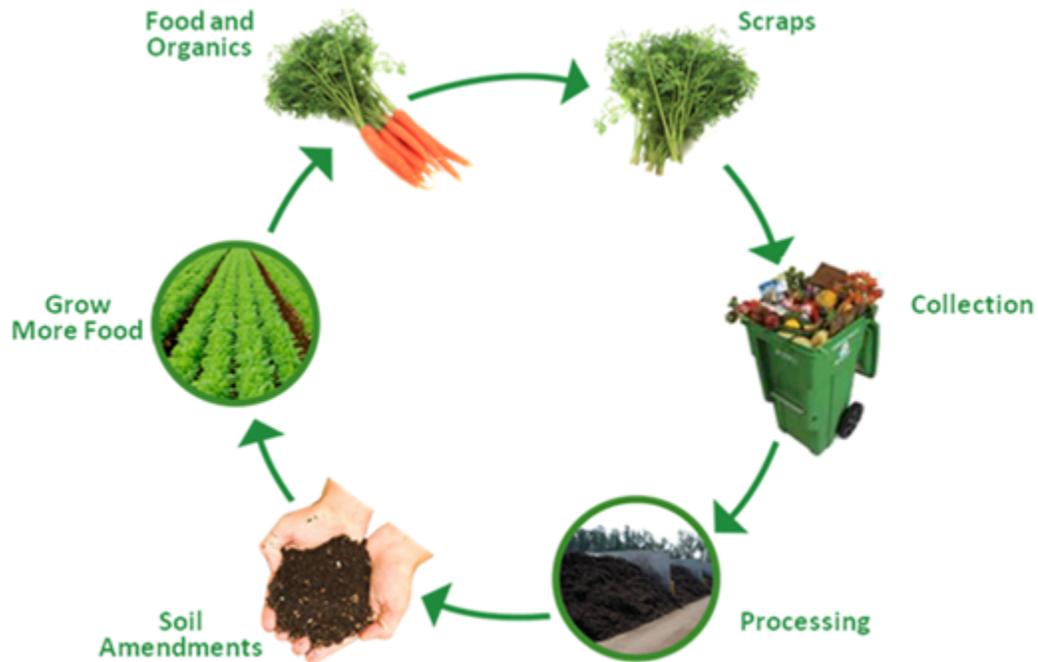


COMMITTEE ON CAMPUS CLIMATE CHANGE (CCCC)

Zero Food Waste at UCSD Campus -

June 6, 2021



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Food Waste: UCSD vs. World

UCSD wastes around 1,700-2,150 tonnes of food yearly, amounting to over 32,000 TCO₂e (metric tons of carbon dioxide equivalents) per year (**Table 1**).^[1-14] This amounts to 20% of UCSD's Scope 1 emissions, and roughly 12% of total emissions from the campus (**Table 2**).^[15]

Scaling upward, we've found that California wastes about 5.44 MTs (million tons) of food, generating nearly 36.38 MTCO₂e -- about 8.6% of 2018's total emissions estimate for CA (**Table 1**).^[13,14,16-21] The U.S. is similar, with food waste accounting for 7% of total CO₂ equivalents, generating roughly 413.3 MTCO₂e from 60 MTs of food waste (**Table 3**).^[14, 22-24]

Globally, we waste around 1.6 GTs of edible foods, and 6.6 GTs of inedible food. This accounts for 6% of all emissions, or about 3.9 - 4.9 GTCO₂e (**Table 3**).^[13, 25-29] Per capita, we see that the U.S. and Europe waste the most amount of food yearly (0.18T and 0.20T, respectively), and the U.S., China, and Europe generate the most food waste emissions per capita (1.25, 0.75 and 0.403-1.14 MTCO₂e yr⁻¹ respectively).^[14, 23, 30-36] UCSD hovers nearby with an emissions rate of 0.88-0.89 MTCO₂e yr⁻¹ per capita.^[1-12] Per capita emissions may be found in **Table 4**.

