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**The roles of human values and generalized trust on stated preferences when food is  
labeled with environmental footprints: Insights from Germany**

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**Abstract**

This study explores influences of human values and trust on stated preferences for food labeled with environmental footprints. We apply survey data to assess influences of these individual-specific characteristics on German consumers' stated choices of potatoes, through an attribute-based choice experiment in which product alternatives are described by footprint labels and prices. We find that accounting for consumers' value systems, but not generalized trust beliefs, aids in understanding choices and identifying possible markets for footprint-labeled food products.

**Key words:** carbon footprint, ecological, Rokeach Value Survey, environmental sustainability, mixed logit

\*Senior authorship of this manuscript is shared.

## 1. Introduction

Consumer choices for environmentally sustainable foods are of interest given links between carbon dioxide and global warming (e.g., IPCC Report 2007), as well as concerns regarding human intervention in the global hydrological cycle as this relates to the production of agri-food products (Rost et al. 2008). In Germany, where the first “Product Carbon Footprinting (PCF) World Summit” was held in 2009, it is estimated that 40% of climate-relevant emissions can be related to consumption patterns (Schächtele and Hertle 2007; Klockenhoff 2009)<sup>1</sup>. Consequently, shifting consumption patterns may have important implications for entire supply chains (Edwards-Jones et al. 2009), particularly for agri-food (Weber and Mathews 2008). However, current knowledge is insufficient to understand whether, how and why consumers might shift to more sustainable consumption patterns (Thøgersen and Ölander 2002). We consider two basic concepts in analyzing consumer choices for sustainable products. These are human values, since these guide consumers’ attitudes and judgments (Rokeach 1973), and individuals’ generalized trust beliefs, which are viewed to reflect innate moral beliefs (Uslaner 2002).

The objective of this paper is to identify differences in consumers’ choices as determined by trust and human values. Varying information content of labels is explored relative to environmentally sustainable choices through attribute-based choice experiments (Louviere et al. 2000), while controlling for trust through measurement of perceptions of the trustworthiness of others (Luhmann 1979) and consumers’ value systems (Rokeach 1973).

Our emphasis on labeling recognizes that consumers with preferences for environmental attributes can only adjust consumption patterns in line with these preferences if environmentally sustainable products can be identified at point of purchase. Early analysts such as Rees (1992) proposed a “nutrition label for the planet”. This ecological concept includes carbon and water

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<sup>1</sup> This figure does not include information on farm-level production and industry level.

footprints which refer, respectively, to the amounts of CO<sub>2</sub> created and water used during food production, processing, storage, packaging and distribution. Several countries and retail chains have established pilot projects to support reduction of carbon emissions by providing information through product labeling, e.g., ‘Carbon Counted Canada’.<sup>2</sup> The world’s first footprint labels were commercially introduced in 2007 in the UK (Economist 2011). Subsequently the food retailer Tesco introduced a carbon footprint label in cooperation with the Carbon Trust during 2009. However, Tesco dropped this in early 2012. Reasons cited for this change were that consumers found the labels to be complicated and difficult to understand; that Tesco had only been able to label 500 instead of 50,000 own-brand products due to time requirements for label calculation; and that other retailers were slow to adopt footprint labeling (Financial Times 2012; Upham et al. 2010).<sup>3</sup> Introduction of such labels has also been slow in other countries (e.g., Powers 2011), despite survey results that found 72% of EU citizens supportive of carbon labeling and agreeing that this should be mandatory (Upham et al. 2010).

This paper makes contributions to the sparse food-related research on carbon footprint labeling and human values. While we are aware of studies on the influence of trust on food consumption and the importance of values to consumption decisions, we are not aware of previous studies that consider the impact of both features on food choices or environmental sustainability. The following section outlines the conceptual model, discusses relevant literature, and develops hypotheses. Methods and experimental design are introduced in section 3, followed by results in section 4, and further discussion and conclusions in the fifth section.

## **2. Literature, hypotheses and conceptual model**

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<sup>2</sup> See: [www.carboncounted.com](http://www.carboncounted.com).

<sup>3</sup> Carbon Trust was a private company established by the UK government, with the stated aim of facilitating a low carbon economy (Upham et al. 2010).

In a study of Canadians' choices among unprocessed meat products (ground beef) labeled for environmental footprints, Grebitus, Steiner and Veeman (2013) find that several human values have predictive power. Furthermore, Viscusi, Huber and Bell (2011) highlight that individuals' environmentally sustainable behavior is potentially influenced by human values regarding environmental quality and economic incentives. However, although human values are increasingly recognized to be important to consumers' choices, the influence of this concept on the possible impact of environmental implications of food choices has received little attention.

