

# Report

## Assessing Opportunities for Agricultural Food Recovery and Conservation of Resources in California

Voices from the Field Project, Phase 2

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## Executive summary

Studies indicate that significant quantities of edible food are lost at the farm level. Our research investigates existing and potential opportunities for recovering more of this food for human uses. Building on earlier research that investigated on-farm food loss from the perspective of California produce growers, we conducted 24 semi-structured interviews with individuals working within three recovery-related arenas—non-profit organizations within the emergency food system (referred to as “food banks”), private companies committed to reducing food loss and waste (“food loss companies”), and government institutions. The research is exploratory in nature, and interviews covered the following key topics: economic and market structures that shape recovery dynamics, logistical systems required, building and maintaining relationships with growers, and the opportunities and constraints faced in crafting food loss policies. Interviews were content coded to identify themes, challenges, and opportunities of interest to researchers, policy makers, and practitioners.

### *Economic structure of recovery*

- Food is lost on farms because it exceeds current demand or falls outside buyer quality specifications, thus recovery markets are defined by their ability to accept both surplus and cosmetically “imperfect” produce. Recovery outlets have quality specifications unique to each institution, but all respondents emphasized having high food safety standards.
- Recovery outlets serve, and help to cultivate, alternative consumer bases with flexible expectations of product availability and wider acceptance of product variation. Shorter supply chains also allow them to accept food that is overripe for other markets.
- Some food is purely donated, but many outlets compensate growers for recovered food, ranging from covering additional harvesting and packing costs to offering 75% of market price. While all respondents agreed there is more produce to be recovered, some noted that there can be de facto competition among seconds markets and recovery outlets. An additional potential pitfall in structuring recovery markets is stimulating additional supply.
- In assessing the economic viability of market-based food recovery strategies, some respondents stressed the difficulty of “making the numbers work out,” while others saw expanding opportunities for “win-win” scenarios with positive environmental, social, and economic outcomes.

### *Logistics of recovery*

- Logistical systems for recovery vary widely—by food product, by farm, and by recovery outlet—making it difficult to generalize. As more than one respondent stated: “If you’ve seen one food bank, you’ve seen one food bank.” For food loss companies, the specificity of recovery systems can be a business opportunity, as there can be value-added in identifying logistical innovations.
- Respondents distinguished between recovering field- and shed-packed produce, with the former presenting greater logistical challenges. Overall, commonly mentioned challenges include retraining labor to identify specific standards for a particular recovery market, configuring equipment to separate out recovered produce, and maintaining separate processes and schedules for recovered produce.
- Scale shapes both how and whether recovery works. Some recovery models function at a smaller scale, such as a rural food bank whose coordinator gleans produce from local farms. Others depend on economies of scale to make investments in logistical innovation and operation pay off, such as food loss companies that work with truckloads of produce. Fluctuating volumes can present an additional challenge for supply-driven recovery efforts.

- Most recovery outlets do some on-site sorting. Many respondents reported losing only 3-5% of produce received, though some food banks accept donations with 20-40% of unusable product. Respondents mentioned composting or animal feed as prevalent disposal options. Some food loss companies donate edible food that falls beyond their specs to food banks.

### *Building and maintaining recovery relationships*

- Respondents had varying experiences with establishing collaborative relationships with growers around recovery. Most agreed that the best way to reach farmers is through personal connections, conducting outreach through networks of trusted partners. Some noted the need for persistence in reaching growers, and a couple of respondents experienced cultural barriers in gaining access to what they described as a “good ol’ boys” club.
- Strategies for “making the pitch” to farmers varied. Some emphasized the values dimension of the exchange, for example highlighting a food bank’s humanitarian mission. Others stressed business opportunities, such as more secure and consistent revenue flow throughout the season. Growers’ responses depended on whether they perceived the collaboration as logistically feasible and economically beneficial, but also on personal outlook.
- Once a partnership is established, effective communication with growers is required to ensure produce falls within quality specifications and respond to fluctuations in product availability. Some respondents found challenges around establishing efficient channels of communication, noting growers’ continued reliance on phone calls (instead of email or text).
- Respondents emphasized the need for mutual trust. While both sides value reliability and consistency, flexibility and accommodation are also needed to negotiate fluid situations.

### *The policy context of recovery*

- The topic of food loss crosscuts various policy arenas and diverse constituencies, presenting both opportunities and challenges. Coalition building requires organizing groups that may have overlapping interest in reducing loss but with differing priorities. Within government, there is the challenge of coordinating across different programs and agencies.
- The government directly impacts recovery through tax incentives for donated produce, though (consistent with grower testimonies) respondents questioned the extent to which they influence grower behavior. Government programs that help growers develop and market new agricultural products—which, as one respondent noted, might just be seen as “business 101”—have been linked to food loss reduction goals. The government also indirectly impacts recovery through regulations, trade policies, and other actions that shift market dynamics.
- The government is a large purchaser of food, and some respondents have sought to promote recovery through government procurement, for example sourcing undersized produce for school meals. Inflexible purchasing processes present a challenge in expanding such efforts.
- Policymaking to reduce on-farm losses through expanded recovery aims to: improve farmer livelihood, reduce environmental impact, and feed hungry people. Yet there is no “silver bullet” solution to loss, and policymaking may involve tradeoffs among these goals.

## Introduction

Studies indicate that significant quantities of edible food are lost at the farm level (Bellemare et al. 2017; Gustavsson et al. 2011; US EPA 2016). The goal of the current research project is to investigate existing and potential opportunities for recovering more of this food for human uses. Toward this end, we gathered input from individuals involved in such efforts in the private, non-profit, and public sectors. This project builds on an earlier research effort in which we investigated on-farm food loss from the perspective of California produce growers (Gillman, Campbell, and Spang 2019; Gillman et al. 2022). Three key findings emerged from this first phase of research that informed the current study.

