Food Quality and Preference 48 (2016) 283–292

Contents lists available at ScienceDirect

Food Quality and Preference

journal homepage: www.elsevier.com/locate/foodqual

Recycled wastewater and product choice: Does it make a difference if and when you taste it?

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ARTICLE INFO

Article history:
Received 14 August 2014
Received in revised form 10 October 2015
Accepted 19 October 2015
Available online 28 October 2015

Keywords:
Discrete choice experiment
Error components
Consequentiality
Scale
Water management

ABSTRACT

With water security issues looming large for much of the world's population, efficient use of water will become increasingly important. One solution is recycling wastewater however consumer acceptability is uncertain with the potential for rejection. People may support wastewater recycling conceptually but reject products containing recycled water due to the "yuck" factor. This simple problem presented an opportunity to compare different experimental approaches emerging from different literatures. This paper reports on an experiment which utilises meat products purported to be manufactured with or containing recycled production wastewater to explore choice behaviour. Participants ($n = 203$ adult consumers of minced beef products) were randomly assigned into two conditions, a Binding Condition (told they would be eating four random selections of their next choices) and an Experience Condition (asked to taste four meatball samples prior to completing their next lot of choices). Statistically significant preference and scale differences between the pre-and post intervention were observed suggesting that participants may initially under-estimate their acceptance of a product with a negative attribute when they believe they are just answering a survey. One explanation of the differences among conditions is that participants experience a degree of anticipatory dread if told they will be eating their next choices in a survey compared with just answering a survey or experiencing the product prior to making choices. Results suggest that any investment in recycling will need to be justified on the basis of avoided waste charges and/or reductions in input costs as consumers are not willing to pay a premium to conserve water.

1. Introduction

Governments are exploring multiple strategies to address water scarcity including amending governance arrangements with respect to water resources, reducing water consumption through restrictions, pricing policies and introducing wastewater reuse and recycling (Grey et al., 2013). Consumer acceptability of wastewater recycling remains a major impediment to adoption. Some communities may support the idea of water recycling conceptually in periods of water scarcity and extended drought but projects have become derailed in the actual implementation (Hurlimann & Dolničar, 2010; Nancarrow, Leviston, & Tucker, 2009).

Recycled wastewater is water returned from municipal/industrial use, agricultural runoff or stormwater that is treated to a state fit for purpose. There are two main motivations for governments to explore wastewater recycling. First, in areas where freshwater is abundant, intercepting, treating and diverting wastewater to alternative uses can serve to reduce pollution loads and protect sensitive receiving waters (Lazarova et al., 2001). The second and more pressing reason for wastewater recycling is fresh water supplies are becoming increasingly scarce with an estimated four billion people worldwide living with either physical or economic scarcity of water (Vörösmarty et al., 2010).

In the Australian context, physical scarcity of water during the Millennium drought (1997–2009) led to urban water utilities exploring the acceptability of desalination and different forms of water recycling such as wastewater and stormwater recycling.

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http://dx.doi.org/10.1016/j.foodqual.2015.10.004
0950-3293/

Many Australian industries reviewed their water usage patterns and replaced potable drinking water with recycled water. Examples include an oil refinery in Brisbane, Queensland, heavy industry in Kwinana WA, steel production in Illawarra, NSW. In the food and beverage industry, restrictions on both water supplies and trade waste disposal limited the expansion of two breweries in Brisbane, Queensland (Apostolidis, Hertle, & Young, 2011). With waste minimisation and on-site advanced treatment, wastewater recycling within a food manufacturing context (such as dairy production or meat production) has the potential for reducing costs in two ways: by reducing trade waste and associated fees, as well as the potential reduction in water as an input cost.

Hazards of wastewater vary by source (municipal sewage, agricultural, manufacturing, industrial), end-use (non-potable reuse such as cooling towers being low risk) and proximity to human contact and ingestion. Risk to human health depends on contact (skin contact vs ingestion) and wastewater constituents: bacteria, parasites and viruses (illness); organic and inorganic chemicals (acute and chronic toxicity, carcinogenic, reproductive, developmental and neurotoxicity risk, Ikehata (2013)).

Consumers are very conscious of food safety, technology in food production and have varying perceptions of risk (Dosman, Adamowicz, & Hrudey, 2001). Further, revulsion may be a deeply ingrained evolutionary response to the oral ingestion of substances that may cause illness (Curtis, Aunger, & Rabie, 2004). Once the association between a technology/product and a visceral "disgust" or "yuck" response has been established, it can be difficult to communicate effectively with consumers (Nancarrow et al., 2009), for example, as the recent case of lean finely textured beef demonstrated in the United States (Tybur & Griskevicius, 2013).

