Greenhouse gas emissions of Community Supported Agriculture production and distribution systems: a comparative life-cycle assessment in the Sacramento Valley region

Final Report

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Executive Summary:

One increasingly popular way of changing eating behavior to address greenhouse gas (GHG) emissions and other negative environmental consequences from agriculture and the food system is through buying locally, including subscribing to Community Supported Agriculture (CSA) operations (Galt 2011). To understand how the increase in CSA farms and membership might affect GHG emissions of the food system as a whole, one needs to compare the changes in both (1) specific farming practices especially vis-à-vis fossil fuel, electricity, and input use and farms' emissions of nitrous oxide (N_2O), a potent GHG (Milà i Canals et al. 2007; Mosier et al. 1998) from soil amendments; and (2) the local transportation networks of CSA and the often long-distance transportation networks of the conventional food system (Van Hauwermeiren et al. 2007; Weber and Matthews 2008). The goal of this project was to provide a detailed GHG emission (carbon footprint) calculation by applying the tools of life-cycle assessment (LCA) to CSA operations in the Sacramento Valley. We use LCA to examine the production and delivery practices of five farms and the produce-pickup practices of their members, and to compare different CSA and the conventional food system.

On average, and measured to the place where the consumer picks it up, a kilogram of diversified produce in a CSA share has a 100-year Global Warming Potential (GWP_{100}) of 2.84 kg CO_2-equivalent (CO_2e). In comparison, the average GWP_{100} per kg of the top seven vegetables produced in California and consumed in the Sacramento Valley region is 2.12 kg CO_2e. Despite the many similarities between the five CSA farms in terms of market outlet and agroecological farming practices, there was large variability in emissions for the five farms — GWP_{100} varies by an order of magnitude from 0.43 to 4.45 CO_2e per kg of CSA produce. This is due to differences in technologies and practices, which we suspect are strongly influenced by access to resources (both capital and human), size of operation, and the level of farming experience. Data from the member survey (n=81 across three CSAs) shows that members' transportation emissions to pick up their produce is 0.47 kg CO_2e, and varies according to the location of the CSA (urban, rural, and workplace pickup).

Specific Results:

Primary data were collected on most aspects of the five CSA farming and delivery systems, while secondary data were used to provide estimates of specific practices' environmental impacts, including total energy use and global warming potential (GWP). Methods included (1) interviewing CSA farmers using a very detailed, on-farm interview in which farmers accessed their records beforehand (see Appendix 1 for an illustration of a typical CSA system and its primary components, and Appendix 2 for the interview protocol), (2) putting this primary farm data into a format usable to develop a life-cycle assessment of GHG emissions and energy consumption, (3) a CSA member survey for three farms that asks about pickup and consumption practices, and (4) determining the top seven vegetables consumed in the US based on estimates from the USDA's Loss-Adjusted Food Availability data sets and using cost-and-return studies of these crops and a spatial understanding of their growing regions in relation to California to estimate GHG emissions associated with their production, transportation, storage, and distribution to consumers in the Sacramento Valley region.

Table 1 shows the CO_2e emissions (based on GWP_{100}) of the five farm operations and is broken down by major category of inputs. One important finding is that there is substantial variation between farms. Other studies applying LCA methods to agricultural systems have shown high levels of variation, up to 50 percent, between farms within the same kind of production systems, e.g., two conventional farms (Milà i Canals et al. 2007). The level of variation we see is considerably higher than this — one order of magnitude — and that variation comes from a number of sources, especially on-farm electricity use and soil amendments, for which the standard deviation is 1 or more. On-farm vehicle use is the next category with the largest variation.

Table 1: 100-year Global Warming Potential (GWP_{100} kg CO_2) for 1 kilogram of CSA produce, Sacramento Valley Region*

Source	Farm 1	Farm 2	Farm 3	Farm 4	Farm 5	Average	St. Dev.
Electricity (on-farm: storage, greenhouse, and/or irrigation)	3.86	0.00	4.01	4.80	2.79	3.09	1.87
Electricity (off-farm: storage)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pesticides	0.00	0.00	0.00	0.01	0.00	0.00	0.00
Plastics for production	0.01	0.03	0.15	0.01	0.05	0.05	0.06
Plastics for packaging	0.00	0.01	0.00	0.00	0.00	0.00	0.00
Soil amendments	-1.65	0.15	0.07	-1.65	0.28	-0.56	1.00
Vehicles (on-farm)	0.01	0.13	0.22	0.25	0.15	0.15	0.09
Vehicles (input pickup)	0.01	0.07	0.00	0.04	0.18	0.06	0.07
Vehicles (distribution)	0.01	0.03	0.00	0.18	0.00	0.04	0.08
Total	2.25	0.43	4.45	3.64	3.44	2.84	1.56

* White columns include produce delivery in the vehicles figures for distribution. Cells with grey fill do not include produce delivery, as these farms have only on-farm produce pickup.

Electricity use varies substantially across CSA farms, and depends largely on storage and on greenhouse production (heated and cooled). The most efficient farm (Farm 2) does not store produce, but rather delivers the produce on the same day as the harvest. This is generally only possible with a relatively small membership size, as all other CSAs in the sample (which have much larger member numbers) tend to have more complex harvesting and storage logistics. The one farm that uses greenhouse production has the highest electricity use; it also has an old refrigeration system and electric pumps (rather than diesel- or gasoline-burning pumps) for irrigation.

CSA farms' use of compost as a soil amendment introduces considerable variability, and results in net negative GHG emissions for soil amendment practices for some farms. For compost, we (1) attributed losses of compost N as N_2O at a rate of 1 percent (following the IPCC) entirely to the farm, and (2) credited CSA farms with emissions avoided in the alternative fate of composted materials, including horse manure (with crediting for CH_4 emissions avoided from field spreading) and landfilling of green wastes and food wastes (with crediting for CH_4 emissions avoided). We do not attribute CO_2 from compost to the production system (following standard procedure for biologically-derived C) and also do not model carbon sequestration or carbon losses from the soil; adding the latter would likely mean lower emissions from the CSA system and higher emissions from the conventional system.

One important question that guided the research was how these CO_2e emissions from CSAs compare to emissions from other agricultural and horticultural production systems. Table 2 shows the CO_2e emissions (based on GWP_{100}) of the top seven fresh vegetables consumed in the US, broken down by the same major category of inputs as in Table 1. These data were generated using LCA based on cost-and-return studies of conventional production for the top seven vegetables consumed in the US. Outcomes show a low of 1.24 kg $CO2_e$ for 1 kg carrots and a high of 3.14 kg $CO2_e$ for 1 kg lettuce or onions. When combined into 1 kg of diversified vegetables, assuming 1/7 kg per product, the total is 2.12 kg CO2e.

