

How can we design out on-farm food waste?

Insights into the opportunities 'whole crop' purchasing presents for producers in Victoria, Australia.



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Executive summary

Food waste is a complex problem that occurs for many reasons across different parts of the food system and supply chain. Some food waste is unavoidable however this report focuses on how we might address food waste as it occurs on-farm. The report provides a summary of insights of the barriers and opportunities for farmers to sell everything they produce in order to reduce on-farm food waste, increase their return and mitigate the impact on climate change.

Our 'Whole Crop Purchasing' project aims to prevent on-farm food waste by addressing any shortfall that a farmer may be experiencing to sell their seasonal gluts, seconds, or to create new, secure markets for current or forward planning crops. When farms can't sell all of their produce, farmers lose money, and the resulting food waste contributes to climate change. By facilitating the development of partnerships between farmer and buyer project participants, we are finding new models to reduce waste before the farm-gate, to share risk, and increase farmer viability.

Reducing on-farm waste is often focused on the type of produce or commodity that is going to waste. However we're finding the defining feature is where farmers are at in their farming life cycle, more so than the type of produce they farm. Farmers that are relatively new to agriculture appear to have a greater openness (both personal interest and farm capacity) to participate in this project.

The early stage of this research has found small to medium sized farmers can be grouped based on their needs or context of 'whole crop' purchasing. We've come up with personas that represent these key typologies identified. The types of farmers we have identified so far demonstrate how the problem of on-farm food waste can stem from different contexts. It presents varying needs and challenges pending the type of produce, scale of production and timeframes that both farmer and potential buyer/s have to work with in order to prevent the food becoming waste. This report covers best practice global examples of reducing on-farm food waste, through the lens of these farmer typologies.

This project takes a circular economy approach of trying to *design out* waste, rather than create reactive, end-of-pipe solutions to whole crop harvesting. The main lesson learned from shifting away from ad hoc and opportunistic whole crop purchasing is that strong governance is needed as part of finding new ways of sharing risk and forward planning to reduce on-farm food waste. As part of this project's experimentation we are trialling different forms of agreements and governance to develop fit-for-purpose governance mechanisms that can be replicated.

Next steps for this project include incorporating these findings into project partnerships between farmers and buyers.

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Introduction

Food waste is a complex problem that occurs for many reasons across different parts of the food system and supply chain. Some food waste is unavoidable however this report focuses on how we might address food waste as it occurs on-farm. We draw on Sustainability Victoria's report *The Path to Half*¹ and the Australian Government's *National Food Waste Strategy*² to define this as food that is intended for human consumption but does not reach the consumer.

This report provides a summary of insights of the barriers and opportunities for farmers to sell everything they produce in order to reduce on-farm food waste, increase their return and mitigate the impact on climate change. This includes our understanding of the problem from a research perspective and the best practice measures that have been applied elsewhere to solve this problem. The report also details early findings from our 'Whole Crop Purchasing' project and on-the-ground investigation in the context of Victoria, Australia and how we might minimise on-farm food waste through innovative, co-designed partnerships between farmers and buyers.

What's the problem?

Around 2.8 million tonnes of food is produced for the population of Melbourne's consumption each year of which 907,000 tonnes is wasted through the supply chain³. This waste contributes to climate change twofold with the waste of resources used in the production and also the emission of greenhouse gases as the majority of waste breaks down in landfill. Minimising food waste therefore becomes critical in working towards a more efficient and sustainable food system. Of the total 907,000 tonnes of wasted food, 24% (217,000 tonnes) is on-farm, 35% occurs during processing and distribution and 41% is post-consumer⁴. While on-farm food waste consists of the lowest proportion of waste, it is still significant and an important focus area for reduction as the effects and benefits will be cumulative across the rest of the supply chain.

Why is it happening?

Identified key factors of why food that is produced for our consumption doesn't make it past the farm gate include: loss or damage due to pests, diseases or weather, produce not meeting market or contract specifications, a fall in the market price that makes it economically

¹ Sustainability Victoria. (2020) *The Path to half*, Sustainability Victoria;

<https://www.sustainability.vic.gov.au/about-us/our-mission/our-strategies/victorias-plan-to-halve-food-waste>

² Commonwealth of Australia. (2017) *National Food Waste Strategy: Halving Australia's food waste by 2030*;

<https://www.awe.gov.au/sites/default/files/documents/national-food-waste-strategy.pdf>

³ Sheridan, J., Carey, R. and Candy, S. (2016) *Melbourne's Foodprint: What does it take to feed a city?*, The University of Melbourne;

<https://fvas.unimelb.edu.au/research/projects/foodprint-melbourne/publications/melbournes-foodprint>

⁴ ibid

unviable to harvest, a change in consumer taste and preference, and lack of market access^{5 6}. A 2017 paper reported that 60% of pre-farmgate food waste is avoidable⁷.