Though these estimates are provided in carbon dioxide equivalents, it is important to remember that it is mainly potent short-lived climate pollutants (such as nitrous oxide and methane) that are released from the food life cycle. The UC's Bending the Curve Report, coauthored by two committee members (Veerabhadran Ramanathan and Fonna Forman), suggests that due to the short-term nature of the gases in our atmosphere, and their strong potency, reduction of these gases will be vital to quickly "bending the curve" on our emissions.^[37]

Current Campus Activity Regarding Food Loss and Waste

Current Strides Towards Zero Waste Goals

UCSD's current diversion rate of all waste is 43% (as of FY 2020), well under the UCOP's goal of 90% diversion.^[38] It is unclear how much of this diversion rate accounts for food waste, however, Jeffrey Summerhays (UCSD's Waste Diversion Manager) indicated that diverting a couple hundred tons of food waste could "move the needle" an additional 5%. Considering our estimates of food waste (from 1,700T to 2,150Ts), and the possibility that ALL of this waste is diverted, UCSD's diversion rate could increase by 15%.^[39]

Last year, UCSD Task Force on the Climate Crisis, co-chaired by a member of this committee (Adam Aron) suggested that UCSD should send post-consumer food waste to anaerobic digestors, expand food forests and close the food cycle, and food labelling should include carbon labelling to encourage consumer to make more sustainable choices.^[40] UCSD does not seem to be making any strides to this yet.

Food Recovery

The main players for food recovery at UCSD are encompassed under The Hub Basic Needs Center, including UCSD's Food Recovery Network (FRN), and the Triton Food Pantry (TFP). The UCSD FRN is responsible for recovering edible food that would otherwise be wasted from various on campus eateries and local grocery stores like Vons. During the 2018-2019 academic year, the FRN recovered 16,387 pounds of food and dispersed it to students and community members.^[41] The Triton Food Pantry is a source for undergraduate and graduate students to discreetly acquire meals in various locations both on and off campus. In the 2019-2020 academic year, 9,800 pounds of food were donated to the FRN, TFP and the San Diego Rescue Mission, providing about 8,200 meals to those in need.^[42]

Nydia Lopez, the Hub's Food Security Programs Coordinator, noted that along with the need to expand the reach of FRN and TFP, UCSD food recovery needs to prioritize recovering products that are culturally representative of the UCSD population.^[43] Because food insecure individuals are typically minoritized BIPOC, it is incredibly important to offer recovered foods that are better understood by those individuals (in terms of preparation for instance) and more relevant to their livelihood.

Composted Food

Not all food on campus is readily donatable, whether it be undignified¹ or inedible. Another alternative to sending food to the landfill is to compost it. UCSD currently composts all the food waste that results prior to reaching consumers (or pre-consumer waste), which amounts to 136 MTs.^[42] Over the 10 years that this composting agreement between UCSD and Miramar Landfill has been established, 1800 MTs of food waste has been diverted from the landfill.^[7]

But what about post-consumer waste? Prior to COVID-19, UCSD's Housing and Dining Department launched a post-consumer waste collection service, nicknamed "Tiny Bin Tim", within campus dining halls and restaurants.^[42] For the start of the academic year (typically around move-in dates), HDH's EcoNauts (student HDH sustainability ambassadors) made an effort to educate UCSD community members on the benefits to composting to the environment, as well as what does/does not belong in a compost bin.^[44] Over 4,000 pounds of food waste was collected for the two years this program was in effect.^[41] This waste disposal option is no longer offered to patrons for various reasons (COVID-19 concerns, misinformation regarding what can go in these compost bins, the extra resources required to sift through the waste, etc.). According to an EcoNaut, UCSD's college councils also attempted to incentivize students to compost by offering free at-home composters but failed in implementation and success.^[44] The campus community gardens are the last option for post-consumer waste on campus, providing some information about what is readily compostable and what isn't, for those that actively seek out this option. However, the four student-run gardens on campus that accept compost likely cannot keep up with the magnitude of waste.^[67]

Food Waste

Due to the complex nature of collecting food waste (UCSD has 4 different systems for post-consumer waste collections just within the dining halls), it becomes a burden to attempt to estimate our

¹ Kerri Kolarik of Feeding San Diego described the difference between undignified vs. dignified recovered foods as whether the food is well-contained and presentable to the individual who is receiving the recovered items. She used the example of putting pasta in a bread bag—though the bread bag is food-safe, it is not a dignified recovered item that Feeding SD would give to another human.

magnitude of food waste.^[39] The estimates provided in this report come from waste audits, where 50-500 pounds of trash are sorted into separate categories (food, recyclables, and trash) and weighed to determine composition of trash that is either food waste, something that could have been recycled or trash that should ultimately be sent to the landfill. However, waste audits have their own uncertainties, especially due to the small sample size, so it is likely not representative of the actual situation.

