Earth's Own

Butter Bean
Dairy Comparison Report

21.03.18

ImaginALL™

Intro

Background

Earth's Own is a purpose-driven organization that is growing rapidly. Earth’s Own’s vision is to be a pioneering company that takes an ethical approach to championing nutritional innovation and high quality products in order to actively improve people's lives and well-being.

Earth's Own is committed to sharing the benefits of plant-based living through their range of dairy alternative products like oat, soy, almond, and cashew milk options. Their messaging is from a lens of positivity and boldness that focuses on the environmental benefits of incorporating a plant-based lifestyle.

The ImaginALL Collective (through Conscious Brands) has worked with Earth's Own to quantify the water footprint of oat milk in comparison to almond and dairy options.

The ImaginALL Collective understands the landscape of carbon calculating, sustainability, strategy and integrated reporting, and offset standards and knows the importance of transparency and building trust with end consumers through these means. The ImaginALL Collective has performed numerous assessments of organizational data as it relates to carbon and higher purpose certifications and is able to identify any gaps or blind spots in reporting on sustainability-related issues.

Background Continued...

Towards a goal of promoting the plant-based diet as a healthful and environmentally sustainable alternative to the conventional North American diet, Earth's Own engaged The ImaginALL Collective to assess the positive impact of Earth's Own Butter Bean based line of products, butter, sour cream, ranch dressing and cream cheese in relation to land use, water use, greenhouse gas emissions, and eutrophication (waste water) in comparison to dairy options that are available. The investigation required direct contact with Earth's Own staff, as well as extensive secondary source research in academic journals, NGOs, and government reports.

The ImaginALL Collective used secondary source research to compile water footprint, land use, and GHG emissions profiles, to compare the impact of Earth's Own range of Butter Bean related products to their dairy counterparts (butter, sour cream, ranch dip, and cream cheese)

What is the water footprint of a product?

The water footprint of a product is the amount of water that is consumed and discharged in all processing stages of its production. A product's water footprint tells us how much pressure that product has put on freshwater resources. It can be measured in cubic metres of water per tonne of production or litres per kilogram of finished product.

By measuring the volume and source of water consumed in the growing of a product, as well as the volume of water needed to assimilate pollutants so that water quality standards are met, we can get a picture of how a specific product contributes to the growing concerns of water scarcity and degraded water quality. It also allows us to compare different products for their relative contribution to these critical water issues.

In the case of rain-fed agriculture, the blue water footprint (water consumption originating from ground/surface water) is zero, and green water use (the consumption of naturally available water from soil moisture/precipitation) is calculated by summing up evapotranspiration per day over the growing season of the plant. In the case of irrigated crops, green and blue water consumption is calculated based on the soil to water ratio. The grey water footprint modeled by Mekonnen and Hoekstra refers only to the water required to assimilate nitrogen fertilizer runoff. All three categories of water consumption are included in this water footprint analysis. [1]

[1] Mekonnen, M.E. and Hoekstra, A.Y. (2010). The Green, Blue and Grey Water Footprint of Crops and Derived Crop Products. Volume 1: Main Report. UNESCO-IHE. https://www.waterfootprint.org/media/downloads/Report47-WaterFootprintCrops-Vol1.pdf

What is the land use of a product?

Land use refers to the area of natural environment or wilderness that is modified into built environment such as settlements and semi-natural habitats such as arable fields, pastures, and managed wood in order to produce the product. It also has been defined as "the total of arrangements, activities, and inputs people undertake in a certain land cover type." [2]
It is measured in units of area/mass of product (e.g. square metres per kilogram, hectare per tonne)

What are the GHG emissions of a product?

The greenhouse gas (GHG) emissions of a product are inclusive of all generated throughout its life cycle. All the emissions are reported as CO_2e - the 'e' stands for 'equivalent'. This simply means that all of the emissions associated with the product throughout its lifecycle, whether they be CO_2, or other common GHG gases like CH_4 (methane) or N_2O (nitrous oxide), have been converted into being reported as CO_2 using the global warming potential for the respective gas. GHG emissions are commonly reported in tonnes of CO_2 equivalent.

[2] IPCC Special Report on Land Use, Land-Use Change And Forestry, 2.2.1.1 Land Use, (n.d.) https://www.grida.no/climate/ipcc/land_use/033.htm

What is Eutrophication?