This study builds primarily on three concepts and strands of literature: ecological footprints trust, and human values. Each contributes to our conceptual model (Figure 1). A brief discussion of some of the key literature on each concept is followed by hypotheses. The conceptual model depicts the main relationships between the component variables that are expected to influence consumer choices of ecologically footprint labeled products. It is postulated that consumers' socio-demographic characteristics as well as individuals' trusting beliefs (generalized trust) and value systems determine related attitudes and subsequent behavior. Consumers' 'emotional engagement' associated with climate change (Roeser 2012) is expected to amplify their interpretation of footprint-labeled products, raising their motivation to choose such products. For specific definitions of the terms used in the model and the following sections see appendix table 1.

Figure 1 here.

### *Ecological footprints*

It has been argued that the ecological footprint concept provides an intuitive framework for understanding the bottom-line of ecological sustainability (Wackernagel and Rees 1997). A rapidly expanding literature has focused on the calculation of water and carbon footprints for a range of food products (e.g., Chapagain and Hoekstra 2007). Information on carbon footprints, typically expressed as a single figure in units of carbon dioxide equivalents, has been generated

as part of life cycle analyses (Chapagain and Orr 2009) and incorporated into labeling studies. Some studies have focused on the relative unfamiliarity with the primary unit of carbon labeling. For example, when compared to nutritional labeling, carbon labeling is not very familiar to consumers because there is a lack of commonplace experiences in which consumers can contextualize carbon equivalents (e.g., Teisl 2003).

Previous research shows that consumer behavior reflects support for environmental policies, i.e., consumer behavior is based on support (commitment/value) for environmentally-friendly products. Kempton (1991) demonstrates that U.S. consumers' desire to preserve the environment for their descendants is a key concern to many. Hersch and Viscusi (2006) consider consumers' risk beliefs regarding climate change, providing evidence from a 1999 Eurobarometer survey that decision-making governed by self-interest, rather than broader social welfare calculations, predominates when consumers are queried on support for gasoline price increases. These authors project that the degree to which consumers benefit directly from climate change policies will decline with age, with younger persons benefiting more as they anticipate longer periods of exposure to problems associated with ongoing climate change. However, the extent of intergenerational differences in support for climate change policies may hinge on sources of consumer preferences: priority on bequest value for future generations will soften age-related differences, contrasting to any dominant role of individual-use values (Hersch and Viscusi 2006). These considerations lead to our first hypothesis:

**H1:** *Younger consumers are more likely to choose products labelled for higher levels of environmental sustainability.*

### *Trust*

As we indicate (Figure 1 and Appendix Table 1), the role of trust has increasingly been recognized in consumer studies (e.g., Allen et al. 2008; Steiner and Yang 2010; Baddeley et al. 2012; Ding, Veeman and Adamowicz 2012). A study by Gulev (2012) finds positive

associations between specific cultural attitudes, including trust, and views of business practices that enable social and environmental sustainability. The role of trust is considered to be of particular importance where information is sparse, hard to assess or complex; in these situations, trust can substitute for full knowledge (Luhmann, 1978). An extensive literature explores varied trust concepts. Individuals' generalized trust beliefs are frequently viewed to reflect a person's innate moral beliefs and world view (Uslaner 2002, 2008). Consequently, in this study the role of generalized trust is explored in the context of footprint labeling:

**H2:** *Consumers who display greater levels of generalized trust are more likely to choose products labelled for higher levels of environmental sustainability.*

### *Human values*

The concept of human values was developed in the context of social preferences (Rokeach 1968, 1973). Rokeach (1968) emphasizes that human values are enduring beliefs that certain modes of conduct are personally and socially preferable. Values are likely to shape attitudes, emotional reactions and choice behavior (Clawson and Vinson 1978; Alwin and Krosnick 1985; Beatty et al. 1985; Thøgersen and Ölander 2002); (Figure 1). such that we expect 'emotional engagement' associated with climate change to be potentially an important element in risk-communication about climate change as it raises awareness and motivates individuals to act (Roeser 2012). In line with Roeser's (2012) emotional engagement hypothesis, it is believed that human values define personal goals and provide standards enabling individuals to evaluate and compare their own and others' attitudes and behavior (Leiserowitz, Kates, and Parris 2006).