There are, however, better forms to track waste. UC Irvine was the first UC campus to have not one, but two zero waste dining halls. Using a combination of tools to reduce food waste including categorizing food with Aramark, requiring food sustainability training for food-handlers, conducting frequent waste audits, composting on campus and anaerobically digesting food to use the biomethane product, UCI was able to reach 97-98% diversion in these dining halls.^[45] UCI's diversion rate is 83%, almost double UCSD's—their tactics could push UCSD closer to reaching the UCOP goals.^[46] Each of these strategies aims to reduce food waste at the source and close the food cycle on campus. A closed food cycle at UCSD could look something like this: food is grown/sent to UCSD, meals are prepared at UCSD, food is eaten at UCSD, leftovers are donated to UCSD community members, and inedible food serves a purpose to either grow more food or power the transportation that creates the food.

Proposed Academic Senate Resolution

Let it be resolved that the UCSD Academic Senate urges the Chancellor to:

1. Institute and incentivize a “zero food waste” mindset across all campus restaurants, dining halls eateries, and events within staff members, students and patrons.
2. Prioritize food waste reduction and food donation (of *dignified, culturally relevant* foods) within these campus eateries whenever possible.
3. Following investigation of our on-campus digesters, plan to send the remaining inedible, undignified foods to on-campus anaerobic digesters first and foremost, then to EDCO's facility second.

Proposed Partnerships

UCSD does not have to reinvent the wheel when it comes to reduction of food waste. UCI, the City of San Diego, local nonprofits, and more are currently doing the work necessary to keep food from landfills.

UCI

As previously described, UCI has had great success with diversion, especially in its two zero waste dining halls. Jeffrey Summerhays alluded to having already instituted some of their successful diversion practices at UCSD, however not all are currently in place (such as their software to monitor which food

are most often wasted, which results in the food handlers to adjust serving sizes accordingly, reducing food waste at the source).^[45] Robert Perez, who was present for the initial launch of UCI's Zero-Waste Dining Program but has since moved on from UCI staff, offered advice on how to get the ball rolling for zero waste dining at UCSD. His ideas revolved around prioritizing food sustainability education and incentivizing the "extra work" involved with food donation/composting/digestion for both food staff and students.^[46]

Local Government & Nonprofits

California policy SB 1383 requires a reduction in organic waste disposal 50% by 2020 and 75% by 2025, and a 20% increase in edible food recovery, in order to reduce methane gas. The regulations take effect in 2022, requiring businesses, homeowners, universities alike to reduce and recover waste.^[47,48] The City of San Diego has already been working on these initiatives, and even offer free webinars to San Diegans to learn more about how to successfully meet these regulations. Recently, *I Love a Clean San Diego* partnered with the City of San Diego to educate commercial kitchens on how to donate food and recycle inedible materials.^[49] Other nonprofits, such as *Solana Center for Environmental Innovation* and *Save the Food SD*, are also working towards educating consumers and businesses on how to appropriately reduce food waste.^[50,51]

Besides education, other nonprofits such as the *San Diego Food Bank* and *Feeding San Diego* are actively working on recovery food and dispersing it to the community. By a combination of consumer donations and rescued foods from retailers, the San Diego Food Bank feeds 350,000 people monthly and Feeding San Diego redistributes 32 million meals/year.^[52,53] For the foods that can't be used, both of these nonprofits send their food to pig farmers as animal feed.^[54,55]

EDCO

UCSD sends waste and recyclables to various local EDCO facilities. Around the fall, Escondido's EDCO facility will open their anaerobic digester to UCSD's food waste.^[7] Dawn Cox, EDCO's Environmental Coordinator, estimates that their digester will have the capacity to digest 400-1000 tons of waste per year (food waste is included but does not make up the entirety of this estimate).