Produce specifications

When high specification standards such as uniformity, quality or size of fresh produce are set, this often creates waste at the farm level. Specification standards are common elements of contracts between farmers and large retailers. These contracts often lack clearly defined 'cosmetic standards', resulting in significant amounts of edible produce being rejected by the retailer⁸ at the expense of farmer viability.

When produce doesn't meet the 'first' standard or grade, markets for second or third grade produce can provide suitable alternatives to utilising what might otherwise become waste. However, this is not always a straightforward solution and often comes down to economics and whether it financially makes sense for the farmer to harvest, process and transport the lesser grades to market. Increasingly so, this is not a viable option for farmers. For example, lettuce and cabbage crops tend to have a 25-30% yield of waste. This waste occurs because food processors that may otherwise buy seconds also have specification standards based on size (i.e. only taking larger sizes) and quality (i.e. only taking tightly packed heads)⁹. Often the produce is left for animal feed and/or ploughed back into the field.



Uniform produce in a supermarket

⁵ Sustainability Victoria. (2020) *The Path to half*, Sustainability Victoria; <https://www.sustainability.vic.gov.au/about-us/our-mission/our-strategies/victorias-plan-to-halve-food-waste>

⁶ Commonwealth of Australia. (2017) *National Food Waste Strategy: Halving Australia's food waste by 2030*; <https://www.awe.gov.au/sites/default/files/documents/national-food-waste-strategy.pdf>

⁷ Davis, R. (2017) *Increasing productivity through decreasing food waste and loss in the value chain, particularly pre-farm gate*, RIRDC;

<https://www.agrifutures.com.au/wp-content/uploads/2017/08/RIRDC-Report-February-2017.pdf>

⁸ For more, see: <https://www.theconsumergoodsforum.com/wp-content/uploads/ECR-Report-2020-v4.pdf>

⁹ Rogers, G. et al (2013), *Vegetable Waste Factsheet for VG12046*, Applied Horticultural Research: <https://ausveg.com.au/infoveg/infoveg-search/vegetables-wastes-factsheet-for-vg12046/>

Climate Variability

Farming as a business is already laden with risks however climate change is adding another layer of risk that farmers have to manage¹⁰. Extreme weather events such as hailstorms, heavy frosts, heatwaves and flooding are increasing and these events can destroy or damage crops and significantly impact the viability of farmers, particularly those who are small to medium size. In order to account for and manage the risk of climate variability, farmers are required to closely monitor and manage their crop plans to ensure they are able to meet their demand. This can lead to waste occurring on-farm due to oversupplying as a method of managing risk.

Labour access

Access to and cost of labour often becomes the critical component in determining whether a farmer will harvest a crop and take it to market. If farmers cannot recoup the cost of labour in their sale price, then they may lose money by harvesting and bringing a crop to market, compared to leaving it as waste on-farm. This can be more of a pinch-point for Australian farmers as Australia has a significantly higher (40%) minimum wage in comparison to other countries such as the US, NZ and Ireland¹¹. Horticulture is one of the most labour intensive agricultural industries, especially during harvest time¹². Therefore, if the crop can be left in the field and not pose risks of disease, it is common for farmers to run livestock through the paddock to eat the remaining rather than pay for the labour to harvest.

Lack of market access

Small to medium scale farmers may struggle to access markets to move their surplus produce. The capital investment required to transform surplus into a higher value / value-add product or technology such as cold storage along with access to alternative supply chains¹³, is often inaccessible for individual farmers who have smaller volumes. This is in addition to less market power to influence demand or price¹⁴. This is a key issue, and is the area where we have focused this project's efforts on designing solutions.

¹⁰ For more, see: <https://farmersforclimateaction.org.au/climate-smart-agriculture-toolkit/#risk>

¹¹ For more, see: <https://www.farmonline.com.au/story/7447005/how-competitive-is-australian-dairy-labour/>

¹² Campbell, I. (2019) *Harvest Labour Markets in Australia: Alleged Labour Shortages and Employer Demand for Temporary Migrant Workers*, Journal of Australian Political Economy: <https://www.ppesydney.net/content/uploads/2020/05/Harvest-labour-markets-in-Australia-Alleged-labour-shortages-and-employer-demand-for-temporary-migrant-workers.pdf>

¹³ Davis, R. (2017) *Increasing productivity through decreasing food waste and loss in the value chain, particularly pre-farm gate*, RIRDC:

<https://www.agrifutures.com.au/wp-content/uploads/2017/08/RIRDC-Report-February-2017.pdf>

¹⁴ For more, see: <https://www.theconsumergoodsforum.com/wp-content/uploads/ECR-Report-2020-v4.pdf>

How might we reduce on-farm waste?