Rokeach (1973) distinguishes instrumental and terminal values. Terminal values in particular are conceived to be either intrapersonal (e.g., peace of mind) or interpersonal (e.g., world peace), and can be distinguished in terms of personal orientation or social orientation (Rokeach 1973). While previous studies indicate that social orientation rather than of personal orientation influences attitudes to sustainable behavior (e.g., Gulev 2012, Schultz and Zelezny 2003), there is also evidence that appeals to the personal effects of sustainability which are more

likely to change the behavior of many individuals (eg., Manning 2009, Schultz and Zelezny 2003). This literature leads to the third hypothesis:

**H3:** *Social orientation increases the likelihood to choose products labelled for higher levels of environmental sustainability, as revealed by footprint labels.*

Footprint labels are also relevant in terms of value-symbol congruity since this may impact consumers' taste evaluations (e.g., Wansink, van Ittersum, and Painter 2005; Allen, Gupta and Monnier 2008). Specifically, where there is value-symbol congruency, consumers describe foods as having better taste and aroma and develop more favorable attitude and behavior intention (Allen et al. 2008). Value-symbol congruency occurs when the symbolic properties of a product are congruent with a consumer's values. Hence, human values can directly impact consumer food choices and purchase likelihoods when consumers differ in the extent to which symbolic meaning is important, as may be embedded in food labels (Allen and Ng 1999; 2003). Consumers make judgments about products based on a product's attributes, if those attributes align with their values (knowledge and beliefs) they will have more favorable judgments of those products. Thus value-symbol congruency is a function of consumers' capability to make judgments in line with their knowledge and beliefs (e.g., Allen et al. 2008). Consequently, we expect that greater capability to make product judgments in line with existing value systems leads to more favorable behavior intentions with regards to footprint labeled products. This leads to the fourth hypothesis:

**H4:** *Consumers characterized by social orientation perceive greater congruency with footprint labels associated with higher levels of sustainability, compared to personal-oriented consumers. Therefore, compared to personal-oriented individuals, social-oriented individuals display greater propensities to purchase products labeled for environmental sustainability.*

### **3. Methods and experimental design**



### *Study design and sample characteristics*

A focus group of 14 consumers preceded an online consumer survey, conducted in Germany with 1579 respondents in early 2011. A professional marketing firm was contracted to ensure that the sample would be reasonably representative in terms of major socio-demographics (see Table 1). The sampled participants were on average 45 years old; 55% were female and the average annual income was 28,000 Euros. About 30% of the sample has some type of higher education (e.g., bachelor or master degree). Household sizes ranged from 1 to 7 individuals, with a mean of 2.2. Some 19% of participants had at least one child in the household.

Table 1 about here

### *Choice experiment*

As potatoes are widely consumed in Germany they are chosen as the research product. The design of our attribute-based choice experiments (Louviere, Hensher, and Swait 2000) provides different combinations of price, carbon emission equivalents and water usage; three levels are included for each (Table 1). Carbon equivalents and water usage numbers used in this analysis are based on estimates from previous studies (Chapagain and Hoekstra 2004; Potato Council 2010). The identified prices are a range that encompasses observed market prices at regular food retailers in Bonn, Germany, in fall 2010, based on the mean observed price, plus and minus one standard deviation (Greibitus et al. 2013). The prices observed are for potatoes that were not labelled with water or carbon footprints.

Table 2 here.

Ngene software (Ngene manual 2012) was used to generate a random parameter panel efficient design with three choice alternatives (A, B, C), using the random parameter panel for efficiency, 500 replications, and 250 Halton draws. Each participant was assigned two choice sets. Figure 2 shows an example choice set for potatoes.

Figure 2 here (for online appearance only).

### *Generalized trust*

To analyze the role of generalized trust (Hong and Bohnet 2007; Georgarakos and Pasini 2011) we employ one of the questions of the Generalized Social Survey and focus thus on one item for measuring generalized trust (Reeskens and Hooghe 2008): “Generally speaking, would you say that most people can be trusted, or that you can’t be too careful in dealing with people?” Respondents chose between “yes”, “no” and “I don’t know”. These responses are subsequently included as an explainer of choices in the estimations.

### *Rokeach Value Survey*

We apply the Rokeach Value Survey (1973), whereby participants were exposed to 18 terminal values that relate to “end states of existence” (e.g., a world at peace) (see appendix table 2 for the complete set of terminal values). These values form the basis for identifying the terminal value system (Rokeach 1968). Respondents ranked each of the alphabetically ordered values (which were accompanied by a short description) from 1 (most important) to 18 (least important) based on the perceived relative order of importance. To aid ranking, participants were asked to consider how much each value acted as a guiding principle in their life.

