Technical Report

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Goal: To establish statistical evidence that the completion of a four-question quiz has a positive effect on the perception of Palm Oil as harmful or beneficial to the environment.

Key Findings

- **64%** of respondents rated Palm Oil as bad for the environment by giving it a score of 1 or 2 on a 5-point scale. After completing the quiz, the number *dropped to 38%.*

- The overall average perception of Palm Oil as positive to the environment *increased from 30.3% to 47.9% after the quiz*, a statistically significant change.

- Participants who showed a higher level of prior knowledge about palm oil had *more positive perceptions* about the product both before (53.0%) and after the questionnaire (67.1%).

- The change in perception about palm oil showed *similar rates for all levels of prior knowledge about the product.*

- For each correct question, there is a *9% increase* in the likelihood that a participant will improve their perception of palm oil, *regardless the rating given before the quiz.*

Introduction

The survey was administered between November 20th and December 1st, attracting 982 complete responses. This survey encompassed four questions—three with definitive correct answers and one subjective question. Analysis revealed 8% of participants answered all three objective questions correctly, 29% answered two correctly, 47% got one right, and 16% did not answer any correctly. 'Sustainability' saw the most incorrect responses at 76%, followed by 'Deforestation' at 60%, and 'Economy' at 36%. Notably, 64% of participants reported a change in opinion after the survey.

This report aims to present the results of statistical analyses performed to describe the magnitude of the change on the perception of palm oil prior that was causes by the survey completion. In addition, it aims to understand the effect that answering particular questions correctly might have on this change in perception.

Methodology

Ratings ranging from 1 to 5 were translated to a 0-100% scale, facilitating a clearer interpretation of mean ratings. Paired-Samples T-tests were used to assess the differences before and after survey completion, applying data stratification where appropriate—for instance, assessing the questionnaire's impact on palm oil perceptions segmented by quiz performance. Means were accompanied by 99% confidence intervals, suggesting a high probability that the sample accurately reflects the broader population. The effect of the quiz performance on perception change was statistically analyzed via logistic regression models (probit models), which tested the effect of quiz performance on any positive change on perception, in contrast with no change or a negative change.

## Which were the opinions before and after the survey?

39% of respondents said palm oil is 'Very Bad' (score of 1) to the environment prior to taking the quiz. Only 7% of the sample said palm oil is 'Very Good' (score of 5). In fact, almost 2 out of every 3 respondents (64%) scored palm oil in the lower-half of the scale (1 or 2 on the 5-point range).

After the survey was taken, this number dropped to 38%, with 36% of respondents now scoring palm oil a 4 or 5 (Very Good) in the scale.

How did opinion change after taking the questionnaire?

The heatmap below presents changes in respondents' perceptions of palm oil's environmental impact before and after completing the questionnaire. The 'Rating Before' scale on the x-axis and 'Rating After' on the y-axis show that a relatively large percentage (16.4%) perceived palm oil as very bad both before and after the questionnaire. There are visible shifts in perception, such as 10.7% moving from a rating of 1 to 3, suggesting a positive shift in perception post-quiz. The color intensity

