

Plant-based versus Animal Protein Sources

Table 1: Greenhouse gas emissions, land use, and water use required for production of plant-based versus animal protein sources ^{1, 2}

| Protein Source | Beef (20% protein) | Pork (20% protein) | Poultry (20% protein) | Eggs (13% protein) | Pulses (20-36% protein) |
|--------------------------------------|-----------------------|-----------------------|--------------------------|-----------------------|-------------------------------|
| GHG (CO2eqs / kg protein) | 45 - 640 | 20 - 55 | 10 - 30 | 15 - 42 | 4 - 10 |
| Land use (m2/yr/kg of protein) | 37 - 2,100 | 40 - 75 | 23 - 40 | 29 - 52 | 10 - 43 |
| Water use liter/g protein | 112 | 57 | 34 | 29 | 19 |



Table 2: US average price per 100 g of plant-based versus animal protein sources ³

| Protein Source | Beef (lean and extra lean) | Pork (boneless chops) | Poultry (boneless chicken breast) | Egg (~2 whole) | Lentils (1/2 cup dry) |
|-------------------|----------------------------------|-----------------------------|---|----------------------|--------------------------|
| Price / 100 g | \$ 1.16 | \$ 0.83 | \$ 0.69 | \$ 0.27 | \$ 0.12 |

Table 3: Nutrient comparisons per 100 g of plant-based versus animal protein sources 4

| Per 100g | Ground Beef 80/20 (~4 oz) | Pork (~4 oz) | Poultry (~4 oz) | Egg (~2 whole) | Lentils (1/2 cup cooked) |
|-------------------|------------------------------|-----------------|--------------------|-------------------|--------------------------------|
| Calories | 254 | 263 | 243 | 143 | 116 |
| Carb (g) | 0 | 0 | 0 | 1 | 20 |
| Dietary Fiber (g) | 0 | 0 | 0 | 0 | 8 |
| Protein (g) | 17 | 17 | 15 | 13 | 9 |
| Fat (g) | 20 | 21 | 20 | 10 | <1 |
| Cholesterol (mg) | 1 | 72 | 143 | 372 | 0 |
| Iron (mg) | 1.9 | 0.9 | 1.2 | 1.8 | 3.3 |
| Potassium (mg) | 269 | 287 | 104 | 138 | 369 |
| Sodium (mg) | 66 | 56 | 40 | 142 | 2 |
| Zinc (mg) | 4.2 | 2.2 | 1.9 | 1.3 | 1.3 |
| Thiamin (mg) | 0.04 | 0.73 | 0.10 | 0.04 | 0.17 |
| Calcium (mg) | 18 | 14 | 187 | 56 | 19 |
| Magnesium(mg) | 17 | 19 | 12 | 12 | 36 |
| Folate (µg) | 7 | 5 | 5 | 47 | 181 |

References: ¹ Mekonnen, M. M. & Hoekstra, A. Y. A Global Assessment of the Water Footprint of Farm Animal Products. *Ecosystems* **15**, 401–415 (2012), ² Nijdam, D., Rood, T. & Westhoek, H. 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**, 760–770 (2012), ³ United Stated Dept of Labor: Bureau of Labor and Statistics, Average Retail Food and Energy Prices, U.S. December 2018, accessed 2/6/2019, ⁴ USDA Food Composition Database, accessed 2/6/2019

For more information contact Teresa Warne at teresa.warne@montana.edu

Artwork by: Angie Mangels



Mountains and Minds



Water Agriculre Food Energy Research Nexus (Waferx)

http://waferx.montana.edu/index.html

This project is part of the Water Agriculture Food Energy Research Nexus (WAFERx). WAFERx is supported by the National Science Foundation under the EPSCoR Track II Cooperative Agreement No. OIA-1632810. Any opinions, findings, conclusions, or recommendations are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.