Following Rokeach (1973), the large number of single values is reduced to fewer indices, in our case, personal orientation and social orientation, since it is anticipated that these are particularly relevant for explaining choice propensities related to ecological footprints (Hypothesis 4). Following Rokeach (1973), unweighted indices were calculated by summing those values that belong to a given index, and dividing that sum by the number of values included in the respective index.<sup>4</sup> Social orientation is comprised of the values: A World at

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<sup>4</sup> Example: Assume that respondent  $i$  ranked the values as follows: A World at Peace (10) + Freedom (6) + Equality (15) + National Security (2) =  $33/4 = 8.25$  for ‘social orientation’ for respondent  $i$ .

Peace; Freedom; Equality; National Security. Personal orientation is comprised of the values: True Friendship; Self-Respect. The two value indices are included as independent variables in the analysis.

### *Multinomial and Mixed Logit Models*

The stated preference data are analyzed using both multinomial and mixed logit models, to explore insights into the heterogeneity of consumer preferences and allow for plausible substitution patterns (Train 2009). Underlying the approach is the model of consumer's random utility ( $U$ ), where the utility of alternative  $j=1, \dots, J$  ( $J=3$ ) for individual  $i=1, \dots, I$  ( $I=1579$ ) in choice situation  $t=1, 2$  is described by:

$$(1) U_{ijt} = V_{ijt} + \varepsilon_{ijt}$$

where  $V_{ijt}$  is the systematic portion of the indirect utility function and  $\varepsilon_{ijt}$  is the stochastic (random) error component, assumed to be independently and identically distributed over all individuals, alternatives, and choice situations. The probability that subject  $i$  chooses option  $j$  in choice situation  $t$  is given by:

$$(2) \text{Prob}(U_{ijt} \geq U_{ikt}) = \text{Prob}(V_{ijt} + \varepsilon_{ijt} \geq V_{ikt} + \varepsilon_{ikt}) \quad \forall k$$

Assuming the observable portion of utility is linear in parameters, we initially specify

$V_{ijt}$  as:

$$(3) V_{ijt} = \alpha_0 P_{jt} + \beta_1 \text{Price}_{jt} + \beta_2 \text{Carbon\_footprint}(CF)_{jt} + \beta_3 \text{Water\_footprint}_{jt} + \\ \beta_4 CF * \text{Trust}_{jt} + \beta_5 \text{Personal orientation}_{jt} + \beta_6 CF * \text{Social orientation}_{jt} + \beta_7 CF * \text{Gender}_{jt} \\ + \beta_8 CF * \text{Age}_{jt} + \beta_9 CF * \text{Education}_{jt} + \beta_{10} \text{None\_of\_these}_{jt}$$

where  $\text{Price}_{jt}$  is the price of alternative  $j$  in choice situation  $t$  (a continuous variable measured in Euros); and  $\text{Carbon\_footprint}_{jt}$  and  $\text{Water\_footprint}_{jt}$  are continuous variables of carbon

emission equivalents in kg and water usage in 1,000 liters, respectively. Since our primary analytic interest here is on carbon footprinting, we include only interaction terms with *Carbon\_footprint<sub>jt</sub>*. *CF\*Trust<sub>jt</sub>*, is an interaction term between generalized trust and carbon footprint<sup>5</sup>; *CF\*Personal orientation<sub>jt</sub>* and *CF\*Socia l orientation<sub>jt</sub>* are interaction effects between carbon footprint and personal and social orientation, respectively. *CF\*Gender (female)<sub>jt</sub>*; *CF\*Age<sub>jt</sub>*; and *CF\*Education<sub>jt</sub>*; are interaction terms between carbon footprint, gender, age, and education, respectively. *None\_of\_these<sub>jt</sub>* refers to the alternative specific constant (ASC) equal to one if the participant chose to make no purchase (alternative C), and 0 if alternative A or B was chosen<sup>6</sup>. The ASC ‘none of these’ was chosen 2.82 % out of all choices.

The estimation strategy starts with multinomial logit models to identify candidate attributes and confirm deterministic functional forms for the subsequent mixed logit (MXL) models (Hensher, Rose and Greene 2005). . *Carbon\_footprint<sub>jt</sub>*; *Water\_footprint<sub>jt</sub>*; *CF\*Trust<sub>jt</sub>*; *CF\*Personal orientation<sub>jt</sub>*; *CF\*Socia l Orientation<sub>jt</sub>*; *None\_of\_these<sub>jt</sub>* and socio-demographic interaction effects are modeled as random parameters to test for variation in preference heterogeneity. The price is modeled as fixed parameter.

