Better Food Foundation's Plant-Based Nudge Calculator: Detailed Methodology

This document describes the methodology underlying the Better Food Foundation (BFF)'s Plant-Based Nudge Calculator — a tool designed to help food service organizations estimate the annual impact of behavioral nudge interventions on plant-based meal uptake.

The calculator draws on a custom nudge database created from a systematic review of the literature, structured around BFF's five nudge categories: plant-based defaults, menu ratios, labeling, ingredient substitution, and prime placement. The following sections document the evidence base and decision rationale for each multiplier, along with secondary impact estimates for carbon emissions and animal lives. The detailed calculations and links to the studies are available in this document.

This nudge calculator sits at the intersection of empirical research and practical resources—we intend it to ground each multiplier in the best available evidence, while being transparent when the evidence base is thin. It is still an estimate, and confidence ratings throughout this document reflect the varying strength of evidence across nudge categories. We intend to update the database annually with new empirical research or updated frameworks to improve the accuracy of the estimates. This document is accurate as of June 2026.

1. Primary Analysis: Nudge Multipliers

For all nudges, we can estimate the number of animal-based meals replaced by each successful nudge implementation with the following equation:

> **Total Meals Impacted (Annually) =** *[Meals Served Per Customer Per Day] x [Days Open Per Year] x [Consumer Population Exposed to Nudge, Daily] x [Unique Nudge Multiplier]*

Where *Meals Served Per Customer Per Day* is the average number of meal occasions per diner (e.g., 2 for an institution that serves lunch and dinner), *Days Open Per Year* is the number of operating days, *Consumer Population Exposed to Nudge, Daily* is the number of unique diners who encounter the nudge each day, and the *Unique Nudge Multiplier* is the estimated percentage point increase in plant-based meal selection for the relevant nudge type. Here are the multipliers for Better Food Foundation's Five Nudges and one category for miscellaneous or undefined nudges.

1.1 Study Search Criteria

For months, we've been collecting studies into this document. To confirm we didn't miss anything, we cross-referenced it against a 2026 meta-analysis and our expansive Research Database. We also showed our databases to experts in this field to ensure accuracy.

When including studies, we ensured they met certain criteria. For defaults, the study had to involve a pre- and post- percentage of veg food ordered (or a corresponding control vs. experimental dataset). For ratios, we excluded studies on the meat-to-plant-protein ratio within a dish. For labels, we excluded studies that only involved a carbon label and included studies with wording changes. However, we did include studies that involve other types of nudges beyond taste, including health or sustainability.

For all nudges, we removed studies that intended to reduce overall food waste – while these are interesting ideas, they're outside our current scope for this project. We also removed any studies that compared large meat portions to small meat portions, such as this default study. Finally, we excluded studies that focused exclusively on supermarkets or other non-dining-related food-service institutions.

We did include studies that involved vegan or vegetarian options, as well as studies that promoted "sustainable" food — as long as the sustainable food option primarily included veg*n options — but we noted this in the spreadsheet.

For each nudge, we included a Confidence Rating: a subjective assessment of the quality of the evidence for each nudge. A 5-score indicates that the quality of evidence is very high (a number of well-designed, peer-reviewed, empirical studies), while a 1 indicates the estimate is closer to an educated guess.

1.2 Plant-Based Defaults

Multiplier: *0.4965*

Confidence: 4 — Medium High

Rationale: Average of 17 trials measuring the percentage point difference in plant-based meal selection between a meat default condition and a plant-based default condition. Studies span a range of real-world settings, including university cafeterias, catered meals, and restaurants, as well as online hypothetical choice experiments. The mean effect (49.65 pp) is notably large relative to other nudge categories, consistent with the broader behavioral economics literature on the outsized influence of default options on choice. Only trials with both a clear control condition (meat default) and treatment condition (plant-based default) were included; studies measuring partial or ambiguous defaults were excluded.

Notes: The multiplier is an unweighted average across all trials. Long-term retention effects are not captured — defaults may produce an initial boost with diminishing returns over time, though longitudinal data on this are limited. Future versions will explore sample-size and quality weighting, as well as more robust causal identification strategies, such as difference-in-differences designs.