1.1. Theoretical perspectives

Stated choice (SC) experiments have been used to understand the context of food choices (Lockshin, Jarvis, d'Hauteville, & Perrouty, 2006; Jaeger & Rose, 2008), labelling of nutritional information (Gracia, Loureiro, & Nayga, 2009), country-of-origin and food safety (Loureiro & Umberger, 2007), and the presence of genetically modified organisms (GMOs) (Hu, Veeman, & Adamowicz, 2005). As food production technologies change to utilise different processes or inputs, consumer acceptability will continue to be an important issue as experience with GMOs indicates. While the Australian public has expressed support in the past for water efficiency and water recycling, it is not clear that this support will be maintained when participant contact with recycled food production wastewater moves from a concept (as part of a survey or a hypothetical stated choice experiment) to actual experiencing of the product. Recent attempts to make SC tasks more realistic and less prone to a problem known as hypothetical bias provide mechanisms for making an experiment consequential for participants. Researchers in other fields such as environmental economics have been concerned with detecting and potentially measuring whether participants act in a strategic manner rather than reveal their true preferences when answering stated choice surveys (Carson & Groves, 2007). Rather than abandon SC experiments, researchers have explored alternative strategies to either encourage participants to act as they would in real markets, or minimise any biases that may arise if they do not make choices that reflect their true preferences.

A limited number of choice experiments have involved product tasting as part of the experimental protocol as a means of providing context and information (e.g. Chowdhury, Meenakshi, Tomlins, & Owori, 2011; Jaeger & Rose, 2008) and tasting within conjoint analysis studies has been undertaken (e.g. Grunert, Bech-Larsen, Lähteenmäki, Ueland, & Åström, 2004). Studies such as Mueller, Osidacz, Francis, and Lockshin (2010), have queried what participants think of previous tasting of the product. Another strategy emerging in the wider discrete choice literature has participants being informed that only one choice task out of the sequence will be randomly selected and used for modelling purposes so as to make choices more consequential (Carson & Groves, 2007; Fifer, Rose, & Greaves, 2014). A variation on this strategy involved participants being informed that at least one of the choices they make whilst undertaking a SC experiment will be selected at random and will be binding in terms of purchasing (Chowdhury et al., 2011; Ding, 2007; List, Sinha, & Taylor, 2006; Lusk & Schroeder, 2004).

The current study drew upon the fundamentals of these methodologies to develop an experiment in the context of consumer acceptance of recycled water usage in food production. We aimed to combine approaches and insights from the food choice literature (Jaeger & Rose, 2008; Jaeger et al., 2011) with the economic, marketing and transport literatures on consequentiality to develop a methodologically robust choice experiment (Ding, 2007; Fifer et al., 2014; Lusk & Schroeder, 2004).

1.2. Study aims and objectives

The current study aimed to explore consumer choice and acceptability of recycled water in food production using a discrete choice experiment with tasting as one of the experimental treatment conditions. The food stimuli used were processed meat products (beef meatballs). The study aimed to compare pencil-and-paper theoretical choice scenarios with (1) binding choice scenarios (Lusk & Schroeder, 2004), where a choice in a survey is tied to an action to explore the role of consequentiality and (2) with actual prior experience of the product.

Specifically we aim to:

1. Test the impact of an experimental Binding Condition on participants choices (taste what they chose in the choice task), relative to a Control (comparing within-subjects).
2. Test the impact of an experimental prior product Experience Condition (tasting before completing choice task), relative to the Control (comparing within-subjects).
3. Compare between-subjects to test for differences between the Binding Condition and the Experience Condition.
4. Compare consumers' willingness to pay (WTP) for products containing recycled water relative to regular tap water.

2. Methods

2.1. Participant selection and inclusion criteria

Participants were recruited by an accredited market research company on basis that they were 18–65 years, not pregnant, without a food allergy, the main shopper in their household and a regular consumer of beef products. Participants (in small groups) attended one central location test session. Prior to the experiment, all participants were given the same standardised set of instructions on the procedural elements of the experiment including how to answer the questionnaires. Participants were also told that they would have an opportunity to taste some beef meatball products, but they were not informed about recycled water use in the food stimuli prior to entering the sensory booth, nor were they informed about when or how tasting would occur. Once signed consent forms were collected, participants were escorted to individual sensory booths. Participants could opt-out of the research at any time, receiving a $40 honorarium for completion of the task.