Food Waste & Food Insecurity

UC San Diego's Undergraduate Experience Survey (UCUES) results as of 2020 indicate that 20% of students experience *very low* food security and 18% experience *low* food security for the past 12 months, based on student responses to this survey.^[56] This is a significant portion of the UCSD undergraduate student population—nearly 8,000 students were very food insecure in 2020.^[3] This does not include the graduate student population. The number of food-insecure individuals only increased due to the COVID-19 pandemic—Feeding America estimates that 1 in 7 adults and 1 in 5 children may have been food insecure in 2020 as a result of the pandemic, as compared to 1 in 9 adults and 1 in 7 children in 2019 (an all-time low for the U.S.).^[57] The same is seen in San Diego County, where 14% of the population (450,000) is food insecure on a daily basis, with 1 out of 7 being adults and 1 out of 5 being children.^[58]

For Winter Quarter 2021, about 867 students benefitted from the Triton Food Pantry, and over 5,000 meals were recovered from the Food Recovery Network and dispersed to students and surrounding

community members.^[42] Prior to the pandemic, the FRN and TFP were able to provide 8,200 meals to UCSD students and community members. Considering, however, the amount of *very low* food security to *low* food security on campus, these 8,200 meals only reach a small portion of food insecure students throughout the entire academic year.

Fueling UC San Diego Using Food Waste

Anaerobically digesting food waste is a more climate-friendly alternative to the waste decomposing in landfills (specifically those without landfill gas capture mechanisms in place). It is thought that, per ton of food waste, methane yields can be maximized at 3,200 square cubic feet. Accounting for the cost of electricity and the conversion efficiency from biogas to electricity, the “energy in food waste” is \$33/ton.^[59] An alternate way to think about it is that 100 tons of food waste anaerobically digested every day can power 800-1,400 homes yearly.^[60] UCSD produces 1700 tons of food waste per year, and though not all food waste is permissible in these digestion systems, UCSD could utilize the benefits of such technology. UCSD does already have two small anaerobic digestors onsite, but they are currently not operational and likely would not be able to digest the amount of waste the UCSD community is currently creating.^[7] Considering UCSD’s future shift from fossil fuel energy, it will be beneficial to not only rid the campus of food waste (and its emissions from sitting in landfills), but also to generate another form of energy.

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APPENDIX: FOOD WASTE EMISSIONS DATA

Table 1: Regional (CA and UCSD) Food Waste Emissions Breakdowns

Region	Tonnes wasted (MMT yr ⁻¹)	Percentage of food waste to food supply	FIXED N ₂ O emissions from agricultural sources (MMTCO ₂ e yr ⁻¹)	Carbon footprint from production of food wasted (MMTCO ₂ e yr ⁻¹)	Net CH ₄ emissions generated from landfilled food waste (MMTCO ₂ e yr ⁻¹)	Total GHG emission (MMTCO ₂ e yr ⁻¹)
California	5.44 ^[16]	18% ^[17,18]	2.142 ^{[19,20]]2}	33.9 ^{[13] 3}	2.48 ^[14]	36.38
UCSD ^[1-12]	0.00170 - 0.00215 ⁴	3.2% ^[66]	-	0.031 ^{[13] 5}	8.47x10 ⁻⁴ - 1.07x10 ⁻³ ^{[14] 6}	0.0322 - 0.0325

Table 2: UCSD's Food Waste Emissions as a Percentage of Scope 1 Emissions^[15]

<i>Emissions Sector</i>	<i>Total MMTCO₂e yr⁻¹</i>	<i>Percentage of Total Scope 1 Emissions</i>
Scope 1	~165,000	100%
Food Waste	32,200 - 32,500	19.5-19.7%

² This point represents total nitrous oxide emissions from agriculture production fixed per the percentage of food wasted to the total supply (the column left of this one).

³ This data point was derived using the carbon footprint per capita of North America and Oceania (860kg per capita)^[13] and California's 2019 population of 39,512,000^[28].