## 4. Results

### *Generalized trust*

Assessment begins with examination of descriptive statistics of participants’ trust measures and human values. Those who answered “Yes” to the question on trust in others are characterized as trusting; some 22% of participants gave this response. Some 71% of respondents indicated

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<sup>5</sup> Although we provide estimates for the interaction terms, interpretation of these in our non-linear model is less than straight-forward (Ai and Norton 2003).

<sup>6</sup> Aside from capturing the average effects on utility of attributes not included in choice-specific labeling attributes (Louviere, Hensher and Swait 2000), the ASC accounts for possible status quo effect on the systematic utility component (Scarpa et al. 2005).

“No” indicating they are non-trusting. Only 7% of participants indicated “Don’t know”. We merged responses for “no” and “don’t know” into an untrusting group (78%) and include this as a dummy variable in the following analysis.

### *Human values*

The most important values regarding the personal and social orientation indices are “Freedom” (M=6.97, SD=4.50) and “A World at Peace” (M=7.31, SD=5.42). As seen from their standard deviations, there is some lack of certainty for these rankings which could influence interpretation of the econometric results. Consequently, to account for heterogeneity in consumer preferences, we ultimately estimate a mixed logit model. Since mixed logit models provide estimates for both parameter mean and standard deviation, we are able to account for ranking uncertainties in interpreting results. Table 3 shows the structure and importance of the value indices.

Table 3 here.

### *Choice modeling results*

To analyze the role of trust and values for consumers’ choices with regard to environmentally labeled potatoes, we employ a step-wise regression approach. After conducting likelihood-ratio tests we reject the hypothesis of homogeneity of the model coefficients, and consider MNL 4 as our preferred model (table 4). Considering the BIC index (Schwarz 1978), MNL 4 is a statistically significant improvement in terms of overall fit compared to MNL 1 to 3. However, since the MNL models do not take into account that the choices of a given individual may be correlated across choice sets, we also estimate MNL 4 as the mixed logit model (i.e. model 5, MXL) (Train 2003). Considering MNL4 and MXL5, the BIC as well as the size of the likelihood values favor the mixed logit model. Similarly, the likelihood ratio test rejects the model specification of MNL4 in favor of MXL5. We conclude that allowing for correlations

across choice sets and allowing for random parameters yields a significant improvement in model fit for MXL5, also judged by the likelihood ratio test (Chi squared= 16.919, degrees of freedom = 9,  $p < 0.01$ ). We have some evidence for significant variation in preference heterogeneity, although these effects are not very strong (Carbon-Age interaction).

Table 4 here.

	<b>Model 1 (MNL1)</b>	<b>Model 2 (MNL2)</b>	<b>Model 3 (MNL3)</b>	<b>Model 4 (MNL4)</b>	<b>Model 5 (MXL)</b>
	<b>Coeff.</b>	<b>Coeff.</b>	<b>Coeff.</b>	<b>Coeff.</b>	<b>Coeff.</b>
Price	-5.642 ***	-5.645 ***	-5.651 ***	-5.651 ***	-6.559 ***
Carbon	-5.045 ***	-4.330 ***	-4.437 ***	-3.622 ***	-2.727
Water	-2.689 ***	-2.688 ***	-2.695 ***	-2.695 ***	-3.519 ***
Carbon*Trust			1.044 ***	1.045 ***	1.200
Carbon*Personal Orientation				-0.001	-0.113
Carbon*Social Orientation				-0.083 **	-0.331 ***
Carbon*Gender		-0.376 *	-0.331	-0.290	-0.640
Carbon*Age		-0.021 ***	-0.023 ***	-0.021 **	0.007
Carbon*Education		0.096 **	0.085 **	0.080 *	0.164
NONE	-14.876 ***	-14.908 ***	-14.952 ***	-14.959 ***	-23.905 ***
<b>Standard Deviation of parameter distributions</b>					
Carbon					0.840
Water					0.288
Carbon*Trust					0.266
Carbon*Personal Orientation					0.121
Carbon*Social Orientation					0.003
Carbon*Gender					2.232
Carbon*Age					0.129 ***
Carbon*Education					0.053
NONE					4.330 ***
AIC	1.616	1.612	1.609	1.608	1.492
BIC	1.623	1.626	1.624	1.628	1.529
LL Value	-2543.86	-2535.72	-2528.69	-2526.39	-2334.06

Results for all models show that the price coefficient is statistically significant and negative, as expected, since utility declines with higher prices. Carbon and water footprint estimates are statistically significant and negative in all models, including MXL5 where the interaction of

social orientation and carbon content is, however, highly significant. Overall, it appears that respondents tend to prefer potatoes that are labeled with lower carbon and water footprints<sup>7</sup>.