First, growers explained that food loss on farms is driven by the economic structure of the dominant agricultural system. Growers are eager to sell the food they grow, and generally only abandon it because they do not see an economically viable outlet for their produce because it is either in excess of market demand (surplus) or below market standards (imperfect). Second, the logistics of reducing loss on farms through improved recovery can be complicated. Farms are designed and managed to push out top-grade product, and efforts to harvest and pack other product can interrupt the “main show.” Finally, growers alerted us to the human elements of the food loss issue. Campaigns to reduce “food waste” on environmental or humanitarian grounds can leave growers feeling judged and misunderstood. Based on these initial conversations with growers, we pursued a second phase of research to explore the structural, logistical, and human dimensions of recovery from the other side: those who are attempting to gather and distribute food that might otherwise be lost.

The term “recovery” requires some clarification because it can easily blur with product differentiation. Many growers sell in different markets. For example, a peach grower might sell off-grade produce in a discount market or sell a certain portion of the culls to a juicer. This is not a study of all “seconds” and processing markets. The term recovery also presumes a counterfactual—that the food would have otherwise been lost to the human food chain—which can be hard to demonstrate with certainty. Relatedly, there is a temporal dimension to recovery. A grower may wait to find a buyer for a product, only abandoning it late in the game. Meanwhile, the edibility of food decreases over time, as processes of decay advance. Finally, food “lost” on the farm often still goes to productive use, such as compost or animal feed (hence our consistent use of the term “food loss” rather than “food waste” when it occurs at the farm level). We define recovery as recuperating food for human use (Mourad 2016; Galli, Cavicchi, and Brunori 2019; Garrone, Melacini, and Perego 2014).

To define our study, we examined two main outlets for what might be considered recovered food. The first is the emergency food system. Growers regularly donate imperfect or surplus product (that might otherwise be lost) to food banks and other non-profit organizations committed to addressing hunger and nutrition. The second is private sector companies with a mission to reduce food loss. In recent years, a handful of companies—or programs within companies—have emerged that are explicitly committed to recovering more food products from farms. In this report, we will refer to these two avenues for imperfect or surplus product as “recovery outlets,” using “food banks” (FB) as shorthand for non-profit organizations working within the emergency food system and “food loss companies” (FLC) as shorthand for the private groups.

## Data and methods

Our sample of recovery outlets includes 16 food banks and food loss companies that differ significantly in size, capacity and organizational structure. While we specifically examine the nexus between farmers and these

institutions, many recovery outlets also source from packing houses, food warehouses, or food distributors, among other places. Some recovery outlets distribute directly to consumers, but others serve as intermediaries, sending recovered produce on to other entities such as food processors or food pantries. In terms of economic models and similarity to mainstream markets, recovery outlets operate along a spectrum. On one end are food banks that rely on uncompensated donations of edible food from local growers. On the other end are food loss companies that buy cosmetically imperfect produce at a percentage of the market price. Large food banks which offer a “pick and pack out” (PPO) fee to cover the harvest and transportation costs of off-grade produce might fall somewhere in the middle. Finally, while we focus on the recovery role of these institutions and group findings across sectors, it is important to note their differing—and principal—missions. Food banks are primarily tasked with addressing hunger and malnutrition. Private companies may make food loss reduction a key objective, but they also seek to generate a profit. Our sample is not representative of all recovery outlets, but rather offers a glimpse into the range of institutions and the broad issues that arise in efforts to move lost food off of farms. Beyond exploring these outlets, we also examined the policy context in which recovery occurs.

Between December 2018 and April 2019, we conducted 24 semi-structured interviews with individuals working within three arenas: food banks (non-profit), food loss companies (private), and policy (public). (See Appendix A for the interview questionnaire.) We professionally transcribed the interviews and then used qualitative data analysis software to code the 16 interviews with individuals working within food banks and food loss companies. Because the interviews on policy ranged widely in topic, we analyzed these without developing a comparative coding matrix. The next three sections share key findings from interviews about the economic structures, logistical arrangements, and relationship patterns that shape the two recovery options reviewed. Interviewee names and institutional affiliations are omitted to preserve confidentiality, but we indicate whether quotes are from food bank (FB) or food loss company (FLC) respondents. In the fourth section, we discuss the broader policy context that influences opportunities for food recovery.

## The economic structure of recovery

### Quality standards

Much of the edible food that is lost on farms is abandoned because it fails to meet the rigid quality specifications (“specs”) of primary markets (Gustavsson et al. 2011; Beausang, Hall, and Toma 2017). Thus, the first defining aspect of a recovery market is quality standards that differ from those specs. Food banks and food loss companies accept a range of cosmetic imperfections that would be rejected by retailers, for example produce that is under- or oversized, or that has surface-level blemishes or irregular shapes. While more lenient than retail, recovery outlets still have quality specifications particular to their institutions. Many respondents described well-defined standards for food they can accept, in some cases outlined in multi-page documents to share with growers. Moreover, safety standards remain as high as in retail grade products:

*We have a detailed spec for each piece of produce we’re buying, but I think the general rule that we use is, “Looks different, tastes the same.” (FLC Respondent)*

*Leafy greens are trickier [than other produce], because an imperfect green is a green that could be decomposing soon. So what we find is smaller heads that don’t quite make retailer specs. I mean a spec could be the difference of a quarter inch [in lettuce sizing specifications] with these retail contracts. (FLC Respondent)*

*If it's food safe and it's ugly, that's fine. But if it's not food safe, it's no good. We serve a population that is at higher risk in a lot of cases. So we're even more vigilant. Some people have the kind of misconception of, "Oh, it's a food bank. It's kind of whatever goes." Actually, we need to pick and choose even more than you normally would. (FB Respondent)*

Another way in which recovery outlets differ from primary buyers is in the degree of ripeness that they are able to accept. Food moving through the emergency food system or loss reduction companies may travel shorter distances to consumers, with fewer stops along the way, and thus can have a shorter remaining "shelf life." As with quality standards, respondents emphasized their own specifications around ripeness. Some food bank personnel noted how volume influences these requirements, as much of the food they collect is sent to other distribution channels (e.g. local food pantries and community organizations). While a small donation might be sent out within a day to a local food pantry, a large load could take longer to move through the system and be distributed throughout a wider geographic area:

