Google

Data-Driven Sustainable Food Sourcing

Developing an assessment of the carbon and water footprints of food purchasing at Google Inc.

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The Group Project is required of all students in the Masters of Environmental Science and Management (MESM) Program. It is a three-quarter activity in which small groups of students conduct focused, interdisciplinary research on the scientific, management, and policy dimensions of a specific environmental issue. This Final Group Project Report is authored by MESM students and has been reviewed and approved by:

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ABSTRACT

Modern agriculture places intense stress on existing natural resources and is a major contributor to anthropogenic climate disruption. Furthermore, as human population continues to grow, global food demand also increases, placing additional pressure on the environment. The identification and implementation of less impactful agricultural practices is critical to sustainably feed the world's population, addressing both present and future challenges.

The purpose of this project is to provide a data-driven method for evaluating the water and carbon footprints of the employee food program at Google Inc.'s Mountain View campus. The project utilized economic input-output life cycle assessment to identify hotspot food categories, based on the client's purchase data for a three month period in 2013. Each hotspot food category underwent an input contribution analysis to establish which primary inputs have the greatest environmental impacts. An output contribution analysis identified recurring processes throughout the supply chain that contribute the greatest environmental impacts as a result of the client's food procurement practices. Finally, a regionalized water stress index provides a tool for sourcing agricultural products from states with appropriate water resources. The end result is an analysis tailored to the client which can help guide a data-driven sustainable food sourcing strategy.

EXECUTIVE SUMMARY

PURPOSE

Google Inc. is renowned for its unique company culture and exceptional employee perks, especially its lauded employee food program. The company provides breakfast, lunch, and dinner, as well as a variety of beverages and snacks, for its entire workforce every weekday. Daily, over 30,000 meals are served at Google's Mountain View, California, headquarters.

The goal of this project is to provide Google with a data-driven method of assessing and reducing the environmental impact of procuring food for its Mountain View campus, without affecting the employee experience. Google demonstrates a commitment to mitigating environmental impacts throughout its business operations; the company's sizable food program is no exception. The challenge Google faces is that it lacks a method to quantify the food program's environmental impact, which is an essential first step to sustainable sourcing. Measuring the program's impacts enables Google to implement a sustainability strategy and quantitatively assess its effectiveness in reducing its environmental footprint.

Three processes serve as project objectives and provide Google with the information to develop a sustainable food sourcing strategy:

- Quantify the global warming impact and water consumption of Google's 2013 food purchases to develop a prioritized list of food category hotspots
- Identify and analyze the food production processes most responsible for global warming impacts and water consumption
- Analyze regional water supply and demand differences in the United States

BACKGROUND

The project team conducted a screening-level input-output life cycle assessment (IO-LCA) to quantify Google's carbon and water footprints. The IO-LCA used three months of 2013 Mountain View food purchasing data and reflects of the client's most recent food purchasing strategies.

METHODS

Google provided three months of purchasing data, which were extrapolated into one year of food expenditures. Individual line items from the data were aggregated to match the North American Industry Classification System (NAICS) categories for compatibility with the IO-LCA tool utilized. This study relied upon the Comprehensive Environmental Data Archive version 4.0 (CEDA) IO-LCA tool, which links economic flows to environmental

impacts, and provides the user with a per-dollar impact for any item purchased. We used CEDA to perform a life cycle impact assessment, as well as input and output contribution analyses, of Google's food purchases in terms of global warming impacts and water consumption. We created a complementary water stress index from United States Geological Survey data to compare water stress between states in order to guide sourcing decisions.

RESULTS

Results are derived from four separate analyses: life cycle impact assessment, input contribution analysis, output contribution analysis, and regional water stress index. All of these results are based on the specific composition of Google's food purchases.

The life cycle impact assessment results provided carbon and water footprints for three separate levels of purchasing: total purchases, broad food categories, and individual food items. The annual global warming impact of Google's 2013 food purchases was 45.91 kilotonnes carbon dioxide equivalent (CO_2e). The total water consumption was 16.14 megatonnes. The analyses of broad food categories and individual food items revealed two important points. First, relatively few food items are responsible for a major portion of global warming impact and water consumption. Second, animal products have dramatically disproportionate environmental impacts.

The input contribution analysis shows the primary inputs that contribute to global warming impact and water consumption of both overall purchases and food category hotspots. For overall purchases, the top primary input contributing to global warming impact was cattle ranching and farming, while the top primary input contributing to water consumption was support activities for agriculture and forestry. The results for food category hotspots can be found in the input contribution analysis results section later in this report.

The output contribution analysis identifies processes that directly generate global warming and consume water as part of the food procurement supply chain. The supply chain process that contributes the most to global warming impact is cattle ranching and farming, while vegetable and melon farming contributes the most to water consumption.

The water stress index quantifies relative water use from regionally sourced agricultural products, based on withdrawals from the environment and irrigation rates. The five most stressed states are Idaho, Colorado, California, Nebraska, and Montana. The five least stressed states are West Virginia, Maine, Vermont, Kentucky, and New Hampshire.

CONCLUSIONS AND RECOMMENDATIONS

The analyses detailed above serve several purposes for the client. They provide a benchmark of annual global warming impact and water consumption; a prioritized list of food category hotspots, primary inputs, and supply chain processes; and an in-depth comparison of states based on water stress. Based on these results, we recommend four primary methods for reducing global warming impact and water consumption.

First, product substitution is one of the most obvious ways to reduce environmental impacts, by replacing highly impactful items, such as red meat, with less impactful alternatives, such as poultry or vegetarian options. However, this strategy does not meet the criteria of reducing Google's environmental footprint without affecting the employee experience.

Second, developing a supplier scorecard based on input contribution analysis results is an effective way to compare production practices among suppliers. Purchases can be made from suppliers who use farm-level practices with the least impact, which yields easily quantified reductions. This allows the client to reduce its carbon and water footprints without any change to the food made available to employees.

Third, the water stress index is a guide for preferentially sourcing foods from states that are the least stressed, which reduces the program's effective water footprint.

Finally, to more completely address food category hotspots, a different life cycle approach may be necessary. While screening-level IO-LCA is useful for analyzing numerous categories at a national scale, a process-based LCA can analyze specific, individual food items in greater detail.

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1 BACKGROUND

1.1 POPULATION GROWTH AND FOOD CRISIS

The importance of sustainable agricultural practices is demonstrated by considering the relationship between human population growth and increased food demand. As global population continues to increase, the demand on agricultural systems similarly rises. A report by the United Nations shows that global population could exceed ten billion people by 2050 ("World Population Prospects", 2011).

Such population growth will account for a 100% to 110% increase in global crop demand, with significant implications for spatial and natural resource requirements (Tilman et al., 2001). A dramatic increase in demand will require strategic and technological advancements to achieve sustainable solutions. A study from the University of Minnesota asserts that the current global food production trajectory will not meet the demand of the human population in 2050 (Ray, Mueller, West, & Foley, 2013). According to a study released by the Center for Agricultural and Rural Development at Iowa State University, "food demand will grow by more than population growth" (Babcock, 2008). See Figure 1.

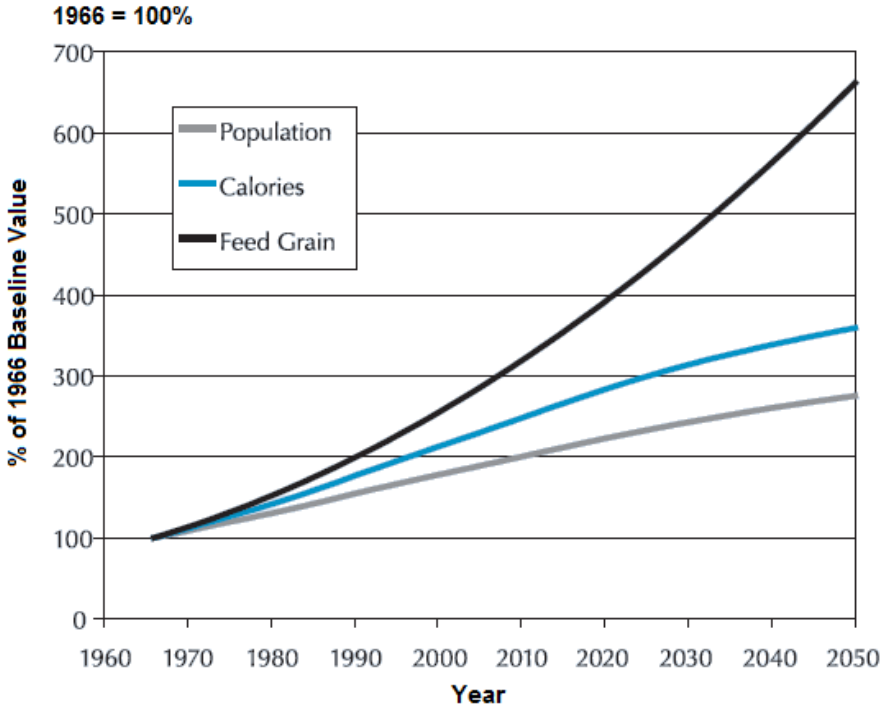


Figure 1 - World Population and Food Demand: Three key indicators of food demand projected to 2050. Values are represented as a percentage of the 1966 baseline. Source: (Babcock, 2008).

The reasoning behind this impending crisis is based on trends of increased per capita calorie consumption, as well as an increase in the proportion of food consumption calories that come in the form of animal protein. As more people in developing countries enter the middle class, as is expected over the next 30 years, protein will constitute a larger

proportion of their diets. Producing animal protein for human consumption has significant environmental implications, increasing land demands for animal feed growth and a greater overall carbon footprint than plant-based foods. To demonstrate this point, consider only that the production of one kilogram of meat can require somewhere between three and ten kilograms of grain (Tilman, Cassman, Matson, Naylor, & Polasky, 2002) that may otherwise be eaten by humans. As protein consumption accelerates along with global food demand, these forecasts have apparent far-reaching implications for the agricultural industry. In fact, there are already areas of developing countries where rapid population growth is causing devastating problems. An estimated 400 million people are chronically malnourished across the globe and 11 million children under the age of five die from hunger or hunger-related diseases annually ("The State of Food", 2012).

Taking these factors into account, a dual imperative emerges: to increase food production to keep up with population growth and to do so in a manner that preserves natural resources and minimizes global warming impact. For humanity's own prosperity, it is crucial that the food demand stress be lowered for the human population in the future.

1.2 AGRICULTURAL CONTRIBUTION TO GLOBAL WARMING

As humans begin to better understand and manage their role in a changing climate, the way in which we eat has come under similar investigation. The United States agricultural system alone is responsible for an estimated 8% of national greenhouse gas (GHG) emissions (USEPA, 2013). On a global scale, agriculture plays a more significant role. In 2005, direct emissions from agriculture accounted for 13.8% of global global warming impact (Herzog, 2009). Land use change, which accounts for 12.2% of global global warming impact, is an important effect of expanding agriculture. Combining these categories, agricultural emissions account for 26% of total global warming impact (Herzog, 2009). In addition, agriculture currently occupies roughly 38% of the earth's land surface, greater than any other land use (Foley et al., 2011). As previously stated, global human population growth will only exacerbate the issue.

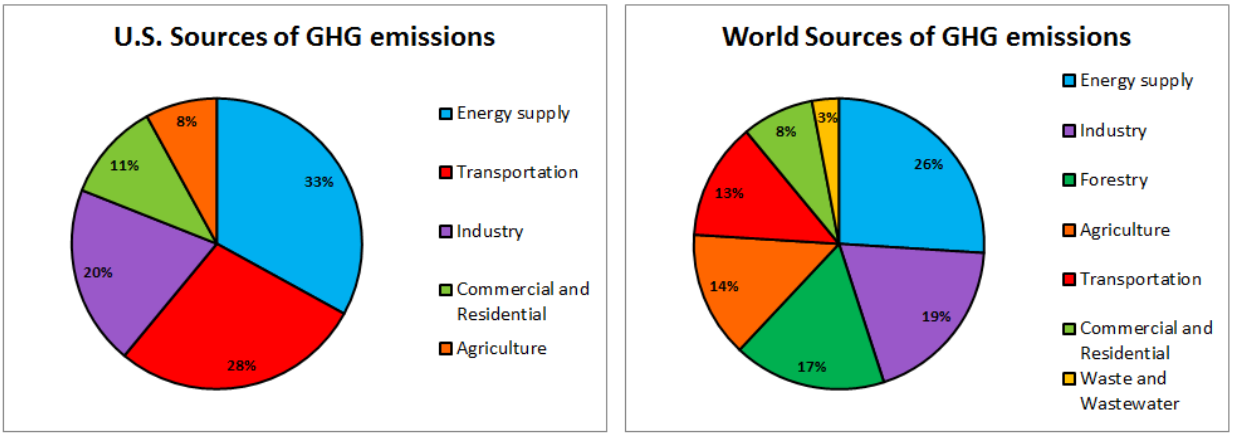


Figure 2 - U.S. (2011) and World (2007) Greenhouse Gas Emissions by Economic Sector: Pie charts depicting the share of greenhouse gas emissions from industrial sectors for the U.S. (left) and the world. Source: US EPA, 2013.

1.3 AGRICULTURAL CONTRIBUTION TO WATER STRESS

Rainfall alone is insufficient to support all of the crops grown in the United States. Where precipitation is insufficient, irrigation technologies make up for national agricultural water demand. Due to regional variations in precipitation and temperature, otherwise identical plants can require vastly different amounts of irrigation. Agriculture accounts for 80% of ground- and surface-water consumption in the U.S., but that number exceeds 90% in the western states ("Irrigation and Water Use", 2013). Irrigation contributes to a large portion of U.S. agricultural value, with 55% of the total value of crop sales coming from irrigated farms. Additional value is derived from the use of irrigation to produce forage and feeds for the livestock and poultry industries ("Irrigation and Water Use", 2013).

About 57 million acres were irrigated in 2007, accounting for 7.5% of all cropland and pasture in the U.S.; the 17 westernmost contiguous states accounted for nearly three quarters of this amount ("Irrigation and Water Use", 2013). Water demands increase as irrigated acreage expands. Irrigated acres increased almost 1.3 million acres between 2002 and 2007, and the increase in irrigation still continues ("Irrigation and Water Use", 2013). In 2008, agriculture used 91.2 million acre-feet of water for irrigation, with the western states contributing to over four-fifths of the water applied ("Irrigation and Water Use", 2013). For context, a single acre-foot is roughly the amount of water typically used by two families of four in a year.

Therefore, it is important to consider not only the quantity of water used to produce food, but also the location of the water sources used for irrigation.

1.4 OTHER AGRICULTURAL IMPACTS TO THE ENVIRONMENT

Conventional agriculture is responsible for many environmental and human health issues, in addition to contributions to water stress and global warming. Such issues include nutrient pollution in the form of eutrophication of marine and freshwater systems, soil degradation and erosion, loss of biological diversity due to the use of toxic pesticides and widespread monoculture farming, public health concerns regarding the consumption and bioaccumulation of pesticides, antibiotic and pesticide resistance, and many others (Tilman et al., 2001). Because the extent of these issues is subject to spatial and temporal variation, global impacts are difficult to quantify and fraught with uncertainty. For the purposes of this project, the metrics of environmental impact are limited to carbon footprint (global warming impact) and water footprint (quantity of water required relative to local water supply).

1.5 TRENDS IN SUSTAINABLE FOOD PURCHASING

A great deal of research has been conducted to better understand the less resource-intensive methods of producing food, but after more than a decade of being widely accepted in literature, the term "sustainable agriculture" still lacks a widely accepted

definition (Heller & Keoleian, 2000). Agricultural production is a complex process that combines different marketable products and affects different environmental goods and services that are linked to each other and are not separable (Heal & Small, 2002). This complexity makes it very difficult to decide which foods or production methods are most sustainable, especially for consumers.

As a result, conscientious consumers have tended to follow food trends that focus either on production method (i.e., organic) or transportation distance (i.e., local farmer's markets or a predetermined production radius) (McWilliams, 2009). These trends have been mirrored by the eco-minded sector of the food service industry, as evidenced by the prominence of restaurant menus that emphasize locally produced, in-season, and/or organic ingredients.

However, such purchasing ethics incompletely address the true environmental impacts of foods. While organically grown produce may require fewer inputs and thus have a smaller carbon footprint (Pimentel, Hepperly, Hanson, Douds, & Seidel, 2005), organically raised animal products may actually have a larger carbon footprint than their conventionally raised counterparts, per unit produced, due to highly efficient economies of scale (De Boer, 2003). Focusing on locally grown foods, on the other hand, may reduce emissions associated with transportation of a product. However, studies show that transportation actually accounts for a trivial amount of lifecycle emissions associated with bringing a food to market. According to Weber & Matthews (2008), for foods that travel 1,640 km on average from producer to market, transportation emissions only contribute 4% to total global warming impact.

According to the United States Department of Agriculture (USDA), the influence of the food service industry as a proportion of the American diet is growing. This means that individuals are increasingly leaving the procurement of the foods they eat to a third party, further separating themselves from the sources of their nutrition. A study conducted during 1977-78 and 1994-96 found that consumption of food prepared away from home increased from 18% to 32% of total calories (Guthrie, Lin, & Frazao, 2002). The food service industry in the United States is also growing. $683.4 billion in projected sales for 2014 are nearly double the $379 billion in food service industry sales from 2000. See Figure

Further, the National Restaurant Association (NRA) expects 47% of US consumer food spending in 2014 to be at food service establishments. Luckily, efforts to engage in environmentally preferable practices are growing in the industry, both as a cost-saving measure and in response to growing consumer interest in sustainability. According to the National Restaurant Association's 2009 Restaurant Industry Forecast, more than six out of ten consumers say they are likely to choose a restaurant based on its environmental efforts. In addition, 44% of consumers say they are likely to make a restaurant choice based on a restaurant's efforts to conserve energy and water ("Restaurant Performance Index", 2008). Although there is consumer interest in environmental sustainability, there is not yet an industry-accepted standard to measure environmental impacts. A clearer understanding of

what foods are minimally impactful on the environment would help both individual consumers and restaurants alike source more sustainably.

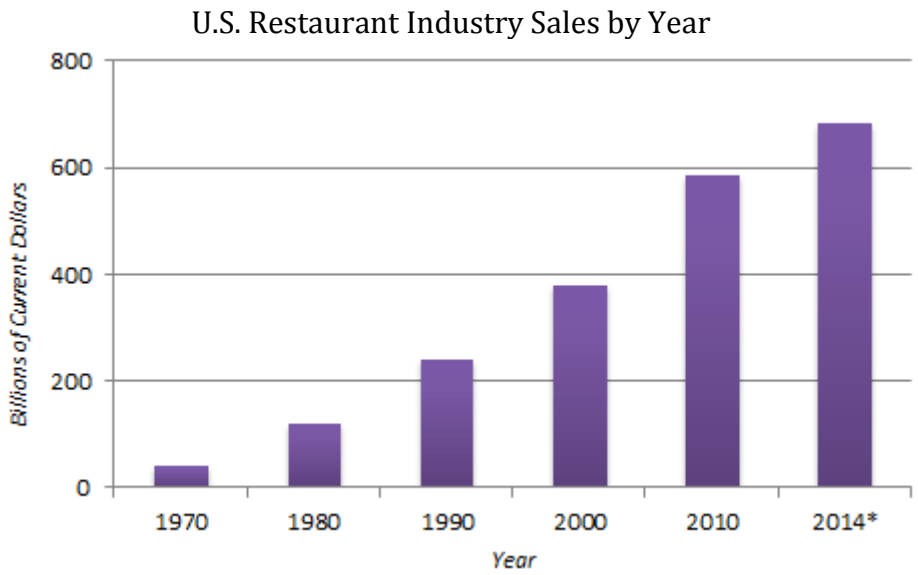


Figure 3 - U.S. Restaurant Industry Sales: Sales of the U.S. Restaurant Industry from 1970 projected to 2014. Figures are depicted in present-day dollars.*Projected yearly sales for 2014. Source: National Restaurant Association, 2014.

The results of environmental impact studies will vary based on the stage of the food system studied (Heller & Keoleian, 2000). The food system is often broken down into the following lifecycle stages:

- origin of genetic resource (seed production, animal breeding)
- agricultural growing and production
- food processing, packaging, and distribution
- preparation and consumption
- end of life (waste)

The environmental impacts and stakeholders involved are all interconnected, yet will have different factors and indicators depending on the life cycle stage of the food system. From the standpoint of a food procurement department, the phases over which the entity has sourcing control would likely include agricultural growing and production as well as food processing, packaging, and distribution. Relevant environmental impacts in these phases might include the following:

- emissions from the production and transport of all agricultural inputs
- direct and indirect emissions from on-farm energy use
- non-energy-related emissions from soils and livestock, such as methane released from livestock rearing and manure management
- eutrophication caused by nutrient runoff
- water stress impacts
- energy consumed in processing foods

- recyclable or compostable packaging
- distance and form of product distribution

In contrast, a restaurant kitchen or individual consumer must consider additional lifecycle stages, namely food preparation and consumption. This portion of the life cycle might include the following:

- energy used in all phases of food preparation, including storage/refrigeration, cooking, and ventilation
- water consumption
- amount and food type of calories consumed
- food waste and disposal

Growing concern about the environmental impacts of agriculture and the broader food system has prompted additional research on the topic. In previous research, life cycle assessment methodology has predominantly been applied to industrial products and processes, though it is increasingly being used as a tool for research in the agricultural sector (Schau & Fet, 2008). The discipline is described in greater detail below.

1.6 LIFE CYCLE ASSESSMENT METHODOLOGY

Life cycle assessment (LCA) is a widely utilized tool that helps decision-makers understand products' environmental impacts through the assessment of products' lifecycles. This tool emerged from the concept of life cycle thinking "a paradigm that provides a holistic picture of an entire product system including resource extraction, material processing, transportation, manufacturing, distribution, use, disposal, and reuse/recycling" (Suh, 2013).

Present-day ISO standards provide a uniform approach to conducting LCAs to allow for researchers to use consistent methodologies and more easily compare results. ISO standards outline four primary steps in a life cycle assessment: goal and scope definition, inventory analysis, impact assessment, and interpretation ("ISO 14040", 2006). Step one, goal and scope definition, includes selection of a system boundary and appropriate level of detail to match the intended use of the study results ("ISO 14040", 2006). Step two, inventory analysis, entails data collection of a product's inputs and outputs throughout its life cycle ("ISO 14040", 2006). Step three, impact assessment, assigns environmental impact categories and values to inventory analysis results in order to understand the environmental significance of the entire product system ("ISO 14040", 2006). These impact categories may include global warming, acidification, smog, ozone layer depletion, eutrophication, toxin release, habitat destruction, desertification, land use, and resource depletion ("ISO 14040", 2006). Step four, interpretation, involves discussion and revision of life cycle inventory and impact assessment results to ensure data collection and analysis match the goal and scope of the project ("ISO 14040", 2006). LCA is an iterative process, while the first three steps have an explicit sequence, the interpretation step may occur at any point during the study ("ISO 14040", 2006). The repetition of the interpretation step

serves to keep the LCA methodologies consistent with the initial goals of the study ("ISO 14040", 2006).

A complete introduction to the study of life cycle assessment is presented in Appendix A.1, which outlines life cycle thinking, understanding a product's life cycle, as well as the concepts of inventory analysis and impact assessment.

1.7 LIFE CYCLE ASSESSMENT IN FOOD SERVICE

The first known application of life cycle assessment took place in 1969, when the Coca-Cola Company's packaging manager wanted to quantify the energy, material, and environmental consequences of the manufacturing process for various types of beverage cans (Heller & Keoleian, 2000). This encompassed process analysis marked the first time that energy and environmental concerns were conceptualized and helped Coca-Cola justify their switch from glass to plastic product packaging. This process was originally used by private clients for internal impact assessments. However, the process gained momentum in 1990 when the Society of Environmental Toxicology and Chemistry convened a workshop systems concept that expanded and defined LCA (Hunt, Franklin, & Hunt, 1996). Concurrently, the Environmental Protection Agency became interested in developing LCA guidelines and databases for public use in determining environmental analysis. Today, many companies have adopted LCA thinking into their food sourcing supply chains with companies ranging from General Mills to Bacardi to McDonald's ("World Food LCA Database", 2014).

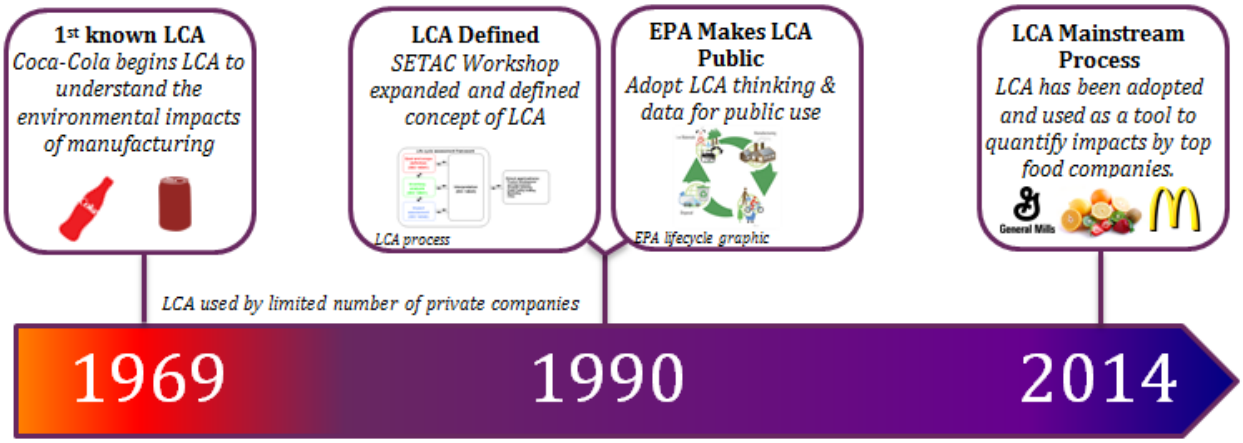


Figure 4 - Timeline of Key Milestones for Life Cycle Assessment in the United States.

One example of a food service company incorporating life cycle thinking into reducing its environmental impact is the onsite food service company Bon Appétit Management Company (BAMCO), which is owned by Compass Group. BAMCO currently has 400 locations in 30 states. The company is focused on bringing high-quality, from-scratch meals to university dining halls, corporate cafés, and other institutions. In 1999, the company became concerned with environmental sustainability and changed procurement

policies to address issues such as the living conditions of livestock and poultry, food waste, and seafood health and sustainability. By 2005, they had a successful Farm-to-Fork program which sourced food from local farmers and had formed a not-for-profit foundation to fund education programming and activism on the food system (Thistlethwaite & Brown, 2010).

BAMCO is also striving to reduce its carbon footprint, noting that "remarkably, the connection between food and climate change is rarely discussed, even though research shows that agriculture and the food system overall is responsible for one-third of global greenhouse gas emissions, and dietary choices can equal the difference between driving an efficient sedan versus a large SUV" ("Tackling Climate Change", 2014). In an effort to encourage chefs and guests to consider the effects their food choices had on climate change, BAMCO designed the Low Carbon Diet, which is an LCA tool that estimates global warming impact associated with food production, distribution, and preparation. Additionally, the company is auditing the energy and water efficiency of kitchen equipment and hosting an annual Low Carbon Diet Day.

1.8 CLIENT BACKGROUND AND HISTORY

Google Inc. is a multinational technology company founded in 1998. Its core business is internet search solutions and online advertising, but the company quickly expanded to other products and services including e-mail, mapping, document storage, mobile device hardware and software, social media, entertainment, and even self-driving vehicles. Google is headquartered in Mountain View, California and has grown to over 70 offices in over 40 countries worldwide. The company, which earned $50 billion in revenue in 2012, is renowned for its unique corporate culture and unconventional employee benefits, perhaps the most prominent of which is their free food program. Other perks include dry cleaning, haircuts, access to exercise equipment and training, and shuttle service to and from work ("Google's Mission," 2014).

Figure 5 - Map of Google Office Locations Worldwide. Source:"Google's Mission," 2014.

	2011	2012
Revenue	$39,705,000,000	$50,175,000,000
Net Income	$9,737,000,000	$10,737,000,000
Number of Shares	322,778,000	327,213,000
Earnings Per Share (EPS)	$30.17	$32.81
Stock Price Growth	6.88%	6.31%

Figure 6 - Google's Financial Information. Source: "2013 Financial Tables," 2014.

1.8.1 CORPORATE SOCIAL RESPONSIBILITY

The employee perks offered at Google's offices are one leg of a broader corporate social responsibility program. On its corporate website, the company states that it is "firmly committed to active philanthropy and to addressing the global challenges of climate change, education, and poverty alleviation" ("A Better Web," 2014). In addition to a variety of philanthropic efforts such as disaster relief and free advertising for select charities, Google has made a series of significant investments in renewable energy, both on its own rooftops and in large-scale solar and wind farms. For its efforts, the EPA recognized Google in 2011 as a "Green Power Leadership Award Winner." The tech giant also achieved the top rank in Greenpeace's "Cool IT Leaderboard" in 2012 and 2013 ("A Better Web," 2014). The company manages its internal sustainability in a variety of ways, from encouraging carpool and bicycle commutes to a strong commitment to indoor environmental quality in the workplace. Though these efforts certainly do lessen the company's environmental impact, they are not without their direct and indirect financial returns for the company.

1.8.2 GOOGLE FOOD PROGRAM

Google's employee food program is quite extensive. In addition to free breakfast, lunch, and dinner provided in a buffet-style café setting, office buildings also feature "micro-kitchens" in which snack foods, coffee, and beverages are made available around the clock. On the Mountain View campus alone, Google serves over 30,000 meals daily to its ever-expanding workforce. At Google cafés, focus is placed on convenient, high-quality, healthy, and sustainable meals made from scratch. The organization has implemented and experimented with a variety of responsible food sourcing strategies, including a "buy local" approach, organic fruit and vegetable sourcing, and a "community supported fishery" (CSF) program (Olivia Wu, personal communication, 2013).

However, with growing procurement needs to feed an ever-growing employee base, sustainable sourcing has become both unfeasible from a supply perspective and undesirable from an economic perspective. Google, a company known for its slogan "don't be evil," is faced with the dilemma of feeding tens of thousands of people while minimizing environmental impacts. Central to this problem is a lack of consensus on what foods actually are the best environmental performers, and how to encourage such a diet. As an environmentally conscious corporation, Google desires a data-driven approach to cost-effective, sustainable food sourcing (Scott Giambastiani, personal communication, 2013).

The food program faces unique demands from its employees, and environmental impact is but one of many competing priorities. In addition to considering the environment, the program seeks to balance taste, health, convenience, special diets, program cost, and social factors associated with food production (Michiel Bakker, personal communication, 2013). For example, although individually packaged snack foods and bottled beverages could be replaced with a more environmentally friendly alternative, this interest must be balanced with the sacrifice in convenience for the client's on-the-go employees. For this reason, it was established early in the project planning phase that the desired focus of this project was to analyze sustainable production (i.e., identifying the most sustainable forms of foods), rather than provide recommendations for sustainable consumption (i.e., product substitution and waste minimization).

A company with Google's breadth of expertise has tremendous ability to disrupt industries with innovative technologies, but may also be able to drive change with its purchasing power and economies of scale. Its search engine, maps software, cloud storage, "Google Glass," and self-driving vehicles are among many prominent examples of Google's disruptive technologies, but the company is also an enormous purchaser. Even small changes in the company's food purchasing supply chain can reap large environmental impacts, and potentially drive demand for more sustainably produced foods. This type of "food revolution" is a movement the company has an interest in fostering, as evidenced by a partnership with chef-activist Jamie Oliver for Food Revolution Day in 2012 (Ho & Kurnit, 2012). However, without quantitative evidence of the impact of various food items, Google is ill-equipped to drive changes on the scale of its formidable employee food program.

2 PROJECT OBJECTIVES

The goal of this project is to provide Google with a data-driven method of assessing and reducing the environmental impact of procuring food for its Mountain View campus, without affecting the employee experience. Google demonstrates a commitment to mitigating environmental impacts throughout its business operations; the company's sizable food program is no exception. The challenge Google faces is that it lacks a method to quantify the food program's environmental impact, which is an essential first step to sustainable sourcing. Measuring the program's impacts enables Google to implement a sustainability strategy and quantitatively assess its effectiveness in reducing its environmental footprint.

Three processes serve as project objectives and provide Google with the information to develop a sustainable food sourcing strategy:

- Quantify the global warming impact and water consumption of Google's 2013 food purchases to develop a prioritized list of food category hotspots
- Identify and analyze the food production processes most responsible for global warming impact and water consumption
- Analyze regional water supply and demand differences in the United States

3 PROJECT SIGNIFICANCE

Google is renowned for its unique company culture and exceptional employee perks, especially its lauded employee food program. The company provides breakfast, lunch, and dinner, as well as a variety of beverages and snacks, for its entire workforce every weekday. When Google was a smaller, younger company, this program was small in scope and flexible to suit the desires of its workforce. However, the company has grown rapidly in recent years, topping 45,000 employees worldwide in 2013. What was once a small side project has quickly become a large-scale food service operation requiring a dedicated team of employees and a sizable budget.

Daily, over 30,000 meals are served at Google's Mountain View headquarters. Google's Global Food Team guides strategic decision-making and implements guidelines company-wide for the food program. Among the team's many priorities is the provision of meals made from high quality, sustainably produced ingredients. Although a technology company at its core, Google is a demonstrated leader in greening its own operations while promoting environmentally responsible actions and technologies outside its organization's walls. The scale and cost of such a commitment to food quality and sustainability makes procurement a significant challenge for the company, however.

This project can be considered a necessary first step in understanding the practical implications of a large-scale food service operation such as Google's. The food system is a complicated web of producers, suppliers, distributors, buyers, consumers, and waste

managers that is growing ever more global. Confronting agriculture or food systems from an industry-level perspective is far too broad to affect any meaningful change. From the perspective of an individual buying entity, however, affecting change can be a daunting task. Even the most sustainably minded buyers might not know where to start, or worse, may focus their attention on the wrong areas. There is a need for a consistent methodology to better understand the impacts of various foods, how and where they were grown, and how they arrived on the eater's plate.

Creating a consistent and replicable framework for measuring and minimizing the impacts of foods could have a meaningful impact on Google's food program and contribute to its broader sustainability goals. If the company was to fully leverage its purchasing power and implement such a sustainable procurement strategy company-wide, the impact would be orders of magnitude greater. Further, considering the reach and influence Google has on other companies, entire industries, and individuals worldwide, the implications of setting the example for environmentally efficient food sourcing could be global in scope.

4 PROCESS OVERVIEW

4.1 FOOD PROCUREMENT DATA

The group obtained Google's food purchasing data for a three month period from the CrunchTime! restaurant inventory management software. An entire year of purchasing data would have been ideal, but data availability was limited due to an internal transition in food procurement software. The data included all food and beverage items purchased between April 12 and July 12, 2013. This data set was deemed sufficiently representative of both the relative quantity and type of foods purchased year round. As such, relevant totals from the dataset were multiplied by a factor of four to extrapolate the data to annual purchasing figures. This decision was made with the agreement of the client.

4.2 PRIORITY PHASING

The life cycle impact assessment portion of this project addressed 100% of the food items purchased by the client. However, for the purposes of providing impactful further analysis, food items were organized into two priority phases. Phase 1 food items were those deemed most impactful and most easily addressed. These foods were determined by the project team to meet all four of the following criteria.

1. Item is homogenous in nature.
2. Item is minimally processed.
3. Item can be sourced from multiple regions and can have variable inputs.
4. Items for which global warming impact and water impact are the most relevant environmental indicators.

A simplified depiction of the phasing procedure is shown in Figure 7.

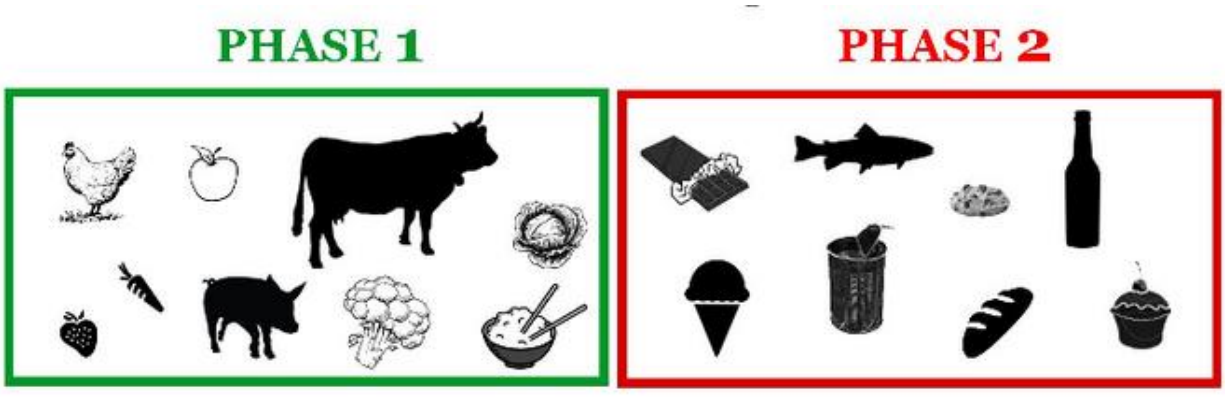


Figure 7 - Simplified Depiction of Phasing of Food Items for Analysis.

For example, foods that were relegated to Phase 2 included items such as trail mix, cookies, soft drinks, or finfish. Trail mix, being characterized by several ingredients such as

grain, nuts, dried fruit, yogurt bits, and so on, does not lend itself to meaningful sourcing recommendations. Oreo cookies, being highly processed, do not have relevant sourcing alternatives that are still Oreo cookies. Coca-Cola is produced identically across the U.S. from identical ingredients, leaving little room for sourcing alternatives. Finally, although finfish production has very high water requirements, other biological concerns such as the status of the fish stock and location of origin are not captured by global warming impact and water consumption, and could result in misleading or incomplete conclusions.

The distinction between phases enabled the group to go beyond a coarse, top-down impact assessment and to conduct a finer, bottom-up analysis for only Phase 1 food categories. Phase 1 food categories account for approximately 73% of total global warming impact and 63% of total water consumption of the food program.

4.3 SUPPLY CHAIN COMPLEXITY

With such a large and varied dataset, Google's food program supply chain is obviously very complex. Foods are sourced from a variety of suppliers and distributors, who source from farmers, ranchers, bakers, and processors, who require a variety of material and energy inputs for their production practices. The Google-specific food supply chain might look like the following:

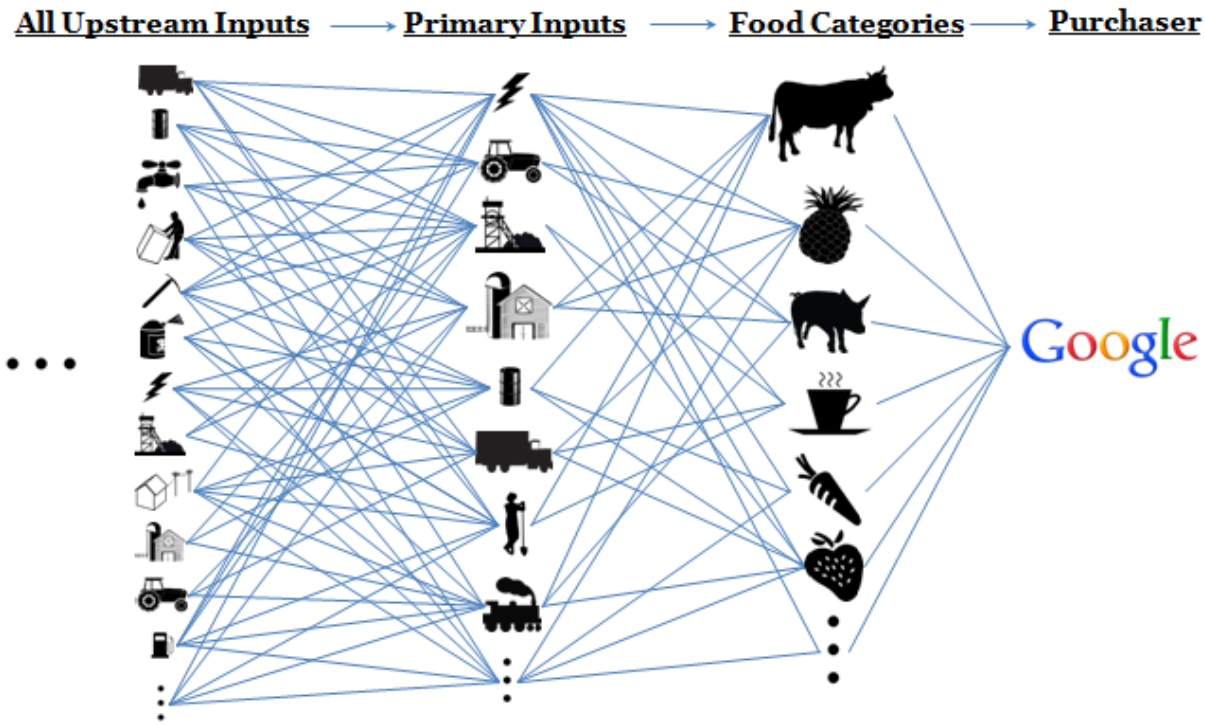


Figure 8 - Complexity of Google Supply Chain: Each icon represents an industry process or product. Each column represents a level of upstream production. The lines indicate relationships between processes and products throughout the supply chain.

This system complexity, beginning with the purchaser and working upstream to all of the inputs required for production of individual food items, necessitates a supply-chain-wide analysis in order to provide the client with the most actionable information possible.

4.4 PROCESS FLOW

In order to find a meaningful way to improve the client food program's sustainability, it was first necessary to take a metrics-based approach to quantifying global warming impact and water consumption of the entire food program, each aggregate food category provided, and each individual food item. This screening-level assessment is the **Life Cycle Impact Assessment** portion of the project, and provides a baseline water and carbon footprint. This section also exposes food category and food item hotspots.

The life cycle impact assessment identified food item hotspots that contribute most significantly to the food program's overall water and carbon footprints. With this knowledge, the next step of the project was to analyze and quantify the top primary inputs to the production of each of these food items through an **Input Contribution Analysis**. Identifying the primary inputs whose impacts are embodied in a given food item provides insight and actionable information for the client's procurement decision-makers. The most impactful primary inputs of the food item hotspots represent the most actionable opportunities for reducing environmental impacts. Knowledge gained from the input contribution analysis provides a framework for the client to compare suppliers based on relative input requirements for a given food.

The next level of analysis is to expand to all upstream inputs and identify hotspot input processes across the entire food program supply chain. The **Output Contribution Analysis** identifies the processes that directly generate environmental impacts attributable to the client's food procurement supply chain. For example, it is known that electricity is required for a variety of processes that go into the production of many different foods. Understanding to what extent electricity is responsible for environmental impacts across the entire supply chain provides the client with information to develop a macro-level food sourcing strategy.

The results to be presented from each of the analyses detailed above are based on national average data. This relative lack of granularity is appropriate for global warming impacts, as greenhouse gases by definition result in impacts on a global scale. However, this is not the case for water consumption. It is very important to consider regional differences in water supply and demand when quantifying impacts. To account for these differences, a regional **Water Stress Index** tool was created to better inform the implications of food sourcing for water.

A visualization of the project process flow is shown in Figure 9. In the diagram, the corresponding colored brackets indicate the depth of the supply chain at which hotspots were identified during an analysis.

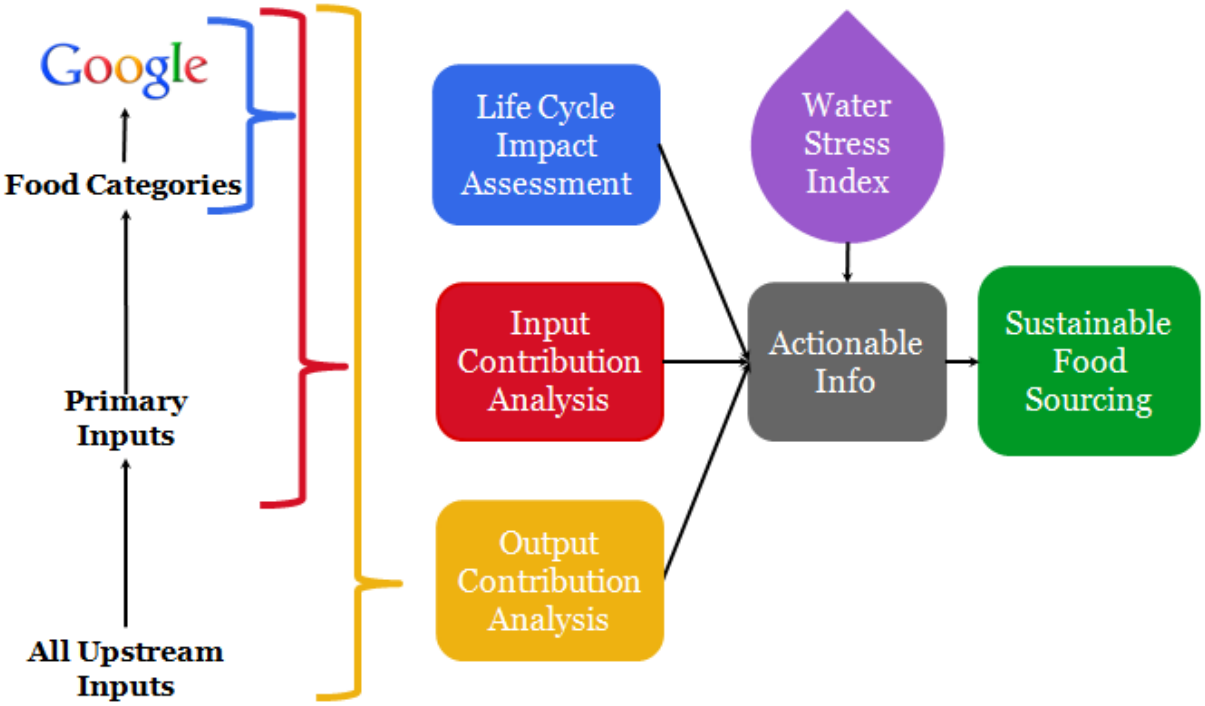


Figure 9 - Process Flow Diagram: A generalized view of the food program supply chain is detailed on the left side of this graphic. The four sections of this project, indicated by the depth with which they address the supply chain, combine to provide actionable information to the client, which ultimately guides sustainable food sourcing.

5 LIFE CYCLE IMPACT ASSESSMENT

5.1 INPUT-OUTPUT LIFE CYCLE ASSESSMENT

Google purchases a diverse assortment of foods, in bulk, nationwide. Therefore, it is appropriate to use an input-output life cycle assessment (IO-LCA), which analyzes purchases on an economy-wide scale. Simply put, input-output life cycle assessment allows users to screen large data sets to quantify environmental impacts if they know how much was spent on an item.

In IO-LCA, the environmental impact of a product is quantified by multiplying purchase dollars spent on an item by an indicator result for that type of item (see Figure 10) (Suh, 2004). For example, if a study wanted to understand the global warming impact of purchasing $5.00 of apples, the study would multiply the global warming specific indicator result for fruit by $5.00 to find an estimation of global warming impact. Indicator results are variables that express the relative harmfulness of an industrial process and are conveyed in units of impact per dollar. The indicator result variable is calculated through the multiplication of a characterization factor and the life cycle inventory of that product. For example, the indicator result for the global warming impact of apple purchasing is the global warming characterization factor multiplied by the amount of greenhouse gases that are produced throughout the apple's life cycle. In IO-LCA, standard pre-determined characterization factors for different types of environmental impacts already exist, while the life cycle inventories for different products need to be developed through the combination of two types of data: (1) a map of economic flows for an entire economy and (2) nationwide averages for environmental impacts of industrial processes (Suh, 2004).

$$IR_{ik} = \sum_{j} CF_{ij} \cdot LCI_{jk}$$

IR – Indicator Result
CF – Characterization Factor
LCI – Life Cycle Inventory
i – impact category
j – elementary flow
k - product

Figure 10 – Indicator Result Quantification: Indicator Results (IR) Can Be Quantified Through the Summation of Characterization Factors (CF) Multiplied by Life Cycle Inventory Results (LCI).

$$IMPACT_i = \sum_{k} IR_{ik} \cdot P_k$$

IMPACT – Total Impact
IR – Indicator Result
P –Price
i – impact category
k - product

Figure 11 – Total Impact Quantification: The Total Impact of Purchases (IMPACT) Can Be Quantified Through the Summation of Indicator Results (IR Multiplied by the Purchase Expenditure.

5.1.1 A MAP OF ECONOMIC FLOWS AND THE LEONTIEF MULTIPLIER

In order to calculate life cycle inventory results, a map of the economy is visualized in a Leontief table (Miller & Blair, 1985). A Leontief table is created from observed economic data based on industries that produce goods (outputs) and consume goods (inputs) from other industries in order to create products (Miller & Blair, 1985). Each row and column represents an industry sector, and intersections between each row and column represent the economic value of the output from one industry as an input to the other (see Figure 12 below) (Suh, 2004). For the rest of this discussion, the primary source of information will be from the CEDA 3.0 User's Guide (Suh, 2004):

	Industry A	Industry B	Final Demand	Total Output
Industry A	30	15	25	70
Industry B	20	40	20	80
Value Added	20	25		
Total Input	70	80		

Industry A → Industry A 30 units

Industry B → Industry A 20 units

Industry A → Industry B 15 units

Industry B → Industry B 40 units

Figure 12 - A Basic Input-Output Table. Source: Institute of developing economics.

In IO-LCA, the industry output is fixed to a one dollar unit, allowing for the assumption that the amount of inputs required for that industry output are relative to the one dollar amount. In order to find the amount of impact this one dollar amount of product embodies, we must find the amount of inputs required to make this final product.

American economist Wassily Leontief, developed a way to find the amount of inputs required to make one dollar's worth of final products, through a process that is now called the Leontief multiplier.

Leontief created a set of equations to represent the related inputs and outputs to create one dollar of end product.

$$
\begin{aligned}
x_1 &= a_{11}x_1 + a_{12}x_2 + \cdots + a_{1n}x_n + y_{1n} \\
x_2 &= a_{21}x_1 + a_{22}x_2 + \cdots + a_{2n}x_n + y_2 \\
&\vdots \quad \vdots \quad \vdots \quad \ddots \quad \vdots \quad \vdots \\
x_n &= a_{n1}x_1 + a_{n2}x_2 + \cdots + a_{nn}x_n + y_n
\end{aligned}
$$

Figure 13 - Leontief Equations.

As seen in Figure 13, "the *i*th element of *x*, *x*i is the total annual output of the *i*th industry, while *a*jj stand for the fractional output of the *i*th industry consumed by the *j*th industry in producing one unit of its output." The *i*th element of the final column, y*i* is the actual amount of *i*th industry output consumed by the final purchaser of the product. Taken all together, this set of equations shows the supply-demand balance of an entire economy, where the consumption of industry and households is equal to total production.