Though the results of models 3 and 4 suggest that those who are more trusting are more likely to choose products with a higher carbon emission rating, this is not evidenced by model 5. From the mixed logit model, trust has no effect on choosing products labeled with carbon or water footprint. On the basis of this result hypothesis 2 can be rejected. Again there is no preference heterogeneity with regard to Carbon footprinting to report.

Valuing personal orientation has no effect on choosing products labeled with carbon footprints. However, valuing social orientation leads to a stated preference for products with lower carbon emissions. This is in line with much of the literature and supports hypothesis 3. This result may also provide a rationale for the anticipated role of value-symbol congruency in affecting choices of consumers with high social orientation values (Hypothesis 4). There is no preference heterogeneity to report for either personal or social orientation.

Regarding socio-demographics, we find significant results in the MNL models but not in the MXL model for the mean parameters. However, we do find significant results for the standard deviation of the parameter for age. This leads to the conclusion that, in support of hypothesis 1 and in line with Hersch and Viscusi's (2006) insight, support for environmental policies may not only be governed by self-interest but can also be age-specific.

The ASC ("none of these") is negative and statistically significant in all models, suggesting a general disinclination to not selecting an eco-labeled product when these are presented as the product alternatives. However, the results show preference heterogeneity for the variable NONE indicating that some participants are more likely to opt out than others.

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<sup>7</sup>The non-significant carbon coefficient in MXL4 might arise from the high number of carbon interaction effects included in this equation.

## 5. Conclusions

In analyzing choice propensities for environmentally sustainable foods, what is the benefit of accounting for measures of generalized trust and human values in addition to traditional socio-demographics? Overall, we conclude that accounting for human values contributes to a better understanding of consumer choices for an environmentally sustainable food, relative to traditional socio-demographic explanators. The results relating to consumers' trust attitudes suggest that more work to understand these in the context of environmental issues may be necessary—at face value, the results of models 3 and 4 suggest that those with high levels of generalized trust are not concerned about environmental consequences of the food choices considered here, to the extent that this is reflected in carbon footprint labels of potatoes. However, consumers' trust attitudes captured here by one of the questions of the Generalized Social Survey did not prove to be significant in our main model. To clarify the impacts of trust in this context, further work is desirable to assess the relationships of those who trust others relative to those who support environmentally sustainable food consumption patterns, including whether and how these may interact in building social trust (Rosenblum 1998).

We find that individuals who have a strong social orientation are more likely to choose potatoes labeled for lower footprints, relative to consumers who show a strong personal orientation – a result which finds parallels to other studies (e.g., Gulev 2012, Schultz and Zelezny 2003). These results provide some support for our hypothesis that consumers characterized by social orientation perceive greater congruency with footprint labels associated with higher levels of sustainability, thus providing further support for the role of value-symbol congruity in food choices as evident from previous studies (e.g., Wansink, van Ittersum, and Painter 2005; Allen, Gupta and Monnier 2008). Regarding traditional socio-demographics, we find a significant standard deviation parameter for age. However, no significant mean parameters were found, a result in line with earlier evidence for a processed non-food product that did not find such differentiation either (Henion 1972; Sandahl and Robertson 1989).



Policy implications of our results arise from finding that consumer heterogeneity matters to at least some degree in the context of labeling vegetables for environmental footprinting in Germany. There is some heterogeneity in reactions to footprint labeling, and while many avoid ecologically unfriendly choices, this may not be true for all. To communicate potential benefits and costs of eco-footprints more effectively, public agents and interested groups will find it helpful to recognize heterogeneity of different consumer segments, assess potentially simpler or more direct label statement methods that signal ecological sustainability. Nonetheless, clarifying the role of trust in the context of sustainable choices requires further research.