*We have a lot faster supply chain than grocery stores. We can move stuff from farms to our customers a lot faster so we're able to work with stuff that's, quote/unquote, more overripe. That being said, because we are delivering, it's a little bit rough on the produce. So if it's overripe but rock hard that's totally fine for us. The stuff that's on the edge—like a peach that's soft and you have to eat tomorrow—that we can't deal with. (FLC Respondent)*

*So the reason we've gotten [the food] is because, technically it's not suitable for a supermarket. But if you go look at it, it's the exact same produce. Sometimes we get fresh stuff, that's right off the tree. But then there's stuff like tomatoes that are turning ripe. That might be exactly what you see in the store too. We're just moving it so quick that that time lag isn't there – from supplier to grocery store. (FB Respondent)*

*If it's a lot more product—say it's a semi-load of product—that's going to really change how long it's going to take for us to get it out. I'm not saying it takes us a whole week to get it out, but we need to make sure that we're going to be getting it out in someone's kitchen before it goes bad. (FB Respondent)*

## Market over-supply

Food that meets retailer specs in terms of quality and ripeness may also be abandoned at the farm level when yields are in excess of demand—either because of a bountiful growing season, or because the market has weakened (Milepost Consulting 2012; Gunders 2012). Thus, recovery outlets may also reduce loss by absorbing some of this surplus. While "imperfects" may be a consistent byproduct throughout the season, the availability of surplus product is usually more sporadic, and the degree to which recovery outlets can respond varies. A food bank might accept a large load that suddenly becomes available, while food loss companies may only be able to slightly modify offerings to clients within a week or two of an order going out:

*I think the flexibility in our model will always kind of be a differentiator [from retail markets]. We're not promising customers a set basket of goods every week, and so we're able to work with surplus from that angle (FLC Respondent)*

*In some cases, it's purely surplus being donated. Like with squash—if it's the end of season, and no one is finding it a hot product anymore to be featured, they [growers] will reach out to us and we coordinate on our end to get our driver there and pick up according to their schedule (FB Respondent).*

## Cultivating alternative consumer demand

Recovery outlets are able to work with imperfect and surplus produce because they cater to what might be called “alternative consumer bases.” These include, for example: creative chefs who can just as easily make a meal from “clipped” as whole spinach leaves; consumers who take pride in reducing food loss by eating an irregularly shaped, but equally delicious, carrot; food processing companies that are creating new juice blends using off-grade kale; or low-income families who would have otherwise forgone fresh produce were it not provided for free. Recovery outlets both identify and cultivate this alternative demand, shaping consumer perceptions of acceptable produce imperfections, working with chefs or processing companies to determine what variations of produce they can work with, and promoting fresh produce consumption among low-income populations:

*So we're really pushing our buyers to think innovatively and flexibly on what [quality of produce] they could take if they had to. And then we're going to the farmers and saying, "Okay. Based on this and what we see, we think that XYZ parts of this product that's been left we could take. And if we paid you this much would you be willing to capture it?" (FLC Respondent)*

*We struggled at [our food loss company] every day trying to change peoples' perceptions on what's okay to eat. We would get customer complaints because there was a scar on the pear. People were like, "Well, is that okay?" In fact, it's just limb rub and there is no issue with it. But it's going to take a long time to change people's perceptions. (FLC Respondent)*

## Financing food recovery

As growers emphasized in phase one of this study, for recovery to be sustainable over time, it needs to be economically viable (Gillman, Campbell, and Spang 2019; Spang et al. 2019). Much of the cost of food is in the harvesting and packing process, and only certain growers can afford to—or are inclined to—cover these additional costs to recover food. Recovery outlets cover costs in different ways. The California Association of Food Banks (CAFB) provides growers with a “pick and pack” fee for donated produce. Tax credits are available for donated food, though—consistent with what we found in our phase 1 interviews—respondents noted that growers do not consistently claim them. As discussed in the following section, some food banks provide the packing materials and arrange volunteer labor for recovering smaller loads. Food loss companies negotiate prices that are a portion of market price—as one respondent estimated, between 50 and 75 percent of market price, though this can vary significantly and determining the “right” price is an area of acquired expertise. Some respondents noted the importance of not only what, but how they pay growers, with much shorter turnaround times as compared to retail:

*We consider all the produce that we obtain donated, but for 90% of it we provide a pick and pack out [PPO] fee. Because when a farmer has completed a season or fulfilled a retail order, they won't pick a field because it costs more than they are going to recoup. So the PPO fee is designed to cover the cost of harvest, but not the product itself. And folks can combine that with the state tax credit and the federal tax deduction, and if they choose to do that, it's much more lucrative than other secondary markets. Why would some farmers choose to do that and others not? It depends on how conservative their accountant is. (FB Respondent)*

*We typically do cost plus pricing. We ask, "How much does it cost to harvest your field, ship it up to us?" So we'll pay that cost and then a percentage above that, coming in under market price. (FLC Respondent)*



*I think it's a pretty tricky balance, because there is really no science to the pricing. It's really all negotiable, and the tricky part is that, the lower that you push on price, there is some point beyond which you just become a trash hauling company. (FLC Respondent)*

## Potential pitfalls

The relationship between grower compensation and food loss reduction highlights two potential pitfalls in recovery efforts. The first is merely shifting demand rather than generating new demand. Recovery outlets can end up competing for imperfect product. All respondents affirmed that there is far more food to be recovered from farms. Yet because recovery also requires overcoming logistical and relational hurdles described below, there can be de facto competition between outlets for accessible food. Simply moving product among seconds markets does not necessarily reduce loss. As growers noted in phase 1 interviews, there is also the risk of diverting food from primary sales (sometimes called “cannibalization”). A couple of respondents noted how they differentiate their consumer base to ensure they do not undercut growers’ other sales:

*So if a product was already going to be sold to a lower value market—like the lemons would have gone to juicing instead of being used in a restaurant—you’re really just kind of changing the grading of the product and the market that it’s destined for, but you’re not taking a product out of animal feed, composting, or a landfill, or a field. Some might argue there is value to that because a farmer may be able to get a little bit more for a product if it’s sold to a restaurant as opposed to for juicing. But when we’re talking about reducing waste, our definition was, “Is it going to human use?” That’s where you’re really making an impact and saving. (FLC Respondent)*

A second potential pitfall in recovery efforts is stimulating new supply. From the perspective of organizations dedicated to feeding hungry people, expanding supply is not a problem. However, if the goal is to reduce the environmental footprint of food, it is important to consider how the presence of a reliable market for off-grade and surplus product might influence growers’ planting decisions:

*Now that they [growers] know we [food loss companies] are going to be there, they harvest a little more just in case we might buy it. Part of the dialogue that I’m hearing going around is that we enable these larger growers by buying the product that they have overplanted. The solution is not to overplant and I completely agree with that. And yet I understand the farmer’s side. If they have a contract, they have to plant more than they need because a weather event could come in. And they could risk losing this very important contract that keeps their farm sustainable. So it’s a double-edged sword. (FLC Respondent)*

## Food recovery as a win-win?

Overall, respondents differed in their assessments of the difficulties of developing viable recovery markets. Some noted the challenge of “making the numbers work out” given the economic structures that drive loss, while others suggested that “win-win” scenarios with improved environmental and social outcomes could also be economically beneficial for all parties involved (Lee et al. 2017; Galli, Cavicchi, and Brunori 2019). Finally, others observed that environmental imperatives and the food demands of a growing population will shift economic calculations in the long run. As discussed further in the section “[The policy context of recovery](#),” government actions to regulate or incentivize particular behaviors can also alter the calculus of when recovery makes economic sense:

*I think the lesson that we walked away with was waste exists because farms are trying to be efficient, and in being as efficient as possible they waste a tremendous amount. But from a financial standpoint that is still worth*

*it. If it had been more financially viable to not waste that product, they would have not wasted that product. In certain scenarios we were offering to pay full price [for imperfect produce], and it still wasn't financially beneficial for them. (FLC Respondent)*

*The fact is that our population is growing, and the demand, globally, for produce is growing 6 to 8 percent, probably more this year. And we're running out of land and resources, and climate change is happening and labor issues. So we literally have no choice but to become more efficient. Or else we're not going to be able to feed everyone. (FLC Respondent)*

## Logistical systems for recovery

In addition to finding or developing appropriate markets, recovery requires creating logistical systems for collecting imperfect or surplus produce from farms. The model that this takes varies greatly by recovery outlet, as well as by farm and food product being recovered (Berkenkamp and Nennich 2015; ReFED 2016; Vitiello et al. 2015). A couple of respondents repeated the phrase, "If you've seen one food bank, you've seen one food bank," emphasizing the very case-specific nature of recovery even within this sphere. One food loss company saw the specificity of recovery models as a business opportunity; their value-added lay largely in identifying logistical innovations and coordinating exchanges between growers and potential buyers.

*There's not any one magic, silver bullet way to get all food waste. The way that you're going to get carrots is different than the way you're going to get Asian greens or something like that. So I think that's the challenge. (FB Respondent)*

*It can be changes in the harvesting practices. It can be changes in the machinery. It can sometimes just be incentivizing them [growers] to just slightly tweak what they're doing, to pack product that they were previously just throwing on the floor. So it's really product and SKU dependent and even farm dependent. People have different slight variations of how they harvest. (FLC Respondent)*

## Common challenges

While logistics are farm- and product-specific, there are some generalizable challenges related to recovery. Respondents distinguished between the difficulties of recovering field- and shed-packed produce. One common challenge in the field is labor, including both availability and the need to train pickers to identify new quality specifications. While some food banks arranged volunteer labor—presenting its own logistical challenges—most recovered food is collected by harvesting crews. Recovering produce from packing sheds requires having appropriate infrastructure so that cosmetically imperfect produce does not get grouped with inedible product. Respondents also noted how recovery systems might interfere with the processes and schedules of retail-grade product. In one case, this risk was enough to compel a farmer to turn down an offer to pay full price for off-grade produce:

*Pack shed negotiations are so much easier than field harvesting. What is often said [by farmers] is they really don't want to confuse their harvest crew by giving them a third thing to harvest. You know, if we just wanted, let's say, a pallet of something, then they [growers] are just kind of like, "It doesn't make any sense because what will happen is, now I train my harvester to do three different things - number one, number two and then*

*your spec - and it's going to get confused. It will get up onto the platform incorrectly. It will be put in the wrong box. We can't risk that." (FLC Respondent)*

*One of the things that we see is that often processing lines are not set up to separate still usable produce. So I have seen a place where there are only two lines—there is a Y in the conveyor belt, and if it goes to the right it's retail grade, and to the left it's not. So there are some simple modifications that can often be made, but it's an investment on the farmers part, and is that going to be the priority? So configuration of their equipment can become an issue. (FB Respondent)*

*If you've ever seen spinach grown, the way they harvest it is like a lawnmower. They go across and it just clips and collects the spinach, and when that happens a lot of smaller spinach sprouts get their tips cut off. We said, "Well, there is so much spinach that's still in the field after that first harvest, if you let it grow a little bit longer it will be just the size that we would use." And we said, "We'll pay the same price we would pay for our existing spinach that we buy from you now." And they [the farm] said it was still not preferable or financially viable for a couple of reasons. One is they still have plenty of other fields of spinach and other customers who aren't going to buy that product. I think just the extra effort of having this sort of funky field that does things differently was a big ask for them. And then the second piece is when they run that product through, they would have to do a specific run of that spinach because it has to be separated out. (FLC Respondent)*

Respondents also described different arrangements for transporting recovered product. Some food banks have their own fleets of trucks and drivers, while other recovery outlets contract out for transportation. Many noted how the high costs of transportation significantly influence the viability of recovery.

