major national producer of frozen vegetables with three processing plants, two of which produce frozen potato chips and a third that produces frozen vegetables other than potatoes — mainly peas and beans.

- Genetics and new varieties have played an important role in increasing and improving production across vegetables.

1. AgriGrowth Tasmania, Department of Natural Resources and Environment, Tasmanian Agri-Food Scorecard 2020-21



Dairy

Fruit

Shared Challenges

Livestock
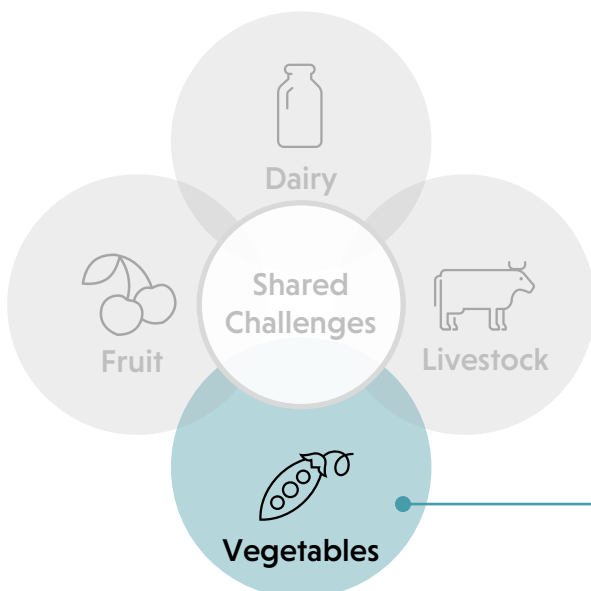
Vegetables

## Challenges & Opportunities

- ④ Reducing input usage to improve margins.
- ⑤ Optimising drainage.

# Technology solutions across the vegetables value chain

| | Traditional journey | Tech enabled journey |
|---|---|---|

**Genetics**
Breeding and genetics

New seeds and varieties generally relate to broadly increasing yield rather than resilience and other factors.

Disease resistance seeds that match consumer preferences are used to improve resilience and profitability.

HZPC · Sound Agriculture

**Crops**
Planting and health

Growers rely on intuition and symptomatic indicators to manage disease in production leading to over spraying.

Grower is alerted to pathogen through fully automated airborne disease tracking sensor reducing preventative spraying.

BioScout · Cherrp · syngenta

**Maintenance**
Weeding, pruning and thinning

Pesticides and herbicides are applied broadly to the whole paddock to address weeds and other pests.

Weeding is completed using a precision robotic laser weeder reducing herbicide use.

WEED-IT · Ambit · CARBON ROBOTICS

**Inputs**
Water and fertiliser

Fertiliser is applied as a precaution to ensure yields are met and irrigation requires manual turning off and on.

Sensors monitors soil moisture and program automatic variable rate irrigator. Drones and satellite used to map paddocks and improve drainage

SWAN systems · wildeye · FIELDNET BY LINDSAY · FARMBOT · AG LOGIC · Trimble · NDrip

**Harvesting**
Yield and quality

Yields are difficult to predict until harvest and done calculating one area and extrapolating across the whole field.

Satellite imagery has provided a forecast of predicted yield. Tractor collects yield data via a loadcell with GPS whilst harvesting.

Ag Leader · GREENTRONICS · JOHN DEERE

**Packing**
Processing and packhouse

Produce is manually graded based on individual worker assessments and sorted using manual labour.

Produce is graded using optical grading technology to customer specifications and automatically sorted and data recorded.

TOMRA · LYRO · ellips

**Transporting**
Transport and supply chain

Traceability exists across some parts of the supply chain, often using paper-based consignment notes /certificates but this not brought together to have complete visibility across the whole supply chain

Traceability is provided across the whole supply allowing more market access and supporting any premiums.

escavox · ripe.io

**Management**
Business IQ, HR and Safety

Limited reporting produced, and disparate sources of data, makes it difficult to understand state of the business in real-time.

Farmer and management team have visibility across the whole supply chain with actionable insights.

iAuditor · Agworld · myob · agrivi · xero · TieUp Farming · TATOU · Power BI

# Top two opportunities where tech has a role to play

## 1 Reducing input usage

### What is the problem?

- Farmer's margins are being squeezed from both sides by ongoing negotiations with buyers on price and increasing input costs reducing the bottom line.
- There has been an increase in pressure from industry and the market to reduce chemical and fertiliser use.

### Why is it important?

- Reducing input usage minimises exposure to future input price building a more resilient and profitable business.
- Reducing GHG emissions and maintain or improving soil health is critical to ongoing future and sustainability of the industry.

### What does success look like?

- Reducing input usage in a way that has a positive return on investment.

- Solution works on a variety of crops given a large majority of vegetable farmers rotate crop types.

## 2 Optimising drainage

### What is the problem?

- Changing rainfall patterns and increased frequency and intensity of storm events in Tasmania is making farms more vulnerable to waterlogging.
- Waterlogging occurs when rainfall exceeds the ability of some soils to drain surplus water away.

### Why is it important?

- Waterlogging and improper drainage increases crop loss and reduces the productivity of the field causing financial losses.
- Post-winter waterlogging can prevent land preparation and spring seeding, induces rot diseases and impacts harvesting

### What does success look like?

- Cost-effective management of areas that are heavier in soil texture and prone to waterlogging.

- Improve yields and minimise loss through better water management.

# ① Reducing input usage

Farmers margins are being squeezed by ongoing negotiations with buyers on price, and increasing input costs. Additionally, a focus on sustainability and soil health requires a reduction in the use of chemicals and fertilisers.

## Why is it important?
- Reducing input usage minimises exposure to future input price building a more resilient and profitable business.
- Reducing GHG emissions and maintain or improving soil health is critical to ongoing future and sustainability of the industry.

## Value chain step

**Inputs**
Water and fertiliser

## What does success look like?
- Reducing input usage in a way that has a positive return on investment.
- Solution works on a variety of crops given a large majority of vegetable farmers rotate crop types.

## Breakdown of Levers:

| Lever | Value add/impact | Technology | Example solutions |
|---|---|---|---|
| **Optimise usage & reduce waste** | • Targeted spraying reduces pesticide and fertilizer usage. • Close to ground nozzles reduces waste from pesticide drift. | Smart precision sprayer CROPLANDS | **WEED-IT (Crop-lands distributor in Australia)** WEED-IT provides optical spot spraying, by detecting chlorophyll in actively growing weeds and targeted them with a fraction of the herbicide and water compared to blanket spraying. |
| | • Ability to turn individual sections on and off at predefined locations in the field | Selection sprayer JOHN DEERE | **John Deere Selection Control (Global)** John Deere Section Control enables you to apply exact amounts of fertiliser, seed and crop protection — where they are needed reducing overlap and waste |
| | • Eliminate chemical use. • Lasers leave the soil microbiology undisturbed. | Laser weeding CARBON ROBOTICS | **Carbon Robotics (USA)** Carbon Robotics delivers chemical-free, no-till, weed control for specialty crops using computer vision and laser modules eliminating more than 100,000 weeds per hour. |
| **Switch to alternative inputs / methods** | • Supplements conventional fertiliser programs by offering essential micro-nutrients and other substances that enhances plant nutrition and yield. | Plant biostimulants OCP | **Organic Crop Protectants (Aus)** OCP offers a range of various biostimulant products such as Stim-Phos which is used to stimulate root growth, enhance plant strength and stress resilience. Acadian powders, which is derived from seaweed extract can be applied as a spray. |
| | • Nutrients are delivered through irrigation (fertigation) or ground injection to increase yield. | Soil & Fertigation RLF AgTech | **RLF AgTech (Aus)** RLF AgTech's Soil & Fertigation products deliver a nutrient package straight to seedlings by using liquid fertilisers via ground injection or drip irrigation. Trials have resulted in 25%+ increase in yield across tomatoes and sugar beet. |
| **Prevent loss of crop** | • Reduces crop loss through early detection of diseases. • Reduces usage of preventative spray. | Early disease detection sensors BioScout | **BioScout (Aus)** BioScout provides early detection of fungal crop diseases. Sensors monitors for spores, and when the AI algorithm detects disease particles an alert text is sent to the farmer. |
| **Data informed decision making** | • Monitoring crop yield allows for better decision making as it allows for evaluation of management practices and areas of low productivity. | Yield mapping & decision support Ag Leader | **Ag Leader – Spatial Management System (SMS) (Global)** SMS software is a decision-making tool that integrates various data such as GPS field mapping and yield monitoring and analyses trends to generate decision insights for farmers. |
| | • Better understanding of soil nutrient needs allows for optimised fertiliser usage. | Variable rate fertiliser mapping precision agriculture | **Precision Agriculture (Aus)** Precision Agriculture analyses soil health and creates variable rate application maps for fertilisers (lime, gypsum, phosphorus, potassium and nitrogen) to inform decisions |

# ② Optimising drainage

Changing rainfall patterns and increased frequency and intensity of storm events in Tasmania is making farms more vulnerable to waterlogging which can lead to crop loss and low yields.

## Why is it important?
- Waterlogging and poor drainage increases crop loss and reduces the productivity of the field causing financial losses.
- Post-winter waterlogging can prevent land preparation and spring seeding.

## Value chain step

### Inputs
Water and fertiliser

## What does success look like?
- Cost-effective management of areas that are heavier in soil texture and prone to waterlogging.
- Improve yields and minimise loss through better water management.

