FOOD FRONTIERS Open Access

RESEARCH ARTICLE OPEN ACCESS

Food for Thought: How Culture Shapes Intentions to Reduce Food Waste in South Africa

Wibke Heidig[1] | Thomas Dobbelstein[2,3] | Roger B. Mason[4]

[1]Department of Business Science and Management, Albstadt-Sigmaringen University of Applied Sciences, Sigmaringen, Germany | [2]Faculty of Management Sciences, Durban University of Technology, Durban, South Africa | [3]Business Faculty, Baden-Württemberg Cooperative State University, Ravensburg, Germany | [4]Department of Marketing and Retail, Durban University of Technology, Durban, South Africa

Correspondence: Roger B. Mason (rogerm@dut.ac.za)

Received: 27 September 2024 | **Revised:** 21 December 2024 | **Accepted:** 2 January 2025

Funding: This work was financially supported by Baden-Württemberg Cooperative State University, Ravensburg, Germany.

Keywords: consumer behavior | culture | cultural values scale (CVSCALE) | food waste | households | South Africa

ABSTRACT

In the context of increasing food scarcity, the issue of household food waste has garnered significant attention, particularly in developing nations. Despite its critical importance, there remains a paucity of empirical research exploring the underlying behavioral and cultural factors that shape individuals' intentions to reduce food waste within their homes. This article seeks to bridge this gap by drawing on the theory of planned behavior to examine how personal cultural values impact attitudes toward food waste reduction, subjective norms, and perceived behavioral control (PBC), which serve as key determinants of behavioral intention. To empirically test the proposed model, a comprehensive quantitative survey was conducted among 529 South African consumers. The data were analyzed using structural equation modeling, revealing that consumers who exhibit stronger adherence to cultural dimensions such as uncertainty avoidance and long-term orientation, coupled with lower scores on power distance, are likely, through the influence of attitude, subjective norms, and PBC, to possess higher intentions to actively reduce food waste. These findings offer valuable insights for marketers and policymakers, highlighting the potential to leverage cultural values in designing effective interventions aimed at encouraging more sustainable consumer behaviors and reducing household food waste.

1 | Introduction

In the face of rising food security challenges and environmental concerns, the phenomenon of food waste is gaining political and scientific attention around the globe. The dilemma of food wastage is a significant hurdle in ensuring the provision of food across both highly and less developed countries. It is estimated that annually, a third of food intended for human consumption globally is either discarded or perishes (Goodwin et al. 2022). This wastage includes food that remains edible, whether before reaching its expiration date or afterward (Lipinski et al. 2013). This wastage spans various points within the food distribution chain, with a significant 61% originating from household settings (United Nations Environment Programme 2021). The research discussed in this article concentrates on household food waste, "which is referred to as avoidable food waste by households during downstream phase of food supply chain" (Chia et al. 2023, 1). Investigating food waste and the drivers of food waste reduction is particularly relevant in emerging countries, because a growing middle class, combined with a change in dietary practices and increasing household income, is expected to raise household food waste on a global scale (Xue et al. 2017). South Africa, as a country dealing with the dual burdens of malnutrition and food scarcity alongside considerable economic disparities

(Mtintsilana 2023; Oxfam South Africa 2023), presents a unique context for examining drivers of food waste reduction intention.

The latest findings from the Food Waste Index Report (United Nations Environment Programme 2021) indicate that the per-household rate of food wastage is similar across nations, regardless of their economic standing. Previously, it was believed that the issue of household food waste was predominantly confined to developed nations, with developing countries facing losses primarily in the production, preservation, and transport phases due to inevitable spoilage (World Food Program USA 2021). Recent studies stress the critical need for mitigating food waste in countries across various income levels (United Nations Environment Programme 2021). As countries progress economically, the locus of food waste moves up the food chain (Institute of Mechanical Engineers (IME) 2013).

The repercussions of food waste are profound, affecting societal, environmental, and economic dimensions. During the COVID-19 pandemic, food insecurity intensified across vast regions of Africa, Latin America, the Caribbean, and Asia (FAO 2022). Notably, in southern Africa, the rate of malnutrition increased from 5.9% in 2010 to an estimated 9.2% in 2021 (FAO 2022). Worldwide, the volume of wasted food, approximately 1.3 billion tons, is more than triple the amount needed to feed around 800 million undernourished people across the planet each year (WWF 2018). With an estimated 10 million tons each year, South Africa contributes to this wastage (DEFF & CSIR 2021). Wasting edible food in South Africa, mostly from households, results in economic losses of US$2.7 billion per annum or 0.7% of South Africa´s GDP (Pal et al. 2023). In the absence of updated studies, it is probable that these figures are currently higher. Roughly 90% of waste in South Africa ends up in landfills, thus promoting methane gas and carbon dioxide development (WWF 2017). Surprisingly, various studies from different South African provinces show that the low-income groups in particular generate a disproportionate amount of food waste as compared to higher income groups (Jarrod Ball et al. 2001 quoted in Nahman et al. 2002; Silbernagl 2011). This disproportionate food waste is explained by Nahman et al. (2012) as being because a higher proportion of the low income households' expenditure is on food (37%) versus high income households (7%).

The reasons for food waste in SA are manifold. Certain causes of food waste are prevalent across countries in the Global North and South, including excessive buying, over-preparation, inadequate storage, and poor planning of purchases (Ramukhwatho et al. 2018). However, other factors are more specific to developing nations such as South Africa, for instance, larger household sizes or the lack of water and storage facilities (such as electric refrigerators) in rural areas (Mbhenyane & Tambe, 2024).

Although the importance of securing food resources is significant, especially for low- and medium-income countries, the amount of literature dealing with food waste in the South African context is limited. Covering the complexity of food waste behavior, current research focuses on different facets of food waste in South Africa. A significant stream of research is dedicated to quantifying food waste and food loss in South Africa (Chakona & Shackleton 2017; Hermanussen & Loy 2024; Nahman et al. 2012; Oelofse et al. 2018; Oelofse & Nahman 2013; Painter et al. 2016; Ramukhwatho 2016). Another line of research examines the influence of demographic factors on food waste behaviors. For example, the study by Machate (2021) found a positive relationship between age and food waste generation, as well as between family size and food waste generation for households of the City of Tshwane. A third line of research dealing with psychological and cultural antecedents is found primarily in studies on the food waste behavior of developed countries but has not been found for South Africa. This is surprising in view of the fact that effective food waste reduction campaigns typically build upon knowledge about behavioral antecedents (Graham-Rowe et al. 2015; Wang et al. 2022). To the best of our knowledge, no study to date has analyzed the influence of psychological and cultural factors on food waste in South Africa. This finding is underpinned by the review on country-specific drivers of household food waste conducted by Chia et al. (2023). They found that most research results originate from European countries that share geographical, economic, and cultural traits, which might result in comparable influences and barriers toward food waste reduction. Because generalizability of these findings and interventions to areas outside of Europe remains uncertain, they call for future research in diverse regions like Africa, Asia, North America, Oceania, Latin America, and the Caribbean. South Africa, as the subject of this study, answers this call for research in more diverse settings because it describes itself as a *Rainbow Country*, thereby stressing its multicultural diversity (Prinsloo & Huysamen 2018). Besides vast economic disparities and unequal distribution of income (Mubangizi Mubangizi 2005), South Africa is a heterogeneous country with various subcultures that hold separate values, beliefs, and norms (Rautenbach 2010). This heterogeneity also results from 11 official languages, 4 broad ethnic groups (split into sub-groups distinguished by language and culture), the least equal country in the world with a Gini coefficient of 67 (World Bank Group 2022), and wide spreads of education, employment, religion, and urbanization. Therefore, performing a study on cultural influences on food waste could be a promising path to fill the above-mentioned research gap. However, because of its high within-country diversity, we follow the research approach of Sreen et al. (2018), who argue that studying the influence of cultural orientations on food waste on a national level (e.g., Pelau et al. 2020) may be of limited value for heterogeneous countries. Instead, employing cultural predictors on the individual level of a consumer may provide a better explanation for food waste in South African households and would be a good starting point for interventions. Therefore, this study views culture as an individual's cultural orientation (see also Yoo et al. 2011).