Scale determines both the model and the feasibility of recovery. Some recovery systems work best at a smaller scale. For example, a food bank with close connections to small-scale farmers recovered food by sending volunteers to glean at local farms, or by collecting unsold product at the local farmers market, recovering approximately 60,000 pounds of produce in a year. At the other end of the spectrum are food banks that move millions, or even tens of millions, of pounds of produce annually, with food loss companies falling somewhere in between. There can be economies of scale around logistical arrangements, and some upfront investments in developing logistical innovations only pay off after reaching a certain volume. A couple of respondents commented that some farms might be too small to work with in pursuing recovery. Others noted the need to present sufficient demand for growers to spend the time to develop recovery systems.

*So because of our scale, we've been able to develop programs with farms where they're going out and doing a second harvest for a certain grade of field packed produce or setting up lines in their operations. I think that for us, or for the farmers, it's just proving to them that there is going to be just enough demand on our side to make that investment worth it. We often work with them to help them set those processes up because there's the upfront cost, but then once they've trained those pickers they're able to see the returns over time. (FLC Respondent)*

*Tree Top has been taking [peeler] grade apples or juice grade apples forever. So our customers tend to be smaller to midsize companies that haven't been in the game long enough to make those contracts with growers. They're not at the volume level to attract interest by growers so we're kind of coming in and bringing those newer juicers and processors into the game. (FLC Respondent)*

Fluctuations in volume present an additional challenge in managing logistics. Particularly for food banks that depend on donations, the availability of produce may be unpredictable. They may see dramatic variation in the amount of produce available at different times in the season, or as a result of market or weather fluctuations:

*It's pretty much as volatile as it gets as far as consistency and reliability goes. So it's pretty crazy trying to balance it. We always talk about it as "riding the wave." And that's what food sourcing is. (FB Respondent)*

*Okay, we know that we need to improve capacity. So do we try to build capacity for full season when there's the most product available? Because different times of the year you need different kind of capacity at a hunger relief organization. Or when we see all this product coming in [as a result of market shifts], do we make the investment in building capacity to accommodate that high volume? Or do we game it so that we're doing 80 percent of that capacity need? So one of the challenges is trying to figure out, what does proper capacity look like? (FB Respondent)*

## Sorting recovered food

While focusing on the nexus between farm and recovery outlet, we also asked about sorting processes once food has been received. Food is not actually recovered if it is taken off of the farm only to be discarded at the next step along the chain. Most recovery outlets reviewed here had some process of on-site sorting, and the percentage of deteriorated food that institutions could accept in a load varied widely, ranging from 40% to 3%. Food banks often had volunteers to sort out unusable product. Most respondents reported composting unusable product or sending it off to be used as animal feed, avoiding landfilling as much as possible. Some food loss companies also reported donating to food banks produce that was edible but did not meet their quality specifications:

*We have a compost machine onsite to make sure that we waste as minimally as possible. In addition to that we work with local farmers, like pig farmers, to cut as much waste as possible. So even the stuff that we don't distribute to people we try to make sure landfill is the last place it goes. (FB Respondent)*

*Our dumping has reduced dramatically, and that's because we have a side door where we now let the public come in and get that produce before it does go to waste. So before, if the pantries and the churches and the other organizations who were coming here to get the food didn't buy it up fast enough and it ended up spoiling, we'd have to just dump it. So then what we decided to do was open our side door and let the public come in and have access to that fruit. (FB Respondent).*

*Whatever we cull out goes into two different bins - one is unusable and then the other one is donation containers. We donate absolutely as much as possible—like 100,000 pounds plus every week. So there's a lot of product that goes to food banks (FLC Respondent).*

## Building and maintaining recovery relationships

Finally, there is a human dimension to constructing systems for food recovery. Food recovery from farms requires building successful relationships with farmers. This involves finding farmers who are interested in donating product, or selling below market price, and then developing ongoing means of communication to coordinate these processes (Meagher et al. 2020). Respondents also talked in more general terms about what makes a successful relationship with a grower.

## Accessing growers through personal networks

Respondents mostly accessed growers through personal networks, emphasizing the need to create a personal connection. Some also described going to conferences, connecting through agricultural association boards, conducting internet searches, or using the university cooperative extension network to try to reach new growers. Respondents from large food banks and higher profile companies also described instances of growers learning about them through word of mouth and seeking them out. While some described grower outreach as a relatively “organic” process of meeting people through other people, other respondents noted the need for persistence, or even ran into what they felt were insurmountable cultural barriers. Some noted how growers from different regions, or of different ideological orientations, might be more approachable:

*With farmers, the best way to develop a relationship is person to person. Our food sourcers are people from industry. They live in those communities. They already know everyone there. It's all about finding trusted partners. (FB Respondent)*

*We went around, and we passed out flyers. We went to different farms. We Googled some farmers. We actually reached a few on Facebook as well. So we tried to reach them through every avenue that we saw. Most of them we got through the farmer who is on our [food bank] Board. He called them, and they told him yes. And then when I contacted them, it was kind of like, “Hey, I don't have time for this.” It's difficult. It is a type of a good ol' boy network. (FB Respondent)*

*In the beginning, it was very, very hard to get anybody to take us seriously because farmers are so used to being promised the world and then nothing coming back or being taken advantage of. What I needed to do was actually go sit down with them, because I find that, when I have a one-on-one talk, the inspiration comes through. (FLC Respondent)*

## Talking to growers about recovery

Once through the door, respondents took different approaches in engaging growers, with varying degrees of success. One question they faced was whether, and how, to talk about the values dimension of the exchange. Some food bank personnel felt that the key to securing a donor was helping growers understand the food bank's mission. Other respondents found that emphasizing ideological goals could be off-putting to growers, particularly if there was any mention of the word “waste.”