Eutrophication is the enrichment of surface waters with plant nutrients. While eutrophication occurs naturally, it is normally associated with anthropogenic sources of nutrients, particularly nitrogen and phosphorus. The "trophic status" of lakes is the central concept in lake management. It describes the relationship between nutrient status of a lake and the growth of organic matter in the lake.

Eutrophication is the process of change from one trophic state to a higher trophic state by the addition of nutrients. For instance, a body of water becomes enriched in dissolved nutrients (such as phosphates), stimulating the growth of aquatic plant life usually resulting in the depletion of dissolved oxygen. Agriculture is a major factor in eutrophication of surface waters. [3]

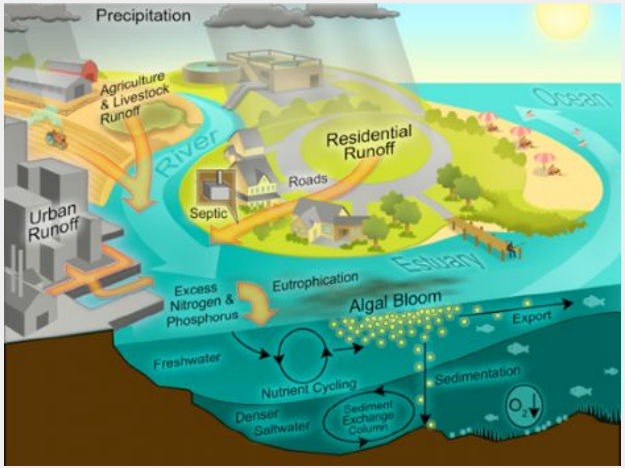


Fig. 1. Schematic diagram of the different pathways of nutrient deposition into coastal waters leading to eutrophication (algal blooms) and hypoxia. (Image Credit: Hans W. Paerl 2006)

[3] Ongley, E. (1996). Control of water pollution from agriculture - FAO irrigation and drainage, Chapter 3: Fertilizers as water pollutants, Paper 55. http://www.fao.org/3/w2598e/w2598e06.htm.

What is Eutrophication? Continued...

Though not the main focus of this project, it is important to note that the production of dairy requires significant quantities of fertilizer to grow the feed for cattle. Waste products from cattle are reintegrated into the soil, where they then enter groundwater and contribute to eutrophication of water bodies. Organic plant crops also tend to have a higher potential for eutrophication and acidification of water bodies, due to increased use of organic manure vs. synthetic fertilizers. Whereas fertilizers tend to release nutrients in response to crop demands, manure is less controllable, being more dependent on weather factors such as moisture and temperature. [4]

[4] Ritchie, H. (Dec. 2017). Is organic really better for the environment than conventional agriculture? https://ourworldindata.org/is-organic-agriculture-better-for-the-environment.

Data

Project Data

Data for this project came from peer reviewed research papers, trade publications, regional reports, and data collected directly from Earth's Own. The bulk of the data was acquired through 'Reducing Food's Environmental Impacts Through Producers and Consumers' [5] and was used as a guide for formatting and model building for butter beans. This paper consolidated data covering five environmental indicators, 38,700 farms and 1600 processors, packaging types, and retailers. Impact can vary fifty-fold among producers of the same product, creating substantial mitigation opportunities. However, mitigation is complicated by trade-offs, multiple ways for producers to achieve low impacts, and interactions throughout the supply chain. Personal conversations with Joseph Poore, author of the above-mentioned paper, also added clarity to the findings and recommendations on data use for Earth's Own's specific requirements.

Data to populate the water usage, land use, and GHG emissions from conventional dairy products was derived from a variety of sources, as listed below:

- Water usage: Poore, J. & Nemecek, T. (June 2018) [5]
- Land use: Nijdam, D, Rood, G.A., and Westhoek, H., 2012 [6]
- GHG emissions: Verge et al., 2013 [7]

Data to populate water usage, land use, and GHG emissions from butter bean products was derived from the resources below:

- Water usage: Direct data from Earth's Own
- Land use: Mark Kirsten Interview (Kirsten Co.), Poore, J. and Nemecek, T. (2018) [5], Efeca, 2017 [8], Dumelin (2009) [9]
- GHG emissions: Espino (2017) [10], Schmidt (2015) [11]

A full list of data sources are available in the reference section of this paper.

Project Data Continued...

[5] Poore, J. & Nemecek, T. (June 2018). Reducing Food's Environmental Impacts Through Producers and Consumers. Science 360 (6392) 987-992, doi: 10.1126/science.aaq0216.