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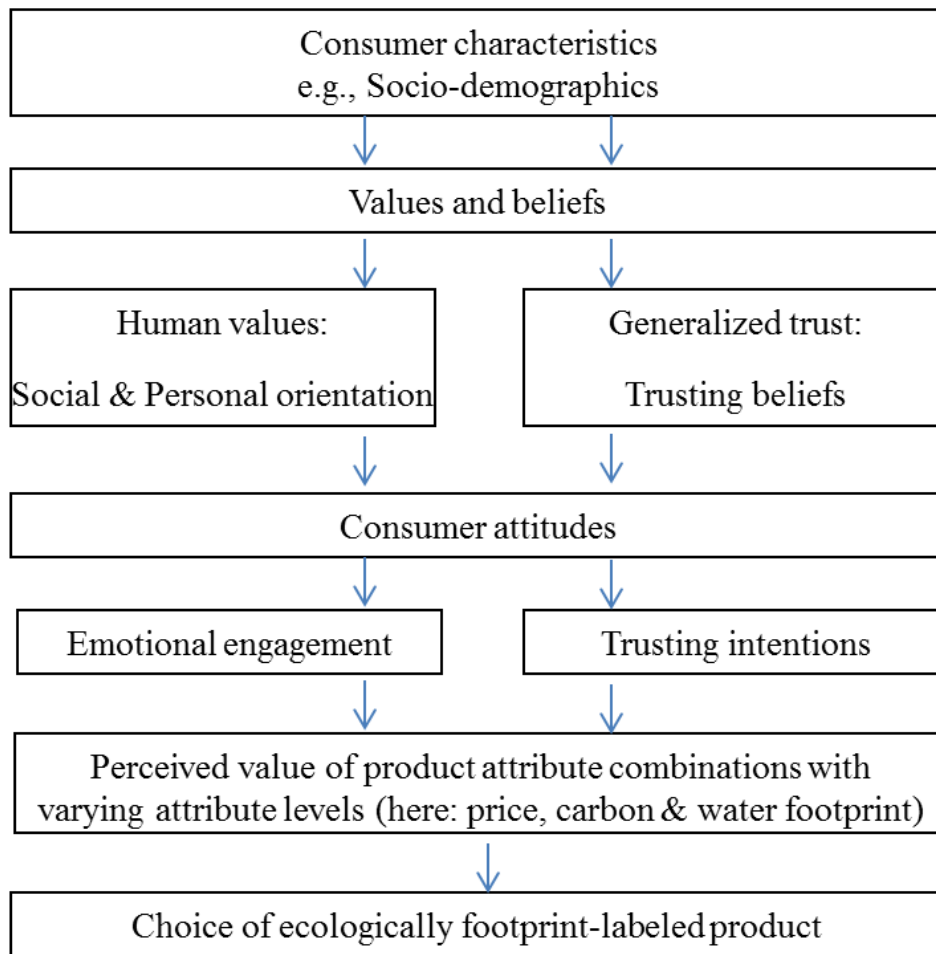
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**Figure 1:**

**Conceptual model**



1 kg Kartoffeln			Alternative C
	Alternative A	Alternative B	
Kohlendioxid (CO2) Äquivalente	0,60 kg	0,69 kg	
Wasserverbrauch	204,30 l	204,30 l	Keins von beidem
Preis	0,72 €	0,85 €	

**Figure 2: Example of Original German Choice Set (for online appearance only)**

**Table 1: Attributes and Attribute Levels for 1 kg of Potatoes used in the Choice**

**Experiment**

<b>Attribute</b>	<b>Level</b>		
Carbon (CO2) emission equivalents	0.69 kg	0.60 kg	0.51 kg
Water usage	2.35 liter	2.04 liter	1.74 liter
Price	0.98 Euro	0.85 Euro	0.72 Euro

**Table 1: Socioeconomic characteristics of the sample compared to the German population**

Variable	Specification	Percentage of the	
		sample (N = 1579)	German population (2007)
Gender	Female	45	51.0
	Male	55	49.0
Age <sup>1</sup>	18-24 years	5.0	9.9
	25-34 years	20.8	14.5
	35-44 years	24.8	20.4
	45-54 years	25.2	17.6
	55-64 years	17.2	14.0
	> 64 years	7.0	23.4
	Income <sup>1</sup>	< 5,000 €	13.5
5,000 - < 15,000 €		12.4	27.1 (6,000 - < 15,600 €)
15,000 - < 25,000 €		14.5	24.5 (15,600 - < 24,000 €)
25,000 - < 60,000 €		45.1	33.8 (24,000 - < 54,000 €)
> 60,000 €		14.5	5.4 (> 54,000 €)
Education	Without any graduation	Not provided	2.9
	Volks-/ Hauptschulabschluss (low)	13.8	42.9
	Mittlere Reife (modest)	31.3	26.4
	University entrance diploma (high)	21.5	27.7
	University degree (very high)	29.4	not provided

<sup>1</sup> Compared to German statistical office year 2005.