The equation above can be turned into $x = Ax + y$ through matrices and vectors, and rearranged to produce $x = (I - A)^{-1}y$, the Leontief multiplier. This final equation shows the amount of industry products (outputs) that are necessary to create a single unit of each industry output to meet final demand *y*. If there is good information available on the entire economy, the Leontief multiplier is a sound way to predict the amount of natural resources that are necessary to produce a specific product.

5.1.2 CALCULATING ENVIRONMENTAL IMPACT

To incorporate environmental impacts into this matrix, a new column is added to the matrix to represent the environment as an industrial sector. With this new format, row values now represent pollutant outputs to the environment (Hendrickson et al. 1997). Instead of modeling demand for a particular good or service, IO-LCA models illustrate how increased demand for these goods or services affects the quantity of emissions to the environment ("Economic Input-Output Life Cycle Assessment", 2006).

5.1.3 CHOOSING AN IO-LCA TOOL

There are few existing IO-LCA tools that offer a high-level screening approach to quantify impacts throughout the United States' specific supply chains. This project utilizes the Comprehensive Environmental Data Archive, which is explained in detail in the next section.

5.2 COMPREHENSIVE ENVIRONMENTAL DATA ARCHIVE

The Comprehensive Environmental Data Archive (CEDA), developed by Dr. Sangwon Suh, combines economic flows with environmental impact data to produce a suite

of indicator results. Of the many indicator models that CEDA provides, the model used was the TRACI version (Tool for the Reduction and Assessment of Chemical and Other Environmental Impacts). Within TRACI, two impact indicators were used: global warming impact, in terms of kg CO_2 equivalent per dollar, and water consumption, in terms of kg H_2O consumed per dollar. For simplicity, the below explanation about CEDA will focus on methodology and data specific to these two indicator results.

As shown in Figure 14 below, the database works by combining data from three primary sources: (1) the Bureau of Economic Analysis (BEA)'s Input-Output Benchmark, (2) the United States Environmental Protection Agency (EPA)'s TRACI model, and (3) specific environmental datasets from the EPA, the United States Department of Energy (DOE), and the United States Geological Survey (USGS) (Suh, 2005).

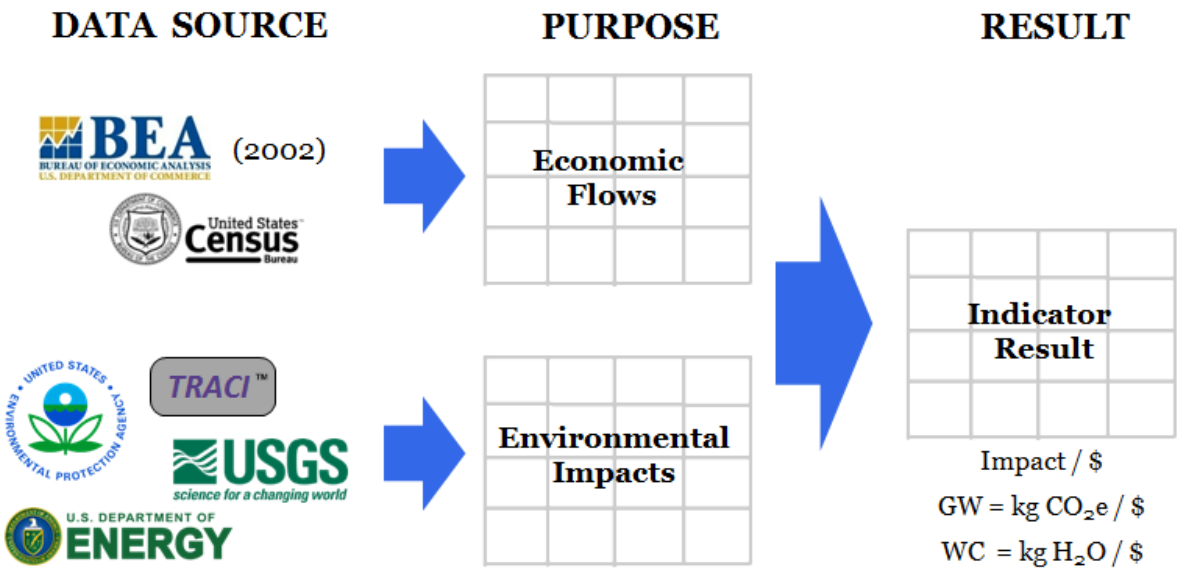


Figure 14 – CEDA Basics: Simplified graphic of the data sources compiled for use in the CEDA database.

5.2.1 BUREAU OF ECONOMIC ANALYSIS INPUT-OUTPUT BENCHMARK

Input-output economics is based on the theory that all industries in a given economy are connected by inputs (materials that go into a production system) and outputs (materials that come out of a production system). In this system, the outputs of a product system have two options: they can go to a final user for consumption, or they can serve as inputs into another production system. By tracking the inputs and outputs of all production systems in a country, we can map out that country's entire economy. The BEA produces this economic map for the United States. Every five years, the BEA's Industry Economic Accounts create benchmark input-output accounts for each industry based on data from the Census Bureau's economic census data ("Bureau of Economic Analysis", n.d.). The data shows how over 500 industries are interconnected via inputs and outputs to produce the gross domestic product.

Input-output accounts are displayed in three ways: make tables, use tables, and requirements tables. Make tables show all of the goods that are produced by each industry. Use tables show the inputs used by each industry, as well as the goods that are consumed by end users. Requirements tables combine information from both the make and use tables in the form of direct requirements and total requirements. Direct requirements tables show the amount of a good that is needed to produce one dollar of the industry's output. Total requirements tables show the direct and indirect production of goods from all industries that are required to deliver one dollar of the end-product consumable good. Both make and use tables are based on the North American Industry Classification System (NAICS). The NAICS provides a standard map of the United States economy by assigning a code and classification to every type of industry in the country.

5.2.2 TRACI

The Tool for the Reduction and Assessment of Chemical and Other Environmental Impacts (TRACI) is an LCA impact assessment tool created by the EPA. The purpose of TRACI is to compile the most applicable methods to model environmental impacts in order to create and maintain a consistent approach to quantifying impacts in LCA (Bare, 2002). TRACI is a downloadable application that runs on a personal computer. It stores life cycle inventory data and quantifies environmental impact based on specific impact categories, as mentioned previously. TRACI provides a single quantification model for each of the following 12 impact categories: ozone depletion, global warming, acidification, cancer air pollutants, noncancer air pollutants, criteria air pollutants, eutrophication, smog formation, ecotoxicity, fossil fuel use, land use, and water consumption (Bare, 2002). TRACI's chosen methodologies for calculating the two impact categories of relevance to this report, global warming and water consumption, are outlined below.

5.2.2.1 Climate Change Impact Quantification

The EPA defines the impact of climate change, a term used synonymously with global warming, as "the potential change in the Earth's climate caused by the buildup of chemicals that trap heat from the reflected sunlight that would have otherwise passed out of the Earth's atmosphere." TRACI uses the global warming index as its chosen model for quantifying climate change impact (Bare, 2002).

In this model, the relative impacts of the three most common greenhouse gases, carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O), are combined to yield values in one consistent unit: kilograms of CO_2 equivalent (kg CO_2e). Because each substance has a unique heat-trapping capacity and residence time in the atmosphere, it is useful to convert the impact of all three into a common unit. Carbon dioxide was set as the benchmark because it represents the majority of greenhouse gases emitted by human activities.

The formula for the global warming index is the following:

$$\sum_i e_i \times GWP_i$$

e_i – The emission (in kilograms) of substance i
GWP_i – Global warming potential of substance i

Figure 15 - Formula for calculating the Global Warming Index. Source: (Bare, 2002).

The global warming index uses a 100-year time horizon for global warming potentials, as proposed by the Intergovernmental Panel on Climate Change, to calculate the strength of greenhouse gases relative to carbon dioxide. The output of this model is the estimated contribution to global warming in CO_2 equivalents.

5.2.2.2 Water Consumption Quantification

A model for water consumption is not yet incorporated into TRACI, but the EPA recommends simply tracking water consumption by volume, which is easily converted to mass. Such measurements can be paired with water availability data to highlight significant water consumption in areas of low water availability (Bare, 2002).

5.2.3 ENVIRONMENTAL DATASETS

In order for CEDA to combine TRACI models with BEA input-output tables to produce environmental impact estimates, environmental data for greenhouse gas emissions as well as water consumption must be included in the tool. CEDA uses national average data from government sources in order to quantify global warming impact and water consumption.

For global warming impact, CEDA incorporates data compiled by the EPA and the DOE. Both the EPA and DOE collect nationwide emissions data. Primary estimations of emissions are based on fuel consumption data by economic sector (Suh, 2005). For water consumption, CEDA incorporates data compiled by the USGS. The USGS data consists of sector-specific irrigation data and quantifies the amount of water withdrawn for irrigation purposes by industry. The water data also distinguishes between groundwater, surface water, saline water, thermoelectric groundwater, thermoelectric surface water, and thermoelectric saline water (Suh, 2005).

5.3 LIFE CYCLE IMPACT ASSESSMENT PROCESS

5.3.1 CATEGORY ASSIGNMENTS

The first step in the life cycle impact assessment process was to match Google's CrunchTime! food categories to the most appropriate CEDA classification categories. After a

thorough review of the CEDA industry classification categories, which are based on NAICS, we selected the categories that best matched how Google received its food products.

For example, two CEDA categories could apply to beef: "cattle ranching and farming" or "animal (except poultry) slaughtering, rendering, and processing." It is important to note that the latter category represents a product further along in the process of being brought to market, and therefore its impact factors embody all upstream processes. Following an IO-life cycle way of thinking, "cattle ranching and farming" could be interpreted as an input to "animal (except poultry) slaughtering, rendering, and processing." As such, because Google generally buys its beef in various cuts as opposed to live from the farm, it is most appropriate to use "animal (except poultry) slaughtering, rendering, and processing" for beef products.

Categorization of vegetables, on the other hand, is considerably simpler. The CEDA category "vegetable and melon farming" most accurately reflects the vegetables and melons that Google generally buys: whole and unprocessed. Vegetables that are purchased dried or otherwise processed are assigned to the "fruit and vegetable canning, pickling, and drying" category, which reflects the additional impacts associated with further processing of produce.

One might argue that in comparing the impacts of beef and fresh vegetables, the system boundaries for each product could be seen as inconsistent. However, we determined that it would be most accurate to assign the purchased foods to categories that most accurately reflect the form in which Google receives those foods.

5.3.2 IMPACT ASSESSMENT CALCULATION

According to the above methodology, the group assigned Google's food categories to the most relevant CEDA categories. Because CEDA outputs are based on inputs of spending in 2002 dollar values, we used the deflation factors provided by IERS LLC to convert 2011 dollars spent into their 2002 equivalent. Each CEDA category carried an associated deflation factor unique to itself (e.g., milk prices rose between 2002 and 2011 at a different rate than carrot prices). Although we were working with 2013 purchasing data, 2011 was the most recent year for which economic deflation values were available.

Once deflated to 2002 dollars, the spending figures for each food category were multiplied by the CEDA global warming factor to determine the overall global warming impact in kilograms CO_2e. We did the same for water impact, multiplying the 2002 dollar spending by the CEDA water factor to determine the water quantity in kilograms H_2O. Using these outputs, we ranked the items by their total global warming and water impacts as a way of identifying hotspots, or top contributors, for the food procurement operation's environmental impact. Because most of the items in the top ten lists for global warming and water impacts overlapped, we decided to investigate the 12 items contained in both top ten lists more closely.

$$P_{k,2002} = P_{k,2013} \cdot D_k$$

$P_{k,2002}$ – Price of Food in 2002
$P_{k,2013}$ – Price of Food in 2013
D_k – CEDA Deflation Factor

Figure 16 - Price Deflation Equation.

$$IMPACT_{GW} = \sum_k IR_{GW,k} \cdot P_{k,2002}$$

$IMPACT_{GW}$ – Total Global Warming Impact
$IR_{GW,k}$ - Food specific CEDA Indicator Result for Global Warming
$P_{k,2002}$ – Price of Food in 2002
k – Food product

Figure 17 - Total Impact Calculation.

To this end, we created a contribution analysis showing a breakdown of each food category into its constituent subcategories. The taxonomy used for this analysis was to refer to coarser Google food categories such as fruits, vegetables, beef, pork, and chicken as PRIMARY categories, and the finer subcategories within each food category, such as cherries, spinach, New York steak, ground pork, and chicken legs as SECONDARY categories. The naming convention for these finer level contributors would then be a PRIMARY:SECONDARY format, such as VEGETABLES:SPINACH. Creating contribution analyses for each primary category was done for two reasons: to determine the high impact items in each food category, and to identify which items were in-scope for further analysis.

5.4 LIFE CYCLE IMPACT ASSESSMENT - RESULTS & ANALYSIS

5.4.1 FOOD PROGRAM TOTAL IMPACT

The total global warming impact and water consumption values were calculated for the entire Mountain View campus food procurement operation. The annual global warming impact was calculated to be about 45.9 kilotonnes CO_2e. The annual water consumption was approximately 16.1 megatonnes of water. The breakdown of each by phase is summarized in Figure 18 and visualized in Figure 19. The client's employee food program is unique, lacking comparable food service operations with quantified environmental impacts. These values are not intended to be used in comparison with other food programs, but they instead provide the client with an understanding of the 2013 food program baseline global warming impact and water consumption. These baseline values can be used as a starting point to measure the effectiveness of future mitigation efforts.

Phase	Global Warming Impact			Water Consumption	
	kt CO_2e	% of Total		Mt H_2O	% of Total
Phase 1	33.45	72.85%		10.21	63.27%
Phase 2	12.46	27.15%		5.93	36.73%
Total	45.91	100%		16.14	100%

Figure 18 - 2013 Baseline Environmental Impacts of Mountain View Food Program.

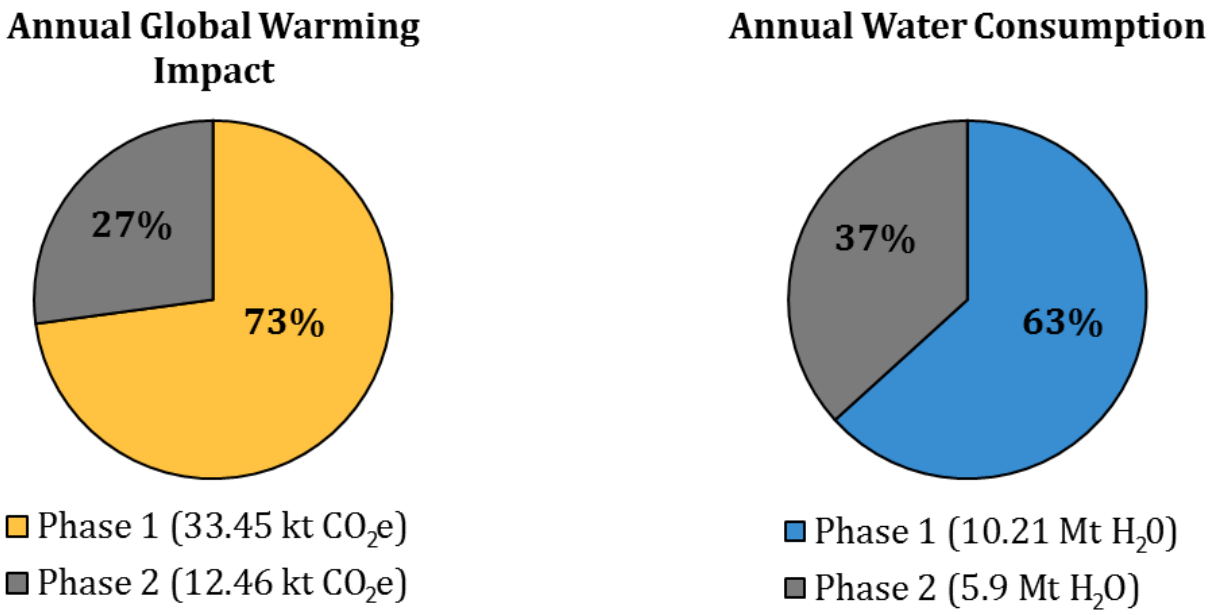


Figure 19 - 2013 Baseline Environmental Impacts of Mountain View Food Program.

Of the 45.9 kt global warming impact, about 73%, or 33.5 kt, is attributable to Phase 1 food categories. For water, Phase 1 food categories comprise 63% of the 16.1 Mt total water consumption. When analyzing these figures, note that the total impact values were calculated using all of Google's food categories. This includes both Phase 1 and Phase 2 food items. Once the total impact values were established, a finer granularity of impact data was assessed for the more readily addressable Phase 1 items. This analysis will be discussed below in the "Coarse Results and Analysis" section below.

5.4.2 COARSE RESULTS AND INTERPRETATION

The impact assessment for coarse results was organized by broad food category, making it simple to observe relative impact differences among Phase 1 food categories. Impact values for all Phase 1 food categories are shown in Figure 20. The impact assessment results for Phase 1 food categories are ranked from highest to lowest impact and show a summation of total Phase 1 impact (Global Warming = 33.45 kt CO_2e, Water Consumption = 10.21 Mt H_2O) at the bottom of the table.

Food Category	Global Warming (kt CO_2e)		Food Category	Water Consumption (Mt H_2O)
VEGETABLES	**6.83**		FRESH FRUITS	**2.96**
BEEF	**4.68**		VEGETABLES	**2.69**
FRESH FRUITS	**3.39**		BEEF	**0.68**
PORK	**3.35**		NUT, SEED, RICE, GRAIN, BEAN TOTAL	**0.58**
CHICKEN	**2.32**		CHICKEN	**0.50**
CHEESE	**2.25**		PORK	**0.48**
NUT, SEED, RICE, GRAIN, BEAN TOTAL	**1.86**		COFFEE	**0.41**
MILK	**1.62**		EGGS	**0.35**
EGGS	**1.27**		JUICES	**0.28**
JUICES	**1.10**		CHEESE	**0.28**
YOGURT	**1.09**		OIL & VINEGAR	**0.21**
COFFEE	**0.96**		MILK	**0.19**
OIL & VINEGAR	**0.65**		YOGURT	**0.19**
LAMB	**0.58**		TURKEY	**0.11**
TURKEY	**0.53**		FLOUR AND FLOUR PRODUCTS	**0.11**
OTHER MEATS	**0.39**		LAMB	**0.08**
BUTTER	**0.31**		OTHER MEATS	**0.07**
FLOUR AND FLOUR PRODUCTS	**0.26**		BUTTER	**0.04**
TOTAL PHASE 1 IMPACT	**33.45**		TOTAL PHASE 1 IMPACT	**10.21**

Figure 20 - LCIA Results for Phase 1 Food Categories.

A comprehensive visualization of the coarse results for Phase 1 food items is shown in Figure 21. This graph illustrates the relative impacts among Phase 1 food categories. Note that the size of each bubble represents the % of total spending on that food category.

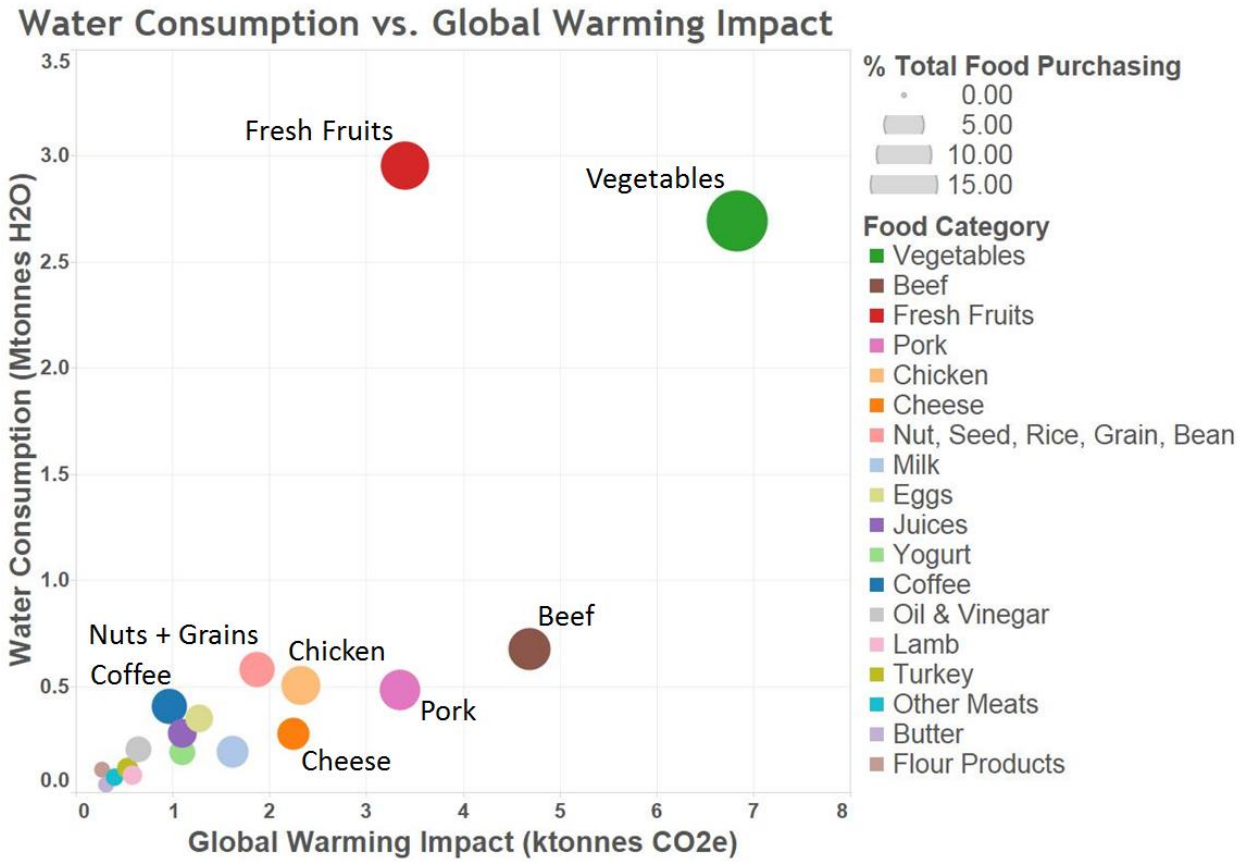


Figure 21 - Coarse Analysis Results: Global Warming Impact vs. Water Consumption.

The coarse analysis allowed for the preliminary prioritization of highly impactful food categories based on life cycle greenhouse gas emissions and water consumption. In order of decreasing impact, the top ten global warming impact food categories are:

1. Vegetables (6.83 kt CO_2e, 20.41%)
2. Beef (4.68 kt CO_2e, 14.00%)
3. Fresh fruits (3.39 kt CO_2e, 10.15% impact)
4. Pork (3.35 kt CO_2e, 10.01%)
5. Chicken (2.32 kt CO_2e, 6.94%)
6. Cheese (2.25 kt CO_2e, 6.72%)
7. Nut, seed, rice, grain, bean total (1.86 kt CO_2e, 5.57%)
8. Milk (1.62kt CO_2e, 4.83%)
9. Eggs (1.27 kt CO_2e, 3.80%)
10. Juices (1.10 kt CO_2e, 3.28%)

In order of decreasing impact, the top ten water consumption food categories are:

1. Fresh fruits (2.96 Mt H_2O, 28.95%)
2. Vegetables (2.69 Mt H_2O, 26.37%)
3. Beef (0.68 Mt H_2O, 6.62%)
4. Nut, seed, rice, grain, bean total (0.58 Mt H_2O, 0.58%)
5. Chicken (0.50 Mt H_2O, 4.93%)
6. Pork (0.48 Mt H_2O, 4.73%)
7. Coffee (0.41 Mt H_2O, 4.00%)
8. Eggs (0.35 Mt H_2O, 3.43%)
9. Juices (0.28 Mt H_2O, 2.73%)
10. Cheese (0.28 Mt H_2O, 2.71%)

Note that these percent impact values are expressed as a percent of total Phase 1 impact.

These results reveal several insights. First, when organized from largest to smallest, the relative impact of individual food categories decreases quite quickly. This illustrates that a minority of food category hotspots account for the majority of global warming impact and water consumption. This information is important because it supports the notion that focusing mitigation efforts the most impactful food items is the most efficient way to achieve meaningful impact. Second, vegetables, fresh fruits, and beef are the top three items for both global warming and water consumption. These three food categories require additional attention and analysis. Third, half of the top 10 food category hotspots are animal products, reaffirming that diets characterized by a large proportion of animal products are the most environmentally impactful.

Another visualization of the coarse analysis LCIA results is shown in Figure 22 and Figure 23. These graphs allow for an easy comparison of purchase dollars (the width of each bar) and CEDA indicator result value (height of each bar). Thus the area (width x height) of each bar represents the total impact of a given food category. This provides perspective on the two variables that determine the magnitude of impact for a given food category. This visualization aids in understanding why vegetables and fresh fruits, for example, are so prominent in the results. Even though vegetables have a low CEDA indicator result value (impact per dollar), the high purchase dollar value for this food category inflates its total impact.

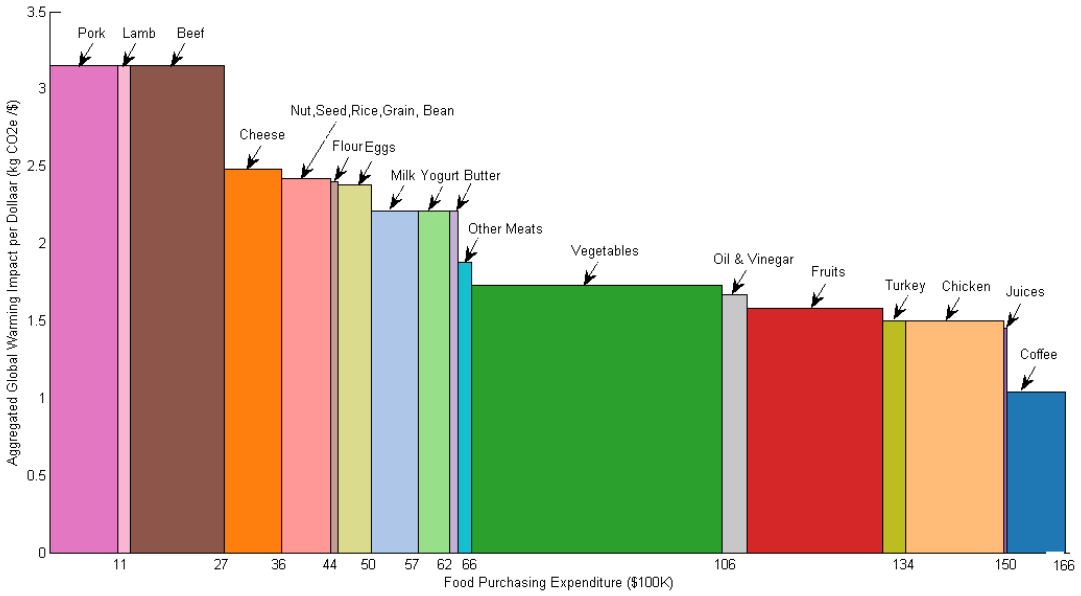


Figure 22 – Global Warming Impact per Dollar by Food Category Purchase Amount: Area of each bar is representative of total impact of the food category.

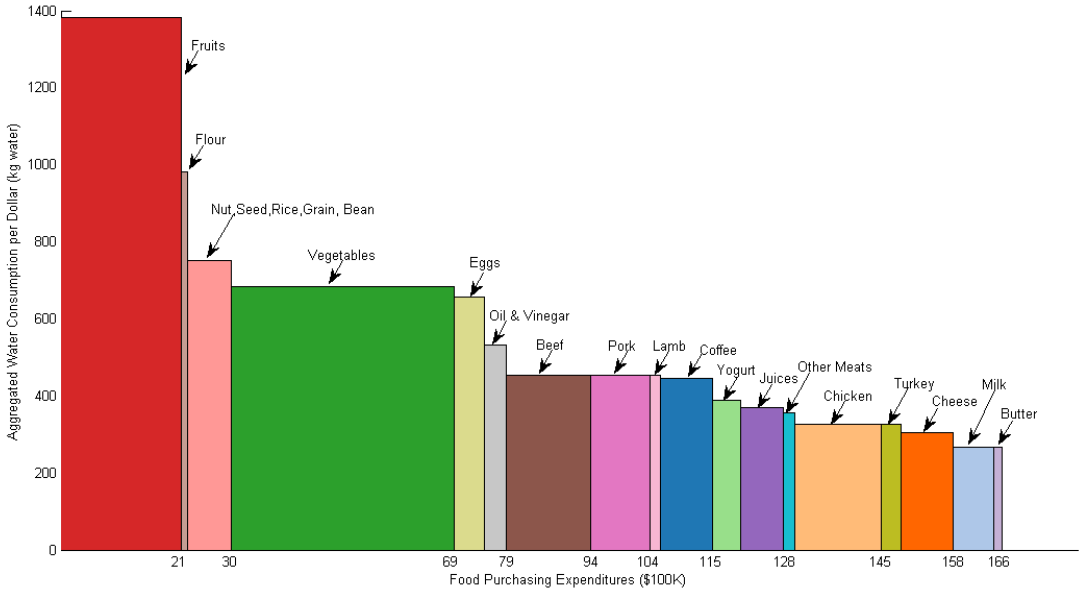


Figure 23 – Water Consumption per Dollar by Food Category Purchase Amount: Area of each bar is representative of total impact of the food category.

After considering the issues identified above, it became necessary to quantify food impacts on a finer scale. The coarse analysis alone does not allow us to identify high-impact individual food items for further investigation. It is essential to understand which individual food item are hotspots in order to meaningfully impact sourcing decisions, which requires broader category disaggregation. As such, food categories were disaggregated into their finer food item constituents. This fine analysis broke down all food categories that consisted of more than one food item for a more equitable comparison of impactful food items. The results of this analysis are discussed in the next section.

5.4.3 FINE RESULTS AND INTERPRETATION

This section provides greater depth in understanding food impacts by breaking down highly aggregated coarse food categories into their individual food items. For example, rather than only displaying impacts of the broader vegetable category as a whole, this section shows the relative impacts of individual vegetables such as lettuce, onions, broccoli, and carrots. Like the coarse analysis results, the fine analysis results are organized into global warming impact and water consumption.

5.4.3.1 Fine Analysis Global Warming

Global warming impact values for all Phase 1 food items are shown in Figure 24. Food items in this table that come from a previously aggregated coarse category are labeled as such. For example, the food item lettuce is labeled with its food category name "vegetables" (referred to as "primary" in Figure 22) and its individual food item name "lettuce" (referred to as "secondary"), separated by a colon. The impact assessment results for Phase 1 food items are ranked from highest to lowest impact, and represent the top 70% of Phase 1 impact (global warming: 23.31 kt CO_2e). The full results for the fine analysis can be found in Appendix B.2.2.

Food Category / Food Item (PRIMARY) / (PRIMARY : SECONDARY)	Global Warming (kt CO_2e)	% PHASE 1 GW Impact
BEEF	**4.68**	**14.0%**
PORK	**3.35**	**10.0%**
CHICKEN	**2.32**	**6.9%**
CHEESE	**2.25**	**6.7%**
MILK	**1.62**	**4.8%**
EGGS	**1.27**	**3.8%**
YOGURT	**1.09**	**3.3%**
VEGETABLES : LETTUCE	**1.01**	**3.0%**
COFFEE	**0.96**	**2.9%**
NUT, SEED, RICE, GRAIN, BEAN TOTAL : NUT	**0.78**	**2.3%**
LAMB	**0.58**	**1.7%**
VEGETABLES : MUSHROOM	**0.56**	**1.7%**
TURKEY	**0.53**	**1.6%**
FRESH FRUITS: MELON	**0.53**	**1.6%**
VEGETABLES : ASPARAGUS	**0.50**	**1.5%**
NUT, SEED, RICE, GRAIN, BEAN TOTAL : RICE	**0.45**	**1.3%**
VEGETABLES : TOMATO	**0.43**	**1.3%**
JUICES : ORANGE	**0.39**	**1.2%**
TOTAL PORTION OF PHASE 1 IMPACT	**23.31**	**69.7%**

Figure 24 - Fine Analysis Results: Global Warming Impact Contributors.

The fine analysis for global warming prioritized highly impactful food items based on life cycle greenhouse gas emissions. In order of decreasing impact, the top ten global warming impact food items are as follows:

1. Beef (4.68 kt CO_2e, 14.0%)
2. Pork (3.35 kt CO_2e, 10.0%)
3. Chicken (2.32 kt CO_2e, 6.9%)
4. Cheese (2.25 kt CO_2e, 6.7%)
5. Milk (1.62 kt CO_2e, 4.8%)
6. Eggs (1.27 kt CO_2e, 3.8%)
7. Yogurt (1.09 kt CO_2e, 3.3%)
8. Lettuce (1.01 kt CO_2e, 3.0%)
9. Coffee (0.96 kt CO_2e, 2.9%)
10. Nuts (0.78 kt CO_2e, 2.3%)

Figure 25 provides an alternative visualization of this data in terms of relevant impact, where the size of the bubble represents the food item's relative global warming impact.

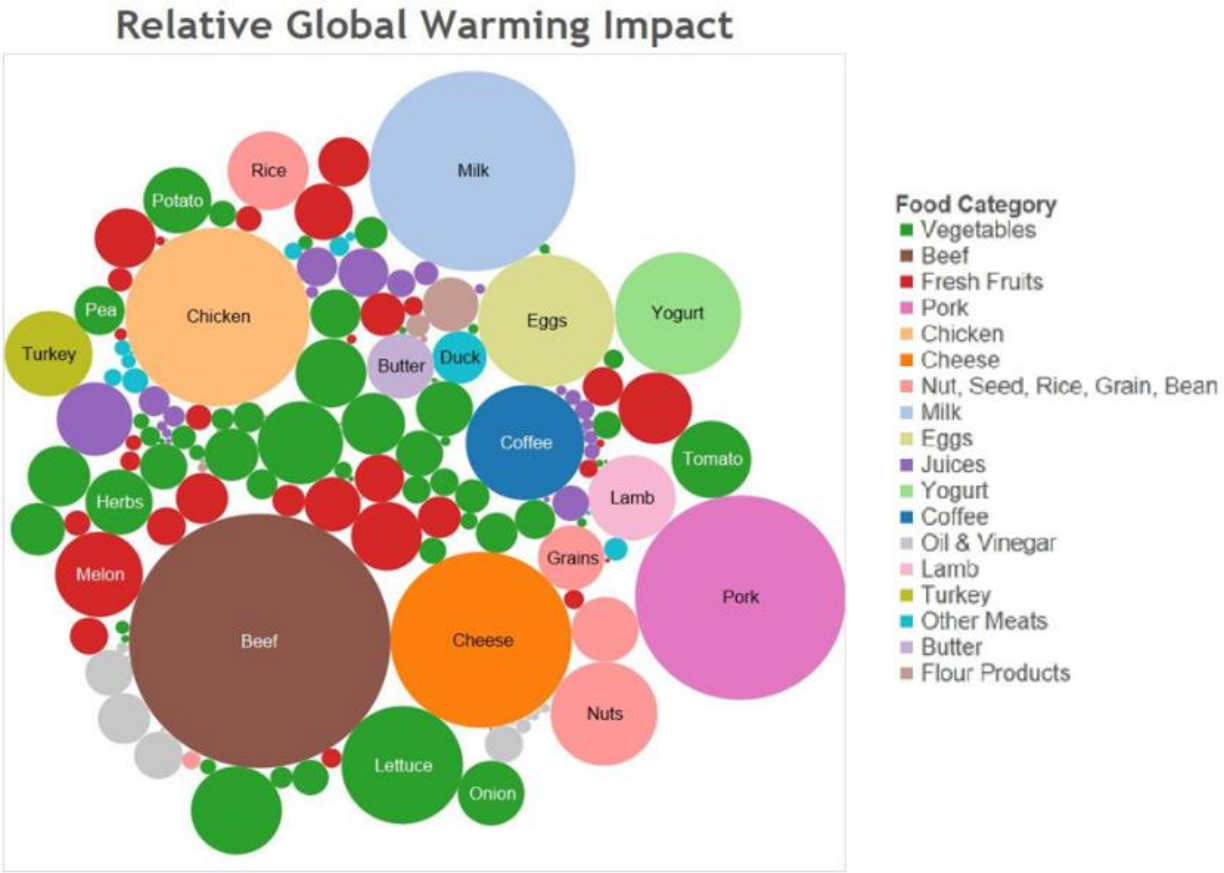


Figure 25 - Data Visualization, Fine Analysis Results: Global Warming Impact Contributors. Circle size represents the impact attributable to each food item.

These results reveal several insights. First, we again see the clear identification of food item hotspots. This information is important because it provides direction as to where mitigation efforts should begin. Second, seven of the food item hotspots are animal products (beef, pork, chicken, cheese, milk, eggs, and yogurt), which sum to nearly 50% of all Phase 1 greenhouse gas emissions. Additionally, of the top seven animal products, the top three items are direct animal proteins (beef, pork, and chicken) which account for over 30% of all Phase 1 GW emissions. This information allows the client to prioritize animal products for impact mitigation programs and research. Third, lettuce is ranked at number eight, making it the most impactful vegetable purchased. This result is primarily due to the fact that expenditures on lettuce are much higher than that of other vegetables, so this large expenditure raises lettuce as yet another ideal category for impact mitigation programs. Fourth, coffee is ranked at number nine, demonstrating significant impact for a single staple food item. Coffee has such a high impact in part due to the large amount purchased, but is still an appropriate target for future mitigation research.

5.4.3.2 Fine Analysis Water Consumption

Water consumption values for all Phase 1 food items are shown in Figure 26. Naming conventions in this analysis are the same as in the global warming analysis above. The impact assessment results for Phase 1 food items are ranked from highest to lowest water consumption, and representing the top 70% of Phase 1 (water consumption: 7.07 Mt H_2O). The full results for the fine analysis can be found in Appendix B.2.3.

Food Category / Food Item (PRIMARY) / (PRIMARY : SECONDARY)	Water Consumption (Mt H_2O)	% PHASE 1 WC
BEEF	**0.68**	**6.6%**
CHICKEN	**0.50**	**4.9%**
PORK	**0.48**	**4.7%**
VEGETABLES : TOMATO	**0.42**	**4.1%**
COFFEE	**0.41**	**4.0%**
FRESH FRUITS: STRAWBERRY	**0.36**	**3.5%**
EGGS	**0.35**	**3.4%**
VEGETABLES : LETTUCE	**0.33**	**3.2%**
FRESH FRUITS: BANANA	**0.33**	**3.2%**
CHEESE	**0.28**	**2.7%**
VEGETABLES : AVOCADO	**0.27**	**2.6%**
NUT, SEED, RICE, GRAIN, BEAN TOTAL : RICE	**0.25**	**2.5%**
FRESH FRUITS: PINEAPPLE	**0.25**	**2.4%**
FRESH FRUITS: PEACH	**0.23**	**2.2%**
FRESH FRUITS: APRICOT	**0.21**	**2.1%**
MILK	**0.19**	**1.9%**
YOGURT	**0.19**	**1.9%**
FRESH FRUITS: CHERRY	**0.19**	**1.8%**
VEGETABLES : MUSHROOM	**0.18**	**1.8%**
FRESH FRUITS: TANGERINE	**0.17**	**1.7%**
FRESH FRUITS: MELON	**0.17**	**1.7%**
NUT, SEED, RICE, GRAIN, BEAN TOTAL : GRAIN	**0.17**	**1.6%**
VEGETABLES : ASPARAGUS	**0.16**	**1.6%**
FRESH FRUITS: APPLE	**0.16**	**1.6%**
FRESH FRUITS: BLUEBERRIES	**0.12**	**1.2%**
TOTAL PORTION OF PHASE 1 IMPACT	**7.07**	**69.2%**

Figure 26 - Fine Analysis Results: Water Consumption Contributors.

The fine analysis for water consumption prioritized highly impactful food items based on life cycle water consumption. In descending order, the top ten water consumption food items are as follows:

1. Beef (0.68 Mt H_2O, 6.6%)
2. Chicken (0.50 Mt H_2O, 4.9%)
3. Pork (0.48 Mt H_2O, 4.7%)
4. Tomatoes (0.42 Mt H_2O, 4.1%)
5. Coffee (0.41 Mt H_2O, 4.0%)
6. Strawberries (0.36 Mt H_2O, 3.5%)
7. Eggs (0.35 Mt H_2O, 3.4%)
8. Lettuce (0.33 Mt H_2O, 3.2%)

9. Bananas (0.33 Mt H_2O, 3.2%)
10. Cheese (0.28 Mt H_2O, 2.7%)

Figure 27 provides an alternative visualization of this data in terms of relevant impact, where the size of the bubble represents the food item's water consumption.

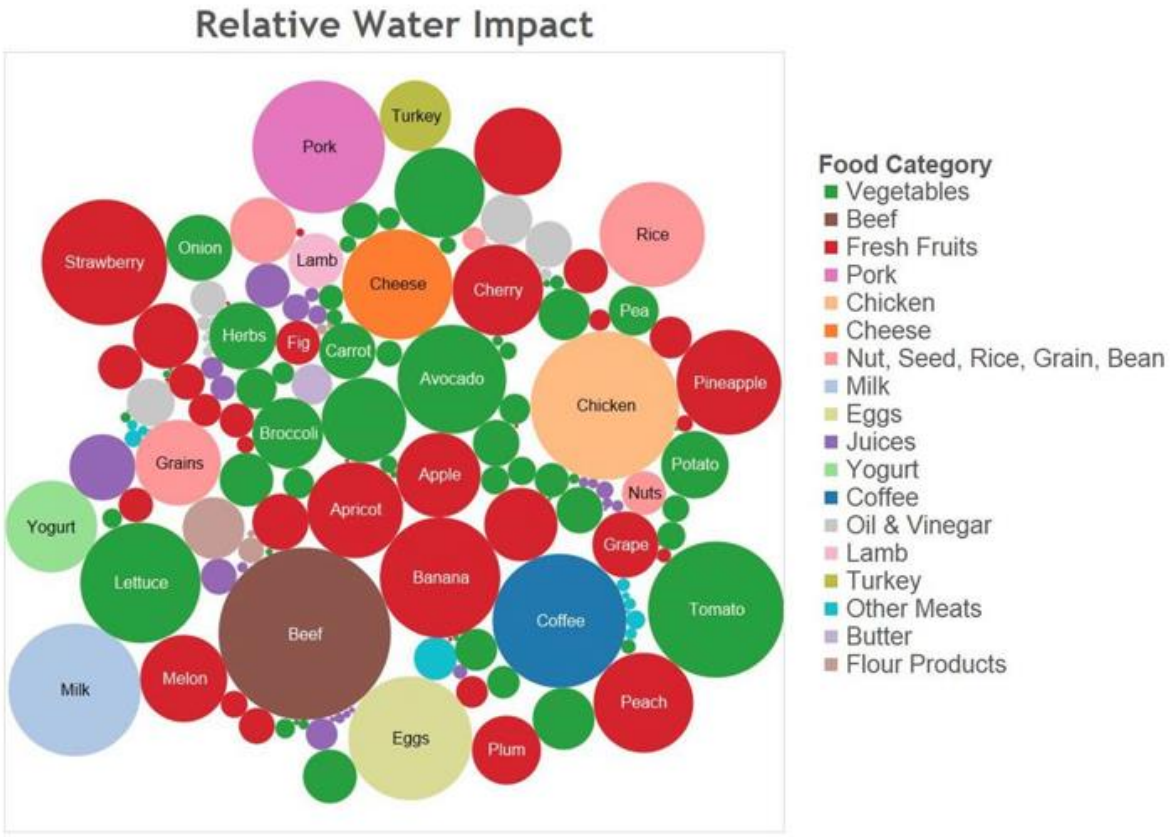


Figure 27 - Data Visualization, Fine Analysis Results: Water Consumption Contributors. Circle size represents the relative water consumption attributable to each food item.

These results reveal several insights. First, the relative impact of individual food items decreases quickly, as seen in the global warming section, again illustrating that a minority of the food items account for the majority of the water consumption. This information is important because mitigation efforts applied to a few top items will result in proportionally large decreases in water consumption. Second, beef, chicken, and pork top the charts for water consumption. The fact that these food items have the most impact in both analyses allows Google to significantly reduce their impacts in both areas through mitigation strategies targeted at these three foods. Third, fresh fruits comprise almost one third of the top ten list (tomatoes, bananas, and strawberries). This information illustrates that fruit have more of a relative significant impact to water consumption than to global warming. Fourth, coffee and lettuce again make the top ten list. This reflects the high amount of purchase dollars allocated to these food items and the opportunity to reduce their impacts.

5.4.4 NORMALIZATION

The results were normalized in order to contextualize the environmental impacts of the client's Mountain View campus food purchases. Impacts are normalized to yearly and daily impact per employee using average employee headcount for the period of April to July 2013, assuming 237 work days per year [260 weekdays - (15 holidays + 8 bank holidays)] (Figure 28). This provides employees with a baseline estimate which could be lowered or raised based on the environmental impacts of their individual food choices. Figure 29 shows the equations for normalization.

Normalization Metric	Global Warming Impact (kg CO_2e)		Water Consumption (gallons H_2O)
Yearly Impact per Employee	**2,139**		**198,652**
Daily Impact per Employee	**9**		**835**

Figure 28 - Daily & Annual Environmental Impact of Mountain View Campus Food Purchases.

$$Yearly\ Impact\ per\ Employee = \frac{IMPACT_i}{(\#\ of\ Employees\ at\ MTV\ Campus)}$$

$$Daily\ Impact\ per\ Employee = \frac{IMPACT_i}{(\#\ of\ Employees\ at\ MTV\ Campus)} * \frac{1\ year}{237\ work\ days}$$

Figure 29 - Equations for Calculating Normalized Impact Results.

6 INPUT CONTRIBUTION ANALYSIS

6.1 RATIONALE

The purpose of the input contribution analysis is to gain a better understanding of the environmental impacts from primary inputs that are directly embodied in agricultural products. According to the CEDA v3.0 user guide, input contribution analysis "seeks to identify which direct inputs to the product or service under study are responsible for the greatest environmental intervention or impact through their upstream supply chains" (Suh, 2004). This knowledge then provides the purchaser with a framework by which to evaluate the environmental performance of a variety of producers of any given food item. The purpose of this analysis is not to recommend one food item over another based on environmental merit, but instead to aid in identifying the least environmentally impactful forms or producers of a given food item. As such, it was necessary to go a step beyond simple impact quantification and understand the underlying process that contribute to a food item's environmental impact.

In order to ascertain which food producers offer the most environmentally friendly items, it is necessary to know what processes within a given food item's production process are most responsible for that food's carbon and water footprints. The most impactful primary inputs present opportunities for reducing the associated environmental impacts from the food items of interest. Understanding the inputs required for the production process of a given food item will give the procurement team a basis on which to compare, and thus decide between, multiple producers of a desired food item. This type of analysis can also help set priorities for data collection from suppliers by the client. The most logical and efficient process is detailed below.

1. Begin with the highest impact products (product hotspots), as identified in the life cycle impact assessment.
2. Determine the most significant production inputs (input hotspots) for each product hotspot.
3. Among input hotspots, determine those inputs that have high variability across producers.
4. Collect relevant data from suppliers and producers, and use these high impact, high variability inputs as the metrics for evaluation.
5. The producer that minimizes the most impactful input hotspots for a given food item are considered the most environmentally friendly option available for that food item.
6. Producers can be ranked based both on environmental impact and cost, permitting a cost-effective, environmentally-friendly sourcing strategy for the procurement team.

For example, if feed production is the top contributor to the overall impact of chicken production, and not all chicken producers use identical feed mixes, Google might survey the available chicken producers and decide to purchase from the producer that uses

the least environmentally impactful feed for its chickens. This input hotspot would also need to be weighed against others, like electricity or natural gas consumption. Such an approach would allow Google to make data-driven food purchasing decisions, and effectively minimize environmental impacts to the extent practicable.

Because input contribution analysis results are based on national averages, purchasers can use this data as a starting point to source from suppliers who demonstrate that their impact is below the national average. The end goal would be to preferentially source foods from the least impactful suppliers available.

Figure 30 visually demonstrates the hotspots identified during an input contribution analysis.

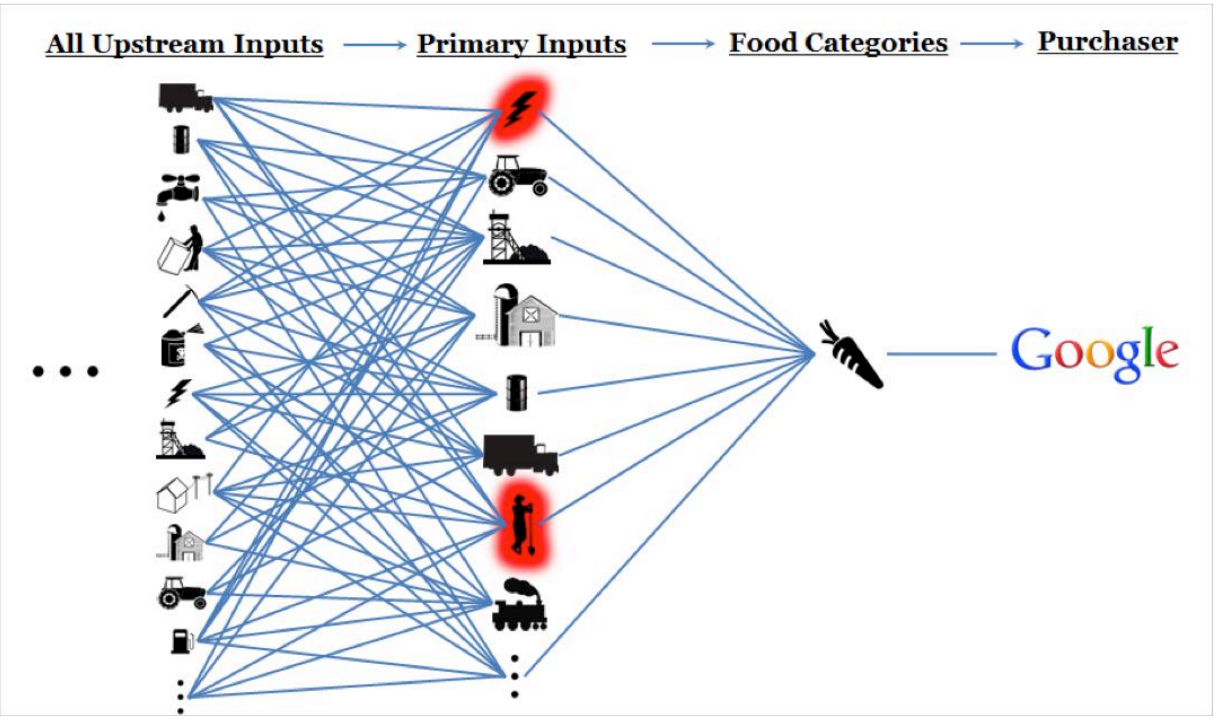


Figure 30 - Input Contribution Analysis Hotspot Demonstration: The icons highlighted in red represent hotspots in the supply chain web at the primary input level for a specific food category.