*When I go and talk to a donor, I can say, “Here are the people we're serving,” dispelling myths and general misconceptions about what food banks do, explaining why we're different, explaining what we can do. Education in general I think is the biggest challenge. (FB Respondent)*

*We said [to growers], “Ultimately, what we're trying to do is help the environment and help farmers. We're trying to do something that's mutually beneficial here.” And it was clear that it was not viewed as mutually beneficial. I think people also just in general bristle when you tell them about waste. They feel a little bit like, “Oh, are you telling me I'm doing a bad job?” So it was a very delicate conversation that we had to have. (FLC Respondent)*

In other cases, respondents talked about the exchange as more of a business opportunity, emphasizing the potential economic benefits for growers rather than the environmental or social impact. Though offering below-market prices, and in some cases a sum intended only to cover costs, respondents noted the unique economic role

they might fill for growers—for example, providing payments at a time in the season when a grower might be “cash poor,” or serving as a reliable source of revenue that could help growers retain a labor force even during a weak market:

*My first point to everybody is, if you don't have a problem that can be solved or helped by us, then you don't need us and I'll just move on. The majority of them—the medium-large to the very large farms—they have built that [loss] into the number one product cost that they're selling into retail, so it's a kind of nonconcern. So the bigger guys are much, much more difficult to negotiate or convince and that's okay, because those bigger guys don't really need us as much as the middle sized farmers. For [middle sized farmers] this loss really makes a huge difference on the bottom line. (FLC Respondent)*

*My pitch [to farmers] is, “I'm not here to tell you people are hungry, or to tell you how to do your business, but I'm here to say that there is a way to donate your excess and increase your prosperity at the same time.” And then people pay attention. I say, “We want to be integral to your business model.” (FB Respondent)*

All respondents related some cases in which the growers they approached were uninterested in collaborating. Some found that most growers responded this way, while others found growers to be mostly receptive. Whether this was the case depended partly on practical factors—the extent to which the collaboration was logistically feasible and economically beneficial—and partly on the orientation of the grower. A couple of respondents felt disheartened by some growers' responses, lamenting their cynicism about the potential for innovation and alternative markets, or their stigmas about the populations served by food banks. Others cautioned against presuming any grower would or should want to engage around food recovery, particularly if the grower is being asked to donate product:

*When it comes to innovation around recovery, there's always going to be early adopters, middle adopters and late adopters, right. And so, are we going to have 100 percent of people saying, “Yeah, let's go for it right now”? No. But we have a lot of interest. (FLC Respondent)*

*I think that if somehow [farmers] could become more aware of how much food they are wasting and how many families it actually could have fed, I think then they would probably feel like, “You know what – let's go ahead and get this stuff and take it to these people who actually need it.” I'm not saying they're all coldhearted or anything like that. I just think that they have a different mindset. (FB Respondent)*

## **Communicating clearly and offering flexibility**

Once collaboration is established, a key element for creating successful recovery systems is ongoing communication between growers and recovery outlets. One of the challenges of coordinating a more supply-driven system that can respond to fluctuations in product is knowing what is going to be available when and in what quantities. For food loss companies, this means modifying orders to accommodate surpluses or shortages. For food banks, this means knowing when a grower has something to donate.

*We're not like retail where we say, “In three months, we want this and this.” We follow the farm. We follow Mother Nature. We follow what is happening and we order seven to ten days out. Let's say on a Monday, we'll reach out to all of our farmers and ask them, “What do you project for next week that you'll be able to offer us?” Most of the farm managers, they know what's happening out there and what's coming in. They know a heat wave is coming so they're going to be doubling what they have in the leaf category and then they're going to have to get it out of the field. (FLC Respondent)*

*We're dealing with so many farmers it's hard to constantly check up on them. So some of the time they will be the ones to reach out through email or phone call. But I feel like there might be some situations where, if I haven't reached out to a certain farm in a while, they might have something to donate but they're too busy and they don't have the time to give me a call. So sometimes I might miss out on opportunities. (FB Respondent)*

Equally important is clear and timely communication about the quality of the product available, including the nature of any imperfections and the remaining shelf life. Though their quality specifications are broader than retail, food loss company respondents still described cases in which they had to reject a load that was below their standards, leading to economic losses on both sides and straining the relationship. Food banks expressed concern about becoming a “dumping ground” for growers if standards were not clearly understood and respected. Respondents invested time in educating growers on what kind of product they were able to accept, and then often verified those standards were being met before receiving product, noting that the greater the trust, the less verification needed.

*Let's say somebody calls me and says, “Hey, I have eight pallets of cucumbers. Can you guys come get them?” I'd say, “Yeah, sure. How much life is left on it? What kind of shape do they look in? Are you able to send me any pictures?” Depending on the donor and their past relationship, if I've gotten bad load after bad load from them – meaning it's going into the trash – then I'm going to be very apprehensive and ask a lot more questions. If it's a donor that every time it looks great, then I'll say, “You got it. We'll have somebody there in a couple hours.” (FB Respondent)*

*I would say the farms that understand what the spec is are the most successful relationships. We worked really hard on that. We talk about still fit for human consumption, but we're able to accept all these imperfections. The farmers that understand that are the ones that we work best with. (FLC Respondent)*

Various respondents noted the continued reliance on phoning as the primary means of reaching farmers. Given the time sensitive nature of sharing information about product availability and quality, some respondents expressed interest in finding more efficient means of communication:

*Most people assume you can just purchase things like on Amazon—where you see a product, you know when it's arriving, you know how much is available, you buy it and it shows, okay, no longer available. That doesn't happen in our world. There is still a lot of ordering via phone. (FLC Respondent)*

*Phone tag is a very real thing, so I would just appreciate if the donor just outlined everything in some kind of message like an email. I call them back and they're not there. I miss their next call. So it's just phone tag, and all this while the shelf life is adding to it. But I think also the industry overall isn't as email oriented or that technology oriented. I think that texting and calling is much more convenient and tangible for them. (FB Respondent)*

## Developing mutual understanding

In reflecting on what makes a successful relationship overall, respondents emphasized mutual understanding of the circumstances and goals of both parties. Many reflected with compassion on the difficulties growers face trying to make a living in today's increasingly competitive agricultural markets while also responding to the fluctuations of the natural world—as one respondent put it, growers are “in the middle, with the market on one side and Mother Nature on the other.” Respondents also emphasized the need for mutual trust that would allow for jointly negotiating fluid situations. While valuing reliability and consistency in the relationship, they noted the need for flexibility and accommodation on both sides:

*So our number one top donor is a local CSA farmer. So we go and glean whatever is left over the day after his pick-ups. So that works very well for us because it's very predictable. He also is really communicative if there for some reason there is not a lot left over. So it's just like he sees kind of that big picture and is considering where we're at and our limited resources. It's super, super helpful and appreciated (FB Respondent)*

*Oftentimes I feel like what can happen with growers is that somebody just sees them as a source of produce. And they say, "Well, we're feeding hungry people, so a farmer should definitely want to do whatever they can to work with us." The reality is when you're at a farm in the middle of summer, the last thing you have is time to try to figure out how to get any excess crop into the hunger relief system. So I think from a hunger relief agency perspective, it's about approaching it as, "I'm developing a long-term partnership with this farmer, and what are ways that I can bring value to the relationship?" As opposed to just making it one way (FB Respondent).*

## The policy context of recovery

Government policy influences how and when farm-level food recovery occurs. In recent years, the topic of food loss and waste (FLW) has garnered increasing attention as a topic of both state and federal policy. At the same time, policies not directly related to FLW can profoundly impact loss and recovery. We interviewed individuals working in state agencies and policymaking arenas to understand this shifting policy context and the ways that government actions shape recovery prospects and processes.

### Food loss and waste: A cross-cutting policy issue

Many respondents noted how the topic of food loss and waste crosscuts various policy arenas and diverse constituencies. Beyond obvious areas implicated—agriculture, human services, or environment—respondents pointed out intersections with issues like trade, labor, and infrastructure. Yet the multidimensional nature of FLW also presents challenges for policymaking. Different stakeholders are interested in the issue for different reasons, and thus building a coalition around specific policies requires organizational effort—particularly when emphasizing certain stakeholder interests may alienate others. Within government, there is the need to coordinate across different programs and agencies. The latest Farm Bill authorized a liaison within the USDA intended to facilitate this process, yet the position has not yet been funded. Many respondents felt that FLW would remain salient on the policy agenda, driven in part by the increasing urgency around climate change. Yet some suggested that the current cooperation around FLW at the federal level has only been possible because scant resources and limited mechanisms of accountability are attached to the goal of food loss reduction:

*I think food loss and waste is definitely still on the upswing [as a policy issue]. Especially because of the connection to climate change—for California, in particular, it's something that's going to be an issue we're looking at for a while.*

*Some people have referred to it [food loss and waste] as like a "pre-partisan" issue. It's an issue that hasn't matured, because it's not yet involved in partisan squabbles.*

*For the first year or two, it was pretty difficult to tackle [food loss and waste], because farmers were on the defensive. It's less stigmatized now, because we've had a lot of conversations on the Hill in the last few years, but it's still a somewhat sensitive topic. I think part of the problem has been that the food donation aspect is*



*driving a lot of this. And while we totally support food donation, we don't want anyone to think that farmers have to donate food. It's a terrible farm economy right now. We should be prioritizing something that makes money for farmers so that they can stay on the farm.*

## Government support for food recovery

Respondents described various ways in which the government directly promotes recovery. The most prominent is state and federal tax credits for farmers who donate product to food banks, though (consistent with grower testimonies) respondents questioned the extent to which farmers claim such credits, as well as whether the credits actually incentivize growers who might not otherwise donate. Various programs also exist at the federal and state level to develop and market new agricultural products that move more food off of farms—though one respondent described these as simply “Business 101,” highlighting the difficulty of defining “recovery” as something distinct. The Local Agriculture Market Program (LAMP) included in the 2018 Farm Bill connects the goal of FLW reduction to value-added producer grants (VAPG) that support growers in pursuing new products as well as initiatives to promote markets with shorter supply chains—both of which promise to widen the range of what growers can sell of the food they produce. Respondents also mentioned state funding for a range of community-based initiatives that include on-farm recovery, such as local gleaning projects:

*In there [the 2018 Farm Bill] there is specific language around allowing farmers to use the [value-added producer grant] program for food waste reduction. We explicitly wanted that to be in there to connect the dots between some of these programs that exist but may not have been used for food waste reduction purposes in the past—having farmers think, “Oh, I normally throw away those ugly misshapen tomatoes, but we could actually grind them up into a sauce, or paste, or whatnot and sell it for even more than I would a normal regular tomato. That's an opportunity for me.”*

*I think it was about three years ago, there was a really big expansion of the assistance [USDA] gave the farmers to build on-farm storage. And that's really important, because if it happens that at a given moment there isn't a strong market for your product, the product might actually become loss and waste.*

*A lot of the time it [an on-farm recovery project] is not a government-initiated program or anything. But it's something that then gets grant-funded when they find out that it's happening.*

## Government procurement of recovered food

The government is a large purchaser of food, and we asked interviewees about the potential for recovery through government procurement. Respondents noted various challenges. If a defining feature of a recovery market is flexibility, government purchasing procedures present the antithesis, involving long lead times and rigid specifications. Respondents also noted that the personnel coordinating purchase of food are focused on their programmatic objectives. Some respondents mentioned school purchasing of undersized produce as an example of recovery that might be expanded. There are efforts at the federal level to encourage purchase of such off-grade product in the next Child Nutrition Reauthorization, and at the state-level respondents described helping growers identify products that might be appropriate for schools. In discussing government procurement, one respondent noted how government programs that absorb product for which growers lack a market might stimulate further production:

*The smaller ones [sizes of fruit] are a perfect example of how farmers can then sell their seconds to a school—which will actually take it as a preferred product for them as opposed to that larger apple. I think the larger picture we look at is like, okay, how can we generally get more California grown fruit and vegetables into schools. But we do often try to point out to growers, “Hey, this is a really good market for those products you might not have quite as much of a robust market for.”*

*There has to be market out there for the product. It’s not about just creating guaranteed buy-up for every excess product grown in the United States. That’s not a solution. [With government purchasing] you’re bumping up the demand curve for every single commodity and product out there. So it really is incentivizing excess production above what the market will bear.*