## Breakdown of Levers:

| | Value add/impact | Technology | Example solutions |
|---|---|---|---|
| **Understanding the landscape** | • Drones can be deployed easily, cover relatively large areas quickly and achieve ultra-high resolution image capture. | Drone surveying <br> DRONE**AG** INTELLIGENT FARMING | **DroneAg** (Aus - TAS) <br> • Collect surface elevation data for drainage planning. <br> • Utilise data to appraise return on investment of big drains vs shallow drains or subsurface drainage before starting a drainage project. |
| | • NDVI is useful for identifying crop establishment and growth variability and assess the impact of waterlogging on crop biomass. | Satellite imaging <br> DATA FARMING | **Data Farming** (Aus - QLD) <br> • Platform provides current and historical satellite imagery showing NDVI and cloud cover. <br> • Pinpoint on-ground issues and identify drainage problem areas prior to planning and on-ground testing. |
| | • EM38 soil mapping differentiates soil types and characteristics for consideration in optimal drainage design. | Soil mapping <br> **AG** LOGIC | **AgLogic** (Aus - TAS) <br> • Utilise advanced mapping tools including EM38 soil survey and to measure soil and topography variations. <br> • Conduct waterflow modelling to design optimal drain layout. |
| **Designing an optimal solution** | • Accurate elevation data means minimal earth moved to achieve the same water movement outcome. <br> • Savings in fuel, equipment, labour and time. <br> • Improves yields and minimises costs by controlling excess water. | Design software <br> T3RRA | **T3RRA** (Global) <br> • T3ERA design software uses elevation data to optimise drainage design. <br> • T3RRA Cutta is an in-cab landforming system that works In conjunction with John Deere's iGrade to survey, design, optimise, and implement earth moving operations. |
| | | Trimble | **Trimble FieldLevel II** (Global) <br> • Provides a complete solution for surveying and collecting topographic data, designing a drainage model, and levelling field surfaces by automatically controlling scraper blades. |
| **Implementing precision landforming** | • Minimise human error by eliminating manual adjustments. <br> • RTK-based system works reliably in poor visibility and rough weather conditions including wind, dust and at night. <br> • Integrate with existing hardware. | Automated control <br> JOHN DEERE | **John Deere iGrade** (Global) <br> • The iGrade system fully automates scraper blades while calculator tools assist operators in designing slopes and setting directions. <br> • In combination with T3RRA Cutta, iGrade allows for professional planning of levelling and even optimised routing |
| | | OptiSURFACE | **OptiSurface (Global)** <br> • Optiworks surveys with any RTK GPS, designs solutions require least earthworks and controls Scraper, Ditcher, Tile Plow Height Automatically With Any Tractors Hydraulics. |

# Using innovative techniques to solve waterlogging

### Greg Gibson
Owner/Manager at Mill Farm

Greg is from Hagley in the north west of Tasmania where he manages his family's 530 hectare intensive farming operation. He runs a cropping program consisting of alkaloid poppies, onions, processing peas, potatoes and an array of seed crops, as well as a lamb trading operation fattening 10,000 head. In 2014, Greg was awarded a prestigious Nuffield Scholarship to study the latest drainage techniques, with the aim of increasing production on non-performing ground through better water management. Following this Greg implemented much of what he had learnt across his own and other properties with success.

## What was the challenge?

- High rainfall zones like Tasmania and Victoria typically experience lost production due to waterlogging.

- For Greg, he experienced past yield losses of between 50-100 per cent across his property due to inadequate drainage.

- A review of his property in 2013 showed the extent of variance in cropping due to waterlogging.

## What was the process?
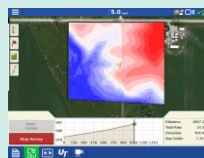
1. **Risk and return:** Greg quantified the risk of crop loss due to waterlogging and determine a viable amount to spend on solving the problem to ensure a positive ROI.

2. **Site specific planning:** Understanding that drainage is very site specific, Greg utilised **AgLeader Intellislope and SMS software** to survey and plan an optimal subsurface drainage plan.

3. **Precision installation:** AgLeader **InCommand** software was able to automatically adjust depth and precisely control the tile plough when implementing the drainage plan.

## Results and lessons

Through implementing this program of work Greg has noticed a significant reduction in waterlogging issues and improvement in yield. Greg realised he had already been collecting a lot of the data he needed but hadn't utilised that information to its fullest potential, partly due to the challenges of integrating and interpreting data from disparate sources. Over time, Greg has been able to rely on technology less as he better understands the drainage situation across his property.
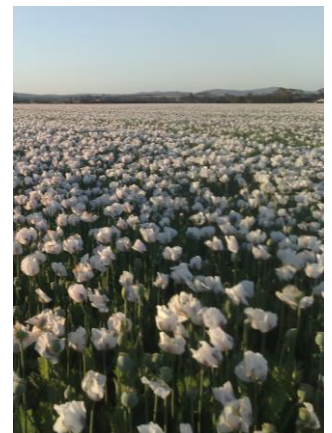
# Dairy in Tasmania

## Overview[1]

**Dairy production quick facts**
● Major dairy processor

| | Gross value | Farms | Dairy cattle |
|---|---|---|---|
| **North West** | 61% | 218 | 186,835 |
| **North** | 36% | 172 | 115,173 |
| **South** | 3% | 15 | 7,605 |

Source: ABS
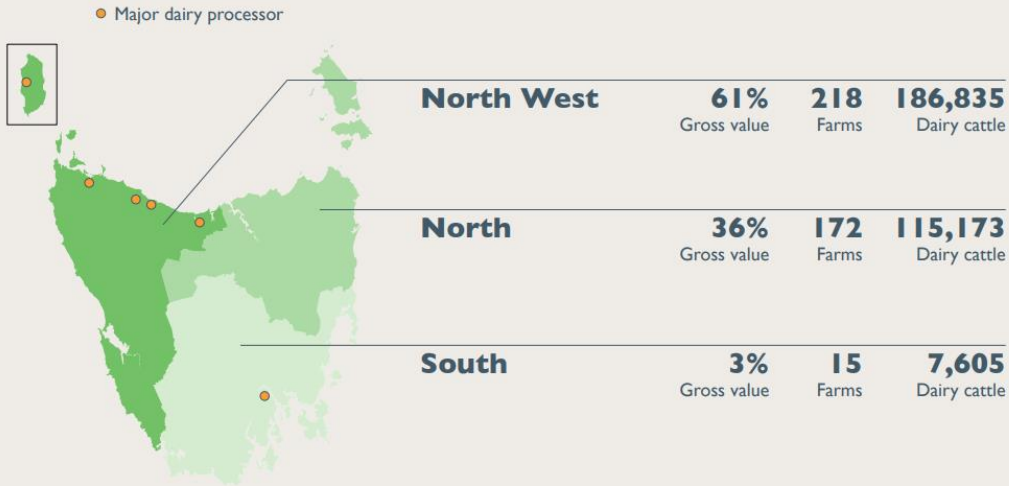
- Tasmania's dairy industry is the largest agricultural sector in the state accounting for about 40% of the state's agricultural land area.

- The sector contributes approximately $490 million in gross farm gate value and employs approximately 2,000 people.

- Tasmania has a mild and temperate climate with relatively more reliable rainfall and increasing irrigation infrastructure. As a result, Tasmania's dairy farmers benefit from sustainable, low-cost, pasture based production systems.

1. AgriGrowth Tasmania, Department of Natural Resources and Environment, Tasmanian Agri-Food Scorecard 2020-21

**Dairy**

Fruit

Shared Challenges

Livestock

Vegetables
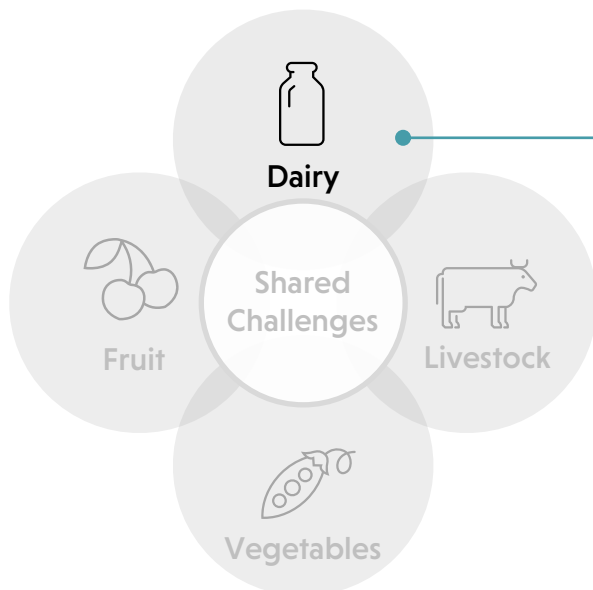
## Challenges & Opportunities

**6** Managing cost of cow feed.

**7** Increase labour-efficiency.

# Technology solutions across the dairy value chain

| | Traditional journey | Tech enabled journey |
|---|---|---|

**Breeding**
Mating and AI

Dairy farmer selects suitable breeding bulls, undertake AI across dairy cows and pregnancy testing, and then manage pregnancy and calving stages.

Farmer easily identifies highest quality genetics for breeding and AI using management system and can refer to years of data to track factors such as reproductive and feed efficiency.

CRV · Alta · LIC · SEMEX · minitube

**Land Management**
Pasture mgmt & irrigation

Farmer manages pasture quality through selection of grasses, infrequent soil testing, and deployment of irrigation across suitable paddocks.

Pasture paddock planning is optimised on a farm management software and available feed is forecasted. Irrigation system is fully automated saving time unless there are issues.

AG LOGIC · Pasture.io · SWANsystems · AgriWebb · FARMPULSE · GALLAGHER

**Animal Management**
Grazing, feed & nutrition, and animal health

Farmer manages grazing patterns and feed management manually. Animal health is often observed through naked eye and reactionary.

Farmer optimises pasture utilisation using virtual fencing technology, proactively detects animal health issues. Cow feed and nutrition are managed and monitored on a per cow level using precision feeding.