Our 'Whole Crop Purchasing' project aims to prevent on-farm food waste by addressing any shortfall that a farmer may be experiencing to sell their seasonal gluts, seconds, or to create new, secure markets for current or forward planning crops. When farms can't sell all of their produce, farmers lose money, and the resulting food waste contributes to climate change. Whole Crop purchasing presents the opportunity to reduce food waste in Victoria by 24,562 tonnes¹⁵.

Our focus is on helping Victorian small to medium sized regenerative farmers. By facilitating the development of partnerships between farmer and buyer project participants, we are finding new models to reduce waste before the farm-gate, to share risk, and increase farmer viability. This facilitation process involves a staged approach - first by developing an in-depth understanding of farmer and buyer needs to appropriately scale-match. Then, a co-design process is being undertaken where the legal requirements of both parties will inform a partnership agreement and contract of sale. Priority is given to partnerships that allow for more produce to be sold for human consumption with the farmer receiving full price, followed by produce sold for lower values (i.e. seconds) for the purpose of processing. Produce sold for animal feed or biofuel is outside of the project scope, as this is classified as a form of waste in comparison to directing produce to human food markets.

Due to the project timeframe, the scale of experimentation is bound to crops harvested by the end of 2022. This project takes a design approach, of attempting to uncover and address barriers to build solutions that will be able to scale following the project.

The types of farmers interested in reducing on-farm waste

Reducing on-farm waste is often focused on the type of produce or commodity that is going to waste. However we're finding the defining feature is where farmers are at in their farming life cycle, more so than the type of produce they farm. Farmers that are relatively new to agriculture appear to have a greater openness (both personal interest and farm capacity) to participate in this project.

The early stage of this research has found small to medium sized farmers can be grouped based on their needs or context of 'whole crop' purchasing. We've come up with personas that represent these key typologies identified. Personas are a product and design tool that help keep the end user at the centre of the solution.

¹⁵ Sustainability Victoria (2020) *The Path to Half*, Sustainability Victoria:
<https://assets.sustainability.vic.gov.au/asset-download/Report-The-Path-to-Half.pdf?mtime=20210127091447&focal=none>

Types of farmers

- **A farmer wanting to sell their whole crop**

A farmer has a mixed variety garlic crop that will be ready to sell in two months. The garlic is harvested in one activity, cured and able to be stored for several months while still maintaining a high quality. The farmer is anticipating that there will be 200kg harvested and available for sale. At this stage of the crop growth and dependency on rainfall, it is hard to predict the size of the garlic bulbs and cloves. Last season their garlic crop was stored for too long as COVID-19 impacted the farmers' plan to sell the garlic. It lost market value as the bulb started to shoot so the farmer lost a significant portion of projected income.

- **A farmer wanting to find a market for their seasonal glut**

A farmer has a consistent summer glut of cucumbers and zucchinis. The peak production usually occurs over the festive period. During this time, the farmer estimates that each crop could reach a glut of 100kg per week. The vegetables may be larger in size due to hot weather leading to significant growth. Once harvested, the vegetables have a short shelf-life. In previous seasons, because the farmer hasn't had a ready market access for the excess, they have been ploughing the saleable produce back into the field.

- **A farmer wanting to find a market for their seconds**

A farmer sells their stonefruit into their CSA program, local farmers' market and retailers. The produce sold into these existing markets is first grade. The second grade produce which consists of approximately 15% of the crop is fed to their livestock as it is not worth the transportation costs to sell the second grade produce at the wholesale market. The farmer wants to find a viable market option to sell their seconds.

- **A farmer wanting to forward crop plan (predetermined crop)**

A certified market gardener has successfully grown dryland certified organic saucing tomatoes on 1/3 block (500-750kg yield) of their farm over the previous three seasons. They are now wanting to scale up their production for the upcoming season to a full block, with an anticipated yield of 1 - 1.5 tonne. The farmer wants to find a buyer/s willing to commit to the crop at the crop planning stage (May) so that they have a secure market at harvest time (January - March). The farmer would be prepared to supply a small volume this season to ensure that both parties are happy before proceeding to committing to scaling up the production.

- **A farmer wanting to forward crop plan (flexible crop/s)**

A farmer has three acres of land available and is looking to establish an intensive market garden. They are located in a rural area where access to fresh produce at a household and business level is challenging. The farmer wants to grow crops to demand for their local community. They are happy to negotiate on the types of crop/s grown.



Project partners Farmer Incubator, who work with beginner farmers to learn farming and marketing.



Reducing on-farm food waste: successful approaches

This section of the report identifies how people are responding to some of the causes of on-farm food waste, such as produce specifications and labour access challenges, and then considers the range of solutions to address a lack of market access.