[6] Nijdam, D, Rood, G.A., and Westhoek, H., (2012). The price of protein: Review of land use and carbon footprints from life cycle assessments of animal food products and their substitutes. Food Policy 37(6):760–770, doi: 10.1016/j.foodpol.2012.08.002.

[7] Vergé et al. (2013). Carbon footprint of Canadian dairy products: Calculations and issues. Dairy Science, 96 :6091–6104, doi: 10.3168/jds.2013-6563.

[8] Adams, A. (2017). "Environmental and social impacts of plant based Iternatives to tallow", Efeca.

[9] Dumelin, E., 2009. "The Environmental Impact of Palm Oil and Other Vegetable Oils". Reproduced from the paper presented at Society of Chemical Industry Conference on 'Palm Oil – the Sustainable 21st Century Oil – Food, Fuel & Chemicals', 23–24.

[10] Espino, M.R.M., (2017). Life cycle assessment of the production of virgin coconut (Cocos nucifera) oil. https://agris.fao.org/agris-search/search.do?recordID=PH2019000221.

[11] Schmidt, J. (2015). Life cycle assessment of five vegetable oils. Cleaner Production 87:130-138. 10.1016/j.jclepro.2014.10.011.

Functional Unit

The functional unit used for each comparison is per kilogram overall product, as follows:

- Water usage: Litres per kilogram (L/kg)
- Land use: Square metres per kilogram (m2/kg)
- GHGs: Kilogram carbon dioxide equivalent per kilogram (kg CO2e/kg)

This unit was chosen over per gram protein or per gram fat, as focusing on a particular macronutrient where content is particularly low (e.g. 0.9% protein content in butter) will introduce larger margins of error. Normalizing by kilogram of overall product also captures the individual footprints of the primary ingredients in butter bean-based products.
Note that in the calculation of functional units for Earth's Own products, the primary ingredients captured in this analysis do not comprise exactly 100% of the respective product. See Table 1 below for the ingredients included in the analysis of Earth's Own butter bean-based products, and the percent mass contribution of the ingredients towards the overall product:

Functional Unit Continued...

Table 1: Ingredients included in Dairy Comparison Calculations

	BUTTER BEAN	COCONUT OIL	SUNFLOWER OIL	%AGE ATTRIBUTION
Butter	Y	Y	Y	98%
Ranch Dip	Y	Y		93%
Cream Cheese	Y	Y		96%
Sour Cream	Y	Y		93%

To normalize the results from butter bean-based products vs. dairy equivalents, the respective functional unit for the butter bean product was divided by the percentage attribution to determine the normalized dairy equivalent.

Functional Unit Continued...

Specifics

Outside of scope

- Water stress indicators, water scarcity assessment and end-point modelling
- Full LCA on packaging of end product
- Primary sourcing of raw data

In Scope

Water:

- Reduced water availability from consumption and degradation + direct pollution impacts, water degradation footprint (grey water), water availability footprint (green and blue water)
- Total farm use water consumption over the complete growing cycle, including:
    - Green water: The consumption of naturally available water from soil moisture/precipitation
    - Blue water: The consumption of water use originating from ground/surface water
    - Grey water: The volume of ground/surface water polluted (required for assimilation of fertilizers or pesticides)

Land Use:

- Includes native forest, cropland, and other lands required to produce a particular product, including all ingredients comprising the product

GHG:

- LCA assessment based on secondary data collection
- Broadening the scope of claims to include land use, carbon impact (in the form of GHG)

Organic Butter Beans

Earth's Own sources butter beans for their product from farms in Central California. The Central California growing region has the ideal growing conditions for Butter Beans, with lower water scarcity factors than Southern California.

Potential Marketing Use

- 'At Earth's Own, we care about quality, both for you, the consumer, as well as the environment. We choose our Butter Beans as close to local sources as possible, to ensure the freshest and to make the most flavorful product for you, and did you know that the Butter Bean…'

Organic Coconut Oil

Earth's Own coconuts are sourced primarily from the Philippines. Through production data collected through efeca.com [7] (500 kg/ha) and Dumelin [7] (700 kg/ha), we were able to find the average production for coconut oil of 600 kg/ha, or a land use footprint of 17.1 m^2/kg.

Results

Overall, butter bean products were found to outperform dairy products in 11 of 12 functional unit comparisons vs. dairy product equivalents. See Table 2 for comparisons of butter bean vs. dairy products for water use, land use, and GHGs. Comparisons in bold highlight the most advantageous marketing claim for each product.