As with the CSAs, there is considerable variation in the GHG emissions associated with the production and distribution of these vegetables. Off-farm electricity use in the form of storage (as separate from transportation) including storage at distribution warehouses and storage in the retail outlet varies considerably. This variation can be attributed to the differences in average storage time for different crops. Crops like carrots, onions, and potatoes can be stored for months in cold storage facilities, and kept on the shelves at retailers for over a week. This is in stark contrast to the extreme perishability of products like tomatoes, lettuce, and corn, for which it is recommended that the crops are stored for about a week, and can survive on the shelf for only a few days. Electricity used for storage was estimated using Unilever's 1996-1997 estimates for MJ/kg/day for cooled and frozen storage at the warehouse and the retailer (Dutilh and Linnemann 2004: 723). On-farm electricity use and soil amendments also vary a great deal. On-farm electricity use comes from the use of low pressure pumps used for drip irrigation systems. Crops like lettuce have high emissions from soil amendments because these measurements are on a per kg basis; lettuce yields per acre are low relative to the other vegetables, while fertilizer use is comparable to the other vegetables.

Table 2: 100-year Global Warming Potential (GWP_{100} kg CO_2e) for 1 kilogram of conventional vegetables grown in or near California and consumed in the Sacramento Valley region

Source	Carrot	Corn, sweet	Lettuce	Onion	Pepper, bell	Potato	Tomato	Average	St. Dev.
Electricity (on-farm: storage, greenhouse, and/or irrigation)	0.00	0.00	1.05	0.21	0.61	0.00	0.26	0.30	0.39
Electricity (off-farm: storage)	1.15	0.82	0.67	2.66	1.50	1.81	0.66	1.32	0.73
Pesticides	0.00	0.00	0.01	0.01	0.00	0.01	0.04	0.01	0.01
Plastics for production	0.00	0.00	0.04	0.01	0.00	0.00	0.03	0.01	0.02
Plastics for packaging	0.00	0.08	0.01	0.00	0.01	0.00	0.01	0.02	0.03
Soil amendments	0.05	0.05	1.12	0.12	0.06	0.04	0.12	0.22	0.40
Vehicles (on-farm)	0.02	0.09	0.09	0.02	0.05	0.04	0.06	0.05	0.03
Vehicles (input pickup)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vehicles (distribution)	0.02	0.21	0.13	0.11	0.25	0.22	0.25	0.17	0.09
Total	1.25	1.24	3.14	3.14	2.50	2.13	1.43	2.12	0.84

Table 3 provides a direct comparison of the GHG emissions for the lowest-emitting CSA, highest-emitting CSA, the average for the five CSAs, and the average of conventional vegetables. The final column shows the difference between the CSA average and the conventional vegetable average in order to compare specific categories. One of the largest trade-offs for CSAs is the electricity to store their produce, which, for conventional systems, occurs entirely off-farm, and usually involves more efficient cooling systems, even if they are stored for longer periods of time than the less-than-a-week norm for CSA produce. The next largest difference is in soil amendments. For CSAs, using compost and being credited for avoiding CH_4 emissions leads to low and sometimes negative emissions for soil amendments; the losses of N_2O from the soil are in many cases offset or more than offset by the savings of CH_4 emissions that would result from an alternative disposal fate. In contrast, the use of conventional fertilizers on conventional vegetable farms leads their net soil emissions to be higher, as they are not credited with any alternative fate since they are using synthetic N produced from fossil fuels.

Other differences between the two systems are smaller, but nonetheless interesting. Plastics play a larger role in organic production systems, which results in GHG emissions being five times higher for plastic for production in the CSAs, although the value is very low relative to other emissions. Conversely, pesticide use is more important in conventional vegetable systems and thereby contributed more to GHG emissions, but, as with plastics, the value is low relative to other emission sources. On-farm vehicle use and vehicle use for input pickup are higher in CSA systems; the small scale of these farms generally means that input distribution is less efficient on a per unit basis, and the transportation of compost and other organic soil amendments is relatively energy intensive as they tend to be bulky inputs.

Table 3. Comparing global warming potential (GWP_{100} kg CO_2e) of CSA and conventional vegetables

	CSA (low)	CSA (high)	CSA Average	Conventional vegetables average	CSA average minus conventional vegetables average
Electricity (on-farm: storage, greenhouse, and/or irrigation)	0.00	4.01	2.76	0.30	2.46
Electricity (off-farm: storage)	0.00	0.00	0.00	1.32	-1.32
Pesticides	0.00	0.00	0.00	0.01	-0.01
Plastics for production	0.03	0.15	0.05	0.01	0.04
Plastics for packaging	0.004	0.002	0.002	0.02	-0.02
Soil amendments	0.11	0.07	-0.43	0.22	-0.65
Vehicles (on-farm)	0.00	0.22	0.14	0.05	0.09
Vehicles (input pickup)	0.06	0.00	0.06	0.00	0.06
Vehicles (distribution)	0.03	0.00	0.04	0.17	-0.13
Total	0.32	4.45	2.62	2.12	0.50

Table 4 shows 100-year CO_2e emissions for a number of different food items, mostly fresh produce, from the LCA literature. The overall pattern that emerges when comparing the total emissions row of Table 1 and Table 2 is that CSA produce tends to fall in the middle of the spectrum, largely within the range of domestic produce, at least in the case of Sweden and the UK. There are, however, instances of much higher GWPs for fresh produce, such as that by Williams et al. (2006), who conducted an LCA of conventional potato and tomato production and on-farm storage, and determined that tomatoes are responsible for 9.4 kg CO_2e per kg. Potatoes come in at 0.24 kg CO_2e (Williams et al. 2006), while field corn is 0.23 kg CO_2e per kg.[1] Starch-rich field crops like corn and potatoes are likely relatively low in GHG emissions on a per-mass basis because of (1) higher yields per acre (which spreads the GHG burden over many more kilograms of product), (2) less intensive cultivation methods, which means fewer plastic materials used and usually less mechanized work, and (3) lower energy use for on-farm (and, potentially, off-farm) storage because they are less perishable than most horticultural crops.

One of the largest differences between our LCA of conventional produce and that of other studies is electricity use for storage in distribution warehouses and/or in retail outlets. For example, potatoes in Table 4 show GHG emissions of 0.24 kg CO_2e, while our calculation for California potatoes is 2.13 kg CO_2e, which includes transportation and distribution. Removing

[1] Calculation using http://www.card.iastate.edu/iowa_ag_review/fall_07/article1.aspx, http://www.news.cornell.edu/Chronicle/01/8.23.01/Pimentel-ethanol.html, and http://www.agmrc.org/renewable_energy/climate_change/greenhouse_gas_emissions_of_corn_ethanol_production.cfm

these categories and focusing on production gives a GHG emission of 0.10 kg CO_2e for California potato.