represents the percentage of respondents in each category, with darker shades indicating higher percentages. Overall, while many respondents did not change their initial negative perception, there is a noticeable movement towards a more positive view of palm oil's environmental impact after the quiz.
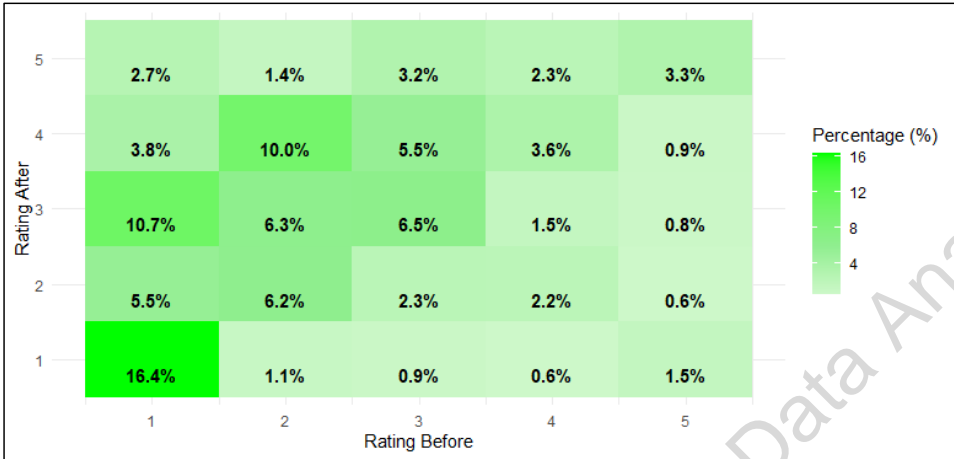
There is a noticeable decrease in the count and percentage of respondents rating palm oil as "very bad" (1) after the survey, dropping from 19.6% to 10.3%. Conversely, the percentage of respondents rating palm oil as "very good" (5) increased from 3.6% to 6.5%.
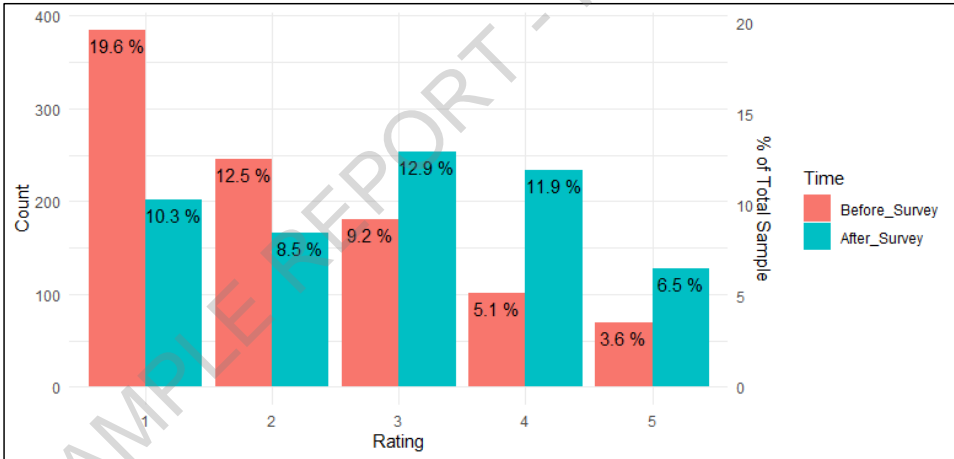
The boxplots below depicts respondents' ratings on palm oil's environmental impact after completing a survey, segmented by their initial ratings. Each box represents the range of ratings after the survey for each initial rating category. For instance, respondents who initially rated palm oil as 'very bad' (1) have a post-survey rating spread from 1 to 3, showing a positive shift. The median ratings post-survey (indicated by the line within each box) increase for initial scores '1' and '2'.
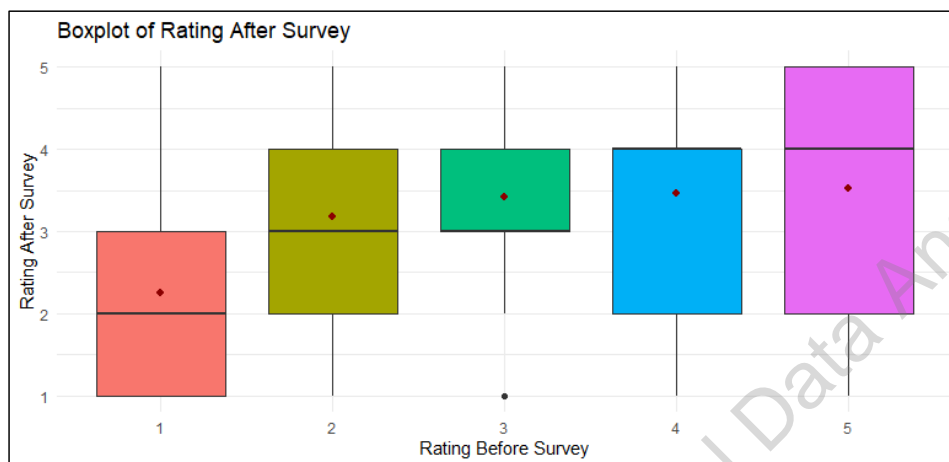
The perception of palm oil prior to taking the quiz was 30.3% (99% CL: 27.8%-32.9%) and increased to 47.9% (99% CL: 45.2%-50.6%). This difference was statistically significant (t = -15.06, p < 0.001), *which means that taking the questionnaire significantly improves the perception of palm oil.* This change represents a *58% change* in perception compared to baseline perception scores.