Because pro-environmental behaviors[1], just like food waste reduction (Graham-Rowe et al. 2019), are future oriented with direct extrinsic long-term effects, it is unlikely that fundamental beliefs such as cultural values directly affect behavior (McCarty & Shrum 2001). Instead, cultural values may influence beliefs and attitudes (Chwialkowska et al. 2020). Therefore, linking cultural values with moderators that might explain under which conditions behavioral intentions are formed might be beneficial in this research. In recent research on green-purchase behavior (that can also be classified as pro-environmental), cultural values of individuals have been linked to behavioral antecedents by the theory of planned behavior (TPB) (Nguyen et al. 2017; Sreen et al. 2018). Using TPB (Ajzen 1991) and its components to investigate the household food waste phenomenon is a well-established

procedure in research on food waste behaviors (Chia et al. 2023; Graham-Rowe et al. 2015; Pilone et al. 2023; Stefan et al. 2013). According to TPB, a certain behavior results from behavioral intention that stems from three psychological factors: attitude toward the behavior, subjective norm, and perceived behavioral control (PBC). Although a study conducted by Strydom (2018) in large South African urban areas showed that TPB explained 26.4% of the variance of household recycling behavior, it remains uncertain whether this explanatory contribution also applies to the intention to reduce food waste in South Africa. A study that establishes the relationship between the components of TPB and the intention to reduce food waste in households in the South African context does not yet exist. In order to close this gap, this research develops a conceptual model by linking cultural values to determinants of intentions to reduce food waste for South Africa. This paves the way to better understand how cultural values held by individuals influence intentions to reduce food waste and thereby to shed light on possible starting points for policymakers to encourage food waste reduction interventions in emerging markets.

2 | Literature Review and Hypothesis Development

2.1 | Theory of Planned Behavior and Intention to Reduce Food Waste

In order to capture psychological and behavioral aspects of food waste, research on domestic food waste and food waste reduction (Chia et al. 2023; Graham-Rowe et al. 2015; Schrank et al. 2023; Stefan et al. 2013; van der Werf et al. 2019) is mainly driven by the TPB (Ajzen 1991). This theory is sometimes extended by including other variables like self-identity, anticipated regret, or moral norm (Graham-Rowe et al. 2015). The TPB proposes that behavior results from an individual's *intention* that can be described as a willingness to exert effort in trying to perform a behavior (Ajzen 1991). In turn, intention to perform an action stems from three predictors: *attitude toward the behavior, subjective norm, and PBC*.

Attitude is the assessment of the behavior as either favorable or unfavorable, with positive attitudes reinforcing the likelihood of engaging in the corresponding behavior (Ajzen 1991). Attitudes are shaped by behavioral beliefs, that is, considerations of anticipated positive or negative outcomes associated with engaging in a specific behavior (Ajzen 2015b). Positive attitudes toward pro-environmental behaviors have been linked to a variety of behaviors such as use of recycling (Zhao et al. 2014), energy conservation (Allen & Marqurdt-Pyatt 2018), green consumption (Laureti Bendetti 2018), and food waste reduction (Schrank et al. 2023). For a comprehensive review, see Yuriev et al. (2020).

Subjective norm pertains to perceived social pressure of significant others toward the behavior, grounded in the normative beliefs that are salient to the individual (Ajzen 2015b). Intention to perform a behavior is heightened when norms and opinions of social agents important to the subject approve a specific behavior (Ajzen 1991; Chwialkowska et al. 2020). Van der Werf et al. (2019) point out that, unlike other pro-environmental behaviors, wasting food, although occurring in a shared environment, is often only seen by the waste generator, which may result in weaker impacts on intention as compared to the remaining drivers of TPB. Nonetheless, in accordance with the TPB and former research (Graham-Rowe et al. 2015), it can be assumed that when people feel approval from others for their food waste reduction, this will strengthen their intentions to reduce food waste.

Intention to perform a specific behavior is also driven by *PBC*, that is, the personal confidence that one is able to carry out that behavior in a given context (Ajzen 1991). In other words, if individuals have control over food preparation and food waste in their home, it is likely that they hold positive intentions to reduce food waste (Soorani Ahmadvand 2019). Notably, in some situations, PBC may directly influence behavior without being mediated by intention (Ajzen 1991). This direct pathway suggests that in contexts where individuals feel particularly confident, or constrained, in their ability to act, PBC may influence behavior directly. Importantly, PBC is rooted in control beliefs, which are based on the perceived presence of factors that facilitate or hinder the performance of the behavior and the perceived power of each factor to affect one's ability to engage in that behavior (Ajzen 2002).

Although widely applied, TPB is not free of criticism. Sniehotta et al. (2014) present a critical evaluation of TPB, arguing that its predictive power and practical application in health psychology are limited. They claim that TPB's constructs do not account adequately for complex behaviors, particularly those sustained over time, such as lifestyle changes. Sniehotta et al. (2014) argue that TPB is overly simplistic, underestimates the role of environmental and contextual factors, and lacks the flexibility to integrate advances in behavioral science. In response, Ajzen (2015a) defends the TPB, emphasizing that the theory was never intended to provide a fully comprehensive model of behavior but rather a focused framework for understanding the proximal predictors of intention and behavior. Ajzen acknowledges the existence of broader influences on behavior but argues that TPB remains highly effective when appropriately applied. In light of the theory's robust empirical support and adaptability to different contexts, Ajzen suggests extending TPB with additional explanatory variables—an approach we pursue in this research.

It is worth noting that research on pro-environmental behavior often focuses on measuring intentions rather than actual behaviors (Yuriev et al. 2020). This gap between intention and actual behavior arises because intentions are typically easier to assess through surveys and questionnaires, whereas tracking real-life behaviors can be more complex (Wang, Dong, & Yin 2018). This especially accounts for the research on food waste behavior that often employs self-report measures for food waste behavior. These measures encompass estimates about percentages of, for example, fruits being thrown away within a week (Graham-Rowe et al. 2015) or self-reports of product categories that end up in a bin with response options like "more than a quarter but less than a half" (Stefan et al. 2013). This raises methodological concerns (Yuriev et al. 2020) and might be one of the reasons why intentions to reduce food waste do not translate to actual food waste measures. In addition, as Stefan et al. (2013) point out, measuring food waste and intention *not* to waste food refers to opposite actions that might result in low or no correlation between both. Consequently, the reduction of food waste should actually be measured over a certain period of time, using objective behavioral data. Due to the

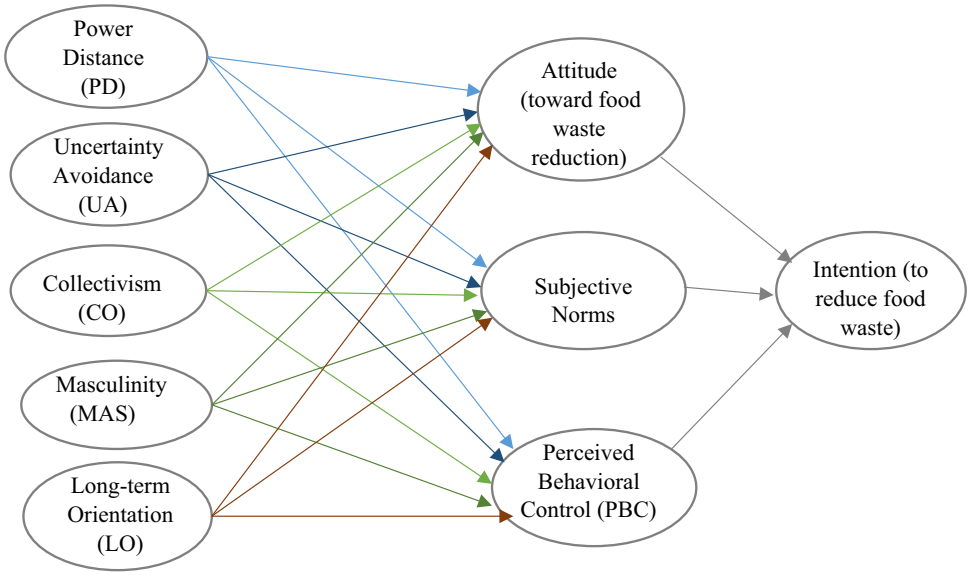

FIGURE 1 | Proposed research framework.

lack of suitable behavioral indicators for self-report surveys on domestic food waste, our research model focuses on *intentions to reduce food* waste as the main dependent variable. In accordance with TPB, we therefore hypothesize:

H1: The intention to reduce household food waste is predicted by (a) attitude toward food waste reduction, (b) subjective norm, and (c) perceived behavioral control.

In the context of environmental studies, TPB has often been combined with an individual's value orientation, like personal or cultural values (Nguyen et al. 2017). It can be assumed that values are relatively stable general beliefs that guide specific beliefs, norms, attitudes, and behaviors over time (Feather 1992; Steg & de Groot 2012). Values in general, and cultural values in particular, serve as evaluation criteria for actions (Henry 1976; Nguyen et al. 2017). Therefore, it seems appropriate to integrate cultural values as possible antecedents in a TPB model on food waste reduction, as is shown in Figure 1.

2.2 | The Impact of Cultural Values

Research on the impact of cultural values on pro-environmental behavior can be distinguished in two major streams. In the first stream, culture is viewed as a national phenomenon and can be defined as "*programming of the human mind by which one group of people distinguishes itself from another group*" (Hofstede et al. 2010, 6). Research that follows this approach often applies Hofstede's cultural dimensions on the aggregated level of countries and relates them to environmental values (Deng et al. 2006; Milfont et al. 2006; Soyez 2012), moral norms (Wang et al. 2021), as well as attitudes and behaviors, such as the usage of low emission cars (Iancu et al. 2023) or fruit and vegetable food wastage (Pelau et al. 2020). These studies primarily focus on a selection or all five established dimensions that Hofstede developed: power distance (PD), uncertainty avoidance (UA), individualism/collectivism (CO), motivation toward achievement and success (MA; formerly masculinity/femininity), and long-term/short-term orientation (LTO). Although dimensional models can be of great use in understanding differences between countries, they fall short in capturing cultural diversity, especially in highly heterogeneous countries (Kaasa et al. 2013).