Table 4: 100-year Global Warming Potential (GWP_{100} kg CO_2e) for 1 kilogram of various fresh produce items

Food	Country	P*	T	H	kg CO_2e	Source
Carrots: domestic, fresh	Sweden	√	√	√	0.22	(Carlsson-Kanyama and González 2009)
Corn, field	US	√			0.23	see text footnote 1
Potatoes	UK	√			0.24	(Williams et al. 2006)
Carrots	Sweden	√	√		0.25	(Carlsson-Kanyama 1998: 530)
Potatoes: cooked, domestic	Sweden	√	√	√	0.45	(Carlsson-Kanyama and González 2009)
Strawberries	UK	√			0.7	(Williams et al. 2009: 261)
Tomatoes	Spain	√			0.74	(Williams et al. 2009: 260)
Apples: fresh, overseas by boat	Sweden	√	√	√	0.82	(Carlsson-Kanyama and González 2009)
Oranges: fresh, overseas by boat	Sweden	√	√	√	1.2	(Carlsson-Kanyama and González 2009)
Green beans: South Europe, boiled	Sweden	√	√	√	1.3	(Carlsson-Kanyama and González 2009)
Green beans: domestic, fresh	UK	√	√	√	1.42 - 1.55	(Milà i Canals et al. 2008: 41)
Green beans: domestic, frozen	UK	√	√	√	1.72	(Milà i Canals et al. 2008: 41)
Broccoli: domestic, fresh	UK	√	√	√	1.94	(Milà i Canals et al. 2008: 23)
Tomatoes	UK	√			2.2	(Williams et al. 2009: 260)
Broccoli: imported from Spain, fresh	UK	√	√	√	2.22	(Milà i Canals et al. 2008: 23)
Vegetables: frozen, overseas by boat, boiled	Sweden	√	√	√	2.3	(Carlsson-Kanyama and González 2009)
Broccoli: domestic, frozen	UK	√	√	√	2.64	(Milà i Canals et al. 2008: 23)
Tomatoes	Sweden	√	√		3.1	(Carlsson-Kanyama 1998: 530)
Tomatoes	UK	√			9.4	(Williams et al. 2006)
Green beans: imported from Kenya, fresh	UK	√	√	√	10.7	(Milà i Canals et al. 2008: 41)
Tropical fruits: by plane, fresh, raw	Sweden	√	√	√	11	(Carlsson-Kanyama and González 2009)

* P = production and on-farm storage, T = transportation, H = household storage and cooking

The CSA member survey collected data on CSA members' most commonly used modes of transportation, distances, miles per gallon (for cars), and changes in travel and consumption patterns attributable to joining a CSA (Table 5). Three CSAs in the study shared the CSA member survey with their members (responses were n=36 for Farm 1, n=21 for Farm 3, and n=24 for Farm 4). These three CSAs represent three kinds of delivery-pickup systems: one is located in an urban area, another is a suburban workplace pickup, and the third is a rural CSA. The three types of CSA delivery-pickup system show considerable difference. Not surprisingly, the workplace pickup CSA has the fewest attributable miles since CSA members pick it up near where they work. The urban CSA members drive fewer miles than rural CSA members. These differences translate into differences in GHG emissions. Comparing GHG emissions from produce pickup versus its farm-based production and distribution, it is clear that farm-based sources of GHG are larger.

Table 5: CSA produce pickup by members, including 100-year Global Warming Potential (GWP_{100} kg CO_2e) per kilogram of CSA produce

	Farm 1: urban	Farm 3: workplace pickup	Farm 4: rural	Average
Miles attributable to CSA pickup per week	4.0	1.8	7.1	4.3
Car MPG	27.8	29.6	23.0	26.8
Gas use per week (gallons)	0.14	0.06	0.31	0.17
GWP_{100} (CO_2e) per kg of produce, pick up	**0.47**	**0.06**	**0.89**	**0.47**
GWP_{100} (CO_2e) per kg of produce, production and distribution (from Table 1)	**2.25**	**4.45**	**3.64**	**2.84**
GWP_{100} (CO_2e) per kg of produce, production + distribution + pick up	**2.72**	**4.51**	**4.53**	**3.31**
% of GWP_{100} (CO_2e) attributable to CSA member pick up	**17%**	**1%**	**20%**	**14%**

Table 6 shows a number of changes to CSA member households that they attribute to their CSA membership. On average, more households report reducing their overall travel for food purchasing due to CSA membership (33% reduced it versus 12% increased it). Although we cannot quantify this in terms of GHG emissions since we did not collect data on the number of miles reduced per week, this speaks to important spillover effects that CSA membership has on other household practices.

Similarly, a large percentage of CSA member households (37%) noted that they decreased their meat consumption as a result of CSA membership (Table 6). In contrast, only two percent of the households noted an increase in their meat consumption (we should note that there are meat CSAs, but that these are not included in the sample). As with the reduction in travel, we cannot quantify the results of these changes in meat consumption in terms of GHG emissions, but these responses identify another important spillover effect of households belonging to vegetable-focused CSAs. If included in the LCA, the spillover effects of these changes in household consumption patterns in terms of driving and reduced meat consumption would move the CSA system lower relative to the conventional system.

The data also suggest that there are important nutritional effects of CSA membership (Table 6). The vast majority of households (68%) report an increase in the consumption of vegetables as a result of their membership, while only 2% report a decrease. A considerable percentage of households (31%) report an increase their fruit consumption, while 5% report a decline. These nutritional effects of CSA membership are not captured in LCAs, yet they are one of the many values that CSA membership fulfills.

Table 6: Changes in travel and meat, vegetable, and fruit consumption practices for CSA member households

	Farm 1: urban	Farm 3: workplace pickup	Farm 4: rural	Average
Percentage of households that *reduced* overall travel as a result of CSA membership	31%	40%	29%	33%
Percentage of households that *increased* overall travel as a result of CSA membership	8%	10%	17%	12%
Percentage of households that *reduced* meat consumption as a result of CSA membership	50%	19%	41%	37%
Percentage of households that *increased* meat consumption as a result of CSA membership	3%	0%	0%	1%
Percentage of households that *reduced* vegetable consumption as a result of CSA membership	4%	3%	0%	2%
Percentage of households that *increased* vegetable consumption as a result of CSA membership	58%	70%	76%	68%
Percentage of households that *reduced* fruit consumption as a result of CSA membership	4%	6%	5%	5%
Percentage of households that *increased* fruit consumption as a result of CSA membership	39%	22%	33%	31%

Potential Impacts:

These comparisons will be of interest to scholarly audiences as well as media outlets and the general public. We are currently working on two scientific papers that will allow us to share these results widely and to have other scholars check our results through the peer review process.