The Centre for Environmental Farming Systems in North Carolina delivered a Whole Crop Harvest Project which sought to understand why produce was being left in the field, in order to provide information to growers to empower them to better consider how they market their produce and the acreage they plant per crop¹⁶. They found that around 30% of their produce was being left in the field; of that amount, around 40% of that was of first grade quality while the remaining 60% was second grade quality. The reason that produce remained was varied, and the project took a multi-faceted approach to its solutions: for example, if produce was left in the field due to a lack of market demand, then agricultural outreach was used to encourage planting less of the crop or diversifying to different crops with the aim of less wastage and more profitability. Alternatively, if a large portion of the crop left in the field was due to not meeting market specifications, then finding a market for the second grade produce helped minimise produce left in the field.

Findings from that project highlight that different approaches are necessary for different needs. Based on our farmer personas, we have listed several case studies from around the world to outline successful examples of how on-farm food waste is and can be addressed for each set of needs.

Outside of these case studies, there is limited academic literature available on best practice approaches to minimising waste through improved farmer / buyer partnerships. Farmers' perception of 'waste' may be contributing to the scarce literature, as many farmers do not perceive unsold produce for human consumption to be a problem as they are able to divert this 'waste' into other farming activities or sell into markets that are not for human consumption.

Farm diversification has been a successful approach for small, medium and large scale farming operations to maximise sales and reduce the financial risk and uncertainty¹⁷ while minimising on-farm waste. For example, broadacre or cropping farmers can plant unsold seed back into the fields for green manure crops to replenish the soil or sell into livestock feed markets. Fruit, vegetable and cropping farmers often have livestock as another stream of farm revenue with any 'waste' produce used as supplementary feed.

As highlighted earlier in the report, product specifications can create significant waste. The Queensland Farmers' Federation has highlighted several larger farming operations that have

¹⁶ For more, see: <https://cefs.ncsu.edu/food-system-initiatives/whole-crop-harvest>

¹⁷ Campbell White & Associates Pty Ltd & Black, A. (2002) *Costs and Benefits of Diversification: Whole Farm Case Studies*, RIRDC: <https://www.agrifutures.com.au/wp-content/uploads/publications/02-029.pdf>

seized the opportunity to create markets themselves rather than depending on buyers¹⁸. Carrots, avocados and bananas are all crops subject to strict specifications. Some Queensland farmers have successfully value-added the seconds produce into products such as pre-cut bags of shredded carrot, gluten free banana flour and cold-pressed, ready-to-use avocado products¹⁹. More examples of second grade produce markets are also included further down.

In cases where a lack of labour access is contributing to on-farm food waste, literature shows that people are broadly trying to tackle this through either improved harvest infrastructure, to reduce labour costs, or through use of free voluntary labour. 'Gleaning' or harvesting what remains in the fields post-harvest is one form of free labour that has been used to reduce on-farm waste. The group Feedback Gleaning Network²⁰ (UK) have reported waste savings of 640 tonnes of produce through their activities. However, the model doesn't scale well, nor does it account for biosecurity and liability concerns that many farmers hold, or the high overhead of coordinating and also training people to harvest safely and effectively.

Case study: Using infrastructure to address labour access for harvest

One of the components of this project led by North Carolina State University was the 'Glean Machine'. The Glean Machine was designed to increase the efficiency of 'gleaning' by decreasing the physical demand and labour costs associated with harvesting second grade produce still in the field²¹. The machine features low to the ground seating and moves at a steady pace to allow gleaning to be done continuously rather than short bursts like regular hand harvesting. The machine was designed to glean a variety of crops including cucumber, capsicum, and sweet potato, all of which are primary commodity crops in the North Carolina region. These are often high wastage crops with as much as 50% sometimes being left in the field. A successful demonstration of the Glean Machine resulted in the gleaning of over 8 tonnes of sweet potato.

Enabling market access to reduce on-farm food waste

The key focus of this project is using market access to reduce on-farm food waste. The types of farmers we have identified so far demonstrate how the problem of on-farm food waste can stem from different contexts. It presents varying needs and challenges pending the type of produce, scale of production and timeframes that both farmer and potential buyer/s have to work with in order to prevent the food becoming waste.

¹⁸ For more, see: <https://www.qff.org.au/presidents-column/innovation-reducing-farm-food-waste/>

¹⁹ *ibid.*

²⁰ For more, see: <https://gleaning.feedbackglobal.org/>

²¹ For more, see: <https://cefs.ncsu.edu/food-system-initiatives/whole-crop-harvest/whole-crop-harvest-the-glean-machine/>

Types of farmers

- **A farmer wanting to sell their whole crop**

Whole crop purchasing projects to-date have usually focused on mechanisms to sell 'imperfect' or low-grade produce as part of a 'whole crop' purchase.