Following on from this criticism, a second stream of research has developed that examines the influence of individual cultural values on pro-environmental behavior. Studies that can be assigned to this line of research do not assign study participants equally to Hofstede's national culture indices solely based upon their national identity. Instead, these studies examine the effect of individual cultural orientations on pro-environmental behaviors (e.g., Riaz et al. 2023; Sreen et al. 2018). The majority of these studies use the Individual Cultural Values Scale (CVSCALE) developed by Yoo et al. (2011) that assesses Hofstede's cultural values on an individual level. For example, a study conducted by Davari et al. (2024) examined the impact of cultural values of Chinese millennials on sustainable tourism. They found that CO was positively associated with pro-environmental behaviors, whereas PD and UA had the opposite effect. In the setting of a Korean university, another study found that cultural value differences between international students were strong predictors of private (e.g., sorting garbage) and public-sphere (e.g., green donation) behaviors (Riaz et al. 2023). The study of Mi et al. (2020) investigated a similar research question with a sample of residents in a Chinese city. With a focus on the CO and long-term-orientation dimension, Sreen et al. (2018) developed and tested a research model in the Indian market that linked cultural values, behavioral measures, and gender to predict green-purchase intentions. It is striking that the research approaches in this stream often include countries outside Europe in their analyses. Although research on the influence of national culture is recognizably subject to a "western bias" (Soyez 2012), with European countries dominating as research objects, research on individual cultural differences focuses on heterogeneous countries such as India or China. In our study, looking at cultural differences from an individual perspective is therefore a promising approach for a country as

heterogeneous as South Africa. The aforementioned studies share the assumption that personal lifestyles and behavioral intentions toward green behavior are deeply rooted in an individual's cultural values (Nordlund & Garvill 2002; Sheng et al. 2019). Therefore, we assume that different cultural values based on Hofstede´s five dimensions impact an individual's intention to reduce food waste. Recent research shows that the cultural values of CO and long-term orientation are the most widely accepted drivers of pro-environmental behavior (Leonidou et al. 2010; Nguyen et al. 2017). However, as there are no findings from the specific application to food waste behavior, we incorporate all five value dimensions. Applying Hofstede's cultural dimensions at the individual level using the CVSCALE allows us to connect and compare our research results with prior research conducted in other countries and with other forms of pro-environmental behavior, which has utilized the same typology. We thereby aim to establish a basis for cross-cultural comparison and contribute to a cohesive body of literature that examines cultural influences on individual behavior across diverse contexts.

2.2.1 | Power Distance

PD is defined as "the extent to which the less powerful members of organizations and institutions (like the family) accept and expect that power is distributed" (Hofstede 2011, 9). As a cultural value, it describes the acceptability of power inequality through the lens of less powerful members (Hofstede 2011). Individuals with low PD values strive for equal opportunities while evaluating huge inequalities in terms of prestige, wealth, or status as unacceptable (Donthu & Yoo 1998). Individuals with high PD cultural values, however, view inequality as positive and desirable (Caputo et al. 2019). Research has shown that individuals holding strong egalitarian views are highly concerned about climate change (Ergun & Rivas 2019). In contrast, individuals with higher PD have been found to drive high-carbon behaviors—such as excessive car usage or shopping trips—as a means to display social status and position in a society´s hierarchy (Mi et al. 2018). On a national level, PD appears as a significant driver of environmental sustainability, with low PD cultures being more sustainable (Park et al. 2007). However, studies on the influence of PD as an individual value on pro-environmental behaviors appear to be context-dependent, with varying effects observed in different study settings. In a study conducted with a Chinese consumer sample, Mi et al. (2020) did not find PD to affect private or public environmentally friendly behavior. Similarly, a study conducted at a Korean university did not find a relationship between students' PD value and their effort to prevent environmental pollution (Riaz et al. 2023). A study conducted by Lou and Li (2022) examined the mediating role of self-enhancement value on the relationship between PD and pro-environmental attitudes. Their study found that PD positively predicted self-enhancement value, which, in turn, influenced pro-environmental attitudes, proving that pro-environmental attitudes are culturally embedded. In a Malaysian setting, PD has been found to negatively influence consumers' preferences for green products (Ghazali et al. 2017). A study conducted in Hungary also revealed a small but negative influence of PD values on actual pro-environmental behavior (Nagy & Molnárné 2018). To date, no study has addressed the question of whether and how PD affects food waste reduction as pro-environmental behavior. In-line with the above argument, we therefore assume a negative relationship between PD and attitudes toward food waste reduction:

H2(a): Individuals with higher power distance values show more negative attitudes toward food waste reduction.

Individuals with higher PD experience greater social distance from others, which reduces their susceptibility to influence from social norms and expectations. High-power individuals tend to feel less dependent on others and are less responsive to social comparison pressures, making them more resistant to subjective norms (Magee & Smith 2013). Moreover, high PD has been associated with lower levels of prosocial behaviors, including compliance with norms aimed at collective responsibility. This suggests a weaker adherence to social norms among individuals who accept PD, as they do not feel a strong sense of communal obligation (Winterich & Zhang 2014). Hence, the hypothesis is

H2(b): Individuals with higher power distance values show lower susceptibility toward subjective norms.

High PD individuals tend to follow established routines rather than take proactive or adaptive actions (Farzana & Charoensukmongkol 2023). As a result, they may feel less able to control and modify household waste practices, relying on pre-existing patterns rather than individual interventions for waste reduction. Moreover, we expect that individuals with high PD values are more likely to internalize a belief that certain actions, including household behaviors like waste management, fall under the control of higher authorities or established norms. A study conducted in rural areas in China, a country typically high on the PD index, shows that compliance with waste disposal behaviors strongly correlates with the availability of organized waste collection services, highlighting the importance of structural and normative guidance over individual action (Wang, Cheng, et al. 2018). Transferring this argument from the national to the individual level, the following can be hypothesized:

H2(c): Individuals with higher power distance values perceive lower behavioral control over food waste reduction in their homes.

2.2.2 | Uncertainty Avoidance

The second cultural value, UA, describes tolerance toward ambiguity and whether individuals "feel either uncomfortable or comfortable in unstructured situations" (Hofstede 2011, 10). Although individuals with low UA feel comfortable when faced with changes and novel or risky situations, people holding high UA values get stressed and anxious in that same situation. There are two lines of argumentation for the influence of UA on pro-environmental behavior, which are associated with contradictory outcomes. On the one hand, it can be assumed that people

scoring high on UA tend to resist change (Denrell & March 2001). Implementing pro-environmental behavior, like saving food from being wasted in the own household, also brings about change of habits and patterns (Jürisoo et al. 2019). Following this line of argumentation, the study of Mi et al. (2020) found that individuals with high UA are less willing to practice pro-environmental behavior. On the other hand, the study of Riaz et al. (2023) postulated and empirically demonstrated that UA has a significant positive effect on pro-environmental behaviors. They argued that UA drives risk-averse behavior, which is reflected in sustainable actions toward themselves and society. This argument is in-line with findings from a study in Malaysia, showing that UA positively influenced consumer preferences for green products (Ghazali et al. 2017). Moreover, other research also shows that UA promotes initiatives to ensure environmental sustainability such as recycling and energy conservation (Irawan et al. 2022; Park et al. 2007) and green-purchase behavior (Ngyuen et al. 2017). Thus, it can be assumed that people holding strong UA values engage in food waste reduction to ensure future well-being. On the basis of the related empirical evidence from the field of pro-environmental behavior, we advance the following proposition:

H3(a): Individuals with higher uncertainty avoidance values show more positive attitudes toward food waste reduction.

Individuals with high UA are more likely to look to social cues and perceived expectations of others to make decisions (Hofstede et al. 2010). They may view adherence to norms as a way to reduce unpredictability and ensure conformity within their social groups, thus increasing their susceptibility to normative influence (Shen et al. 2022). Thus, we assume as follows:

H3(b): Individuals with higher uncertainty avoidance values show higher susceptibility toward subjective norms.

Ajzen's (1991) foundational work on the TPB supports the idea that individuals who favor structured, predictable environments—characteristics of high UA—will likely perceive stronger behavioral control over behaviors they can structure and manage, such as household waste reduction. Thus, we argue that individuals with high levels of UA implement systematic approaches for food consumption and food waste, which, in turn, reinforces their PBC. The following can be hypothesized:

H3(c): Individuals with higher uncertainty avoidance values perceive higher behavioral control over food waste reduction in their homes.