Additional next steps include sharing these results with each of the five farmers that participated in the study. This will allow each to see her/his emissions relative to similar farms and to see what processes or materials in their operations contribute to higher and lower than average emissions. For example, Farm 4 uses a large amount of electricity for its CSA relative to other farms. Sharing this information with this farmer might help target this 'hotspot' for GHG emissions by, for example, investing in more efficient refrigeration equipment.

More generally, the importance of electricity to overall GHG emissions from CSAs suggestions that investment in renewable energy resources will go a long way to significantly reduce CSA GHG emissions in California. In fact, if a CSA farm completely offset its electricity use with renewable electricity generation, it can reduce its GHG emissions to the point where they are net negative because of the use of compost (i.e., electricity use contributed 3.09 kg CO_2e per kg of CSA produce, while overall emissions are 2.84 kg CO_2e per kg of CSA produce).

We are also considering building a website tool for CSA farmers based on the survey instrument we developed. We suspect, however, that the high level of complexity of the survey would lead to a low usage rates since it will require farmers going through detailed records and takes a number of hours to complete. However, further consultation with CSA farmers and further refinement of the instrument could lead to a streamlined tool that would be attractive to farmers.

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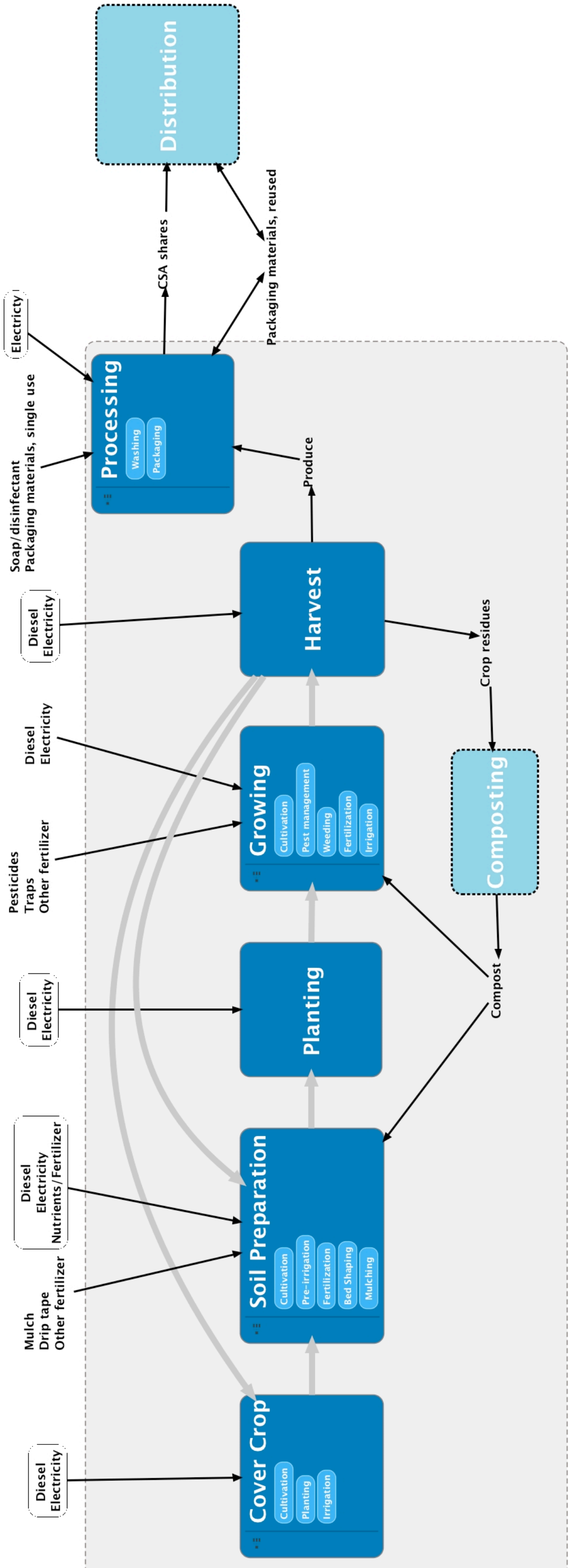
Appendix 1: CSA system components and boundaries



Appendix 2: CSA Interview Instrument
The on-farm interview involved a very detailed, 14-section protocol to capture all major inputs and outputs of the CSA system: farm characteristics, fuel and machinery, electricity, natural gas, water, seeds and transplants, mulch, fertilizer and soil amendments, pesticides, produce cleaning and packaging, other inputs, yields of produce and other outputs, and the produce distribution system. The protocol was tested with a CSA farmer outside the study site, and modified based on the trial. Five farms in the Sacramento Valley were chosen from a previous sample of CSA farms (Galt et al. 2011), with sampling based on two similar characteristics — farms with acreage similar to the median size CSA in the sample region and the lack of animals on the farm to make a very complex LCA slightly less complex — and stratified according to different types of distribution systems (three farms with neighborhood delivery and two with on-farm pickup only).

The level of intensity of primary data collection was extremely high. Farmers spent an hour or more preparing records, and the interview process itself took many hours. Many follow-up conversations were needed as well. This level of detail in primary data also required an intensive effort in linking it properly with GHG emissions and energy consumption.

Interview Script for LCA of CSA farmers in California's Central Valley and Surrounding Foothills

Ryan Galt, Libby O'Sullivan, Alissa Kendall
UC Davis, 2010

Introducing the study and recruitment to the interviewee

As you know, we're working on a research project that is documenting CSA farmers' philosophies, farmers' journeys in becoming a CSA farmer, CSA farmers' marketing and production practices, and CSA farmers' views on future research needs and policy concerns. An additional component of this research focuses on environmental issues, including greenhouse gases and energy use. Our goal is to collect data and model life cycle energy and greenhouse gases in CSA farming and delivery systems using life-cycle methods. The life cycle methodology allows researchers quantify flows of energy, materials and emissions from a system. It is basically one type of accounting system for energy and greenhouse gases. Historically the methodology has focused on industrial systems but there is growing interest in the application to natural systems and agriculture. Institutions and organizations undertake life cycle assessments to support business strategy, research and development, inform product or process design, educate within and outside of the organization, and for value-added labeling.

While the amount of detail of our questions may seem excessive, the exercise can be very useful since together we will create a detailed accounting of all of the inputs and energy used on your farm and all of its food outputs. We will also be able to understand greenhouse gas emissions from the farming and delivery operation, and break it down by specific source in order to get a better idea of how to reduce emissions and your energy bill. For your participation we are also offering to create detailed farm maps if you would find this useful, as well as write up a brief description of what we are doing for your newsletter. Please let us know if you'd be interested in these. We would also like to compensate you for your time by offering you $500 for completing the questionnaire with me. We can pay $100 up front and then $400 at the end if it takes more than one session. We'll fill out paperwork at the end to make sure you are compensated.