6.2 INPUT CONTRIBUTION FOR FOOD CATEGORY HOTSPOTS

6.2.1 PROCESS

The group first addressed hotspots across individual high impact Phase 1 food categories using CEDA's Input Contribution Analysis Tool. Upon selecting the impact category and industrial process of interest, the tool displays the top 10 most environmentally impactful input processes for the selected industrial process. The industrial process selected for each food category is the same as the NAICS category used in the life cycle impact assessment portion of this project. A detailed list of industrial

processes and their definitions can be found in Appendix C.2. A visual representation of the data presented in the input contribution analysis is provided in Figure 31.

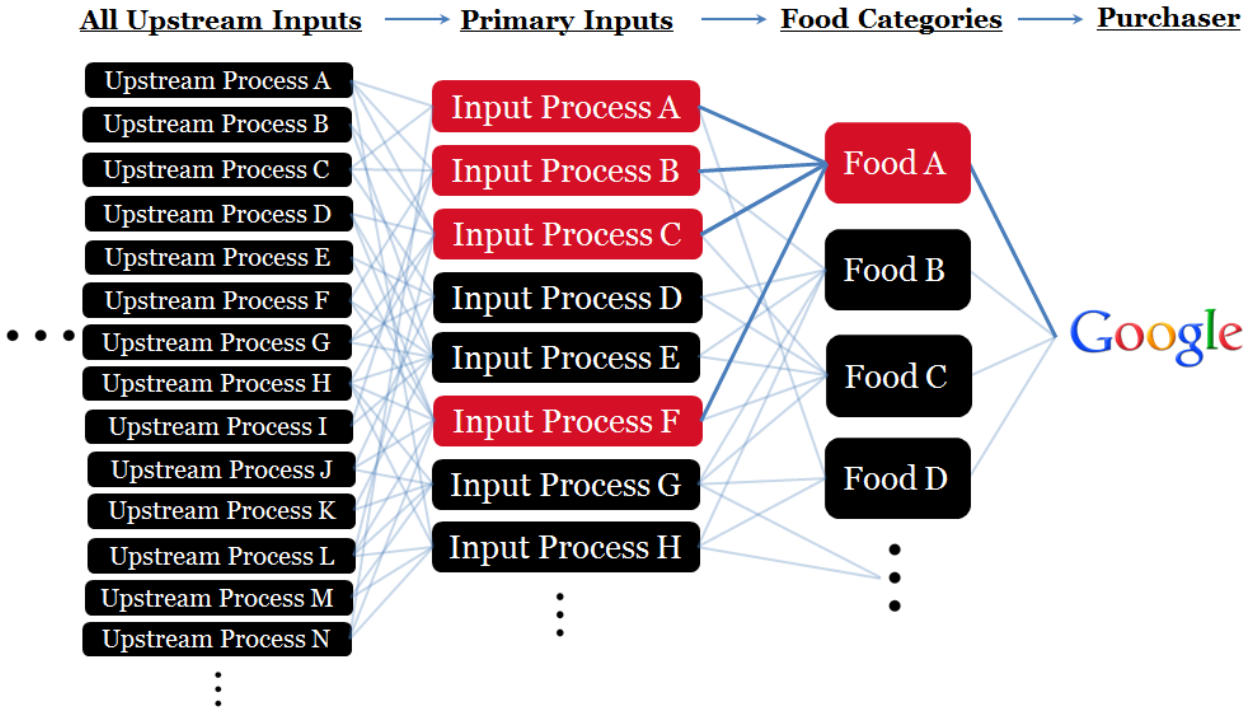


Figure 31 - Conceptualization of Input Contribution Analysis: The input contribution analysis of theoretical Food A yields direct input hotspots of Input Process A, B, C, and F as most impactful.

6.2.2 RESULTS AND INTERPRETATION

To provide the most actionable information for use by the client, the analysis focused on farm-level, rather than processing-level, of each food category. The farm-level reflects impacts prior to their processing, allowing for more direct comparison among growers. For full input contribution analyses of global warming impact and water consumption for farm level and processing level NAICS categories, see Appendix C.3 and Appendix C.4. The interpretation of the following tables is limited by the level of specificity of the input categories; some categories are relatively discrete processes with addressable aspects, while others are highly aggregated and broad, which prevents them from being useful in guiding mitigation efforts.

6.2.2.1 Global Warming Impact

Using the vegetable food category as an example illustrates the per food category global warming input contribution results at the farm level, as seen in Figure 32. Vegetable and melon farming was chosen because it is the most impactful food category in the global warming LCIA results.

Global Warming Input Contribution Analysis: Vegetables		
NAICS Category: Vegetable and melon farming		
Input Rank	**Input Category**	**Percent**
1	Electric power generation, transmission, and distribution	31.0%
2	Support activities for agriculture and forestry	17.4%
3	Fertilizer manufacturing	11.1%
4	Vegetable and melon farming	7.9%
5	Petroleum refineries	7.2%
6	Pesticide and other agricultural chemical manufacturing	6.7%
Rest	All the remaining	18.8%
	Total	100.0%

Figure 32 – Global Warming Input Contribution Analysis: Vegetables.

The reduction of the carbon footprint from vegetables can be best addressed through the electricity used during production, because a singular mitigation approach addressing energy impacts will yield impact reductions for this homogeneous input process. Although the support activities for agriculture and forestry category is the second largest input contributor, it is composed of many dissimilar processes, which cannot all be addressed through a singular mitigation approach. Based on these principles, the utility of input contribution results varies by category. For each input process, utility level is listed (HIGH or LOW) followed by a brief explanation:

1. Electric power generation, transmission, and distribution
   HIGH: can improve energy efficiency, can source from renewables

2. Support activities for agriculture and forestry
   LOW: aggregation of unrelated processes

3. Fertilizer manufacturing
   HIGH: can reduce fertilizer use, can source sustainably

4. Vegetable and melon farming
   HIGH: can alter general farming practices

5. Petroleum refineries
   HIGH: can reduce petroleum use

6. Pesticide and other agricultural chemical manufacturing
   HIGH: can apply less chemicals

7. All the remaining
   LOW: high aggregation, insignificant contribution level

In summary, for vegetables, the input processes which are the least aggregated represent the greatest opportunity to quantify and compare impacts between different

farm sources. Conversely, input category results for highly aggregated processes do not represent actionable areas for the client's food procurement strategy.

Using this methodology, the client can determine a sourcing strategy for any food category. To establish a comprehensive approach to food procurement at the farm level, refer to appendix C.3.1 which lists global warming input contribution results for all Phase 1 food categories similar to the vegetables example.

The global warming input contribution results for each food category show that similar food categories tend to have several input contribution processes in common. Looking at animal products, it is apparent that livestock rearing, grain and soy feedstock production, electricity use, and petroleum use, are highly impactful input processes. Looking at crops, it is apparent that farming practices, electricity use, petroleum use, application of fertilizer, and application of pesticides and other agricultural chemicals are highly impactful input processes. It is not surprising that the food category specific input contribution results match expectations. The benefit of this analysis is a quantification of relative contributions to guide program development, including the creation of a scorecard to evaluate different producers. Scorecards are discussed fully in the conclusions section.

6.2.2.2 Water Consumption

Using the fresh fruits food category as an example illustrates the per food category water consumption input contribution results at the farm level, as seen in Figure 33. Fruit farming was chosen because it is the most impactful food category in the water consumption LCIA results.

Water Consumption Input Contribution Analysis: Fresh Fruits		
NAICS Category: Fruit farming		
Input Rank	**Input Category**	**Percent**
1	Support activities for agriculture and forestry	37.5%
2	Electric power generation, transmission, and distribution	23.0%
3	Fruit farming	13.8%
4	Water, sewage and other systems	12.2%
Rest	All the remaining	13.6%
	Total	100.0%

Figure 33 – Water Consumption Input Contribution Analysis: Fresh Fruits.

Although the support activities for agriculture and forestry category is the largest input contributor to the water footprint of fruit, it is composed of many dissimilar processes, which cannot all be addressed through a singular mitigation approach. Fresh fruits' water consumption can be best addressed through the electricity used during production, because a singular mitigation approach addressing energy impacts will yield impact reductions for this homogeneous input process. Based on these principles, the utility of input contribution results varies by category. For each input process, utility level is listed (HIGH or LOW) followed by a brief explanation:

1. Support activities for agriculture and forestry
   LOW: aggregation of unrelated processes

2. Electric power generation, transmission, and distribution
   HIGH: can improve energy efficiency, can source from renewables

3. Fruit farming
   HIGH: can alter general farming practices

4. Water sewage and other systems
   HIGH: can increase water use efficiency

5. All the remaining
   LOW: high aggregation, insignificant contribution level

In summary, for fresh fruits, the input processes which are the least aggregated represent the greatest opportunity to quantify and compare impacts between different farm sources. Conversely, input category results for highly aggregated processes do not represent actionable areas for the client's food procurement strategy.

Using this methodology, the client can determine a sourcing strategy for any food category. To establish a comprehensive approach to food procurement at the farm level, refer to appendix C.3.2 which lists water consumption input contribution results for all Phase 1 food categories similar to the fresh fruits example.

The water consumption input contribution results for each food category show that similar food categories tend to have several input contribution processes in common. Looking at animal products, it is apparent that grain and soy feedstock production, livestock rearing, and electricity use are highly impactful input processes. Looking at crops, it is apparent that farming practices, electricity use, water use, application of fertilizer, application of pesticides and other agricultural chemicals, and petroleum use are highly impactful input processes. It is not surprising that the food category specific input contribution results match expectations. The benefit of this analysis is a quantification of relative contributions to guide program development, including the creation of a scorecard to evaluate different producers. Scorecards are discussed fully in the conclusions section.

After observing the input contribution results for each high impact food category, the group was interested in understanding of the most impactful primary input processes for all Phase 1 purchased food items.

6.3 INPUT CONTRIBUTION FOR ALL PHASE ONE PURCHASED FOODS

6.3.1 PROCESS

Equipped with an understanding of the primary input hotspots to both global warming and water consumption on a food category basis, the group then sought to ascertain the highest contributing input processes across all Phase 1 food products. Figure 34 shows a conceptual visualization for the data presented in our findings in this section.

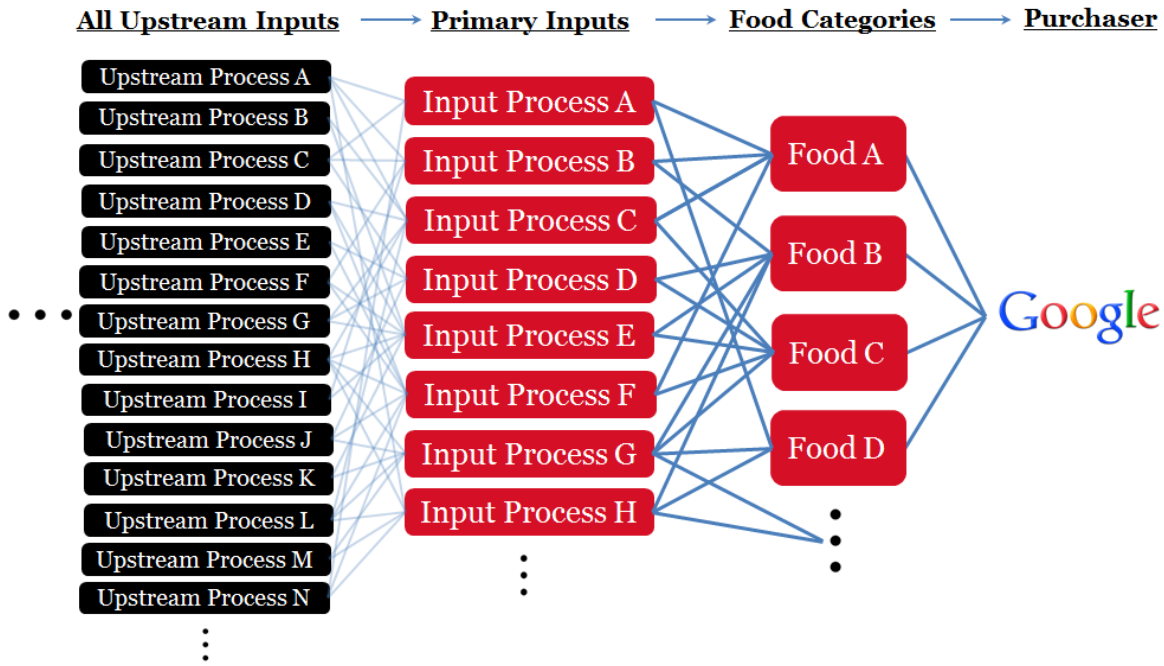


Figure 34 - Conceptual Map of Input Contribution Analysis for All Phase One Foods: The primary input hotspots most prominent in Phase 1 food items are identified in this analysis.

Recall that for each food product, the input contribution analysis tool in CEDA displays the top ten primary input process hotspots. Also recall that results are generated by selecting an impact category and NAICS code. For this aggregate analysis, it is important to note that the NAICS codes used for each category are the same as those used in the LCIA analysis. That is to say, some categories are farm level and some are processing level, based on the methodology explained in the LCIA methods section. Using per food category input contribution results (Appendices C.3 and C.4), the group devised a simple method for calculating the percent impact of a primary input process across all Phase 1 food categories. This provided the group with an understanding of the most environmentally impactful input processes across all Phase 1 food products.

Figure 35 shows a generalized equation for calculating the percent input contribution for a process across all Phase 1 food products. This example shows the result for global warming.

$$Y_{GW,TOTAL_1} = \sum_{k} \frac{IMPACT_{GW,k}}{IMPACT_{GW1}} \cdot Y_{GW,k}$$

$Y_{GW,TOTAL_1}$ – % input contribution for a process for global warming across all Phase 1 food products

k – Food product

$IMPACT_{GW,k}$ – Total global warming impact for food product, calculated during LCIA

$IMPACT_{GW^1}$ – Total global warming impact across all Phase 1 food products, calculated during LCIA

$Y_{GW,k}$ – % input contribution for a process for global warming impact and food product

Figure 35 - Generalized Equation and Accompanying Key for Input Contribution Analysis Across All Phase 1 Food Items.

This was done for all input processes ($Y_{GW,k}$) that appeared in any input contribution analysis across all Phase 1 food products. Results were ranked from highest to lowest percent contribution ($Y_{GW,TOTAL1}$). The same process was performed for water consumption percent input contribution values ($Y_{WC,k}$) that appeared in any water consumption input contribution analysis across all Phase 1 food products. Results were ranked from highest to lowest percent contribution ($Y_{WC,TOTAL1}$), and are discussed in the next section.

6.3.2 RESULTS AND INTERPRETATION

The input contribution results for greenhouse gas emissions and water consumption shown in Figure 36 and 37 display the relative contribution of each primary input process in the production of all Phase 1 foods. Only input processes that represent above a 5% contribution are specified; contributions of less than 5% are aggregated into the "all remaining" category. Results are shown for both global warming and water consumption. Full results for global warming appear in appendix C.5.1 and for water consumption in appendix C.5.2.

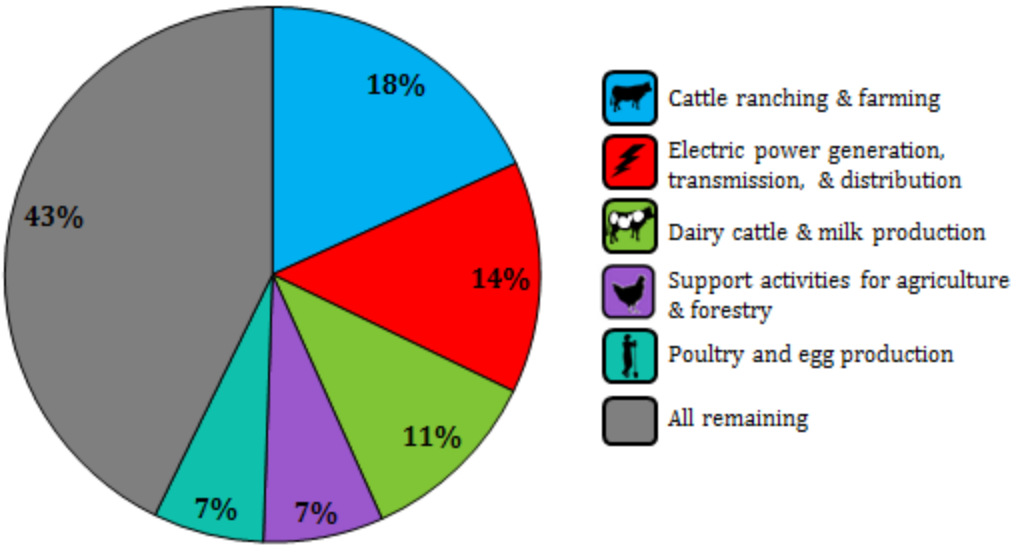


Figure 36 - Top Contributing Greenhouse Gas (CO_2e) Supply Chain Inputs.

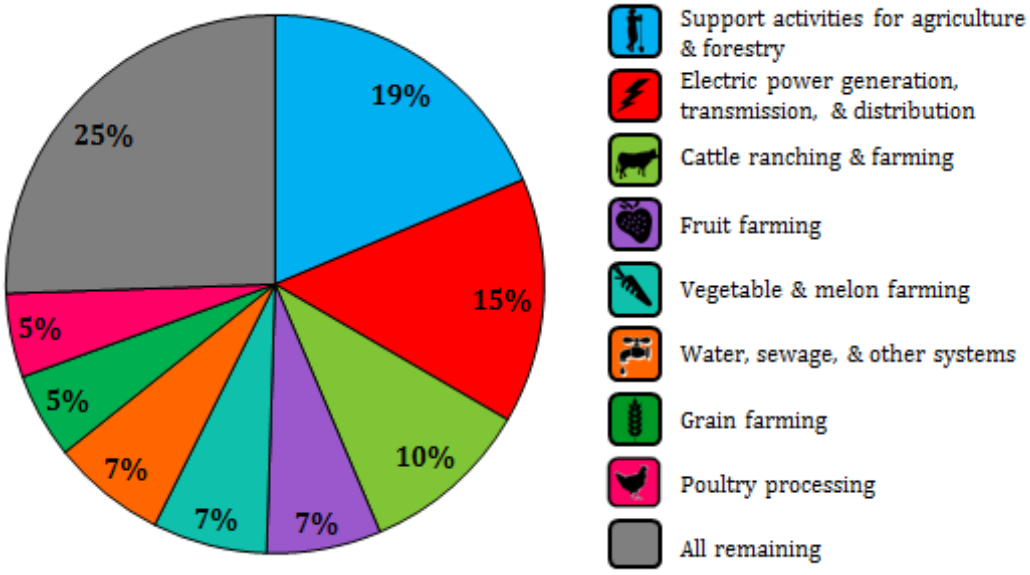


Figure 37 - Top Contributing Water Consumption Supply Chain Inputs.

The input contribution results for all Phase 1 food products echo the food category specific results from earlier in the input contribution analysis, because it is simply an aggregation of that data. In its current state, this data provides context for overall hotspot primary input processes, but the result of the subsequent output contribution analysis provide a more meaningful perspective of impacts generated throughout the entire food procurement supply chain.

7 OUTPUT CONTRIBUTION ANALYSIS

7.1 RATIONALE

The purpose of output analysis is to understand the overall processes that directly generate global warming and water consumption attributable to Google's food procurement supply chain. Figure 38 provides a visualization for this type of analysis.

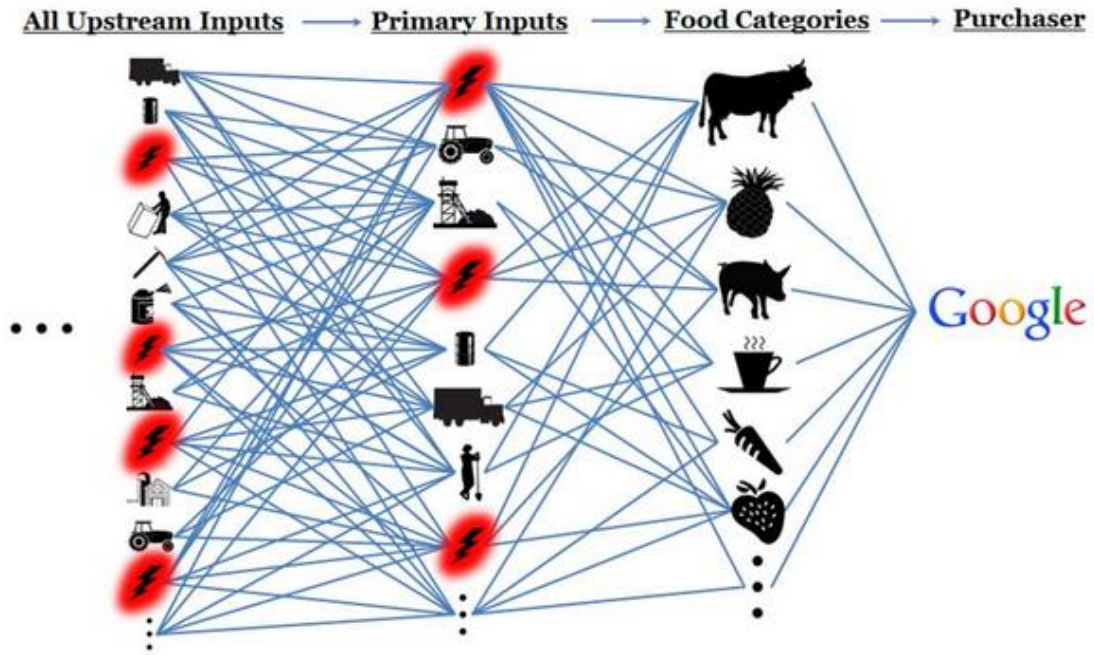


Figure 38 - Conceptual map of output contribution analysis: Icons highlighted in red represent recurring processes that contribute environmental impacts throughout the entire supply chain.

7.2 PROCESS

In order to understand the environmental impacts from the food purchasing supply chain, it is necessary to know which common processes are most responsible for global warming and water impacts when all food purchases are taken into account. Called the output contribution analysis, this process identifies all significant inputs repeated throughout the supply chain and their associated environmental impacts. The most impactful recurring inputs present opportunities for reducing the associated environmental impacts of the overall purchasing strategy without actually changing the amount purchased of any given food. This allows the client to minimize food production impacts in a way that does not affect the Google's employee dining experience.

For example, electricity is required for a variety of processes that go into the production of many different foods. Understanding the effects of this supply chain hotspot enables the client to create a macro-level food sourcing strategy to mitigate the

environmental impacts of electricity embodied in food products. A logical approach would be the following:

1. Determine the most significant common supply chain inputs for aggregated purchasing results.
2. Among the identified supply chain hotspots, determine those that have high variability across producers.
3. Treat these high impact, high variability supply chain inputs as priorities in a sustainable purchasing strategy.
4. A purchase that minimizes the most impactful supply chain hotspots is considered the most environmentally friendly option available for that purchasing strategy.
5. Purchases can be ranked based both on environmental impact and cost, creating a cost-effective, environmentally friendly sourcing strategy for the procurement team.

For example, if electricity is the top contributor to the overall supply chain impact, and not all food producers use the same amount of electricity, Google might survey their producers and decide to purchase from the producer that best manages its energy efficiency. This approach would allow Google to create general data-driven large scale purchasing strategies to reduce environmental impact.

The Output Contribution Analysis was performed using CEDA's Output Contribution Analysis Tool. Upon selecting the impact category and industrial process of interest, this tool displays the top ten input process hotspots embodied in the impact of the selected industrial process. The industrial process selected for each food category is the same NAICS category used to calculate impact during the Life Cycle Impact Assessment. A detailed list of industrial process definitions can be found in Appendix C.2. Figure 39 is a visual representation of the data presented in the output contribution analysis. All primary input processes and upstream input processes are analyzed across all food products.

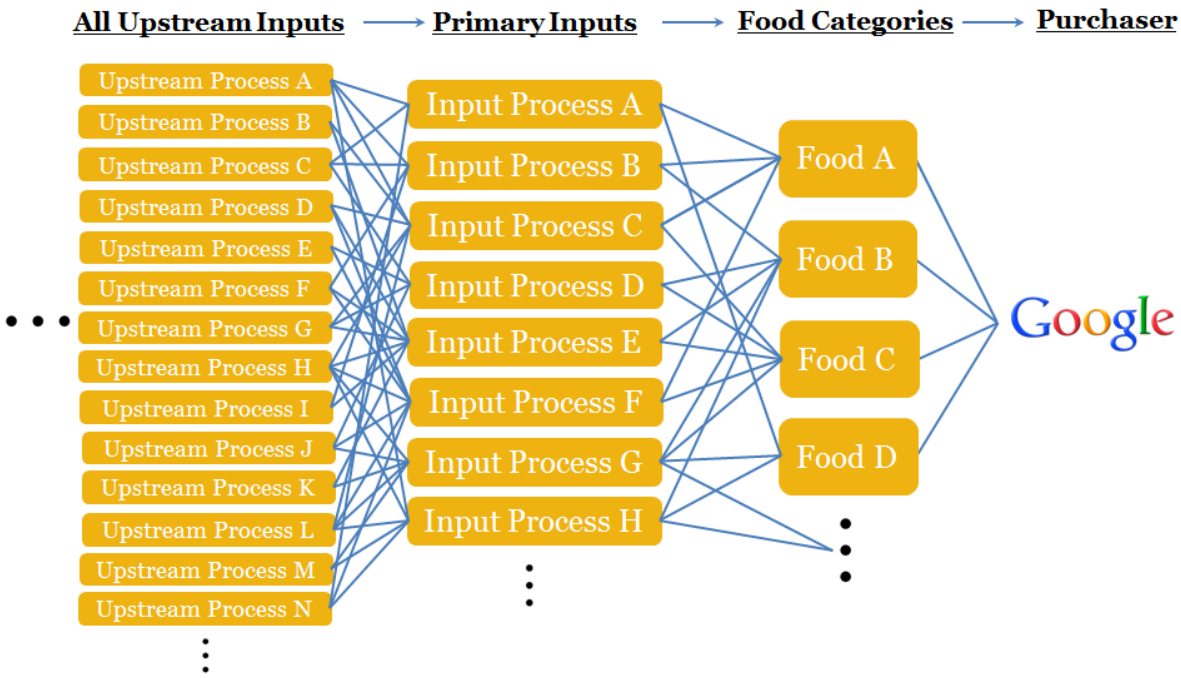


Figure 39 - Visualization of the output contribution analysis for all Phase 1 food categories.

Recall that for each food product, the Output Contribution Analysis tool displays the top ten most environmentally impactful input processes. Using a large dataset generated by analyzing output contributions for each food product, the group devised a simple method for aggregating percent impact of a process across all Phase 1 food categories. This revealed the most environmentally impactful processes throughout the client's food supply chain, which directly account for the environmental impacts across all Phase 1 food products.

Figure 40 shows an example equation for calculating percent output contribution for a process across all Phase 1 food products. This example shows percent output contribution result for global warming.

$$Z_{GW,TOTAL_1} = \sum_k \frac{IMPACT_{GW,k}}{IMPACT_{GW1}} \cdot Z_{GW,k}$$

$Z_{GW,TOTAL_1}$ - % output contribution for a process for global warming across all Phase 1 food products

k – Food product

$IMPACT_{GW,k}$ – Total global warming impact for food product, calculated during LCIA

$IMPACT_{GW1}$ – Total global warming impact across all Phase 1 food products, calculated during LCIA

$Z_{GW,k}$ - % output contribution for a process for global warming impact and food product

Figure 40 - Generalized equation for calculating output contribution analysis.

This was done for all $Z_{GW,k}$ that appeared in any input contribution analysis across all Phase 1 food products. Results were ranked from highest $Z_{GW,TOTAL1}$ value to lowest $Z_{GW,TOTAL1}$. The same process was performed for water consumption percent input contribution values ($Z_{WC,k}$) that appeared in any water consumption input contribution analysis across all Phase 1 food products. Results were ranked from highest $Z_{WC,TOTAL1}$ value to lowest $Z_{WC,TOTAL1}$. These results are shown fully in Appendices D.1 and D.2 and discussed in detail in the next section.

7.3 RESULTS AND INTERPRETATION

Figures 41 and 42 show the largest environmental impacts for global warming and water consumption. Only categories that represent above a 5% contribution are specified; contributions of less than 5% are aggregated into the "all remaining" category.

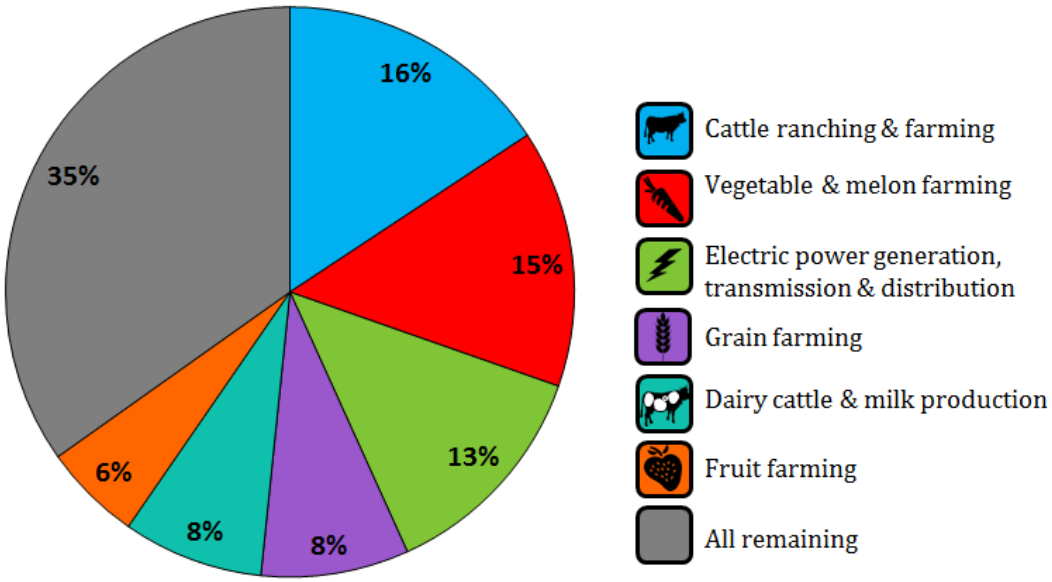


Figure 41 - Global Warming Output Contribution Analysis for All Phase 1 Food Categories.

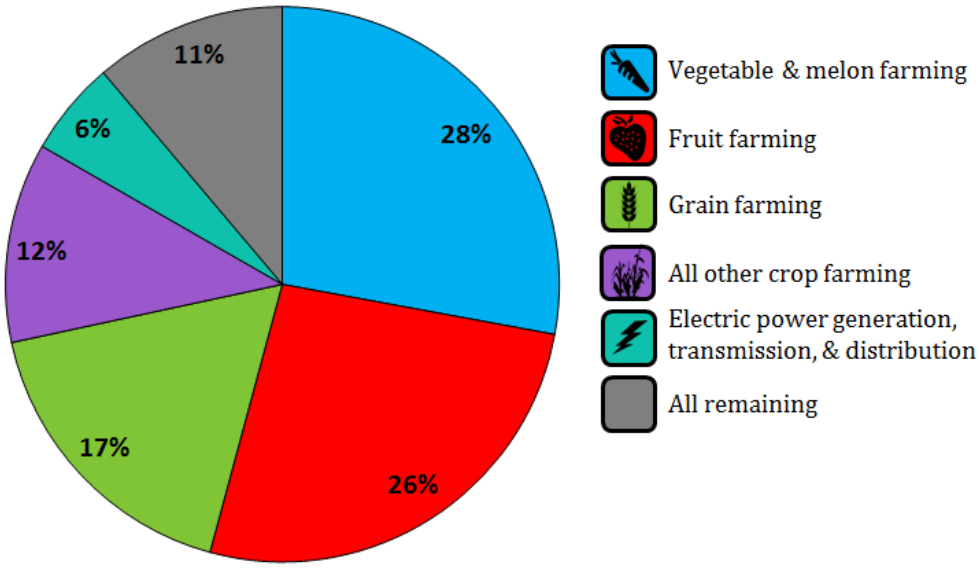


Figure 42 - Water Consumption Output Contribution Analysis for All Phase 1 Food Categories.

Using the information from the output contribution analysis, the purchaser can directly engage suppliers to mitigate impacts for these highly impactful processes, leading to a reduction of environmental impacts on the supplier end. In a general sense, environmental impacts can be reduced in two ways. One method is to reduce the use of the process, and the other is to increase the efficiency of the process. Output contribution results are not useful for quantifying environmental impact reductions, but they do provide high-level perspective for strategic planning. With these results, a purchaser such as Google

can effectively communicate hotspot processes and pressure producers to undertake process use reductions and efficiency improvements. Reducing the impact of these hotspot processes throughout the supply chain can result in a reduction of environmental impacts without changing the employee dining experience.

It is important to remember that all preceding analyses are based on national average data contained in CEDA. This is appropriate for global warming, since greenhouse gases have global-scale impacts. However, water consumption has regional variation in supply and demand. In order to understand water consumption more thoroughly, we have developed a regional water stress index.

8 WATER STRESS INDEX

8.1 WATER: A UNIQUE CASE IN LCA

In performing an LCA to understand the environmental impacts of food sourcing, it is important to consider more than the quantity of water used in the agricultural processes. The location from which water is sourced is integral to determining the overall environmental impact. Where water is plentiful, a process may use large amounts of water with very little impact, whereas areas in which water is scarce may be dramatically affected by processes that require relatively little water.

Traditional LCAs tend to neglect the importance of freshwater throughout a product's lifecycle, as the methodology was originally developed with a focus on analyzing the energy consumption and waste products of industrial processes in countries that do not suffer from water scarcity (Berger & Finkbeiner, 2010). Comparatively, agricultural processes use relatively tremendous amounts of water and much of the world's most productive land is in areas with scarce water supplies (Berger & Finkbeiner, 2010). Furthermore, there are different categories of use for water: in-stream or off-stream use and degradative or consumptive use. In-stream use occurs when water is used without being removed from its watercourse, whereas off-stream use occurs when water is used in a way that removes it from its watercourse. Degradative use occurs when the quality of water is altered and it is returned to its watershed of origin. Consumptive use arises when water is removed from its watershed of origin and not returned (Berger & Finkbeiner, 2010). The various uses of water and the significance of regional effects illustrates the importance of conducting an LCA that accounts for these components when investigating agricultural products.

The Water Footprint Assessment Manual serves as a tool and guideline for analyzing the impacts of water through a product's lifecycle. The manual divides water consumption into three categories: blue water, green water, and greywater. Blue water is the consumption of surface and groundwater that is lost from the original catchment area due to evaporation or transfer. Green water is the consumption of rainwater by plants, which prevent the water from becoming runoff due to evapotranspiration. Grey water is the pollution of water, gauged by the amount of freshwater needed to dilute the pollution to an appropriate level (Hoekstra, Chapagain, Aldaya, & Mekonnen, 2011). This book provides detailed methods for developing water footprints of various scopes and with a range of spatial and temporal detail, which is especially useful for conducting a regional analysis of a limited set of producers.

Ridoutt and Pfister (2009) offer a detailed example of the method and benefit of conducting a scarcity-based analysis rather than a simple volumetric analysis. They explain that water footprints are similar to carbon footprints in name only; whereas carbon emissions have almost entirely global effects, the impacts of water consumption are almost entirely regional (Ridoutt & Pfister, 2009). Water footprints cannot be simply expressed as

a single number, as is the case with carbon dioxide equivalents, but the use of water stress indices allows for some degree of normalization between water consumption in different regions (Ridoutt & Pfister, 2009). Such water stress indices can be useful tools for comparing the impacts of sourcing local food from water-stressed farms with food shipped from distant suppliers with abundant water supplies.

8.2 WATER STRESS MODEL

In order to regionalize the water impacts derived from CEDA's national data, it is necessary to establish a water stress index to compare water availability and extraction across states. In this report, water stress is defined as the relative difference in water that would be available to the environment without human withdrawals compared to the amount of water that is available to the environment after humans make with withdrawals. This definition of water stress emphasizes an ecological perspective of water supply and demand, where ecosystems are adapted to flows undisrupted by human intervention; contrast this with conventional water stress indices from the human perspective, in which stress is gauged by economically-driven demands for water consumption and the amount of water that can be feasibly withdrawn from the environment.

The full dataset for the following explanation of the water stress model methodology is located in Appendix E.

The National Oceanic and Atmospheric Administration's average annual precipitation by state from 1971-2000, in inches per year, was used as the baseline for the water supply. The average precipitation was multiplied by the United States Geological Survey's conversion factor ("Rain and precipitation", 2013) and the United States Census' state area data ("State Area Measurement", n.d.) to derive an annual volume of water available to each state. The volume of water was then converted to mass in kilograms to bring it in line with the CEDA impact output.

$$state\ average\ precipitation \frac{in}{yr} * \frac{65{,}780{,}000\ liters\ water}{\frac{in\ precipitation}{mi^2}} * state\ mi^2 * \frac{1\ kg\ water}{1\ liter\ water}$$
$$= state\ supply\ \frac{kg\ water}{yr}$$

The 2009 USGS report on 2005 water withdrawals provided data in millions of gallons per day for surface water and groundwater withdrawals by state (Kenny et al., 2009). The average volume per day was converted to total kilograms per year and summed to provide total annual withdrawals by mass.

$$\left(groundwater\ withdrawal\ \frac{gal}{day} * \frac{3.785\ kg\ water}{1\ gal\ water} * \frac{365\ days}{1\ yr}\right) +$$

$$\left(surface\ water\ withdrawal\ \frac{gal}{day} * \frac{3.785\ kg\ water}{1\ gal\ water} * \frac{365\ days}{1\ yr}\right) = total\ withdrawals\ \frac{kg\ water}{yr}$$

Further calculation provided the percent of precipitation withdrawn from the environment as either surface or groundwater, as both a by-state value and the U.S. average.

$$\left(withdrawals\ \frac{kg\ water}{year} \div supply\ \frac{kg\ water}{yr}\right) * 100\% = \%\ of\ water\ supply\ used$$

Dividing the percent of supply used for each state by the U.S. average percent supply used reveals the difference in water stress between states.

$$(\%\ of\ state\ water\ supply\ used \div U.S.\ average\ \%\ supply\ used) = state\ water\ stress\ multiplier$$

The resulting number associated with each state is the water stress multiplier. The water stress multiplier can be used to compare the relative impact of water used within a state to the impact of the same amount of water used in another state (Figure 43 and 44).

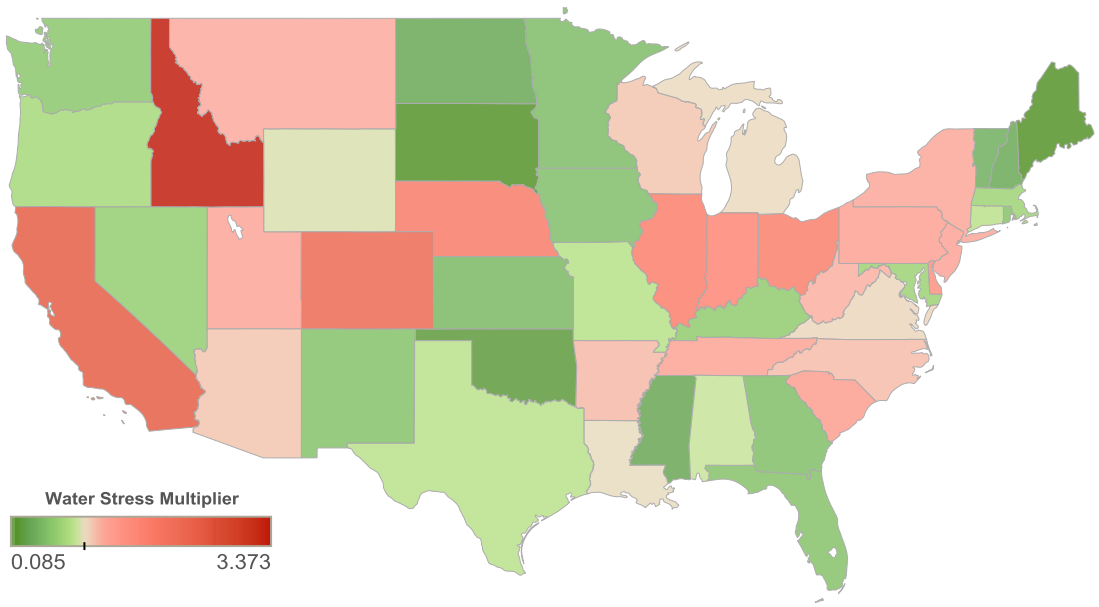


Figure 43 – Map of Water Stress Multiplier by State.

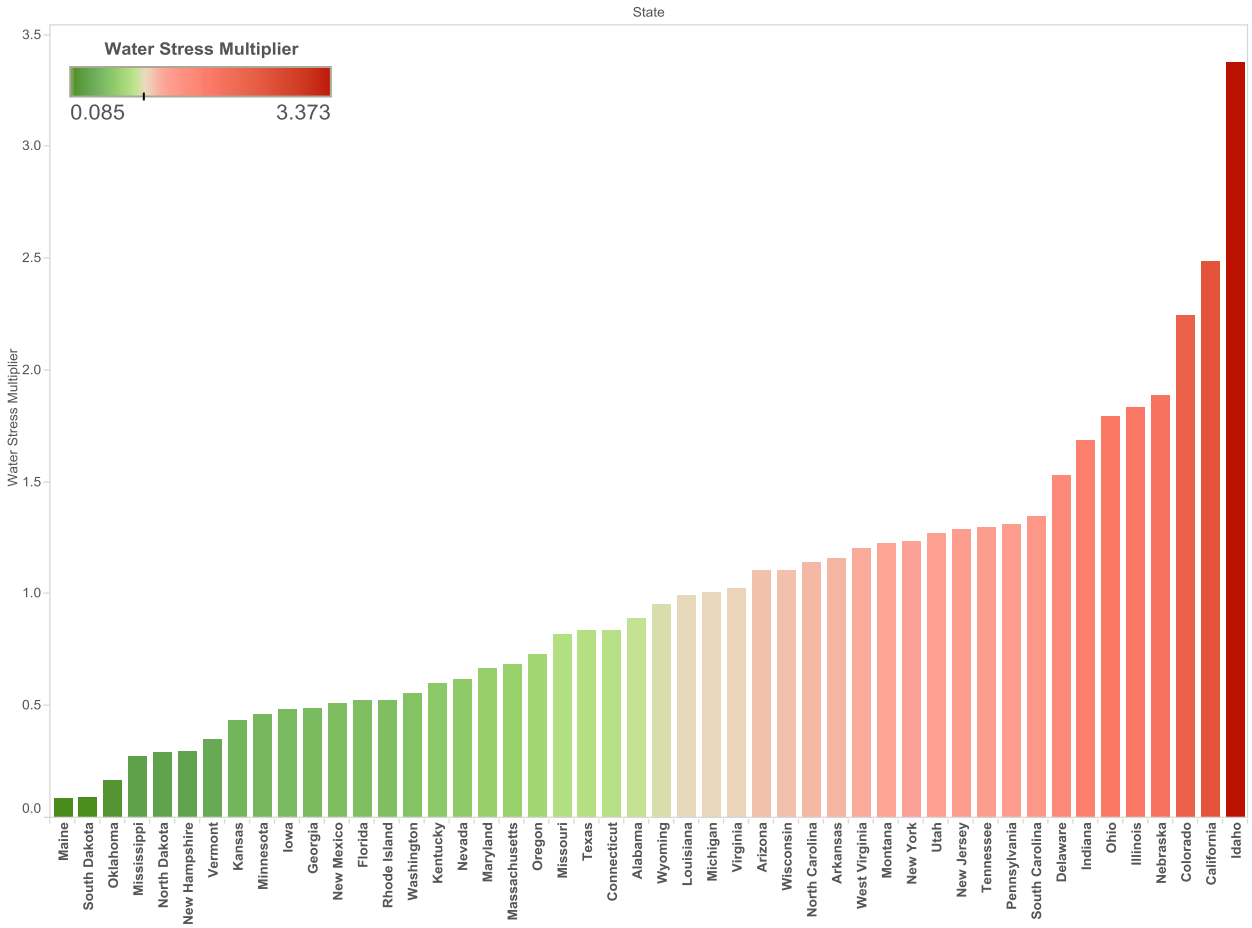


Figure 44 - Graphical Representation of State-by-State Water Stress Multiplier.

In order to use the water stress index to guide the sourcing of agricultural products, an additional consideration of agricultural irrigation should be applied. Because the goal is not only to source agricultural products from the least water stressed states, but to reduce the effective water footprint of those sourcing decisions, the proportion of water used for irrigation needs to be considered. In other terms, a state may have a high water stress but have consistent precipitation and use very little irrigation for agriculture, so agricultural products from that state may embody less water consumption than comparable products from a state with a lower stress and a high percentage of overall water used for irrigation. Multiplying the initial water stress multiplier by the percent water used for irrigation for each associated state provides the irrigation water stress multiplier for each state (Figure 45).

$$\frac{W_s/P_s}{W_n/P_n} \cdot I_s = Irrigation\ Water\ Stress\ Multiplier$$

W_s - Withdrawals (state)
W_n - Withdrawals (national)
P_s - Precipitation (state)
P_n - Precipitation (national)
I_S - % Water Used for Irrigation (state)

Figure 45 – Regionalized Water Stress Equation.

Figures 46 and 47 graphically display the comparison of irrigation water stress between states.

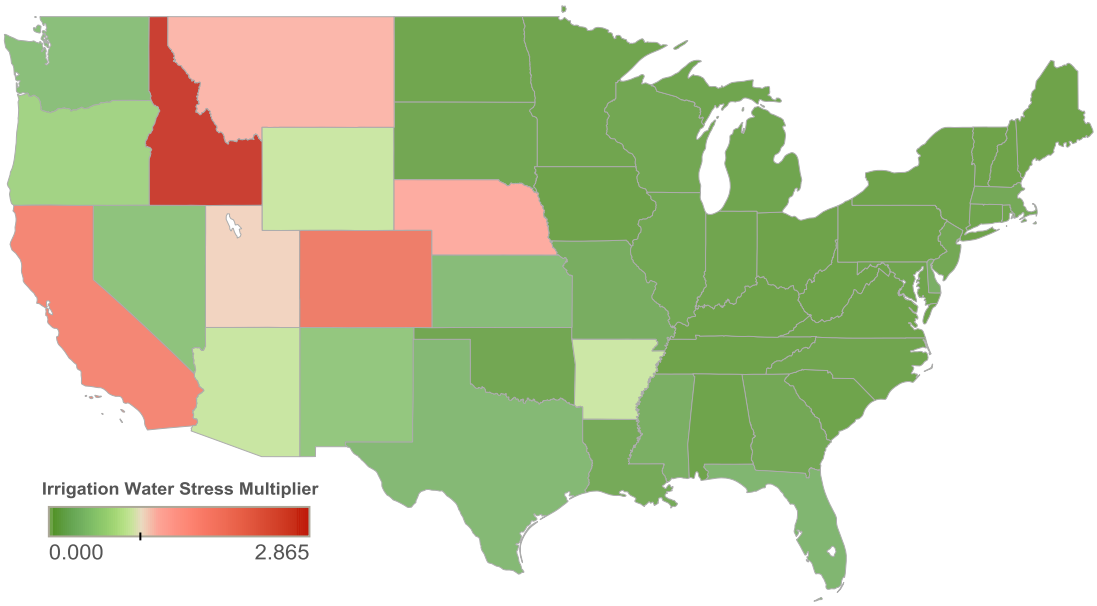


Figure 46 – Map of Irrigation Water Stress Multiplier by State.

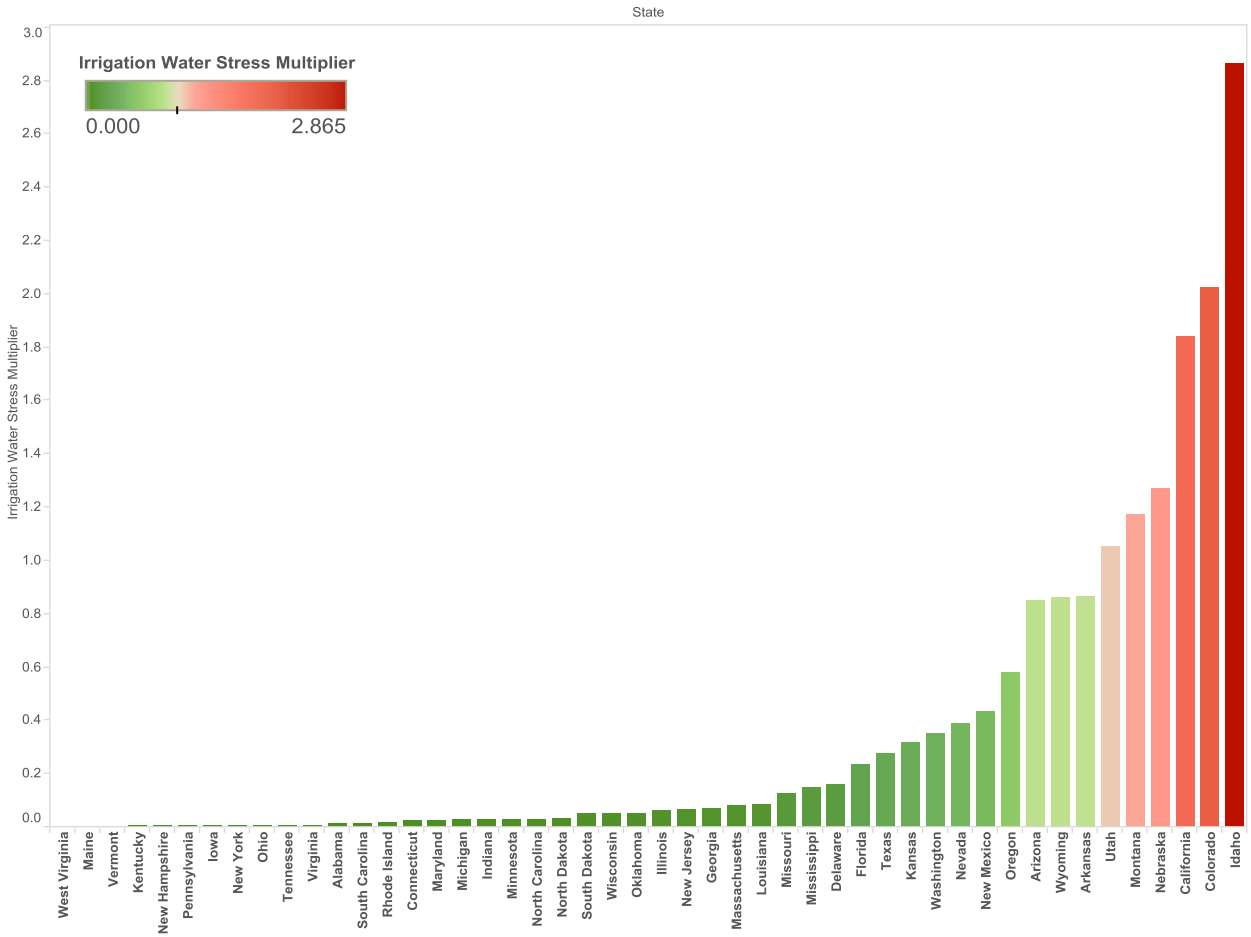


Figure 47 – Graphical Representation of State-by-State Irrigation Water Stress Multiplier

The resulting value associated with each state can then be multiplied by the CEDA water consumption output for the purchase of a given item to provide the water consumption equivalent for sourcing the item from a specific state instead of as a nationally-sourced commodity.

$$CEDA\ water\ consumption * \ state\ irrigation\ water\ stress\ multiplier = H_2Oe$$

H_2Oe can be subtracted from the CEDA water consumption to find the difference in H_2Oe.

$$CEDA\ water\ consumption - H_2Oe = H_2Oe\ difference$$

If the number is positive, it represents that much reduction from the CEDA water footprint. If the number is negative, it represents that much increase above the CEDA water footprint. This tool can be applied to a food procurement program to selectively source from the states that have less environmental water stress from irrigation to reduce the effective water footprint of that program.