2.2.3 | CO vs. Individualism

CO versus its counterpart individualism refers to "the value judgement whether the collective interest or individual interest are more important" for an individual's behavior (Mi et al. 2020, 1541). Although individualists value individual goals by looking after him- or herself and immediate family, collectivists are "we"-conscious and see themselves as an integral part of a group (Hofstede 2011). Although studies on cultural differences assume that individualism and CO are the two ends of a continuum (Hofstede 2011), researchers hold different views with respect to the individual level. On the one hand, McCarty and Shrum (2001) and Triandis (1994) assume that individual and collectivistic beliefs are separate dimensions that can be held simultaneously by one person. On the other hand, the research of Yoo et al. (2011) conceptualizes each cultural dimension as opposing individual values on a continuum (see CVSCALE). The CVSCALE has stimulated some research in the area of pro-environmental behavior (e.g., Mi et al. 2020; Riaz et al. 2023). To allow for comparability of study results, we follow the unidimensional approach of Yoo et al. (2011) in conceptualizing individualism and CO as opposite value orientations in a person.

Insights into the impact of this dimension on pro-environmental behaviors allow for the conclusion that collectivistic values are linked to sustainability attitudes and behaviors (Chan 2001; Nguyen et al. 2017). Some sources argue and empirically show that CO goes hand in hand with promoting group benefits. It is assumed that pronounced collectivist values accompany prioritized group interests and cooperative behaviors, such as recycling (McCarty & Shrum 1994). Compared to individualists, collectivists are assumed to be more strongly driven by subjective norms, which accompany moral obligation toward sustainability efforts and a feeling of guilt if not adhering to pro-environmental behavior (Chwialkowska et al. 2020; Triandis 2004). However, individualists primarily focus on an immediate benefit as compared to the relative costs of pro-environmental actions. The study conducted by McCarthy and Shrum (2001) shows that the degree of individualism positively relates to the individual's belief that recycling is inconvenient, resulting in a lower importance rating of recycling. Individualism stresses self-reliance, freedom of choice, and maintaining one's own rights (Bellah et al. 1985; Triandis 1994). Thus, it can be assumed that pronounced individualistic values accompany pursuit of the individual's, rather than the group's, goals (Chwialkowska et al. 2020), resulting in more negative attitudes toward food waste reduction. Hence, the hypothesis is

H4(a): Individuals with higher collectivistic values show more positive attitudes toward food waste reduction.

The behavior of individuals with strong collectivistic values is generally motivated by social norms (Shina & Verma 1987) in order to achieve social approval (Triandis 2004). This results in social conformance, which motivates pro-environmental behaviors. Studies examining the drivers of green-purchase decisions found support for positive relationships between CO and the impact of social norms on a national level (Nguyen et al. 2017; Sreen et al. 2018). Therefore, the hypothesis is formulated as follows:

H4(b): Individuals with higher collectivistic values show higher susceptibility toward subjective norms.

Research by Moon et al. (2008) demonstrated that consumers in collectivist settings are willing to pay a premium for products deemed beneficial to society, unlike their individualistic counterparts who tend to prioritize personal cost–benefit analyses. For consumers who place high value on group norms, practices like recycling become an automatic and less contested behavior (McCarty & Shrum 1994, 2001). Sreen et al. (2018) found that, for green products, CO positively impacts social norms. These findings suggest that individuals with collectivistic values perceive a heightened sense of behavioral control over food waste reduction in their homes. Therefore, we propose:

H4(c): Individuals with higher collectivistic values perceive higher behavioral control over food waste reduction in their homes.

2.2.4 | Masculinity vs. Femininity

Masculinity and femininity as opposite cultural values describe an individual's emotional role when it comes to achievement and success (Mi et al. 2020). In 2022, this dimension was renamed to *MA*, spanning from decisive to consensus oriented, without changing the meaning of the content (for more information see https://www.hofstede-insights.com/frequently-asked-questions). Feminine/consensus-oriented cultures value caring and quality of life over competition and success (Hofstede 2011). For masculine/decisive-oriented cultures, the opposite holds true. Literature suggests that femininity is linked with societal devotion (Francis et al. 2017), preservation of resources, and environmentalism (Tindall et al., 2003). Women, who generally embrace more feminine values, are more inclined to engage in green purchasing (Fontes et al. 2021) and hold stronger environmental concerns (Lee 2009). With a specific focus on food waste behavior, a study conducted in the Romanian context showed that as women age, they develop a negative perspective on food waste. Compared to men, women associate food waste with inequality and a feeling of guilt (Cantaragiu 2019). Masculinity or decisive-oriented cultural values, however, are more linked with a dominant relationship with nature, resulting in a pursuit of economic success over sustainability concerns (Reardon & Govender 2013). This is reflected in research results showing that masculinity negatively affects environmental sustainability on a national level (Park et al. 2007). We therefore hypothesize that

H5(a): Individuals with higher masculinity/decisive-oriented values show more negative attitudes toward food waste reduction.

In the context of pro-environmental behavior, research suggests that individuals with high masculinity values may show lower susceptibility to subjective norms due to their greater autonomy and personal value alignment over social expectations (e.g., Chard et al. 2024; Brough et al. 2016). Driven by competition rather than consensus, we expect individuals with high levels of masculinity and decisiveness to be less susceptible to norms. Thus, we assume:

H5(b): Individuals with higher masculinity/decisive-oriented values show lower susceptibility toward subjective norms.

To date, studies examining the influence of masculinity values on perceived behavioral control in the context of pro-environmental behavior are lacking. However, research in other areas has shown that masculinity values can exert a complex and context-dependent impact on perceived behavioral control. In the context of couple therapy, masculinity norms, which emphasize self-reliance and emotional control, can negatively influence perceived behavioral control. In the field of food waste behavior, however, we argue that masculinity values strengthen individuals' feelings of being able to manage challenging situations, such as reducing food waste. Because reducing food waste requires proactive behavior and often the development of new routines, individuals with higher masculinity values might see themselves as capable of exercising control over these behaviors. Thus, we assume:

H5(c): Individuals with higher masculinity/decisive-oriented values perceive lower behavioral control over food waste reduction in their homes.

2.2.5 | Long-Term Orientation

As a value orientation on a national level, long-term orientation can be described as "fostering of virtues oriented toward future rewards, in particular, preservation and thrift" (Hofstede 2001, 359). In other words, it describes the extent to which a society prioritizes long-term values, planning, and traditions over short-term goals, immediate outcomes, and short-term gratifications (Chekima et al. 2015). Long-term-oriented individuals value and preserve social traditions and responsiveness (Furrer et al. 2000), which naturally aligns with maintaining sustainable environmental conditions for a better future as part of their value set (Leonidou et al. 2010). In the realm of green purchases, there is strong empirical support for a positive impact of long-term-orientation values on consumers' attitudes, subjective norms, PBC, and purchase intentions toward green products (Carmi & Arnon 2014; Chekima et al. 2015; Sreen et al. 2018). In the field of food waste behavior, a study conducted in Denmark found that food-related lifestyle patterns, such as planning meals and enjoying cooking, significantly influence self-reported food waste behavior (Aschemann-Witzel et al. 2018). These patterns are associated with long-term orientation, as they involve planning and foresight. Studies have found that individuals with a long-term perspective are likely to form more positive environmental attitudes (Samarasinghe 2012). Such attitudes may also concern sustainable actions within the household (Leonidou et al. 2010), such as decreasing food wastage. Hence, the following can be hypothesized:

H6(a): Individuals with higher long-term-orientation values show more positive attitudes toward food waste reduction.

Consumers with a long-term orientation are inclined to weigh options when making purchases (Hofstede 2001; Sharma 2010). Consequently, they often seek opinions and support from influential individuals in their lives. According to Bratt (1999), this tendency is particularly significant in the environmental realm, where uncertainties about the impacts of pro-environmental actions can arise. Additionally, long-term-oriented consumers display a strong sense of social responsibility and prioritize sustaining future societal relationships (Hofstede 2001; Bearden et al. 2006), leading them to generally avoid actions that might breach social norms. In the context of green purchasing, LTO has been found to positively impact subjective social norms (Nguyen et al. 2017; Sreen et al. 2018). Thus, the hypothesis is formulated as follows:

H6(b): Individuals with higher long-term-orientation values show higher susceptibility toward subjective norms.

People with a long-term orientation tend to adopt behaviors that benefit future generations, even if these choices involve certain inconveniences or personal costs (Thøgersen & Grunert-Beckmann 1997). Known for their strong work ethic (Soares et al. 2007; Yoo et al. 2011), individuals with this mindset are willing to make additional efforts to choose actions that support a positive future. In-line with research conducted by Sreen et al. (2018), we therefore hypothesize that

H6(c): Individuals with higher long-term-orientation values perceive higher behavioral control over food waste reduction in their homes.