Allflex · DAIRYKING · afimilk

**Milk Production**
Milking, handling & milk quality

Farmer will manually draft their cows to be presented for milking at the milking rotary. Milk is handled and stored to maintain milk quality and periodic milk testing is used.

Automatic drafting gates are used bringing cows into a robotic milking system that has automated teat-cleaning systems, and milk quality sensors.

GEA · BouMatic · LELY · DeLaval · WAIKATO

**Transport**
Collection, testing & traceability

Milk is sampled and then transferred to milk tankers that are then transported to the processors for processing.

The collection processes involves the use of sensors and real-time monitoring of batches allowing feedback loops to address quality parameters.

MilkTestnz · LACTOTRONIC · FOSS

**Processing**
End product processing (incl pasteurisation etc)

Milk is received and tested, and then progresses through to standardisation, pasteurisation and homogenisation before being processed to the end product.

Upon milk receipt and during processing, advanced filtration techniques are deployed to improve efficiency and processing quality, designated for more premium customer segments.

GEA · nda Group · ALFA LAVAL

**Packaging**
Local and export, and labelling

The end-products are packaged by the processor (or contract packaged), labelled and quality controlled before going to storage.

The end-product is packaged using advanced materials to improve efficiency, convenience, and sustainability; RFID tags, QR codes and smart labels are used to detect product quality, and for traceability.

MPI · Tetra Pak · MUELLER · Diverseco · SYNTEGON · Sidel

**Distribution**
Warehousing, delivery and sales

The end-product is stored in a temperature-controlled warehouse in preparation for order processing and then transportation to retail outlets for stocking and sale.

Temperature and humidity levels are detected in real time as the product moves to the end customer. The products are sold on e-commerce platforms, and marketplaces that reach a wider customer segment.

m2m connectivity · Manhattan · foodbomb · MONNIT · BlueYonder

# Top two opportunities where tech has a role to play

## ① Managing cost of cow feed

### What is the problem?

- Rising cost of feed from pasture management as well as bought in feed is impacting farmer profitability.
- Feed costs are by far the largest cost for a dairy farm, lack of tools to better manage pasture and feed means farmers have less ability to manage rising costs.

### Why is it important?

- Having a good handle on levers that enable dairy farmers to optimise their pasture and feed base efficiency will allow for better control of farm input costs.
- This enables dairy farmers to maximise their natural advantages and take advantage of favourable seasonal conditions.

### What does success look like?

- Reduction in the cost of metabolisable energy (ME) per cow due to greater flexibility in feed options.

- Improving margin per cow over time due to more flexible feed options.

## ② Increase labour-efficiency

### What is the problem?

- Dairy farming is labour-intensive and a relatively high proportion of total farm expenses.
- Shortages and increasing costs of labour means that dairy farmers today are looking for avenues to improve labour-efficiency to provide buffer.

### Why is it important?

- Solutions to improve labour-efficiency and reduce the burden of monotonous tasks has the potential to improve profitability, employee engagement, and work-life balance satisfaction.

### What does success look like?

- Increase in the number of cows managed per labour unit.

- Increase in the amount of time flexibility on-farm.

# ① Managing cost of cow feed

Rising cost of feed from pasture management as well as bought in feed is impacting farmer profitability.
Feed costs are by far the largest cost for a dairy farm, where a lack of tools to manage pasture and feed means farmers have less ability to manage rising costs.

## Why is it important?
- Having a good handle on levers that enable dairy farmers to optimise their pasture and feed base efficiency will allow for better control of farm input costs.
- This enables dairy farmers to maximise their natural advantages and take advantage of favourable seasonal conditions.

## Value chain step

### Land & Animal Management

Pasture management, irrigation, Grazing, feed & nutrition, and animal health

## What does success look like?
- Reduction in the cost of metabolisable energy (ME) per cow due to greater flexibility in feed options.
- Improved average ME per cow over time due to ability to manage silage costs.

## Breakdown of Levers:

| | Value add/impact | Technology | Example solutions |
|---|---|---|---|
| **Improve pasture management and utilisation** | • Ability to monitor pasture health allows for faster identification of pasture issues, saving time and resources for targeted fertiliser and water applications.<br>• Some solutions are integrated with farm management system enabling easier use. | Satellite Imaging / crop monitoring<br><br>DATA FARMING | **Data Farming – Digital Agronomist Platform** (Aus - QLD)<br>• Platform provides current and historical satellite imagery showing NDVI, cloud cover.<br>• Autozones pasture with suggested variable rate fertilizer requirements which is compatible with major farm machinery systems, decreases input costs. |
| | | IoT sensors & farm mgmt. software<br><br>farmdeck | **Farmdeck** (Aus - NSW)<br>• Farmdeck offers a farm management solution with a complete suite of sensors to monitor rainfall, soil moisture, track livestock movement to inform grazing and pasture management decisions. |
| | • Real-time paddock yield estimates and forecasts help farmers plan ahead. | Pasture growth forecast model<br><br>Pasture.io | **Pasture.io – Predictive Feed Wedge** (Aus – TAS)<br>• The feed wedge provides a visual representation of pasture yield over time and predicts yield in future weeks to help farmers make better grazing decisions. |
| **Optimise irrigation management** | • Better understanding of soil moisture and characteristics automatically feed into variable rate maps increasing efficiency and productivity | Soil Moisture Probe integrated into smart irrigation platform<br><br>SWAN systems  PRIMARY INSIGHT | **Primary Insight / Swan Systems –** (NZ/AUS)<br>• Primary Insights' Sentek probes measure soil moisture, temperature and fertiliser movement. Variable rate maps are fed into Swan System's platform to create a 7-day predictive schedule for pivot systems informing timing, location, and amount of irrigation required |
| | • Better understanding of soil quality and moisture enables better decisions to optimise nutrient and water usage. | Electro-magnetic soil-mapping<br><br>SWATMAPS | **Croptimistic – SWAT Maps** (Canada)<br>• A SWAT box can be mounted on a larger vehicle, driven over an area to generate soil and water-related map layers<br>• Soil maps help identify where crop yield is limited and guide variable-rate applications. |
| **Utilise precision feeding** | • Precision feeding allows better management of feed, reduces feed waste and better optimisation of feed to yield. | Automatic precision feeder<br><br>DAIRYMASTER | **Dairymaster – In-Parlour Automatic Feeders** (Global)<br>• The Dairymaster feeder automatically dispenses feed to cows as they are being milked, with system automatically tailoring feeding to each cow's specific needs which greatly reduces feed waste. |
| | | Automatic concentrate feeder<br><br>Lely | **Lely - Cosmix** (Global)<br>• The cosmix system recognizes each cow and tailors the concentrate amount to the cow. The integration with Lely's feed management system also allows insights into feeding behaviour. |
| **Minimise loss of feed** | • Allows for monitoring of temperature of hay bales, reducing risk of loss due to fires. | IoT temperature sensors<br><br>FARMSCAN | **Farm Scan - HAYTECH** (Global)<br>• HAYTECH is a wireless monitoring system with probes that measure real-time temperature of hay bales and send mobile alerts if temperatures rise to unsafe levels, preventing the loss of hay due to fires and damage. |

# 2  Increase labour-efficiency

Dairy farming is labour-intensive and a relatively high proportion of total farm expenses. Shortages and increasing costs of labour means that dairy farmers today are looking for avenues to improve labour-efficiency to provide buffer.

## Why is it important?
- Solutions to improve labour-efficiency and reduce the burden of monotonous tasks has the potential to improve profitability, employee engagement, and work-life balance satisfaction.

## Value chain step
☀ **Land & Animal Management / Milk production**
Pasture mgmt., irrigation, Grazing, feed & nutrition, and animal health

## What does success look like?
- Increase in the number of cows managed per labour unit
- Increase in the amount of time flexibility on-farm

## Breakdown of Levers:

| | Value add/impact | Technology | Example solutions |
|---|---|---|---|
| **Herd movement automation** | • Removes need to set up physical fences and move herd between locations by controlling movement with a digital collar. | Virtual fencing  HALTER | **Halter** (NZ)<br>• Cow collar delivers real-time heat and health monitoring.<br>• Virtual fencing zones automatically move the cows through sound and vibrations from the collar, saving up to 40 hrs/wk.<br>• LED lights on each collar to allow for easy identification.<br>• Raised $29m Series B funding in 2021 and continuing to develop product. |
| | • Saves time spent physically separating cows for veterinary checks, Artificial Insemination and milking. | Automatic drafting gate  DAIRYMASTER | **Dairymaster – Drafting Systems** (Global)<br>• Provides 2 or 3-way drafting of cows using automatic sorting software which can be controlled via computer or mobile app.<br>• Pathway for each cow can be pre-programmed in advance and save time on physically separating. |
| **Milking and feed automation** | • Saves time on placing clusters, herding cows into milking parlour, milking, feeding whilst milking and cleaning equipment. | Automatic cupping, milking, and cleaning robots  DAIRYMASTER | **Dairymaster – Swiftflo Revolver Rotary** (Global)<br>• Dairymaster's milking carousel identifies individual cows as they walk onto a revolving platform. The milking cluster can be attached within 8 seconds, automatically starting the milking process . Feed may be automatically dispensed as cows are milked. Once the cow has been fully milked, the cluster is released and automatically sanitised for the next cow. The cow's teats are also sprayed with teat disinfectant. |
| **Health and hygiene automation** | • Sensors monitors cow health and send alerts for early intervention.<br>• Time saved on conducting manual checks. | Cow collar and leg sensor  AfiCollar | **Afimilk – Cow collar and leg sensor** (Global)<br>• **AfiCollar** provides 24/7 heat detection, behaviour and digestion monitoring for individual cows as well as groups. When data strays from normal patterns, alerts are sent with details and possible causes.<br>• **AfiAct II** leg sensors monitors and sends alerts when cows are calving, and identifies group wellbeing issues such as overcrowding. |
| | • Ability to track health and digestion parameters from inside cow's first stomach and early detection of issues | Rumen sensor and Artificial Intelligence  smaXtec | **SmaXtec** (Global)<br>• Sensor is swallowed and sits in the cow rumen and measures temperature, activity, drinking cycles and rumen pH and activity<br>• AI-based applications analyses data and provides alerts and recommendations for action. |
| | • Reduces time and physical exertion required to physically prepare cow for treatment. | Robotics - Treatment box  (Lely) | **Lely – Treatment Box** (Global)<br>• The treatment box is designed to keep cows still within the frame for health check-ups, insemination and administration of medication.<br>• Different parts of frame can be opened or removed to provide access to cow, and a head lifter pulley helps stabilise the cow's head for interventions such as oral treatment. |

