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Taste the Difference: An Investigation of the Correlation Between Sustainable Farming Practices and Distinct Taste Perceptions

Daucus carota (carrots), Brassica oleracea (kale), and Phaseolus vulgaris (bush beans)

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01. Introduction

The demand for sustainably produced food is increasing due to its perceived benefits, including better nutrition, health, environmental sustainability, and taste (Fillion & Arazi, 2002).

Studies have shown that vegetables grown using environmentally sustainable practices can impact their taste profiles. Specifically, cultivation practices have been shown to modulate epigenetic changes, which are reflected in various organoleptic traits, including color, shape, acidity, sweetness, flavor and aroma (Lucini et al., 2020).

The primary motivation of this study is to assess whether taste differences in vegetables can be attributed to variable cultivation methods. It explores how a gradient of cultivation practices, from conventional to fully sustainable affect taste, and at what point consumers can perceive these differences.

This study is important because consumer purchasing decisions influence the direction of the food and agriculture industries, therefore identifying organoleptic distinctions could help steer the market toward more sustainable practices (Virginia Tech, 2018).

02. Objective

To determine if kale, carrots, and bush beans grown under five increasing levels of sustainable farming practices show increasingly distinguishable taste perceptions and flavor intensities, correlating with the degree of sustainable practices implemented.

Related literature

This study builds upon the work of de Jongh (2020) and adopts a similar methodological approach, with some modifications.

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03. Methodology

Kale, carrots, and bush beans were evaluated by a human sensory panel (n=86) to determine if crops grown under five increasingly sustainable farming practices could be distinguished by taste and flavour.
Sensory evaluation:

- **Five treatment groups evaluated**
- **iPad based surveys**
- **Treatment distinguishability**
- **Quantifying flavour intensity**

Statistical tests used:

- Adjusted Chi-square
- Generalized Linear Model
- Odds Ratio

The vegetables used in this study were grown at Sandown Centre for Regenerative Agriculture, a restoration agricultural research plot, located in North Saanich, British Columbia.

04. Results/Findings

Treatment distinguishability

Cumulative assessment of all treatments suggests that varying sustainable farming practices do not result in distinguishable taste perceptions. However, sensory differences may be detected in specific treatment comparisons, rather than across all treatments.

Treatment comparisons that suggest sustainably vs conventionally grown vegetables have taste differences perceivable to consumers:

- **Bush beans: treatments 1 vs 5**
- **Carrots: treatments 1 vs 5 ; 3 vs 4**
- **Kale: treatments 1 vs 3 ; 1 vs 4**

Quantifying flavour intensity

For bush beans and carrots, the treatments that were distinguishable by taste showed that the more conventionally produced treatments were associated with a more positive flavor.

Photo credit: Kyriakides, M. (2024)

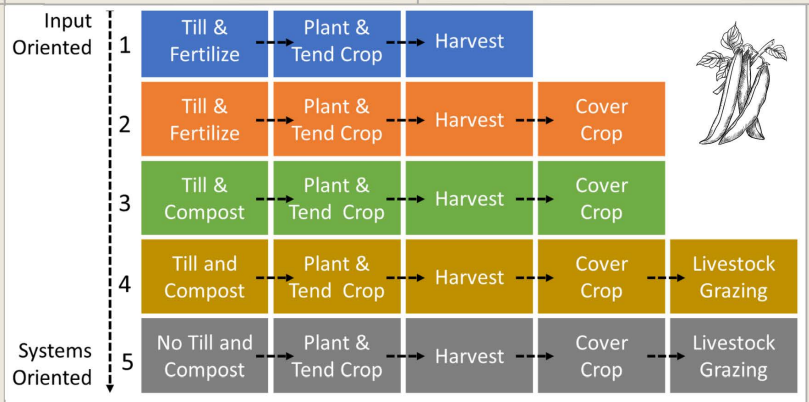

Figure. Adapted from Kyriakides, M. (2023). Visualization of the five treatment groups for kale, carrots and bush beans used to determine treatment distinguishability and flavour intensity. Treatment 1 is the most conventional method and treatment 5 is the most sustainable method of production.

05. Analysis/Conclusions

In bush beans and carrots, the comparison of treatments 1 and 5 suggests a four-degree difference in cultivation practices is necessary for taste differentiation. However, the comparisons of treatments 3 vs 5 in bush beans, treatments 3 vs 4 in carrots, and treatments 1 vs 3 and 1 and 4, in kale, imply that lesser degrees of difference may result in distinguishable taste.

Treatment 1 was a significant differentiator across all three crops, with kale showing the greatest sensitivity to variation and bush beans the least.

A common pattern in distinguishable treatments is the use of synthetic versus organic fertilizers, suggesting that fertilizer type may significantly affect taste.

Further research is needed to pinpoint which specific differences along the conventional-to-sustainable cultivation gradient have a significant impact on taste perceptible to consumers. However, this study suggests that a fully organic approach may not be required to push the agricultural system toward greater sustainability.