To sum up, we hypothesize that cultural value dimensions influence intentions indirectly through attitudes, subjective norms, and perceived behavioral control, rather than exerting a direct effect on intentions themselves. This approach aligns with Ajzen's (1991) conceptualization of background factors in TPB, which include broad, distal influences such as personality traits, demographic characteristics, and cultural values. According to TPB, although background factors provide critical context, they are assumed to shape behavioral, normative, and control beliefs rather than directly influencing intentions (Ajzen 2024). Consequently, these beliefs mediate the effects of background factors, such as cultural values, on behavioral intentions. Thus, our study considers cultural value dimensions as background factors that influence intention indirectly by shaping individuals' beliefs about food waste-reducing behavior.

3 | Research Methodology

3.1 | Population and Sample

South Africa is a nation of immense variety, characterized by rich cultural diversity and significant socio-economic disparities (Mubangizi 2012). To account for these differences, the Living Standards Measure (LSM) system of segmentation has been used in South African research for a number of decades (Lappeman et al. 2021). It is a widely recognized tool in (market) research and socio-economic studies, categorizing households into 10 groups (LSM 1–LSM 10) based on various criteria, including education, access to services, and ownership of durable goods (Ungerer & Joubert 2011). Lower LSMs correspond to poorer, less serviced households, whereas higher LSMs indicate wealthier, better serviced households from both household asset and socio-economic perspectives. Especially in emerging countries, the growing middle class is expected to lead to a higher proportion of global food waste (Aschemann-Witzel et al. 2019). Therefore, our research focused on participants from LSM categories 5–10. These groups represent a significant portion of the population with varying levels of disposable income and consumption patterns. Studies have shown that higher income households tend to generate more food waste per capita (Nahman et al. 2012) due to greater purchasing power and less sensitivity to food costs (Oelofse et al. 2018). By targeting middle- and higher income classes, we can capture a broad spectrum of attitudes toward food waste, providing a comprehensive understanding of the issue across different socio-economic strata (Nahman et al. 2012).

Because of certain demographic shifts upwards in the LSM categories, as consumers have become wealthier over the past 30 years (KANTAR TNS, 2019; Langschmidt 2017), we used the newer ES socio-economic measures (SEM) to create our quota (Reidon 2018) by applying the SEM category percentages to the SA population. However, we chose not to use SEM as the sampling tool due to its novelty and the unavailability of consumer databases using it. SEM and LSM only differ at the lower end (i.e., LSMs 1–4) (Muller 2017), which are excluded from our study. The result is a quota profile of individuals as presented in Table 1.

The geographical spread of provinces in our sample is according to the size of the population in South Africa. The digital survey platform, Cint Exchange, using their online panel, guaranteed the quota samples based on the criteria set above. Potential respondents for the online survey were recruited from the online panel provider for compensation. According to Bless et al. (2013), bias or non-response error can result from self-selection sampling, but the reasonable spread of respondents shown in Table 2 indicates a low likelihood of such bias or error. A *t*-distribution needs a sample size of 385.16 (excluding correction factor) (Sekaran & Bougie 2013). This is determined for a 95% level of confidence, assumed variance of 1, and allowed error of 0.1 (for a 7-point Likert-type scale). To allow for incomplete or otherwise unusable responses, a sample size of 550 was set. The size of the final, useable samples was 529.

This demographic profile shows the sample distribution for South Africa to be similar to the population distribution. However, at 53.1%, the proportion of female survey participants is slightly above the national average of 51% in South Africa (StatsSA 2020). This is because LSMs 6–9 are biased toward females (Living Standards Measure 2017) and because shopping, especially grocery shopping, in emerging or developing, countries is more often conducted by females (Docrat 2007). Therefore, the achieved sample is acceptable to represent South Africa's population from LSM groups 5–10.

TABLE 1 | Adjusted sample quotas and achieved sample.

LSM categories	5	6	7	8	9	10	Total
LSM: % of SA pop of LSMs 5–10	27.2	44.2	13.6	6.2	7.4	3.7	100
SEM % applied to SA pop of LSMs 5–10	20.8	18.8	18.8	14.6	12.4	14.6	100
N of LSM 5–10 quota sample	114	104	104	80	68	80	550
N of sample achieved	110	94	101	79	69	76	529
% of sample achieved	20.8	17.8	19.1	14.9	13.0	14.4	100

Abbreviations: LSM, living standards measure; SEM, socio-economic measures.

TABLE 2 | Sample profile.

Dimension	Category	*n*	%
Gender	Female	281	53.1
	Male	248	46.9
Age	18–24	113	21.4
	25–34	225	42.5
	35–49	133	25.1
	50–59	45	8.5
	60+	13	2.5
Household size (no. of people)	1	17	3.2
	2	50	9.5
	3	118	22.3
	4	159	30.1
	5	94	17.8
	6+	91	17.2
Education	None, some, or all primary	0	0.0
	Some high school	27	5.1
	High school/matriculation	170	32.1
	Technikon	120	22.7
	University degree	198	37.4
	Other post matric	14	2.6
Monthly household net income[a]	0–R8000	96	18.1
	R8001–18,000	162	30.6
	R18,001–37,000	164	31.0
	R37,001–63,000	78	14.7
	More than R63,000	29	5.5
Total		529	100

[a]R = South African Rand.

3.2 | Measures

The questionnaire was developed using scales established in prior research (see Appendix). To measure the constructs of TPB, we followed the guidelines of Ajzen (1991). Except for the socio-demographic variables, all measures were assessed using 7-point scales.

Intention to reduce food waste was measured using two items adopted from Russell et al. (2017). The items included the following statements: "My intention to reduce food waste in my home in the next week is…" (1 = very weak, 7 = very strong); and "How likely are you to reduce food waste in the next week?" (1 = very unlikely, 7 = very likely).

To assess *attitudes toward food waste reduction*, participants responded to the following question: "I think that reducing food waste in my home is…." Answers were measured on six semantic differentials (bad/good, unimportant/important, non-beneficial/beneficial, unpleasant/pleasant, useless/useful, worthless/valuable) with 1 = bad, 4 = neutral, 7 = good. We rephrased this measure from Russell et al. (2017) to the reduction of food waste and extended the list of semantic differentials with adjectives taken from Carrus et al. (2008).

Subjective norms were measured using two standard items of TPB (Ajzen 1991) that were adapted from Carrus et al. (2008). Participants were asked, "Most people important to me expect me to reduce food waste in my home" and "Most people important to me think I should avoid food waste at all" (1 = completely disagree, 7 = completely agree).

PBC, as the remaining construct from TPB, was measured using three items we adopted from Russell et al. (2017). Participants were asked, "Regarding how much control I have over whether I reduce food waste in my household, I have…" (1 = very little control, 7 = a great deal of control); "Regarding how difficult it is to reduce food waste in my home, I find it…?" (1 = very difficult, 7 = very easy), and "It is mostly up to me whether I reduce food waste in my home" (1 = completely disagree, 7 = completely agree).

To measure the *individual cultural value* dimensions of each participant, we used the CVSCALE developed by Yoo et al. (2011). We adapted the measures for the cultural dimensions of PD, UA, CO, and long-term orientation. PD included five items such as "People in more senior positions should make most decisions without consulting people in lower positions." Five items were used to assess UA, for example, "It is important to closely follow instructions and procedures." The degree of collectivistic versus individualistic values was measured using six items, for example, "Group welfare is more important than individual rewards." Long-term orientation, as the fourth value dimension, was assessed asking participants how important six values like "careful management of money" or "planning for the longer term" were for them. For the *masculinity* dimension, however, we replaced the four-item subscale with five new items. This is because the masculinity items proposed by Yoo et al. (2011) strongly focus on gender-specific role distinctions between men and women. This binary gender-role distinction might cause discomfort among study participants, which was one reason for Hofstede (2024) to change the name of masculinity to MA. We therefore closely followed his description of this dimension in wording five new items to measure MA. These items are "Financial prosperity is very important to me."; "My social status is very important to me."; "I live to work."; "I try to be the best in field whenever possible." and "Work-life balance is more important to me than professional success." The wording of all items can be found in Appendix A.

4 | Results

In this study, structural equation modeling was employed to test the proposed model. The analysis was conducted using SmartPLS 4.0 software, which facilitated the evaluation of the relationships among the constructs in the research model through partial least squares (PLS) analysis. PLS was chosen for its ability to simultaneously assess both measurement and structural models, to maximize the explained variance of the dependent variables, and to handle the analysis of a large number of constructs (Hair et al. 2017). Data analysis followed a two-step procedure. First, a confirmatory factor analysis was run to evaluate the reliability of the constructs and the validity of the measurement model. Second, structural equation modeling was used to test the hypotheses.

4.1 | Assessment of Measurement Model

Following the recommendations of Hair et al. (2019), the assessment of the reflective measurement model in PLS analysis involves examining Chronbach´s Alpha composite reliability (CR) to evaluate internal consistency among items for each construct, as well as item loadings and average variance extracted (AVE) to assess convergent validity. Table 3 displays the results of the reliability and validity analysis.