1.3 Ratios ("Climate-Friendly Ratios")

Multiplier: *0.7536(x_2 - x_1); x2 = new ratio of plant-based foods offered, x1 = prior ratio*

Confidence: 4 — Medium High

Rationale: Unlike the other nudge categories, the ratio nudge requires input about the initial and updated percentage of plant-based foods offered — the output of the above formula is a percentage point increase in plant-based meal selection, directly comparable to the multipliers used in other nudge categories. To calculate it, we fit a linear regression to 23 data points of plant-based ratios (n = 23; R^2 = 0.58; Pearson r = 0.76; slope = 0.7536, SE = 0.14) . We then multiplied the slope by the percentage-point difference between the nudge and control conditions. In other words, if an institution currently offers 50% vegan food, up from 10% vegan food before, the change would be 40 percentage points (.40).

Notes: It is unknown if the relationship between the veg food offered and the veg food ordered is strictly linear. Reviewing the collected data points (n = 23), they appear linear and homoscedastic, indicating linearity. Three caveats temper the estimate: (1) the datapoints come from only about 6 studies, so observations from the same study are not statistically independent; conventional R^2 and the reported slope SE therefore slightly overstate precision. (2) The linear form is an empirical convenience; we cannot confirm the true availability-to-selection relationship is strictly linear, especially near the 0% and 100% bounds. (3) Datapoints derive from studies with differing baselines, menu sizes, and outcome definitions, adding cross-study heterogeneity. Future versions will explore study-level clustering and sample-size weighting.

1.4 Labels ("Tasty Titles & Descriptions")

Multiplier: *0.124*

Confidence: 3 — Medium

Rationale: Average of 34 trials measuring the percentage point increase in plant-based or vegetarian meal selection when descriptive or framing language was applied to menu items — including taste-focused, health-focused, and sustainability-focused labels. Studies span real-world cafeteria and restaurant settings as well as online choice experiments. We included studies involving broadly construed wording changes, including health and sustainability framings. Still, we excluded studies that involved only carbon footprint labels (which are captured separately in the eco-labeling literature) and studies that measured only attitudinal rather than behavioral outcomes. The mean effect of 12.4 percentage points is notably smaller than defaults and ratios, consistent with the broader finding in Lohmann et al. (2025) that decision-information interventions are less effective than structural choice-architecture changes.

Notes: Could further categorize based on nudge appeal (i.e., *health-focused* vs. *taste-focused*). However, this could increase the difficulty of nudge tracking for advocates and institutions and may not be worthwhile.

1.5 Ingredient Swap ("Subtle Substitutions")

Multiplier: *0.05*

Confidence: 1 — Low

Rationale: We are unaware of a large-scale estimate of the number of animal product servings mitigated through ingredient swaps. The closest is the Rethink Priorities study on eggs, which shows that eggs typically make up a small percentage of overall prepared meals. The .05 multiplier is therefore an estimate that needs more data.

Notes: High amount of variance here, so estimated on the lower end of the spectrum, given that many substitutions may not affect the whole menu.

1.6 Prime Placement

Multiplier: *0.0475*

Confidence: 3 — Medium

Rationale: Based on 10 data points from 7 studies measuring the effect of repositioning plant-based or vegetarian options to a more prominent position — either first on a menu or at the front of a buffet or counter. Studies spanned university cafeterias, restaurants, hospital menus, and simulated food-delivery apps and yielded a mean effect of **4.75 percentage points** (range: 0–15 pp). The wide range reflects genuine context-dependency: a large-scale study across 136 Swedish hamburger restaurants found no significant effect of moving vegetarian items to first position on a digital menu. In contrast, a simulated food-delivery app study found a 15-pp increase. The central estimate of 0.0475 is used as the multiplier.

Notes: Effect sizes appear modestly larger in buffet/counter settings than menu-only interventions, though the evidence base is too small to stratify reliably. Pre-post designs in some included studies may inflate estimates.

1.7 Other Nudges

Multiplier: *0.074*

Confidence: 2 — Medium Low

Rationale: Averaged the multiplier for substitutions, placement, and label nudges. These three nudges are closer in terms of impact (being weaker than the two most powerful nudges: defaults and ratios).

Notes: Since this category is inherently a catch-all, it may be difficult to refine further. Improvements to the estimates of the other three categories may improve this estimate.

