

Sustainability Capstone Proposal Independent Research Capstone (ENVR 599)



Education: BA in International Relations, Minor in French Language at Saint Anselm College (Class 2012)

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1. What is the working title?

Examining the Environmental and Health Impacts of Substituting Insect Protein for Pork Protein for Human Consumption in China

2. Why was this topic chosen?

China's economic rise has raised incomes across the country, but also drastically increased demand for meat, leading to major shifts in dietary patterns. China is the most populous country in the world and consumes nearly 30% of the world's meat and 50% of the world's pork. China has seen a 50% increase in meat consumption over the past decade alone, placing massive pressure on national and global resources to meet demands. These changes to dietary practices—which traditionally have been limited in meat—have both environmental and health consequences.

In 2016, the Chinese Government issued an update to their dietary guidelines, advising citizens to reduce their meat consumption by 50% of current levels of 63kg per person per year, to a maximum of 27.4kg per person by 2030. According to the Chatham House, consumption of meat and dairy products is expected to rise 76% and 65% respectively by 2050 without intervention. Current global patterns of meat consumption—with China leading the trend—are not sustainable. A curbing of China's meat consumption would have both health and environmental significance.

The United Nations Food and Agricultural Organization's (Gerber et al., 2013) major report outlined the benefits of entomophagy—the practice of consuming insects—on health and the environment. Insects are high in protein, fat, minerals, and vitamins, as well as having a significantly smaller environmental footprint over traditional protein sources. The UN estimates that 2 billion people consume insects around the world, including China, as a traditional source of protein. China has a history of entomophagy that dates back well over 3,000 years and is still practiced in many parts of southern China today.

3. What research methodology is to be utilized?

This project will include building a simple system model to analyze the environmental and human health impacts on a range of partial substitutions of insect protein for pork protein in China. The majority of the project will consist of a cost-benefit analysis discussing the results of the system modeling.

4. What do you hope the project will accomplish?

I hope this project will allow me to better understand the possible benefits and/or challenges of partially substituting insect protein for an animal protein (pork). I hope to be able to use this project to draw further attention to the growing field of entomophagy, especially as an area of interest for environmentalists and policy-makers.

5. How has your Sustainability coursework prepared you for this undertaking?

The coursework in the Sustainability program has been instrumental in preparing me for this project. I will draw from my coursework in Quantitative Methods, Life Cycle and Supply Chain Assessment, and Critical Analysis of Environmental System for my system modeling and cost-benefit analysis. I will also plan to use the material I covered in Environmental Economics, Global Energy and Environmental Politics, Global Climate Change, and Health, Water, and Sustainability for my concluding analysis.

6. Relevant references outlining the applicability of the topic and research method.

Bailey, R., Froggatt, A., & Wellesley, L. (2014). *Livestock - Climate Change's Forgotten Sector*. Chatham House, Energy, Environment and Resources. London: The Royal Institute of International Affairs.

Berggren, A. J. a. Å. (2015). *Insects as Food—Something for the Future?* Retrieved from Uppsala, Sweden

Dennis G. A. B. Ooninx, J. v. I., Marcel J. W. Heetkamp, Henry van den Brand, Joop J. A. van Loon, Arnold van Huis. (2010). An Exploration on Greenhouse Gas and Ammonia Production by Insect Species Suitable for Animal or Human Consumption. *PLoS ONE*, 5(12), 1-7.

Feng, Y., Zhao, M., He, Z., Chen, Z., & Sun, L. (2009). Research and utilization of medicinal insects in China. *Entomological Research*, 39(5), 313-316. doi:10.1111/j.1748-5967.2009.00236.x

Caraher, M and J Coveney (2016). *Food poverty and insecurity : international food inequalities*. Springer.

Hartmann, C., Shi, J., Giusto, A., & Siegrist, M. (2015). The psychology of eating insects: A cross-cultural comparison between Germany and China. *Food Quality and Preference*, 44, 148-156. doi:10.1016/j.foodqual.2015.04.013

- Huis, A. v. (2014). *The insect cookbook : food for a sustainable planet* (English-language edition. ed.). New York.
- Jin, X. B., & Yen, A. L. (1998). Conservation and the cricket culture in China. *Journal of Insect Conservation*, 2(3), 211-216. doi:10.1023/A:1009616418149
- Looy, H., Dunkel, F., & Wood, J. (2014). How then shall we eat? Insect-eating attitudes and sustainable foodways. *Agric Hum Values*, 31(1), 131-141. doi:10.1007/s10460-013-9450-
- United Nations Food and Agriculture Organization. (2015). *The State of Food Insecurity in the World*. Retrieved from Rome, Italy:
- Gerber, P.J., Steinfeld, H., Henderson, B., Mottet, A., Opio, C., Dijkman, J., Falcucci, A. & Tempio, G. (2013). *Tackling Climate Change Through Livestock*. United Nations Food and Agriculture Organization. Rome: FAO.
- Ramos-Elorduy, J. (2009). Anthro-entomophagy: Cultures, evolution and sustainability. *Entomological Research*, 39(5), 271-288.
- Shelomi, M. (2015). Why we still don't eat insects: Assessing entomophagy promotion through a diffusion of innovations framework. *Trends in Food Science & Technology*, 45(2), 311-318. doi:10.1016/j.tifs.2015.06.008
- Van Huis, A., Van Itterbeeck, J., Klunder, H., Mertens, E., Halloran, A., Muir, G., & Vantomme, P. (2013). *Edible insects: future prospects for food and feed security* (0258-6150). Retrieved from Rome, Italy:
- Wellesley, L., Happer, C., & Froggatt, A. (2015). *Changing Climate, Changing Diets: Pathways to Lower Meat Consumption*. Chatham House. London: The Royal Institute of International Affairs.
- Xiaodong, W. (2016, May 14). Ministry tweaks eating guidelines. *China Daily*. Beijing, China.
- Xiaoming Chen, Y. F., Zhiyong Chen. (2009). Common edible insects and their utilization in China. *Entomological Research*, 39, 299-303.
- Yates-Doerr, E. (2015). The world in a box? Food security, edible insects, and "One World, One Health" collaboration. *Social Science & Medicine*, 129, 106-112. doi:10.1016/j.socscimed.2014.06.020
- Yen, A. L. (2009). Edible insects: Traditional knowledge or western phobia? *Entomological Research*, 39(5), 289-298. doi:10.1111/j.1748-5967.2009.00239.x
- Zhang, C.-X., Tang, X.-D., & Cheng, J.-A. (2008). The utilization and industrialization of insect resources in China. *Entomological Research*, 38, S38-S47. doi:10.1111/j.1748-5967.2008.00173.x

Zhi-Yi, L. (1997). Insects as food in China. *Ecology of Food and Nutrition*, 36(2-4), 201-207.
doi:10.1080/03670244.1997.9991515