Table 2 - Suggested Marketing Claims for Earth's Own Butter Bean Products

ORGANIC PRODUCT	WATER USE	LAND USE	GREENHOUSE GASES
Butter	Grown using 55% less water than dairy butter	Grown using 5 times less land than dairy butter	**Produces 11 times less GHGs than dairy butter**
Ranch Dip	**Grown using 5 times less water than it's dairy equivalent.**		Produces 4 times less GHGs thanit's dairy equivalent.
Cream Cheese	Grown using 5 times less water than it's dairy equivalent.	Grown using 6 times less land than it's dairy equivalent.	**Produces 18 times less GHGs than it's dairy equivalent.**
Sour Cream	Grown using 50% less water than it's dairy equivalent.	Grown using 50% less land than it's dairy equivalent.	**Produces 14 times less GHGs than it's dairy equivalent.**

Example Marketing Claim...

Our Ranch Dip is grown using

5

Times Less Water

than the dairy equivalent.

ImaginALL™

Results Continued...

Inventory Data Sources

The sources of data for the water footprint of each product were selected to be as recent and geographically relevant as possible. A range of published literature and national data sources were used in this water footprint. Tables 3 through 5 show the source of data for each aspect of the life cycle assessment model described above.

Table 3: Overall Results - Conventional Dairy

DAIRY PRODUCT	WATER USE (L/kg)	LAND USE (m^2/kg)	GHGs (kg CO_2e/kg)
Butter	5,553	46.51	6.56
Ranch Dip	5,057	2.41	1.67
Cream Cheese	5,060	20	6.74
Sour Cream	1,898	8	5.18

Results Continued...

Table 4: Overall Results - Butter Bean Organic

EARTH'S OWN PRODUCT	WATER USE (L/kg)	LAND USE (m^2/kg)	GHGs (kg CO_2e/kg)
Butter	2,485	8.19	0.59
Ranch Dip	861	3.02	0.36
Cream Cheese	926	2.93	0.36
Sour Cream	956	3.35	0.37

Results Continued...

Table 5: Comparison of Earth's Own vs. their dairy equivalents

PRODUCT	WATER USE FACTOR	LAND USE FACTOR	GHG FACTOR
Butter	2.23	5.68	11.21
Ranch Dip	5.46	0.80	4.64
Cream Cheese	5.24	6.83	18.78
Sour Cream	1.85	2.39	13.99

The figures we have used in this analysis represent the best available data we could collect from the client and secondary sources given the project budget and timeline. A dedicated research analysis with an unlimited budget would undoubtedly arrive at different conclusions than we have, but their conclusions would not likely contradict the two claims above by very much.

The Value of Organic Over Conventional

We live in an ecosystem and nothing, or no one, exists in isolation. Growing food non-organically requires the use of over 1.1 billion pounds of pesticides in the United States annually, with more than 90% of those pesticides utilized in the agricultural sector. [12]

Almost 1,400 pesticides with over 900 active ingredients are currently registered with the U.S. Environmental Protection Agency (EPA) and approved for use in the United States. [13] Pesticides can help farmers increase their yield and crop quality while reducing labor, however, increasing reliance on pesticides for food and fiber production has also led to serious unintended consequences.

By definition, pesticides are toxic to living organisms, so it is not surprising that they can also be toxic to the environment and humans. While the adverse effects of pesticides on non-target organisms such as beneficial insect predators, song birds, [14] pollinators, [15] and native plants [16] are well documented in the scientific literature, the unintended effects of pesticides on humans are perhaps less understood or acknowledged. Farmers and farm workers are at the greatest risk for pesticide exposure and associated adverse health impacts. Not only are they often exposed to pesticides at higher doses and with greater frequency than the general public, they are also at risk for exposure to more toxic, restricted-use pesticides that are not available for use by the general public.

The Value of Organic Over Conventional Continued...

A large and growing body of research documents the health hazards associated with occupational exposure to pesticides commonly used on conventional farms. Health impacts include acute poisoning due to high dose exposure leading to immediate health effects as well as long-term health impacts such as cancer.

Positive Impact Statement:

- By choosing organic you are choosing better health for you, the environment, and the workers who grow your food.

[12] Atwood, D. and Paisley-Jones, C. (2017). Pesticides industry sales and usage 2008–2012 market estimates. US Environmental Protection Agency, Washington, DC Google Scholar.