The reliability analysis shows that nearly all Cronbach's Alphas are bigger than the threshold of 0.7 (Churchill 1979; Hair et al. 2010), while intention to reduce food waste slightly misses the threshold (Pearson value of 0.681). The Pearson value for subjective norms (0.586) cannot be compared with a clear threshold (Eisinga et al. 2013), and the Cronbach's Alpha value for masculinity clearly misses the threshold (0.605). These results are supported by the loadings from the CFA. Masculinity shows three critical factor loadings (0.386, 0.320, and 0.523). CR (rho_c) is above 0.7 and can be regarded as good for all constructs (Hair et al. 2019). Except for masculinity (0.358), the AVE for all constructs is above the acceptable value of 0.5 (Fornell & Larcker 1981). The reason for the limited reliability of the masculinity scale can be seen in the fact that we did not adhere to the formulation of the established CVSCALE. As already described, we replaced the four-item masculinity subscale with five new items to avoid discomfort and reactance among study participants. Although we strictly adhered to the description of the dimension in the operationalization, the subscale does not appear to have the desired reliability.

4.2 | Discriminant Validity of Constructs

Discriminant validity is assessed by comparing the square root of the AVE with the correlations between constructs, following the Fornell and Larcker (1981) criterion. As presented in Table 4, all diagonal elements of the matrix, representing the square root of the AVEs, exceed the corresponding inter-construct correlations, thereby confirming discriminant validity (Fornell & Larcker 1981). Additionally, the correlations between each latent construct's composite and all other constructs are below 0.7, indicating that the constructs are sufficiently distinct from one another (Urbach & Ahlemann 2010). The assessment of discriminant validity using the Heterotrait–Monotrait Ratio (HTMT) indicates that all values fall below the recommended threshold of 0.85 (Henseler et al. 2015). Hence, discriminant validity is established.

TABLE 3 | Assessment of measurement model.

Construct	Item	Loadings	Cronbach's alpha	Composite reliability (CR)	Average variance extracted (AVE)
Power distance	PD1	0.813	0.875	0.909	0.667
	PD2	0.848			
	PD3	0.861			
	PD4	0.816			
	PD5	0.738			
Uncertainty avoidance	UA1	0.721	0.831	0.881	0.597
	UA2	0.788			
	UA3	0.795			
	UA4	0.728			
	UA5	0.826			
Collectivism	CO1	0.754	0.845	0.883	0.557
	CO2	0.753			
	CO3	0.756			
	CO4	0.765			
	CO5	0.767			
	CO6	0.680			
Long-term orientation	LO1	0.805	0.803	0.861	0.518
	LO2	0.450			
	LO3	0.763			
	LO4	0.843			
	LO5	0.568			
	LO6	0.801			
Masculinity	MAS1	0.766	0.605	0.712	0.358
	MAS2	0.386			
	MAS3	0.320			
	MAS4	0.822			
	MAS5	0.523			
Attitude	Att1	0.810	0.896	0.920	0.658
	Att2	0.826			
	Att3	0.826			
	Att4	0.779			
	Att5	0.791			
	Att6	0.834			
Intention to reduce food waste	Int1	0.910	0.681 (Pearson)	0.883	0.790
	Int2	0.868			
Subjective norms	SN1	0.879	0.586 (Pearson)	0.852	0.742
	SN2	0.844			
Perceived behavioral control	PBC1	0.852	0.711	0.839	0.635
	PBC2	0.800			
	PBC3	0.734			

Note: Average variance extracted (AVE) = (summation of the square of the factor loadings)/([summation of the square of the factor loadings] + [summation of the error variances]). Composite reliability (CR) = (square of the summation of the factor loadings)/([square of the summation of the factor loadings] + [square of the summation of the error variances]).

TABLE 4 | Fornell–Larcker criterion and Heterotrait–Monotrait Ratio (HTMT).

	Attitude	Collectivism	Intention to reduce food waste	Long-term orientation	Masculinity	Perceived behavioral control	Power distance	Subjective norms	Uncertainty avoidance
Attitude	**0.811**	0.086	0.656	0.402	0.335	0.554	0.235	0.386	0.343
Collectivism	0.054	**0.747**	0.113	0.218	0.359	0.106	0.325	0.240	0.195
Intention to reduce food waste	0.537	0.096	**0.889**	0.465	0.282	0.667	0.171	0.605	0.410
Long-term orientation	0.351	0.147	0.358	**0.720**	0.680	0.529	0.332	0.430	0.751
Masculinity	0.241	0.182	0.264	0.579	**0.598**	0.397	0.327	0.402	0.487
Perceived behavioral control	0.445	0.094	0.488	0.403	0.311	**0.797**	0.110	0.545	0.414
Power distance	−0.211	0.264	−0.142	−0.288	−0.099	−0.087	**0.817**	0.098	0.239
Subjective norms	0.300	0.190	0.422	0.312	0.255	0.374	−0.076	**0.862**	0.396
Uncertainty avoidance	0.300	0.180	0.322	0.621	0.425	0.320	−0.213	0.295	**0.773**

Note: The **bold** diagonal figures (from top left to bottom right) are the square roots of the AVE. The figures below the **bold** diagonal are correlations between the constructs, while above the diagonal are the HTMT values. **Bold** is used to make the table easier to read.

4.3 | Structural Model Assessment

The structural model was evaluated by calculating the variance inflation factor (VIF). The VIF statistic is used to assess multicollinearity among the indicators. According to Hair et al. (2019), multicollinearity is not considered a significant concern if the VIF value is below 5. All VIF values for the indicators in this study are below 2.3, showing that the VIF for each indicator is below the recommended threshold. SRMR is below 0.08, which is regarded as good (Hu & Bentler 1999). The Chi Square is just above two and considered indicative of a good fit (Carmines & McIver 1981). An NFI of 0.774 indicates a moderate fit (Bentler & Bonett 1980). The VIF values for the constructs in the structural model range between 1.171 and 2.143, which are clearly below the strict threshold of 3, indicating that collinearity does not have a substantial effect (Hair et al. 2022). The values for d_{uls} (3.675) and d_G (0.674) are slightly bigger than the suggested 95% value (1.530 and 0.573) and therefore indicate only a medium fit of the model (Henseler et al. 2016). The R^2 values for the independent constructs are medium to satisfying (0.149 for attitude, 0.179 for PBC, and 0.136 for subjective norms), whereas the value for intention to reduce food waste is very good (0.407).

After evaluating the measurement model, the next step involves assessing the structural model to examine the path coefficients (relationships between the study constructs) and their statistical significance. The structural model was evaluated using bootstrapping, a resampling technique that generates multiple samples from the original dataset. In this case, 10,000 samples were used to estimate the significance of the correlations between dimensions (path significance) within the structural model (Henseler et al. 2009). The results of the structural model are presented in Table 5.

Hypothesis 1 evaluates whether the drivers of the TPB can also be applied in the South African context of food waste. The results reveal that attitude ($\beta = 0.362$, $t = 7.453$, $p = 0.000$) has the strongest impact on the intention to reduce food waste, followed by PBC ($\beta = 0.244$, $t = 5.012$, $p = 0.000$) and subjective norms ($\beta = 0.222$, $t = 4.710$, $p = 0.000$). Hence, H1a, H1b, and H1c are supported.

Hypothesis 2 evaluates whether the individual cultural dimension of PD has a significant negative effect on attitude toward food waste reduction, subjective norms, and PBC. The results show that only H2a is supported, showing that PD negatively impacts attitude toward food waste reduction ($\beta = -0.128$, $t = 2.798$, $p = 0.005$). The effect of PD on subjective norms ($\beta = -0.032$, $t = 0.724$, $p = 0.469$) and PBC ($\beta = 0.025$, $t = 0.533$, $p = 0.594$) was non-significant. Hence, H2b and H2c are not supported.

Hypothesis 3 evaluates whether UA of individuals has a significant positive effect on attitude toward food waste reduction, subjective norms, and PBC. The results reveal support for H3a and H3b, showing that UA positively impacts attitude toward food waste reduction ($\beta = 0.117$, $t = 2.169$, $p = 0.030$) and subjective norms ($\beta = 0.134$, $t = 2.353$, $p = 0.019$). The effect of UA on PBC ($\beta = 0.103$, $t = 0.1.776$, $p = 0.076$) slightly failed the significance threshold, showing no support for H3c.

Hypothesis 4 evaluates whether collectivist values of individuals promote attitude toward food waste reduction, subjective norms, and PBC. The results show that only H4b is supported, showing that collectivist values positively impact attitude toward food waste reduction ($\beta = 0.137$, $t = 3.184$, $p = 0.001$). The effect of CO on subjective norms ($\beta = 0.026$, $t = 0.571$, $p = 0.568$) and PBC ($\beta = 0.009$, $t = 0.189$, $p = 0.850$) was non-significant. Hence, H4a and H4c are not supported.

Hypothesis 5 evaluates whether the individual value of masculinity has a significant negative effect on attitude toward food waste reduction, subjective norms, and PBC. The results reveal non-significant impacts on attitude ($\beta = 0.054$, $t = 0.855$, $p = 0.393$), subjective norms ($\beta = 0.082$, $t = 1.387$, $p = 0.166$), and PBC ($\beta = 0.104$, $t = 1.894$, $p = 0.058$). Hence, H5a, H5b, and H5c are not supported.