To what extent questionnaire performance impacts perception change?

The table below shows the patterns of the attitude change towards palm oil for respondents that have accurately responded to questions and those that have not. It also shows the pattern of change based on how many questions respondents got correctly.

Factor	Mean - Before	Mean - After	99% CI	Mean Difference
Sustainability - Wrong	27.3%	44.1%	(16.78%; 24.41%)	16.8%
Sustainability - Correct	39.7%	59.7%	(20.00%; 34.18%)	20.0%
Deforestation - Wrong	27.4%	45.0%	(17.65%; 24.02%)	17.6%
Deforestation - Correct	34.6%	52.1%	(17.44%; 30.62%)	17.4%
Environment - Wrong	31.8%	49.4%	(17.67%; 27.63%)	17.7%
Environment - Correct	29.5%	47.0%	(17.51%; 26.17%)	17.5%
Survey Score - None correct	30.5%	48.9%	(18.35%; 23.87%)	18.4%

Survey Score - One correct	26.5%	41.8%	(15.39%; 22.80%)	15.4%
Survey Score - Two correct	30.4%	52.0%	(21.58%; 25.88%)	21.6%
Survey Score - All correct	53.0%	67.1%	(14.14%; 42.76%)	14.1%

Respondents' attitudes toward palm oil become more positive following the questionnaire, regardless of initial accuracy on key environmental topics. Those with misconceptions about sustainability or deforestation show substantial perception improvements (16.8% and 17.6%, respectively) after the survey. Nevertheless, respondents who have answered correctly exhibit similar patterns of perception change. With respect to the number of questions answered correctly, those that answered two questions correctly show a larger gap of perception compare to those that got none of only one question correctly. Interestingly, the difference decreases for respondents that have answered them all correctly. It's worth noticing that only 7.7% of respondents represent this category and their initial perception of palm oil was already quite positive (53%).

The graph below shows the mean perception scores (before and after the quiz) as the number of correct answers increase.

A probit model was tested to check if the survey score influenced the likelihood of improving perception change. The model was controlled by the rate given before the quiz, in order to neutralize the effect that the strength of this opinion might have on the perception change. This allowed the model to check if the survey score, solely, had any effect on perception change.

We found that, *for each additional question the respondent answers correctly, the likelihood that their perception of palm oil gets better increases by 9%* (B = 0.091, OR = 1.096, p < 0.10).

An additional model was tested to evaluate if particular questions would influence the likelihood of perception change, but this influence was not observed ($p > 0.10$), which indicates that the relative content of the questions did not play a significant role.

Finally, a moderation analysis was performed to check if the effect of answering correctly on perception change depended on the prior perception that the participant had about palm oil. The model showed that the Rating given before the questionnaire *does not have any significant influence* on the relationship between the number of correct answers and perception change ($p > 0.10$). This means that answering correctly *increases the likelihood of improving perceptions of palm oil regardless of the initial rating that was given.*

<u>Conclusion</u>

The questionnaire's impact on public perception of palm oil's environmental effects is noteworthy. Initially, a majority of respondents viewed palm oil negatively, with 64% assigning it lower ratings. Following the survey, this perspective shifted positively, dropping to 38%. This shift is underscored by the increased average positive perception, rising from 30.3% to 47.9%. Those with a robust understanding of palm oil consistently rated it more favorably, indicating that prior knowledge may influence positive perceptions. Interestingly, regardless of initial opinions, the survey uniformly improved perceptions, with an expected 9% increase in positive outlook for each correct response. This pattern suggests that educational interventions like this survey can effectively reshape environmental perceptions.