[13] Reuben, S.H., (2010). Reducing environmental cancer risk: what we can do now. DIANE Publishing.

[14] Stanton, R., C. Morrissey, and R. Clark 2018. Analysis of trends and agricultural drivers of farmland bird declines in North America: A review. Agriculture, Ecosystems & Environment, 254, 244–254.

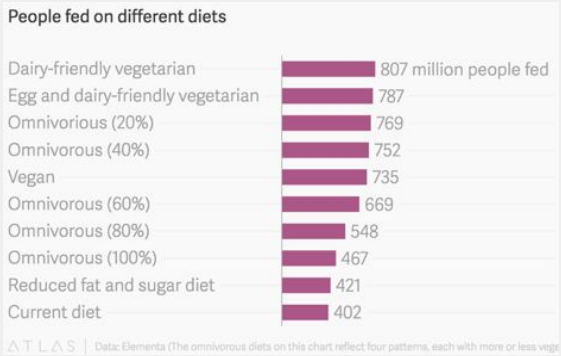
[15] Stokstad, E., Pesticides under fire for risks to pollinators. 2013, American Association for the Advancement of Science.

[16] Egan, J.F., E. Bohnenblust, S. Goslee, D. Mortensen, and J.Tooker 2014. Herbicide drift can affect plant and arthropod communities. Agriculture, ecosystems & environment, 185, 77–87.

Organic Impact Statement...

By choosing organic you are choosing ***better health*** for you, the environment, and the workers who grow your food.

Last Mentions



A balanced diet, plant based
is better than animal proteins. [17]

[17] Schlanger, Z. (2018) Is promoting vegetarianism a form of colonialism? https://qz.com/1311884/is-promoting-vegetarianism-a-form-of-colonialism/

[18] Peters, C.J. et al., (2016). Carrying capacity of U.S. agricultural land: Ten diet scenarios. Elementa: Science of the Anthropocene • 4: 000116. Doi: 10.12952/journal.elementa.000116

Plant-based diet:

- The debate over the virtues of plant-based diets in the face of climate change, water shortages and deforestation seem to be top of mind with the masses. In a study [18] conducted by researchers looking at 10 diet scenarios, they found that the environmental benefits of an exclusively plant-based diet depended on where one lived, but that, as a whole, a plant-based diet is almost twice as beneficial for the planet than the current North American diet. The most beneficial diet - or the diet that could feed more of the world's population consisted of a plant-based diet with dairy options, and no meat.

Coconut processing:
Coconut Farming and the Environment

- Negative environmental impacts of the coconut industry can also be traced directly back to the coconut farms themselves. As with other trends or fads in foods, monoculture farming has become an issue in areas where coconuts are grown. As the coconut tree ages, it becomes less productive. This motivates farmers to plant more and more coconut trees to maintain a constantly stream of product. Replacing native plants and biodiversity to meet the demand for coconuts, can take a major toll on the soil, leading farmers to turn to chemical fertilizers to boost their productivity.

Last Mentions Continued...

With increased demands for production, some governments have rolled out plans to subsidize chemical fertilizers for farmers. With a cheap alternative to organic farming methods, environmental protection can take a backseat while farmers focus on cutting costs. As with any agricultural endeavor, there is threat to local biodiversity as well as soil, water and air health when chemical inputs are introduced.

Advances in organic dairy:

Organic and non-organic dairy are both making advances in capturing the methane emissions associated with dairy farming through the use of methane digesters. Capturing methane does two things as it relates to the overall farming practices of dairy farming:

1. it greatly reduces the GHG emissions associated with farming practices. A dairy farm would produce 3 times the GHG emissions as soy or oat farming without a methane digester but with a methane digester dairy farming would potentially either be on par or lower in terms of GHG emissions than soy or oat farming.
2. The methane digester would also allow dairy farmers to better control the eutrophication impacts of dairy farming practises. Leading this charge is Straus Family Creamery. "We're telling the story of regenerative farming. We're talking about micro-organisms in the soil and carbon sequestration." [19]

We mention this as something that is on the horizon and the numbers reported in this Positive Impact Assessment will likely need to be adjusted in the future as addressing climate change becomes more mainstream.

[19] Climate + Farm: Poop to Power. (2021) Straus Family Creamery. https://www.strausfamilycreamery.com/mission-practices/climate-farm/

References

Sources Referenced

Adams, A. (2017). “Environmental and social impacts of plant based alternatives to tallow”, Efeca.