Finally, *Hypothesis 6* evaluates whether long-term orientation of an individual has a significant positive effect on attitude toward food waste reduction, subjective norms, and PBC. The results show strong support for H6a, H6b, and H6c. That is, long-term orientation positively impacts attitudes toward food waste reduction ($\beta = 0.207$, $t = 2.716$, $p = 0.007$), subjective norms ($\beta = 0.151$, $t = 0.2.297$, $p = 0.0.22$), and PBC ($\beta = 0.285$, $t = 4.108$, $p = 0.000$).

5 | Discussion

This study systematically analyzed the influence of individual cultural value differences on attitude toward food waste reduction, subjective norms, and PBC as drivers of a person's intention to reduce food waste in the South African context. The results showed a differentiated picture regarding the antecedents of food waste.

First, the results support the TPB in the field of food waste and extend its applicability to a developing country. The results show that attitude toward food waste reduction, subjective norms, and PBC drive the intention to reduce food waste in a private setting. Attitude toward food waste reduction shows the highest impact on intention (beta-coefficient: 0.362), followed by PBC (beta-coefficient: 0.244) and subjective norms (beta-coefficient: 0.222). These insights are in-line with the previous research (Graham-Rowe et al. 2015; Schrank et al. 2023; Soorani & Ahmadvand 2019). In total, these three drivers account for 40.7% of the variance in behavioral intentions toward food waste reduction.

Second, the results of our study show that PD has a negative, but small, effect on attitudes toward food waste reduction. This is in-line with our argument and with the findings of previous studies from the realm of pro-environmental behaviors (e.g., Lou & Li 2022; Nagy & Molnárné 2018). However, we did not find a significant effect of PD on subjective norms and PBC. This may be explained by the notion of van der Werf et al. (2019), who point out that, unlike other pro-environmental behaviors, wasting food and reducing food waste are more private and mostly unseen by others. PD does therefore not influence subjective norms that

TABLE 5 | Summary of structural model.

		Beta coefficient (β)	Standard deviation	*T* statistics	*p* values	Results
H1a	Attitude → intention	0.362	0.049	7.453	0.000	Supported
H1b	Subjective norms → intention	0.222	0.047	4.710	0.000	Supported
H1c	PBC → intention	0.244	0.049	5.012	0.000	Supported
H2a	PD → attitude	−0.128	0.046	2.798	0.005	Supported
H2b	PD → subjective norms	−0.032	0.044	0.724	0.469	Not supported
H2c	PD → PBC	0.025	0.046	0.533	0.594	Not supported
H3a	UA → attitude	0.117	0.054	2.169	0.030	Supported
H3b	UA → subjective norms	0.134	0.057	2.353	0.019	Supported
H3c	UA → PBC	0.103	0.058	1.776	0.076	Not supported
H4a	CO → attitude	0.026	0.046	0.571	0.568	Not supported
H4b	CO → subjective norms	0.137	0.043	3.184	0.001	Supported
H4c	CO → PBC	0.009	0.046	0.189	0.850	Not supported
H5a	MAS → attitude	0.054	0.064	0.855	0.393	Not supported
H5b	MAS → subjective Norms	0.082	0.059	1.387	0.166	Not supported
H5c	MAS → PBC	0.104	0.055	1.894	0.058	Not supported
H6a	LO → attitude	0.207	0.076	2.716	0.007	Supported
H6b	LO → subjective norms	0.151	0.066	2.297	0.022	Supported
H6c	LO → PBC	0.285	0.069	4.108	0.000	Supported

Note: All beta values with a *p* value >0.05 include the 0 in the 95% confidence interval and can therefore be seen as not significant (Hair et al. 2022). For all non-significant constructs, the f^2 values are below 0.02, which also indicates that there is no measurable effect of these constructs (Hair et al. 2022).

Abbreviations: CO, collectivism; LO, long-term orientation; MAS, masculinity; PBC, perceived behavioral control; PD, power distance; UA, uncertainty avoidance.

are connected with food waste reduction. Moreover, the power gap perceived by individuals probably does not reflect in the responsibility for food preparation and disposal in individuals' private lives. This explains the missing link between PD and PBC.

Third, UA emerged as a significant driver of attitude toward food waste reduction, with higher UA leading to more positive attitudes toward food waste reduction. People with higher UA values are more risk averse and therefore assess food waste reduction behavior as more desirable. The positive influence of UA on subjective norms is significant but narrowly misses the significant threshold for PBC. The first result can be explained because individual norms, which are widely accepted standards of behavior, provide a framework that reduces ambiguity and offers a predictable guide for behavior. By adhering to these norms, individuals with high UA can mitigate their anxiety related to uncertain situations (Zhuang & Carey 2024). However, UA plays a positive but non-significant role for the perception of behavioral control through individuals in private food waste reduction. This outcome may be attributed to the dual influence of UA on PBC. On one hand, UA can diminish individuals' confidence in their ability to manage or influence outcomes, as suggested by Tang and Zhou (2022). Conversely, it can be posited that UA enhances the perception of control by fostering a preference for structured environments and clear guidelines, which reinforce an individual's sense of predictability and control over their surroundings (Arslanagic-Kalajdzic et al. 2019).

Fourth, CO was found to significantly influence subjective norms, suggesting that strong collectivist values enhance the importance of moral norms and obligations associated with group membership in the South African context. Contrary to our hypotheses, CO did not significantly impact the other components of the TPB. This outcome diverges from previous studies on eco-friendly behavior (Leonidou et al. 2010), green-purchase intentions (Nguyen et al. 2017), and pro-environmental behaviors in both private and public spheres (Mi et al. 2020). However, it aligns with findings from Kim and Choi (2005), who observed that CO did not directly affect environmental concerns or green-purchasing behavior. In the context of food waste reduction in South Africa, our findings indicate that CO does not significantly impact attitudes toward food waste reduction or PBC. Future research may benefit from conceptualizing CO/individualism as four distinct dimensions, crossing CO and hierarchy (vertical/horizontal) to refine and deepen the understanding of this cultural influence (Shavitt et al. 2006; Triandis & Gelfand 1998).

Fifth, masculinity did not significantly influence any of the three drivers of food waste reduction intentions, which contradicts our initial hypotheses and the previous research findings (e.g., Park et al. 2007). This lack of effect may be due to potential measurement issues. Notably, we opted against using the validated subscale for measuring masculinity provided by Yoo et al. (2011) and instead operationalized masculinity based on Hofstede's conceptualization, focusing on decisiveness versus consensus orientation rather than traditional gender role perceptions. Although we pretested this subscale, reliability analyses in our main study revealed that the five items did not consistently capture a single construct. Consequently, we infer that our chosen operationalization may not have effectively measured the individual value of masculinity in a manner comparable to the CVSCALE and prior studies in this realm.

Sixth and finally, and as expected, long-term orientation shows a significant and positive effect on attitude toward food waste reduction, subjective norms and PBC. These findings are similar to the results of studies on cultural differences on a national (e.g., Sian et al. 2010), corporate (e.g., Graafland & Noorderhaven 2018), as well as on the individual level (e.g., Sreen et al. 2018). Our study is the first to show that consumers' long-term-orientation values encourage positive attitudes toward food waste reduction in order to mitigate negative long-term effects. Moreover, opinion seeking from others seems to be more important for people with a long-term orientation (Sharma 2010), as has been shown in the positive and direct impact on subjective norm.

6 | Implications for Practice and Theory

In South Africa, the pathways leading to the intention to reduce food waste appear to be significantly shaped by cultural value orientations. The insights from our study provide implications relevant for political and corporate interventions to motivate intentions to reduce food waste. The extent and effectiveness of educational and promotional efforts aimed at reducing food waste are likely to be influenced by the cultural value orientations, especially LO and UA, of the target population. Our study primarily explored the relationship between cultural values and intentions to reduce food waste, with a focus on how these values might inform policy and marketing strategies. The findings suggest several implications for practice, particularly in the areas of segmentation and targeting, and in the construction of persuasive messages designed to encourage food waste reduction.

Specifically, our results indicate that individuals with a strong long-term orientation exhibit higher intentions to reduce food waste. This finding has direct implications for both promotional efforts and public policy. For individuals high in long-term orientation, promotional messages should emphasize the long-term benefits of food waste reduction, such as financial savings and contributions to environmental sustainability. Such messaging resonates with individuals who prioritize future outcomes and are motivated by the prospect of long-term rewards. Similarly, public policy should be designed to align with these values by offering incentives that reward long-term commitment to reducing food waste. For instance, policies could include tax incentives or rebates for households that demonstrate sustained reductions in food waste over time. For individuals with short-term orientation, however, immediate rewards, like the waste-picking initiative of the GoodGreenDeeds campaign implemented in South Africa in 2019, can be appealing (Jive Media 2019). These strategies, tailored to the cultural values of the population, could enhance the effectiveness of efforts to reduce food waste, ultimately contributing to more sustainable food consumption practices.