8.3 DISCUSSION OF KEY TAKEAWAYS

8.3.1 LIFE CYCLE IMPACT ASSESSMENT

This project provided a screening-level life cycle assessment based on greenhouse gas and water consumption environmental impacts for one year of Google's food purchasing. Results of this analysis can be broken into three primary sections: (1) overall greenhouse gas impacts and water consumption, (2) impacts of coarse food categories, and (3) impacts of individual food items.

The overall annual impact of Google's food purchasing was estimated to be 45.91kt CO_2e for total global warming and 16.14mt for total water consumption. In terms of Phase 1, or immediately addressable food items, impact was estimated to be 33.45kt CO_2e for total global warming and 10.21mt for total water consumption. Coarse food category results can be divided into high impact categories for both global warming impact and water consumption. In descending order, the top ten global warming impact food categories are:

1. Vegetables (6.83 kt CO_2e, 20.41%)
2. Beef (4.68 kt CO_2e, 14.00%)
3. Fresh fruits (3.39 kt CO_2e, 10.15% impact)
4. Pork (3.35 kt CO_2e, 10.01%)
5. Chicken (2.32 kt CO_2e, 6.94%)
6. Cheese (2.25 kt CO_2e, 6.72%)
7. Nut, seed, rice, grain, bean total (1.86 kt CO_2e, 5.57%)
8. Milk (1.62kt CO_2e, 4.83%)
9. Eggs (1.27 kt CO_2e, 3.80%)
10. Juices (1.10 kt CO_2e, 3.28%)

In order of decreasing impact, the top ten water consumption food categories are:

1. Fresh fruits (2.96 Mt H_2O, 28.95%)
2. Vegetables (2.69 Mt H_2O, 26.37%)
3. Beef (0.68 Mt H_2O, 6.62%)
4. Nut, seed, rice, grain, bean total (0.58 Mt H_2O, 0.58%)
5. Chicken (0.50 Mt H_2O, 4.93%)
6. Pork (0.48 Mt H_2O, 4.73%)
7. Coffee (0.41 Mt H_2O, 4.00%)
8. Eggs (0.35 Mt H_2O, 3.43%)
9. Juices (0.28 Mt H_2O, 2.73%);
10. Cheese (0.28 Mt H_2O, 2.71%).

Note that these percent impact values are expressed as a percent of total Phase 1 impact.

As with coarse food category results, individual food item results can be divided into high impact categories for both global warming impacts and water consumption. The fine analysis for global warming prioritized highly impactful food items based on life cycle greenhouse gas emissions. In descending order, the top ten global warming impact food items are as follows:

1. Beef (4.68 kt CO_2e, 14.0%)
2. Pork (3.35 kt CO_2e, 10.0%)
3. Chicken (2.32 kt CO_2e, 6.9%)
4. Cheese (2.25 kt CO_2e, 6.7%)
5. Milk (1.62 kt CO_2e, 4.8%)
6. Eggs (1.27 kt CO_2e, 3.8%)
7. Yogurt (1.09 kt CO_2e, 3.3%)
8. Lettuce (1.01 kt CO_2e, 3.0%)
9. Coffee (0.96 kt CO_2e, 2.9%)
10. Nuts (0.78 kt CO_2e, 2.3%)

In descending order, the top ten water consumption food items are as follows:

1. Beef (0.68 Mt H_2O, 6.6%)
2. Chicken (0.50 Mt H_2O, 4.9%)
3. Pork (0.48 Mt H_2O, 4.7%)
4. Tomatoes (0.42 Mt H_2O, 4.1%)
5. Coffee (0.41 Mt H_2O, 4.0%)
6. Strawberries (0.36 Mt H_2O, 3.5%)
7. Eggs (0.35 Mt H_2O, 3.4%)
8. Lettuce (0.33 Mt H_2O, 3.2%)
9. Bananas (0.33 Mt H_2O, 3.2%)
10. Cheese (0.28 Mt H_2O, 2.7%)

Note that these percent impact values are expressed as percent of total Phase 1 impact.

These results reveal several insights. First, the relative impact of individual food items decreases quickly, illustrating that a minority of the food items account for the majority of global warming impact and water consumption. This demonstrates that mitigation efforts applied to a few top items will result in proportionally large decreases in carbon and water footprints. Second, animal products account for at least five out of the top ten items in both the overall food category and individual food item analysis for both global warming impacts and water consumption. This information directs the client to prioritize animal products for impact mitigation strategies and further research.

8.3.2 INPUT CONTRIBUTION ANALYSIS

The life cycle impact assessment provided the client with a baseline estimate of carbon and water footprints attributable to food purchasing. In order to understand the primary inputs responsible for the greatest environmental intervention throughout the food supply chain, the project team performed an input contribution analysis. The analysis found that of 47 total input processes, the hotspot food categories for global warming impact were the following:

- Cattle ranching and farming (18%)
- Electric power generation, transmission, and distribution (14%)
- Dairy cattle and milk production (11%)
- Poultry processing (7%)
- Support activities for agriculture and forestry (7%)

The same supply chain level input contribution analysis was completed for water consumption. The following direct process input categories were identified as the most impactful for water consumption:

- Support activities for agriculture and forestry (19%)
- Electric power generation, transmission, and distribution (15%)
- Cattle ranching and farming (10%)
- Fruit farming (7%)
- Vegetable and melon farming (7%)
- Water, sewage, and other systems (7%)
- Grain farming (5%)
- Poultry processing (5%)

The procurement team can use the aggregating input contribution analysis to identify which inputs should be focused on when deciding between suppliers.

In addition to a supply chain overview of input contributions, the team also performed an analysis of the direct input process requirements of various food categories, which is a way of determining the practices that have comparatively less impact on the environment. This analysis was performed for vegetables, beef; fruit; pork; chicken; cheese; and nut, seed, rice, grain, bean. For any given food category hotspot, this displays the individual inputs that account for the embodied carbon and water footprints of the food item. This food category specific input contribution analysis can serve as a first step in creating a metrics-based scorecard for assessing the environmental performance of a grower's production methods.

8.3.3 OUTPUT CONTRIBUTION ANALYSIS

The output contribution analysis is useful in understanding the processes that directly generate global warming and water consumption attributable to Google's food procurement supply chain. The following six processes are most impactful, accounting for approximately 75% of total greenhouse gas emissions in the client's food supply chain:

- Cattle ranching and farming (16%)
- Vegetable and melon farming (15%)
- Electric power generation, transmission, and distribution (13%)
- Grain farming (8%)
- Dairy cattle and milk farming (8%)
- Fruit farming (6%)

For water consumption, the following processes are most impactful, making up over 89% of the total supply chain water consumption:

- Vegetable and melon farming (28%)
- Fruit farming (26%)
- Grain farming (17%)
- All other crop farming (12%)
- Electric power generation, transmission, and distribution (6%)

Using the information from the output contribution analysis, the purchaser can directly engage suppliers to reduce impacts in these environmental categories. This would lead to a reduction of environmental impacts on the supplier end, resulting in an overall reduction of impacts without changing the employee dining experiences.

8.3.4 WATER STRESS IMPACT QUANTIFICATION

The water stress model can be used to quantify water impact reductions from regional sourcing of agricultural products. CEDA provided the water consumption benchmark for each product category, which can be treated as nationally sourced. Applying the irrigation water stress multiplier to product purchases results in the water consumption equivalent. The top five most stressed states (and their stress multipliers) are:

- Idaho (286.5%)
- Colorado (202.3%)
- California (184.1%)
- Nebraska (127.1%)
- Montana (117.1%)

The top five least stresses states (and their stress multipliers) are:

- West Virginia (0.0%)
- Maine (0.1%)
- Vermont (0.2%)
- Kentucky (0.3%)
- New Hampshire (0.3%)

The difference between the CEDA water consumption output and the water consumption equivalent for a given state is the change in equivalent water consumption, so choosing products from less-stressed states is equivalent to consuming less water. Implementing this tool into their sustainable sourcing program would enable Google to accomplish its goal of quantifiably reducing its water footprint without affecting the employee experience.

8.4 ASSUMPTIONS & LIMITATIONS

The following sections discuss the assumptions and limitations of the project methods employed the potential effect these limitations might have on the results.

8.4.1 DATA

The CrunchTime! data received from the client includes three months of food procurement data, which was extrapolated to annual figures. The client acknowledges seasonal fluctuations in procurement patterns and prices, but felt the given data was representative of an average year of food purchasing. Although individual items may differ throughout the year due to seasonality, the broader categories of foods do not vary significantly from quarter to quarter. Neither price fluctuation or product seasonality are expected to significantly influence the results of the project.

For the data underlying the water stress index portion of the analysis, the timescales selected for the precipitation data from NOAA and the withdrawal data from USGS undoubtedly influenced the relevant stress values. NOAA precipitation data was used for the period 1971 to 2000, whereas the USGS withdrawal data comes from a report estimating U.S. water consumption in 2005. Furthermore, the water stress is geographically defined using state borders. As watersheds do not conform to state defined geographical constraints, a county level stress index would provide increased granularity to the stress of a food production region.

8.4.2 METHODS

8.4.2.1 Category Assignments

The results and subsequent recommendations of the life cycle impact assessment, input contribution analysis, and output contribution analysis are significantly impacted by category assignments provided by the client and how they were interpreted by the group. For example, the broader categories contained in the supplied raw data included "fresh fruits," "vegetables," "cheese," "milk," "chicken," "pork," beef," "finfish," "shellfish," and so on. The definition and makeup of these categories had a large effect on the outcome of the initial analysis: had all forms of land protein been combined into one "meat" category, the way food groups are traditionally organized, the comparative impacts of meat would have been significantly greater than in their individual categories. This logic could apply to dairy, seafood, and a variety of other food categories. The decision of which categories to disaggregate into their constituent subcategories for subsequent levels of analysis can and should be subject to the same level of scrutiny.

8.4.2.2 Priority Phasing

The specific criteria used for determining priority phasing of purchased foods also impacted the scope of the project's analysis. By choosing to exclude entire food categories from the primary analysis, the extent of useful and actionable information provided to the client is necessarily limited. The counterargument, however, is that these categories were not fully excluded, but rather prioritized below other more actionable foods.

8.4.2.3 Category Aggregation/Disaggregation

The broadly aggregated NAICS categories used by the CEDA database treat all products within a category as the same with regard to environmental impacts. The only variable is the price of the product. This means, for example, that within the fresh fruits category, growing one dollar's worth of apples has an identical environmental impact (in a given category) as growing one dollar's worth of oranges. The databases do not account for specific growing requirements within a category, nor different production methods such as no-till, organic, or conventional agriculture. However, it may be the case that the dollar-based allocation method of IO-LCA inherently accounts for differences in growth requirements. Under the assumption that higher food prices reflect greater resource input requirements, the higher price will reflect a similarly higher environmental impact.

8.4.2.4 Water Stress Index

The water stress index relies on a number of assumptions to relate national water consumption averages to more specific state-level water stress. To simplify the model, we

assume that there are no interstate effects and that ground and surface water withdrawals have the same environmental impacts. It also assumes that the ecosystem response is linear, meaning that the first kilogram of water removed from the ecosystem has the same impact as the last. Additional information could be used to generate a model with much finer precision, ideally at the watershed level, but considering the highly aggregated output from IO-LCA, additional precision would lead to false confidence.

8.4.2.5 Environmental Impact Indicators

There are a number of environmental impact indicators to choose from when conducting a life cycle assessment. The client chose to limit the analysis to global warming impact and water consumption. If the analyses were expanded to other impact indicators, recommendations may differ.

8.4.2.6 Database Granularity

Economic input-output life cycle assessment uses national average data to quantify environmental impacts. The production impacts of any specific, actual product may lie above or below the mean. A process-based LCA could supplement the project's analysis to quantify the emissions or water consumption of various product systems for a specific food item.

Results will be influenced by commodity price fluctuations. For example, if beef prices spike due to changes in supply or demand, the environmental impact as indicated by CEDA will increase. This application of price consideration is unnecessary given the goals of the client. A process-based LCA, which is not tied to economic factors, would not have this limitation.

8.5 RECOMMENDATIONS TO CLIENT

Now that global warming impact and water consumption attributable to the client's food program have been measured, they can be managed. The next step is to evaluate the goals for the food program, given the IO-LCA results. A discussion of strategies based on client preferences will promote solutions that satisfy both the client and its employees, while also achieving the goal of reducing global warming impact and water consumption. The following information, based on the project results, outlines options through which the client could make progress to the stated goal.

8.5.1 PRODUCT SUBSTITUTION

The largest reductions in global warming impact and water consumption can be achieved with product substitution. However, the client indicated that any sourcing strategy must not affect the employee dining experience. If the client chooses to

incorporate product substitution in its impact mitigation strategy, it needs to do so incrementally in an effort to avoid noticeable changes in menu offerings.

8.5.2 PRODUCER SCORECARD

Food production systems are complex and interconnected. A scorecard that incorporates the client's mission to reduce its carbon and water footprints can be used to differentiate between producers in terms of their environmental practices and impact. The contribution analyses in this report identify areas in which variation in food production systems significantly contribute to differences in global warming impact and water consumption. A scorecard would highlight these hotspot input processes, enabling quantitative comparisons between producers based on environmental factors.

8.5.3 WATER STRESS INDEX

The water stress index indicates states that are most and least affected by regional differences in water supply and irrigation demand. Google can use the index to selectively source from less-stressed states and quantify the equivalent water savings. Comparing the water stress equivalent for a product from a specific state to the benchmark value for that product reveals how much more or less impact is embodied by that regionalized product. This method allows them to claim footprint reductions without needing to substitute for less water consuming products.

8.5.4 PROCESS-BASED LCA

Now that a screening-level IO-LCA has identified hotspot food items, those items can be studied in-depth with process-based LCA. Transitioning from national average data to item-specific data would provide greater precision for determining impacts and making strategic food sourcing decisions to reduce carbon and water footprints.

9 REFERENCES

Babcock, B. A. (2008). Charting growth in food demand. *Iowa Ag Review*, *14*(3).

Bare, J. C. (2002). Traci. *Journal of Industrial Ecology*, *6*(3-4), 49-78.

Berger, M., & Finkbeiner, M. (2010). Water footprinting: How to address water use in life cycle assessment?. *Sustainability*, *2*(4), 919-944.

Bon Appétit Management Company. (2014). *Tackling climate change through our food choices*. Retrieved from http://www.bamco.com/timeline/low-carbon-diet/

Carnegie Mellon University. "Economic Input-Output Life Cycle Assessment." Carnegie Mellon. 2006. http://www.eiolca.net/Method/index.html

De Boer, I. J. (2003). Environmental impact assessment of conventional and organic milk production. *Livestock Production Science*, *80*(1), 69-77.

FAO, WFP, & IFAD. (2012). The State of Food Insecurity in the World 2012: Economic growth is necessary but not sufficient to accelerate reduction of hunger and malnutrition. *FAO, Rome*. Retrieved from http://www.fao.org/docrep/016/i3027e/i3027e.pdf

Foley, J. A., Ramankutty, N., Brauman, K. A., Cassidy, E. S., Gerber, J. S., Johnston, M., ... & Zaks, D. P. (2011). Solutions for a cultivated planet. *Nature*,*478*(7369), 337-342.

Geography, U. C. B. (n.d.). State Area Measurements and Internal Point Coordinates. Retrieved from http://www.census.gov/geo/reference/state-area.html

Google Investor Relations. (2013). Google's Income Statement Information. Retrieved from http://investor.google.com/financial/tables.html

Guthrie, J. F., Lin, B. H., & Frazao, E. (2002). Role of food prepared away from home in the American diet, 1977-78 versus 1994-96: changes and consequences. *Journal of nutrition education and behavior*, *34*(3), 140-150.

Heal, G. M., & Small, A. A. (2002). Agriculture and ecosystem services. *Handbook of agricultural economics*, *2*, 1341.

Heller, M. C., & Keoleian, G. A. (2000). *Life cycle-based sustainability indicators for assessment of the US food system* (No. 4). Center for Sustainable Systems, University of Michigan.

Hendrickson, C. T., Horvath, A., Joshi, S., Klausner, M., Lave, L. B., & McMichael, F. C. (1997, May). Comparing two life cycle assessment approaches: a process model vs. economic input-output-based assessment. In*Electronics and the Environment, 1997. ISEE-1997., Proceedings of the 1997 IEEE International Symposium on* (pp. 176-181). IEEE.

Herzog, T. (2009). World greenhouse gas emissions in 2005. *World Resources Institute*.

Ho, V., & Kurnit, K. (2012, June 11). *Celebrating The Food Revolution At Google*. Retrieved from http://www.jamieoliver.com/us/foundation/jamies-food-revolution/news-

Hoekstra, A. Y., Chapagain, A. K., Aldaya, M. M., Mekonnen, M. M. (2011) The water footprint assessment manual: Setting the global standard. Can only find 2012 version…

Hunt, R. G., Franklin, W. E., & Hunt, R. G. (1996). LCA—How it came about.*The International Journal of Life Cycle Assessment*, *1*(1), 4-7.

International Organization for Standardization. "ISO 14040." Environmental Management – Life Cycle Assessment – Principles and Framework 2 (2006) 1-20

Kenny, J.F., Barber, N.L., Hutson, S.S., Linsey, K.S., Lovelace, J.K., and Maupin, M.A., (2009). *Estimated use of water in the United States in 2005* (p. 52). Reston, VA: US Geological Survey. Retrieved from http://pubs.usgs.gov/circ/1344/pdf/c1344.pdf

McWilliams, J. E. (2009). *Just food: Where locavores get it wrong and how we can truly eat responsibly*. Hachette Digital, Inc.

Melack, J. (2013). Eutrophication and Global Warming. *Biogeochemistry*. Lecture conducted at University of California Santa Barbara, Santa Barbara, CA.
(http://www.bibme.org/citation-guide/APA/lecture) – used this format

Miller, R. E., & Blair, P. D. (2009). *Input-output analysis: foundations and extensions*. Cambridge University Press.

National Restaurant Association. (2008). Restaurant Performance Index, 2009 Restaurant Industry Forecast. Retrieved from http://www.restaurant.org/

Pimentel, D., Hepperly, P., Hanson, J., Douds, D., & Seidel, R. (2005). Environmental, energetic, and economic comparisons of organic and conventional farming systems. *BioScience*, *55*(7), 573-582.

Quantis (2009). *Case Studies*. World Food LCA Database. Retrieved from http://www.quantis-intl.com/case_studies.php

Ridoutt, B.G., Pfister, S. (2010). A revised approach to water footprinting to make transparent the impacts of consumption and production on global freshwater scarcity.Global Environmental Change-Human and Policy Dimensions , 20, 113-120. doi:10.1016/j.gloenvcha.2009.08.003

Ray, D. K., Mueller, N. D., West, P. C., & Foley, J. A. (2013). Yield trends are insufficient to double global crop production by 2050. *PLoS One*, *8*(6), e66428.

Schau, E. M., & Fet, A. M. (2008). LCA studies of food products as background for environmental product declarations. *The International Journal of Life Cycle Assessment*, *13*(3), 255-264.

Special Projects Staff, S. S. S. D. (n.d.). North American Industry Classification System (NAICS) Main Page. Retrieved March 22, 2014, from https://www.census.gov/eos/www/naics/

Suh, S. (2004). Comprehensive Environmental Data Archive (CEDA) 3.0. *User's Guide. Institute of Environmental Science (CML), Leiden University, Leiden, The Netherlands*.

Suh, S. (2005). Developing a sectoral environmental database for input–output analysis: the comprehensive environmental data archive of the US. *Economic Systems Research*, *17*(4), 449-469.

Suh, S. (2013). Goal and Scope Definition, Life Cycle Inventory Assessment, Life Cycle Impact Assessment. *Life Cycle Assessment*. Lecture conducted from University of California Santa Barbara, Santa Barbara, CA.

Thistlethwaite, R., & Brown, M. (2010). Case Study No. 2: Bon Appétit Management Company.

Tilman, D., Cassman, K. G., Matson, P. A., Naylor, R., & Polasky, S. (2002). Agricultural sustainability and intensive production practices. *Nature*, *418*(6898), 671-677.

Tilman, D., Fargione, J., Wolff, B., D'Antonio, C., Dobson, A., Howarth, R., ... & Swackhamer, D. (2001). Forecasting agriculturally driven global environmental change. *Science*, *292*(5515), 281-284.

U.S. Department of Commerce, B. E. A. (n.d.). Bureau of Economic Analysis. Retrieved from http://www.bea.gov/industry/iedguide.htm

U.S. Environmental Protection Agency. (2013, April 12). *Inventory of U.S. greenhouse gas emissions and sinks: 1990-2011* Retrieved from http://www.epa.gov/climatechange/Downloads/ghgemissions /US-GHG-Inventory-2013-Main-Text.pdf

United States Geological Survey. (2013, October, 31). *Rain and precipitation.* Retrieved from http://water.usgs.gov/edu/earthrain.html

United Nations, Department of Economic and Social Affairs, Population Division (2011). World Population Prospects: The 2010 Revision, Highlights and Advance Tables. ESA/P/WP.220

United States Department of Agriculture Economic Research Service. (2013, June 7). *Irrigation & water use*. Retrieved from http://www.ers.usda.gov/topics/farm-practices-management/irrigation-water-use.aspx

Weber, C. L., & Matthews, H. S. (2008). Food-miles and the relative climate impacts of food choices in the United States. *Environmental science & technology*, *42*(10), 3508-3513.

APPENDIX OUTLINE

A – Background

1. A Lesson in Life Cycle Assessment

B – Life Cycle Impact Assessment

1. Overview
2. Life Cycle Impact Assessment Results
    1. Coarse Analysis Results
    1. Total
    2. Phase 1, Global Warming
    3. Phase 1, Water Consumption
    2. Fine Analysis Results
    1. Total
    2. Phase 1, Global Warming
    3. Phase 1, Water Consumption
3. Impact Calculation Breakdowns
    1. Primary Only
    2. Secondary Breakdowns
        1. Vegetables
        2. Beverages
        3. Fresh Fruits
        4. Nut, Seed, Rice, Grain, Bean Total
        5. Finfish
        6. Bread & Baked Goods
        7. Juices
        8. Shellfish
        9. Canned & Jarred
        10. Oil & Vinegar
        11. Other Meats
        12. Flour & Flour Products
        13. Secondary Category Blank Template
        14. Deflation Factors

C - Input Contribution Analysis

1. Overview
2. Input Process Definitions
3. Input Contribution Results per Food Category at the Farm Level
    1. Global Warming Results
        1. Vegetables
        2. Beef
        3. Fresh Fruits
        4. Pork
        5. Chicken
        6. Cheese
        7. Nut, Seed, Rice, Grain, Bean
        8. Milk
        9. Eggs
        10. Juices
        11. Yogurt
        12. Coffee
        13. Oil & Vinegar
        14. Lamb
        15. Turkey
        16. Other Meats
        17. Butter
        18. Flour and Flour Products
    2. Water Consumption Results
        1. Fresh Fruits
        2. Vegetables
        3. Beef
        4. Nut, Seed, Rice, Grain, Bean
        5. Chicken
        6. Pork
        7. Coffee
        8. Eggs
        9. Juices
        10. Cheese
        11. Oil & Vinegar
        12. Milk
        13. Yogurt
        14. Turkey
        15. Flour and Flour Products
        16. Lamb
        17. Other Meats
        18. Butter

4. Input Contribution Results per Food Category at the Processing Level
    1. Global Warming Results
        1. Beef
        2. Pork
        3. Chicken
        4. Cheese
        5. Milk
        6. Juices
        7. Yogurt
        8. Coffee
        9. Oil & Vinegar
        10. Lamb
        11. Turkey
        12. Other Meats
        13. Butter
        14. Flour & Flour Products
    2. Water Consumption Results
        1. Beef
        2. Chicken
        3. Pork
        4. Coffee
        5. Juices
        6. Cheese
        7. Oil & Vinegar
        8. Milk
        9. Yogurt
        10. Turkey
        11. Flour and Flour Products
        12. Lamb
        13. Other Meats
        14. Butter
5. Input Contribution Results for All Phase 1 Food Categories
        1. Global Warming Results
        2. Water Consumption Results

D – Output Contribution Analysis

1. Output Contribution Results for All Phase 1 Food Categories – Global Warming Results
2. Output Contribution Results for All Phase 1 Food Categories – Water Consumption Results

E – Water Stress Index

1. Water Stress Index Results

Appendix A
Overview of Life Cycle Assessment
Description: Provides overview of Life Cycle Assessment methodology

A LESSON IN LIFE CYCLE ASSESSMENT

SIGNIFICANCE

As seen in prior sections of this paper, present day environmental problems stem largely from the impacts of modern society and an expanding human population. Humans, like all other organisms, are consumers; we require specific resources for survival. These requirements, such as the food we eat, the clothes we wear, the cars we drive, and the houses we live in are all derived from natural resources and have associated environmental impacts from production, use, and end-of-life. As awareness of the environmental implications of lifestyle choices increases, a growing societal push to improve the sustainability of our consumer decisions has emerged (Young, 2010). In order to make environmentally preferable decisions, a consumer must be presented with factual and credible information on the environmental impacts of the products between which they choose (Young, 2010).

LIFE CYCLE THINKING

Understanding the environmental impacts of a certain product or service relative to another is a complex issue most accurately addressed through the paradigm of life cycle thinking. In order to make a fully informed decision on the overall environmental sustainability of a product, it is insufficient to assess only one of its aspects. Examples include the fuel efficiency of a car, the recycled content of a plastic container, or the compostability of a paper plate. By assessing only one aspect of a product, we may be leaving out significant impacts associated with other stages of its life cycle and therefore making uninformed decisions.

For example, if we were to compare two different microwaves, we could choose to evaluate them based on how much energy they each require to heat up a specific food item. Perhaps microwave A requires less energy to heat a cup of soup than microwave B. Does this mean microwave A is a more environmentally friendly product? Not necessarily. There are other factors to consider: microwave A could be made of a more resource-intensive material than microwave B, or microwave A's parts might have a lower recycling rate than those of microwave B. The overall, life-cycle environmental performance of microwave A could be much weaker than that of microwave B.

By looking only at one metric associated with the product, a consumer could be led to make a poor decision with respect to environmental criteria. "Products create impacts at all stages of their life-cycles. It is important to consider the entire life cycle of a product" when attempting to understand its environmental impacts (Geyer, 2014). The holistic approach of evaluating a product's environmental performance throughout its entire existence, rather than just one of its attributes, is now referred to as life cycle thinking, which eventually

evolved into the science of life cycle assessment (LCA) (Suh, 2013).

DEFINITION AND PHASES

The goal of life cycle assessment is to quantify the environmental impacts of a product system throughout its life cycle (Suh, 2013). The three basic phases of life cycle assessment are as follows: (1) defining the product life cycle, (2) life cycle inventory analysis (LCIA), and (3) impact assessment.

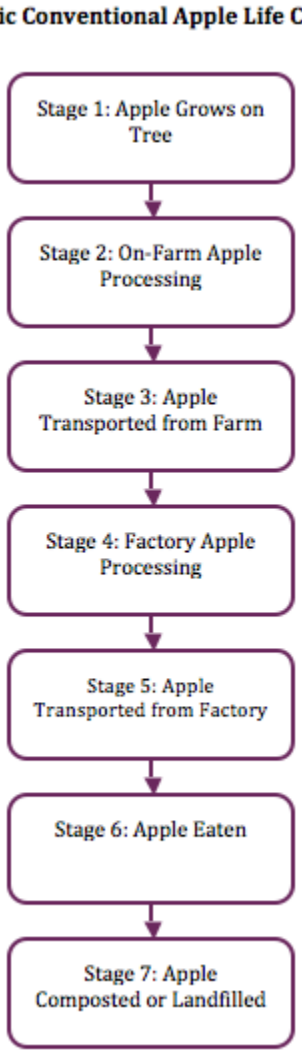
Phase 1: Definition of the Product Life Cycle

The first basic phase of Life Cycle Assessment is to accurately define a product's life cycle (Suh, 2013). The product life cycle, similar to that of a living organism, traces the product from "birth" to "death" and each step between the two. An example of a product life cycle pertinent to this project is that of a conventional apple (**see Figure Appendix a.1**). The basic life cycle of an apple or any other produce item can be broken down into a few basic stages:

- Stage 1: on-farm product creation. This stage represents an apple growing on a tree in an orchard (the "birth" of the apple).
- Stage 2: on-farm product processing. This stage represents the apple being picked from the tree and packaged for transport.
- Stage 3: transportation from farm. This stage represents the packaged apple being shipped to a facility for further processing.
- Stage 4: further facility processing. This stage represents the apple being cleaned, waxed, and labeled at a factory facility.
- Stage 5: transportation to market. This stage represents the apple being shipped from the factory to a grocery store to be sold to a consumer.
- Stage 6: food product use. This stage represents the apple being purchased and eventually consumed.
- Stage 7: food product end-of-life. This stage represents the land filling or composting of the apple core (the "death" of the apple).

Appendix A (page 3)
Overview of Life Cycle Assessment
Description: Provides overview of Life Cycle Assessment methodology

Figure Appendix a.1 - Displays an example of an agricultural product life cycle.



This life cycle is not necessarily comprehensive. For example, there could be additional on- or off-farm processing required and additional transportation in both the use phase as well as the end-of-life phase in this basic apple lifecycle. One can see how detail-intensive the process can become. However, this simplistic approach suffices to explain the process, and by replacing the word "apple" with any other food item, we could easily gain a rough understanding of most food product life cycles.

Many definitions of life cycles are used today, but the three most common forms are "cradle-to-grave," "cradle-to-gate," and "cradle-to-cradle." We can explain these types of life cycles using the same apple example. In a cradle-to-grave life cycle, the full life cycle of a product from resource extraction to disposal is considered (Cholette, 2010) - or, from the apple

growing on a free to its core landing in a garbage can or compost bin. In a cradle-to-gate approach, we study the life cycle of a product from resource extraction to manufacturing of the finished product (Cholette, 2010) - or from the apple growing on a tree, to the processed apple at the factory waiting to be sent to a grocery store. In a cradle-to-cradle approach, we consider more strongly the "cycling" of a product, from resource extraction all the way to potential reuse and recycling of the disposed product (Cholette, 2010) - or from the apple growing on a tree, to the decomposed apple's use as compost fertilizer to grow a new apple.

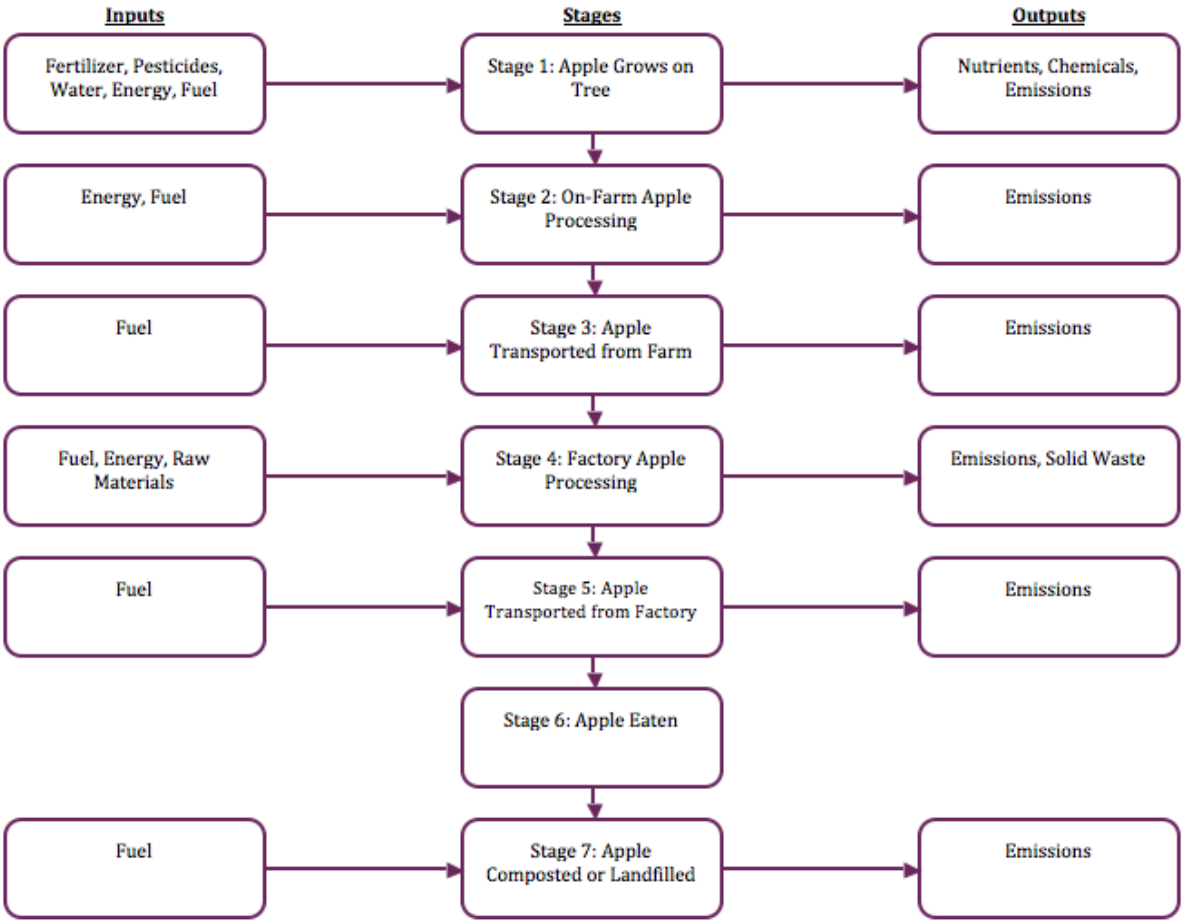
Phase 2: Life Cycle Inventory Analysis

The second basic phase of life cycle assessment is referred to as life cycle inventory analysis, where the inputs and outputs for each stage of a product's life cycle are identified and quantified (Geyer, 2014). It is important to understand that each stage of a product's life cycle requires material and energy inputs, and ultimately produces waste and emissions outputs. The outputs are often the source of pollutants to air or water (Carnegie Mellon University, 2008). To stay with our example, we can explain some of the basic inputs and outputs associated with each stage of the apple's life cycle (**see Figure Appendix a.2**).

- Stage 1: on-farm product creation
    - Inputs: fertilizer for plant growth, pesticides to ward off predatory insects, water for plant growth, fuel to run orchard maintenance machinery
    - Outputs: nutrients from fertilizers, chemicals from pesticides, emissions from fuel combustion
- Stage 2: on-farm product processing
    - Inputs: fuel to run orchard machines
    - Outputs: emissions from fuel combustion
- Stage 3: transportation from farm
    - Inputs: fuel for transportation
    - Outputs: emissions from fuel combustion
- Stage 4: further factory processing
    - Inputs: fuel and electricity to run machinery, materials for apple wax and stickers
    - Outputs: emissions from fuel combustion, solid waste from unused materials
- Stage 5: transportation from factory
    - Inputs: fuel for transportation
    - Outputs: emissions from fuel combustion
- Stage 6: food product consumption
    - No inputs or outputs
- Stage 7: food product end-of-life
    - Inputs: fuel to run garbage truck, landfill machinery, or compost facility
    - Outputs: emissions from fuel combustion, methane emissions from landfill

Description: Provides overview of Life Cycle Assessment methodology

Figure Appendix a.2: Basic Apple Life Cycle Inventory Analysis



Although the list above is not exhaustive of all inputs and outputs associated with one apple, it does provide a good example of the implications of growing a single piece of fruit within the framework of life cycle inventory assessment.

Phase 3: Impact Assessment

The third basic phase of life cycle assessment is impact assessment, where environmental impact categories and values are assigned to inventory analysis results (Geyer, 2014). As described above, each stage in a product's life cycle is associated with inputs and outputs. These inputs and outputs can be correlated with different impact categories, or "class[es] representing environmental issues of concern to which life cycle inventory assessment results can be assigned" (ISO, 2006). Examples of impact categories include global warming, acidification, smog, ozone layer depletion, eutrophication, toxin release, habitat destruction, desertification, land use issues, and resource depletion (Suh, 2013).

Appendix A (page 6)
Overview of Life Cycle Assessment
Description: Provides overview of Life Cycle Assessment methodology

We can cite a few appropriate environmental indicators from the impacts of inputs and outputs in the apple example. First, on-farm plant growth requires water inputs, which can be correlated to the environmental impact of resource (or water) depletion. Second, on-farm fertilizer use can result in the leaching of nitrates and phosphates into waterways, which can be correlated to the environmental impact of eutrophication (Melack, 2013). And third, the combustion of fossil fuels to run machinery and transport vehicles can result in the release of carbon dioxide, a well-known greenhouse gas, which can be correlated to the environmental impact of global warming (Melack, 2013).

Figure Appendix a.3 below represents a simple organization of the environmental impact categories associated with various life cycle stages of an apple. Note that five out of the seven life cycle stages presented have climate change impacts, while only the growth stage has eutrophication or water consumption impacts.

Figure Appendix a.3: A Simplified Life Cycle Impact Assessment

		Environmental Impact Categories		
		Climate Change	Eutrophication	Water Use
Life Cycle Stages	Apple Grows on Tree	a	f	g
	On-Farm Apple Processing	b		h
	Apple Transported from Farm			
	Factory Apple Processing	c		i
	Apple Transported from Factory	d		
	Apple Eaten			
	Apple Composted or Landfilled	e		
Total Impact		a+b+c+d+e	f	g+h+i

Not all environmental impact indicators are of interest to every person, however. A researcher conducting a life cycle assessment can choose to include as few or as many environmental impact indicators as they want, in any combination (Suh, 2013). The choice of impact indicators used usually depends on the relative importance of environmental impacts to the interested party (Suh, 2013).

Once impact indicators have been selected, the next step is to assign every input and output

of the life cycle assessment to a value that represents its impact for each indicator. If we were to focus on the impact indicators of water consumption, global warming, and eutrophication for the apple, we would add up the results of our impact analysis to yield a total amount of water consumption, greenhouse gases emitted and eutrophying emissions produced (usually by mass). The resulting values are an assessment of the quantified impacts associated with the product's life cycle.

Applications of Life Cycle Assessment Results

The results of an LCA study can be used in three primary ways. First, it allows consumers to compare products, such as household cleaners or electronics, based on their total environmental impacts. Second, LCA studies can help product manufacturers compare the impacts of a variety of production methods and implement the one that is least impactful. Third, LCA helps decision-makers identify particular stages in a product's life cycle that have the highest environmental impacts so that stage may be targeted for impact mitigation through technology efficiencies, materials substitution, or other forms of innovation (Carnegie Mellon University, 2008).

Appendix B.1
Appendix B Overview

1. Overview

2. Life Cycle Impact Assessment Results

This section contains the following data: Global warming impact, water consumption values for Coarse and Fine Analyses. All impact values are quarterly data, representative of the April 2013 – July 2013 Crunchtime! data used in the impact Calculation Breakdown section, Appendices B.3.1 to B.3.2.12.

Organization: The results in this appendix are organized from coarse to fine granularity. Line item results throughout all of appendix B are organized from highest to lowest global warming impact (unless it is a water consumption result table).

1. **Coarse Analysis Results**
    1. **Total**
    2. **Phase 1, Global Warming**
    3. **Phase 1, Water Consumption**

2. **Fine Analysis Results**
    1. **Total**
    2. **Phase 1, Global Warming**
    3. **Phase 1, Water Consumption**

3. Impact Calculation Breakdowns

This section contains the following data: All data used to calculate the LCIA result values. This includes: NAICS category for each food category, quarterly purchase dollars (2013) for each food category from provided Crunchtime! data, purchase dollar Deflation Factors from CEDA, deflated quarterly purchase dollars (2002) for each food category, CEDA Indicator Results for global warming impact and water consumption. “Primary Only” refers to food categories which were not broken down to finer granularity, “Secondary Breakdowns” refers to highly aggregated food categories that were broken down to finer granularity for the Life Cycle Impact Assessment Fine Analysis.

1. **Primary Only**
2. **Secondary Breakdowns**
    1. **Vegetables**
    2. **Beverages**
    3. **Fresh Fruits**
    4. **Nut, Seed, Rice, Grain, Bean Total**
    5. **Finfish**
    6. **Bread & Baked Goods**
    7. **Juices**
    8. **Shellfish**
    9. **Canned & Jarred**
    10. **Oil & Vinegar**
    11. **Other Meats**
    12. **Flour & Flour Products**
    13. **Secondary Category Blank Template**
    14. **Deflation Factors**

Appendix - B.2.1.1

Life Cycle Impact Assessment Results - Coarse Analysis - TOTAL

Description: Coarse results for ALL categories, arranged in order of highest to lowest Global Warming Impact

Food Category (PRIMARY)	Category GW Impact (kg CO_2e)	% TOTAL GW Impact	Cumulative % TOTAL GW Impact	Category Water Consumption (kg H2O)	% TOTAL WC	PHASE 1	PHASE 2
VEGETABLES	**1,707,104.41**	14.87%	14.87%	**673,336,637.74**	16.69%	x	
BEEF	**1,170,592.00**	10.20%	25.07%	**168,914,260.00**	4.19%	x	
BEVERAGES	**882,083.42**	7.68%	32.76%	**85,470,029.58**	2.12%		x
FRESH FRUITS	**848,516.07**	7.39%	40.15%	**739,053,515.11**	18.32%	x	
PORK	**837,418.03**	7.30%	47.44%	**120,837,832.37**	2.99%	x	
CHICKEN	**580,680.00**	5.06%	52.50%	**125,742,303.00**	3.12%	x	
CHEESE	**561,719.00**	4.89%	57.40%	**69,104,193.00**	1.71%	x	
NUT, SEED, RICE, GRAIN, BEAN TOTAL	**465,909.18**	4.06%	61.45%	**144,494,677.14**	3.58%	x	
MILK	**404,169.38**	3.52%	32.22%	**48,446,778.73**	1.20%	x	
FINFISH	**386,513.54**	3.37%	68.34%	**670,015,040.96**	16.61%		x
EGGS	**317,929.00**	2.77%	71.11%	**87,554,181.00**	2.17%	x	
BREAD & BAKED GOODS	**291,434.17**	2.54%	73.65%	**53,125,431.02**	1.32%		x
JUICES	**274,433.60**	2.39%	76.04%	**69,659,203.69**	1.73%	x	
YOGURT	**272,893.01**	2.38%	78.42%	**47,960,132.72**	1.19%	x	
COFFEE	**239,827.18**	2.09%	55.44%	**102,076,254.86**	2.53%	x	
SHELLFISH	**207,121.01**	1.80%	82.31%	**352,713,582.11**	8.74%		x
CANNED & JARRED	**204,977.04**	1.79%	69.23%	**40,768,359.32**	1.01%		x
OIL & VINEGAR	**162,093.67**	1.41%	85.51%	**51,467,972.11**	1.28%	x	
LAMB	**145,755.65**	1.27%	86.78%	**21,032,263.73**	0.52%	x	
FRUIT SNACKS	**134,957.00**	1.18%	73.09%	**26,841,929.00**	0.67%		x
MISC SNACKS	**132,603.00**	1.16%	74.24%	**38,086,396.00**	0.94%		x
TURKEY	**132,280.00**	1.15%	75.39%	**28,644,332.00**	0.71%	x	
BAR (Granola, etc)	**107,249.00**	0.93%	91.20%	**30,804,036.00**	0.76%		x
OTHER MEATS	**98,085.92**	0.85%	92.05%	**18,535,934.00**	0.46%	x	
COOKIES/BISCUITS	**95,639.00**	0.83%	92.89%	**21,912,135.00**	0.54%		x
FROZEN PRODUCE	**93,586.00**	0.82%	93.70%	**23,754,759.00**	0.59%		x
CHIPS	**91,528.00**	0.80%	94.50%	**26,288,602.00**	0.65%		x
CEREAL	**85,612.00**	0.75%	95.25%	**21,417,517.00**	0.53%		x
BUTTER	**77,177.00**	0.67%	95.92%	**9,251,073.00**	0.23%	x	
ALCOHOL TOTAL	**76,246.64**	0.66%	96.58%	**17,062,353.00**	0.42%		x
SPICES & DRY HERBS	**74,215.00**	0.65%	97.23%	**22,096,159.00**	0.55%		x
FROZEN YOGURT & ICE CREAM	**73,294.00**	0.64%	97.87%	**8,593,501.00**	0.21%		x
FLOUR AND FLOUR PRODUCTS	**66,140.90**	0.58%	98.44%	**26,918,408.80**	0.67%	x	
CHOCOLATE	**64,614.00**	0.56%	99.01%	**10,584,272.00**	0.26%		x
DRIED PRODUCE	**34,255.00**	0.30%	99.31%	**6,813,000.00**	0.17%		x
GUM	**27,721.70**	0.24%	99.55%	**3,517,320.88**	0.09%		x
HOT TEAS	**24,627.00**	0.21%	99.76%	**10,481,648.00**	0.26%		x
CANDY	**17,557.00**	0.15%	99.91%	**2,227,624.00**	0.06%		x
DESSERTS	**4,957.00**	0.04%	99.96%	**903,624.00**	0.02%		x
OTHER SEAFOOD (Fish Roe)	**4,857.00**	0.04%	100.00%	**8,419,000.00**	0.21%		x
SUM TOTAL IMPACT	**11,478,372**	**100.00%**	**-**	**4,034,926,272**	**100.00%**		

Appendix - B.2.1.2

Life Cycle Impact Assessment Results - Coarse Analysis - PHASE 1 - (Global Warming Impact)

Description: Coarse results for all PHASE 1 categories, arranged in order of highest to lowest Global Warming Impact

Food Category (PRIMARY)	Category GW Impact (kg CO_2e)	% PHASE 1 GW Impact	Cumulative % PHASE 1 GW Impact	Category Water Consumption (kg H2O)	% PHASE 1 WC
VEGETABLES	**1,707,104.41**	20.41%	20.41%	**673,336,637.74**	26.37%
BEEF	**1,170,592.00**	14.00%	34.41%	**168,914,260.00**	6.62%
FRESH FRUITS	**848,516.07**	10.15%	44.56%	**739,053,515.11**	28.95%
PORK	**837,418.03**	10.01%	54.57%	**120,837,832.37**	4.73%
CHICKEN	**580,680.00**	6.94%	61.51%	**125,742,303.00**	4.93%
CHEESE	**561,719.00**	6.72%	68.23%	**69,104,193.00**	2.71%
NUT, SEED, RICE, GRAIN, BEAN TOTAL	**465,909.18**	5.57%	73.80%	**144,494,677.14**	5.66%
MILK	**404,169.38**	4.83%	78.64%	**48,446,778.73**	1.90%
EGGS	**317,929.00**	3.80%	82.44%	**87,554,181.00**	3.43%
JUICES	**274,433.60**	3.28%	85.72%	**69,659,203.69**	2.73%
YOGURT	**272,893.01**	3.26%	88.98%	**47,960,132.72**	1.88%
COFFEE	**239,827.18**	2.87%	91.85%	**102,076,254.86**	4.00%
OIL & VINEGAR	**162,093.67**	1.94%	93.79%	**51,467,972.11**	2.02%
LAMB	**145,755.65**	1.74%	95.53%	**21,032,263.73**	0.82%
TURKEY	**132,280.00**	1.58%	97.11%	**28,644,332.00**	1.12%
OTHER MEATS	**98,085.92**	1.17%	98.29%	**18,535,934.00**	0.73%
BUTTER	**77,177.00**	0.92%	99.21%	**9,251,073.00**	0.36%
FLOUR AND FLOUR PRODUCTS	**66,140.90**	0.79%	100.00%	**26,918,408.80**	1.05%
SUM TOTAL PHASE 1 IMPACT	**8,362,724**	**100.00%**	-	**2,553,029,953**	**100.00%**

Appendix - B.2.1.3
Life Cycle Impact Assessment Results - Coarse Analysis - PHASE 1 - (Water Consumption)

Description: Coarse results for all PHASE 1 categories, arranged in order of highest to lowest Water Consumption

Food Category (PRIMARY)	Category GW Impact (kg CO_2e)	% PHASE 1 GW Impact	Category Water Consumption (kg H_2O)	% PHASE 1 WC	Cumulative % PHASE 1 WC
FRESH FRUITS	**848,516.07**	10.15%	**739,053,515.11**	28.95%	28.95%
VEGETABLES	**1,707,104.41**	20.41%	**673,336,637.74**	26.37%	55.32%
BEEF	**1,170,592.00**	14.00%	**168,914,260.00**	6.62%	61.94%
NUT, SEED, RICE, GRAIN, BEAN TOTAL	**465,909.18**	5.57%	**144,494,677.14**	5.66%	67.60%
CHICKEN	**580,680.00**	6.94%	**125,742,303.00**	4.93%	72.52%
PORK	**837,418.03**	10.01%	**120,837,832.37**	4.73%	77.26%
COFFEE	**239,827.18**	2.87%	**102,076,254.86**	4.00%	81.25%
EGGS	**317,929.00**	3.80%	**87,554,181.00**	3.43%	84.68%
JUICES	**274,433.60**	3.28%	**69,659,203.69**	2.73%	87.41%
CHEESE	**561,719.00**	6.72%	**69,104,193.00**	2.71%	90.12%
OIL & VINEGAR	**162,093.67**	1.94%	**51,467,972.11**	2.02%	92.14%
MILK	**404,169.38**	4.83%	**48,446,778.73**	1.90%	94.03%
YOGURT	**272,893.01**	3.26%	**47,960,132.72**	1.88%	95.91%
TURKEY	**132,280.00**	1.58%	**28,644,332.00**	1.12%	97.03%
FLOUR AND FLOUR PRODUCTS	**66,140.90**	0.79%	**26,918,408.80**	1.05%	98.09%
LAMB	**145,755.65**	1.74%	**21,032,263.73**	0.82%	98.91%
OTHER MEATS	**98,085.92**	1.17%	**18,535,934.00**	0.73%	99.64%
BUTTER	**77,177.00**	0.92%	**9,251,073.00**	0.36%	100.00%
SUM TOTAL PHASE 1 IMPACT	**8,362,724**	**100.00%**	**2,553,029,953**	**100.00%**	-