Spade and Barrow was a Victorian-based organisation that aimed to counter the issue of food waste and farmer viability that is driven by the rigid aesthetic standards of retailers and wholesalers²². Spade and Barrow focused on the hospitality sector as a willing customer base that wasn't concerned by 'ugly' produce. Sales were brokered between farmers and food businesses at more competitive prices than wholesalers (up to 40% less²³) as the supply chain was shortened and transparent. The organisation also partnered with Aussie Farmers Direct to expand access to imperfect produce into households. This approach of making wonky fruit and vegetables available for consumers was also adopted by Harris Farms²⁴ and reported to be 50% cheaper than the standardised, conventional looking produce²⁵. Since 2014, Harris Farms has sold a total of 30,863 tonnes of produce through the 'Imperfect Picks' campaign (pictured below)²⁶.



²² For more, see:

<https://www.broadsheet.com.au/melbourne/food-and-drink/article/spade-barrow-crops-left-behind>

²³ For more, see:

<https://www.ausfoodnews.com.au/2014/12/03/spade-barrow-launches-wonky-fruit-and-veg-boxes-for-home-delivery.html>

²⁴ For more, see: <https://www.harrisfarm.com.au/blogs/campaigns/imperfect-picks>

²⁵ For more, see:

<https://www.ausfoodnews.com.au/2014/12/03/spade-barrow-launches-wonky-fruit-and-veg-boxes-for-home-delivery.html>

²⁶ Correspondence with project team

Models such as the above which genuinely divert 'waste' produce can result in positive outcomes for some farmers and food waste diversion. But there have been criticisms of 'imperfect produce' schemes elsewhere, where food waste is becoming increasingly commodified and gentrified through 'corporate-supported agriculture'²⁷ start-up enterprises that rely on the over-production and waste of industrial agriculture. These forms of market-based solutions continue to reinforce the need for waste, rather than prevent it from occurring in the first place²⁸. This then works to undermine the work of small, localised food networks of farmers and food justice initiatives, as experienced by Phat Beets Produce in California, with their community-support agriculture (CSA) membership gutted.

Another form of whole 'crop' purchasing are those initiatives which enable use of whole animals through nose-to-tail processing. Currently most abattoirs will only return generic offal, rather than guaranteeing returned offal is from a specific lot; this means that farmers cannot be sure whether the offal returned is theirs, and if not, it is unlikely to meet their farming practices which undermines any ability to retail it. Changes to abattoir legislation that enable on-farm processing of low throughput farms presents the opportunity to regain access to whole animal retailing for more farmers.

Takeaways for this project: This project has similar goals to past 'imperfect' or 'nature's grade' produce initiatives, but aims to build on a gap in those models related to governance and risk-sharing. This should enable new models that ensure a larger proportion of produce is directed to markets, rather than working on an ad hoc basis. By working with farmers to design solutions, it creates outcomes that benefit rather than undermine farmer viability.

- **A farmer wanting to find a market for their seasonal glut**

The most common form of solution for the challenge of seasonal gluts is processing and preserving, or collective aggregation. In India, seasonal gluts of tomatoes, onions and potatoes are monitored for matching with processor needs, alongside a raft of initiatives that aim to build farmer capacity for crop planning, farmgate infrastructure and retail development²⁹. Other regions have focused on enabling collective processing where farmers retain control of the supply chain by setting up shared or leasable processing infrastructure³⁰. Locally, some farmers have also formed alliances across the two main growing regions for specific crops (i.e. Victoria and Queensland for a crop such as potatoes) to aggregate supply and maintain a stable level of retail output that is buffered by each other's output.

²⁷ *ibid.*

²⁸ For more, see:

<https://thecounter.org/imperfect-produce-ugly-food-waste-commodification-community-supported-agriculture/>

²⁹ For more, see: https://miews.nafed-india.com/index.php?commodity_id=2

³⁰ Illinois Department of Commerce and Economic Opportunity (2012) *Building Successful Food Hubs*: <https://www.newventureadvisors.net/wp-content/uploads/2016/01/Building-Successful-Food-Hubs.pdf>

Stimulating development of processor businesses that respond to local gluts has been another intervention adopted by governments³¹. In some cases buyers have worked with farmers to create new products in response to a glut, such as cider-makers Faire Ferments who began in response to a glut of pears in the Goulburn Valley created by SPC processors closing their doors³². Existing processors may also have capacity to process gluts, but as mentioned elsewhere in this report, they may have more set throughput needs and would require longer lead times to incorporate gluts into their processing.

Takeaways for this project: Working to find infrastructure and processing buyers as part of our producer partnerships will be key to ensuring gluts aren't wasted.



From pear gluts to value-added cider. Images via Faire Ferments



- **A farmer wanting to find a market for their seconds**

Distinct from farmers aiming to sell their whole crop, there are also farmers looking to sell their seconds to a different market from their primary market. This may be through strategic marketing, value-adding, or ad hoc opportunistic sales.