## Indirect policy influences

The government also indirectly impacts on-farm food loss and recovery by influencing pricing and distribution through its purchasing, regulatory and trade policies. One respondent commented on the effects of a recent trade mitigation package for farmers, which distributed retail-grade product throughout the emergency food system, thus reducing demand for off-grade product and, in some cases, interrupting grower-food bank relationships. Others commented on the way that labor regulations around labor and transportation influence the cost and feasibility of recovery efforts. In California, recently passed regulations aimed at reducing organic waste (SB 1383) will also indirectly impact on-farm loss and recovery, though in ways that are difficult to predict. Among other effects of the regulation, retailers will be pressured to both reduce their sources of loss and waste and expand donations to food banks. While reducing landfilled food, the former could actually increase on-farm losses if retailers tighten quality specifications in an effort to further cull the produce they receive, while the latter could impact the demand of recovery outlets. Overall, loss and recovery occur in an environment that is in flux and profoundly shaped by government actions (and inactions).

*In agriculture, a lot of the costs do not reflect societal or environmental cost. When you start to say, “Well, it’s just the cost of business—this is normal,” you have to remember that cost of business is also not fixed forever. Not only will different rules and regulations impact it, because they could impact pricing on things like water or labor, technology or other infrastructure-type changes can change that cost calculus. So while sometimes people say, “This is the business case for waste,” that’s not necessarily true either.*

While there is no “silver bullet” policy proposition to reduce on-farm food loss and improve recovery, coalitions are building around the prospects of “win-win-win” scenarios that advance the economic, social, and environmental goals behind FLW agendas. At the same time, policy solutions may involve tradeoffs depending on which goal is being prioritized: improving the economic stability of farmers, reducing the environmental footprint of food, or feeding hungry people.

## Conclusion

In the midst of growing concern around the issue food loss and waste—including new interest in the topic of on-farm food loss in particular—this study has shed light on existing and potential models of food recovery by gathering input from individuals involved in such efforts. Recovery itself is a complicated concept. It is difficult to tell if and when food would be lost to human use, and, to the extent that growers are compensated for product, it can be difficult to distinguish recovery from any other “seconds” markets. We attempt to define the field of study by examining two outlets for produce: non-profit organizations within the emergency food system, which source food outside of

mainstream market channels, and for-profit entities with an explicit aim of reducing food loss and waste. The institutions explored here vary significantly in their missions, organizational and economic structures, and size and capacity, among other characteristics. Yet they all in some way help to move surplus or imperfect produce from farmers to people who can use it.

In this report, we shared findings on the economic structure, logistical arrangements, and human relationships that make recovery possible. Creating a feasible economic structure requires identifying and cultivating alternative markets for food that is either in excess of market demand or fails to meet quality specifications. The challenge lies in generating truly novel demand without stimulating additional supply, and respondents varied in their assessments of how this can be done. Making the logistics of recovery work involves innovating processes for harvesting and packing alternative product that can run alongside current operations, modifying practices and infrastructure in the field or in the packing shed. Different scales of operation shape whether and what forms of logistical arrangements are feasible. Finally, recovery requires building successful relationships with growers, including getting their initial buy in and maintaining ongoing communication. Such relationships can also be seen as a prerequisite for tackling the other two dimensions of recovery; success requires collaborating closely with growers to identify and address structural determinants for viable recovery markets, and to negotiate the logistical arrangements that make recovery practical and feasible.

In analyzing these three aspects of recovery, this study captures a snapshot in time—how is recovery functioning in this current context? As various respondents noted, however, this context is in flux. Population shifts, environmental change, market dynamics, and cultural and attitudinal changes, among other factors, will alter the opportunities and constraints that shape recovery systems. Policy change is one of the most obvious and deliberate ways that context can shift. The policy discussion of this report highlights both direct and indirect ways that government actions impact current recovery efforts and might alter what is considered possible and practical in the future. The government influences on-farm loss and recovery as a regulator, grantor, and market actor, among other roles. The multidimensional character of food loss and waste as a policy issue that touches on many areas of government action and that interests diverse stakeholders presents opportunities for coalition building to reduce loss and improve recovery. It also presents challenges for grassroots organizing and interagency cooperation.

In the best-case scenario, recovering surplus or imperfect food from farms for human use promises significant benefits across multiple arenas. These include environmental benefits as fewer inputs can be used to feed more people, social benefits as healthy produce makes its way to food insecure populations, and economic benefits as farmers receive revenue for food that they have already paid to grow. For private sector entrepreneurs, there is also the promise of profit. Our research has not revealed one particular model of success for achieving these multiple goals, and findings indicate that—depending on which of these goals is prioritized—there may be tradeoffs in the other areas. We have presented a broad framework for thinking about how to work with growers in building recovery systems, addressing economic structure, its logistical processes, and its relational dimension, and we have shown how different institutions are addressing these three dimensions. Without identifying one clear way forward, insights from interviewees shared in this report do suggest some promising practices on which to build.

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## Appendix A. Interview Questionnaire

### *Background on the Respondent & Organization*

1. What is your role in this organization? How long have you worked here?
2. Can you tell me a bit about how this organization recovers and distributes food?
3. Approximately how much food does your organization help recover in a year? What portion of that food is fresh produce?

### *Food Recovery Experiences*

4. In your efforts to reduce food loss, do you have direct connections with growers? If so, what is the nature of that relationship?
  - a. How do you find and communicate with growers?
  - b. Can you give examples of a grower relationship that works well? How about one that doesn't work as well?
  - c. What factors make relationships with growers successful?
5. What do you see as the primary challenges for improving food recovery?
6. Do you see opportunities for expanding or improving efforts to recover food? If so, what are they?
7. Can you comment on policies or programs that might reduce on-farm food losses or promote food recovery? (Prompt for specific policies or programs, e.g., tax incentives, improved coordination, secondary markets, consumer education, etc.)
8. What do you think would be the most viable opportunities for improving food recovery and reducing food loss and waste?
9. Is there anything else we should know?