To our knowledge, we are the first to undertake a detailed life-cycle assessment of CSA farming and delivery systems. There have been very few studies that have taken a look at diversified food production systems and they have almost exclusively been done in Europe. We recognize that each farmering system is very different and highly variable due to location and production practices, as a result this tool will probably not be useful for generic conclusions, but instead identify particular energy intensive or carbon emitting sectors of production.

I want to emphasize that all of your responses are confidential, which means that no names will be used in any publications and we will disguise identifying characteristics of you and your CSA operation. You can choose to skip any question and also can end the interview at any time. I also want to ask you for your permission to record our conversation in a quiet location.

[To be said when setting up the interview, on the phone or email, with confirmation that the participant understands:]

If at all possible, we will need to access your records. Specifically, the following records for all parts of your farming & delivery operation would be very useful:

- electricity bills for 2010. If you use different sites with separate bills (such as farms or storage locations), please have each of these available.
- natural gas bills for 2010. If you use different sites with separate bills (such as farms or storage locations), please have each of these available.
- propane bills for 2010. If you have multiple tanks that serve different buildings or operations, please have separate bills are available.
- irrigation and water bills for 2010. If you use different sites with separate bills (such as farms or storage locations), please have each of these available.
- 2010 purchasing orders for all materials, including
    - diesel
    - gasoline

- fertilizers (all kinds)
- single season drip tape/T-tape
- seeds
- soil for growing transplants
- flats for growing transplants
- starts for transplanting
- mulch (including straw, plastic, etc.)
- fertilizers and soil amendments
- purchased pesticides
- rinse or cleaner for produce
- packaging for shares (boxes, twist ties, plastic & paper bags, etc.)

- 2010 production details for all crops going into the CSA share
- Map(s) of production location(s)

I. Time frame and farm context

Before we start, I want to let you know that when I ask about a specific resource use, I'll be referring to those resources used in both your farming operation <u>and</u> your CSA delivery operation.

1. When does your growing season begin and end? ________________
    a. When does your CSA season begin and end? ________________
2. How many farm locations do you have? _____ What can we call these? *[Fill in Table 0]*
    a. How many acres of cropland did you farm in these different farm locations in 2010? *[Fill in Table 0]*
    b. Do you know the dominant soil series at this location? *[Fill in Table 0]*
    c. Which of these locations have active utility services like electricity and gas? *[Fill in Table 0]*
    d. What are the addresses of these different farm locations? *[Fill in Table 0]*
    e. What percentage of that acreage is devoted to crops that go in your CSA shares? *[Fill in Table 0]*
    f. Have any of your production locations have been converted from native vegetation to agriculture within the last 30 years? *[If so]* Do you know the previous domiant vegetation type? *[Fill in Table 0]*

TABLE 0: Farm location details Location name	Acres [cropland]	Soil series	Utilities *[E for electricity, G for natural gas]*	Address	% land to CSA shares	Veg in last 30 years?
Location 1:			E G			
Location 2:			E G			
Location 3:			E G			
Location 4:			E G			
Location 5:			E G			

II. Diesel, Gasoline, and Farm Machinery

1. During 2010, how much **diesel** did you use, either in volume or value?
    a. *[Other option: use records to fill in monthly values below]*

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec

2. How many **tractors** do you use on your farming operation?
    a. How many run on diesel, and how many run on gasosline? __ (d)/__ (g)
    b. What is their make, model, and year? [fill in table 1&2, column 1]

3. How many **trucks** do you use on your farm and in your delivery system?
    a. How many run on diesel, and how many run on gasoline? __ (d)/_ (g)
    b. What is their make, model (HP), and year? [fill in table 1&2, column 1]

4. How many **generators** do you use on pumps for your farming operation? ___
    a. How many run on diesel, and how many run on gasoline? __ (d)/__ (g)
    b. What is their make, model, and year? [fill in table 1&2, column 1]

5. Is there any **other machinery or equipment** that you have that uses diesel or gasoline, like lawn mowers, weedwackers, or heavy equipment?
    a. What is their make, model, and year? [fill in table 1&2, column 1]

TABLE 1: Diesel use Machine: Make, HP, and year	*[Option 1]* % of all diesel use (if records available)	*[Option 2]* hours of use during a typical month
Tractor 1:		
Tractor 2:		
Tractor 3:		
Tractor 4:		
Tractor 5:		
Truck 1:		
Truck 2:		
Truck 3:		
Truck 4:		
Truck 5:		
Generator/pump 1:		
Generator/pump 2:		
Generator/pump 3:		
Generator/pump 4:		
Generator/pump 5:		
Generator/pump 6:		
Generator/pump 7:		
Generator/pump 8:		
Generator/pump 9:		
Other 1:		
Other 2:		
Other 3:		

6. During 2010, how much **gasoline** did you use, either in volume or value? ______
    a. *[Other option: use records to fill in monthly values below]*

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec

[Table below is filled in at the same time as Table 1 above]

TABLE 2: Gasoline use Machine: Make and year	*[Option 1]* % of all gasoline use (if records available)	*[Option 2]* hours of use during a typical month
Tractor 1:		
Tractor 2:		
Truck 1:		
Truck 2:		
Truck 3:		

Truck 4:		
Truck 5:		
Generator/pump 1:		
Generator/pump 2:		
Generator/pump 3:		
Generator/pump 4:		
Generator/pump 5:		
Other 1:		
Other 2:		
Other 3:		

III. Electricity

1. During 2010, how much electricity did you use in kWhs (or cost, if kWh is not available)?
    a. *[Other option: use records to fill in monthly values for up to four locations below.]*

Loc	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
1												
2												
3												
4												
5												

    b. Is this divided between residential uses and business uses at any of the locations? Y N
    c. *[If yes]* Are these different uses billed separately or together? ____________
    d. Do you know the approximate percentage used by these two kinds of uses? _______
2. Who provides your electricity service in your farm locations? *[fill in table 3a]*
3. Is there local electricity generation on site, like through photovoltaic cells or wind? *[fill in table 3a]*
4. How many buildings with active electric hookups are there on each of your farm locations? *[fill in table 3a]*
5. What equipment do you have in each location? *[fill in table 3a]*

TABLE 3a: Electricity use by location	Electricity Provider	Local generation? [*if yes:* age, technology, generation capacity]	# of buildings w/ hookups	Equipment
Location 1:				
Location 2:				
Location 3:				
Location 4:				
Location 5:				

IV. Natural Gas

1. During 2010, how much gas did you use, either in therms, MCF, BTU (or cost, if other units aren't available)? ______
    a. [Other option: use records to fill in monthly values below.]