Strategic marketing of seconds is most relevant for produce that has an additional Unique Selling Point, such as organic produce. In one case, organic apple growers Newton Orchards have managed to increase their 'pack out' rate - i.e. the amount of fruit that leaves the farm - to 95%, up from an industry average of 70% through developing strategic markets for

³¹ For more, see: <https://www.icar.org.in/node/321>

³² For more, see: <http://www.faireferments.com.au/about>

secondary produce³³. This involved matching their supply with the increasing demand for organic baby foods, juices, and soups which all can be made using second grade fruit. One challenge presented by turning to external processing for seconds is the need for processors to forward plan quite specific volumes to match their processing capacity.

Similarly, other producers have turned to value-adding activities to create a market for their second-grade produce. In some cases, rather than supplying to external processors, they are choosing to purchase and build their own processing infrastructure to retain greater control over the end price of the product, and to secure the margin that is created by turning second grade produce into a value-added product. See the Case Study below for an example.

The North Carolina Whole Crop Harvest team addressed this issue in their region by developing a Mobile Dehydrator. This mobile piece of equipment allows for on-farm drying of fruit and vegetables and an opportunity for producers to diversify their markets. As the asset is mobile, the dehydrator infrastructure can be used by multiple growers therefore enabling a collaborative, risk-sharing model.

Takeaways for this project: To develop whole crop purchasing, it may be necessary to build relationships with separate buyers for primary and secondary grade produce, and set up different purchasing agreements either with multiple parties or between all parties. Produce with a USP such as organic may present the best opportunity for early adopters who might participate in this project. Matching scale and volume requirements is a known challenge but also an opportunity for exploration of aggregation. Developing relationships with infrastructure providers and processors may assist with securing outlets for whole crops.

Case study: Investing in innovative technology to value-add seconds³⁴

The Mantovani family have been growing fruit in Cobram, Northern Victoria for over 30 years. They estimate that a crop will have approximately 10-12% waste or seconds in a normal season however this has increased drastically over the past several seasons due to hailstorms damaging most of their apple crop to an unsellable condition.

Despite the apples no longer being saleable, due to the risk of disease, they are still required to pick and put the apples through the packing shed as they do when their produce is going to market.



Apple Crisps product image via MP Harvest Foods

³³ For more, see: <https://apal.org.au/organics-surging-secondary-market/>

³⁴ For more, see: <https://www.abc.net.au/news/rural/2021-07-26/apples-crisps-from-damaged-fruit/100323966>

With luck, one of the farm employees knew of a man in Taiwan who was inventing new technology to vacuum-dry fresh produce. The Mantovani family recognised the opportunity and enlisted inventor Polo Zhuang to help them turn their unsaleable apples into a value-added product.

The process involves slicing the fruit, putting it in a drying room for 12 hours and then into pressurised ovens that suck the remaining moisture out of the fruit to transform into the crisp. The Apple Crisps product has now been on the market since mid 2021.

The investment in this technology and diversification of products means that they can be more resilient against increasing climate variability, divert seconds from waste or lower value markets and have improved viability in an industry that is more and more difficult to survive in. The technology is also able to process peaches, apricots and mangoes and is planned to be used collaboratively with other local growers.

- **A farmer wanting to forward crop plan with secured sales**

If a farmer is looking to sell a portion or whole of crop, forward contracts can provide surety to the farmer to go ahead with the crop plan as they have a guaranteed buyer at time of harvest. These types of contract farming instances are common with larger scale buyers and farming operations in industries such as cropping, horticulture and livestock, but don't necessarily account for reducing waste as a central goal³⁵. Forward contracts can take on varying iterations such as forward priced contracts where the agreed volume, grade and price is agreed upon from the outset³⁶. These can benefit the farmer by establishing a price that is secure from market fluctuations and allows the farmer to plan crop rotations for longer term³⁷. Disadvantages to forward priced contracts for the farmer include inability to access market price increases and being locked in to supplying the agreed volume and quality of product³⁸.

Takeaways for this project: There is an opportunity for forward contracts to be applied at a smaller enterprise scale for both farmers and buyers, in a way that eliminates (or drastically reduces) wastage. The relationship between farmer and buyer must be well-established, and will need to encompass the fluctuating amounts that must be sold in order to reduce waste. Successful contracts should clearly outline terms and specifications that are understood by both parties³⁹. This highlights the importance of codesign in the contract development process.

³⁵ For more, see: <https://www.fao.org/3/y0937E/y0937e02.htm>

³⁶ For more, see: <https://forages.oregonstate.edu/fi/topics/marketing/marketing>

³⁷ *ibid.*

³⁸ *ibid.*

³⁹ For more, see: <https://www.fao.org/3/y0937E/y0937e02.htm>

Case study: Moving beyond the traditional fixed contract with forward contracts

The world's third largest retailer, UK based Tesco, has committed to working with suppliers to halve the amount of food waste in their supply chains by 2030⁴⁰. Since 2013, Tesco has been adopting forward contracts with their suppliers via long-term contracts (3-5 years) and whole crop purchasing contracts⁴¹. The whole crop purchasing contracts mean that Tesco commits to purchasing the producer's entire crop, including that which does not meet shelf or 'cosmetic' standards. This type of contract aims to have threefold benefits by bargaining of reduced costs for Tesco as they give certainty to the farmer that they will sell everything they produce (and subsequently said to increase farmer income), while also reducing the amount of food waste⁴². For produce that does not meet shelf quality, Tesco are able to value-add into meals in their in-store kitchens or further process into products such as frozen chopped vegetables under their home brand label⁴³.