Appendix - B.2.2.1

Life Cycle Impact Assessment Results - Fine Analysis - TOTAL

Description: Fine analysis results for ALL disaggregated categories, arranged in order of highest to lowest Global Warming Impact

Food Category / Food Item (PRIMARY) / (PRIMARY : SECONDARY)	Item GW Impact ($kg CO_2e$)	% TOTAL GW Impact	Item WC ($kg H_2O$)	% TOTAL WC	PHASE 1	PHASE 2
BEEF	1,170,592.00	10.20%	168,914,260.00	4.19%	x	
PORK	837,418.03	7.30%	120,837,832.37	2.99%	x	
MILK	404,169.38	3.52%	48,446,778.73	1.20%	x	
CHICKEN	580,680.00	5.06%	125,742,303.00	3.12%	x	
CHEESE	561,719.00	4.89%	69,104,193.00	1.71%	x	
EGGS	317,929.00	2.77%	87,554,181.00	2.17%	x	
BEVERAGES : FLAVORED WATER	290,491.45	2.53%	28,147,352.68	0.70%		x
YOGURT	272,893.01	2.38%	47,960,132.72	1.19%	x	
VEGETABLES : LETTUCE	251,993.95	2.20%	82,496,620.60	2.04%	x	
COFFEE	239,827.18	2.09%	102,076,254.86	2.53%	x	
BEVERAGES : TEA	208,536.20	1.82%	20,206,246.98	0.50%		x
NUT, SEED, RICE, GRAIN, BEAN TOTAL : NUT	196,035.75	1.71%	11,018,389.49	0.27%	x	
BEVERAGES : SODA	180,525.89	1.57%	17,492,170.35	0.43%		x
VEGETABLES : MUSHROOM	140,936.43	1.23%	46,139,120.31	1.14%	x	
FRUIT SNACKS	134,957.00	1.18%	26,841,929.00	0.67%		x
MISC SNACKS	132,603.00	1.16%	38,086,396.00	0.94%		x
TURKEY	132,280.00	1.15%	28,644,332.00	0.71%	x	
LAMB	145,755.65	1.27%	21,032,263.73	0.52%	x	
FRESH FRUITS: MELON	131,759.92	1.15%	43,134,956.12	1.07%	x	
VEGETABLES : ASPARAGUS	124,414.57	1.08%	40,730,269.60	1.01%	x	
NUT, SEED, RICE, GRAIN, BEAN TOTAL : RICE	112,348.56	0.98%	63,190,916.02	1.57%	x	
VEGETABLES : TOMATO	108,534.26	0.95%	105,378,941.31	2.61%	x	
BAR (Granola, etc)	107,249.00	0.93%	30,804,036.00	0.76%		x
BREAD & BAKED GOODS: BREAD	106,161.24	0.92%	19,352,094.64	0.48%		x
FINFISH : SALMON	105,215.41	0.92%	182,389,232.61	4.52%		x
BREAD & BAKED GOODS: PASTRY	100,514.59	0.88%	18,322,769.19	0.45%		x
BEVERAGES : ENERGY	99,328.71	0.87%	9,624,518.33	0.24%		x
JUICES : ORANGE	98,071.12	0.85%	24,893,294.24	0.62%	x	
SHELLFISH : SHRIMP	95,823.53	0.83%	163,216,896.13	4.05%		x
COOKIES/BISCUITS	95,639.00	0.83%	21,912,135.00	0.54%		x
FROZEN PRODUCE	93,586.00	0.82%	23,754,759.00	0.59%		x
FRESH FRUITS: STRAWBERRY	92,707.59	0.81%	90,012,383.97	2.23%	x	
CHIPS	91,528.00	0.80%	26,288,602.00	0.65%		x
VEGETABLES : BROCCOLI	85,846.76	0.75%	28,104,118.33	0.70%	x	
CEREAL	85,612.00	0.75%	21,417,517.00	0.53%		x
FRESH FRUITS: BANANA	84,733.27	0.74%	82,269,893.94	2.04%	x	
FINFISH : TUNA	79,395.94	0.69%	137,631,589.97	3.41%		x
VEGETABLES : POTATO	79,113.96	0.69%	25,899,965.25	0.64%	x	
VEGETABLES : HERBS	77,949.58	0.68%	25,518,774.09	0.63%	x	
NUT, SEED, RICE, GRAIN, BEAN TOTAL : BEAN	77,252.48	0.67%	25,290,562.87	0.63%	x	
BUTTER	77,177.00	0.67%	9,251,073.00	0.23%	x	
ALCOHOL TOTAL	76,246.64	0.66%	17,062,353.00	0.42%		x
VEGETABLES : ONION	75,870.86	0.66%	24,838,254.15	0.62%	x	
NUT, SEED, RICE, GRAIN, BEAN TOTAL : GRAIN	74,411.52	0.65%	41,853,067.52	1.04%	x	
SPICES & DRY HERBS	74,215.00	0.65%	22,096,159.00	0.55%		x
FROZEN YOGURT & ICE CREAM	73,294.00	0.64%	8,593,501.00	0.21%		x
BEVERAGES : SPRITZER	69,962.28	0.61%	6,779,039.17	0.17%		x
VEGETABLES : AVOCADO	69,341.89	0.60%	67,325,977.77	1.67%	x	
VEGETABLES : PEPPER	66,878.79	0.58%	21,894,471.46	0.54%	x	
CHOCOLATE	64,614.00	0.56%	10,584,272.00	0.26%		x
FINFISH : ROCKFISH	64,478.26	0.56%	111,772,032.60	2.77%		x
FRESH FRUITS: PINEAPPLE	64,409.03	0.56%	62,536,528.07	1.55%	x	
FRESH FRUITS: PEACH	58,511.18	0.51%	56,810,135.85	1.41%	x	
VEGETABLES : CARROT	55,409.36	0.48%	18,139,660.93	0.45%	x	
FRESH FRUITS: APRICOT	53,945.38	0.47%	52,377,080.39	1.30%	x	
FLOUR AND FLOUR PRODUCTS: WHEAT FLOUR	53,897.31	0.47%	21,935,440.28	0.54%	x	
VEGETABLES : CAULIFLOWER	50,361.87	0.44%	16,487,239.05	0.41%	x	
VEGETABLES : SQUASH	50,313.86	0.44%	16,471,520.91	0.41%	x	
OTHER MEATS: DUCK	48,805.85	0.43%	10,568,583.42	0.26%	x	
FRESH FRUITS: CHERRY	48,423.40	0.42%	47,015,634.67	1.17%	x	
OIL & VINEGAR : OLIVE OIL	46,935.17	0.41%	15,069,900.79	0.37%	x	
FRESH FRUITS: TANGERINE	44,910.16	0.39%	43,604,526.78	1.08%	x	
JUICES : COCONUT	44,601.12	0.39%	11,321,057.72	0.28%	x	
VEGETABLES : CUCUMBER	44,343.58	0.39%	14,516,998.53	0.36%	x	
VEGETABLES : PEA	43,375.37	0.38%	14,200,030.70	0.35%	x	
CANNED & JARRED : TOMATO	42,259.91	0.37%	8,405,172.14	0.21%		x
FRESH FRUITS: APPLE	41,732.59	0.36%	40,519,337.54	1.00%	x	
OIL & VINEGAR : CANOLA OIL	40,730.14	0.35%	13,077,595.03	0.32%	x	
VEGETABLES : GARLIC	38,836.34	0.34%	12,714,061.44	0.32%	x	
OIL & VINEGAR : RICE BRAN OIL	38,458.15	0.34%	12,348,108.10	0.31%	x	
VEGETABLES : BEAN	38,162.31	0.33%	12,493,402.29	0.31%	x	
SHELLFISH : CRAB	37,296.28	0.32%	63,530,069.15	1.57%		x
DRIED PRODUCE	34,255.00	0.30%	6,813,000.00	0.17%		x
FINFISH : TROUT	34,035.14	0.30%	58,999,366.23	1.46%		x
FINFISH : COD	33,203.74	0.29%	57,558,149.57	1.43%		x
FRESH FRUITS: BLUEBERRIES	31,555.40	0.27%	30,638,015.35	0.76%	x	
VEGETABLES : CORN	29,823.18	0.26%	9,763,375.76	0.24%	x	
BREAD & BAKED GOODS: BAGELS	29,536.98	0.26%	5,384,285.02	0.13%		x
CANNED & JARRED : SAUCES	29,109.62	0.25%	5,789,679.42	0.14%		x
BREAD & BAKED GOODS: TORTILLAS	29,015.38	0.25%	5,289,203.36	0.13%		x
VEGETABLES : EGGPLANT	28,873.54	0.25%	9,452,486.43	0.23%	x	
JUICES : GRAPE	28,496.83	0.25%	7,233,320.61	0.18%	x	
FRESH FRUITS: PLUM	27,901.99	0.24%	27,090,822.29	0.67%	x	
GUM	27,722.00	0.24%	3,517,321.00	0.09%		x
FRESH FRUITS: GRAPE	26,229.32	0.23%	25,466,778.44	0.63%	x	
BEVERAGES : BOTTLED WATER	26,015.89	0.23%	2,520,825.65	0.06%		x
FRESH FRUITS: ORANGE	25,051.09	0.22%	24,322,806.67	0.60%	x	

Appendix - B.2.2.1

Life Cycle Impact Assessment Results - Fine Analysis - TOTAL

Description: Fine analysis results for ALL disaggregated categories, arranged in order of highest to lowest Global Warming Impact

Food Category / Food Item (PRIMARY) / (PRIMARY : SECONDARY)	Item GW Impact (kg CO_2e)	% TOTAL GW Impact	Item WC (kg H_2O)	% TOTAL WC	PHASE 1	PHASE 2
OIL & VINEGAR : VINEGAR	24,708.80	0.22%	7,356,564.11	0.18%	x	
HOT TEAS	24,627.00	0.21%	10,481,648.00	0.26%		x
VEGETABLES : MICROGREENS	22,914.73	0.20%	7,501,718.15	0.19%	x	
JUICES : SPARKLING APPLE	22,155.54	0.19%	5,623,719.36	0.14%	x	
SHELLFISH : CLAM	21,603.24	0.19%	36,791,705.79	0.91%		x
BREAD & BAKED GOODS: NOODLES & PASTA	21,108.07	0.18%	3,847,783.03	0.10%		x
VEGETABLES : CABBAGE	20,507.43	0.18%	6,713,627.21	0.17%	x	
CANNED & JARRED : OLIVE	18,621.72	0.16%	3,703,716.77	0.09%		x
VEGETABLES : MISC. ROOT VEGETABLES	18,485.71	0.16%	6,051,768.17	0.15%	x	
FRESH FRUITS: BLACKBERRY	18,281.75	0.16%	17,750,259.64	0.44%	x	
CANDY	17,557.00	0.15%	2,227,624.00	0.06%		x
JUICES : CARROT	16,532.30	0.14%	4,196,377.72	0.10%	x	
VEGETABLES : CHARD	16,436.16	0.14%	5,380,795.77	0.13%	x	
CANNED & JARRED : SOY	16,422.21	0.14%	3,266,251.62	0.08%		x
VEGETABLES : BOK CHOY	16,062.12	0.14%	5,258,344.28	0.13%	x	
CANNED & JARRED : PEPPER	14,724.53	0.13%	2,928,595.39	0.07%		x
VEGETABLES : BRUSSEL SPROUTS	14,245.95	0.12%	4,663,774.14	0.12%	x	
VEGETABLES : BEET	14,176.85	0.12%	4,641,153.00	0.12%	x	
VEGETABLES : SHALLOT	13,952.44	0.12%	4,567,684.74	0.11%	x	
JUICES : GRAPEFRUIT	13,879.89	0.12%	3,523,119.42	0.09%	x	
CANNED & JARRED : OTHER VEGETABLE	13,875.16	0.12%	2,759,663.60	0.07%		x
SHELLFISH : MUSSEL	13,104.47	0.11%	22,329,002.65	0.55%		x
FINFISH : HALIBUT	12,813.19	0.11%	22,211,457.78	0.55%		x
VEGETABLES : RADISH	12,621.86	0.11%	4,132,085.32	0.10%	x	
VEGETABLES : CELERY	12,370.67	0.11%	4,049,854.55	0.10%	x	
FINFISH : CATFISH	12,105.10	0.11%	20,983,995.79	0.52%		x
FRESH FRUITS: RASPBERRY	11,944.52	0.10%	11,597,269.69	0.29%	x	
OTHER MEATS: BUFFALO	11,759.39	0.10%	1,696,857.67	0.04%	x	
FRESH FRUITS: SNAP PEA	11,599.85	0.10%	11,262,616.20	0.28%	x	
FRESH FRUITS: FIG	11,302.99	0.10%	10,974,386.29	0.27%	x	
JUICES : LEMON	10,989.70	0.10%	2,789,505.22	0.07%	x	
VEGETABLES : GAI LAN	10,756.48	0.09%	3,521,406.72	0.09%	x	
FRESH FRUITS: PEAR	10,350.76	0.09%	10,049,840.97	0.25%	x	
OTHER MEATS: QUAIL	9,538.15	0.08%	2,065,422.90	0.05%	x	
CANNED & JARRED : MILK	9,456.40	0.08%	1,880,805.67	0.05%		x
FLOUR AND FLOUR PRODUCTS: ALMOND	9,375.24	0.08%	3,815,589.35	0.09%	x	
FINFISH : YELLOWTAIL	9,289.65	0.08%	16,103,464.61	0.40%		x
SHELLFISH : LOBSTER	9,040.02	0.08%	15,379,850.17	0.38%		x
CANNED & JARRED : COCONUT	9,030.67	0.08%	1,796,130.75	0.04%		x
CANNED & JARRED : FRUIT	9,028.13	0.08%	1,795,626.74	0.04%		x
SHELLFISH : SQUID	9,013.36	0.08%	15,344,575.28	0.38%		x
FINFISH : SEA BASS	8,923.02	0.08%	15,467,921.28	0.38%		x
CANNED & JARRED : PROCESSED	8,733.25	0.08%	1,736,976.98	0.04%		x
SHELLFISH : SCALLOP	8,681.69	0.08%	14,780,177.11	0.37%		x
VEGETABLES : FENNEL	8,613.93	0.08%	2,819,989.20	0.07%	x	
VEGETABLES : MISC. GREENS	8,606.39	0.07%	2,817,520.08	0.07%	x	
JUICES : APPLE	7,951.98	0.07%	2,018,442.58	0.05%	x	
SHELLFISH : OYSTER	7,403.47	0.06%	12,593,134.19	0.31%		x
FRESH FRUITS: LEMON	7,394.77	0.06%	7,179,786.83	0.18%	x	
FRESH FRUITS: NECTARINE	7,290.26	0.06%	7,078,316.43	0.18%	x	
VEGETABLES : LEAF	7,106.85	0.06%	2,326,608.95	0.06%	x	
FRESH FRUITS: MANDARIN	7,017.38	0.06%	6,813,369.31	0.17%	x	
FRESH FRUITS: MANGO	6,943.67	0.06%	6,741,806.40	0.17%	x	
OTHER MEATS: BOAR	6,935.40	0.06%	1,000,765.56	0.02%	x	
CANNED & JARRED : BEAN	6,840.37	0.06%	1,360,497.93	0.03%		x
CANNED & JARRED : PEANUT	6,752.47	0.06%	1,343,014.09	0.03%		x
VEGETABLES : YU CHOY	6,725.20	0.06%	2,201,666.42	0.05%	x	
CANNED & JARRED : ARTICHOKE	6,168.49	0.05%	1,226,865.90	0.03%		x
FRESH FRUITS: GRAPEFRUIT	6,158.29	0.05%	5,979,256.63	0.15%	x	
JUICES : MANGO	6,133.39	0.05%	1,556,832.46	0.04%	x	
CANNED & JARRED : MUSTARD	6,068.58	0.05%	1,206,993.46	0.03%		x
FRESH FRUITS: KIWI	5,917.95	0.05%	5,745,901.08	0.14%	x	
NUT, SEED, RICE, GRAIN, BEAN TOTAL : SEED	5,860.88	0.05%	3,141,741.25	0.08%	x	
BEVERAGES : PROTEIN DRINK	5,802.57	0.05%	562,243.81	0.01%		x
FINFISH : MAHI MAHI	5,518.29	0.05%	9,565,871.64	0.24%		x
OTHER MEATS: VENISON	5,351.65	0.05%	772,232.68	0.02%	x	
OTHER MEATS: GOAT	5,174.25	0.05%	746,634.00	0.02%	x	
VEGETABLES : COLLARD GREEN	5,072.86	0.04%	1,660,728.28	0.04%	x	
VEGETABLES : ARTICHOKE	5,025.51	0.04%	1,645,229.43	0.04%	x	
BREAD & BAKED GOODS: DESSERT	4,957.08	0.04%	903,623.65	0.02%		x
DESSERTS	4,957.00	0.04%	903,624.00	0.02%		x
OTHER SEAFOOD (Fish Roe)	4,857.00	0.04%	8,419,000.00	0.21%		x
FINFISH : SOLE	4,724.57	0.04%	8,189,973.09	0.20%		x
VEGETABLES : LEEK	4,527.60	0.04%	1,482,223.92	0.04%	x	
VEGETABLES : NOPALES	4,503.98	0.04%	1,474,492.03	0.04%	x	
JUICES : STRAWBERRY	4,394.49	0.04%	1,115,447.95	0.03%	x	
FRESH FRUITS: LIME	4,338.07	0.04%	4,211,955.08	0.10%	x	
OTHER MEATS: RABBIT	4,334.43	0.04%	625,449.94	0.02%	x	
VEGETABLES : FLOWER	4,160.34	0.04%	1,361,991.56	0.03%	x	
JUICES : LIME	4,150.76	0.04%	1,053,582.08	0.03%	x	
OIL & VINEGAR : SESAME	3,958.32	0.03%	1,270,932.74	0.03%	x	
OTHER MEATS: FROG	3,871.84	0.03%	558,699.66	0.01%	x	
FINFISH : MACKEREL	3,855.89	0.03%	6,684,126.82	0.17%		x
VEGETABLES : PARSNIP	3,710.37	0.03%	1,214,682.26	0.03%	x	
CANNED & JARRED : MEAT	3,571.34	0.03%	710,312.17	0.02%		x
VEGETABLES : ONG CHOY	3,225.35	0.03%	1,055,900.12	0.03%	x	
JUICES : RASPBERRY	3,221.64	0.03%	817,745.70	0.02%	x	

Appendix - B.2.2.1

Life Cycle Impact Assessment Results - Fine Analysis - TOTAL

Description: Fine analysis results for ALL disaggregated categories, arranged in order of highest to lowest Global Warming Impact

Food Category / Food Item (PRIMARY) / (PRIMARY : SECONDARY)	Item GW Impact (kg CO_2e)	% TOTAL GW Impact	Item WC (kg H_2O)	% TOTAL WC	PHASE 1	PHASE 2
CANNED & JARRED : ALMOND	3,136.53	0.03%	623,831.89	0.02%		x
SHELLFISH : OCTOPUS	3,091.94	0.03%	5,255,957.97	0.13%		x
FINFISH : PANGASIUS	3,087.23	0.03%	5,351,665.18	0.13%		x
FRESH FRUITS: PAPAYA	2,674.09	0.02%	2,596,351.88	0.06%	x	
FINFISH : SWORDFISH	2,622.41	0.02%	4,545,904.23	0.11%		x
JUICES : CHERRY	2,566.70	0.02%	651,502.68	0.02%	x	
OIL & VINEGAR : VEGALENE	2,454.89	0.02%	788,214.31	0.02%	x	
FINFISH : SARDINE	2,374.03	0.02%	4,115,340.56	0.10%		x
JUICES : PASSION FRUIT	2,367.95	0.02%	601,054.72	0.01%	x	
JUICES : BLACKBERRY	1,996.87	0.02%	506,863.43	0.01%	x	
JUICES : GUAVA	1,974.77	0.02%	501,253.32	0.01%	x	
JUICES : PEACH	1,946.56	0.02%	494,093.13	0.01%	x	
VEGETABLES : CHOY SUM	1,916.00	0.02%	627,251.94	0.02%	x	
VEGETABLES : JICAMA	1,915.68	0.02%	627,146.69	0.02%	x	
VEGETABLES : TURNIPS	1,803.77	0.02%	590,509.04	0.01%	x	
OIL & VINEGAR : BLACK TRUFFLE OIL	1,653.28	0.01%	530,834.21	0.01%	x	
FLOUR AND FLOUR PRODUCTS: CORN FLOUR	1,644.24	0.01%	669,183.96	0.02%	x	
OTHER MEATS: CORNISH GAME HEN	1,602.10	0.01%	346,925.08	0.01%	x	
FRESH FRUITS: DATE	1,601.84	0.01%	1,555,270.82	0.04%	x	
FRESH FRUITS: PLUOT	1,587.57	0.01%	1,541,412.73	0.04%	x	
VEGETABLES : KALE	1,573.28	0.01%	515,054.08	0.01%	x	
FINFISH : STURGEON	1,492.88	0.01%	2,587,888.49	0.06%		x
BEVERAGES : CARBONATED MILK	1,420.42	0.01%	137,632.60	0.00%		x
SHELLFISH : CRAWFISH	1,377.90	0.01%	2,363,417.34	0.06%		x
JUICES : OTHER (JUJITSU YASAI)	1,353.21	0.01%	343,482.76	0.01%	x	
FINFISH : SMELT	1,292.00	0.01%	2,239,667.18	0.06%		x
FRESH FRUITS: STARFRUIT	1,173.90	0.01%	1,139,771.73	0.03%	x	
OIL & VINEGAR : GRAPESEED	1,166.59	0.01%	374,566.33	0.01%	x	
FINFISH : ONO	1,077.76	0.01%	1,868,275.33	0.05%		x
VEGETABLES : OKRA	1,071.47	0.01%	350,772.35	0.01%	x	
VEGETABLES : RHUBARB	977.35	0.01%	319,958.84	0.01%	x	
VEGETABLES : FIDDLEHEAD FERN	885.61	0.01%	289,925.97	0.01%	x	
FLOUR AND FLOUR PRODUCTS: GARBANZO	821.49	0.01%	334,336.62	0.01%	x	
FINFISH : SNAPPER	810.33	0.01%	1,404,689.59	0.03%		x
VEGETABLES : AMARANTH	757.91	0.01%	248,122.03	0.01%	x	
JUICES : LYCHEE	738.37	0.01%	187,419.87	0.00%	x	
JUICES : POMEGRANATE	685.66	0.01%	174,039.29	0.00%	x	
SHELLFISH : UNI	685.12	0.01%	1,128,796.34	0.03%		x
CANNED & JARRED : JUICE	613.19	0.01%	121,958.72	0.00%		x
VEGETABLES : KOHLRABI	611.33	0.01%	200,134.35	0.00%	x	
CANNED & JARRED : SEASONING	564.46	0.00%	112,266.07	0.00%		x
VEGETABLES : DAIKON	514.89	0.00%	168,562.12	0.00%	x	
OTHER MEATS: GUNEA HEN	458.11	0.00%	99,201.48	0.00%	x	
OIL & VINEGAR : COCONUT OIL	445.61	0.00%	143,074.71	0.00%	x	
OIL & VINEGAR : FLAX OIL	427.73	0.00%	137,335.39	0.00%	x	
FRESH FRUITS: POMEGRANITE	411.28	0.00%	399,327.94	0.01%	x	
FLOUR AND FLOUR PRODUCTS: RICE	402.61	0.00%	163,858.59	0.00%	x	
OIL & VINEGAR : RAYU CHILI OIL	355.41	0.00%	114,115.19	0.00%	x	
VEGETABLES : SALSIFY	256.69	0.00%	84,033.27	0.00%	x	
OIL & VINEGAR : SUNFLOWER	249.65	0.00%	80,157.53	0.00%	x	
OIL & VINEGAR : WORCHESTERSHIRE SAUCE	249.15	0.00%	79,998.10	0.00%		x
OIL & VINEGAR : SOY	230.23	0.00%	73,923.15	0.00%	x	
JUICES : PEAR	224.76	0.00%	57,049.43	0.00%	x	
OTHER MEATS: PHEASANT	205.58	0.00%	44,517.83	0.00%	x	
VEGETABLES : FUZZY MELON	174.55	0.00%	57,144.90	0.00%	x	
VEGETABLES : POPCORN SHOOTS	168.98	0.00%	55,320.48	0.00%	x	
FRESH FRUITS: DRAGON FRUIT	150.71	0.00%	146,331.64	0.00%	x	
BREAD & BAKED GOODS: BAKED GOODS	140.83	0.00%	25,672.14	0.00%		x
VEGETABLES : BAMBOO SHOOTS	131.28	0.00%	42,979.28	0.00%	x	
FRESH FRUITS: CHERIMOYA	131.05	0.00%	127,238.73	0.00%	x	
FINFISH : FISH BONES	127.38	0.00%	220,814.73	0.01%		x
FRESH FRUITS: OLALLIEBERRY	127.31	0.00%	123,606.82	0.00%	x	
FRESH FRUITS: RAMBUTAN	101.44	0.00%	98,487.77	0.00%	x	
VEGETABLES : SPINACH MALABAR	84.02	0.00%	27,506.74	0.00%	x	
FRESH FRUITS: BOYSENBERRY	73.07	0.00%	70,944.06	0.00%	x	
VEGETABLES : WASABI NAMA	72.34	0.00%	23,682.46	0.00%	x	
FINFISH : ANCHOVY	71.31	0.00%	123,613.69	0.00%		x
OIL & VINEGAR : ALMOND OIL	70.55	0.00%	22,652.42	0.00%	x	
OTHER MEATS: GOOSE	49.15	0.00%	10,643.78	0.00%	x	
FRESH FRUITS: QUINCE	47.76	0.00%	46,372.85	0.00%	x	
FRESH FRUITS: TANGELO	25.47	0.00%	24,733.54	0.00%	x	
SUM TOTAL IMPACT	11,478,372	100.00%	4,034,926,272	100.00%		

Appendix - B.2.2.2

Life Cycle Impact Assessment Results - Fine Analysis - PHASE 1 (Global Warming Impact)

Description: Fine analysis results for all disaggregated PHASE 1 categories, arranged in order of highest to lowest Global Warming Impact

Food Category / Food Item (PRIMARY) / (PRIMARY : SECONDARY)	Item GW Impact (kg CO_2e)	% PHASE 1 GW Impact	Cumulative % PHASE 1 GW Impact	Cumulative % TOTAL GW Impact	Item WC (kg H_2O)	% PHASE 1 WC
BEEF	1,170,592.00	14.00%	14.00%	10.20%	168,914,260.00	6.62%
PORK	837,418.03	10.01%	24.01%	17.49%	120,837,832.37	4.73%
CHICKEN	580,680.00	6.94%	30.96%	22.55%	125,742,303.00	4.93%
CHEESE	561,719.00	6.72%	37.67%	27.45%	69,104,193.00	2.71%
MILK	404,169.38	4.83%	42.51%	30.97%	48,446,778.73	1.90%
EGGS	317,929.00	3.80%	46.31%	33.74%	87,554,181.00	3.43%
YOGURT	272,893.01	3.26%	49.57%	36.11%	47,960,132.72	1.88%
VEGETABLES : LETTUCE	251,993.95	3.01%	52.58%	38.31%	82,496,620.60	3.23%
COFFEE	239,827.18	2.87%	55.45%	40.40%	102,076,254.86	4.00%
NUT, SEED, RICE, GRAIN, BEAN TOTAL : NUT	196,035.75	2.34%	57.80%	42.11%	11,018,389.49	0.43%
LAMB	145,755.65	1.74%	59.54%	43.38%	21,032,263.73	0.82%
VEGETABLES : MUSHROOM	140,936.43	1.69%	61.23%	44.61%	46,139,120.31	1.81%
TURKEY	132,280.00	1.58%	62.81%	45.76%	28,644,332.00	1.12%
FRESH FRUITS: MELON	131,759.92	1.58%	64.38%	46.91%	43,134,956.12	1.69%
VEGETABLES : ASPARAGUS	124,414.57	1.49%	65.87%	47.99%	40,730,269.60	1.60%
NUT, SEED, RICE, GRAIN, BEAN TOTAL : RICE	112,348.56	1.34%	67.21%	48.97%	63,190,916.02	2.48%
VEGETABLES : TOMATO	108,534.26	1.30%	68.51%	49.91%	105,378,941.31	4.13%
JUICES : ORANGE	98,071.12	1.17%	69.68%	50.77%	24,893,294.24	0.98%
FRESH FRUITS: STRAWBERRY	92,707.59	1.11%	70.79%	51.58%	90,012,383.97	3.53%
VEGETABLES : BROCCOLI	85,846.76	1.03%	71.82%	52.32%	28,104,118.33	1.10%
FRESH FRUITS: BANANA	84,733.27	1.01%	72.83%	53.06%	82,269,893.94	3.22%
VEGETABLES : POTATO	79,113.96	0.95%	73.78%	53.75%	25,899,965.25	1.01%
VEGETABLES : HERBS	77,949.58	0.93%	74.71%	54.43%	25,518,774.09	1.00%
NUT, SEED, RICE, GRAIN, BEAN TOTAL : BEAN	77,252.48	0.92%	75.64%	55.10%	25,290,562.87	0.99%
BUTTER	77,177.00	0.92%	76.56%	55.78%	9,251,073.00	0.36%
VEGETABLES : ONION	75,870.86	0.91%	77.47%	56.44%	24,838,254.15	0.97%
NUT, SEED, RICE, GRAIN, BEAN TOTAL : GRAIN	74,411.52	0.89%	78.36%	57.08%	41,853,067.52	1.64%
VEGETABLES : AVOCADO	69,341.89	0.83%	79.18%	57.69%	67,325,977.77	2.64%
VEGETABLES : PEPPER	66,878.79	0.80%	79.98%	58.27%	21,894,471.46	0.86%
FRESH FRUITS: PINEAPPLE	64,409.03	0.77%	80.75%	58.83%	62,536,528.07	2.45%
FRESH FRUITS: PEACH	58,511.18	0.70%	81.45%	59.34%	56,810,135.85	2.23%
VEGETABLES : CARROT	55,409.36	0.66%	82.12%	59.83%	18,139,660.93	0.71%
FRESH FRUITS: APRICOT	53,945.38	0.65%	82.76%	60.30%	52,377,080.39	2.05%
FLOUR AND FLOUR PRODUCTS: WHEAT FLOUR	53,897.31	0.64%	83.41%	60.76%	21,935,440.28	0.86%
VEGETABLES : CAULIFLOWER	50,361.87	0.60%	84.01%	61.20%	16,487,239.05	0.65%
VEGETABLES : SQUASH	50,313.86	0.60%	84.61%	61.64%	16,471,520.91	0.65%
OTHER MEATS: DUCK	48,805.85	0.58%	85.19%	62.07%	10,568,583.42	0.41%
FRESH FRUITS: CHERRY	48,423.40	0.58%	85.77%	62.49%	47,015,634.67	1.84%
OIL & VINEGAR : OLIVE OIL	46,935.17	0.56%	86.33%	62.90%	15,069,900.79	0.59%
FRESH FRUITS: TANGERINE	44,910.16	0.54%	86.87%	63.29%	43,604,526.78	1.71%
JUICES : COCONUT	44,601.12	0.53%	87.40%	63.68%	11,321,057.72	0.44%
VEGETABLES : CUCUMBER	44,343.58	0.53%	87.93%	64.06%	14,516,998.53	0.57%
VEGETABLES : PEA	43,375.37	0.52%	88.45%	64.44%	14,200,030.70	0.56%
FRESH FRUITS: APPLE	41,732.59	0.50%	88.95%	64.81%	40,519,337.54	1.59%
OIL & VINEGAR : CANOLA OIL	40,730.14	0.49%	89.44%	65.16%	13,077,595.03	0.51%
VEGETABLES : GARLIC	38,836.34	0.46%	89.90%	65.50%	12,714,061.44	0.50%
OIL & VINEGAR : RICE BRAN OIL	38,458.15	0.46%	90.36%	65.83%	12,348,108.10	0.48%
VEGETABLES : BEAN	38,162.31	0.46%	90.82%	66.17%	12,493,402.29	0.49%
FRESH FRUITS: BLUEBERRIES	31,555.40	0.38%	91.20%	66.44%	30,638,015.35	1.20%
VEGETABLES : CORN	29,823.18	0.36%	91.55%	66.70%	9,763,375.76	0.38%
VEGETABLES : EGGPLANT	28,873.54	0.35%	91.90%	66.95%	9,452,486.43	0.37%
JUICES : GRAPE	28,496.83	0.34%	92.24%	67.20%	7,233,320.61	0.28%
FRESH FRUITS: PLUM	27,901.99	0.33%	92.57%	67.44%	27,090,822.29	1.06%
FRESH FRUITS: GRAPE	26,229.32	0.31%	92.89%	67.67%	25,466,778.44	1.00%
FRESH FRUITS: ORANGE	25,051.09	0.30%	93.19%	67.89%	24,322,806.67	0.95%
OIL & VINEGAR : VINEGAR	24,708.80	0.30%	93.48%	68.11%	7,356,564.11	0.29%
VEGETABLES : MICROGREENS	22,914.73	0.27%	93.76%	68.31%	7,501,718.15	0.29%
JUICES : SPARKLING APPLE	22,155.54	0.26%	94.02%	68.50%	5,623,719.36	0.22%
VEGETABLES : CABBAGE	20,507.43	0.25%	94.27%	68.68%	6,713,627.21	0.26%
VEGETABLES : MISC. ROOT VEGETABLES	18,485.71	0.22%	94.49%	68.84%	6,051,768.17	0.24%
FRESH FRUITS: BLACKBERRY	18,281.75	0.22%	94.71%	69.00%	17,750,259.64	0.70%
JUICES : CARROT	16,532.30	0.20%	94.90%	69.14%	4,196,377.72	0.16%
VEGETABLES : CHARD	16,436.16	0.20%	95.10%	69.28%	5,380,795.77	0.21%
VEGETABLES : BOK CHOY	16,062.12	0.19%	95.29%	69.42%	5,258,344.28	0.21%
VEGETABLES : BRUSSEL SPROUTS	14,245.95	0.17%	95.46%	69.55%	4,663,774.14	0.18%
VEGETABLES : BEET	14,176.85	0.17%	95.63%	69.67%	4,641,153.00	0.18%
VEGETABLES : SHALLOT	13,952.44	0.17%	95.80%	69.79%	4,567,684.74	0.18%
JUICES : GRAPEFRUIT	13,879.89	0.17%	95.97%	69.91%	3,523,119.42	0.14%
VEGETABLES : RADISH	12,621.86	0.15%	96.12%	70.02%	4,132,085.32	0.16%
VEGETABLES : CELERY	12,370.67	0.15%	96.26%	70.13%	4,049,854.55	0.16%
FRESH FRUITS: RASPBERRY	11,944.52	0.14%	96.41%	70.24%	11,597,269.69	0.45%
OTHER MEATS: BUFFALO	11,759.39	0.14%	96.55%	70.34%	1,696,857.67	0.07%
FRESH FRUITS: SNAP PEA	11,599.85	0.14%	96.69%	70.44%	11,262,616.20	0.44%
FRESH FRUITS: FIG	11,302.99	0.14%	96.82%	70.54%	10,974,386.29	0.43%
JUICES : LEMON	10,989.70	0.13%	96.95%	70.63%	2,789,505.22	0.11%
VEGETABLES : GAI LAN	10,756.48	0.13%	97.08%	70.73%	3,521,406.72	0.14%
FRESH FRUITS: PEAR	10,350.76	0.12%	97.21%	70.82%	10,049,840.97	0.39%
OTHER MEATS: QUAIL	9,538.15	0.11%	97.32%	70.90%	2,065,422.90	0.08%
FLOUR AND FLOUR PRODUCTS: ALMOND	9,375.24	0.11%	97.43%	70.98%	3,815,589.35	0.15%
VEGETABLES : FENNEL	8,613.93	0.10%	97.53%	71.06%	2,819,989.20	0.11%
VEGETABLES : MISC. GREENS	8,606.39	0.10%	97.64%	71.13%	2,817,520.08	0.11%
JUICES : APPLE	7,951.98	0.10%	97.73%	71.20%	2,018,442.58	0.08%
FRESH FRUITS: LEMON	7,394.77	0.09%	97.82%	71.27%	7,179,786.83	0.28%
FRESH FRUITS: NECTARINE	7,290.26	0.09%	97.91%	71.33%	7,078,316.43	0.28%
VEGETABLES : LEAF	7,106.85	0.08%	97.99%	71.39%	2,326,608.95	0.09%
FRESH FRUITS: MANDARIN	7,017.38	0.08%	98.08%	71.45%	6,813,369.31	0.27%
FRESH FRUITS: MANGO	6,943.67	0.08%	98.16%	71.51%	6,741,806.40	0.26%
OTHER MEATS: BOAR	6,935.40	0.08%	98.24%	71.57%	1,000,765.56	0.04%
VEGETABLES : YU CHOY	6,725.20	0.08%	98.32%	71.63%	2,201,666.42	0.09%
FRESH FRUITS: GRAPEFRUIT	6,158.29	0.07%	98.40%	71.69%	5,979,256.63	0.23%
JUICES : MANGO	6,133.39	0.07%	98.47%	71.74%	1,556,832.46	0.06%
FRESH FRUITS: KIWI	5,917.95	0.07%	98.54%	71.79%	5,745,901.08	0.23%
NUT, SEED, RICE, GRAIN, BEAN TOTAL : SEED	5,860.88	0.07%	98.61%	71.84%	3,141,741.25	0.12%
OTHER MEATS: VENISON	5,351.65	0.06%	98.68%	71.89%	772,232.68	0.03%
OTHER MEATS: GOAT	5,174.25	0.06%	98.74%	71.93%	746,634.00	0.03%
VEGETABLES : COLLARD GREEN	5,072.86	0.06%	98.80%	71.98%	1,660,728.28	0.07%
VEGETABLES : ARTICHOKE	5,025.51	0.06%	98.86%	72.02%	1,645,229.43	0.06%
VEGETABLES : LEEK	4,527.60	0.05%	98.91%	72.06%	1,482,223.92	0.06%

Appendix - B.2.2.2

Life Cycle Impact Assessment Results - Fine Analysis - PHASE 1 (Global Warming Impact)

Description: Fine analysis results for all disaggregated PHASE 1 categories, arranged in order of highest to lowest Global Warming Impact

Food Category / Food Item (PRIMARY) / (PRIMARY : SECONDARY)	Item GW Impact ($kg\ CO_2e$)	% PHASE 1 GW Impact	Cumulative % PHASE 1 GW Impact	Cumulative % TOTAL GW Impact	Item WC ($kg\ H_2O$)	% PHASE 1 WC
VEGETABLES : NOPALES	4,503.98	0.05%	98.97%	72.10%	1,474,492.03	0.06%
JUICES : STRAWBERRY	4,394.49	0.05%	99.02%	72.14%	1,115,447.95	0.04%
FRESH FRUITS: LIME	4,338.07	0.05%	99.07%	72.18%	4,211,955.08	0.16%
OTHER MEATS: RABBIT	4,334.43	0.05%	99.12%	72.21%	625,449.94	0.02%
VEGETABLES : FLOWER	4,160.34	0.05%	99.17%	72.25%	1,361,991.56	0.05%
JUICES : LIME	4,150.76	0.05%	99.22%	72.29%	1,053,582.08	0.04%
OIL & VINEGAR : SESAME	3,958.32	0.05%	99.27%	72.32%	1,270,932.74	0.05%
OTHER MEATS: FROG	3,871.84	0.05%	99.32%	72.36%	558,699.66	0.02%
VEGETABLES : PARSNIP	3,710.37	0.04%	99.36%	72.39%	1,214,682.26	0.05%
VEGETABLES : ONG CHOY	3,225.35	0.04%	99.40%	72.42%	1,055,900.12	0.04%
JUICES : RASPBERRY	3,221.64	0.04%	99.44%	72.44%	817,745.70	0.03%
FRESH FRUITS: PAPAYA	2,674.09	0.03%	99.47%	72.47%	2,596,351.88	0.10%
JUICES : CHERRY	2,566.70	0.03%	99.50%	72.49%	651,502.68	0.03%
OIL & VINEGAR : VEGALENE	2,454.89	0.03%	99.53%	72.51%	788,214.31	0.03%
JUICES : PASSION FRUIT	2,367.95	0.03%	99.56%	72.53%	601,054.72	0.02%
JUICES : BLACKBERRY	1,996.87	0.02%	99.58%	72.55%	506,863.43	0.02%
JUICES : GUAVA	1,974.77	0.02%	99.60%	72.57%	501,253.32	0.02%
JUICES : PEACH	1,946.56	0.02%	99.63%	72.58%	494,093.13	0.02%
VEGETABLES : CHOY SUM	1,916.00	0.02%	99.65%	72.60%	627,251.94	0.02%
VEGETABLES : JICAMA	1,915.68	0.02%	99.67%	72.62%	627,146.69	0.02%
VEGETABLES : TURNIPS	1,803.77	0.02%	99.70%	72.63%	590,509.04	0.02%
OIL & VINEGAR : BLACK TRUFFLE OIL	1,653.28	0.02%	99.71%	72.65%	530,834.21	0.02%
FLOUR AND FLOUR PRODUCTS: CORN FLOUR	1,644.24	0.02%	99.73%	72.66%	669,183.96	0.03%
OTHER MEATS: CORNISH GAME HEN	1,602.10	0.02%	99.75%	72.67%	346,925.08	0.01%
FRESH FRUITS: DATE	1,601.84	0.02%	99.77%	72.69%	1,555,270.82	0.06%
FRESH FRUITS: PLUOT	1,587.57	0.02%	99.79%	72.70%	1,541,412.73	0.06%
VEGETABLES : KALE	1,573.28	0.02%	99.81%	72.72%	515,054.08	0.02%
JUICES : OTHER (JUJITSU YASAI)	1,353.21	0.02%	99.83%	72.73%	343,482.76	0.01%
FRESH FRUITS: STARFRUIT	1,173.90	0.01%	99.84%	72.74%	1,139,771.73	0.04%
OIL & VINEGAR : GRAPESEED	1,166.59	0.01%	99.85%	72.75%	374,566.33	0.01%
VEGETABLES : OKRA	1,071.47	0.01%	99.87%	72.76%	350,772.35	0.01%
VEGETABLES : RHUBARB	977.35	0.01%	99.88%	72.77%	319,958.84	0.01%
VEGETABLES : FIDDLEHEAD FARM	885.61	0.01%	99.89%	72.77%	289,925.97	0.01%
FLOUR AND FLOUR PRODUCTS: GARBANZO	821.49	0.01%	99.90%	72.78%	334,336.62	0.01%
VEGETABLES : AMARANTH	757.91	0.01%	99.91%	72.79%	248,122.03	0.01%
JUICES : LYCHEE	738.37	0.01%	99.92%	72.79%	187,419.87	0.01%
JUICES : POMEGRANATE	685.66	0.01%	99.93%	72.80%	174,039.29	0.01%
VEGETABLES : KOHLRABI	611.33	0.01%	99.93%	72.81%	200,134.35	0.01%
VEGETABLES : DAIKON	514.89	0.01%	99.94%	72.81%	168,562.12	0.01%
OTHER MEATS: GUNEA HEN	458.11	0.01%	99.94%	72.81%	99,201.48	0.00%
OIL & VINEGAR : COCONUT OIL	445.61	0.01%	99.95%	72.82%	143,074.71	0.01%
OIL & VINEGAR : FLAX OIL	427.73	0.01%	99.96%	72.82%	137,335.39	0.01%
FRESH FRUITS: POMEGRANITE	411.28	0.00%	99.96%	72.83%	399,327.94	0.02%
FLOUR AND FLOUR PRODUCTS: RICE	402.61	0.00%	99.96%	72.83%	163,858.59	0.01%
OIL & VINEGAR : RAYU CHILI OIL	355.41	0.00%	99.97%	72.83%	114,115.19	0.00%
VEGETABLES : SALSIFY	256.69	0.00%	99.97%	72.83%	84,033.27	0.00%
OIL & VINEGAR : SUNFLOWER	249.65	0.00%	99.98%	72.84%	80,157.53	0.00%
OIL & VINEGAR : SOY	230.23	0.00%	99.98%	72.84%	73,923.15	0.00%
JUICES : PEAR	224.76	0.00%	99.98%	72.84%	57,049.43	0.00%
OTHER MEATS: PHEASANT	205.58	0.00%	99.98%	72.84%	44,517.83	0.00%
VEGETABLES : FUZZY MELON	174.55	0.00%	99.99%	72.84%	57,144.90	0.00%
VEGETABLES : POPCORN SHOOTS	168.98	0.00%	99.99%	72.84%	55,320.48	0.00%
FRESH FRUITS: DRAGON FRUIT	150.71	0.00%	99.99%	72.85%	146,331.64	0.01%
VEGETABLES : BAMBOO SHOOTS	131.28	0.00%	99.99%	72.85%	42,979.28	0.00%
FRESH FRUITS: CHERIMOYA	131.05	0.00%	99.99%	72.85%	127,238.73	0.00%
FRESH FRUITS: OLLALLIEBERRY	127.31	0.00%	99.99%	72.85%	123,606.82	0.00%
FRESH FRUITS: RAMBUTAN	101.44	0.00%	99.99%	72.85%	98,487.77	0.00%
VEGETABLES : SPINACH MALABAR	84.02	0.00%	100.00%	72.85%	27,506.74	0.00%
FRESH FRUITS: BOYSENBERRY	73.07	0.00%	100.00%	72.85%	70,944.06	0.00%
VEGETABLES : WASABI NAMA	72.34	0.00%	100.00%	72.85%	23,682.46	0.00%
OIL & VINEGAR : ALMOND OIL	70.55	0.00%	100.00%	72.85%	22,652.42	0.00%
OTHER MEATS: GOOSE	49.15	0.00%	100.00%	72.85%	10,643.78	0.00%
FRESH FRUITS: QUINCE	47.76	0.00%	100.00%	72.85%	46,372.85	0.00%
FRESH FRUITS: TANGELO	25.47	0.00%	100.00%	72.85%	24,733.54	0.00%
SUM TOTAL PHASE 1 IMPACT	8,362,475	100.00%	-	-	2,552,949,955	100.00%
SUM TOTAL IMPACT (From Appendix D.2.2.1)	11,478,372	n/a	-	-	4,034,926,272	n/a
% PHASE 1 (PHASE 1 IMPACT / TOTAL IMPACT)	72.85%	n/a	-	-	63.27%	n/a

Appendix - B.2.2.3

Life Cycle Impact Assessment Results - Fine Analysis - PHASE 1 - (Water Consumption)

Description: Fine analysis results for all disaggregated PHASE 1 categories, arranged in order of highest to lowest Water Consumption