Loc	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
1												
2												
3												
4												
5												

2. Who provides your natural gas service in your farm locations? *[fill in table 4]*
3. Is there local natural gas generation or methane capture on site? *[fill in table 4]*

4. How many buildings with active natural gas hookups are there on each of your farm locations? *[fill in table 4]*

TABLE 4: Natural gas use by location	Gas Provider	Local generation/methane capture?	# of buildings w/ hookups
Location 1:			
Location 2:			
Location 3:			
Location 4:			
Location 5:			

V. Water

1. During 2010, how much water did you use, in acre-feet (or gallons if acre-feet not available)?
   a. [Other option: use records to fill in monthly values below]

Loc	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
1												
2												
3												
4												
5												

2. Who provides your water in your farm locations? *[fill in table 5]*
3. What percentage of the water comes from canals in each location? *[fill in table 5]*
4. What percentage of the water comes from wells in each location? *[fill in table 5]*
5. What percentage of the water is used for irrigation in each location? *[fill in table 5]*
6. What percentage of the water is used for washing produce in each location? *[fill in table 5]*
7. What percentage of the water is used for all other uses in each location? *[fill in table 5]*

TABLE 5: Water use by location	Water provider	Source: % canal	Source: % well	Use: % irrigation	Use: % washing produce	Use: % other
Location 1:						
Location 2:						
Location 3:						
Location 4:						
Location 5:						

8. During 2010, how much t-tape, drip tape ¾ diameter pipe, and 2 inch diameter blue hose did you use?
   a. How long do you use the each of the short term irrigation tools? ______
   b. Where did you purcahse them from?
   c. Was it delivered to your property or did you pick it up? ______________________________
9. Do you use a filtration system on any of your irrigation or washing systems? *[circle one]* **Y** N
   a. How often do you replace the filters? ______
   b. Where did you purchase the filters from? ______________________________________
   c. Was it delivered to your property or did you pick it up? ______________________________

VI. Seeds and Transplants

Seeds

1. During 2010, what crops did you purchase seeds for (including cover crop)? *[fill in first column of Table 6]*
2. During 2010, where there any crops that you saved seed for? *[fill in first column of Table 6]*
3. What was the weight or volume (or cost if others not available) of your ______ *[crop x]* seed purchase?
4. Who did you purchase ______ *[crop x]* seeds from, and where are they located?

5. What equipment do you use to save seed (hand/fuel powered thrashers, mesh bags and/or screens) and how long do you use the equipment?
6. How were the _______ *[crop x]* seeds transported to your farm?

TABLE 6: Seeds purchased/saved	Volume/weight/ value of seeds	Source of seed *[name of business]* & location *[town/city]*	Transport type
1: ☐/☐			
2: ☐/☐			
3: ☐/☐			
4: ☐/☐			
5: ☐/☐			
6: ☐/☐			
7: ☐/☐			
8: ☐/☐			
9: ☐/☐			
10: ☐/☐			
11: ☐/☐			
12: ☐/☐			
13: ☐/☐			
14: ☐/☐			
15: ☐/☐			
16: ☐/☐			
17: ☐/☐			
18: ☐/☐			
19: ☐/☐			
20: ☐/☐			
21: ☐/☐			
22: ☐/☐			
23: ☐/☐			
24: ☐/☐			
25: ☐/☐			
26: ☐/☐			
27: ☐/☐			
28: ☐/☐			
29: ☐/☐			
30: ☐/☐			

Turning seeds into starts on the farm

7. During 2010, did you grow any seeds for transplants? *[circle one]* Y N
8. What's in your starting soil? *[fill in first column of Table 6a]*
   a. What amount of _______ *[component x]* did you use in 2010? *[fill in Table 6a]*
   b. Who did you purchase *[component x]* from, and where are they located? *[fill in Table 6a]*
   c. How was _______ *[component x]* transported to your farm? *[fill in Table 6a]*

TABLE 6a: Starting soil components	Volume/weight/value of seeds	Source of seed *[name of business]* & location *[town/city]*	Transport type
1:			
2:			
3:			
4:			
5:			

6:			
7:			
8:			
9:			
10:			

9. What kind of start containers or flats did you use?
    a. How many of each did you use in 2010? ____
    b. Are they reusable?
    c. How long do they typically last? ________________________
    d. Where did you purchase them from *[name of business & town/city]*? ________________
    e. How were they transported to your farm? ________________________________
10. Did you use a greenhouse or greenhouses to grow these transplants? *[circle one]* Y N Num. ____
    a. Does the greenhouse have active climate control? *[circle one]* Y N Source _______
    b. What is/are it/they made from?
    c. Where is/are the greenhouse(s) located?

Purchased starts

11. During 2010, what crops did you purchase starts for? *[fill in first column of Table 7]*
12. What was the volume, weight, or value of your ______ *[crop x]* starts purchase? *[fill in Table 7]*
13. Who did you purchase ______ *[crop x]* starts from, and where are they located? *[fill in Table 7]*
14. How were the ______ *[crop x]* starts transported to your property? *[fill in Table 7]*

TABLE 7: Starts (purchased)	Number/weight/ value of starts	Source of starts *[name of business]* & location *[town/city]*	Transport type
1:			
2:			
3:			
4:			
5:			
6:			
7:			
8:			
9:			
10:			
11:			
12:			
13:			
14:			
15:			
16:			
17:			
18:			
19:			
20:			

VII. Mulch

1. During 2010, what kinds of mulches did you use, if any? *[fill in first column of Table 8]*
2. What was the volume, weight, or value of ______ *[mulch x]* you used? *[fill in Table 8]*
3. How long does ______ *[mulch x]* last? *[fill in Table 8]*
4. Who did you purchase ______ *[mulch x]* from, and where are they located? *[fill in Table 8]*
5. How was ______ *[mulch x]* transported to your farm? *[fill in Table 8]*

TABLE 8: Mulches	Volume/weight/ value of mulch	Lifespan	Source of mulch *[name of business]* & location *[town/city]*	Transport type
Mulch 1:				
Mulch 2:				
Mulch 3:				
Mulch 4:				
Mulch 5:				
Mulch 6:				

VIII. Fertilizers and soil amendments

1. During 2010, what kinds of fertilizers or soil amendments did you use, if any (including cover crops)? *[fill in first column of Table 9]*
2. What was the volume, weight, or value of ______ *[amendment x, or crop residues left on field (indicate whether dry or wet weights)]* you used? *[fill in Table 9]*
3. For ______ *[amendment x]*, did you make it on-farm, or did you purchase it? *[fill in Table 9]*
    a. Where did you purchase it from, and where are they located? *[fill in Table 9]*
    b. *[If purchased]* How was ______ *[amendment x]* transported to your farm? *[fill in Table 9]*
4. *[If compost is made on farm]* What is your C:N ratio generally? ______
    a. What is your source of C? ______
    b. Did you purchase C, if so where was it delivered from? ______
    c. What is your source of N? ______
    d. Did you purchase N, if so where was it delivered from? ______
    e. How often do you turn your pile? ______
    f. What implement do you use to turn your pile? ______
    g. Do you water your pile? Y N
        i. *[If yes]* How often and for how long? ______