⁴ This data point is a range to include two different estimates of tons wasted: one through UCSD waste audit information (0.00170) and the higher estimate through approximation of UCSD's waste generation compared to a RecyclingWorks study.^[61]

⁵ This data point was derived using the carbon footprint per capita of North America and Oceania (860kg per capita)^[13] and UCSD's Weighted Campus User Population of 36,582.^[7]

⁶ Using the EPA's Waste Reduction Model (WARM), and assuming that all of UCSD's food waste that is not composted is actually landfilled, this range was created based on tons of waste. The EPA's WARM tool includes these four factors in Landfill waste data: "(1) GHG emissions from energy used during the acquisition and food production processes, (2) GHG emissions from energy used to transport materials [including retail transportation], (3) non-energy GHG emissions resulting from production processes [excluding packaging-associated GHGs], and (4) non-energy GHG emissions resulting from refrigerated transportation and storage."^[12]

Table 3: Global Food Waste Emissions Breakdowns

Region	Tons wasted (MMT yr ⁻¹)	Percentage of food waste to food supply	FIXED N ₂ O emissions from agricultural sources (MMTCO ₂ e yr ⁻¹) ^[22] ⁷	Carbon footprint from production of food wasted (MMTCO ₂ e yr ⁻¹) ⁸ ^[13]	Net CH ₄ emissions generated from landfilled food waste (MMTCO ₂ e yr ⁻¹)	Total GHG Emissions (MMtCO ₂ e yr ⁻¹)
USA ^[14,23]	60	30-40%	48-64 [North America]	384	29.3	413.3
EU ^[30-32]	88	20%	2.98	170- 500	10.6	180.6 - 510.6
China ^[33-36]	90	>6%	8.85 [East Asia]	1,041	15.0	1,056
India ^[25,37-39]	67	40%	5.11 [South Asia]	437	7.5	444.5
World ^[13,25-29]	1600 - 6600	25-30%	0.541 - 0.939 Gt	~3.3Gt	256	3905 - 4936

Table 3 illustrates the breakdown of emissions from food waste in various regions of the world. Fixed N₂O emissions represents the total nitrous oxide emissions from agriculture production fixed per the percentage of food wasted to the total supply (the column left of this one). The locations within the brackets indicate what area the data describes (i.e. for the U.S., the available statistic was for North America). Carbon Footprint is defined as the GHG emissions emitted throughout the life cycle of food waste. ^[13] This includes the agricultural emissions (both energy and non-energy) ^[12], but does not include land-use changes and waste disposal. ^[63] For the net methane emissions column, all data points except the U.S.A.'s have fixed the total region's GHG emissions with the percent of municipal solid waste (MSW) that is food waste. U.S.A.'s data point comes from using the EPA's algorithm of emissions from food waste. Only the U.S. methane emissions data point includes transportation to the landfill. ^[23]

⁸ The carbon footprint for food waste production in North America and Oceania is 860kg per capita, 680kg per capita in the EU, 740kg per capita in China, and 320kg per capita in India. ^[13] The U.S. population used was 330,272,000. ^[28] The E.U. population used was 447,700,000. ^[61] China's population number used was 1,408,000,000. ^[64] India's population used for this point was 1,366,417,754. ^[63]

Table 4: Global and Campus per capita GHG Emissions from Food Waste

Location	Total Food Waste (MMT)	Waste per capita (MT/person)	Total Food Waste Emissions (MMTCO ₂ e)	Total Food Waste emissions per capita (MTCO ₂ e/person)
UCSD	0.00170 - 0.00215	0.04 ^[14] ⁹	0.0322 - 0.0325	0.880 - 0.889
United States	60	0.18	413.3	1.25
Europe	88	0.20	180.6 - 510.6	0.403 - 1.14
China	35	0.025	1,056	0.75
India	67	0.049	444.5	0.325
World ¹⁰	1600 - 6600 ^[13]	0.21-0.86	3,950 - 4,936	0.513 - 0.64

⁹ This point came from the UC San Diego Zero Waste Working Group's estimate of pounds thrown away per weighted campus user (WCU). ^[7] Composition of total waste is estimated to be 26.29% based on UCSD Waste Audit information from the University's Waste Manager, Jeffrey Summerhays.

¹⁰ The World population used for this row was 7.76 billion. ^[28]