Food Category / Food Item (PRIMARY) / (PRIMARY : SECONDARY)	Item WC (kg H_2O)	% PHASE 1 WC	Cumulative % PHASE 1 WC	Cumulative % TOTAL WC	Item GW Impact (kg CO_2e)	% PHASE 1 GW Impact
BEEF	168,914,260.00	6.62%	6.62%	4.19%	1,170,592.00	14.00%
CHICKEN	125,742,303.00	4.93%	11.54%	7.30%	580,680.00	6.94%
PORK	120,837,832.37	4.73%	16.28%	10.30%	837,418.03	10.01%
VEGETABLES : TOMATO	105,378,941.31	4.13%	20.40%	12.91%	108,534.26	1.30%
COFFEE	102,076,254.86	4.00%	24.40%	15.44%	239,827.18	2.87%
FRESH FRUITS: STRAWBERRY	90,012,383.97	3.53%	27.93%	17.67%	92,707.59	1.11%
EGGS	87,554,181.00	3.43%	31.36%	19.84%	317,929.00	3.80%
VEGETABLES : LETTUCE	82,496,620.60	3.23%	34.59%	21.88%	251,993.95	3.01%
FRESH FRUITS: BANANA	82,269,893.94	3.22%	37.81%	23.92%	84,733.27	1.01%
CHEESE	69,104,193.00	2.71%	40.52%	25.64%	561,719.00	6.72%
VEGETABLES : AVOCADO	67,325,977.77	2.64%	43.15%	27.30%	69,341.89	0.83%
NUT, SEED, RICE, GRAIN, BEAN TOTAL : RICE	63,190,916.02	2.48%	45.63%	28.87%	112,348.56	1.34%
FRESH FRUITS: PINEAPPLE	62,536,528.07	2.45%	48.08%	30.42%	64,409.03	0.77%
FRESH FRUITS: PEACH	56,810,135.85	2.23%	50.30%	31.83%	58,511.18	0.70%
FRESH FRUITS: APRICOT	52,377,080.39	2.05%	52.36%	33.13%	53,945.38	0.65%
MILK	48,446,778.73	1.90%	54.25%	34.33%	404,169.38	4.83%
YOGURT	47,960,132.72	1.88%	56.13%	35.52%	272,893.01	3.26%
FRESH FRUITS: CHERRY	47,015,634.67	1.84%	57.97%	36.68%	48,423.40	0.58%
VEGETABLES : MUSHROOM	46,139,120.31	1.81%	59.78%	37.82%	140,936.43	1.69%
FRESH FRUITS: TANGERINE	43,604,526.78	1.71%	61.49%	38.91%	44,910.16	0.54%
FRESH FRUITS: MELON	43,134,956.12	1.69%	63.18%	39.97%	131,759.92	1.58%
NUT, SEED, RICE, GRAIN, BEAN TOTAL : GRAIN	41,853,067.52	1.64%	64.82%	41.01%	74,411.52	0.89%
VEGETABLES : ASPARAGUS	40,730,269.60	1.60%	66.41%	42.02%	124,414.57	1.49%
FRESH FRUITS: APPLE	40,519,337.54	1.59%	68.00%	43.03%	41,732.59	0.50%
FRESH FRUITS: BLUEBERRIES	30,638,015.35	1.20%	69.20%	43.78%	31,555.40	0.38%
TURKEY	28,644,332.00	1.12%	70.32%	44.49%	132,280.00	1.58%
VEGETABLES : BROCCOLI	28,104,118.33	1.10%	71.42%	45.19%	85,846.76	1.03%
FRESH FRUITS: PLUM	27,090,822.29	1.06%	72.49%	45.86%	27,901.99	0.33%
VEGETABLES : POTATO	25,899,965.25	1.01%	73.50%	46.50%	79,113.96	0.95%
VEGETABLES : HERBS	25,518,774.09	1.00%	74.50%	47.14%	77,949.58	0.93%
FRESH FRUITS: GRAPE	25,466,778.44	1.00%	75.50%	47.77%	26,229.32	0.31%
NUT, SEED, RICE, GRAIN, BEAN TOTAL : BEAN	25,290,562.87	0.99%	76.49%	48.39%	77,252.48	0.92%
JUICES : ORANGE	24,893,294.24	0.98%	77.46%	49.01%	98,071.12	1.17%
VEGETABLES : ONION	24,838,254.15	0.97%	78.44%	49.63%	75,870.86	0.91%
FRESH FRUITS: ORANGE	24,322,806.67	0.95%	79.39%	50.23%	25,051.09	0.30%
FLOUR AND FLOUR PRODUCTS: WHEAT FLOUR	21,935,440.28	0.86%	80.25%	50.77%	53,897.31	0.64%
VEGETABLES : PEPPER	21,894,471.46	0.86%	81.10%	51.32%	66,878.79	0.80%
LAMB	21,032,263.73	0.82%	81.93%	51.84%	145,755.65	1.74%
VEGETABLES : CARROT	18,139,660.93	0.71%	82.64%	52.29%	55,409.36	0.66%
FRESH FRUITS: BLACKBERRY	17,750,259.64	0.70%	83.33%	52.73%	18,281.75	0.22%
VEGETABLES : CAULIFLOWER	16,487,239.05	0.65%	83.98%	53.14%	50,361.87	0.60%
VEGETABLES : SQUASH	16,471,520.91	0.65%	84.63%	53.54%	50,313.86	0.60%
OIL & VINEGAR : OLIVE OIL	15,069,900.79	0.59%	85.22%	53.92%	46,935.17	0.56%
VEGETABLES : CUCUMBER	14,516,998.53	0.57%	85.78%	54.28%	44,343.58	0.53%
VEGETABLES : PEA	14,200,030.70	0.56%	86.34%	54.63%	43,375.37	0.52%
OIL & VINEGAR : CANOLA OIL	13,077,595.03	0.51%	86.85%	54.95%	40,730.14	0.49%
VEGETABLES : GARLIC	12,714,061.44	0.50%	87.35%	55.27%	38,836.34	0.46%
VEGETABLES : BEAN	12,493,402.29	0.49%	87.84%	55.58%	38,162.31	0.46%
OIL & VINEGAR : RICE BRAN OIL	12,348,108.10	0.48%	88.32%	55.88%	38,458.15	0.46%
FRESH FRUITS: RASPBERRY	11,597,269.69	0.45%	88.78%	56.17%	11,944.52	0.14%
JUICES : COCONUT	11,321,057.72	0.44%	89.22%	56.45%	44,601.12	0.53%
FRESH FRUITS: SNAP PEA	11,262,616.20	0.44%	89.66%	56.73%	11,599.85	0.14%
NUT, SEED, RICE, GRAIN, BEAN TOTAL : NUT	11,018,389.49	0.43%	90.09%	57.00%	196,035.75	2.34%
FRESH FRUITS: FIG	10,974,386.29	0.43%	90.52%	57.28%	11,302.99	0.14%
OTHER MEATS: DUCK	10,568,583.42	0.41%	90.94%	57.54%	48,805.85	0.58%
FRESH FRUITS: PEAR	10,049,840.97	0.39%	91.33%	57.79%	10,350.76	0.12%
VEGETABLES : CORN	9,763,375.76	0.38%	91.71%	58.03%	29,823.18	0.36%
VEGETABLES : EGGPLANT	9,452,486.43	0.37%	92.08%	58.26%	28,873.54	0.35%
BUTTER	9,251,073.00	0.36%	92.45%	58.49%	77,177.00	0.92%
VEGETABLES : MICROGREENS	7,501,718.15	0.29%	92.74%	58.68%	22,914.73	0.27%
OIL & VINEGAR : VINEGAR	7,356,564.11	0.29%	93.03%	58.86%	24,708.80	0.30%
JUICES : GRAPE	7,233,320.61	0.28%	93.31%	59.04%	28,496.83	0.34%
FRESH FRUITS: LEMON	7,179,786.83	0.28%	93.59%	59.22%	7,394.77	0.09%
FRESH FRUITS: NECTARINE	7,078,316.43	0.28%	93.87%	59.39%	7,290.26	0.09%
FRESH FRUITS: MANDARIN	6,813,369.31	0.27%	94.14%	59.56%	7,017.38	0.08%
FRESH FRUITS: MANGO	6,741,806.40	0.26%	94.40%	59.73%	6,943.67	0.08%
VEGETABLES : CABBAGE	6,713,627.21	0.26%	94.66%	59.90%	20,507.43	0.25%
VEGETABLES : MISC. ROOT VEGETABLES	6,051,768.17	0.24%	94.90%	60.05%	18,485.71	0.22%
FRESH FRUITS: GRAPEFRUIT	5,979,256.63	0.23%	95.14%	60.19%	6,158.29	0.07%
FRESH FRUITS: KIWI	5,745,901.08	0.23%	95.36%	60.34%	5,917.95	0.07%
JUICES : SPARKLING APPLE	5,623,719.36	0.22%	95.58%	60.48%	22,155.54	0.26%
VEGETABLES : CHARD	5,380,795.77	0.21%	95.79%	60.61%	16,436.16	0.20%
VEGETABLES : BOK CHOY	5,258,344.28	0.21%	96.00%	60.74%	16,062.12	0.19%
VEGETABLES : BRUSSEL SPROUTS	4,663,774.14	0.18%	96.18%	60.85%	14,245.95	0.17%
VEGETABLES : BEET	4,641,153.00	0.18%	96.36%	60.97%	14,176.85	0.17%
VEGETABLES : SHALLOT	4,567,684.74	0.18%	96.54%	61.08%	13,952.44	0.17%
FRESH FRUITS: LIME	4,211,955.08	0.16%	96.71%	61.19%	4,338.07	0.05%
JUICES : CARROT	4,196,377.72	0.16%	96.87%	61.29%	16,532.30	0.20%
VEGETABLES : RADISH	4,132,085.32	0.16%	97.03%	61.39%	12,621.86	0.15%
VEGETABLES : CELERY	4,049,854.55	0.16%	97.19%	61.49%	12,370.67	0.15%
FLOUR AND FLOUR PRODUCTS: ALMOND	3,815,589.35	0.15%	97.34%	61.59%	9,375.24	0.11%
JUICES : GRAPEFRUIT	3,523,119.42	0.14%	97.48%	61.68%	13,879.89	0.17%
VEGETABLES : GAI LAN	3,521,406.72	0.14%	97.62%	61.76%	10,756.48	0.13%
NUT, SEED, RICE, GRAIN, BEAN TOTAL : SEED	3,141,741.25	0.12%	97.74%	61.84%	5,860.88	0.07%
VEGETABLES : FENNEL	2,819,989.20	0.11%	97.85%	61.91%	8,613.93	0.10%
VEGETABLES : MISC. GREENS	2,817,520.08	0.11%	97.96%	61.98%	8,606.39	0.10%
JUICES : LEMON	2,789,505.22	0.11%	98.07%	62.05%	10,989.70	0.13%
FRESH FRUITS: PAPAYA	2,596,351.88	0.10%	98.17%	62.11%	2,674.09	0.03%
VEGETABLES : LEAF	2,326,608.95	0.09%	98.26%	62.17%	7,106.85	0.08%
VEGETABLES : YU CHOY	2,201,666.42	0.09%	98.35%	62.23%	6,725.20	0.08%
OTHER MEATS: QUAIL	2,065,422.90	0.08%	98.43%	62.28%	9,538.15	0.11%
JUICES : APPLE	2,018,442.58	0.08%	98.51%	62.33%	7,951.98	0.10%
OTHER MEATS: BUFFALO	1,696,857.67	0.07%	98.58%	62.37%	11,759.39	0.14%
VEGETABLES : COLLARD GREEN	1,660,728.28	0.07%	98.64%	62.41%	5,072.86	0.06%
VEGETABLES : ARTICHOKE	1,645,229.43	0.06%	98.71%	62.45%	5,025.51	0.06%
JUICES : MANGO	1,556,832.46	0.06%	98.77%	62.49%	6,133.39	0.07%

Appendix - B.2.2.3

Life Cycle Impact Assessment Results - Fine Analysis - PHASE 1 - (Water Consumption)

Description: Fine analysis results for all disaggregated PHASE 1 categories, arranged in order of highest to lowest Water Consumption

Food Category / Food Item (PRIMARY) / (PRIMARY : SECONDARY)	Item WC (kg H_2O)	% PHASE 1 WC	Cumulative % PHASE 1 WC	Cumulative % TOTAL WC	Item GW Impact (kg CO_2e)	% PHASE 1 GW Impact
FRESH FRUITS: DATE	1,555,270.82	0.06%	98.83%	62.53%	1,601.84	0.02%
FRESH FRUITS: PLUOT	1,541,412.73	0.06%	98.89%	62.57%	1,587.57	0.02%
VEGETABLES : LEEK	1,482,223.92	0.06%	98.95%	62.60%	4,527.60	0.05%
VEGETABLES : NOPALES	1,474,492.03	0.06%	99.00%	62.64%	4,503.98	0.05%
VEGETABLES : FLOWER	1,361,991.56	0.05%	99.06%	62.67%	4,160.34	0.05%
OIL & VINEGAR : SESAME	1,270,932.74	0.05%	99.11%	62.71%	3,958.32	0.05%
VEGETABLES : PARSNIP	1,214,682.26	0.05%	99.15%	62.74%	3,710.37	0.04%
FRESH FRUITS: STARFRUIT	1,139,771.73	0.04%	99.20%	62.76%	1,173.90	0.01%
JUICES : STRAWBERRY	1,115,447.95	0.04%	99.24%	62.79%	4,394.49	0.05%
VEGETABLES : ONG CHOY	1,055,900.12	0.04%	99.28%	62.82%	3,225.35	0.04%
JUICES : LIME	1,053,582.08	0.04%	99.32%	62.84%	4,150.76	0.05%
OTHER MEATS: BOAR	1,000,765.56	0.04%	99.36%	62.87%	6,935.40	0.08%
JUICES : RASPBERRY	817,745.70	0.03%	99.40%	62.89%	3,221.64	0.04%
OIL & VINEGAR : VEGALENE	788,214.31	0.03%	99.43%	62.91%	2,454.89	0.03%
OTHER MEATS: VENISON	772,232.68	0.03%	99.46%	62.93%	5,351.65	0.06%
OTHER MEATS: GOAT	746,634.00	0.03%	99.49%	62.95%	5,174.25	0.06%
FLOUR AND FLOUR PRODUCTS: CORN FLOUR	669,183.96	0.03%	99.51%	62.96%	1,644.24	0.02%
JUICES : CHERRY	651,502.68	0.03%	99.54%	62.98%	2,566.70	0.03%
VEGETABLES : CHOY SUM	627,251.94	0.02%	99.56%	62.99%	1,916.00	0.02%
VEGETABLES : JICAMA	627,146.69	0.02%	99.59%	63.01%	1,915.68	0.02%
OTHER MEATS: RABBIT	625,449.94	0.02%	99.61%	63.03%	4,334.43	0.05%
JUICES : PASSION FRUIT	601,054.72	0.02%	99.64%	63.04%	2,367.95	0.03%
VEGETABLES : TURNIPS	590,509.04	0.02%	99.66%	63.06%	1,803.77	0.02%
OTHER MEATS: FROG	558,699.66	0.02%	99.68%	63.07%	3,871.84	0.05%
OIL & VINEGAR : BLACK TRUFFLE OIL	530,834.21	0.02%	99.70%	63.08%	1,653.28	0.02%
VEGETABLES : KALE	515,054.08	0.02%	99.72%	63.09%	1,573.28	0.02%
JUICES : BLACKBERRY	506,863.43	0.02%	99.74%	63.11%	1,996.87	0.02%
JUICES : GUAVA	501,253.32	0.02%	99.76%	63.12%	1,974.77	0.02%
JUICES : PEACH	494,093.13	0.02%	99.78%	63.13%	1,946.56	0.02%
FRESH FRUITS: POMEGRANITE	399,327.94	0.02%	99.80%	63.14%	411.28	0.00%
OIL & VINEGAR : GRAPESEED	374,566.33	0.01%	99.81%	63.15%	1,166.59	0.01%
VEGETABLES : OKRA	350,772.35	0.01%	99.82%	63.16%	1,071.47	0.01%
OTHER MEATS: CORNISH GAME HEN	346,925.08	0.01%	99.84%	63.17%	1,602.10	0.02%
JUICES : OTHER (JUJITSU YASAI)	343,482.76	0.01%	99.85%	63.18%	1,353.21	0.02%
FLOUR AND FLOUR PRODUCTS: GARBANZO	334,336.62	0.01%	99.86%	63.19%	821.49	0.01%
VEGETABLES : RHUBARB	319,958.84	0.01%	99.88%	63.19%	977.35	0.01%
VEGETABLES : FIDDLEHEAD FARM	289,925.97	0.01%	99.89%	63.20%	885.61	0.01%
VEGETABLES : AMARANTH	248,122.03	0.01%	99.90%	63.21%	757.91	0.01%
VEGETABLES : KOHLRABI	200,134.35	0.01%	99.91%	63.21%	611.33	0.01%
JUICES : LYCHEE	187,419.87	0.01%	99.91%	63.22%	738.37	0.01%
JUICES : POMEGRANATE	174,039.29	0.01%	99.92%	63.22%	685.66	0.01%
VEGETABLES : DAIKON	168,562.12	0.01%	99.93%	63.22%	514.89	0.01%
FLOUR AND FLOUR PRODUCTS: RICE	163,858.59	0.01%	99.93%	63.23%	402.61	0.00%
FRESH FRUITS: DRAGON FRUIT	146,331.64	0.01%	99.94%	63.23%	150.71	0.00%
OIL & VINEGAR : COCONUT OIL	143,074.71	0.01%	99.94%	63.24%	445.61	0.01%
OIL & VINEGAR : FLAX OIL	137,335.39	0.01%	99.95%	63.24%	427.73	0.01%
FRESH FRUITS: CHERIMOYA	127,238.73	0.00%	99.95%	63.24%	131.05	0.00%
FRESH FRUITS: OLLALLIEBERRY	123,606.82	0.00%	99.96%	63.25%	127.31	0.00%
OIL & VINEGAR : RAYU CHILI OIL	114,115.19	0.00%	99.96%	63.25%	355.41	0.00%
OTHER MEATS: GUNEA HEN	99,201.48	0.00%	99.97%	63.25%	458.11	0.01%
FRESH FRUITS: RAMBUTAN	98,487.77	0.00%	99.97%	63.25%	101.44	0.00%
VEGETABLES : SALSIFY	84,033.27	0.00%	99.98%	63.26%	256.69	0.00%
OIL & VINEGAR : SUNFLOWER	80,157.53	0.00%	99.98%	63.26%	249.65	0.00%
OIL & VINEGAR : SOY	73,923.15	0.00%	99.98%	63.26%	230.23	0.00%
FRESH FRUITS: BOYSENBERRY	70,944.06	0.00%	99.98%	63.26%	73.07	0.00%
VEGETABLES : FUZZY MELON	57,144.90	0.00%	99.99%	63.26%	174.55	0.00%
JUICES : PEAR	57,049.43	0.00%	99.99%	63.26%	224.76	0.00%
VEGETABLES : POPCORN SHOOTS	55,320.48	0.00%	99.99%	63.27%	168.98	0.00%
FRESH FRUITS: QUINCE	46,372.85	0.00%	99.99%	63.27%	47.76	0.00%
OTHER MEATS: PHEASANT	44,517.83	0.00%	99.99%	63.27%	205.58	0.00%
VEGETABLES : BAMBOO SHOOTS	42,979.28	0.00%	100.00%	63.27%	131.28	0.00%
VEGETABLES : SPINACH MALABAR	27,506.74	0.00%	100.00%	63.27%	84.02	0.00%
FRESH FRUITS: TANGELO	24,733.54	0.00%	100.00%	63.27%	25.47	0.00%
VEGETABLES : WASABI NAMA	23,682.46	0.00%	100.00%	63.27%	72.34	0.00%
OIL & VINEGAR : ALMOND OIL	22,652.42	0.00%	100.00%	63.27%	70.55	0.00%
OTHER MEATS: GOOSE	10,643.78	0.00%	100.00%	63.27%	49.15	0.00%
SUM TOTAL PHASE 1 IMPACT	2,552,949,955	100.00%	-	-	8,362,475	100.00%
SUM TOTAL IMPACT (From Appendix D.2.2.1)	4,034,926,272	n/a	-	-	11,478,372	n/a
% PHASE 1 (PHASE 1 IMPACT / TOTAL IMPACT)	63.27%	n/a	-	-	72.85%	n/a

Appendix - B.3.1

Impact Calculation Breakdown - PRIMARY Only Categories

Description: Calculation breakdown and associated data for PRIMARY ONLY categories. "% Total Food Program Expenditures 2013" is based on total quarterly spending of $[redacted]

Food Category (PRIMARY)	NAICS Category Name	2013 Purchase Dollars ($)	Deflation Factor	2002 Purchase Dollars ($)	% of Total Food Program Expenditures 2013	CEDA GW Indicator Result (kg CO_2e / $)	Category GW Impact (kg CO_2e)	CEDA WC Indicator Result (kg H_2O / $)	Category WC (kg H_2O)
BEEF	Animal (except poultry) slaughtering, rendering, and processing	[redacted]	0.643452321	[redacted]	[redacted]	[redacted]	1,170,592.39	[redacted]	168,914,260.13
PORK	Animal (except poultry) slaughtering, rendering, and processing		0.50027042				837,418.03		120,837,832.37
CHICKEN	Poultry processing		0.787454099				580,679.56		125,742,302.63
CHEESE	Cheese manufacturing		0.722693509				561,719.37		69,104,192.93
MILK	fluid milk and butter manufacturing		0.586674145				404,169.38		48,446,778.73
EGGS	Poultry and egg production		0.598388441				317,929.32		87,554,180.96
YOGURT	fluid milk and butter manufacturing		0.6820458				272,893.01		32,711,007.09
COFFEE	Coffee and tea manufacturing		0.590720246				239,827.18		102,076,254.86
LAMB	Animal (except poultry) slaughtering, rendering, and processing		0.50027042				145,755.65		21,032,263.73
FRUIT SNACKS	Fruit and vegetable canning, pickling, and drying		0.749223499				134,957.09		26,841,929.43
MISC SNACKS	snack food manufacturing		0.712433354				132,603.32		38,086,396.18
TURKEY	Poultry processing		0.787454099				132,279.89		28,644,332.06
BAR (Granola, etc)	Snack food manufacturing		0.712433354				107,248.73		30,804,035.73
COOKIES/BISCUITS	Cookie, cracker, and pasta manufacturing		0.747754842				95,638.58		21,912,135.35
CHIPS	Snack food manufacturing		0.712433354				91,527.59		26,288,602.61
CEREAL	Breakfast cereal manufacturing		0.800539107				85,611.54		21,417,516.72
BUTTER	Fluid milk and butter manufacturing		0.68204578				77,177.48		9,251,072.87
ALCOHOL TOTAL	Wineries (57%), Breweries (36%), Distilleries (7%)		0.862364657				76,246.64		16,133,193.25
SPICES & DRY HERBS	Seasoning and dressing manufacturing		0.760035587				74,215.28		22,096,158.91
FROZEN YOGURT & ICE CREAM	Ice cream and frozen dessert manufacturing		0.783145789				73,294.41		8,593,500.90
FROZEN PRODUCE	Frozen food manufacturing		0.777045481				72,875.87		14,494,450.38
CHOCOLATE	confectionery manufacturing from purchased chocolate		0.705404621				64,613.55		10,584,271.69
DRIED PRODUCE	fruit and vegetable canning, pickling, and drying		0.749223499				30,118.76		5,990,389.48
GUM	nonchocolate confectionery manufacturing		0.703333602				27,721.70		3,517,320.88
HOT TEAS	coffee and tea manufacturing		0.590720246				24,626.53		10,481,646.79
CANDY	nonchocolate confectionery manufacturing		0.703333602				17,556.97		2,227,623.50
DESSERTS	Bread and bakery product manufacturing		0.729620768				4,957.08		903,623.65
OTHER SEAFOOD (Fish Roe)	seafood product preparation and packaging		0.686016974				4,856.69		8,418,999.52

[redacted] = SENSITIVE DATA HAS BEEN OMITTED PER NON-DISCLOSURE AGREEMENT WITH GOOGLE INC.

Appendix - B.3.2.1
Impact Calculation Breakdown - VEGETABLES

Description: Calculation breakdown and associated data for Vegetables food category

***Multiple NAICS codes were used to calculate the LCIA results for this food category. For this food category, the proportion of purchase dollars for each NAICS code is as follows: Vegetable and Melon Farming [redacted] and Fruit Farming [redacted]

Food Category (PRIMARY)	Vegetables		
NAICS Category	Vegetable and melon farming	Fruit Farming	Both Categories
Total purchase dollars for category 2013 ($)			
Deflation Factor	0.7642	0.6699	n/a
Total purchase dollars for category 2002 ($)			
CEDA GW Indicator Result (kg CO_2e / $)			
Global Warming Impact (kg CO_2e)	1,529,228	177,876	1,707,104
CEDA WC Indicator Result (kg H_2O / $)			
Water Consumption (kg H_2O)	500,631,719	172,704,919	673,336,638

Food Item (PRIMARY : SECONDARY)	2013 Purchase Dollars ($)	2002 Purchase Dollars ($)	Subcategory GW Impact (kg CO_2e)	Subcategory WC (kg H_2O)
VEGETABLES : LETTUCE			251,993.95	82,496,620.60
VEGETABLES : MUSHROOM			140,936.43	46,139,120.31
VEGETABLES : TOMATO			108,534.26	105,378,941.31
VEGETABLES : ASPARAGUS			124,414.57	40,730,269.60
VEGETABLES : AVOCADO			69,341.89	67,325,977.77
VEGETABLES : BROCCOLI			85,846.76	28,104,118.33
VEGETABLES : POTATO			79,113.96	25,899,965.25
VEGETABLES : HERBS			77,949.58	25,518,774.09
VEGETABLES : ONION			75,870.86	24,838,254.15
VEGETABLES : PEPPER			66,878.79	21,894,471.46
VEGETABLES : CARROT			55,409.36	18,139,660.93
VEGETABLES : CAULIFLOWER			50,361.87	16,487,239.05
VEGETABLES : SQUASH			50,313.86	16,471,520.91
VEGETABLES : CUCUMBER			44,343.58	14,516,998.53
VEGETABLES : PEA			43,375.37	14,200,030.70
VEGETABLES : GARLIC			38,836.34	12,714,061.44
VEGETABLES : BEAN			38,162.31	12,493,402.29
VEGETABLES : CORN			29,823.18	9,763,375.76
VEGETABLES : EGGPLANT			28,873.54	9,452,486.43
VEGETABLES : MICROGREENS			22,914.73	7,501,718.15
VEGETABLES : CABBAGE			20,507.43	6,713,627.21
VEGETABLES : MISC. ROOT VEGETABLES			18,485.71	6,051,768.17
VEGETABLES : CHARD			16,436.16	5,380,795.77
VEGETABLES : BOK CHOY			16,062.12	5,258,344.28
VEGETABLES : BRUSSEL SPROUTS			14,245.95	4,663,774.14
VEGETABLES : BEET			14,176.85	4,641,153.00
VEGETABLES : SHALLOT			13,952.44	4,567,684.74
VEGETABLES : RADISH			12,621.86	4,132,085.32
VEGETABLES : CELERY			12,370.67	4,049,854.55
VEGETABLES : GAI LAN			10,756.48	3,521,406.72
VEGETABLES : FENNEL			8,613.93	2,819,989.20
VEGETABLES : MISC. GREENS			8,606.39	2,817,520.08
VEGETABLES : LEAF			7,106.85	2,326,608.95
VEGETABLES : YU CHOY			6,725.20	2,201,666.42
VEGETABLES : COLLARD GREEN			5,072.86	1,660,728.28
VEGETABLES : ARTICHOKE			5,025.51	1,645,229.43
VEGETABLES : LEEK			4,527.60	1,482,223.92
VEGETABLES : NOPALES			4,503.98	1,474,492.03
VEGETABLES : FLOWER			4,160.34	1,361,991.56
VEGETABLES : PARSNIP			3,710.37	1,214,682.26
VEGETABLES : ONG CHOY			3,225.35	1,055,900.12
VEGETABLES : CHOY SUM			1,916.00	627,251.94
VEGETABLES : JICAMA			1,915.68	627,146.69
VEGETABLES : TURNIPS			1,803.77	590,509.04
VEGETABLES : KALE			1,573.28	515,054.08
VEGETABLES : OKRA			1,071.47	350,772.35
VEGETABLES : RHUBARB			977.35	319,958.84
VEGETABLES : FIDDLEHEAD FARM			885.61	289,925.97
VEGETABLES : AMARANTH			757.91	248,122.03
VEGETABLES : KOHLRABI			611.33	200,134.35
VEGETABLES : DAIKON			514.89	168,562.12
VEGETABLES : SALSIFY			256.69	84,033.27
VEGETABLES : FUZZY MELON			174.55	57,144.90
VEGETABLES : POPCORN SHOOTS			168.98	55,320.48
VEGETABLES : BAMBOO SHOOTS			131.28	42,979.28
VEGETABLES : SPINACH MALABAR			84.02	27,506.74
VEGETABLES : WASABI NAMA			72.34	23,682.46
Totals - For Verification			*1,707,104.41*	*673,336,637.74*

[redacted] = SENSITIVE DATA HAS BEEN OMITTED PER NON-DISCLOSURE AGREEMENT WITH GOOGLE INC.

Appendix - B.3.2.2
Impact Calculation Breakdown - BEVERAGES

Description: Calculation breakdown and associated data for BEVERAGES food category

Food Category (PRIMARY)	**Beverages**
NAICS Category	Soft Drink and Ice Manufacturing
Total purchase dollars for category 2013 ($)	[redacted]
Deflation Factor	0.8224
Total purchase dollars for category 2002 ($)	[redacted]
[redacted]	[redacted]
CEDA GW Indicator Result (kg CO_2e / $)	[redacted]
Global Warming Impact (kg CO_2e)	882,083
[redacted]	[redacted]
CEDA WC Indicator Result (kg H_2O / $)	[redacted]
Water Consumption (kg H_2O)	85,470,030

Food Item (PRIMARY : SECONDARY)	**2013 Purchase Dollars ($)**	**% of Category Total 2013 Purchase Dollars**	**Subcategory GW Impact (kg CO_2e)**	**Subcategory WC (kg H_2O)**
BEVERAGES : FLAVORED WATER	[redacted]	[redacted]	290,491.45	28,147,352.68
BEVERAGES : TEA	[redacted]	[redacted]	208,536.20	20,206,246.98
BEVERAGES : SODA	[redacted]	[redacted]	180,525.89	17,492,170.35
BEVERAGES : ENERGY	[redacted]	[redacted]	99,328.71	9,624,518.33
BEVERAGES : SPRITZER	[redacted]	[redacted]	69,962.28	6,779,039.17
BEVERAGES : BOTTLED WATER	[redacted]	[redacted]	26,015.89	2,520,825.65
BEVERAGES : CARBONATED MILK	[redacted]	[redacted]	1,420.42	137,632.60
BEVERAGES : PROTEIN DRINK	[redacted]	[redacted]	5,802.57	562,243.81
Totals - For Verification	[redacted]	[redacted]	*882,083.42*	*85,470,029.58*

[redacted] = **SENSITIVE DATA HAS BEEN OMITTED PER NON-DISCLOSURE AGREEMENT WITH GOOGLE INC.**

Appendix - B.3.2.3
Impact Calculation Breakdown - FRESH FRUITS

Description: Calculation breakdown and associated data for FRESH FRUITS food category

***Multiple NAICS codes were used to calculate the LCIA results for this food category. For this food category, the proportion of purchase dollars for each NAICS code is as follows: Fruit Farming [redacted] and Vegetable and Melon Farming [redacted]

Food Category (PRIMARY)	Fresh Fruits		
NAICS Category	Fruit Farming	Vegetable and Melon Farming	Both Categories
Total purchase dollars for category 2013 ($)	[redacted]		
Deflation Factor	0.6699	0.7642	n/a
Total purchase dollars for category 2002 ($)	[redacted]		
[redacted]			
CEDA GW Indicator Result (kg CO_2e / $)			
Global Warming Impact (kg CO_2e)	716,756	131,760	848,516
[redacted]			
CEDA WC Indicator Result (kg H_2O / $)			
Water Consumption (kg H_2O)	695,918,559	43,134,956	739,053,515

Food Item (PRIMARY : SECONDARY)	2013 Purchase Dollars ($)	2002 Purchase Dollars ($)	Subcategory GW Impact (kg CO_2e)	Subcategory WC (kg H_2O)
FRESH FRUITS: MELON	[redacted]		131,759.92	43,134,956.12
FRESH FRUITS: STRAWBERRY			92,707.59	90,012,383.97
FRESH FRUITS: BANANA			84,733.27	82,269,893.94
FRESH FRUITS: PINEAPPLE			64,409.03	62,536,528.07
FRESH FRUITS: PEACH			58,511.18	56,810,135.85
FRESH FRUITS: APRICOT			53,945.38	52,377,080.39
FRESH FRUITS: CHERRY			48,423.40	47,015,634.67
FRESH FRUITS: TANGERINE			44,910.16	43,604,526.78
FRESH FRUITS: APPLE			41,732.59	40,519,337.54
FRESH FRUITS: BLUEBERRIES			31,555.40	30,638,015.35
FRESH FRUITS: PLUM			27,901.99	27,090,822.29
FRESH FRUITS: GRAPE			26,229.32	25,466,778.44
FRESH FRUITS: ORANGE			25,051.09	24,322,806.67
FRESH FRUITS: BLACKBERRY			18,281.75	17,750,259.64
FRESH FRUITS: RASPBERRY			11,944.52	11,597,269.69
FRESH FRUITS: SNAP PEA			11,599.85	11,262,616.20
FRESH FRUITS: FIG			11,302.99	10,974,386.29
FRESH FRUITS: PEAR			10,350.76	10,049,840.97
FRESH FRUITS: LEMON			7,394.77	7,179,786.83
FRESH FRUITS: NECTARINE			7,290.26	7,078,316.43
FRESH FRUITS: MANDARIN			7,017.38	6,813,369.31
FRESH FRUITS: MANGO			6,943.67	6,741,806.40
FRESH FRUITS: GRAPEFRUIT			6,158.29	5,979,256.63
FRESH FRUITS: KIWI			5,917.95	5,745,901.08
FRESH FRUITS: LIME			4,338.07	4,211,955.08
FRESH FRUITS: PAPAYA			2,674.09	2,596,351.88
FRESH FRUITS: DATE			1,601.84	1,555,270.82
FRESH FRUITS: PLUOT			1,587.57	1,541,412.73
FRESH FRUITS: STARFRUIT			1,173.90	1,139,771.73
FRESH FRUITS: POMEGRANITE			411.28	399,327.94
FRESH FRUITS: DRAGON FRUIT			150.71	146,331.64
FRESH FRUITS: CHERIMOYA			131.05	127,238.73
FRESH FRUITS: OLLALLIEBERRY			127.31	123,606.82
FRESH FRUITS: RAMBUTAN			101.44	98,487.77
FRESH FRUITS: BOYSENBERRY			73.07	70,944.06
FRESH FRUITS: QUINCE			47.76	46,372.85
FRESH FRUITS: TANGELO			25.47	24,733.54
Totals - For Verification			*848,516.07*	*739,053,515.11*

[redacted] = SENSITIVE DATA HAS BEEN OMITTED PER NON-DISCLOSURE AGREEMENT WITH GOOGLE INC.

Appendix - B.3.2.4

Impact Calculation Breakdown - NUT, SEED, RICE, GRAIN, BEAN TOTAL

Description: Calculation breakdown and associated data for NUT, SEED, RICE, GRAIN, BEAN TOTAL* food category

Nut/Seeds

***Multiple NAICS codes were used to calculate the LCIA results for this food category. For this food category, the proportion of purchase dollars for each NAICS code is as follows: Tree nut farming [redacted] Grain Farming [redacted] Vegetable & melon farming [redacted] Oil seed farming [redacted]

Food Category (PRIMARY)	NUT, SEED, RICE, GRAIN, BEAN TOTAL			NUT/SEED		
NAICS Category	Tree Nut Farming	Grain Farming	Vegetable & Melon Farming	Tree Nut Farming	Oilseed Farming	All Categories Together
Total purchase dollars for category 2013 ($)						
Deflation Factor	0.6049	0.3781	0.7642	0.6049	0.4357	n/a
Total purchase dollars for category 2002 ($)						
CEDA GW Indicator Result (kg CO_2e / $)						
Global Warming Impact (kg CO_2e)	64,825	186,760	77,252	131,211	5,861	465,909
CEDA WC Indicator Result (kg H_2O / $)						
Water Consumption (kg H_2O)	3,643,537	105,043,984	25,290,563	7,374,852	3,141,741	144,494,677

Food Item (PRIMARY : SECONDARY)	2013 Purchase Dollars ($)	% of Category Total 2013 Purchase Dollars	Subcategory GW Impact (kg CO_2e)	Subcategory WC (kg H_2O)
Background Work				
NUT, SEED, RICE, GRAIN, BEAN TOTAL : Rice			112,348.56	63,190,916.02
NUT, SEED, RICE, GRAIN, BEAN TOTAL : Grain			74,411.52	41,853,067.52
NUT, SEED, RICE, GRAIN, BEAN TOTAL : Bean			67,491.89	22,095,184.72
NUT, SEED, RICE, GRAIN, BEAN TOTAL : Nut			64,824.68	3,643,537.33
NUT, SEED, RICE, GRAIN, BEAN TOTAL : Seed			5,735.45	3,074,503.90
Totals for verification (NUT, SEED, RICE, GRAIN, BEAN TOTAL)			*324,812.09*	*133,857,209.48*
NUT/SEEDS : Nut			131,211.07	7,374,852.16
NUT/SEEDS : Bean			9,760.59	3,195,378.15
NUT/SEEDS : Seed			125.43	67,237.35
Totals for verification (NUT/SEEDS)			*141,097.09*	*10,637,467.66*
Categories Together Totals				
NUT, SEED, RICE, GRAIN, BEAN TOTAL : NUT			196,035.75	11,018,389.49
NUT, SEED, RICE, GRAIN, BEAN TOTAL : RICE			112,348.56	63,190,916.02
NUT, SEED, RICE, GRAIN, BEAN TOTAL : BEAN			77,252.48	25,290,562.87
NUT, SEED, RICE, GRAIN, BEAN TOTAL : GRAIN			74,411.52	41,853,067.52
NUT, SEED, RICE, GRAIN, BEAN TOTAL : SEED			5,860.88	3,141,741.25
Totals for verification			*465,909.18*	*144,494,677.14*

[redacted] = SENSITIVE DATA HAS BEEN OMITTED PER NON-DISCLOSURE AGREEMENT WITH GOOGLE INC.

Appendix - B.3.2.5
Impact Calculation Breakdown - FINFISH

Description: Calculation breakdown and associated data for FINFISH food category

Food Category (PRIMARY)	Finfish
NAICS Category	Seafood product preparation and packaging
Total purchase dollars for category 2013 ($)	
Deflation Factor	0.6860
Total purchase dollars for category 2002 ($)	
CEDA GW Indicator Result (kg CO_2e / $)	
Global Warming Impact (kg CO_2e)	386,514
CEDA WC Indicator Result (kg H_2O / $)	
Water Consumption (kg H_2O)	670,015,041

Food Item (PRIMARY : SECONDARY)	2013 Purchase Dollars ($)	% of Category Total 2013 Purchase Dollars	Subcategory GW Impact (kg CO_2e)	Subcategory WC (kg H_2O)
FINFISH : SALMON			105,215.41	182,389,232.61
FINFISH : TUNA			79,395.94	137,631,589.97
FINFISH : ROCKFISH			64,478.26	111,772,032.60
FINFISH : TROUT			34,035.14	58,999,366.23
FINFISH : COD			33,203.74	57,558,149.57
FINFISH : HALIBUT			12,813.19	22,211,457.78
FINFISH : CATFISH			12,105.10	20,983,995.79
FINFISH : YELLOWTAIL			9,289.65	16,103,464.61
FINFISH : SEA BASS			8,923.02	15,467,921.28
FINFISH : MAHI MAHI			5,518.29	9,565,871.64
FINFISH : SOLE			4,724.57	8,189,973.09
FINFISH : MACKEREL			3,855.89	6,684,126.82
FINFISH : PANGASIUS			3,087.23	5,351,665.18
FINFISH : SWORDFISH			2,622.41	4,545,904.23
FINFISH : SARDINE			2,374.03	4,115,340.56
FINFISH : STURGEON			1,492.88	2,587,888.49
FINFISH : SMELT			1,292.00	2,239,667.18
FINFISH : ONO			1,077.76	1,868,275.33
FINFISH : SNAPPER			810.33	1,404,689.59
FINFISH : FISH BONES			127.38	220,814.73
FINFISH : ANCHOVY			71.31	123,613.69
Totals - For Verification			*386,513.54*	*670,015,040.96*

= **SENSITIVE DATA HAS BEEN OMITTED PER NON-DISCLOSURE AGREEMENT WITH GOOGLE INC.**

Appendix - B.3.2.6
Impact Calculation Breakdown - BREAD & BAKED GOODS

Description: Calculation breakdown and associated data for BREAD & BAKED GOODS food category

Food Category (PRIMARY)	**Bread and Baked Goods**
NAICS Category	Bread and Bakery Product Manufacturing
Total purchase dollars for category 2013 ($)	[redacted]
Deflation Factor	0.7296
Total purchase dollars for category 2002 ($)	[redacted]
[redacted]	[redacted]
CEDA GW Indicator Result (kg CO_2e / $)	[redacted]
Global Warming Impact (kg CO_2e)	291,434
[redacted]	[redacted]
CEDA WC Indicator Result (kg H_2O / $)	[redacted]
Water Consumption (kg H_2O)	53,125,431

Food Item (PRIMARY : SECONDARY)	2013 Purchase Dollars ($)	% of Category Total 2013 Purchase Dollars	Subcategory GW Impact (kg CO_2e)	Subcategory WC (kg H_2O)
BREAD & BAKED GOODS: BREAD	[redacted]	[redacted]	106,161.24	19,352,094.64
BREAD & BAKED GOODS: PASTRY	[redacted]	[redacted]	100,514.59	18,322,769.19
BREAD & BAKED GOODS: BAGELS	[redacted]	[redacted]	29,536.98	5,384,285.02
BREAD & BAKED GOODS: TORTILLAS	[redacted]	[redacted]	29,015.38	5,289,203.36
BREAD & BAKED GOODS: NOODLES & PASTA	[redacted]	[redacted]	21,108.07	3,847,783.03
BREAD & BAKED GOODS: DESSERT	[redacted]	[redacted]	4,957.08	903,623.65
BREAD & BAKED GOODS: BAKED GOODS	[redacted]	[redacted]	140.83	25,672.14
Totals - For Verification	[redacted]	[redacted]	*291,434.17*	*53,125,431.02*

[redacted] = SENSITIVE DATA HAS BEEN OMITTED PER NON-DISCLOSURE AGREEMENT WITH GOOGLE INC.

Appendix - B.3.2.7
Impact Calculation Breakdown - JUICES

Description: Calculation breakdown and associated data for JUICES food category

Food Category (PRIMARY)	Juices
NAICS Category	Frozen food manufacturing
Total purchase dollars for category 2013 ($)	[redacted]
Deflation Factor	0.7770
Total purchase dollars for category 2002 ($)	[redacted]
[redacted]	[redacted]
CEDA GW Indicator Result (kg CO_2e / $)	[redacted]
Global Warming Impact (kg CO_2e)	274,434
[redacted]	[redacted]
CEDA WC Indicator Result (kg H_2O / $)	[redacted]
Water Consumption (kg H_2O)	69,659,204

Food Item (PRIMARY : SECONDARY)	2013 Purchase Dollars ($)	% of Category Total 2013 Purchase Dollars	Subcategory GW Impact (kg CO_2e)	Subcategory WC (kg H_2O)
JUICES : ORANGE	[redacted]	[redacted]	98,071.12	24,893,294.24
JUICES : COCONUT	[redacted]	[redacted]	44,601.12	11,321,057.72
JUICES : GRAPE	[redacted]	[redacted]	28,496.83	7,233,320.61
JUICES : SPARKLING APPLE	[redacted]	[redacted]	22,155.54	5,623,719.36
JUICES : CARROT	[redacted]	[redacted]	16,532.30	4,196,377.72
JUICES : GRAPEFRUIT	[redacted]	[redacted]	13,879.89	3,523,119.42
JUICES : LEMON	[redacted]	[redacted]	10,989.70	2,789,505.22
JUICES : APPLE	[redacted]	[redacted]	7,951.98	2,018,442.58
JUICES : MANGO	[redacted]	[redacted]	6,133.39	1,556,832.46
JUICES : STRAWBERRY	[redacted]	[redacted]	4,394.49	1,115,447.95
JUICES : LIME	[redacted]	[redacted]	4,150.76	1,053,582.08
JUICES : RASPBERRY	[redacted]	[redacted]	3,221.64	817,745.70
JUICES : CHERRY	[redacted]	[redacted]	2,566.70	651,502.68
JUICES : PASSION FRUIT	[redacted]	[redacted]	2,367.95	601,054.72
JUICES : BLACKBERRY	[redacted]	[redacted]	1,996.87	506,863.43
JUICES : GUAVA	[redacted]	[redacted]	1,974.77	501,253.32
JUICES : PEACH	[redacted]	[redacted]	1,946.56	494,093.13
JUICES : OTHER (JUJITSU YASAI)	[redacted]	[redacted]	1,353.21	343,482.76
JUICES : LYCHEE	[redacted]	[redacted]	738.37	187,419.87
JUICES : POMEGRANATE	[redacted]	[redacted]	685.66	174,039.29
JUICES : PEAR	[redacted]	[redacted]	224.76	57,049.43
Totals - For Verification	[redacted]	[redacted]	*274,433.60*	*69,659,203.69*

[redacted] = **SENSITIVE DATA HAS BEEN OMITTED PER NON-DISCLOSURE AGREEMENT WITH GOOGLE INC.**

Appendix - B.3.2.8
Impact Calculation Breakdown - SHELLFISH

Description: Calculation breakdown and associated data for SHELLFISH food category

Food Category (PRIMARY)	**Shellfish**
NAICS Category	Seafood product preparation and packaging
Total purchase dollars for category 2013 ($)	[redacted]
Deflation Factor	0.686017
Total purchase dollars for category 2002 ($)	[redacted]
[redacted]	[redacted]
CEDA GW Indicator Result (kg CO_2e / $)	[redacted]
Global Warming Impact (kg CO_2e)	207,121
[redacted]	[redacted]
CEDA WC Indicator Result (kg H_2O / $)	[redacted]
Water Consumption (kg H_2O)	359,040,963

Food Item (PRIMARY : SECONDARY)	2013 Purchase Dollars ($)	% of Category Total 2013 Purchase Dollars	Subcategory GW Impact (kg CO_2e)	Subcategory WC (kg H_2O)
SHELLFISH: SHRIMP	[redacted]	[redacted]	95,823.53	166,108,552.91
SHELLFISH: CRAB	[redacted]	[redacted]	37,296.28	64,652,511.10
SHELLFISH: CLAM	[redacted]	[redacted]	21,603.24	37,448,875.52
SHELLFISH: MUSSEL	[redacted]	[redacted]	13,104.47	22,716,389.95
SHELLFISH: LOBSTER	[redacted]	[redacted]	9,040.02	15,670,722.83
SHELLFISH: SQUID	[redacted]	[redacted]	9,013.36	15,624,519.48
SHELLFISH: SCALLOP	[redacted]	[redacted]	8,681.69	15,049,562.50
SHELLFISH: OYSTER	[redacted]	[redacted]	7,403.47	12,833,791.88
SHELLFISH: OCTOPUS	[redacted]	[redacted]	3,091.94	5,359,826.81
SHELLFISH: CRAWFISH	[redacted]	[redacted]	1,377.90	2,388,566.90
SHELLFISH: UNI	[redacted]	[redacted]	685.12	1,187,642.74
Totals - For Verification	[redacted]	[redacted]	*207,121.01*	*359,040,962.61*

[redacted] = SENSITIVE DATA HAS BEEN OMITTED PER NON-DISCLOSURE AGREEMENT WITH GOOGLE INC.

Appendix - B.3.2.9
Impact Calculation Breakdown - CANNED & JARRED

Description: Calculation breakdown and associated data for CANNED & JARRED food category

Food Category (PRIMARY)	Canned & Jarred
NAICS Category	Fruit and vegetable canning, pickling, and drying
Total purchase dollars for category 2013 ($)	[redacted]
Deflation Factor	0.7492
Total purchase dollars for category 2002 ($)	[redacted]
	[redacted]
CEDA GW Indicator Result (kg CO_2e / $)	[redacted]
Global Warming Impact (kg CO_2e)	204,977
	[redacted]
CEDA WC Indicator Result (kg H_2O / $)	[redacted]
Water Consumption (kg H_2O)	40,768,359

Food Item (PRIMARY : SECONDARY)	2013 Purchase Dollars ($)	% of Category Total 2013 Purchase Dollars	Subcategory GW Impact (kg CO_2e)	Subcategory WC (kg H_2O)
CANNED & JARRED : TOMATO	[redacted]	20.62%	42,259.91	8,405,172.14
CANNED & JARRED : SAUCES		14.20%	29,109.62	5,789,679.42
CANNED & JARRED : OLIVE		9.08%	18,621.72	3,703,716.77
CANNED & JARRED : SOY		8.01%	16,422.21	3,266,251.62
CANNED & JARRED : PEPPER		7.18%	14,724.53	2,928,595.39
CANNED & JARRED : OTHER VEGETABLE		6.77%	13,875.16	2,759,663.60
CANNED & JARRED : MILK		4.61%	9,456.40	1,880,805.67
CANNED & JARRED : COCONUT		4.41%	9,030.67	1,796,130.75
CANNED & JARRED : FRUIT		4.40%	9,028.13	1,795,626.74
CANNED & JARRED : PROCESSED		4.26%	8,733.25	1,736,976.98
CANNED & JARRED : BEAN		3.34%	6,840.37	1,360,497.93
CANNED & JARRED : PEANUT		3.29%	6,752.47	1,343,014.09
CANNED & JARRED : ARTICHOKE		3.01%	6,168.49	1,226,865.90
CANNED & JARRED : MUSTARD		2.96%	6,068.58	1,206,993.46
CANNED & JARRED : MEAT		1.74%	3,571.34	710,312.17
CANNED & JARRED : ALMOND		1.53%	3,136.53	623,831.89
CANNED & JARRED : JUICE		0.30%	613.19	121,958.72
CANNED & JARRED : SEASONING		0.28%	564.46	112,266.07
Totals - For Verification		*100%*	*204,977.04*	*40,768,359.32*

[redacted] = **SENSITIVE DATA HAS BEEN OMITTED PER NON-DISCLOSURE AGREEMENT WITH GOOGLE INC.**

Appendix - B.3.2.10
Impact Calculation Breakdown - OIL & VINEGAR

Description: Calculation breakdown and associated data for OIL & VINEGAR food category

***Multiple NAICS codes were used to calculate the LCIA results for this food category. For this food category, the proportion of purchase dollars for each NAICS code is as follows: Fats and oils refining and blending [redacted] Seasoning and dressing manufacturing [redacted]

Food Category (PRIMARY)	Oil & Vinegar		
NAICS Category	Fats and oils refining and blending	Seasoning and dressing manufacturing	Both categories together
Total purchase dollars for category 2013 ($)	[redacted]	[redacted]	[redacted]
Deflation Factor	0.4645	0.7600	n/a
Total purchase dollars for category 2002 ($)	[redacted]	[redacted]	[redacted]
[redacted]			
CEDA GW Indicator Result (kg CO_2e / $)			
Global Warming Impact (kg CO_2e)	137,385	24,709	162,094
[redacted]			
CEDA WC Indicator Result (kg H_2O / $)			
Water Consumption (kg H_2O)	44,111,408	7,356,564	51,467,972

Food Item (PRIMARY : SECONDARY)	2013 Purchase Dollars ($)	2002 Purchase Dollars ($)	Subcategory GW Impact (kg CO_2e)	Subcategory WC (kg H_2O)
OIL & VINEGAR : OLIVE OIL	[redacted]	[redacted]	46,935.17	15,069,900.79
OIL & VINEGAR : CANOLA OIL			40,730.14	13,077,595.03
OIL & VINEGAR : RICE BRAN OIL			38,458.15	12,348,108.10
OIL & VINEGAR : VINEGAR			24,708.80	7,356,564.11
OIL & VINEGAR : SESAME			3,958.32	1,270,932.74
OIL & VINEGAR : VEGALENE			2,454.89	788,214.31
OIL & VINEGAR : BLACK TRUFFLE OIL			1,653.28	530,834.21
OIL & VINEGAR : GRAPESEED			1,166.59	374,566.33
OIL & VINEGAR : COCONUT OIL			445.61	143,074.71
OIL & VINEGAR : FLAX OIL			427.73	137,335.39
OIL & VINEGAR : RAYU CHILI OIL			355.41	114,115.19
OIL & VINEGAR : SUNFLOWER			249.65	80,157.53
OIL & VINEGAR : WORCHESTERSHIRE SAUCE			249.15	79,998.10
OIL & VINEGAR : SOY			230.23	73,923.15
OIL & VINEGAR : ALMOND OIL			70.55	22,652.42
Totals - For Verification			*162,093.67*	*51,467,972.11*

[redacted] = SENSITIVE DATA HAS BEEN OMITTED PER NON-DISCLOSURE AGREEMENT WITH GOOGLE INC.

Appendix - B.3.2.11
Impact Calculation Breakdown - OTHER MEATS

Description: Calculation breakdown and associated data for OTHER MEATS food category

***Multiple NAICS codes were used to calculate the LCIA results for this food category. For this food category, the proportion of purchase dollars for each NAICS code is as follows: Poultry processing [redacted] and Animal (except poultry) slaughtering, rendering, and processing [redacted].