TABLE 9: Fertilizers	Volume/weight /value of fertilizer wet/dry	Source *[name of business]* & location *[town/city]*	Transport type	Composition *[C:N ratio; N-P-K]*
1:	☐/☐			
2	☐/☐			
3:	☐/☐			
4:	☐/☐			
5:	☐/☐			
6:	☐/☐			
7:	☐/☐			
8:	☐/☐			
9:	☐/☐			
10:	☐/☐			

IX. Pesticides

1. During 2010, what kinds of pesticides did you use, if any? *[fill in first column of Table 10]*
2. What was the amount of ______ *[pesticide x]* you used? *[fill in Table 10]*
3. What was the percent active ingredient of ______ *[pesticide x]*? *[fill in Table 10]*
4. Who did you purchase ______ *[pesticide x]* from, and where are they located? *[fill in Table 10]*
5. How was ______ *[pesticide x]* transported to your farm? *[fill in Table 10]*
6. How was ______ *[pesticide x]* applied? *[fill in Table 10]*

TABLE 10: Pesticides	Amount	% active ingredient	Source *[name of business]* & location *[town/city]*	Transport type	Application method

1:					
2:					
3:					
4:					
5:					
6:					
7:					
8:					
9:					
10:					

X. Cleaning and packaging of produce

1. During 2010, what kinds of produce and wash bin clearner (like Simple Green, vinegar, bleach) did you use, if any? *[fill in first column of Table 11]*
2. What was the amount of ______ *[cleaner x]* you used? *[fill in Table 11]*
3. Who did you purchase ______ *[cleaner x]* from, and where are they located? *[fill in Table 11]*
4. How was ______ *[cleaner x]* transported to your farm? *[fill in Table 11]*

TABLE 11: Produce cleaners	Amount	Source *[name of business]* & location *[town/city]*	Transport type
1:			
2:			
3:			
4:			
5:			
6:			
7:			
8:			

5. During 2010, what kinds of packaging did you use for your CSA shares, if any? *[read entries in first column of Table 12 and check boxes]*
6. What was the amount of ______ *[packaging item x]* you used? *[fill in Table 12]*
7. Who did you purchase ______ *[packaging item x]* from, and where are they located? *[fill in Table 12]*
8. How was ______ *[packaging item x]* transported to your farm? *[fill in Table 12]*

TABLE 12: Packaging	Amount	Lifespan *[if reusable]*	Source *[name of business]* & location *[town/city]*	Transport type
Boxes ☐				
Plastic bags ☐				
Compostible (cellulose) bags ☐				
Paper bags ☐				
Twist ties ☐				
Rubber bands ☐				
Other:				
Other:				
Other:				

XI. Other inputs

1. Are there any other products your farm purchases that I haven't asked you about? *[fill in first column of Table 13]*
2. What was the amount of ______ *[other input x]* you used? *[fill in Table 13]*
3. Who did you purchase ______ *[other input x]* from, and where are they located? *[fill in Table 13]*

4. How was ______ *[other input x]* transported to your farm? *[fill in Table 13]*
5. How was ______ *[other input x]* applied? *[fill in Table 13]*

TABLE 13: Other inputs	Amount	Source *[name of business]* & location *[town/city]*	Transport type
1:			
2:			
3:			
4:			
5:			

XII. Produce in your shares and other outputs

1. *[Option 1, ideal]* Do you keep track of your harvests each week in terms of volume by crop? *[if yes, record volumes in Table 14 {separate table from Excel file}, if no, ask following questions]*
    a. For ______ *[crop x]*, what percentage of overall production goes to your CSA?
2. *[Option 2, less ideal]* Do you have a newsletter that tells the contents of your box each week?
    b. *[If so]* May I please have access to these, either in paper form or electronically? I will fill in the weeks that have certain kinds of crops and then will follow up later to ask for an average amount that you give in each box.
    c. *[Upon follow up]* For ______ *[crop x]*, what amount normally goes in a share?
    d. *[Upon follow up]* For ______ *[crop x]*, what percentage of overall production goes to your CSA?
3. *[Option 3, least ideal]* Can you describe your average box in each of the four seasons? *[Fill in Table 15]*
    e. In other words, what are the common items that you provide in <u>spring</u>?
        i. How much of ______ *[item x]* do you give in a box?
    f. What are the common items that you provide in <u>summer</u>?
        i. How much of ______ *[item x]* do you give in a box?
    g. What are the common items that you provide in <u>fall</u>?
        i. How much of ______ *[item x]* do you give in a box?
    h. What are the common items that you provide in <u>winter</u>?
        i. How much of ______ *[item x]* do you give in a box?

TABLE 15: Boxes by season			
Spring Item & Amount	Summer Item & Amount	Fall Item & Amount	Winter Item & Amount

4. Approximately what proportion of your produce is lost in the field? ______
    a. What percentage of this is plowed under? ______
    b. What percentage is composted? ______

5. Are there any other products your farm sells (outputs) that I haven't asked you about? *[fill in first column of Table 16]*
    a. What was the amount of ______ *[other output x]* you sold or that left your farm in 2010? *[fill in Table 16]*
    b. What proportion of ______ *[other output x]* went into your CSA shares? *[fill in Table 16]*

TABLE 16: Other outputs	Amount sold or left farm in 2010 [weight or volume preferred, price less ideal]	% to CSA share
1:		
2:		
3:		
4:		
5:		
6:		
7:		
8:		
9:		

6. Do you use produce in your shares from any source other than your farm? Y N
    a. Approximately what proportion of your CSA shares are from these purchases? ______
    b. What type of products do you typically purchase (i.e. citrus, stonefruit, grains, crops that you already grow but need more of)? ______
    c. Where do you aggregate it with your produce? ______
    d. What vehicle or vehicles do you transport this produce to the aggregation location? ______
    e. Are these vehicles refrigerated? Y N

XII. Distribution system

1. When we talked to you before, you described your delivery system as:
    a. *[Type A]* Multiple drop-off locations that where your members pick up their shares *[proceed to question 2]*
    b. *[Type B]* Members pick up their shares on the farm *[skip to question 3]*
    c. *[Type C]* Delivery to every member *[proceed to question 4]*
    d. Other
2. *[Type A]* What are the addresses of each of your drop-off locations? *[fill in first column of Table 17]*
3. *[Type B]* How many delivery routes do you have, and how many miles are on each? *[fill in first column of Table 17]*
4. How many shares
    a. *[Type A]* do you leave at each location? *[fill in Table 17]*
    b. *[Type B]* are delivered in each route? *[fill in Table 17]*
5. Which truck(s) do you use for your deliveries?
6. How often, if at all, do you combine trips on each route?