Tesco's adoption of these more flexible types of contracts have proved successful in reducing the amount of food waste within their supply chain. For example, variable weather conditions in the UK meant that the 2021 strawberry season started earlier than anticipated resulting in a produce glut. Flexible supplier contracts and ability to influence and stimulate consumer demand through marketing meant that Tesco were able to purchase an extra 400 tonnes of produce that may have otherwise become on-farm food waste⁴⁴.

⁴⁰ For more, see:

<https://www.tescopl.com/sustainability/taking-action/environment/food-waste/working-with-suppliers/>

⁴¹ For more, see: <https://www.theconsumergoodsforum.com/wp-content/uploads/ECR-Report-2020-v4.pdf>

⁴² *ibid.*

⁴³ *ibid.*

⁴⁴ For more, see:

<https://www.foodnavigator.com/Article/2021/06/18/Fighting-on-farm-food-waste-through-flexible-procurement-Tesco-s-response-to-a-bumper-strawberry-harvest>

The role of governance in reducing on-farm waste

This project takes a circular economy approach of trying to *design out* waste, rather than create reactive, end-of-pipe solutions to whole crop harvesting. The main lesson learned from shifting away from ad hoc and opportunistic whole crop purchasing is that strong governance is needed as part of finding new ways of sharing risk and forward planning to reduce on-farm food waste. As part of this project's experimentation we are trialling different forms of agreements and governance to develop fit-for-purpose governance mechanisms that can be replicated.

Eater to producer forward contracts: CSA Risk-sharing

Community Supported Agriculture (CSA) is a food production and distribution model that was first established by Japanese market gardeners in the 1970's to better share the risks, and also bumper crops, with consumers.⁴⁵ As the Australian Food Sovereignty Alliance describes, 'people buy shares in a farm's projected harvest in advance and for a set period (a season, or a year, for example) and receive regular deliveries'⁴⁶. It is a model used increasingly by farmers across the world to strengthen the connection with the people eating their food. Our project will explore the principles of the Community Supported Agriculture model and how these may be applied to a whole crop partnership between farmer and buyer. For example, if an organic farmer is growing a crop of tomatoes for one buyer, the farmer may split the costs of the seedlings and labour costs to plant with the buyer.

It's not new that many producers are required to be competent risk-managers, managing for price risk, disaster and biosecurity⁴⁷. Likewise, many producers and particularly small-scale producers, are familiar with risk-sharing through household scale CSAs. The advantages of CSA to farmers are manifold - through displacing of the financial risk of seasonal volatility to customers. Having paying customers bought-in to the overall viability of the farm can create long-lasting business relationships for the farmer, giving season to season security of livelihood. Because the risk is shared between farmer and customer, the relationship requires some upfront articulation of costs and benefits for each actor, and provisions to be made for problems such as crop failure or distribution of surplus crops. As such, there are a wide range of resources available to producers to formulate agreements with buyers, both locally and globally^{48 49}.

⁴⁵ For more, see: <https://afsa.org.au/csa/>

⁴⁶ *ibid.*

⁴⁷ Meuwissen, Hardaker, Huirne, Dijkhuizen, *Sharing risks in agriculture; principles and empirical results*, NJAS - Wageningen Journal of Life Sciences: <https://www.sciencedirect.com/science/article/pii/S1573521401800221>

⁴⁸ Burch, M.L. and M.D. Ernst. (2010) A Farmer's Guide to Marketing through Community Supported Agriculture (CSAs). Knoxville, TN: University of Tennessee Extension

⁴⁹ Goeringer, L.P, A. Newhall, S. Everhart, and W. Elangwe. (2015) Community Supported Model Contract. University of Maryland: <http://drum.lib.umd.edu/handle/1903/16329>

Generic CSA agreements tend to incorporate the following elements⁵⁰:

- Product and delivery schedules
- Clear indication of the costs and benefits of CSA membership
- Clear lines of communication articulated
- Explain the possibility of crop failure
- Indemnification for harm to members
- Explanation of how surplus crop benefits are distributed
- Outline requirements for mediation, authority to terminate membership for violations of agreement

Often the design and delivery of these kind of agreements is driver by producers or the producer collective⁵¹. Customers might agree to the document, but not have substantial input into the design of the agreement itself. The onus is on the producer to calculate risks to themselves and the customer, and make provisions to share that risk.