1.8 Concerns & Limitations

- Most studies in this database use pre-post or quasi-experimental designs rather than randomized controlled trials, which may inflate effect size estimates. Lohmann et al. (2025), the most comprehensive meta-analysis of food nudge interventions to date, found that studies without randomization or control groups tend to report larger effects — suggesting our multipliers should be treated as upper-bound estimates rather than precise predictions. However, Lohmann does not provide a clean conversion factor that would allow us to adjust our multipliers downward with confidence, and we therefore do not apply a correction. We will revisit this if future research quantifies the inflation effect more precisely.

- The long-term impact of most nudges is unknown, so the effect may differ in long-term implementations.

- Studies on food nudges vary in how they define the outcome measure — some target strictly vegan or vegetarian choices, others measure "non-meat" selection, which may include fish. Where studies used broader definitions, this is noted in the database. This heterogeneity introduces some imprecision into cross-study comparisons.

- Extrapolating data into the total number of animals saved or CO_2 emissions saved will be very imprecise without knowing the types of animal products that existed before the nudges. BFF addresses this in Sections 2 and 3 by applying weighted averages based on US average meat consumption data (USDA ERS), which proxies for a typical animal-product baseline in the absence of institution-specific data.

- Future versions of this methodology will explore sample-size weighting across nudge categories to better reflect the relative evidential weight of individual studies.

2. Secondary Impact Analysis: CO_2e Savings per Meal Replaced

Annual CO_2e Mitigation Potential = *1.77 x [Animal-Based Meals Replaced]*

The Nudge Calculator estimates the number of animal-based meals replaced by each intervention. This section translates those meal counts into estimated greenhouse gas (GHG) savings, expressed in kilograms of CO_2 equivalent (CO_2e). Estimates are based on US consumption patterns and peer-reviewed lifecycle assessment (LCA) data.

This approach is complementary to estimates such as WRI's Protein Scorecard, adapted to a per-meal basis, which is the level that nudges operate on.

2.1 CO_2e Per Meal, Meat

To calculate the average CO_2e mitigation per type of animal protein, we calculated:

[kg CO_2e / kg of meat product] x 0.20 x [share of US meat consumption]*

We then summed the weighted CO_2e for each protein type to obtain a final total of **2.59 kilograms of CO_2e** per meal with animal protein. Full calculations are available here, with all sources [Poore & Nemecek, 2018; USDA].

*This assumes 200g of cooked meat per meal. To estimate the grams of cooked meat per meal, we reviewed several sources, including US dietary guidelines, surveys of restaurant owners, and studies on the topic — these are shown in the limitations section below. We believe the 200g, while a conservative estimate compared to restaurant settings, is still quite variable.

2.2 CO_2e per Meal, Plant-Based

For the plant-based meal baseline, we draw on Scarborough et al. (2023), the most comprehensive dietary emissions study to date, which found that vegan diets in the UK produce 2.47 kg CO_2e per day across all meals. Dividing by three meals per day gives an estimated plant-based meal emissions of **0.82 kg CO_2e.**

Note: The 0.82 kg CO_2e figure is drawn from a UK cohort; US vegan diets may differ in composition and emissions intensity. We treat this as a conservative floor — US-specific estimates suggest a lower per-meal plant-based footprint, which would increase the savings figure above 1.77 kg CO_2e.

2.3 CO_2e per Meal Replaced

Subtracting the average plant-based meal carbon emissions from the average meat-based meal carbon emissions yields a central estimate of:

2.59 - .82 = 1.77 kg CO_2e

This figure can be multiplied directly by the Total Meals Impacted (Annually) output from the Nudge Calculator to produce an estimated annual CO_2e reduction per nudge or program.

2.4 Limitations & Assumptions

- **Protein mix uncertainty:** If a nudge targets a specific protein context (e.g., a beef-heavy burger outlet), the weighted average will understate or overstate savings.
  - **Geographic Limitation:** This model uses a US-specific protein split and may not be as accurate in other cultures.
- **LCA variability:** Per-kg CO_2e figures vary substantially across production systems, geographies, and methodologies. The Poore & Nemecek dataset draws on global averages; US-specific figures may differ.
- **Indirect effects not captured:** Nudges may shift purchasing behavior beyond the meal occasion. These upstream effects are not reflected in this estimate.
- **Compounding uncertainty:** This CO_2e layer inherits all uncertainty from the Nudge Calculator multipliers. Low-confidence nudge estimates (e.g., Ingredient Swap, Confidence 1) will produce commensurately uncertain emissions figures.
- **Geographic mismatch in plant-based baseline:** The plant-based meal footprint (0.82 kg CO_2e) is derived from a UK vegan diet study (Scarborough et al., 2023), while the meat-based footprint uses US consumption data. US vegan diets are associated with lower emissions per calorie than the UK equivalent, suggesting the 1.77 kg CO_2e savings figure is likely conservative rather than inflated for US contexts.