TABLE 17: Delivery Type A Address *[#, street, city]* Type B miles in route	Number of shares	Truck(s) used	Combined trips
1:			
2:			
3:			
4:			
5:			
6:			
7:			
8:			
9:			

10:			
11:			
12:			
13:			
14:			
15:			
16:			
17:			
18:			
19:			
20:			
21:			
22:			
23:			
24:			
25:			
26:			
27:			
28:			
29:			
30:			

7. Can we leave a very short, anonymous questionnaire for your members about how they get to the drop-off site?

XIV. Final questions

1. Is there anything else I should have asked you?

2. May we contact you by phone if we have any follow up questions?

XV. Payment paperwork

Vegetable \ Week	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	% CSA	% FM	% W
artichoke																																																							
asparagus																																																							
avocado																																																							
basil																																																							
beans, fava																																																							
beans, green																																																							
beets																																																							
bok choy																																																							
broccoli																																																							
Brussels sprouts																																																							
cabbage																																																							
carrots																																																							
cauliflower																																																							
celery																																																							
celery root/celeriac																																																							
chard																																																							
collards																																																							
corn, sweet																																																							
cucumber																																																							
daikon																																																							
eggplant																																																							
fennel																																																							
garlic																																																							
kale																																																							
kohlrabi																																																							
leeks																																																							
lettuce																																																							
mushrooms																																																							
okra																																																							
onions																																																							
onions, green																																																							
parsnip																																																							
peas																																																							
peppers, hot																																																							
peppers, sweet/bell																																																							
potatoes																																																							
pumpkin																																																							
radish																																																							
rutabaga																																																							
salad mix																																																							
spinach																																																							
squash, summer																																																							
squash, winter																																																							
sunchoke																																																							
sweet potatoes																																																							
tomatillos																																																							
tomatoes																																																							
turnips																																																							
yams																																																							
other 1:																																																							
other 2:																																																							
other 3:																																																							

Fruit & nuts \ Week	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	% CSA	% FM	% W
almonds																																																							
apples																																																							
apricots																																																							
berries:																																																							
blackberries																																																							
blueberries																																																							
boysenberries																																																							

cranberries																																																							
raspberries																																																							
strawberries																																																							
other 1:																																																							
other 2:																																																							
cherimoya																																																							
cherries																																																							
chestnuts																																																							
figs																																																							
grapefruit																																																							
grapes																																																							
kiwi																																																							
kumquat																																																							
lemons																																																							
limes																																																							
mandarins/tangerines																																																							
melons:																																																							
cantaloupe																																																							
honeydew																																																							
watermelon																																																							
nectarines																																																							
oranges																																																							
peaches																																																							
pears																																																							
persimmons																																																							
pistacios																																																							
plums																																																							
pomegranate																																																							
pummelo																																																							
quince																																																							
rhubarb																																																							
walnut																																																							
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Appendix 3: CSA Member Survey

The member survey collected information for calculating the GHG emissions from consumers' pick-up practices for their CSA share, in addition to other aspects of their CSA membership.

Short Survey of CSA Members

CSA Share and Household Information

This short survey is part of a UC Davis research project about farmers and members involved in Community Supported Agriculture (CSA) in California's Central Valley and surrounding foothills. It should take less than 10 minutes to complete. This survey will help us to get a better sense of food distribution and energy and fossil fuel use in CSA. Your responses will remain anonymous. Thank you for your participation.

1. Which CSA does your household belong to?

2. What year did you start this CSA subscription?

3. How many members of your household regularly eat your CSA's produce?

4. What is your zip code?

5. How often does your household pick up your CSA share?

Other (please specify)

6. What size of CSA share does your household receive?

Other, including split share (please specify)

7. What percentage of your fresh vegetables do you get from the following?

CSA

Grocery stores

Farmers' markets

Gardening

Other (please specify)

8. What do you value most about belonging to a CSA?

Short Survey of CSA Members

CSA Share Pick Up

For this section, please answer for the person primarily responsible for picking up your household's CSA share. Consider your pick up activities for the entire year and report what is typical.

9. How many miles do you typically travel round-trip to pick up your CSA share?

10. Do you typically combine errands or other trips with picking up your CSA share?

- Yes
- No

If yes, how many of the total miles traveled (in Question 9) are attributable to the CSA share pick up?

11. What mode(s) of transportation do you usually use for picking up your CSA share?

- Car
- Mass Transit
- Bike
- Walking

Other (please specify)

12. If you use a mix of modes to pick up your CSA share, please note the percent of the time you use for each. This may either occur within a single trip (e.g., you take mass transit for 80% of the miles traveled and then bike 20%) or for different trip (e.g., you use your car 20% of the time and you bike 80% of the time).

Car

Mass Transit

Bike

Walking

Other

13. If your household uses a car to pick up your CSA share,

	what type of fuel does it primarily use?	what is its average fuel economy (in MPG)?
Car		

CSA share and consumption

Consider your consumption activities for the entire year and report what is typical.

14. What percentage of your household's CSA share on average:

Is eaten cooked?

Is eaten raw?

Is disposed of during preparation (e.g., carrot leaves)?

Is disposed of due to spoilage?

Has another fate? (please specify)

15. What percentage of the food waste (from preparation, spoilage, and plate scrapings) from your CSA share goes to:

Garbage?

Garbage disposal?

Compost?

Animal feed?

Another destination? (please specify)

16. For each category of food below, consider if and how your household food consumption has shifted as a result of joining a CSA. Because of CSA membership, we eat ____

	more	the same amount	less
fresh vegetables	○	○	○
frozen vegetables	○	○	○
canned vegetables	○	○	○
vegetables (including fresh, frozen, canned)	○	○	○
fresh fruit	○	○	○
frozen fruit	○	○	○
canned fruit	○	○	○
fruit (including fresh, frozen, canned)	○	○	○
meat	○	○	○

17. For each behavior below, consider if and how your household patterns have shifted as a result of joining a CSA. Because of CSA membership, ____

	more	the same	less
we shop at grocery stores ...	○	○	○
we shop at farmers' markets ...	○	○	○
we grow our own food ...	○	○	○
our overall travel to get food is ...	○	○	○
our total money spent on food purchases is ...	○	○	○

18. Is there anything else you would like to add?

Thank you very much for your response. We will be sharing our findings with your CSA farmer(s), so we hope you will read about it in your future newsletters.