

PLANT-RICH DIET



OVERVIEW OF A HIGH-IMPACT DRAWDOWN SOLUTION

A plant-rich diet, such as a vegetarian or vegan diet, would reduce emissions associated with meat production. This solution assumes people 1) maintain a 2,500 calorie per day nutritional regime; 2) meet daily protein requirements; and 3) purchase locally produced food when available.

TECHNOLOGY AND MARKET READINESS

Meat-rich diets are one of the major sources of GHG emissions in the United States. An alternative to meat, plant-rich diets have significant potential to reduce GHG emissions. The technology is becoming mature by brands such as “Beyond Meat” and “Impossible Foods”, but the market readiness depends on the shift of consumer choices and affordability. The National Academies of Sciences, Engineering and Medicine (2019) convened a workshop in 2019 to review and discuss the Sustainable Diets, Food and Nutrition for Americans.

LOCAL EXPERIENCE AND DATA AVAILABILITY

A good number of companies in the United States are promoting plant-rich diets and grass-fed meats that produce less CO₂ emissions. There is a wide range of environmental impacts data for the production of animal-based proteins, which widely vary based on the production practices.

TECHNICALLY ACHIEVABLE CO₂ REDUCTION POTENTIAL

The solution has significant potential to reduce CO₂ emissions by displacing meat with plant-based diet or low-carbon meats. According to the USDA-ERS, the per capita disappearance of meat was about 100 kg of red meat and poultry in 2018. Based on the Life Cycle Analysis (LCA) data from Heller et al., (2013), the average GHG emissions rate is 12.05 kg of CO₂ per kg of meat. If 10% of the Georgia population shifts to plant-based diet, the shift would reduce about 1.4 Mt CO₂-e per year.

COST COMPETITIVENESS

It depends on the consumer choices, accessibility, availability and preferences.

BEYOND CARBON ATTRIBUTES

This solution results in improved water quality and less extensive farming practices. The farming efficiency of plant-based foods increases with the concentration of higher proteins, while higher animal protein foods decreases the efficiency of energy inputs (Sabaté & Soret, 2014). It promotes an increased quality of life due to the health benefits associated with a plant-rich diet, and it encourages a reduction in obesity.² There is statistically significant protection from cancer associated with switching to a non-animal-based diet and a reduced risk of developing diabetes (Tonstad et al., 2013; Tantamango-Bartley et al., 2013). Plant-rich diets are less expensive, especially in healthcare costs from lowering chronic diseases (Tilman & Clark, 2014). An example from New Zealand found healthcare savings to be from \$14-\$20 billion over the lifetime of their population (Drew et al., 2020).

A negative impact can result from the possibility of increased water usage for plant-based crops, which could amount to 16% increase in freshwater usage (Springmann, et al., 2018). There could also be adverse monetary effects for producers of meat-based products and loss of money on livestock. A major difficulty for this solution will be overcoming opposition in specific regions to a non-meat diet, although smaller steps towards the new diet will be more effective in achieving success.

References:

- Drew, J., Cleghorn, C., Macmillan, A., and Mizdrak, A. (2020). Healthy and Climate-Friendly Eating Patterns in the New Zealand Context. *Environmental Health Perspectives*, 128(1).
- Eshel, G., P.Sttainier, A. Shepon and A. Swaminathan. (2019). Environmentally optimal, nutritionally sound, protein and energy conserving plant based alternatives to U.S. meat. *Scientific Reports*, 9:10345
- Eshel, G., Shepon, A., Noor, E. & Milo, (2016). R. Environmentally Optimal, Nutritionally Aware Beef Replacement Plant-Based Diets. *Environ. Sci. Technol.* 50, 8164–8168.
- Heller, M.C., G.A. Keoleian and W.C. Willett. (2013). Toward a life cycle-based, diet-level framework for food environmental impact and nutritional quality assessment: a critical review. *Environ. Sci. Technol.* 47, 12632–12647.
- National Academies of Sciences, Engineering, and Medicine. (2019). *Sustainable Diets, Food, and Nutrition: Proceedings of a Workshop*. Washington, DC: The National Academies Press. <https://doi.org/10.17226/25192>.
- Sabaté, J., and Soret, S. (2014). Sustainability of plant-based diets: back to the future. *American Journal of Clinical Nutrition*, 100(1), 476S-82S.
- Shepon, A., Eshel, G., Noor, E. & Milo, (2018). R. The opportunity cost of animal based diets exceeds all food losses. *Proc. Natl. Acad. Sci. USA* 115.
- Springmann, M., Wiebe, K., Mason-D’Croz, D., Suler, T.B., Rayner, M., and Scarborough, P. (2018). Health and nutritional aspects of sustainable diet strategies and their association with environmental impacts: a global modelling analysis with country-level detail. *Lancet Plant Health*, 2.
- Tantamango-Bartley, Y., Jaceldo-Siegl, K., Fan, J., and Fraser, G. (2013). Vegetarian Diets and the Incidence of Cancer in a Low-risk Population. *Cancer Epidemiology, Biomarkers & Prevention*, 22(2).
- Tilman, D. & Clark, M. 2014. Global diets link environmental sustainability and human health. *Nature* 515, 518–522.
- Tonstad, S., Stewart, K., Oda, K., Batech, M., Herring, R.P., and Fraser, G.E. (2013). Vegetarian diets and incidence of diabetes in the Adventist Health Study-2. *Nutrition, Metabolism & Cardiovascular Diseases*, 23, 292-299.

Endnotes:

1. <https://www.drawdown.org/solutions/food/plant-rich-diet> <https://www.health.harvard.edu/blog/what-is-a-plant-based-diet-and-why-should-you-try-it-2018092614760>

Corresponding Author:

Dr. Sudhagar Mani

Professor, School of Chemicals, Materials, and Biomedical Engineering

University of Georgia

Phone: 706-542-2358

Email: smani@engr.uga.edu

**0155F Riverbend Research Center North
110 Riverbend Road, Athens, GA, 30602**