# Adoption of Halter technology



### Duncan MacDonald

Partner & Operations Manager
at Macdonald Dairies

Duncan, a distinguished Nuffield Scholar, was one of the first  Australian dairy farmers to adopt Halter –an innovative smart cow-collar – for his dairy herd in the north west of Tasmania, near Burnie. He has a passion for harnessing technology, particularly given the focus of his Nuffield research  project  on *Utilising technology for decision making in pasture based dairy.*

## Drivers of adoption

There were three key drivers that led to Duncan deciding to adopt Halter
- Reducing farm labour.
- Ability to provide complete overview of farming system.
- Clarity in cow health, mating and pasture health.

## Description of technology

Halter's cow collar has four key features:

### Automate Herd Movements

The cow collar sends vibrations to virtually fence the herd and automating herd movements, reducing on-farm workload.

### Health and Heat detection

Sensors provides heat detection and health monitoring, helping to maximise mating performance, and increasing milk yield.

### Seamless Mob Management

Split herd into specialised mobs and schedule movements at preset times from the Halter app.

### Precise Pasture Management

App automatic implementation of grazing plan through virtual fencing, enabling an increase in pasture utilisation.

## 3. Results

When Duncan first came across Halter through his Facebook feed, the NZ-based company had not yet focused their distribution efforts on Australia. However, after several discussions with Halter, and other NZ farmers who have used the technology, Duncan decided to trial the technology. He now has two full herds equipped with Halter cow collars.

Although still in the early phases of adoption, Duncan expects to see the following benefits across his operations:
- Upward trend in milk production, improved animal health and reproduction outcomes.
- Reduction in costs and time spent on farm (overtime hours).
- Improvement in milking quality

# Overview of Livestock (Beef and Sheep)

## Overview[1]

**Meat production quick facts[22]**



- Export abattoir
- Non-export abattoir[23]

**North** no. farms
660    487

**North West** no. farms
624    171

**South** no. farms
252    355

Source: ABS
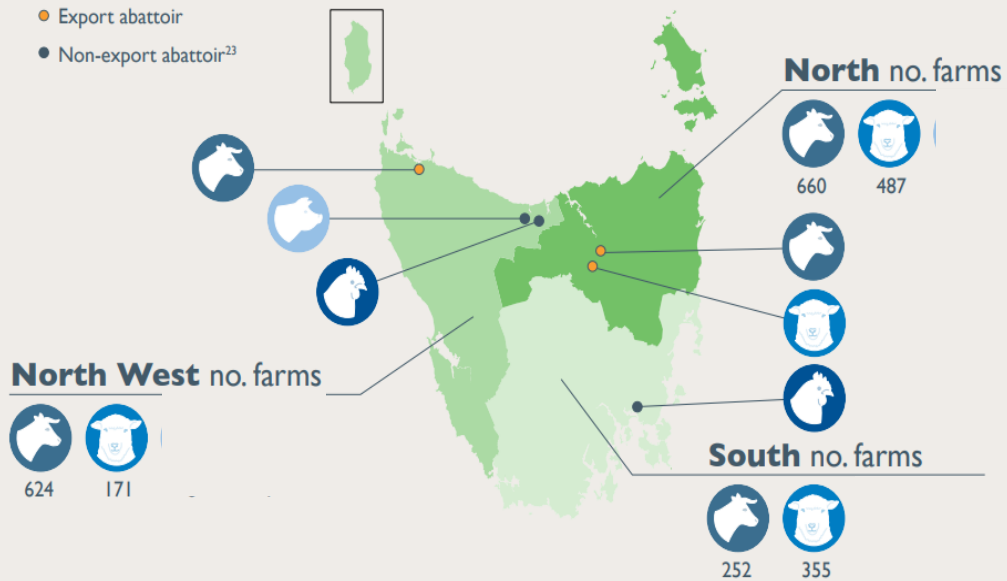
- Beef, lamb and mutton production represents a significant portion of Tasmania's production and accounts for approximately 30% of the farm gate value of agriculture. Pork, chicken and egg production represents an additional 3%.

- However Tasmanian production systems differ to the rest of Australia in that they involve more mixed production rather than a single enterprise focus.

- This means that the Return on Investment (ROI) for adopting AgTech can be lower as producers may need to adopt multiple solutions to meet their needs.

1. AgriGrowth Tasmania, Department of Natural Resources and Environment, Tasmanian Agri-Food Scorecard 2020-21



Dairy

Fruit

Shared Challenges

**Livestock**

Vegetables
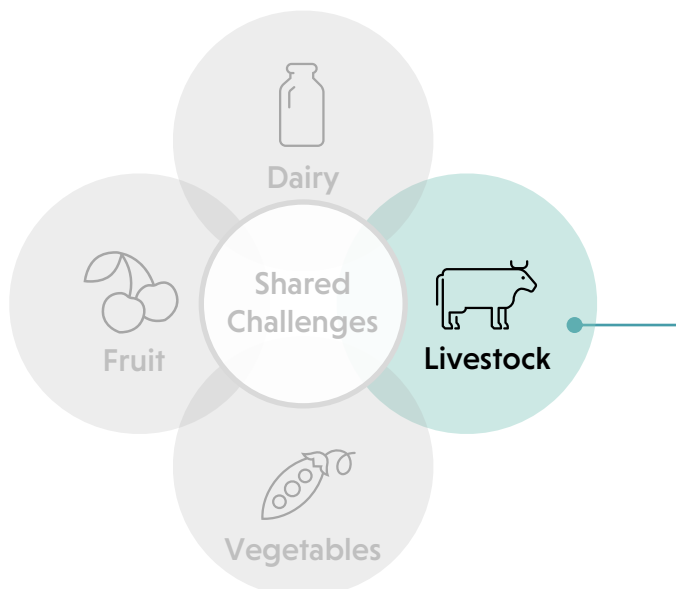
## Challenges & Opportunities

8  Using individual animal data to drive better decision-making.

9  Supporting intensive / rotational grazing methods.

# Technology solutions across the livestock (beef & sheep) value chain

| Traditional journey | Tech enabled journey |
| --- | --- |

**Land Mgmt**
Irrigation and cropping
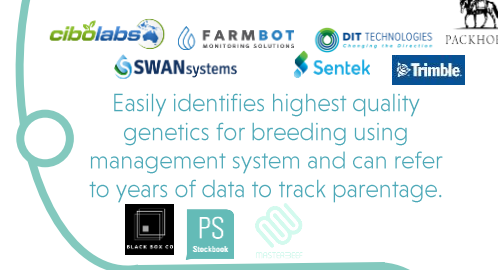
Farmer drives around property checking on troughs to ensure animals always have water. Irrigation is typically on a set timer or managed manually for all farms.

Automatic monitoring of remote water sources means the farmer only needs to drive out and check when there is an issue, thus saving time.

cibolabs · FARMBOT MONITORING SOLUTIONS · DIT TECHNOLOGIES · PACKHORSE · SWANsystems · Sentek · Trimble.

**Breeding**
Mating and Artificial Insemination

Purchase of breeding stock based on EBVs, visual traits & stud reputation. Joins animals based on availability of bulls / rams and finds it difficult to trace back lineage of best performing animals.

Easily identifies highest quality genetics for breeding using management system and can refer to years of data to track parentage.

BLACK BOX CO · PS Stockbook

**Grazing**
Weaning and Growing

Manual process to track and monitor animals by driving around property and checking paddocks.

Knows where animals are at all times using GPS-enabled ear tags and gets alerts when animals are strayed or downed.

CERES · VENCE · Smart Paddock · Allflex · OPTIWEIGH · Vytelle

**Backgrounding**
Muster and Drafting

Assumes animals weight based on size and visual assessment. When a more accurate weight is needed musters animals into yards to weigh if scales are available.
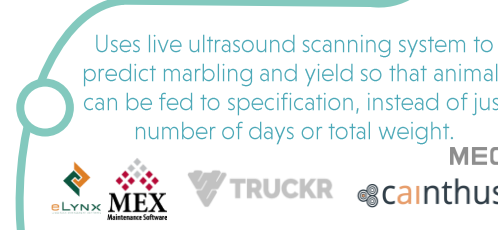
Daily tracking and recording of in-field average daily gain using automatic weighing system to quickly react to changes in condition.

AgriWebb · TE PARI · Tru-Test · GALLAGHER · Mobble

**Finishing**
Transport and Feedlots

Keeps animals in finishing for a certain number of days until they hit a certain weight, visual or manual assessment of fat score to assess compliance to market specifications.

Uses live ultrasound scanning system to predict marbling and yield so that animals can be fed to specification, instead of just number of days or total weight.

eLynx · MEX Maintenance Software · TRUCKR · cainthus · MEQ

**Processing**
Dressing and Boning

Inventory levels, types and locations can be difficult to manage and understand, especially across multiple breeds and customers.