Source: authors' calculation; StBA 2007; StBA 2008, p. 29; 62.

**Table 3: Importance of Social and Personal Orientation to Respondents**

<b>Value index</b>	<b>Values</b>	<b>Mean</b>	<b>Std. Dev.</b>
<b>Social orientation</b>		<b>7.94</b>	
	Freedom	6.97	4.50
	A World at Peace	7.31	5.42
	Equality	8.34	5.07
	National Security	9.15	4.70
<b>Personal orientation</b>		<b>8.37</b>	
	True Friendship	8.36	4.63
	Self-Respect	8.39	4.28

Note: 1=most important, 18=least important

**Table 4: Empirical models**

	MNL Model 1	MNL Model 2	MNL Model 3	MNL Model 4	MXL Model 5
	<b>Coeff.</b>	<b>Coeff.</b>	<b>Coeff.</b>	<b>Coeff.</b>	<b>Coeff.</b>
Price	-5.642 ***	-5.645 ***	-5.651 ***	-5.651 ***	-6.559 ***
Carbon	-5.045 ***	-4.330 ***	-4.437 ***	-3.622 ***	-2.727
Water	-2.689 ***	-2.688 ***	-2.695 ***	-2.695 ***	-3.519 ***
Carbon*Trust			1.044 ***	1.045 ***	1.200
Carbon*Personal Orientation				-0.001 n.s.	-0.113
Carbon*Social Orientation				-0.083 **	-0.331 ***
Carbon*Gender		-0.376 *	-0.331 n.s.	-0.290 n.s.	-0.640
Carbon*Age		-0.021 ***	-0.023 ***	-0.021 **	0.007
Carbon*Education		0.096 **	0.085 **	0.080 *	0.164
NONE	-14.876 ***	-14.908 ***	-14.952 ***	-14.959 ***	-23.905 ***
<b>Standard Deviation of parameter distributions</b>					
Carbon					0.840
Water					0.288
Carbon*Trust					0.266
Carbon*Personal Orientation					0.121
Carbon*Social Orientation					0.003
Carbon*Gender					2.232
Carbon*Age					0.129 ***
Carbon*Education					0.053
NONE					4.330 ***
AIC	1.616	1.612	1.609	1.608	1.492
BIC	1.623	1.626	1.624	1.628	1.529
LL Value	-2543.86	-2535.72	-2528.69	-2526.39	-2334.06

† \*significant at 10% level, \*\* significant at 5% level, \*\*\* significant at 1% level

## Appendix

**Table 1: Definitions of attitudes, beliefs, values, perception and preferences**

<b>Term</b>	<b>Definition</b>
Attitudes	Attitudes are personal evaluations, determined by beliefs about likelihoods of consequences of behavior, and evaluations of how good or bad those consequences would be (Trafimow and Finlay 2002; Ajzen 1991). Attitudes influence psychological processes such as perception, learning and thinking. Strong attitudes can affect purchase behaviour and quality judgments of consumers (Trommsdorff 2003).
Beliefs	“Beliefs refer to a person’s subjective probability judgments concerning some discriminable aspect of his world; they deal with the person’s understanding of himself and his environment” (Fishbein and Ajzen 1975).
Human values	Human values are enduring beliefs that certain modes of conduct are personally and socially preferable (Rokeach 1968).
Perception	Perception applies after consumers select, organise and interpret product information (Gryna, 1998).
Preferences	Preferences as a latent construct, as viewed in random utility models (Manski 1977).

## Appendix Table 2: Terminal Values

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<b>Terminal values</b>	
<b>A Comfortable Life</b>	a prosperous life
<b>Equality</b>	brotherhood and equal opportunity for all
<b>An Exciting Life</b>	a stimulating, active life
<b>Family Security</b>	taking care of loved ones
<b>Freedom</b>	independence and free choice
<b>Health</b>	physical and mental well-being
<b>Inner Harmony</b>	freedom from inner conflict
<b>Mature Love</b>	sexual and spiritual intimacy
<b>National Security</b>	protection from attack
<b>Pleasure</b>	an enjoyable, leisurely life
<b>Salvation</b>	saved; eternal life
<b>Self-Respect</b>	self-esteem
<b>A Sense of Accomplishment</b>	a lasting contribution
<b>Social Recognition</b>	respect and admiration
<b>True Friendship</b>	close companionship
<b>Wisdom</b>	a mature understanding of life
<b>A World at Peace</b>	a world free of war and conflict
<b>A World of Beauty</b>	beauty of nature and the arts

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