2.5 Contextual Information on Serving Size Estimate

Value	Rationale	Source
85g (3 oz) cooked	USDA Dietary Guidelines recommended portion. Represents a nutritional target, not a description of actual eating behavior.	USDA Dietary Guidelines for Americans 2020–2025
~340g (12 oz) cooked Portions 2–4× USDA guidelines	Survey of US restaurant chefs (*n* = 300). Nearly half reported serving 12 oz (340g) strip steaks as standard. Restaurant portions were 2 to 4 times larger than USDA recommendations. Customer expectations and food cost—not calorie content—were the primary drivers of portion-size decisions.	Condrasky et al. (2007), *Obesity*, 15(8), 2086–2094.

211g cooked 183g in reduced-portion condition	Cross-over field experiment across three Dutch restaurants (n = 1,006 observations). Meat portions on standard main dishes averaged 211g in the control condition.	Reinders et al. (2017), *PLOS ONE.*
113–340g (4–12 oz) cooked Varies by event type	Industry catering guidance places adult dinner portions at 113–170g for plated meals, 170–227g for buffets and barbecues, 227–283g for weddings and formal events, and 283–340g for holiday feasts.	Webstaurant Store, "Protein Portion Guide". (Non-academic industry guidance source, used as supplementary evidence)

3. Tertiary Analysis: Number of Animal Lives Represented

3.1 Simple Calculation

Total Animals Represented (Annually) = *.087 x [Animal-Based Meals Replaced]*

Take your annual meals impacted from the Nudge Calculator and multiply by 0.087 (US average diet) to estimate animal lives impacted per year. Example: If your nudge is projected to replace 50,000 meals annually, you would estimate 50,000 × 0.087 = 4,350 animal lives annually.

3.2 More Detailed Diet Scenarios

The number of individual animals needed to produce each kilogram of meat varies substantially across species. Around 179 chickens are required to produce the same amount of meat as a single cow. This means that replacing meals has vastly different impacts on animal lives depending on which proteins people were eating before the nudge. To help reconcile these discrepancies, we've created the following multipliers based on other diet compositions.

- • Use **0.087 (Midpoint, Default Estimate)** if the target meals are similar to a US-standard diet.
- • Use **0.069 (High-Beef)** if your population is beef-heavy (e.g., Texas steakhouse, traditional American restaurant)

- • Use **0.104 (High-Chicken)** if your population is chicken-heavy (e.g., health-conscious campus, fast-casual chains)
- Use **a range (.069-.104)** if you are unsure of the diet composition

  Example (High-Chicken Scenario): Nudge Calculator Output: 50,000 meals replaced annually in a health-focused university cafe with many chicken options • Calculation: 50,000 × 0.104 = 5,200 animals represented by the nudge intervention

If your nudge targets a **specific protein only** (e.g., a beef burger swap program, or seafood-specific intervention), you can use the protein-specific values from Step 2 for a more accurate estimate:

- **Beef-only nudges:** 0.00066 animals per meal (much lower due to large body size)
- **Chicken-only nudges:** 0.118 animals per meal (higher due to small body size)
- **Fish/seafood-only nudges:** 0.74 animals per meal (highest impact)
- **Pork-only nudges:** 0.058 animals per meal
- **General/mixed protein nudges:** Use the diet scenario multipliers above (0.069-0.104)

To review the full calculations, see this datatable.

3.3 Considerations & Limitations

*These calculations rely on prior estimates from the nudge calculator and assumptions that cascade, resulting in limitations and assumptions that introduce **uncertainty across multiple estimation layers**. Therefore, we urge organizations to think of these numbers as estimates, not exact figures.*

Fish species variation: Fish lives per kilogram vary enormously by species. Our figure (3.7) uses a weighted average for farmed fish in US markets.

Eggs and dairy: This framework focuses exclusively on meat protein. Ingredient swaps involving eggs or dairy would require separate calculations.

Indirect deaths included: the methodology includes feeder fish killed and fed to pigs and chickens, as well as male chicks and calves that die as indirect effects of egg and dairy production. These substantially increase the per-kilogram animal count, particularly for chicken and pork.