Food Category (PRIMARY)	**Other Meats**		
NAICS Category	Poultry Processing	Animal (except poultry) slaughtering, rendering, and processing	Both Categories together
Total purchase dollars for category 2013 ($)	[redacted]		
Deflation Factor	0.7875	0.6435	n/a
Total purchase dollars for category 2002 ($)	[redacted]		
[redacted]			
CEDA GW Indicator Result (kg CO_2e / $)	[redacted]		
Global Warming Impact (kg CO_2e)	60,659	37,427	98,086
[redacted]			
CEDA WC Indicator Result (kg H_2O / $)	[redacted]		
Water Consumption (kg H_2O)	13,135,294	5,400,640	18,535,934

Food Item (PRIMARY : SECONDARY)	**2013 Purchase Dollars ($)**	**2002 Purchase Dollars ($)**	**Subcategory GW Impact (kg CO_2e)**	**Subcategory WC (kg H_2O)**
OTHER MEATS: DUCK	[redacted]	[redacted]	48,805.85	10,568,583.42
OTHER MEATS: BUFFALO	[redacted]	[redacted]	11,759.39	1,696,857.67
OTHER MEATS: QUAIL	[redacted]	[redacted]	9,538.15	2,065,422.90
OTHER MEATS: BOAR	[redacted]	[redacted]	6,935.40	1,000,765.56
OTHER MEATS: VENISON	[redacted]	[redacted]	5,351.65	772,232.68
OTHER MEATS: GOAT	[redacted]	[redacted]	5,174.25	746,634.00
OTHER MEATS: RABBIT	[redacted]	[redacted]	4,334.43	625,449.94
OTHER MEATS: FROG	[redacted]	[redacted]	3,871.84	558,699.66
OTHER MEATS: CORNISH GAME HEN	[redacted]	[redacted]	1,602.10	346,925.08
OTHER MEATS: GUNEA HEN	[redacted]	[redacted]	458.11	99,201.48
OTHER MEATS: PHEASANT	[redacted]	[redacted]	205.58	44,517.83
OTHER MEATS: GOOSE	[redacted]	[redacted]	49.15	10,643.78
Totals - For Verification	[redacted]	[redacted]	98,085.92	18,535,934.00

[redacted] = SENSITIVE DATA HAS BEEN OMITTED PER NON-DISCLOSURE AGREEMENT WITH GOOGLE INC.

Appendix - B.3.2.12

Impact Calculation Breakdown - FLOUR & FLOUR PRODUCTS

Description: Calculation breakdown and associated data for FLOUR & FLOUR PRODUCTS food category

Food Category (PRIMARY)	**Flour and Flour Products**
NAICS Category	Flour milling and malt manufacturing
Total purchase dollars for category 2013 ($)	[redacted]
Deflation Factor	0.51051
Total purchase dollars for category 2002 ($)	[redacted]
[redacted]	[redacted]
CEDA GW Indicator Result (kg CO_2e / $)	[redacted]
Global Warming Impact (kg CO_2e)	66,141
[redacted]	[redacted]
CEDA WC Indicator Result (kg H_2O / $)	[redacted]
Water Consumption (kg H_2O)	26,918,409

Food Item (PRIMARY : SECONDARY)	2013 Purchase Dollars ($)	% of Category Total 2013 Purchase Dollars	Subcategory GW Impact (kg CO_2e)	Subcategory WC (kg H_2O)
FLOUR AND FLOUR PRODUCTS: WHEAT FLOUR	[redacted]	[redacted]	53,897.31	21,935,440.28
FLOUR AND FLOUR PRODUCTS: ALMOND	[redacted]	[redacted]	9,375.24	3,815,589.35
FLOUR AND FLOUR PRODUCTS: CORN FLOUR	[redacted]	[redacted]	1,644.24	669,183.96
FLOUR AND FLOUR PRODUCTS: GARBANZO	[redacted]	[redacted]	821.49	334,336.62
FLOUR AND FLOUR PRODUCTS: RICE	[redacted]	[redacted]	402.61	163,858.59
Totals - For Verification	[redacted]	[redacted]	*66,140.90*	*26,918,408.80*

[redacted] = SENSITIVE DATA HAS BEEN OMITTED PER NON-DISCLOSURE AGREEMENT WITH GOOGLE INC.

Appendix - B.3.2.13
Impact Calculation Breakdown - Secondary Category Blank Template

Description: Blank template used by group to standardiaze work and methodically breakdown each food category

***** Directions**
*** Populate the Purple fields
**** Follow the Italicized text for detailed instructions*
*** When table is fully populated... Copy "Subcategory Name", associated "Subcategory GW Impact (kg CO_2e)" and "Subcategory Water Impact (kg H_2O)" into "Fine CEDA Analysis" LCIA results table

Food Category (PRIMARY)		<--- *Write Category Name*
NAICS Category		<--- *Write NAICS Category Name*
Total purchase dollars for category 2013 ($)		<--- *Copy Total 2013 $ Amount from Crunchtime! data*
Deflation Factor		<--- *Copy deflation factor from "Deflation Factors" Appendix B.3.2.14*
Total purchase dollars for category 2002 ($)		<--- *Calculate 2002 $ amount using deflation factor*
CEDA GW Indicator Result (kg CO_2e / $)		<--- *Insert CEDA Global Warming Indicator Result*
Global Warming Impact (kg CO_2e)	0.00	<--- *Do not edit*
CEDA WC Indicator Result (kg H_2O / $)		<--- *Insert CEDA Water Consumption Indicator Result*
Water Consumption (kg H_2O)	0.00	<--- *Do not edit*

Food Item (PRIMARY : SECONDARY)	2013 Purchase Dollars ($)	% of Category Total 2013 Purchase Dollars	Subcategory GW Impact (kg CO_2e)	Subcategory WC (kg H_2O)
		#DIV/0!	#DIV/0!	#DIV/0!
		#DIV/0!	#DIV/0!	#DIV/0!
		#DIV/0!	#DIV/0!	#DIV/0!
		#DIV/0!	#DIV/0!	#DIV/0!
		#DIV/0!	#DIV/0!	#DIV/0!
		#DIV/0!	#DIV/0!	#DIV/0!
		#DIV/0!	#DIV/0!	#DIV/0!
		#DIV/0!	#DIV/0!	#DIV/0!
		#DIV/0!	#DIV/0!	#DIV/0!
Totals - For Verification	*$0.00*	*#DIV/0!*	*#DIV/0!*	*#DIV/0!*
Insert Sub Category Names Format is (PRIMARY : SECONDARY) Example: (FRESH FRUIT : STRAWBERRIES)	*Insert 2013 Amount Spent 2013 per Subcategory Here*	*Do not edit*	*Do not edit*	*Do not edit*

Appendix - B.3.2.14
Deflation Factors

Description: Pertinent CEDA / NAICS category names and associated deflation factors used for deflating 2013 purchase dollars to 2002 purchase dollars.

Cautionary note on the use of these data

These data include detailed estimates underlying the GDP-by-industry accounts published elsewhere on the BEA website (www.bea.gov) and in the Survey of Current Business. The Bureau of Economic Analysis does not include these detailed estimates in the published tables because their quality is significantly less than that of the higher-level aggregates in which they are included. Compared to these aggregates, the more detailed estimates are more likely to be either based on judgmental trends, on trends in the higher-level aggregate, or on less reliable source data.

CEDA Code	Category Description	Value of 2005 $100 in Year		Deflation Factor
		2002	2011	2002 / 2011
1119B0	All other crop farming	$93.65	$147.75	0.634
311990	All other food manufacturing	$92.59	$121.23	0.764
31161A	Animal (except poultry) slaughtering, rendering, and processing	$82.40	$128.05	0.643
112A00	Animal production, except cattle and poultry and eggs	$72.15	$144.22	0.500
311313	Beet sugar manufacturing	$92.49	$160.39	0.577
311810	Bread and bakery product manufacturing	$93.93	$128.73	0.730
311230	Breakfast cereal manufacturing	$93.85	$117.23	0.801
312120	Breweries	$92.06	$113.56	0.811
1121A0	Cattle ranching and farming	$73.67	$126.62	0.582
311513	Cheese manufacturing	$87.66	$121.30	0.723
311320	Chocolate and confectionery manufacturing from cacao beans	$96.41	$135.51	0.711
311920	Coffee and tea manufacturing	$83.75	$141.77	0.591
311330	Confectionery manufacturing from purchased chocolate	$92.33	$130.89	0.705
311820	Cookie, cracker, and pasta manufacturing	$94.00	$125.72	0.748
111920	Cotton farming	$91.25	$195.60	0.467
112120	Dairy cattle and milk production	$78.45	$133.73	0.587
312140	Distilleries	$103.73	$104.88	0.989
311514	Dry, condensed, and evaporated dairy product manufacturing	$92.13	$130.52	0.706
311225	Fats and oils refining and blending	$79.62	$171.42	0.465
114100	Fishing	$82.79	$132.77	0.624
311930	Flavoring syrup and concentrate manufacturing	$95.57	$106.98	0.893
311210	Flour milling and malt manufacturing	$87.42	$171.24	0.511
31151A	Fluid milk and butter manufacturing	$87.72	$128.62	0.682
113A00	Forest nurseries, forest products, and timber tracts	$90.80	$115.94	0.783
311410	Frozen food manufacturing	$95.03	$122.29	0.777
311420	Fruit and vegetable canning, pickling, and drying	$95.28	$127.17	0.749
1113A0	Fruit farming	$94.21	$140.63	0.670
1111B0	Grain farming	$105.08	$277.93	0.378
111400	Greenhouse, nursery, and floriculture production	$98.18	$112.13	0.876
114200	Hunting and trapping	$99.17	$119.84	0.828
311520	Ice cream and frozen dessert manufacturing	$94.65	$120.86	0.783
113300	Logging	$91.24	$115.60	0.789
311340	Nonchocolate confectionery manufacturing	$87.35	$124.19	0.703
1111A0	Oilseed farming	$95.54	$219.28	0.436
112300	Poultry and egg production	$75.38	$125.97	0.598
311615	Poultry processing	$85.35	$108.39	0.787
311700	Seafood product preparation and packaging	$91.82	$133.85	0.686
311940	Seasoning and dressing manufacturing	$92.26	$121.39	0.760
311910	Snack food manufacturing	$89.39	$125.48	0.712
312110	Soft drink and ice manufacturing	$95.19	$115.74	0.822
31122A	Soybean and other oilseed processing	$79.24	$178.08	0.445
31131A	Sugar cane mills and refining	$92.67	$163.25	0.568
1119A0	Sugarcane and sugar beet farming	$92.39	$158.92	0.581
111910	Tobacco farming	$113.75	$111.87	1.017
311830	Tortilla manufacturing	$92.69	$125.52	0.738
111335	Tree nut farming	$39.22	$64.83	0.605
111200	Vegetable and melon farming	$101.75	$133.16	0.764
311221	Wet corn milling	$87.24	$161.76	0.539
312130	Wineries	$97.40	$110.75	0.879

Appendix C.1
Appendix C Overview

1. **Overview**

2. **Input Process Definitions**

3. **Input Contribution Results per Food Category at the Farm Level**

This section contains the following data: Input Contribution Results at the Farm Level. Results were obtained using the CEDA Contribution Analysis Tool to analyze each Phase 1 Food Category. Results are shown for the Global Warming Input Contribution Analyses (C.3.1) and Water Consumption Input Contribution Analyses (C.3.2).

Organization: The results in this appendix are organized from highest impact foods to lowest impact foods based on the impact category being analyzed.

1. **Global Warming Results**
    1. **Vegetables**
    2. **Beef**
    3. **Fresh Fruits**
    4. **Pork**
    5. **Chicken**
    6. **Cheese**
    7. **Nut, Seed, Rice, Grain, Bean**
    8. **Milk**
    9. **Eggs**
    10. **Juices**
    11. **Yogurt**
    12. **Coffee**
    13. **Oil & Vinegar**
    14. **Lamb**
    15. **Turkey**
    16. **Other Meats**
    17. **Butter**
    18. **Flour and Flour Products**

2. **Water Consumption Results**
    1. **Fresh Fruits**
    2. **Vegetables**
    3. **Beef**
    4. **Nut, Seed, Rice, Grain, Bean**
    5. **Chicken**
    6. **Pork**
    7. **Coffee**
    8. **Eggs**
    9. **Juices**
    10. **Cheese**
    11. **Oil & Vinegar**
    12. **Milk**
    13. **Yogurt**
    14. **Turkey**
    15. **Flour and Flour Products**
    16. **Lamb**
    17. **Other Meats**
    18. **Butter**

4. Input Contribution Results per Food Category at the Processing Level

This section contains the following data: Input Contribution Results at the Processing Level. Results were obtained using the CEDA Contribution Analysis Tool to analyze each Phase 1 Food Category. Results are shown for the Global Warming Input Contribution Analyses (C.4.1) and Water Consumption Input Contribution Analyses (C.4.2).

Organization: The results in this appendix are organized from highest impact foods to lowest impact foods based on the impact category being analyzed.

1. **Global Warming Results**
    1. **Beef**
    2. **Pork**
    3. **Chicken**
    4. **Cheese**
    5. **Milk**
    6. **Juices**
    7. **Yogurt**
    8. **Coffee**
    9. **Oil & Vinegar**
    10. **Lamb**
    11. **Turkey**
    12. **Other Meats**
    13. **Butter**
    14. **Flour & Flour Products**

2. **Water Consumption Results**
    1. **Beef**
    2. **Chicken**
    3. **Pork**
    4. **Coffee**
    5. **Juices**
    6. **Cheese**
    7. **Oil & Vinegar**
    8. **Milk**
    9. **Yogurt**
    10. **Turkey**
    11. **Flour and Flour Products**
    12. **Lamb**
    13. **Other Meats**
    14. **Butter**

5. Input Contribution Results for All Phase 1 Food Categories

This section contains the following data: Aggregate Input Contribution Results across all Phase 1 Food Categories. The NAICS category assigned to each Phase 1 Food Category in this aggregate analysis was the same as NAICS category used when calculating LCIA results (Appendix B). Results were obtained by aggregating the appropriate result data from Appendix C.3 and C.4. Aggregate results are shown for both Global Warming (C.5.1) and Water Consumption (C.5.2).

1. **Global Warming Results**
2. **Water Consumption Results**

Appendix C.2
Input Process Definitions

Description: Definitions of the input processes listed in subsequent sections of this appendix.
***Source of definitions: **https://www.census.gov/eos/www/naics/2012NAICS/2012_Definition_File.pdf**

Process	NAICS Code	Definition
Air transportation	481112	This U.S. industry comprises establishments primarily engaged in providing air transportation of cargo without transporting passengers over regular routes and on regular schedules. Establishments in this industry operate flights even if partially loaded. Establishments primarily engaged in providing scheduled air transportation of mail on a contract basis are included in this industry.
All other basic inorganic chemical manufacturing	325180	This industry comprises establishments primarily engaged in manufacturing basic inorganic chemicals (except industrial gases and synthetic dyes and pigments).
All other crop farming	111998	This industry group comprises establishments primarily engaged in (1) growing crops (except oilseed and/or grain; vegetable and/or melon; fruit and tree nut; and greenhouse, nursery, and/or floriculture products). These establishments grow crops, such as tobacco, cotton, sugarcane, hay, sugar beets, peanuts, agave, herbs and spices, and hay and grass seeds; or (2) growing a combination of crops (except a combination of oilseed(s) and grain(s) and a combination of fruit(s) and tree nut(s)).
Animal (except poultry) slaughtering, rendering, and processing	311611	This U.S. industry comprises establishments primarily engaged in slaughtering animals (except poultry and small game). Establishments that slaughter and prepare meats are included in this industry.
Animal production, except cattle and poultry and eggs	11290	This industry group comprises establishments primarily engaged in raising animals and insects (except cattle, hogs and pigs, poultry, sheep and goats, aquaculture) for sale or product production. These establishments are primarily engaged in raising one of the following: bees, horses and other equines, rabbits and other fur-bearing animals, and so forth, and producing products, such as honey and other bee products. Establishments primarily engaged in raising a combination of animals with no one animal or family of animals accounting for one-half of the establishment's agricultural production (i.e., value of animals for market) are included in this industry group.
Cattle ranching and farming	1121A0	This industry group comprises establishments primarily engaged in raising cattle, milking dairy cattle, or feeding cattle for fattening.
Cheese manufacturing	311513	This U.S. industry comprises establishments primarily engaged in (1) manufacturing cheese products (except cottage cheese) from raw milk and/or processed milk products and/or (2) manufacturing cheese substitutes from soybean and other nondairy substances.
Coal mining	21211	This industry comprises establishments primarily engaged in one or more of the following: (1) mining bituminous coal, anthracite, and lignite by underground mining, auger mining, strip mining, culm bank mining, and other surface mining; (2) developing coal mine sites; and (3) beneficiating (i.e., preparing) coal (e.g., cleaning, washing, screening, and sizing coal).
Cotton farming	111920	This industry comprises establishments primarily engaged in growing cotton. and establishments primarily engaged in ginning cotton are classified in U.S. Industry 115111, Cotton Ginning.
Dairy cattle and milk production		This industry comprises establishments primarily engaged in milking dairy cattle and establishments primarily engaged in: (1) Raising dairy herd replacements--are classified in U.S. Industry 112111, Beef Cattle Ranching and Farming; and (2) Milking goats--are classified in Industry 112420, Goat Farming.
Dry, condensed, and evaporated dairy product manufacturing	311514	This U.S. industry comprises establishments primarily engaged in manufacturing dry, condensed, and evaporated milk and dairy substitute products.
Electric power generation, transmission, and distribution	221100	This industry group comprises establishments primarily engaged in generating, transmitting, and/or distributing electric power. Establishments in this industry group may perform one or more of the following activities: (1) operate generation facilities that produce electric energy; (2) operate transmission systems that convey the electricity from the generation facility to the distribution system; and (3) operate distribution systems that convey electric power received from the generation facility or the transmission system to the final consumer
Fats and oils refining and blending	311225	This U.S. industry comprises establishments primarily engaged in one or more of the following: (1) manufacturing shortening and margarine from purchased fats and oils; (2) refining and/or blending vegetable, oilseed, and tree nut oils from purchased oils; and (3) blending purchased animal fats with purchased vegetable fats.
Fertilizer manufacturing	325310	This industry comprises establishments primarily engaged in one or more of the following: (1) manufacturing nitrogenous or phosphatic fertilizer materials; (2) manufacturing fertilizers from sewage or animal waste; (3) manufacturing nitrogenous or phosphatic materials and mixing with other ingredients into fertilizers; and (4) mixing ingredients made elsewhere into fertilizers.
Fishing	114110	This industry comprises establishments primarily engaged in the commercial catching or taking of finfish, shellfish, or miscellaneous marine products from a natural habitat, such as the catching of bluefish, eels, salmon, tuna, clams, crabs, lobsters, mussels, oysters, shrimp, frogs, sea urchins, and turtles.
Flavoring syrup and concentrate manufacturing	311930	This industry comprises establishments primarily engaged in manufacturing flavoring syrup drink concentrates and related products for soda fountain use or for the manufacture of soft drinks.

Appendix C.2

Input Process Definitions

Description: Definitions of the input processes listed in subsequent sections of this appendix.

***Source of definitions: **https://www.census.gov/eos/www/naics/2012NAICS/2012_Definition_File.pdf**

Process	NAICS Code	Definition
Frozen food manufacturing	311410	This industry comprises establishments primarily engaged in manufacturing frozen fruit, frozen juices, frozen vegetables, and frozen specialty foods (except seafood), such as frozen dinners, entrees, and side dishes; frozen pizza; frozen whipped toppings; and frozen waffles, pancakes, and french toast.
Fruit farming	111300	This industry group comprises establishments primarily engaged in growing fruit and/or tree nut crops. The crops included in this industry group are generally not grown from seeds and have a perennial life cycle.
Glass container manufacturing	327213	This U.S. industry comprises establishments primarily engaged in manufacturing glass packaging containers.
Grain farming	111100	This industry group comprises establishments primarily engaged in (1) growing oilseed and/or grain crops and/or (2) producing oilseed and grain seeds. These crops have an annual life cycle and are typically grown in open fields.
Management of companies and enterprises	551110	This industry comprises (1) establishments primarily engaged in holding the securities of (or other equity interests in) companies and enterprises for the purpose of owning a controlling interest or influencing the management decisions or (2) establishments (except government establishments) that administer, oversee, and manage other establishments of the company or enterprise and that normally undertake the strategic or organizational planning and decision making role of the company or enterprise. Establishments that administer, oversee, and manage may hold the securities of the company or enterprise.
Metal can, box, and other metal container (light gauge) manufacturing	332430	This industry comprises establishments primarily engaged in forming light gauge metal containers.
Natural gas distribution	221210	This industry comprises: (1) establishments primarily engaged in operating gas distribution systems (e.g., mains, meters); (2) establishments known as gas marketers that buy gas from the well and sell it to a distribution system; (3) establishments known as gas brokers or agents that arrange the sale of gas over gas distribution systems operated by others; and (4) establishments primarily engaged in transmitting and distributing gas to final consumers.
Oilseed farming	111100	This industry group comprises establishments primarily engaged in (1) growing oilseed and/or grain crops and/or (2) producing oilseed and grain seeds. These crops have an annual life cycle and are typically grown in open fields.
Other animal food manufacturing	311119	This U.S. industry comprises establishments primarily engaged in manufacturing animal food (except dog and cat) from ingredients, such as grains, oilseed mill products, and meat products
Other plastics product manufacturing	326190	This industry comprises establishments primarily engaged in manufacturing plastics plumbing fixtures and other plastics products (except film, sheet, bags, profile shapes, pipes, pipe fittings, laminates, foam products, and bottles).
Paperboard container manufacturing	322210	This industry comprises establishments primarily engaged in converting paperboard into containers without manufacturing paperboard. These establishments use corrugating, cutting, and shaping machinery to form paperboard into containers. Products made by these establishments include boxes, corrugated sheets, pads, pallets, paper dishes, and fiber drums, and reels.
Pesticide and other agricultural chemical manufacturing	325320	This industry comprises establishments primarily engaged in the formulation and preparation of agricultural and household pest control chemicals (except fertilizers).
Petroleum refineries	324110	This industry comprises establishments primarily engaged in refining crude petroleum into refined petroleum. Petroleum refining involves one or more of the following activities: (1) fractionation; (2) straight distillation of crude oil; and (3) cracking.
Plastics bottle manufacturing	326160	This industry comprises establishments primarily engaged in manufacturing plastics bottles.
Plastics packaging materials and unlaminated film and sheet manufacturing	326112	This U.S. industry comprises establishments primarily engaged in converting plastics resins into plastics packaging (flexible) film and packaging sheet.
Poultry and egg production	112300	This industry group comprises establishments primarily engaged in breeding, hatching, and raising poultry for meat or egg production.
Poultry processing	311615	This U.S. industry comprises establishments primarily engaged in (1) slaughtering poultry and small game and/or (2) preparing processed poultry and small game meat and meat byproducts.
Real estate	531000	Industries in the Real Estate subsector group establishments that are primarily engaged in renting or leasing real estate to others; managing real estate for others; selling, buying, or renting real estate for others; and providing other real estate related services, such as appraisal services.
Support activities for agriculture and forestry	115000	Industries in the Support Activities for Agriculture and Forestry subsector provide support services that are an essential part of agricultural and forestry production. These support activities may be performed by the agriculture or forestry producing establishment or conducted independently as an alternative source of inputs required for the production process for a given crop, animal, or forestry industry. Establishments that primarily perform these activities independent of the agriculture or forestry producing establishment are in this subsector.
Flavoring syrup and concentrate manufacturing	311930	This industry comprises establishments primarily engaged in manufacturing flavoring syrup drink concentrates and related products for soda fountain use or for the manufacture of soft drinks.

Appendix C.2

Input Process Definitions

Description: Definitions of the input processes listed in subsequent sections of this appendix.

***Source of definitions: **https://www.census.gov/eos/www/naics/2012NAICS/2012_Definition_File.pdf**

Process	NAICS Code	Definition
Flour milling and malt manufacturing	311210	This industry comprises establishments primarily engaged in one or more of the following: (1) milling flour or meal from grains or vegetables; (2) preparing flour mixes or doughs from flour milled in the same stablishment; (3) milling, cleaning, and polishing rice; and (4) manufacturing malt from barley, rye, or other grains.
Tree nut farming	111335	This U.S. industry comprises establishments primarily engaged in growing tree nuts.
Truck transportation	484121	This U.S. industry comprises establishments primarily engaged in providing long-distance general freight truckload (TL) trucking. These long-distance general freight truckload carrier establishments provide full truck movement of freight from origin to destination. The shipment of freight on a truck is characterized as a full single load not combined with other shipments.
Vegetable and melon farming	111219	This U.S. industry comprises establishments primarily engaged in one or more of the following: (1) growing melons and/or vegetables (except potatoes; dry peas; dry beans; field, silage, or seed corn; and sugar beets); (2) producing vegetable and/or melon seeds; and (3) growing vegetable and/or melon bedding plants.
Water transportation	483211	This U.S. industry comprises establishments primarily engaged in providing inland water transportation of cargo on lakes, rivers, or intracoastal waterways (except on the Great Lakes System).
Water, sewage and other systems	22130	This industry comprises establishments primarily engaged in operating water treatment plants and/or operating water supply systems. The water supply system may include pumping stations, aqueducts, and/or distribution mains. The water may be used for drinking, irrigation, or other use. It also includes establishments primarily engaged in operating sewer systems or sewage treatment facilities that collect, treat, and dispose of waste.
Wet corn milling	311221	This U.S. industry comprises establishments primarily engaged in wet milling corn and other vegetables (except to make ethyl alcohol). Examples of products made in these establishments are corn sweeteners, such as glucose, dextrose, and fructose; corn oil; and starches (except laundry).
Wood container and pallet manufacturing	321920	This industry comprises establishments primarily engaged in manufacturing wood pallets, wood box shook, wood boxes, other wood containers, and wood parts for pallets and containers.

Appendix C.3.1.1
Input Contribution Results - Farm Level - Global Warming - Vegetables

Description: Input Contribution Results for the Vegetables Food Category at the Farming Level.

Global Warming Input Contribution Analysis: Vegetables		
NAICS Category: Vegetable and melon farming		
Input Rank	**Input Category**	**Percent**
1	Electric power generation, transmission, and distribution	31.0%
2	Support activities for agriculture and forestry	17.4%
3	Fertilizer manufacturing	11.1%
4	Vegetable and melon farming	7.9%
5	Petroleum refineries	7.2%
6	Pesticide and other agricultural chemical manufacturing	6.7%
7	Real estate	3.0%
8	Cattle ranching and farming	2.0%
9	Water, sewage and other systems	1.5%
10	Wood container and pallet manufacturing	1.3%
Rest	All the remaining	11.0%
	Total	100.0%

Appendix C.3.1.2
Input Contribution Results - Farm Level - Global Warming - Beef

Description: Input Contribution Results for the Beef Food Category at the Farming Level.

Global Warming Input Contribution Analysis: Beef		
NAICS Category: Cattle ranching and farming		
Input Rank	**Input Category**	**Percent**
1	Cattle ranching and farming	65.8%
2	All other crop farming	16.6%
3	Grain farming	7.6%
4	Electric power generation, transmission, and distribution	3.0%
5	Other animal food manufacturing	1.9%
6	Petroleum refineries	1.6%
7	Support activities for agriculture and forestry	0.5%
8	Real estate	0.5%
9	Natural gas distribution	0.4%
10	Truck transportation	0.4%
Rest	All the remaining	1.8%
	Total	100.0%

Appendix C.3.1.3
Input Contribution Results - Farm Level - Global Warming - Fresh Fruits

Description: Input Contribution Results for the Fresh Fruits Food Category at the Farming Level.

Global Warming Input Contribution Analysis: Fresh Fruits		
NAICS Category: Fruit farming		
Input Rank	**Input Category**	**Percent**
1	Electric power generation, transmission, and distribution	33.4%
2	Support activities for agriculture and forestry	25.7%
3	Fertilizer manufacturing	9.2%
4	Pesticide and other agricultural chemical manufacturing	6.7%
5	Petroleum refineries	5.6%
6	Fruit farming	2.1%
7	Water, sewage and other systems	2.0%
8	Cattle ranching and farming	1.5%
9	Wood container and pallet manufacturing	1.3%
10	Real estate	1.1%
Rest	All the remaining	11.3%
	Total	100.0%

Appendix C.3.1.4
Input Contribution Results - Farm Level - Global Warming - Pork
Description: Input Contribution Results for the Pork Food Category at the Farming Level.

Global Warming Input Contribution Analysis: Pork		
NAICS Category: Animal production, except cattle and poultry and eggs		
Input Rank	**Input Category**	**Percent**
1	Animal production, except cattle and poultry and eggs	23.8%
2	All other crop farming	16.5%
3	Other animal food manufacturing	12.2%
4	Electric power generation, transmission, and distribution	12.2%
5	Grain farming	12.2%
6	Cattle ranching and farming	8.5%
7	Petroleum refineries	3.8%
8	Support activities for agriculture and forestry	2.5%
9	Soybean and other oilseed processing	1.2%
10	Real estate	0.8%
Rest	All the remaining	6.4%
	Total	100.0%

Appendix C.3.1.5
Input Contribution Results - Farm Level - Global Warming - Chicken
Description: Input Contribution Results for the Chicken Food Category at the Farming Level.

Global Warming Input Contribution Analysis: Chicken		
NAICS Category: Poultry and egg production		
Input Rank	**Input Category**	**Percent**
1	Other animal food manufacturing	32.7%
2	Grain farming	23.3%
3	Poultry and egg production	18.6%
4	Electric power generation, transmission, and distribution	6.7%
5	Soybean and other oilseed processing	6.3%
6	Coal mining	1.7%
7	Petroleum refineries	1.6%
8	Animal (except poultry) slaughtering, rendering, and processing	1.3%
9	Flour milling and malt manufacturing	1.2%
10	Truck transportation	1.1%
Rest	All the remaining	5.8%
	Total	100.0%

Appendix C.3.1.6
Input Contribution Results - Farm Level - Global Warming - Cheese
Description: Input Contribution Results for the Cheese Food Category at the Farming Level.

Global Warming Input Contribution Analysis: Cheese		
NAICS Category: Dairy cattle and milk production		
Input Rank	**Input Category**	**Percent**
1	Other animal food manufacturing	24.9%
2	All other crop farming	23.1%
3	Electric power generation, transmission, and distribution	14.3%
4	Grain farming	11.0%
5	Cattle ranching and farming	10.1%
6	Petroleum refineries	3.6%
7	Support activities for agriculture and forestry	2.1%
8	Soybean and other oilseed processing	1.1%
9	Wholesale trade	0.8%
10	Real estate	0.8%
Rest	All the remaining	8.2%
	Total	100.0%

Appendix C.3.1.7

Input Contribution Results - Farm Level - Global Warming - Nut, Seed, Rice, Grain, Bean

Description: Input Contribution Results for the Nut, Seed, Rice, Grain, Bean Food Category at the Farming Level.
***Multiple NAICS codes were used to calculate the LCIA results for this food category. Recall LCIA results are based on purchase dollars. For this food category, the proportion of purchase dollars for each NAICS code is as follows: Tree nut farming (48.1%), Grain Farming (23.4%), Vegetable & melon farming (12.9%), Oil seed farming (1.6%).

Global Warming Input Contribution Analysis: Nut, Seed, Rice, Grain, Bean		
NAICS Category: Tree nut farming		
Input Rank	**Input Category**	**Percent**
1	Electric power generation, transmission, and distribution	35.3%
2	Support activities for agriculture and forestry	25.6%
3	Fertilizer manufacturing	8.5%
4	Pesticide and other agricultural chemical manufacturing	7.0%
5	Petroleum refineries	6.0%
6	Tree nut farming	3.0%
7	Water, sewage and other systems	1.9%
8	Cattle ranching and farming	1.6%
9	Wholesale trade	1.2%
10	Real estate	1.2%
Rest	All the remaining	8.8%
	Total	100.0%

Global Warming Input Contribution Analysis: Nut, Seed, Rice, Grain, Bean		
NAICS Category: Grain farming		
Input Rank	**Input Category**	**Percent**
1	Grain farming	28.4%
2	Fertilizer manufacturing	21.4%
3	Support activities for agriculture and forestry	8.9%
4	Electric power generation, transmission, and distribution	7.9%
5	Petroleum refineries	7.8%
6	Pesticide and other agricultural chemical manufacturing	4.5%
7	Real estate	4.3%
8	All other crop farming	3.0%
9	Natural gas distribution	2.3%
10	All other basic inorganic chemical manufacturing	1.5%
Rest	All the remaining	10.1%
	Total	100.0%

Global Warming Input Contribution Analysis: Nut, Seed, Rice, Grain, Bean		
NAICS Category: Vegetable & melon farming		
Input Rank	**Input Category**	**Percent**
1	Electric power generation, transmission, and distribution	31.0%
2	Support activities for agriculture and forestry	17.4%
3	Fertilizer manufacturing	11.1%
4	Vegetable and melon farming	7.9%
5	Petroleum refineries	7.2%
6	Pesticide and other agricultural chemical manufacturing	6.7%
7	Real estate	3.0%
8	Cattle ranching and farming	2.0%
9	Water, sewage and other systems	1.5%
10	Wood container and pallet manufacturing	1.3%
Rest	All the remaining	11.0%
	Total	100.0%

Global Warming Input Contribution Analysis: Nut, Seed, Rice, Grain, Bean		
NAICS Category: Oilseed farming		
Input Rank	**Input Category**	**Percent**
1	Oilseed farming	17.3%
2	Electric power generation, transmission, and distribution	13.9%
3	Grain farming	13.3%
4	Fertilizer manufacturing	10.2%
5	Support activities for agriculture and forestry	8.2%
6	Petroleum refineries	7.8%
7	Cotton farming	6.8%
8	Pesticide and other agricultural chemical manufacturing	4.7%
9	Real estate	4.5%
10	All other basic inorganic chemical manufacturing	3.5%
Rest	All the remaining	9.8%
	Total	100.0%

Appendix C.3.1.8
Input Contribution Results - Farm Level - Global Warming - Milk
Description: Input Contribution Results for the Milk Food Category at the Farming Level.

Global Warming Input Contribution Analysis: Milk		
NAICS Category: Dairy cattle and milk production		
Input Rank	**Input Category**	**Percent**
1	Other animal food manufacturing	24.9%
2	All other crop farming	23.1%
3	Electric power generation, transmission, and distribution	14.3%
4	Grain farming	11.0%
5	Cattle ranching and farming	10.1%
6	Petroleum refineries	3.6%
7	Support activities for agriculture and forestry	2.1%
8	Soybean and other oilseed processing	1.1%
9	Wholesale trade	0.8%
10	Real estate	0.8%
Rest	All the remaining	8.2%
	Total	100.0%

Appendix C.3.1.9
Input Contribution Results - Farm Level - Global Warming - Eggs
Description: Input Contribution Results for the Eggs Food Category at the Farming Level.

Global Warming Input Contribution Analysis: Eggs		
NAICS Category: Poultry and egg production		
Input Rank	**Input Category**	**Percent**
1	Other animal food manufacturing	32.7%
2	Grain farming	23.3%
3	Poultry and egg production	18.6%
4	Electric power generation, transmission, and distribution	6.7%
5	Soybean and other oilseed processing	6.3%
6	Coal mining	1.7%
7	Petroleum refineries	1.6%
8	Animal (except poultry) slaughtering, rendering, and processing	1.3%
9	Flour milling and malt manufacturing	1.2%
10	Truck transportation	1.1%
Rest	All the remaining	5.8%
	Total	100.0%

Appendix C.3.1.10
Input Contribution Results - Farm Level - Global Warming - Juices
Description: Input Contribution Results for the Juices Food Category at the Farming Level.

Global Warming Input Contribution Analysis: Juices
NAICS Category: N/A*
* refer to relevant fruit or vegetable input contribution analysis

Appendix C.3.1.11
Input Contribution Results - Farm Level - Global Warming - Yogurt
Description: Input Contribution Results for the Yogurt Food Category at the Farming Level.

Global Warming Input Contribution Analysis: Yogurt		
NAICS Category: Dairy cattle and milk production		
Input Rank	**Input Category**	**Percent**
1	Other animal food manufacturing	24.9%
2	All other crop farming	23.1%
3	Electric power generation, transmission, and distribution	14.3%
4	Grain farming	11.0%
5	Cattle ranching and farming	10.1%
6	Petroleum refineries	3.6%
7	Support activities for agriculture and forestry	2.1%
8	Soybean and other oilseed processing	1.1%
9	Wholesale trade	0.8%
10	Real estate	0.8%
Rest	All the remaining	8.2%
	Total	100.0%

Appendix C.3.1.12
Input Contribution Results - Farm Level - Global Warming - Coffee
Description: Input Contribution Results for the Coffee Food Category at the Farming Level.

Global Warming Input Contribution Analysis: Coffee		
NAICS Category: Fruit farming		
Input Rank	**Input Category**	**Percent**
1	Electric power generation, transmission, and distribution	33.4%
2	Support activities for agriculture and forestry	25.7%
3	Fertilizer manufacturing	9.2%
4	Pesticide and other agricultural chemical manufacturing	6.7%
5	Petroleum refineries	5.6%
6	Fruit farming	2.1%
7	Water, sewage and other systems	2.0%
8	Cattle ranching and farming	1.5%
9	Wood container and pallet manufacturing	1.3%
10	Real estate	1.1%
Rest	All the remaining	11.3%
	Total	100.0%

Appendix C.3.1.13
Input Contribution Results - Farm Level - Global Warming - Oil & Vinegar
Description: Input Contribution Results for the Oil & Vinegar Food Category at the Farming Level.
***Multiple NAICS codes were used to calculate the LCIA results for this food category. Recall LCIA results are based on purchase dollars. For this food category, the proportion of purchase dollars for each NAICS code is as follows: Fats and oils refining and blending (84.4%), Seasoning and dressing manufacturing (15.6%). Theses are both Processing Level NAICS codes. The most pertinent Farm Level NAICS code for these Processing Level NAICS codes is Oilseed farming.

Global Warming Input Contribution Analysis: Oil & Vinegar		
NAICS Category: Oilseed farming		
Input Rank	**Input Category**	**Percent**
1	Oilseed farming	17.3%
2	Electric power generation, transmission, and distribution	13.9%
3	Grain farming	13.3%
4	Fertilizer manufacturing	10.2%
5	Support activities for agriculture and forestry	8.2%
6	Petroleum refineries	7.8%
7	Cotton farming	6.8%
8	Pesticide and other agricultural chemical manufacturing	4.7%
9	Real estate	4.5%
10	All other basic inorganic chemical manufacturing	3.5%
Rest	All the remaining	9.8%
	Total	100.0%

Appendix C.3.1.14
Input Contribution Results - Farm Level - Global Warming - Lamb
Description: Input Contribution Results for the Lamb Food Category at the Farming Level.

Global Warming Input Contribution Analysis: Lamb		
NAICS Category: Animal production, except cattle and poultry and eggs		
Input Rank	**Input Category**	**Percent**
1	Animal production, except cattle and poultry and eggs	23.8%
2	All other crop farming	16.5%
3	Other animal food manufacturing	12.2%
4	Electric power generation, transmission, and distribution	12.2%
5	Grain farming	12.2%
6	Cattle ranching and farming	8.5%
7	Petroleum refineries	3.8%
8	Support activities for agriculture and forestry	2.5%
9	Soybean and other oilseed processing	1.2%
10	Real estate	0.8%
Rest	All the remaining	6.4%
	Total	100.0%

Appendix C.3.1.15
Input Contribution Results - Farm Level - Global Warming - Turkey
Description: Input Contribution Results for the Turkey Food Category at the Farming Level.

Global Warming Input Contribution Analysis: Turkey		
NAICS Category: Poultry and egg production		
Input Rank	**Input Category**	**Percent**
1	Other animal food manufacturing	32.7%
2	Grain farming	23.3%
3	Poultry and egg production	18.6%
4	Electric power generation, transmission, and distribution	6.7%
5	Soybean and other oilseed processing	6.3%
6	Coal mining	1.7%
7	Petroleum refineries	1.6%
8	Animal (except poultry) slaughtering, rendering, and processing	1.3%
9	Flour milling and malt manufacturing	1.2%
10	Truck transportation	1.1%
Rest	All the remaining	5.8%
	Total	100.0%

Appendix C.3.1.16
Input Contribution Results - Farm Level - Global Warming - Other Meats
Description: Input Contribution Results for the Other Meats Food Category at the Farming Level.
***Multiple NAICS codes were used to calculate the LCIA results for this food category. Recall LCIA results are based on purchase dollars. For this food category, the proportion of purchase dollars for each NAICS code is as follows: Animal production, except cattle and poultry and eggs (26.5%), Poultry and egg production (73.5%).

Global Warming Input Contribution Analysis: Other Meats		
NAICS Category: Animal production, except cattle and poultry and eggs		
Input Rank	**Input Category**	**Percent**
1	Animal production, except cattle and poultry and eggs	23.8%
2	All other crop farming	16.5%
3	Other animal food manufacturing	12.2%
4	Electric power generation, transmission, and distribution	12.2%
5	Grain farming	12.2%
6	Cattle ranching and farming	8.5%
7	Petroleum refineries	3.8%
8	Support activities for agriculture and forestry	2.5%
9	Soybean and other oilseed processing	1.2%
10	Real estate	0.8%
Rest	All the remaining	6.4%
	Total	100.0%

Global Warming Input Contribution Analysis: Other Meats		
NAICS Category: Poultry and egg production		
Input Rank	**Input Category**	**Percent**
1	Other animal food manufacturing	32.7%
2	Grain farming	23.3%
3	Poultry and egg production	18.6%
4	Electric power generation, transmission, and distribution	6.7%
5	Soybean and other oilseed processing	6.3%
6	Coal mining	1.7%
7	Petroleum refineries	1.6%
8	Animal (except poultry) slaughtering, rendering, and processing	1.3%
9	Flour milling and malt manufacturing	1.2%
10	Truck transportation	1.1%
Rest	All the remaining	5.8%
	Total	100.0%

Appendix C.3.1.17
Input Contribution Results - Farm Level - Global Warming - Butter
Description: Input Contribution Results for the Butter Food Category at the Farming Level.

Global Warming Input Contribution Analysis: Butter		
NAICS Category: Dairy cattle and milk production		
Input Rank	**Input Category**	**Percent**
1	Other animal food manufacturing	24.9%
2	All other crop farming	23.1%
3	Electric power generation, transmission, and distribution	14.3%
4	Grain farming	11.0%
5	Cattle ranching and farming	10.1%
6	Petroleum refineries	3.6%
7	Support activities for agriculture and forestry	2.1%
8	Soybean and other oilseed processing	1.1%
9	Wholesale trade	0.8%
10	Real estate	0.8%
Rest	All the remaining	8.2%
	Total	100.0%

Appendix C.3.1.18

Input Contribution Results - Global Warming - Flour & Flour Products - Farm Level

Description: Input Contribution Results for the Flour & Flour Products Food Category at the Farming Level.

Global Warming Input Contribution Analysis: Flour and Flour Products		
NAICS Category: Grain Farming		
Input Rank	**Input Category**	**Percent**
1	Grain farming	28.4%
2	Fertilizer manufacturing	21.4%
3	Support activities for agriculture and forestry	8.9%
4	Electric power generation, transmission, and distribution	7.9%
5	Petroleum refineries	7.8%
6	Pesticide and other agricultural chemical manufacturing	4.5%
7	Real estate	4.3%
8	All other crop farming	3.0%
9	Natural gas distribution	2.3%
10	All other basic inorganic chemical manufacturing	1.5%
Rest	All the remaining	10.1%
	Total	100.0%

Appendix C.3.2.1
Input Contribution Results - Farm Level - Water Consumption - Fresh Fruits

Description: Input Contribution Results for the Fresh Fruits Food Category at the Farming Level.

Water Consumption Input Contribution Analysis: Fresh Fruits		
NAICS Category: Fruit farming		
Input Rank	**Input Category**	**Percent**
1	Support activities for agriculture and forestry	37.5%
2	Electric power generation, transmission, and distribution	23.0%
3	Fruit farming	13.8%
4	Water, sewage and other systems	12.2%
5	Pesticide and other agricultural chemical manufacturing	2.1%
6	Cattle ranching and farming	1.6%
7	Fertilizer manufacturing	1.1%
8	Wood container and pallet manufacturing	1.1%
9	Vegetable and melon farming	0.9%
10	Grain farming	0.8%
Rest	All the remaining	6.0%
	Total	100.0%

Appendix C.3.2.2
Input Contribution Results - Farm Level - Water Consumption - Vegetables

Description: Input Contribution Results for the Vegetables Food Category at the Farming Level.

Water Consumption Input Contribution Analysis: Vegetables		
NAICS Category: Vegetable and melon farming		
Input Rank	**Input Category**	**Percent**
1	Support activities for agriculture and forestry	28.1%
2	Electric power generation, transmission, and distribution	23.7%
3	Vegetable and melon farming	19.4%
4	Water, sewage and other systems	10.3%
5	All other crop farming	2.9%
6	Cattle ranching and farming	2.3%
7	Pesticide and other agricultural chemical manufacturing	2.3%
8	Real estate	2.1%
9	Fertilizer manufacturing	1.5%
10	Petroleum refineries	1.2%
Rest	All the remaining	6.1%
	Total	100.0%

Appendix C.3.2.3
Input Contribution Results - Farm Level - Water Consumption - Beef

Description: Input Contribution Results for the Beef Food Category at the Farming Level.

Water Consumption Input Contribution Analysis: Beef		
NAICS Category: Cattle ranching and farming		
Input Rank	**Input Category**	**Percent**
1	All other crop farming	46.3%
2	Cattle ranching and farming	34.7%
3	Grain farming	14.5%
4	Other animal food manufacturing	2.4%
5	Electric power generation, transmission, and distribution	1.1%
6	Support activities for agriculture and forestry	0.4%
7	Real estate	0.2%
8	Dairy cattle and milk production	0.1%
9	Petroleum refineries	0.1%
10	Natural gas distribution	0.1%
Rest	All the remaining	0.3%
	Total	100.0%

Appendix C.3.2.4

Input Contribution Results - Farm Level - Water Consumption - Nut, Seed, Rice, Grain, Bean

Description: Input Contribution Results for the Nut, Seed, Rice, Grain, Bean Food Category at the Farming Level.
***Multiple NAICS codes were used to calculate the LCIA results for this food category. Recall LCIA results are based on purchase dollars. For this food category, the proportion of purchase dollars for each NAICS code is as follows: Tree nut farming (48.1%), Grain Farming (23.4%), Vegetable & melon farming (12.9%), Oil seed farming (1.6%).

Water Consumption Input Contribution Analysis: Nut, Seed, Rice, Grain, Bean		
NAICS Category: Tree nut farming		
Input Rank	**Input Category**	**Percent**
1	Support activities for agriculture and forestry	43.4%
2	Electric power generation, transmission, and distribution	28.2%
3	Water, sewage and other systems	13.4%
4	Pesticide and other agricultural chemical manufacturing	2.5%
5	Cattle ranching and farming	1.9%
6	Tree nut farming	1.3%
7	Fertilizer manufacturing	1.2%
8	Petroleum refineries	1.0%
9	Grain farming	1.0%
10	Real estate	0.9%
Rest	All the remaining	5.1%
	Total	100.0%

Water Consumption Input Contribution Analysis: Nut, Seed, Rice, Grain, Bean		
NAICS Category: Grain farming		
Input Rank	**Input Category**	**Percent**
1	Grain farming	66.8%
2	All other crop farming	10.3%
3	Support activities for agriculture and forestry	8.0%
4	Electric power generation, transmission, and distribution	3.4%
5	Water, sewage and other systems	3.0%
6	Real estate	1.7%
7	Fertilizer manufacturing	1.6%
8	Cattle ranching and farming	0.9%
9	Pesticide and other agricultural chemical manufacturing	0.9%
10	Petroleum refineries	0.7%
Rest	All the remaining	2.7%
	Total	100.0%

Water Consumption Input Contribution Analysis: Nut, Seed, Rice, Grain, Bean		
NAICS Category: Vegetable & melon farming		
Input Rank	**Input Category**	**Percent**
1	Support activities for agriculture and forestry	28.1%
2	Electric power generation, transmission, and distribution	23.7%
3	Vegetable and melon farming	19.4%
4	Water, sewage and other systems	10.3%
5	All other crop farming	2.9%
6	Cattle ranching and farming	2.3%
7	Pesticide and other agricultural chemical manufacturing	2.3%
8	Real estate	2.1%
9	Fertilizer manufacturing	1.5%
10	Petroleum refineries	1.2%
Rest	All the remaining	6.1%
	Total	100.0%

Water Consumption Input Contribution Analysis: Nut, Seed, Rice, Grain, Bean		
NAICS Category: Oilseed farming		
Input Rank	**Input Category**	**Percent**
1	Cotton farming	33.3%
2	Oilseed farming	27.5%
3	Grain farming	22.2%
4	Support activities for agriculture and forestry	5.2%
5	Electric power generation, transmission, and distribution	4.2%
6	Water, sewage and other systems	2.3%
7	Real estate	1.3%
8	Pesticide and other agricultural chemical manufacturing	0.6%
9	Fertilizer manufacturing	0.6%
10	Petroleum refineries	0.5%
Rest	All the remaining	2.4%
	Total	100.0%

Appendix C.3.2.5
Input Contribution Results - Farm Level - Water Consumption - Chicken
Description: Input Contribution Results for the Chicken Food Category at the Farming Level.

Water Consumption Input Contribution Analysis: Chicken		
NAICS Category: Poultry and egg production		
Input Rank	**Input Category**	**Percent**
1	Grain farming	37.7%
2	Other animal food manufacturing	34.5%
3	Poultry and egg production	14.7%
4	Soybean and other oilseed processing	7.2%
5	Electric power generation, transmission, and distribution	2.0%
6	Flour milling and malt manufacturing	1.4%
7	Support activities for agriculture and forestry	0.6%
8	Animal (except poultry) slaughtering, rendering, and processing	0.5%
9	Wet corn milling	0.5%
10	Water, sewage and other systems	0.1%
Rest	All the remaining	0.8%
	Total	100.0%

Appendix C.3.2.6
Input Contribution Results - Farm Level - Water Consumption - Pork
Description: Input Contribution Results for the Pork Food Category at the Farming Level.

Water Consumption Input Contribution Analysis: Pork		
NAICS Category: Animal production, except cattle and poultry and eggs		
Input Rank	Input Category	Percent
1	All other crop farming	41.9%
2	Grain farming	21.3%
3	Other animal food manufacturing	13.9%
4	Animal production, except cattle and poultry and eggs	9.8%
5	Cattle ranching and farming	4.1%
6	Electric power generation, transmission, and distribution	3.8%
7	Support activities for agriculture and forestry	1.7%
8	Soybean and other oilseed processing	1.5%
9	Flour milling and malt manufacturing	0.3%
10	Petroleum refineries	0.3%
Rest	All the remaining	1.5%
	Total	100.0%

Appendix C.3.2.7
Input Contribution Results - Farm Level - Water Consumption - Coffee
Description: Input Contribution Results for the Coffee Food Category at the Farming Level.