Alcock, T.D., Salt, D.E., and Ramsden, S.J. (2020). A harmonised systems-wide re-analysis of greenhouse gas emissions from sunflower oil production. doi: 10.1101/2020.06.19.161893

Blaustein-Rejto, D. and Blomqvist, L. (2018) Fixing Nitrogen: The Hidden Footprint of Making All Farms Organic. https://thebreakthrough.org/articles/fixing-nitrogen.

Climate + Farm: Poop to Power. (2021) Straus Family Creamery. https://www.strausfamilycreamery.com/mission-practices/climate-farm/

Dumelin, E., 2009. “The Environmental Impact of Palm Oil and Other Vegetable Oils”. Reproduced from the paper presented at Society of Chemical Industry Conference on ‘Palm Oil – the Sustainable 21st Century Oil – Food, Fuel & Chemicals’, 23–24.

Egan, J.F., E. Bohnenblust, S. Goslee, D. Mortensen, and J.Tooker 2014. Herbicide drift can affect plant and arthropod communities. Agriculture, ecosystems & environment, 185, 77–87.

Espino, M.R.M., (2017). Life cycle assessment of the production of virgin coconut (Cocos nucifera) oil. https://agris.fao.org/agris-search/search.do?recordID=PH2019000221.

IPCC Special Report on Land Use, Land-Use Change And Forestry, 2.2.1.1 Land Use on Greenhouse Gas Sources and Sinks, (n.d.) https://www.grida.no/climate/ipcc/land_use/033.htm

Magat, S.S. Productive and Sustainable Coconut Farming Ecosystems as Potential Carbon “Sinks” in Climate-Change Minimization: (A Review and Advisory Notes) - https://pca.gov.ph/pdf/techno/fsysclimatemin.pdf

Sources Referenced Continued...

Mekonnen, M.E. and Hoekstra, A.Y. (2010). The Green, Blue and Grey Water Footprint of Crops and Derived Crop Products. Volume 1: Main Report. UNESCO-IHE. https://www.waterfootprint.org/media/downloads/Report47-WaterFootprintCrops-Vol1.pdf

Nijdam, D, Rood, G.A., and Westhoek, H., (2012). The price of protein: Review of land use and carbon footprints from life cycle assessments of animal food products and their substitutes. Food Policy 37(6):760–770, doi: 10.1016/j.foodpol.2012.08.002.

Ongley, E. (1996). Control of water pollution from agriculture - FAO irrigation and drainage, Chapter 3: Fertilizers as water pollutants, Paper 55. http://www.fao.org/3/w2598e/w2598e06.htm.

Pelletier, N., Arsenault, N. and P. Tyedmers. (2008). Scenario-modeling potential eco-efficiency gains from a transition to organic agriculture: Environmental Management, 42, 989-1001.

Poore, J. & Nemecek, T. (June 2018). Reducing Food's Environmental Impacts Through Producers and Consumers. Science 360 (6392) 987-992, doi: 10.1126/science.aaq0216.

Reuben, S.H., (2010). Reducing environmental cancer risk: what we can do now. DIANE Publishing.

Schlanger, Z. (2018) Is promoting vegetarianism a form of colonialism? https://qz.com/1311884/is-promoting-vegetarianism-a-form-of-colonialism/

Ritchie, H. (2017). Is organic really better for the environment than conventional agriculture? - https://ourworldindata.org/is-organic-agriculture-better-for-the-environment

Schmidt, J. (2015). Life cycle assessment of five vegetable oils. Cleaner Production 87:130-138. 10.1016/j.jclepro.2014.10.011.

Sources Referenced Continued...

Stanton, R., C. Morrissey, and R. Clark 2018. Analysis of trends and agricultural drivers of farmland bird declines in North America: A review. Agriculture, Ecosystems & Environment, 254, 244–254.

Stokstad, E., Pesticides under fire for risks to pollinators. 2013, American Association for the Advancement of Science.

United Nations Conference on Trade and Development. (2020). Assessment of Organic Certification in the Coconut Oil Value Chain in the Philippines. https://unctad.org/system/files/official-document/ditctabinf2020d1_en.pdf

Vergé et al. (2013). Carbon footprint of Canadian dairy products: Calculations and issues. Dairy Science, 96 :6091–6104, doi: 10.3168/jds.2013-6563.

DISCLAIMER