Is It Eco-friendly and Safe? Investigation of Consumers' Perceived Ecological Benefits, Contagion Beliefs, and Safety Concerns of Hydroponic, Aquaponic, and Organic Produce

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Economic Impact on California Agriculture: Vertical and indoor farming companies are gaining traction in California as a sustainable farming system. One example is Plenty Ag (https://www.plenty.ag), a leader in developing technologically advanced farms to grow leafy greens and other produce in controlled environments. Plenty Ag has built their business model around the concept of growing food in warehouses, using less water and land. However, vertically farming is risky, not only in California, but globally, with several high-profile operations unable to stay in business. While some of the risk of vertical farming is centered around energy costs (for lighting and pumps), the cost of facilities, and other capital equipment; another aspect of risk involves consumers who may not understand the ecological and social benefits of soil free growing systems. Understanding the value consumers place on vertical farming may decrease the riskiness of vertical farming.

Rationale/Introduction: USDA Organic certified food sales in the US rose between 2008 and 2023, from $20.39 billion to $69.7 billion, as consumers continue to demand sustainably produced food. Two other sustainable growing methods, hydroponics and aquaponics, are less familiar to consumers than organic production. Both alternative methods grow plants without soil, with water delivering nutrients. Much of the water is recycled in this closed-loop system, resulting in water savings of over 90%. Hydroponics requires a nutrient solution to be added to the system, whereas aquaponics relies on fish within the system to deliver the bulk of the nutrients. Most eco-conscious consumers are very familiar with the organic label and understand the eco-benefits of organic production. Consumers may have limited knowledge or confusion about the environmental benefits of hydroponics and aquaponics and may even lack an understanding of the safety risks associated with soilless growing technologies. This research is working to understand where knowledge gaps occur and to quantify what consumers are willing to pay (WTP) when it comes to aquaponic and hydroponic produce.

Experimental Approach: The primary research approach has been to develop and implement market research instruments that ask consumers about their perceptions of agricultural products grown using these methods, and also asks about their WTP for the products. We collect additional demographic information, including their race and ethnicity, education, and income levels, to better understand the factors that lead to knowledge, attitudes, and WTP. The survey design was approved by the Institutional Review Board (IRB), with the first round of reaching approximately 300 respondents.

Major Conclusions: Results have shown participants perceive that aquaponics are significantly more natural, free of pesticides, free of preserves, organic, pure, unprocessed, healthy, nutritional, and full of vitamins than hydroponics. It was also seen that consumers perceive aquaponics to be significantly safer and less dangerous than hydroponics. Another interesting finding is that they have a higher WTP for organic basil, kale, and lettuce than for hydroponics or aquaponics. The differences in WTP between hydroponics and aquaponics are minimal. These results indicate producers can expect a premium from hydroponics and aquaponics but may need to invest resources towards improving consumer knowledge. Doing so may enable producers to raise the WTP of their consumers.