Full visibility of-stock on hand, and ability to lock in forward contracts with certainty and reduce wasted inventory.

EMYDEX · Sapien Technology

**Trading**
Local and export

Lack of data across animals life means unable to understand true cost of production leading to margin uncertainty.

Leverages predictive analytics software to forecast available turnoff for next six months for sales team to enter forward contracts.

TRITON · AXICHAIN · PrimeXConnect · ripe.io

**Management**
Business IQ, HR and Safety

Limited reporting produced, generally with lagging indicators makes it difficult to understand state of the business in real-time.

Farmer and management team have visibility across the whole supply chain with actionable insights.

xero · myob · PAIRTREE · Figured · Power BI · iAuditor by SafetyCulture · employmenthero

# Top two opportunities where tech has a role to play

## 1 Use animal data to drive better decision-making

### What is the problem?

- There is increasing demand for more and higher quality animal data to maintain compliance and reporting with national regulation as well as market and customer requirements.
- There are a number of solution providers emerging that each have different requirements and functionality.

### Why is it important?

- Capturing provenance, traceability data is increasingly becoming a right-to-play in both domestic and export markets.
- Finding a fit-for-purpose livestock management system can save producers time and improve the quality of their product.

### What does success look like?

- Adopting a fit-for-purpose tool for different sizes and types of operations that saves cost.

- Easy to use and enhances decision-making to improve profit margins.

## 2 Enabling more efficient and effective intensive grazing methods

### What is the problem?

- Intensive grazing methods can be time-consuming and logistically challenging for producers to constantly move animals, fencing and water.

### Why is it important?

- These methods are increasing in importance around the world due to the benefits for both animals, the environment and bottom-line profitability.

### What does success look like?

- Farmers can more effectively manage their pasture and optimise carrying capacity.

- Farmers are able to reduce the time it takes to move animals.

# ① Using animal data to drive better decision-making

There is increasing demand for high quality animal data to maintain compliance with national regulation as well as market and customer requirements. A number of solutions exist with different costs, functionality and uses.

## Why is it important?
- Capturing provenance, traceability data is increasingly becoming a right-to-play in both domestic and export markets.
- Finding a fit-for-purpose livestock management system can save producers time and improve the quality of their product.

## Value chain step

### Breeding to finishing
Mating and AI, Grazing, feed & nutrition, animal health transport and feedlotting

## What does success look like?
- Adopting a fit-for-purpose tool for different sizes and types of operations that saves cost.
- Easy to use and enhances decision-making to improve profit margins.

## Breakdown of Levers:

| | Value add/impact | Technology | Example solutions |
|---|---|---|---|
| **Collecting data** | • Gives accurate weights as allows for 4-foot weighing.<br>• Very good integration with Livestock management systems (e.g. direct data transfer from crush to cloud). | Gravity scales and RFID readers<br>GALLAGHER | **Gallagher** (Global)<br>• Gallagher offers a range of EID tag readers, handlers and drafters, weigh platforms, scales and data collectors. These data collectors integrate well with most major Livestock Management Systems.<br>• Increasingly used for individual cattle and sheep management too. |
| | | Walk-over weighers<br>Tru-Test. | **Tru-Test Flexi Mobile 4000C** (Global)<br>• Designed to tow behind a vehicle it can be used in temporary or semi-permanent applications. Can be set up in a 'walk over weighing' or 'walk on 4 foot weighing' configuration. |
| | • Time saving and lower stress as don't need to get cattle to yards.<br>• Good at providing trend data, not specific weights. | In-paddock feed-weighers<br>OPTIWEIGH | **Optiweigh** (NSW)<br>• The highly portable Optiweigh system allows for in-field weight monitoring as cattle come up to stored lick block, molasses or salt.<br>• Reporting and analytics included and also integrates with livestock systems (e.g. Aglive, Pairtree etc).<br>• Satellite comms included for annual subscription (similar to phone). |
| | • Measures location, movement and feed intake of individual animals. | Smart ear tags<br>CERES TAG | **Ceres Tag** (Global)<br>• Solar powered GPS tag for cattle (ear tag) and sheep (collar) Connectivity for 3 years but needs a software partner too.<br>• Typically, only need to tag ~10% of herd. |
| **Storing and using data** | • Many Tasmanian producers operate mixed farming operations, and these platforms offer more than just livestock management. | Mixed production management systems<br>AgriWebb | **AgriWebb** (Global)<br>• All-in-one farm management system for livestock and mixed farms connecting records, insights, teams and data tools.<br>• Launched in 2014 is now one of the world's leading platforms |
| | | Mobble | **Mobble** (VIC)<br>• Individual animal and farm management for sheep and/or cattle.<br>• Also connects with crop platform AgWorld.<br>• Launched in 2018 is now used by 1000+ farmers in Australia. |
| | • Actionable data for cattle and/or sheep producers on weight, treatments & medicines, traits, breed, gender, cattle type, mob, etc. | Livestock only management systems<br>Sapien Technology<br>eLYNX<br>MASTERBEEF | **Sapien** (VIC)<br>• The KoolCollect tool collects individual cattle and sheep data in yards.<br>• Founded in 2002 is now used by farms and feedlot operators.<br>• Integrates with Gallagher TSi and handheld devices. |
| | | | **Elynx** (QLD)<br>• Elynx's StockMate app provides full animal management.<br>• Founded in 2000 and is used by largest producers and feedlots.<br>• Integrates seamlessly with NLIS database for reconciliation etc. |
| | | | **Masterbeef** (QLD)<br>• Advanced software that collects livestock data from carcass performance to genetic information, primarily in Wagyu operations.<br>• Used to inform better pairings and accurately forecast performance. |

# 2 Enabling more efficient and effective intensive grazing methods

Intensive grazing methods can be time-consuming and logistically challenging for producers to constantly move animals, fencing and water.

## Why is it important?
- These methods are increasing in importance around the world due to the benefits for both animals, the environment and bottom-line profitability.

## Value chain step

### Grazing
Weaning and Growing

## What does success look like?
- Adopting a fit-for-purpose tool for different sizes and types of operations that saves cost.
- Easy to use and enhances decision-making to improve profit margins.

## Breakdown of Levers:

| | Value add/impact | Technology | Example solutions |
|---|---|---|---|
| **Stock water technology** | • Investments in water infrastructure can be costly even at small scale.<br>• These portable solutions provide water and a far cheaper, and more mobile way. | Portable water systems<br><br>KIWITECH INTERNATIONAL LIMITED<br><br>MIRACO Livestock Water Systems | **KIWITECH** (Global)<br>• Portable, quick connect and disconnect troughs of different sizes.<br>• Very robust and modular in design.<br>• From $60 for a micro trough (services ~50 cattle).<br><br>**Miraco Mirafount 3330** (USA with distributer in Melbourne)<br>• Polyethylene with high-impact resistant "Rockite" material.<br>• Float valve mechanism that maintains a consistent water level.<br>• Energy free, but insulated to prevent freezing, 75l capacity. |
| **Virtual herding** | • Has the potential to address the challenges associated with aging farmers, more larger and corporate farms, rising costs, scarce skilled farm labour, water and land sustainability.<br>• Most are still in testing and development.<br>• May raise animal welfare concerns with some consumers.  Can be used without a license in Tasmania.<br>• All companies are cattle focused and very little work has been completed on virtual fencing for sheep. | Virtual fencing technology<br><br>GALLAGHER<br><br>VENCE<br><br>H A L T E R | **Gallagher's eShepherd** (Aus and global)<br>• Solar powered, GPS enabled, livestock neckband.<br>• Gallagher acquired virtual fencing leader, Agersons, in 2021.<br>• Currently in the final stages of trials on beef farms in New Zealand and now entering final BETA trials in Australia.<br><br>**Vence** (USA and Global including Australia)<br>• GPS enabler collar to track herds and monitor grazing patterns of animals, and monitor animal health.<br>• Purchased by Merck Animal Health (MSD) in 2022.<br>• Being trialled by Rio Tinto in WA.<br><br>**Halter** (NZ and global)<br>• Cow collar delivers real-time heat and health monitoring.<br>• Virtual fencing zones automatically move the cows through sound and vibrations from the collar, saving farmers time.<br>• LED lights on each collar to allow for easy identification.<br>• Raised $29m Series B funding in 2021 and continuing to develop product. |
| **Digital management tools** | • For large operations it can become difficult to stay on top of feed base.<br>• Remote sensing and digital tools support farmers to optimally graze their paddocks. | Remote sensing<br>cibolabs<br><br>Grazing management<br>MAIA GRAZING<br><br>Ag360 | **CIBO Labs' PastureKey** (Aus and global)<br>• World-leading satellite remote sensing and data science with on-farm knowledge to estimate feed supply for every hectare.<br>• Monitors changes in the feedbase and land condition every week.<br><br>**MAIA Grazing** (Aus and global)<br>• Grazing management tool providing actionable data insights.<br>• Launched in 2015 is now used by 1000+ farmers in Australia.<br>• Starts at $130/month for up to 4000 DSE or 580 LSU.<br><br>**Ag360** (Aus)<br>• Farm management decision support tool with focus on forecasting future rainfall, pasture availability, animal growth and health.<br>• Launched in 2020 with focus on sheep. Developed by University of New England's data transformation hub, CASI. |

# Adopting a range of technologies for rotational grazing

Russell runs large sheep operation in Bothwell with 10,000 ewes, along with crops grown under pivots. He uses a combination of technology to track and manage his operations.

All Russell's ewes are tagged with EIDs through which he is able to track weight gain on his Gallagher system. These weights are recorded and analysed in AgriWebb, with strip grazing process built by Enable Ag.