Water Consumption Input Contribution Analysis: Coffee		
NAICS Category: Fruit farming		
Input Rank	**Input Category**	**Percent**
1	Support activities for agriculture and forestry	37.5%
2	Electric power generation, transmission, and distribution	23.0%
3	Fruit farming	13.8%
4	Water, sewage and other systems	12.2%
5	Pesticide and other agricultural chemical manufacturing	2.1%
6	Cattle ranching and farming	1.6%
7	Fertilizer manufacturing	1.1%
8	Wood container and pallet manufacturing	1.1%
9	Vegetable and melon farming	0.9%
10	Grain farming	0.8%
Rest	All the remaining	6.0%
	Total	100.0%

Appendix C.3.2.8
Input Contribution Results - Farm Level - Water Consumption - Eggs
Description: Input Contribution Results for the Eggs Food Category at the Farming Level.

Water Consumption Input Contribution Analysis: Eggs		
NAICS Category: Poultry and egg production		
Input Rank	**Input Category**	**Percent**
1	Grain farming	37.7%
2	Other animal food manufacturing	34.5%
3	Poultry and egg production	14.7%
4	Soybean and other oilseed processing	7.2%
5	Electric power generation, transmission, and distribution	2.0%
6	Flour milling and malt manufacturing	1.4%
7	Support activities for agriculture and forestry	0.6%
8	Animal (except poultry) slaughtering, rendering, and processing	0.5%
9	Wet corn milling	0.5%
10	Water, sewage and other systems	0.1%
Rest	All the remaining	0.8%
	Total	100.0%

Appendix C.3.2.9
Input Contribution Results - Farm Level - Water Consumption - Juices
Description: Input Contribution Results for the Juices Food Category at the Farming Level.

Water Consumption Input Contribution Analysis: Juices
NAICS Category: N/A*
* refer to relevant fruit or vegetable input contribution analysis

Appendix C.3.2.10
Input Contribution Results - Farm Level - Water Consumption - Cheese
Description: Input Contribution Results for the Cheese Food Category at the Farming Level.

Water Consumption Input Contribution Analysis: Cheese		
NAICS Category: Dairy cattle and milk production		
Input Rank	**Input Category**	**Percent**
1	All other crop farming	48.2%
2	Other animal food manufacturing	23.4%
3	Grain farming	15.8%
4	Cattle ranching and farming	4.0%
5	Electric power generation, transmission, and distribution	3.7%
6	Support activities for agriculture and forestry	1.2%
7	Soybean and other oilseed processing	1.1%
8	Flour milling and malt manufacturing	0.8%
9	Wet corn milling	0.3%
10	Animal production, except cattle and poultry and eggs	0.2%
Rest	All the remaining	1.5%
	Total	100.0%

Appendix C.3.2.11
Input Contribution Results - Farm Level - Water Consumption - Oil & Vinegar
Description: Input Contribution Results for the Oil & Vinegar Food Category at the Farming Level.
dollars. For this food category, the proportion of purchase dollars for each NAICS code is as follows: Fats and oils refining and blending

Water Consumption Input Contribution Analysis: Oil & Vinegar		
NAICS Category: Oilseed farming		
Input Rank	**Input Category**	**Percent**
1	Cotton farming	33.3%
2	Oilseed farming	27.5%
3	Grain farming	22.2%
4	Support activities for agriculture and forestry	5.2%
5	Electric power generation, transmission, and distribution	4.2%
6	Water, sewage and other systems	2.3%
7	Real estate	1.3%
8	Pesticide and other agricultural chemical manufacturing	0.6%
9	Fertilizer manufacturing	0.6%
10	Petroleum refineries	0.5%
Rest	All the remaining	2.4%
	Total	100.0%

Appendix C.3.2.12
Input Contribution Results - Farm Level - Water Consumption - Milk
Description: Input Contribution Results for the Milk Food Category at the Farming Level.

Water Consumption Input Contribution Analysis: Milk		
NAICS Category: Dairy cattle and milk production		
Input Rank	**Input Category**	**Percent**
1	All other crop farming	48.2%
2	Other animal food manufacturing	23.4%
3	Grain farming	15.8%
4	Cattle ranching and farming	4.0%
5	Electric power generation, transmission, and distribution	3.7%
6	Support activities for agriculture and forestry	1.2%
7	Soybean and other oilseed processing	1.1%
8	Flour milling and malt manufacturing	0.8%
9	Wet corn milling	0.3%
10	Animal production, except cattle and poultry and eggs	0.2%
Rest	All the remaining	1.5%
	Total	100.0%

Appendix C.3.2.13
Input Contribution Results - Farm Level - Water Consumption - Yogurt
Description: Input Contribution Results for the Oil & Vinegar Food Category at the Farming Level.

Water Consumption Input Contribution Analysis: Yogurt		
NAICS Category: Dairy cattle and milk production		
Input Rank	**Input Category**	**Percent**
1	All other crop farming	48.2%
2	Other animal food manufacturing	23.4%
3	Grain farming	15.8%
4	Cattle ranching and farming	4.0%
5	Electric power generation, transmission, and distribution	3.7%
6	Support activities for agriculture and forestry	1.2%
7	Soybean and other oilseed processing	1.1%
8	Flour milling and malt manufacturing	0.8%
9	Wet corn milling	0.3%
10	Animal production, except cattle and poultry and eggs	0.2%
Rest	All the remaining	1.5%
	Total	100.0%

Appendix C.3.2.14
Input Contribution Results - Farm Level - Water Consumption - Turkey
Description: Input Contribution Results for the Turkey Food Category at the Farming Level.

Water Consumption Input Contribution Analysis: Turkey		
NAICS Category: Poultry and egg production		
Input Rank	**Input Category**	**Percent**
1	Grain farming	37.7%
2	Other animal food manufacturing	34.5%
3	Poultry and egg production	14.7%
4	Soybean and other oilseed processing	7.2%
5	Electric power generation, transmission, and distribution	2.0%
6	Flour milling and malt manufacturing	1.4%
7	Support activities for agriculture and forestry	0.6%
8	Animal (except poultry) slaughtering, rendering, and processing	0.5%
9	Wet corn milling	0.5%
10	Water, sewage and other systems	0.1%
Rest	All the remaining	0.8%
	Total	100.0%

Appendix C.3.2.15
Input Contribution Results - Farm Level - Water Consumption - Flour and Flour Products
Description: Input Contribution Results for the Flour & Flour Products Food Category at the Farming Level.

Water Consumption Input Contribution Analysis: Flour and Flour Products		
NAICS Category: Grain Farming		
Input Rank	**Input Category**	**Percent**
1	Grain farming	66.9%
2	All other crop farming	10.3%
3	Support activities for agriculture and forestry	8.0%
4	Electric power generation, transmission, and distribution	3.3%
5	Water, sewage and other systems	3.0%
6	Real estate	1.7%
7	Fertilizer manufacturing	1.6%
8	Cattle ranching and farming	0.9%
9	Pesticide and other agricultural chemical manufacturing	0.9%
10	Petroleum refineries	0.7%
Rest	All the remaining	2.7%
	Total	100.0%

Appendix C.3.2.16
Input Contribution Results - Farm Level - Water Consumption - Lamb
Description: Input Contribution Results for the Lamb Food Category at the Farming Level.

Water Consumption Input Contribution Analysis: Lamb		
NAICS Category: Animal production, except cattle and poultry and eggs		
Input Rank	**Input Category**	**Percent**
1	All other crop farming	41.9%
2	Grain farming	21.3%
3	Other animal food manufacturing	13.9%
4	Animal production, except cattle and poultry and eggs	9.8%
5	Cattle ranching and farming	4.1%
6	Electric power generation, transmission, and distribution	3.8%
7	Support activities for agriculture and forestry	1.7%
8	Soybean and other oilseed processing	1.5%
9	Flour milling and malt manufacturing	0.3%
10	Petroleum refineries	0.3%
Rest	All the remaining	1.5%
	Total	100.0%

Appendix C.3.2.17
Input Contribution Results - Farm Level - Water Consumption - Other Meats
Description: Input Contribution Results for the Other Meats Food Category at the Farming Level.
***Multiple NAICS codes were used to calculate the LCIA results for this food category. Recall LCIA results are based on purchase dollars. For this food category, the proportion of purchase dollars for each NAICS code is as follows: Animal production, except cattle and poultry and eggs (26.5%), Poultry and egg production (73.5%).

Water Consumption Input Contribution Analysis: Other Meats		
NAICS Category: Animal production, except cattle and poultry and eggs		
Input Rank	**Input Category**	**Percent**
1	All other crop farming	41.9%
2	Grain farming	21.3%
3	Other animal food manufacturing	13.9%
4	Animal production, except cattle and poultry and eggs	9.8%
5	Cattle ranching and farming	4.1%
6	Electric power generation, transmission, and distribution	3.8%
7	Support activities for agriculture and forestry	1.7%
8	Soybean and other oilseed processing	1.5%
9	Flour milling and malt manufacturing	0.3%
10	Petroleum refineries	0.3%
Rest	All the remaining	1.5%
	Total	100.0%

Water Consumption Input Contribution Analysis: Other Meats		
NAICS Category: Poultry and egg production		
Input Rank	**Input Category**	**Percent**
1	Grain farming	37.7%
2	Other animal food manufacturing	34.5%
3	Poultry and egg production	14.7%
4	Soybean and other oilseed processing	7.2%
5	Electric power generation, transmission, and distribution	2.0%
6	Flour milling and malt manufacturing	1.4%
7	Support activities for agriculture and forestry	0.6%
8	Animal (except poultry) slaughtering, rendering, and processing	0.5%
9	Wet corn milling	0.5%
10	Water, sewage and other systems	0.1%
Rest	All the remaining	0.8%
	Total	100.0%

Appendix C.3.2.18

Input Contribution Results - Farm Level - Water Consumption - Butter

Description: Input Contribution Results for the Butter Food Category at the Farming Level.

Water Consumption Input Contribution Analysis: Butter		
NAICS Category: Dairy cattle and milk production		
Input Rank	**Input Category**	**Percent**
1	All other crop farming	48.2%
2	Other animal food manufacturing	23.4%
3	Grain farming	15.8%
4	Cattle ranching and farming	4.0%
5	Electric power generation, transmission, and distribution	3.7%
6	Support activities for agriculture and forestry	1.2%
7	Soybean and other oilseed processing	1.1%
8	Flour milling and malt manufacturing	0.8%
9	Wet corn milling	0.3%
10	Animal production, except cattle and poultry and eggs	0.2%
Rest	All the remaining	1.5%
	Total	100.0%

Appendix C.4.1.1
Input Contribution Results - Processing Level - Global Warming - Beef
Description: Input Contribution Results for the Beef Food Category at the Processing Level.

Global Warming Input Contribution Analysis: Beef		
NAICS Category: Animal (except poultry) rendering, slaughtering, and processing		
Input Rank	**Input Category**	**Percent**
1	Cattle ranching and farming	63.4%
2	Animal (except poultry) slaughtering, rendering, and processing	18.1%
3	Animal production, except cattle and poultry and eggs	11.5%
4	Electric power generation, transmission, and distribution	2.3%
5	Poultry processing	0.7%
6	Truck transportation	0.6%
7	Natural gas distribution	0.5%
8	Paperboard container manufacturing	0.4%
9	Management of companies and enterprises	0.2%
10	Plastics packaging materials and unlaminated film and sheet manufacturing	0.2%
Rest	All the remaining	2.1%
	Total	100.0%

Appendix C.4.1.2
Input Contribution Results - Processing Level - Global Warming - Pork
Description: Input Contribution Results for the Pork Food Category at the Processing Level.

Global Warming Input Contribution Analysis: Pork		
NAICS Category: Animal (except poultry) rendering, slaughtering, and processing		
Input Rank	**Input Category**	**Percent**
1	Cattle ranching and farming	63.4%
2	Animal (except poultry) slaughtering, rendering, and processing	18.1%
3	Animal production, except cattle and poultry and eggs	11.5%
4	Electric power generation, transmission, and distribution	2.3%
5	Poultry processing	0.7%
6	Truck transportation	0.6%
7	Natural gas distribution	0.5%
8	Paperboard container manufacturing	0.4%
9	Management of companies and enterprises	0.2%
10	Plastics packaging materials and unlaminated film and sheet manufacturing	0.2%
Rest	All the remaining	2.1%
	Total	100.0%

Appendix C.4.1.3
Input Contribution Results - Processing Level - Global Warming - Chicken
Description: Input Contribution Results for the Chicken Food Category at the Processing Level.

Global Warming Input Contribution Analysis: Chicken		
NAICS Category: Poultry Processing		
Input Rank	**Input Category**	**Percent**
1	Poultry and egg production	62.0%
2	Poultry processing	11.2%
3	Electric power generation, transmission, and distribution	6.5%
4	Animal (except poultry) slaughtering, rendering, and processing	4.6%
5	Cattle ranching and farming	2.8%
6	Paperboard container manufacturing	1.3%
7	Management of companies and enterprises	1.2%
8	Animal production, except cattle and poultry and eggs	1.1%
9	Truck transportation	1.0%
10	Other plastics product manufacturing	1.0%
Rest	All the remaining	7.5%
	Total	100.0%

Appendix C.4.1.4
Input Contribution Results - Processing Level - Global Warming - Cheese
Description: Input Contribution Results for the Cheese Food Category at the Processing Level.

Global Warming Input Contribution Analysis: Cheese		
NAICS Category: Cheese Manufacturing		
Input Rank	**Input Category**	**Percent**
1	Dairy cattle and milk production	62.9%
2	Cheese manufacturing	21.1%
3	Electric power generation, transmission, and distribution	3.0%
4	Fluid milk and butter manufacturing	2.4%
5	Dry, condensed, and evaporated dairy product manufacturing	2.3%
6	Truck transportation	0.8%
7	Natural gas distribution	0.8%
8	Plastics bottle manufacturing	0.7%
9	Plastics packaging materials and unlaminated film and sheet manufacturing	0.7%
10	Paperboard container manufacturing	0.6%
Rest	All the remaining	4.9%
	Total	100.0%

Appendix C.4.1.5
Input Contribution Results - Processing Level - Global Warming - Milk
Description: Input Contribution Results for the Milk Food Category at the Processing Level.

Global Warming Input Contribution Analysis: Milk		
NAICS Category: Fluid milk and butter manufacturing		
Input Rank	**Input Category**	**Percent**
1	Dairy cattle and milk production	71.8%
2	Fluid milk and butter manufacturing	8.6%
3	Electric power generation, transmission, and distribution	4.6%
4	Dry, condensed, and evaporated dairy product manufacturing	1.8%
5	Paperboard container manufacturing	1.2%
6	Cheese manufacturing	1.1%
7	Wet corn milling	1.1%
8	Plastics material and resin manufacturing	1.0%
9	Truck transportation	0.9%
10	Other plastics product manufacturing	0.8%
Rest	All the remaining	7.2%
	Total	100.0%

Appendix C.4.1.6
Input Contribution Results - Processing Level - Global Warming - Juices
Description: Input Contribution Results for the Juices Food Category at the Processing Level.

Global Warming Input Contribution Analysis: Juices		
NAICS Category: Frozen food manufacturing		
Input Rank	**Input Category**	**Percent**
1	Grain farming	20.7%
2	Animal (except poultry) slaughtering, rendering, and processing	14.8%
3	Electric power generation, transmission, and distribution	9.8%
4	Vegetable and melon farming	7.9%
5	Frozen food manufacturing	7.0%
6	Cheese manufacturing	6.9%
7	Poultry processing	4.8%
8	Fruit farming	3.8%
9	Paperboard container manufacturing	3.5%
10	Flour milling and malt manufacturing	2.4%
Rest	All the remaining	18.6%
	Total	100.0%

Appendix C.4.1.7
Input Contribution Results - Processing Level - Global Warming - Yogurt
Description: Input Contribution Results for the Yogurt Food Category at the Processing Level.

Global Warming Input Contribution Analysis: Yogurt		
NAICS Category: Fluid milk and butter manufacturing		
Input Rank	**Input Category**	**Percent**
1	Dairy cattle and milk production	71.8%
2	Fluid milk and butter manufacturing	8.6%
3	Electric power generation, transmission, and distribution	4.6%
4	Dry, condensed, and evaporated dairy product manufacturing	1.8%
5	Paperboard container manufacturing	1.2%
6	Cheese manufacturing	1.1%
7	Wet corn milling	1.1%
8	Plastics material and resin manufacturing	1.0%
9	Truck transportation	0.9%
10	Other plastics product manufacturing	0.8%
Rest	All the remaining	7.2%
	Total	100.0%

Appendix C.4.1.8
Input Contribution Results - Processing Level - Global Warming - Coffee
Description: Input Contribution Results for the Coffee Food Category at the Processing Level.

Global Warming Input Contribution Analysis: Coffee		
NAICS Category: Coffee and tea manufacturing		
Input Rank	**Input Category**	**Percent**
1	Fruit farming	40.3%
2	All other crop farming	10.4%
3	Electric power generation, transmission, and distribution	6.1%
4	Other plastics product manufacturing	5.9%
5	Metal can, box, and other metal container (light gauge) manufacturing	5.3%
6	Glass container manufacturing	5.0%
7	Paperboard container manufacturing	3.4%
8	Wholesale trade	2.3%
9	Truck transportation	2.3%
10	Plastics bottle manufacturing	2.1%
Rest	All the remaining	16.9%
	Total	100.0%

Appendix C.4.1.9
Input Contribution Results - Processing Level - Global Warming - Oil & Vinegar
Description: Input Contribution Results for the Oil & Vinegar Food Category at the Processing Level.
***Multiple NAICS codes were used to calculate the LCIA results for this food category. Recall LCIA results are based on purchase dollars. For this food category, the proportion of purchase dollars for each NAICS code is as follows: Fats and oils refining and blending (84.4%), Seasoning and dressing manufacturing (15.6%).

Global Warming Input Contribution Analysis: Oil & Vinegar		
NAICS Category: Fats and Oils refining and blending		
Input Rank	**Input Category**	**Percent**
1	Soybean and other oilseed processing	25.9%
2	Oilseed farming	24.4%
3	Fats and oils refining and blending	16.8%
4	Grain farming	6.0%
5	Wet corn milling	5.0%
6	Electric power generation, transmission, and distribution	4.9%
7	Animal (except poultry) slaughtering, rendering, and processing	2.3%
8	Natural gas distribution	2.2%
9	Rail transportation	1.4%
10	Cattle ranching and farming	1.2%
Rest	All the remaining	9.9%
	Total	100.0%

Global Warming Input Contribution Analysis: Oil & Vinegar		
NAICS Category: Seasoning and Dressing Manufacturing		
Input Rank	**Input Category**	**Percent**
1	All other crop farming	22.2%
2	Fats and oils refining and blending	6.2%
3	Seasoning and dressing manufacturing	5.7%
4	Electric power generation, transmission, and distribution	5.5%
5	Wet corn milling	4.4%
6	Plastics bottle manufacturing	4.2%
7	Flavoring syrup and concentrate manufacturing	3.5%
8	Glass container manufacturing	3.3%
9	Soybean and other oilseed processing	3.2%
10	Dairy cattle and milk production	2.9%
Rest	All the remaining	39.1%
	Total	100.0%

Appendix C.4.1.10
Input Contribution Results - Processing Level - Global Warming - Lamb
Description: Input Contribution Results for the Lamb Food Category at the Processing Level.

Global Warming Input Contribution Analysis: Lamb		
NAICS Category: Animal (except poultry) rendering, slaughtering, and processing		
Input Rank	**Input Category**	**Percent**
1	Cattle ranching and farming	63.4%
2	Animal (except poultry) slaughtering, rendering, and processing	18.1%
3	Animal production, except cattle and poultry and eggs	11.5%
4	Electric power generation, transmission, and distribution	2.3%
5	Poultry processing	0.7%
6	Truck transportation	0.6%
7	Natural gas distribution	0.5%
8	Paperboard container manufacturing	0.4%
9	Management of companies and enterprises	0.2%
10	Plastics packaging materials and unlaminated film and sheet manufacturing	0.2%
Rest	All the remaining	2.1%
	Total	100.0%

Appendix C.4.1.11
Input Contribution Results - Processing Level - Global Warming - Turkey
Description: Input Contribution Results for the Turkey Food Category at the Processing Level.

Global Warming Input Contribution Analysis: Turkey		
NAICS Category: Poultry Processing		
Input Rank	**Input Category**	**Percent**
1	Poultry and egg production	62.0%
2	Poultry processing	11.2%
3	Electric power generation, transmission, and distribution	6.5%
4	Animal (except poultry) slaughtering, rendering, and processing	4.6%
5	Cattle ranching and farming	2.8%
6	Paperboard container manufacturing	1.3%
7	Management of companies and enterprises	1.2%
8	Animal production, except cattle and poultry and eggs	1.1%
9	Truck transportation	1.0%
10	Other plastics product manufacturing	1.0%
Rest	All the remaining	7.5%
	Total	100.0%

Appendix C.4.1.12
Input Contribution Results - Processing Level - Global Warming - Other Meats
Description: Input Contribution Results for the Other Meats Food Category at the Processing Level.
***Multiple NAICS codes were used to calculate the LCIA results for this food category. Recall LCIA results are based on purchase dollars. For this food category, the proportion of purchase dollars for each NAICS code is as follows: Animal production, except cattle and poultry and eggs (26.5%), Poultry and egg production (73.5%).

Global Warming Input Contribution Analysis: Other Meats		
NAICS Category: Animal (except poultry) rendering, slaughtering, and processing		
Input Rank	**Input Category**	**Percent**
1	Cattle ranching and farming	63.4%
2	Animal (except poultry) slaughtering, rendering, and processing	18.1%
3	Animal production, except cattle and poultry and eggs	11.5%
4	Electric power generation, transmission, and distribution	2.3%
5	Poultry processing	0.7%
6	Truck transportation	0.6%
7	Natural gas distribution	0.5%
8	Paperboard container manufacturing	0.4%
9	Management of companies and enterprises	0.2%
10	Plastics packaging materials and unlaminated film and sheet manufacturing	0.2%
Rest	All the remaining	2.1%
	Total	100.0%

Global Warming Input Contribution Analysis: Other Meats		
NAICS Category: Poultry Processing		
Input Rank	**Input Category**	**Percent**
1	Poultry and egg production	62.0%
2	Poultry processing	11.2%
3	Electric power generation, transmission, and distribution	6.5%
4	Animal (except poultry) slaughtering, rendering, and processing	4.6%
5	Cattle ranching and farming	2.8%
6	Paperboard container manufacturing	1.3%
7	Management of companies and enterprises	1.2%
8	Animal production, except cattle and poultry and eggs	1.1%
9	Truck transportation	1.0%
10	Other plastics product manufacturing	1.0%
Rest	All the remaining	7.5%
	Total	100.0%

Appendix C.4.1.13
Input Contribution Results - Processing Level - Global Warming - Butter
Description: Input Contribution Results for the Butter Food Category at the Processing Level.

Global Warming Input Contribution Analysis: Butter		
NAICS Category: Fluid milk and butter manufacturing		
Input Rank	**Input Category**	**Percent**
1	Dairy cattle and milk production	71.8%
2	Fluid milk and butter manufacturing	8.6%
3	Electric power generation, transmission, and distribution	4.6%
4	Dry, condensed, and evaporated dairy product manufacturing	1.8%
5	Paperboard container manufacturing	1.2%
6	Cheese manufacturing	1.1%
7	Wet corn milling	1.1%
8	Plastics material and resin manufacturing	1.0%
9	Truck transportation	0.9%
10	Other plastics product manufacturing	0.8%
Rest	All the remaining	7.2%
	Total	100.0%

Appendix C.4.1.14
Input Contribution Results - Processing Level - Global Warming - Flour and Flour Products
Description: Input Contribution Results for the Flour and Flour Products Food Category at the Processing Level.

Global Warming Input Contribution Analysis: Flour and Flour Products		
NAICS Category: Flour milling and malt manufacturing		
Input Rank	**Input Category**	**Percent**
1	Grain farming	75.3%
2	Electric power generation, transmission, and distribution	9.6%
3	Rail transportation	3.2%
4	Water transportation	2.7%
5	Wholesale trade	1.8%
6	Natural gas distribution	1.2%
7	Flour milling and malt manufacturing	1.0%
8	Truck transportation	0.8%
9	Oilseed farming	0.8%
10	Air transportation	0.4%
Rest	All the remaining	3.3%
	Total	100.0%

Appendix C.4.2.1
Input Contribution Results - Processing Level - Water Consumption - Beef
Description: Input Contribution Results for the Beef Food Category at the Processing Level.

Water Consumption Input Contribution Analysis: Beef		
NAICS Category: Animal (except poultry) rendering, slaughtering, and processing		
Input Rank	**Input Category**	**Percent**
1	Cattle ranching and farming	64.7%
2	Animal (except poultry) slaughtering, rendering, and processing	17.3%
3	Animal production, except cattle and poultry and eggs	10.0%
4	Fishing	3.0%
5	Electric power generation, transmission, and distribution	1.6%
6	Poultry processing	1.0%
7	Seasoning and dressing manufacturing	0.3%
8	Other animal food manufacturing	0.3%
9	Grain farming	0.2%
10	Poultry and egg production	0.2%
Rest	All the remaining	1.4%
	Total	100.0%

Appendix C.4.2.2
Input Contribution Results - Processing Level - Water Consumption - Chicken
Description: Input Contribution Results for the Chicken Food Category at the Processing Level.

Water Consumption Input Contribution Analysis: Chicken		
NAICS Category: Poultry Processing		
Input Rank	**Input Category**	**Percent**
1	Poultry and egg production	72.2%
2	Poultry processing	10.3%
3	Fishing	6.5%
4	Animal (except poultry) slaughtering, rendering, and processing	2.8%
5	Electric power generation, transmission, and distribution	2.8%
6	Cattle ranching and farming	1.8%
7	Animal production, except cattle and poultry and eggs	0.6%
8	Water, sewage and other systems	0.5%
9	Management of companies and enterprises	0.3%
10	Seasoning and dressing manufacturing	0.3%
Rest	All the remaining	2.1%
	Total	100.0%

Appendix C.4.2.3
Input Contribution Results - Processing Level - Water Consumption - Pork
Description: Input Contribution Results for the Pork Food Category at the Processing Level.

Water Consumption Input Contribution Analysis: Pork		
NAICS Category: Animal (except poultry) rendering, slaughtering, and processing		
Input Rank	**Input Category**	**Percent**
1	Cattle ranching and farming	64.7%
2	Animal (except poultry) slaughtering, rendering, and processing	17.3%
3	Animal production, except cattle and poultry and eggs	10.0%
4	Fishing	3.0%
5	Electric power generation, transmission, and distribution	1.6%
6	Poultry processing	1.0%
7	Seasoning and dressing manufacturing	0.3%
8	Other animal food manufacturing	0.3%
9	Grain farming	0.2%
10	Poultry and egg production	0.2%
Rest	All the remaining	1.4%
	Total	100.0%

Appendix C.4.2.4
Input Contribution Results - Processing Level - Water Consumption - Coffee
Description: Input Contribution Results for the Coffee Food Category at the Processing Level.

Water Consumption Input Contribution Analysis: Coffee		
NAICS Category: Coffee and tea manufacturing		
Input Rank	**Input Category**	**Percent**
1	Fruit farming	77.2%
2	All other crop farming	16.8%
3	Electric power generation, transmission, and distribution	1.2%
4	Other plastics product manufacturing	0.6%
5	Dairy cattle and milk production	0.5%
6	Metal can, box, and other metal container (light gauge) manufacturing	0.4%
7	Glass container manufacturing	0.4%
8	Paperboard container manufacturing	0.3%
9	Wholesale trade	0.3%
10	Plastics bottle manufacturing	0.2%
Rest	All the remaining	2.1%
	Total	100.0%

Appendix C.4.2.5
Input Contribution Results - Processing Level - Water Consumption - Juices
Description: Input Contribution Results for the Juices Food Category at the Processing Level.

Water Consumption Input Contribution Analysis: Juices		
NAICS Category: Frozen food manufacturing		
Input Rank	**Input Category**	**Percent**
1	Grain farming	39.6%
2	Fruit farming	12.7%
3	Vegetable and melon farming	8.8%
4	Animal (except poultry) slaughtering, rendering, and processing	7.3%
5	Frozen food manufacturing	6.0%
6	Fishing	4.2%
7	Poultry processing	3.5%
8	Electric power generation, transmission, and distribution	3.4%
9	Flour milling and malt manufacturing	3.3%
10	Cheese manufacturing	2.9%
Rest	All the remaining	8.4%
	Total	100.0%

Appendix C.4.2.6
Input Contribution Results - Processing Level - Water Consumption - Cheese
Description: Input Contribution Results for the Cheese Food Category at the Processing Level.

Water Consumption Input Contribution Analysis: Cheese		
NAICS Category: Cheese Manufacturing		
Input Rank	**Input Category**	**Percent**
1	Dairy cattle and milk production	65.7%
2	Cheese manufacturing	19.7%
3	Electric power generation, transmission, and distribution	2.4%
4	Fluid milk and butter manufacturing	2.2%
5	Dry, condensed, and evaporated dairy product manufacturing	2.0%
6	All other crop farming	1.7%
7	Fishing	1.1%
8	Fats and oils refining and blending	0.9%
9	Wet corn milling	0.3%
10	Wholesale trade	0.3%
Rest	All the remaining	3.7%
	Total	100.0%

Appendix C.4.2.7
Input Contribution Results - Processing Level - Water Consumption - Oil & Vinegar

Description: Input Contribution Results for the Oil & Vinegar Food Category at the Processing Level.
***Multiple NAICS codes were used to calculate the LCIA results for this food category. Recall LCIA results are based on purchase dollars. For this food category, the proportion of purchase dollars for each NAICS code is as follows: Fats and oils refining and blending (84.4%), Seasoning and dressing manufacturing (15.6%).

Water Consumption Input Contribution Analysis: Oil & Vinegar		
NAICS Category: Fats and Oils refining and blending		
Input Rank	**Input Category**	**Percent**
1	Oilseed farming	35.2%
2	Soybean and other oilseed processing	28.1%
3	Fats and oils refining and blending	14.5%
4	Grain farming	9.0%
5	Cotton farming	4.0%
6	Wet corn milling	3.0%
7	All other crop farming	1.5%
8	Electric power generation, transmission, and distribution	1.3%
9	Animal (except poultry) slaughtering, rendering, and processing	0.9%
10	Cattle ranching and farming	0.5%
Rest	All the remaining	2.0%
	Total	100.0%

Water Consumption Input Contribution Analysis: Oil & Vinegar		
NAICS Category: Seasoning and Dressing Manufacturing		
Input Rank	**Input Category**	**Percent**
1	All other crop farming	55.5%
2	Fats and oils refining and blending	6.0%
3	Seasoning and dressing manufacturing	5.2%
4	Soybean and other oilseed processing	3.9%
5	Wet corn milling	3.1%
6	Fruit farming	2.6%
7	Fishing	2.3%
8	Poultry and egg production	2.3%
9	Grain farming	2.2%
10	Flavoring syrup and concentrate manufacturing	2.1%
Rest	All the remaining	14.9%
	Total	100.0%

Appendix C.4.2.8
Input Contribution Results - Processing Level - Water Consumption - Milk

Description: Input Contribution Results for the Milk Food Category at the Processing Level.

Water Consumption Input Contribution Analysis: Milk		
NAICS Category: Fluid milk and butter manufacturing		
Input Rank	**Input Category**	**Percent**
1	Dairy cattle and milk production	76.9%
2	Fluid milk and butter manufacturing	8.1%
3	Electric power generation, transmission, and distribution	3.6%
4	Wet corn milling	1.9%
5	Dry, condensed, and evaporated dairy product manufacturing	1.7%
6	Cheese manufacturing	1.0%
7	Fruit farming	0.5%
8	Paperboard container manufacturing	0.5%
9	Fats and oils refining and blending	0.4%
10	Water, sewage and other systems	0.4%
Rest	All the remaining	5.1%
	Total	100.0%

Appendix C.4.2.9

Input Contribution Results - Processing Level - Water Consumption - Yogurt

Description: Input Contribution Results for the Yogurt Food Category at the Processing Level.

Water Consumption Input Contribution Analysis: Yogurt		
NAICS Category: Fluid milk and butter manufacturing		
Input Rank	**Input Category**	**Percent**
1	Dairy cattle and milk production	76.9%
2	Fluid milk and butter manufacturing	8.1%
3	Electric power generation, transmission, and distribution	3.6%
4	Wet corn milling	1.9%
5	Dry, condensed, and evaporated dairy product manufacturing	1.7%
6	Cheese manufacturing	1.0%
7	Fruit farming	0.5%
8	Paperboard container manufacturing	0.5%
9	Fats and oils refining and blending	0.4%
10	Water, sewage and other systems	0.4%
Rest	All the remaining	5.1%
	Total	100.0%

Appendix C.4.2.10

Input Contribution Results - Processing Level - Water Consumption - Turkey

Description: Input Contribution Results for the Turkey Food Category at the Processing Level.

Water Consumption Input Contribution Analysis: Turkey		
NAICS Category: Poultry Processing		
Input Rank	**Input Category**	**Percent**
1	Poultry and egg production	72.2%
2	Poultry processing	10.3%
3	Fishing	6.5%
4	Animal (except poultry) slaughtering, rendering, and processing	2.8%
5	Electric power generation, transmission, and distribution	2.8%
6	Cattle ranching and farming	1.8%
7	Animal production, except cattle and poultry and eggs	0.6%
8	Water, sewage and other systems	0.5%
9	Management of companies and enterprises	0.3%
10	Seasoning and dressing manufacturing	0.3%
Rest	All the remaining	2.1%
	Total	100.0%

Appendix C.4.2.11

Input Contribution Results - Processing Level - Water Consumption - Flour and Flour Products

Description: Input Contribution Results for the Flour and Flour Products Food Category at the Processing Level.

Water Consumption Input Contribution Analysis: Flour and Flour Products		
NAICS Category: Flour milling and malt manufacturing		
Input Rank	**Input Category**	**Percent**
1	Grain farming	94.4%
2	Electric power generation, transmission, and distribution	2.2%
3	Oilseed farming	0.9%
4	Flour milling and malt manufacturing	0.9%
5	Wholesale trade	0.3%
6	All other crop farming	0.2%
7	Soybean and other oilseed processing	0.1%
8	Natural gas distribution	0.1%
9	Cotton farming	0.1%
10	Fats and oils refining and blending	0.1%
Rest	All the remaining	0.8%
	Total	100.0%

Appendix C.4.2.12
Input Contribution Results - Processing Level - Water Consumption - Lamb
Description: Input Contribution Results for the Lamb Food Category at the Processing Level.

Water Consumption Input Contribution Analysis: Lamb		
NAICS Category: Animal (except poultry) rendering, slaughtering, and processing		
Input Rank	**Input Category**	**Percent**
1	Cattle ranching and farming	64.7%
2	Animal (except poultry) slaughtering, rendering, and processing	17.3%
3	Animal production, except cattle and poultry and eggs	10.0%
4	Fishing	3.0%
5	Electric power generation, transmission, and distribution	1.6%
6	Poultry processing	1.0%
7	Seasoning and dressing manufacturing	0.3%
8	Other animal food manufacturing	0.3%
9	Grain farming	0.2%
10	Poultry and egg production	0.2%
Rest	All the remaining	1.4%
	Total	100.0%

Appendix C.4.2.13
Input Contribution Results - Processing Level - Water Consumption - Other Meats
Description: Input Contribution Results for the Other Meats Food Category at the Processing Level.
***Multiple NAICS codes were used to calculate the LCIA results for this food category. Recall LCIA results are based on purchase dollars. For this food category, the proportion of purchase dollars for each NAICS code is as follows: Animal production, except cattle and poultry and eggs (26.5%), Poultry and egg production (73.5%).

Water Consumption Input Contribution Analysis: Other Meats		
NAICS Category: Animal (except poultry) rendering, slaughtering, and processing		
Input Rank	**Input Category**	**Percent**
1	Cattle ranching and farming	64.7%
2	Animal (except poultry) slaughtering, rendering, and processing	17.3%
3	Animal production, except cattle and poultry and eggs	10.0%
4	Fishing	3.0%
5	Electric power generation, transmission, and distribution	1.6%
6	Poultry processing	1.0%
7	Seasoning and dressing manufacturing	0.3%
8	Other animal food manufacturing	0.3%
9	Grain farming	0.2%
10	Poultry and egg production	0.2%
Rest	All the remaining	1.4%
	Total	100.0%

Water Consumption Input Contribution Analysis: Other Meats		
NAICS Category: Poultry Processing		
Input Rank	**Input Category**	**Percent**
1	Poultry and egg production	72.2%
2	Poultry processing	10.3%
3	Fishing	6.5%
4	Animal (except poultry) slaughtering, rendering, and processing	2.8%
5	Electric power generation, transmission, and distribution	2.8%
6	Cattle ranching and farming	1.8%
7	Animal production, except cattle and poultry and eggs	0.6%
8	Water, sewage and other systems	0.5%
9	Management of companies and enterprises	0.3%
10	Seasoning and dressing manufacturing	0.3%
Rest	All the remaining	2.1%
	Total	100.0%

Appendix C.4.2.14
Input Contribution Results - Processing Level - Water Consumption - Butter
Description: Input Contribution Results for the Butter Food Category at the Processing Level.

Water Consumption Input Contribution Analysis: Butter		
NAICS Category: Fluid milk and butter manufacturing		
Input Rank	**Input Category**	**Percent**
1	Dairy cattle and milk production	76.9%
2	Fluid milk and butter manufacturing	8.1%
3	Electric power generation, transmission, and distribution	3.6%
4	Wet corn milling	1.9%
5	Dry, condensed, and evaporated dairy product manufacturing	1.7%
6	Cheese manufacturing	1.0%
7	Fruit farming	0.5%
8	Paperboard container manufacturing	0.5%
9	Fats and oils refining and blending	0.4%
10	Water, sewage and other systems	0.4%
Rest	All the remaining	5.1%
	Total	100.0%

Appendix C.5.1

Input Contribution Results for All Phase 1 Food Categories - Global Warming

Description: Aggregated Input Contribution Results for all Phase 1 Food Categories

Global Warming Input Contribution Analysis		
Input Rank	**CEDA Input Category**	**Percent**
1	Cattle ranching and farming	18.18%
2	Electric power generation, transmission, and distribution	14.00%
3	Dairy cattle and milk production	11.11%
4	Support activities for agriculture and forestry	7.26%
5	Poultry and egg production	6.68%
6	Fertilizer manufacturing	4.16%
7	Animal (except poultry) slaughtering, rendering, and processing	4.09%
8	Grain farming	3.02%
9	Petroleum refineries	2.61%
10	Pesticide and other agricultural chemical manufacturing	2.46%
11	Vegetable and melon farming	2.14%
12	Animal production, except cattle and poultry and eggs	2.03%
13	Cheese manufacturing	1.80%
14	Fruit farming	1.52%
15	Poultry processing	1.35%
16	Other animal food manufacturing	1.29%
17	Fluid milk and butter manufacturing	0.97%
18	Real estate	0.94%
19	Soybean and other oilseed processing	0.70%
20	Water, sewage and other systems	0.59%
21	Paperboard container manufacturing	0.55%
22	Truck transportation	0.45%
23	All other crop farming	0.45%
24	Oilseed farming	0.43%
25	Wood container and pallet manufacturing	0.42%
26	Other plastics product manufacturing	0.35%
27	Dry, condensed, and evaporated dairy product manufacturing	0.33%
28	Fats and oils refining and blending	0.30%
29	Natural gas distribution	0.25%
30	Frozen food manufacturing	0.24%
31	Wet corn milling	0.20%
32	Glass container manufacturing	0.16%
33	Metal can, box, and other metal container (light gauge) manufacturing	0.16%
34	Management of companies and enterprises	0.16%
35	Flour milling and malt manufacturing	0.14%
36	Plastics bottle manufacturing	0.12%
37	Wholesale trade	0.11%
38	Plastics material and resin manufacturing	0.10%
39	Plastics packaging materials and unlaminated film and sheet manufacturing	0.08%
40	Tree nut farming	0.07%
41	Coal mining	0.07%
42	Rail transportation	0.05%
43	All other basic inorganic chemical manufacturing	0.04%
44	Water transportation	0.02%
45	Seasoning and dressing manufacturing	0.02%
46	Flavoring syrup and concentrate manufacturing	0.01%
	All the remaining*	7.83%
	Total	*100%*

*CEDA's Contribution Analysis Tool generates Top 10 contributor results for each food category. If a percent remains after listing the top 10, then it is titled "All the remaining". Across all Phase 1 food categories, the "All the Remaining" processes totaled to 7.83% of the aggregated % values.

Appendix C.5.2

Input Contribution Results for All Phase 1 Food Categories - Water Consumption

Description: Aggregated Input Contribution Results for all Phase 1 Food Categories

Water Consumption Input Contribution Analysis		
Input Rank	**CEDA Input Category**	**Percent**
1	Support activities for agriculture and forestry	18.98%
2	Electric power generation, transmission, and distribution	14.51%
3	Cattle ranching and farming	10.40%
4	Fruit farming	6.70%
5	Water, sewage and other systems	6.56%
6	Vegetable and melon farming	6.52%
7	Grain farming	5.23%
8	Poultry and egg production	5.13%
9	Dairy cattle and milk production	4.89%
10	Animal (except poultry) slaughtering, rendering, and processing	2.85%
11	All other crop farming	2.04%
12	Animal production, except cattle and poultry and eggs	1.45%
13	Pesticide and other agricultural chemical manufacturing	1.29%
14	Other animal food manufacturing	1.21%
15	Fishing	0.98%
16	Poultry processing	0.89%
17	Fertilizer manufacturing	0.82%
18	Soybean and other oilseed processing	0.73%
19	Real estate	0.72%
20	Cheese manufacturing	0.64%
21	Oilseed farming	0.62%
22	Petroleum refineries	0.40%
23	Fluid milk and butter manufacturing	0.39%
24	Fats and oils refining and blending	0.30%
25	Frozen food manufacturing	0.16%
26	Wet corn milling	0.16%
27	Wood container and pallet manufacturing	0.16%
28	Flour milling and malt manufacturing	0.14%
29	Dry, condensed, and evaporated dairy product manufacturing	0.12%
30	Cotton farming	0.09%
31	Seasoning and dressing manufacturing	0.08%
32	Paperboard container manufacturing	0.03%
33	Tree nut farming	0.03%
34	Management of companies and enterprises	0.02%
35	Other plastics product manufacturing	0.02%
36	Wholesale trade	0.02%
37	Flavoring syrup and concentrate manufacturing	0.01%
38	Glass container manufacturing	0.01%
39	Metal can, box, and other metal container (light gauge) manufacturing	0.01%
40	Plastics bottle manufacturing	0.01%
	All the remaining*	4.58%
	Total	*100%*

*CEDA's Contribution Analysis Tool generates Top 10 contributor results for each food category. If a percent remains after listing the top 10, then it is titled "All the remaining". Across all Phase 1 food categories, the "All the Remaining" processes totaled to 4.58% of the aggregated % values.

Appendix D.1

Output Contribution Results for All Phase 1 Food Categories - Global Warming

Description: Output Contribution Results for all Phase 1 Food Categories

Global Warming Output Contribution Analysis		
Input Rank	**CEDA Output Category**	**Percent**
1	Cattle ranching and farming	15.72%
2	Vegetable and melon farming	14.63%
3	Electric power generation, transmission, and distribution	12.88%
4	Grain farming	8.41%
5	Dairy cattle and milk production	7.99%
6	Fruit farming	5.57%
7	Poultry and egg production	2.68%
8	All other crop farming	2.60%
9	Fertilizer manufacturing	2.53%
10	Animal production, except cattle and poultry and eggs	2.36%
11	Petroleum refineries	2.30%
12	Animal (except poultry) slaughtering, rendering, and processing	1.75%
13	Natural gas distribution	1.52%
14	Tree nut farming	1.32%
15	Poultry processing	1.00%
16	Support activities for agriculture and forestry	0.88%
17	Oilseed farming	0.83%
18	Fluid milk and butter manufacturing	0.79%
19	Cheese manufacturing	0.65%
20	Other basic organic chemical manufacturing	0.63%
21	Frozen food manufacturing	0.51%
22	Coffee and tea manufacturing	0.48%
23	Coal mining	0.46%
24	Other animal food manufacturing	0.33%
25	Fats and oils refining and blending	0.28%
26	All other basic inorganic chemical manufacturing	0.15%
27	Truck transportation	0.12%
28	Water, sewage and other systems	0.08%
29	Flour milling and malt manufacturing	0.08%
30	Soybean and other oilseed processing	0.07%
31	Iron and steel mills and ferroalloy manufacturing	0.07%
32	Glass container manufacturing	0.06%
33	Wet corn milling	0.04%
34	Seasoning and dressing manufacturing	0.03%
35	Rail transportation	0.02%
36	Water transportation	0.02%
	All the remaining*	10.17%
	Total	*100%*

*CEDA's Contribution Analysis Tool generates Top 10 contributor results for each food category. If a percent remains after listing the top 10, then it is titled "All the remaining". Across all Phase 1 food categories, the "All the Remaining" processes totaled to 10.17% of the aggregated % values.

Appendix D.2

Output Contribution Results For All Phase 1 Food Categories - Water Consumption

Description: Output Contribution Results for all Phase 1 Food Categories

Water Consumption Output Contribution Analysis		
Input Rank	**CEDA Output Category**	**Percent**
1	Vegetable and melon farming	27.89%
2	Fruit farming	26.32%
3	Grain farming	17.43%
4	All other crop farming	11.65%
5	Electric power generation, transmission, and distribution	5.52%
6	Support activities for agriculture and forestry	2.47%
7	Oilseed farming	2.15%
8	Water, sewage and other systems	1.48%
9	Fishing	1.42%
10	All the remaining	0.99%
11	Cotton farming	0.65%
12	Cattle ranching and farming	0.48%
13	Poultry and egg production	0.43%
14	Dairy cattle and milk production	0.30%
15	Animal (except poultry) slaughtering, rendering, and processing	0.15%
16	Animal production, except cattle and poultry and eggs	0.12%
17	Natural gas distribution	0.12%
18	Poultry processing	0.11%
19	Flour milling and malt manufacturing	0.09%
20	Forest nurseries, forest products, and timber tracts	0.08%
21	Cheese manufacturing	0.05%
22	Coffee and tea manufacturing	0.04%
23	Frozen food manufacturing	0.04%
24	Fats and oils refining and blending	0.02%
	All the remaining*	0.99%
	Total	*100%*

*CEDA's Contribution Analysis Tool generates Top 10 contributor results for each food category. If a percent remains after listing the top 10, then it is titled "All the remaining". Across all Phase 1 food categories, the "All the Remaining" processes totaled to 0.99% of the aggregated % values.

Appendix E

Water Stress Index Results

Description:Water stress index calculation results, arranged alphabetically by state (excluding Alaska and Hawaii)

State	Total Average Precipitation (Mg/yr)	Total Withdrawals (Mg/yr)	% of Supply Used	Water Stress Multiplier	% Withdrawals Used for Irrigation	Irrigation Water Stress Multiplier
United States	**6263253026802**	**479883760950**	**7.66%**	-	**36.68%**	-
Alabama	200960373328	13759989000	6.85%	89.37%	1.62%	1.44%
Arizona	102051348542	8620716000	8.45%	110.25%	77.00%	84.89%
Arkansas	177634260404	15749385000	8.87%	115.72%	74.77%	86.52%
California	239046427620	45452172500	19.01%	248.16%	74.18%	184.10%
Colorado	109351434020	18788740000	17.18%	224.25%	90.20%	202.27%
Connecticut	18373128231	1179822350	6.42%	83.81%	2.63%	2.21%
Delaware	7479022866	877268375	11.73%	153.09%	10.27%	15.72%
Florida	236045876867	9422000500	3.99%	52.10%	44.97%	23.43%
Georgia	198263288080	7432604500	3.75%	48.93%	13.98%	6.84%
Idaho	104226320827	26939737500	25.85%	337.35%	84.93%	286.52%
Illinois	149792800414	20999180000	14.02%	182.97%	3.32%	6.08%
Indiana	99948921072	12903443500	12.91%	168.50%	1.62%	2.73%
Iowa	126040771857	4655739250	3.69%	48.21%	0.99%	0.48%
Kansas	156522178613	5235979750	3.35%	43.66%	72.41%	31.61%
Kentucky	130190712995	5982003250	4.59%	59.97%	0.44%	0.26%
Louisiana	207035578636	15749385000	7.61%	99.28%	8.67%	8.61%
Maine	98398091792	643790650	0.65%	8.54%	0.84%	0.07%
Maryland	36429216595	1865058750	5.12%	66.82%	3.70%	2.47%
Massachusetts	33240312706	1740721500	5.24%	68.35%	11.56%	7.90%
Michigan	208923052853	16163842500	7.74%	100.98%	2.63%	2.66%
Minnesota	156919758195	5581361000	3.56%	46.42%	6.05%	2.81%
Mississippi	188698307741	3937346250	2.09%	27.23%	54.86%	14.94%
Missouri	193638336406	12143604750	6.27%	81.85%	15.62%	12.78%
Montana	148663115744	13953402500	9.39%	122.50%	95.58%	117.08%
Nebraska	120228292527	17407215000	14.48%	188.97%	67.23%	127.05%
Nevada	69388485566	3288029500	4.74%	61.85%	62.92%	38.91%
New Hampshire	26702310892	606489475	2.27%	29.64%	1.03%	0.31%
New Jersey	27054620021	2666343250	9.86%	128.63%	4.95%	6.37%
New Mexico	117013522626	4600478250	3.93%	51.31%	84.49%	43.36%
New York	150363509010	14229707500	9.46%	123.51%	0.50%	0.61%
North Carolina	178603787219	15611232500	8.74%	114.08%	2.57%	2.94%
North Dakota	82872167321	1851243500	2.23%	29.16%	11.27%	3.28%
Ohio	115469301605	15887537500	13.76%	179.58%	0.37%	0.66%
Oklahoma	168055299841	2127548500	1.27%	16.52%	32.27%	5.33%
Oregon	178286260581	9974610500	5.59%	73.02%	79.11%	57.77%
Pennsylvania	130326169802	13083041750	10.04%	131.02%	0.26%	0.34%
Rhode Island	4876212198	194795025	3.99%	52.14%	3.89%	2.03%
South Carolina	104976775904	10844971250	10.33%	134.83%	1.17%	1.58%
South Dakota	102163986267	690762500	0.68%	8.82%	58.29%	5.14%
Tennessee	150310436390	14920470000	9.93%	129.56%	0.51%	0.66%
Texas	510082229686	32603990000	6.39%	83.42%	32.98%	27.51%
Utah	68466272332	6658950500	9.73%	126.94%	82.81%	105.12%
Vermont	27085383354	722537575	2.67%	34.82%	0.60%	0.21%
Virginia	124901896405	9781197000	7.83%	102.21%	0.68%	0.69%
Washington	181877519023	7736540000	4.25%	55.52%	62.90%	34.92%
West Virginia	72201377820	6645135250	9.20%	120.12%	0.00%	0.00%
Wisconsin	140623789363	11881115000	8.45%	110.27%	4.67%	5.15%
Wyoming	83450784646	6092525250	7.30%	95.29%	90.30%	86.05%