For consumers with high UA, promotional campaigns should emphasize the reliability and safety of products by focusing on clear and detailed labeling, such as expiration dates and storage

instructions. Given their heightened sensitivity to subjective norms, marketing strategies could also leverage societal approval by promoting widespread adoption or by establishing consumer groups centered on food waste reduction. Policymakers, in turn, should prioritize the development and enforcement of stringent guidelines on labeling and waste management practices to mitigate uncertainty. Conversely, for consumers with low UA, promotional efforts might be more effective if they highlight the experiential and multifunctional aspects of food, particularly its versatility in various culinary applications.

Our study makes a unique theoretical contribution by linking cultural drivers at the individual consumer level with the components of the Theory of Planned Behavior to explain the intention to reduce food waste. Unlike prior approaches, which predominantly focus on selected cultural dimensions, namely, CO and long-term orientation in the context of green-purchase behavior (e.g., Nguyen et al. 2017; Sreen et al. 2018), our research expands the theoretical scope by integrating five cultural dimensions into the framework of food waste behavior. Furthermore, this study significantly advances the understanding of food waste behavior within the context of a developing country. South Africa, like many other developing nations, has been underrepresented in the scientific investigation of pro-environmental behavior (Ifegbesan et al. 2022), offering valuable insights that contribute to a more globally inclusive understanding of this critical issue.

7 | Limitations and Future Research

In terms of limitations, it must be recognized that there are other drivers of intention to reduce food waste. These are, for example, age (e.g., McCarthy & Liu 2017), food-related lifestyle (e.g., Aschemann-Witzel et al. 2021), as well as habits and routines (Stefan et al. 2013). For a comprehensive review of drivers and barriers to food waste prevention and influential interventions, see Chia et al. (2023) and Simões et al. (2022). Although our study showed a link between cultural values on an individual level and intentions, it must be acknowledged that culture in terms of cultural practices and eating habits might directly influence food waste behavior, without TPB mediating in between. In South Africa, it is a common practice to prepare food in large quantities for social events like weddings and funerals so that unexpected guests will not be disappointed. Leftovers are typically discarded because "piggy-bagging," or taking left-overs home, is seen as uncultured, although in some African cultures food is more valued, and leftovers are given to those who need them (Phasha et al. 2020). In the same vein, even the meaning of food waste differs between cultures on a national level, with some cultures wasting more food than others, because abundance on the table matters (Aschemann-Witzel et al. 2019). As such, future studies could incorporate individual values, based on Hofstede´s dimensions, and cultural practices in one model. Moreover, it might be fruitful to enrich insights from quantitative surveys like ours with insights from qualitative sources like focus groups or in-depth interviews.

As previously addressed, intentions are valuable predictors of behavior, but they do not always translate directly into action due to various barriers such as social, economic, or structural constraints (Chia et al. 2023). As a result, studies like ours, based on self-reports, may portray an overly optimistic view of food waste-related intentions, potentially overlooking the factors that inhibit the translation of these intentions into tangible food waste reduction. For instance, South African consumers exhibit a complex relationship with food waste, characterized by a mix of awareness and behavioral inconsistencies. A study conducted by Pal et al. (2023) in a South African municipality indicates that although many consumers are aware of the negative impacts of food waste, this awareness does not always translate into reduced waste behaviors. They found that 67.9% of households felt guilty about food waste, yet significant amounts of food, particularly bread and vegetables, were still wasted. This discrepancy underscores the need for more research methodologies that capture actual behaviors and valid measures of food waste reduction.

The delimitation of the South African sample to, essentially, the middle and upper income groups (LSMs 5–10) is a limitation. Although this accounts for about 80% of the South African population, the remaining 20% are becoming more urbanized and wealthier and therefore should not be ignored in future research. As previously mentioned, food waste creation by this income group accounts for a large proportion of their total waste and, as they become wealthier, will probably increase their per capita food wastage. Therefore, future research into food waste in South Africa should cover the whole population.

Finally, the challenges associated with accurately measuring masculinity as an individual value highlight the need for further research. Hofstede's recent redefinition of the masculinity dimension to focus on MA, while maintaining the original interpretation, underscores the evolving understanding of this construct. However, the masculinity CVSCALE continues to rely on gender role-specific items, which may introduce discomfort or bias among study participants, potentially impacting the reliability of the results. To enhance the validity of future research, it may be advantageous to revise the CVSCALE to better align with the updated conceptualization, thereby improving its applicability and accuracy in capturing the nuances of masculinity as an individual dimension.

8 | Conclusion

Although TPB has been shown to explain a proportion of the variance of household recycling behavior (Strydom 2018), similar research into food waste behavior in South Africa has been lacking. Our study is the first, to our knowledge, to propose and empirically test a conceptual model that links personal cultural values (rather than national cultures) through TPB to intentions to reduce food waste. Despite the limitations listed above, our findings showed that those respondents with strong adherence to the UA and long-term-orientation cultural dimensions, but with lower PD scores, are likely, through the influence of attitude, subjective norms, and PBC, to score highly on intention to actively reduce food waste. These findings have enabled us to make empirically supported suggestions as to how to encourage food waste reduction in an emerging market such as South Africa.

Acknowledgment

This work was financially supported by Baden-Württemberg Cooperative State University, Ravensburg, Germany. The funder had no other involvement with the project.

Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

The data presented in this study are available on request from the corresponding author. The data are not publicly available due to restrictions. All authors confirm that they had full access to all the data in the study and take joint responsibility for the integrity of the data and the accuracy of the data analysis.

Endnotes

[1] Pro-environmental behavior is a term for a range of activities that serve to improve environmental conditions, protect the environment or curb environmentally harmful behavior (Steg and Vlek 2009).

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APPENDIX A

Study Constructs and Measurement Items

Construct	Items
Intention to reduce food waste (adopted from Russell et al., 2017)	Int1: My intention to reduce food waste in my home in the next week is…" (1 = very weak, 7 = very strong)
	Int2: How likely are you to reduce food waste in the next week?" (1 = very unlikely, 7 = very likely)
Attitudes toward food waste reduction (adopted from Carrus et al., 2008)	I think that reducing food waste in my home is…
	Att1: …bad (1)/good (7)
	Att2: …unimportant (1)/important (7)
	Att3: …non-beneficial (1)/beneficial (7)
	Att4: …unpleasant (1)/pleasant (7)
	Att5: …useless (1)/useful (7)
	Att6: …worthless (1)/valuable (7)
Subjective norms (adapted from Carrus et al., 2008)[a]	SN1: Most people important to me expect me to reduce food waste in my home
	SN2: Most people important to me think I should totally avoid food waste
Perceived behavioral control (PBC) (adopted from Russell et al., 2017)	PBC1: Regarding how much control I have over whether I reduce food waste in my household, I have… (1 = very little control, 7 = a great deal of control)
	PBC2: Regarding how difficult it is to reduce food waste in my home, I find it… (1 = very difficult, 7 = very easy)
	PBC3: It is mostly up to me whether I reduce food waste in my home (1 = completely disagree, 7 = completely agree)
Power distance (PD) (adapted from Yoo et al., 2011)[a]	PD1: People in more senior positions should make most decisions without consulting people in lower positions
	PD2: People in more senior positions should not ask the opinions of people in lower positions too frequently
	PD3: People in more senior positions should avoid social interaction with people in lower positions
	PD4: People in lower positions should not disagree with decisions by people in more senior positions
	PD5: People in more senior positions should not delegate important tasks to people in lower positions
Uncertainty avoidance (UA) (adapted from Yoo et al., 2011)[a]	UA1: It is important to have instructions spelled out in detail so that I always know what I'm expected to do
	UA2: It is important to closely follow instructions and procedures
	UA3: Rules and regulations are important because they inform me of what is expected of me
	UA4: Standardized work procedures are helpful
	UA5: Instructions for operations are important
Collectivism (CO) (adapted from Yoo et al., 2011)[a]	CO1: Individuals should sacrifice self-interest for the group
	CO2: Individuals should stick with the group even through difficulties
	CO3: Group welfare is more important than individual rewards
	CO4: Group success is more important than individual success
	CO5: Individuals should only pursue their goals after considering the welfare of the group

(Continues)

Construct	Items
Long-term orientation (LO) (adapted from Yoo et al., 2011)[b]	LO1: Careful management of money
	LO2: Going on resolutely in spite of opposition
	LO3: Personal steadiness and stability
	LO4: Planning for the longer term
	LO5: Giving up today's fun for success in the future
Masculinity (MAS) (own)[a]	MAS1: Financial prosperity is very important to me
	MAS2: My social status is very important to me
	MAS3: I live to work
	MAS4: I try to be the best in field whenever possible
	MAS5: Work-life balance is more important to me than professional success. (r)

Note: r = reverse coded. **Bold** = constructs comprising the research framework.

[a]Answers range from *completely disagree* (1) to *completely agree* (7).

[b]Answers range from *not important at all* (1) to *very important* (7).