**Russell Fowler**
Farmer, Bothwell

## Drivers of adoption

Drivers to adopt these solutions include:
1. Improve and optimise weight gains to maximise production and understand the impact of different feeds and trials.
2. Integrate both crop and sheep production instead of using multiple systems.
3. Clarity in ewe health, breeding and pasture health.

## How the technologies fit together

Each solution proves data to improve management

**Data collection from EID tags**

EID tags on all ewes help monitor individual gain and treatments. Not yet directly interfaced with AgriWebb but direct integration exists.

**Livestock management software**

Russel stores and analyses mob data on AgriWebb, with individual animal data also possible. He also submits his NVDs through the system.

**Seamless Mob Management**

Developed strip-grazing process/management system under the pivots which integrates with plate meter.

**Monitor paddocks**

Phantom 4 drone with noise cancelling blades flown above 50m to check on lambing paddocks for any issues.

## 3. Results

Russell has previously used both AgWorld and Maia Grazing, both of which worked well for their purpose. He found AgriWebb was able to integrate both sides well enough and was very visual and easy to use by farmhands. Russel says he could use it better (e.g. individual animal management and automatic integration with Gallagher's APS), but has nonetheless seen numerous benefits

especially complemented by the EnableAg training and processes
- Ability to successfully adopt early weaning practices and ensure lambs are getting 200g/head/day liveweight gain.
- Reduction in time spent checking for issues during lambing.
- Ability for farmhands to improve strip grazing themselves through the EnableAg colour coding system from plate meter data.

# Using animal data to drive better decision-making



### Aiden Coombe
Manager, Greenham

Aiden Coombe has been with Greenham for 9 years and manages their largest farm at Westmore, north west Tasmania. This consists of 2,700ha of grazing property which finishes ~5,500 cattle a year, including British Breed, dairy-beef and some Wagyu. Cattle are inducted at around 300kg with steers turned off around 600kg and heifers around 500-550kg live weight.
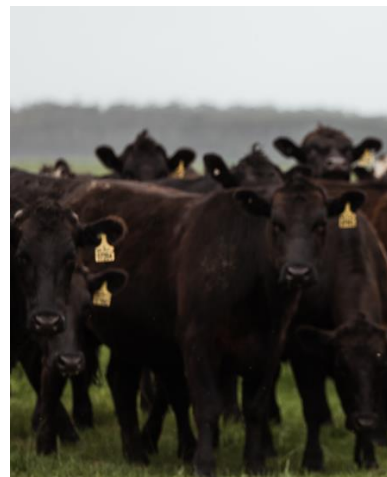


## What was the challenge?

- Aiden needed to be able to understand the cost of gain for the animals he managed – to allow him to optimise his inputs, stocking density.
- He also wanted to be able to understand overall Average Daily Gain's (ADGs) to allow for better mob management, rotational pasture management, and genetic selection.
- Looking forward Aiden is hoping to be able to start to forecast out weights per mob.

*"Everything we do is about improving the land and increasing productivity so at the end of the day we're producing better beef and more of it."*

## What was the process?

1. The previous manager used Practical Systems' Stockbook to good effect, but Aiden needed something that had an easier user interface so that his employees could better use it.

2. Aiden undertook a Google search for livestock management systems and reviewed a few options for their functionality.

3. Elynx's StockMate software emerged as the right solution for him with its interactive user experience and its functionality developed through use by some of Australia's largest livestock producers.

## Results

*"I can now understand not only my entry and exit weights, but the overall cost of every animal over its whole of life."*





StockMate is set up crush-side integrating with a Gallagher TWi5 via Bluetooth. Each animal has its own unique data code based on key characteristics and traits.

Elynx also integrates with the NLIS database allowing for reconciliation of animal movements.

Observing the ADG of different breeds and being able to rank different suppliers has led to Greenham being able to optimise their supplier selection based on superior genetics and performance.

# Overview of Fruit

## Overview[1]

**Fruit production quick facts**



| | | Gross value | Hectares | Farm businesses |
|---|---|---|---|---|
| **North West** | | 26% | 542 | 30 |
| **North** | | 36% | 502 | 36 |
| **South** | | 38% | 2,332 | 110 |
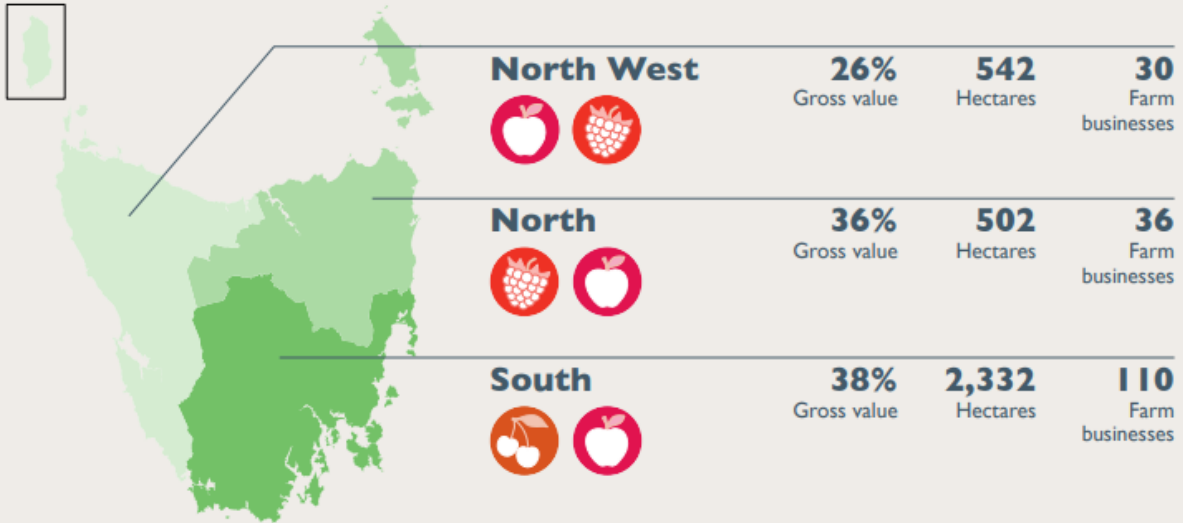
*Source: ABS*

- Fruit production represents 17% of Tasmania's agricultural production, accounting for approximately $407 million in the farm gate value in 2020–21.

- Berries were the highest value fruit at $209 million (51%), followed by apples at $75 million (18.4%), and cherries at $73 million (17.9%).

- The following information is drawn from interviews with berry and cherry growers. As a result, the information applies more specifically to these production systems.

1. AgriGrowth Tasmania, Department of Natural Resources and Environment, Tasmanian Agri-Food Scorecard 2020-21
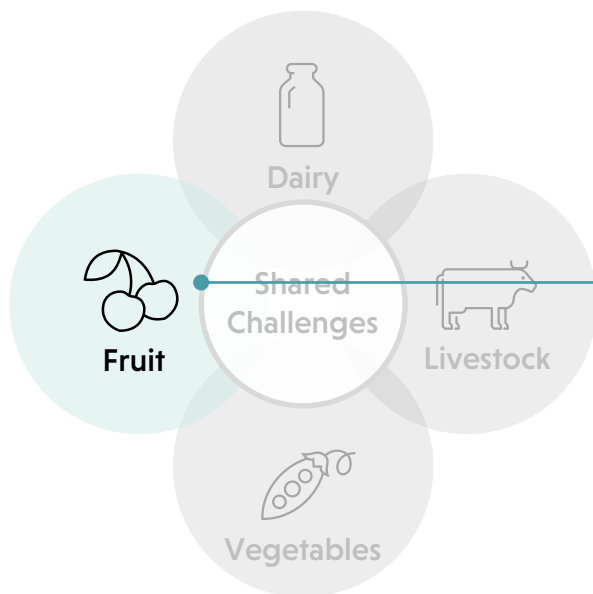


## Challenges & Opportunities

10 Improve harvest record keeping and efficiency.

11 Monitoring, managing and mitigating risks in the growing environment.

# Top two opportunities where tech has a role to play

## 1 Improve harvest record keeping and efficiency

### What is the problem?
- Pieceworker award rates have been changed, removing the link between worker earnings and productivity and putting a larger requirement on tracking individual performance for management and compliance.
- This can be difficult and time-consuming across a large workforce.
- Additionally, higher cost and limited availability of labour is impacting profitability and harvest capacity.

### Why is it important?
- Accurate record-keeping enables growers to satisfy regulations and manage individual picker performance.
- Improving harvest efficiency has the potential to improve profitability, employee engagement, and work-life balance.

### What does success look like?
- Fit for purpose time and harvest management platform.
- Accurate measure of individual picker performance, enabling effective incentives for high productivity.
- Time spent picking maximised, increasing returns for both the grower and picker.

## 2 Monitoring, managing and mitigating risks in the growing environment

### What is the problem?
- Climate change is likely to see increase in incidence and severity of damaging environmental conditions, such as rain, hail, wind and extremes of temperature contributing to plant and fruit damage and leading to economic loss.
- The use of protected cropping systems (PCS) can mitigate these risks and is increasingly being taken up by producers in Tasmania.

### Why is it important?
- Protected cropping systems are ensuring fruit quality parameters are met, prompting more stringent quality specifications.
- Investing in PCS is a complex decision, understanding the range of options is important to ensuring best-fit in the context of your farming business.

### What does success look like?
- Protected cropping system matched to the farm business, balancing capital investment and operational costs.
- Tools in place to optimise growing conditions and maintain stringent quality specifications.

# Technology solutions across the fruit value chain

| | Traditional journey | Tech enabled journey |
|---|---|---|

**Farm Setup**
Site and Growing Environment, Genetics.

*Traditional:* Limited data for site selection and planning. Outdoor plantings.