CSA box from Victorian producers, image from FarmRaiser

⁵⁰ Endres, Johnson, Armstrong (2013) *Model CSA Member Agreement and Guide*, North Central Risk Management Education Center and the USDA National Institute of Food and Agriculture

⁵¹ Johnson, N.R., R. Armstrong, and A.B. Endres. (2013) *Community Supported Agriculture: An Exploration of Legal Issues and Risk Management Strategies*. Natural Resources & Environment

Enterprise to producer forward contracts: Whole crop purchases

So, how is governance a whole crop purchase different to a CSA? Global models of whole crop purchasing tend to be driven by purchasers or suppliers. So, they are in effect an 'Enterprise' supported agriculture agreement. The Consumer Good Forum Coalition of Action on Food Waste⁵² indicate that the governance of whole crop purchasing contracts globally has traditionally been driven by larger retailers, citing UK supermarket giant 'Tesco' as a pioneer of whole crop purchases. They indicate that the part of the success of the governance of large-scale whole crop purchases is due to the vertically integrated nature of large retailers, giving them leverage and capacity to negotiate with multiple suppliers.

Many retailers, instead, rely on relationships with aggregators to wear the risk of supply and meet the demand of retailers seamlessly. In these scenarios, the risk is distributed in the supply chain, and the scale of the retailer and aggregator enables suppliers to ensure use of large or surplus amounts of producer can be utilised through diverse value chains (e.g. Tesco has infrastructure to utilise 'seconds' produce in their frozen vegetable or in-house salad value streams). In the Tesco example, the supply contracts are negotiated in a similar way to other large retail supply contracts, but the retailer commits to a larger portion of shared risk & responsibility for use of the product.

There are also other examples of suppliers & aggregators (as opposed to retailers) entering into similar contracts with producers but this tends to be for products like meat where shelf-life and demand-driven supply chains enable lower risk of glut or failure⁵³. It's worth noting that governance at this scale involves retailer legal teams and, generally medium to large suppliers or producers.

So, how can smaller-scale enterprises and smaller-scale producers engage in forward contracts (i.e. whole crop purchases) that effectively distribute risk and responsibility, akin to a CSA. And, how can this be done between organisations without internal legal teams or capacity to engage legal advice. There is a dearth of research or documentation on this specific domain of whole crop purchasing.

MOU approach to governance

In our early brokering activities, it's clear that documentation of risk-sharing will be essential for getting whole crop purchases from planned to actual. However, this is in tension with a wariness/hesitation about entering into contractual agreements and scale matching between buyers and producers. For example, larger buyers like government organisations have tight procurement requirements of budget that are not immediately deliverable by smaller producers. Small enterprises in the early phases of developing a farming enterprise may not be able to guarantee adequate supply or are reticent to commit contractually. It's clear that

⁵² For more, see: <https://www.theconsumergoodsforum.com/wp-content/uploads/ECR-Report-2020-v4.pdf>

⁵³ *ibid.*

who holds the risk if things go wrong is a barrier to progressing a whole crop purchase forward contract.

In order to balance a. the needs of producers and buyers for some documentation of risk & responsibility sharing with b. the imbalance of legal capacity between larger buyers and smaller producers, we are advocating for co-design & development of memorandum of understanding (MOU) documents between parties. An MOU is not legally binding but signals the willingness of the parties to move forward with a contract. In the same way that CSA models and agreements are now widely available for producers, whole crop purchases might be supported with accessible, standard MOU documents. An MOU enables both parties to strongly indicate that they intend to move towards a buyer-producer contract, whilst navigating the parameters of that relationship. Our early conversations with producers and buyers indicates that this level of documentation might offer the right balance and level of commitment with challenges of moving to contract stage.

At present, we are taking a generic MOU template that meets legal requirements, and consulting with producer and buyer partners to understand any additional elements or alterations that would be required to progress a whole crop purchase.

Next steps

As the match-making process of farmer and buyer partnerships continues to emerge, this project will simultaneously build detail into the development of formalised partnerships through the participant co-design process.

The project initially focused on the hospitality sector as a key potential buyer group. However due to the impact and ongoing uncertainty of COVID-19 and lockdowns in Victoria, along with types of farmers wanting to participate, the focus has shifted to food processors and businesses that have capacity to deal with larger volumes of produce at the one time. Expressions of interest in the project from potential buyers has been varied, and has included food processors, artisan food businesses, food box schemes, and institutional buyers.

The transaction and delivery of farmers' crops and harvests to buyers will begin from December 2021 through to mid 2022 (and possible future crops!). Further project findings will be summarised following the completion of this pilot period in June 2022.

For those interested in participating in the project, see project details and current opportunities to get involved at

<https://about.openfoodnetwork.org.au/project/innovation-to-reduce-food-waste-on-farm/>