*Tech enabled:* Geospatial data for site selection and planning. Protected and climate-controlled cropping systems.
Cravo · AIR-POT · FrostBoss · Elite TUNNELS LTD · VOEN COVERING SYSTEMS · Haygrove

**Plant Production**
Water, Nutrition and Environmental Manipulation/Control.

*Traditional:* Conventional (3D) canopy management, manual irrigation and fertigation scheduling, monitoring and control.

*Tech enabled:* Formal (2D) canopy management. Automated irrigation and fertigation scheduling, monitoring and control, integrating microclimate data.
GOLDTEC CONTROL SYSTEMS · PRIVA · Link4 CORPORATION

**Plant Protection**
Weeds, Pests and Disease.

*Traditional:* Paper-based records of pest and disease observation, spray schedule, spray records, and inventory.

*Tech enabled:* High-resolution, farm-wide detection and forecasting. Digital spray schedule, records and inventory. Autonomous spray equipment.
BioScout · Farmable · GUSS · rimpro

**Monitoring**
Environment, Crop, Harvest.

*Traditional:* Visual observation and sample-based monitoring of crop performance and maturity. Single location measurement of weather and soil conditions.

*Tech enabled:* High-resolution sensing of crop performance. Continuous monitoring of crop, weather, and soil conditions in real-time.
SupPlant · bitwise Agronomy · GreenAtlas · GREEN BRAIN

**Harvesting**
Labour management and efficiency.

*Traditional:* Paper-based harvest tracking and record-keeping. Ladders, crates and buckets.

*Tech enabled:* Digital harvest tracking and record keeping. Labour augmentation; platforms, autonomous trolleys, and robots.
Hectre · Dogtooth · DATAPHYLL · Agpick · BURRO

**Packing**
Grading and Packing.

*Traditional:* Individual assessment of harvested produce. Manual grading and packing.

*Tech enabled:* Rapid, electronic grading and packing of harvested produce, sorting for size, colour, firmness, internal defects.
UNITEC · eb engineering solutions · Opal. · gpgraders · MARCO

**Distribution**
Marketing, Transport and Storage.

*Traditional:* Paper-based consignment notes, one-up, one-down traceability. Limited ability to ensure cold chain integrity.

*Tech enabled:* Digital temperature, time and location logging. Digital-based traceability and provenance, utilising blockchain technology.
SourceCertain · Laava · escavox · FreshChain

**Management**
Business IQ, HR and Safety.

*Traditional:* Unconnected farm management and paper-based records. Retrospective analysis and decision-making.

*Tech enabled:* Integrated farm management and record-keeping tools, enabling real-time strategic decision making across the business and value-chain.
CUSTOM SOFTWARE · MTRACK · ABC HELPS YOU GROW · WorkBox SAFETY · NEXT WORLD

# ① Improve harvest record keeping and efficiency.

Changes to the Horticulture Award, establishing a minimum wage guarantee for pieceworkers, requires growers to maintain greater record-keeping of labour activity. High cost and limited availability of labour is impacting profitability and harvest capacity.

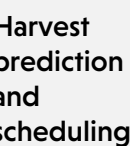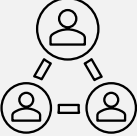| Why is it important? | Value chain step |
|---|---|
| • Accurate record-keeping enables growers to satisfy regulations and manage individual picker performance.<br>• Improve profitability, employee engagement, and work-life balance for growers and employees. | **Harvesting**<br>Labour management and efficiency.<br>**Management**<br>Business IQ, HR and Safety. |

## What does success look like?
• Fit for purpose time and harvest management platform.
• Accurate measure of (individual picker performance), incentivising worker productivity.
• Time spent picking maximised, increasing returns for both the grower and picker.

## Breakdown of levers:

| | Value add/impact | Technology | Example solutions |
|---|---|---|---|
| **Harvest prediction and scheduling** | • Monitor crop health and maturity to inform management and harvest decisions. | Crop analysis<br>bitwise Agronomy | **Bitwise Agronomy** (Tasmania)<br>• Technology to visually inspect crops, visualise crop condition and maturity via dashboards and maps.<br>• Utilises off-the-shelf cameras attached to existing farm machinery to capture data when performing jobs. |
| **Labour management and reporting** | • Labour tracking tools enabling management of labour efficiency and quality. | Harvest tracking<br>Agpick | **AgPick** (South Australia)<br>• RFID (radio frequency identification) system that increases efficiency, data transparency, collection and analytics.<br>• Enables vessel count and fraud control, electronic records, calculation of fair pay in real-time. |
| | • Integrated software packages managing range of tasks, including spray, harvest and packing operations.<br>• Enables fair pay and incentives through accurate time and piece-rate calculation.<br>• Enables real-time strategic decision making across the business and value-chain. | Management software<br>ABC<br>HELPS YOU GROW | **ABC Software** (New Zealand)<br>• Software solutions providing comprehensive, real-time reporting of farming operations across three programs: ABCpacker, ABCgrower and ABCspray. |
| | | MTRACK | **Mtrack Agrii** (United Kingdom)<br>• Time and piece work recording via mobile, web and PC based tools to give an accurate record of 'who produced what, when and where'. |
| | | GV CUSTOM SOFTWARE | **GV Custom Software** (Victoria)<br>• Specialised software solutions designed range of requirements, from farm management and picking entry, to packhouse stock entry and market orders. |
| **Labour augmentation** | • Reduced physicality of picking increases size of labour pool. | Picking platforms<br>BILLO | **Billo Platforms** (Italy) licensed to Inspired Ag (Victoria)<br>• Versatile, diesel or electric powered orchard platforms designed to enable work at elevated positions in the tree canopy for harvesting, pruning, thinning and tree training. |
| | • Improve labour productivity via automation where it is needed most | Autonomous vehicles<br>BURRO | **Burro** (United States)<br>• Collaborative robots designed to help worker productivity, through automation where it is needed most.<br>• Utilises computer vision, GPS and AI to navigate autonomously from A to B while carrying and towing. |
| | • Robotic picking and in-situ crop monitoring.<br>• Real-time insights on crop conditions including yield and defect rates. | Robotic harvesting<br>Dogtooth | **Dogtooth** (United Kingdom)<br>• Dogtooth robots count berries at each stage of maturity, providing insights into yield utilising 60-degree imaging of picked berries to determine mass and ripeness and identify a wide range of defects. |

# ② Monitoring, managing, mitigating environmental risk.

Climate change is likely to see increase in incidence and severity of a changing climate such as rain, hail, wind and extremes of temperature. These conditions contribute to plant and fruit damage, leading to economic loss. The use of protected cropping systems can mitigate these risks.

## Why is it important?
- Protected cropping systems (PCS) are ensuring fruit quality parameters are met, prompting more stringent quality specifications.
- Investing in PCS is a complex decision, understanding the range of options is important to ensuring best-fit in your context.

## Value chain step

### Plant Production

Water, nutrition and environmental manipulation/control.

## What does success look like?
- Covered cropping system matched to the farm business, balancing capital investment and operational costs.

## Breakdown of Levers:

| | Value add/impact | Technology | Example solutions |
|---|---|---|---|
| **Protected cropping systems (PCS)** | • Range of protected cropping systems.<br>• Protection from environmental damage and ability to manage cropping environment. | PCS | **Elite Tunnels** (United Kingdom)<br>• Polytunnel systems for protection from rain, frost, hail. |
| | | | **VOEN** (Germany)<br>• Covers for protection from heavy rain, wind, frost, hail with manual venting (retraction) system. |
| | | | **Haygrove** (United Kingdom)<br>• Retractable polytunnel systems for protection from rain, wind, frost, hail with manual and mechanised venting system enables management of crop conditions. |
| | | | **Cravo** (Canada)<br>• Automated retractable roof production system for protection from rain, wind, and hail with automated venting system enables management of crop conditions, via PCS control. |
| **PCS control systems** | • Control systems for managing automated venting of protected cropping systems.<br>• Enabling precise management of crop conditions, optimising the growing environment, ensuring yield and quality. | PCS control | **Link 4** (United States)<br>• Greenhouse control systems for managing automated venting system with different models designed to match the requirements of the grower and compatibility with standard greenhouse equipment.<br>• Expandable and flexible: add input and output modules to expand to specific requirements.<br>• Also develops irrigation and fertigation control systems. |
| | | | **Priva** (Netherlands)<br>• Smart control systems for managing automated venting system with ability to integrate data from weather, climate, light and water sensors and develops irrigation and fertigation control. |
| **Irrigation and fertigation systems** | • Control systems for irrigation and fertigation.<br>• Precise water and nutrient supply, for optimal growth and efficiency. | Irrigation control | **Goldtec** (South Australia)<br>• Irrigation and fertigation control system with programs for managing water and fertilizer dosage, operation timing and conditions.<br>• Ability to handle various water sources and irrigation by soil moisture, rain accumulation and evapotranspiration. |
| **Agricultural sensing systems** | • Accurate sensing informs (manual and automated) management decisions. | Agricultural sensing | **AgLogic** (Tasmania)<br>• Provides products and advice on agricultural sensors, telemetry and systems that run off them.<br>• Custom designed sensing systems for a wide range of applications and farming systems. |

# Robotic harvesting in Tasmania



**Kate, Laurie and Eva**
Burlington Berries and Dogtooth

Burlington Berries is a leading berry farm in Tasmania. Laurie Adams (Manager) and Kate Sutherland (Managing Director), oversee the production of raspberries, blackberries and strawberries on 60 hectares on Burlington, near Cressy in the Northern Midlands. Burlington places a high value on innovation. This is exemplified through integration of a robotic harvesting team on their strawberry operation.

Eva Thilderkvist got a start with Burlington as a Harvest Supervisor in 2022. After showing an interest in applying her skills as a Software Engineer to improving harvesting processes, Eva now leads a harvesting team, consisting of 16 Dogtooth robots and three operators trained by Eva.

## 'Good pickers are worth their weight in gold'

Dogtooth currently operates Gen4 robots at Burlington, which are no match for the best pickers. Replacing pickers is not the aim. Dogtooth robots introduce automation to help harvest workers be more productive and address the increasing shortage in the workforce which cost Australian strawberry producers $23 million last year.



## How it works

| SCAN Robot images the crop to detect ripe fruits and locate them in 3D space. | PICK-PATH Robot moves around each ripe fruit finding a clear path to its stalk. |
|---|---|
| HARVEST Robot simultaneously grips and cuts the stem of the fruit, minimising risk of bruising. | INSPECTION Fruit is given a 360-degree inspection to gauge fruit size and quality. |
| PACKING Graded fruit is lowered into a punnet according to its size, colour, and quality. |  |

## 3. Further innovation

Through their collaboration with Burlington, Dogtooth are learning 'real-life lessons' for fitting into the production system. Dogtooth and Burlington are working to understand and integrate their robots into the current tabletop growing system, rather than simply providing a demonstration site. Which, for Kate, is preferable to 're-gigging the entire farm'.

Kate envisages continued innovation in varieties (longer stalk, fewer leaves on lower-vine) and canopy management, to enable commercial robotic harvesting.

The technology also enables in-situ crop monitoring and greater accuracy when grading and punnetising which can reduce the amount of labour required in the field and packing shed.

# About Tasmanian Innovation Hub

The Tasmanian Drought Resilience Adoption and Innovation Hub – known as the TAS Farm Innovation Hub – is one of eight hubs nationally funded through the Australian Government's Future Drought Fund.

The hub is based at the Tasmanian Institute of Agriculture (TIA) at the University of Tasmania and delivered through an extensive network of industry and community partners. The hub helps Tasmanian farmers, and those who support them, to build valuable relationships and access critical information. Through the hub, people and organisations in the agriculture industry build knowledge to drive innovation in their businesses, care for land and waterways, and enhance community wellbeing.

Learn more at www.tasfarmhub.com.au

# About Beanstalk AgTech

Beanstalk is an agri-food innovation agency that believes that agriculture can be a leading force for good.

Beanstalk supports corporations, start-up innovators, investors, and government bodies across the Asia-Pacific to advance sustainable, ethical, and responsible food systems. Beanstalk's core competency is in helping their clients to navigate and adopt leading practices and technologies, with purpose and clarity. Beanstalk's team consists of agriculture, innovation, strategy, and operation experts based in Hobart, Melbourne, Sydney, Brisbane, Perth and Singapore.

Learn more at www.beanstalkagtech.com

# Acknowledgements

This work was made possible through funding from AgriFutures Australia

We would like to thank all those who provided support, insights and assistance in the development of this report.

*We acknowledge the traditional owners of this Country and recognise Aboriginal people's continuing connection to Land, Sea, Waterways, Sky and Culture. We pay our respects to Elders, past, present and emerging.*

# The AgTech Glossary

| Term | Definition |
| --- | --- |
| **Access point** | An access point (or Wi-Fi Access Point (WAP)) is a networking hardware device that allows other Wi-Fi devices to connect to a wired network. |
| **AgTech** | AgTech is any innovation used across the value chain to improve efficiency, productivity, profitability and/or sustainability. It includes hardware and software, business models, new technologies and new applications.<br><br>The new frontiers of AgTech are in the digital space, using data, tools and decision-support to assist agribusinesses to meet emerging consumer demands or enter new markets. |
| **Artificial Intelligence (AI)** | Artificial intelligence (AI) is the simulation of human intelligence processes by machines, especially computer systems |
| **Backhaul** | Backhaul refers to the side of the network that communicates with the global internet, and generally references which type of network or technology (mobile, fixed line, satellite etc) is being used to underpin individual internet access.<br><br>In an agricultural setting, backhaul may refer to the type of on-farm connectivity network deployed to support devices operating on-farm. |
| **Biostimulants** | A substance or microorganism that, when applied to seeds, plants, or on the rhizosphere, stimulates natural processes to enhance or benefit nutrient uptake, nutrient use efficiency, tolerance to abiotic stress, or crop quality and yield |
| **Broadband** | Broadband is a term used to refer to 'always on' high speed internet. |
| **Cloud** | Cloud refers to remotely-hosted managed services (of which storage may be one of these services) that are accessed over the internet.<br>By using cloud computing, users and companies don't have to manage physical servers themselves or run software applications on their own machines. The cloud enables users to access the same files and applications from almost any device, because the computing and storage takes place on servers in a data centre, instead of locally on the user device. |

Source: Beanstalk analysis and National Farmers Federation On-Farm Connectivity Guide (Edition 1 | Nov 2022)

# The AgTech Glossary

| Term | Definition |
| --- | --- |
| **Data** | In computing, data is described as information that has been translated into a form that is efficient for movement or processing by electronic means. |
| **Data Lake** | A data lake is a centralised repository that ingests and stores large volumes of data in its original form (structured and unstructured). |
| **Device** | A gadget that collects and transmits data e.g., soil moisture probes, water level sensors, electric fence sensor, weather stations. Each device will have a technology embedded, such as a microchip and radio transmitter, allowing it to sense and communicate data via a network to a central server. |
| **EID** | An electronic identification device (eID) contains a microchip which is applied to individual animals, generally in the form of an ear tag |
| **EM38 soil survey** | EM38 refers to electromagnetic soil mapping. EM38 surveys involve a vehicle towed sensor that is used in the field to measure electrical conductivity (EC) in the soil at designated depths.<br><br>Electrical conductivity is primarily influenced by soil texture, in particular clay content, soil salinity and moisture levels. |
| **Gateways** | Access points, which can include antennas, that send and receive signal between devices and networks. Gateways usually connect two networks together, enabling one to connect to the internet.<br><br>One gateway can connect many networks to a single connection to the internet, such as a LPWAN to a higher bandwidth broadband network.<br><br>In a mesh network, a gateway often refers to the main/central point of connection to the modem. |
| **Internet of Things (IoT)** | The Internet of Things, or IoT, refers to the billions of physical devices around the world that are now connected to the internet, all collecting and sharing data.<br><br>In agriculture the term is often used to describe sensors/stations in the field or in machines.Devices can be remotely monitored and controlled (including some in real time), and can include anything from pumps, sheds and tractors to weather stations and computers. |

Source: Beanstalk analysis and National Farmers Federation On-Farm Connectivity Guide (Edition 1 | Nov 2022)

# The AgTech Glossary

| Term | Definition |
| --- | --- |
| **IoT device** | A device, such as a soil moisture probe, often with minimal power requirements, capable of recording, collecting and sending data via wired or wireless communication. |
| **LoRaWAN** | Long Range, low power, wide area network designed to wirelessly connect IoT devices and transmit data. |
| **Low Earth Orbit (LEO) satellite** | Low Earth Orbit (LEO) satellites, or constellation satellites, are an interconnected network of satellites operating between 250km and 2,000km above the earth.<br><br>LEO satellites used for communications purposes typically have lower latency than geostationary (GEO) satellites, however because of the speed that a LEO satellite orbits the earth, many satellites are required in order to supply a constant connection. |
| **Middleware** | Middleware is software that different applications use to communicate with each other. It provides functionality to connect applications intelligently and efficiently so that you can innovate faster. |
| **Network** | The infrastructure that enables two or more physically or wireless connected components to exchange data. |
| **Node** | A network communicating device that connects several devices or sensors to a gateway. |
| **Platform** | A platform refers to the means by which information collected by a device and shared across the network is presented to the user in a meaningful format. This includes visualising sensor data via a dashboard interface.<br><br>A platform is often connected to the internet via an interface (where cloud storage may be used), or may be proprietary (requiring connection to the data source).<br><br>Some common types of platforms include Facebook, Twitter, YouTube and Spotify. |

Source: Beanstalk analysis and National Farmers Federation On-Farm Connectivity Guide (Edition 1 | Nov 2022)

# The AgTech Glossary

| Term | Definition |
| --- | --- |
| **Real-time Kinematic positioning (RTK)** | Real-time kinematic (RTK) is a surveying technology that measures the relative positions using two Global Navigation Satellite System (GNSS) antennas in real-time with better accuracy.<br><br>This enables farmers and agribusinesses to map their plantations and then use that information to guide their tractors and other agricultural equipment. It is used to achieve accuracy in mapping and managing crops. |
| **Router** | A router receives your internet connection, distributes it to your computers and devices and is capable of distributing it to multiple devices simultaneous.<br><br>A router's internal computer can manage the connection in a variety of ways and allows computers and devices to communicate with each other. The connection can be routed via cables or wirelessly (Wi-Fi). |
| **Satellite** | A communications vehicle orbiting the Earth. Satellites typically provide a variety of information from weather data to television programming. Satellites send time-stamped signals to GPS receivers to determine the position on the Earth. |
| **Telemetry** | Telemetry is the in-situ collection of measurements or other data at remote points and their automatic transmission to receiving equipment for monitoring. |
| **Voice and VoIP** | Voice is often referred to a type of telecommunication technology. Voice over Internet Protocol (VoIP), is a technology that allows you to make voice calls using a broadband Internet connection instead of a regular (or analog) phone line. |
| **Wi-Fi** | A facility allowing wireless network enabled technology to connect and communicate with an attached network, such as local, business or internet networks. |
| **Wireless** | A system using radio signals rather than wires to connect computers, sensors, mobile phones, etc. to each other.<br><br>*See also: Wi-Fi.* |
| **Wireless access point** | See Gateway or Access Point |

Source: Beanstalk analysis and National Farmers Federation On-Farm Connectivity Guide (Edition 1 | Nov 2022)

Thank you