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# Ecology shapes moral judgments towards food-wasting behavior: Evidence from the Yali of West Papua, the Ngorongoro Maasai, and Poles

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ABSTRACT

People judge food wasting as an immoral behavior. Although moral concerns vary widely across cultures, to this date, food wasting moral judgments were investigated only among rich and industrialized ones. This study reports first evidence of cultural variability on moral judgments of food wasting between modern and traditional cultures. We conducted our study among the Maasai - pastoralists of Ngorongoro, Yali - horticulturalists of West Papua, and among citizens of Poland. According to the results, Maasai judge food wasting as more immoral compared to Yali and Poles. What's more, Yali judge food wasting harsher than Poles. These results suggest that there are cultural differences in moral judgments of food wasting. These differences might reflect the impact of unstable ecology on food economy of a given society. We hypothesize that harsh moral judgment concerning food waste may serve as a cultural adaptation for food insecurity.



## 1. Introduction

### 1.1. Food wastage

Around one-third of food produced worldwide is lost or wasted, which amounts to roughly 1.3 billion tons of edible parts of food per year (Gustavsson, Cederberg, Sonesson, van Otterdijk, & Meybeck, 2011). According to the World Economic Forum (2016), food crises are one of the biggest global risks in the future and food-wasting practices interfere with efforts to establish global food security. Wasting food is a primary cause of higher food prices in both developing and developed countries, and contributes to the undernourishment of the poorest people worldwide (Stuart, 2009). Wasting food affects the environment because the expansion of agriculture to maintain the food supply contributes directly to deforestation and a decrease in biodiversity (Houghton, 2012). The overproduction of food also results in the waste of drinkable water (Chapagain & James, 2011). Food wastage is also a source of greenhouse gases, such as methane, which is even more harmful to the atmosphere than carbon dioxide. In addition, decomposing food in the landfill affects the climate. The production, distribution, and refrigeration of food waste are also indirect sources of emissions (Vermeulen, Campbell, & Ingram, 2012).

Food wastage happens at every stage of the food supply chain, but household consumers waste the highest amount of food. Thus, decreasing household food wastage is one of the methods to help slow the expansion of agriculture, contribute to the condition of the environment, and provide global food security (Bajželj et al., 2014). Several studies have explored people's behaviors towards wasting food. For example, studies have shown that larger or childless households tend to waste less food per capita. Younger people also appear to waste more food than older people do (Parfitt, Barthel & MacNaughton, 2010).

Recent studies have explored psychological factors concerning food waste. Research aimed at describing motivations toward reducing food waste discovered that people worry that they waste their money when they waste food (Cox & Downing, 2007). In addition to these economic concerns, people feel that wasting food is somehow immoral (Cox & Downing, 2007; Graham-Rowe, Jessop, & Sparks, 2014, 2015).

In one study, Graham-Rowe et al. (2014) examined the motives

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behind willingness to minimize food waste in 15 British households using qualitative interviews. They identified two core motivations: waste concerns, i.e., people do not want to waste food because it is a waste of money; doing the "right thing," i.e., people felt that wasting food could be disrespectful to themselves and their traditions, or they became more aware of the environmental and social repercussions of wasting food.

In their following study, Graham-Rowe, Jessop, and Sparks (2015) derived a list of predictors that can influence intentions to reduce household food waste. According to their study, people reduce their food waste when it is consistent with their attitudes, i.e., they think that it is right to reduce food waste; subjective norms, i.e., perceived social pressure to reduce food waste; and perceived behavioral control, i.e., whether people believe that they are capable of reducing their food waste.

Food-wasting judgments are not merely economic dilemmas in these studies mentioned previously. Although previous studies did not consider this issue directly, food-wasting judgments also plausibly appear to involve the moral domain.

### 1.2. Moral judgments

Throughout history, morality and moral judgments were mostly the subject of interest for philosophers. However, the number of studies on morality and moral psychology has recently grown rapidly (Haidt, 2007). Haidt (2001, p. 817) defined moral judgments as "evaluations (good vs. bad) of the actions or character of a person that are made with respect to a set of virtues held to be obligatory by a culture or subculture."

Numerous studies have shown that moral judgments vary between cultures (Graham, Meindl, Beall, Johnson, & Zhang, 2016; Shweder, Much, Mahapatra, & Park, 1997). The more recent literature has shown deeper and wider differences in moral reasoning among cultures, and suggests that their individual ecological challenges shaped some of these differences. Culturally specific moral logic could serve as a cultural adaptation to ecological challenges by providing a population with additional social resources or specific social mechanisms of coping with ecological challenges. Cultural adaptations concerning moral reasoning may remain in a society even if the ecological challenges disappeared. For example, the parasite-stress theory (Thornhill & Fincher, 2014; Tybur et al., 2016) suggests that human values were partly shaped by historical pathogen prevalence. People living in ecologies with a history of high pathogen prevalence tend to restrict individual personal rights and are more authoritarian and conservative. This kind of reasoning served as a cultural adaptation and discouraged people from behaviors that may lead to disease contagion.

Some moral judgments can be presumed to have emerged because of ecological factors concerning food economy. For example, Talhelm, Zhang, Oishi, Shimin, Duan, Lan, et al (2014) suggested that the practice of rice agriculture instead of wheat in China shaped a culture of collectivism. People raised in this culture are more interdependent and loyal toward their group than people in other cultures. This kind of moral reasoning might have emerged to facilitate the cooperation of rice farmers, which is necessary to maintain their complex irrigation systems and coordinate groups of farmers to work on the rice fields.

Although ecological factors cannot be regarded as the only or the most important factor that shaped human attitudes, the growing body of evidence highlights it's utility in explaining cultural differences among human populations.

### 1.3. The present study

Rozin (2005) noted that foraging for food consumed energy throughout natural human history; therefore, the maintenance of a positive energy balance, with a greater energy intake than expenditure, is very important. Thus, food plays a critical role in ecologies with no food surplus, where food is not easily accessible and has low variety, which makes it impossible to maintain a healthy diet. Modern societies with food markets and industries have created ecologies where food is easily accessible; therefore, it is easier to maintain a positive energy balance and a healthy diet.

According to these premises, we hypothesized that societies where food is more highly valued because of their harsh ecology should tend to consider food-wasting behavior as immoral. We examined whether moral judgments towards food waste vary among societies. We suggest that traditional cultures judge food-wasting behavior as more immoral compared with industrialized cultures. The cultural learning from these judgments could serve as a human adaptation for surviving in food-scarce environments.

## 2. Method

### 2.1. Participants

We collected data from among three different groups of people: the Maasai of Ngorongoro, the Yali of West Papua, and Poles living in Poznań, western Poland. The study complied with the Declaration of Helsinki on Biomedical Research Involving Human Subjects.

#### 2.1.1. The Maasai

The Maasai live in southern Kenya and northern Tanzania. Our data were collected from the inhabitants of Maasai villages (*bomas*) located around Endulen in the Ngorongoro Conservation Area (NCA) of northern Tanzania, which is characterized by a relatively wet climate and resilient to droughts and rainfalls (Galvin, 2009).

Although Maasai from other regions of the NCA have contact with Westerners because of an increase in natural tourism activities in the Ngorongoro region (Charnley, 2005), this is not typical for the population of Endulen because the settlement is distant from tourism routes. The Endulen Maasai are traditional pastoralists and their diet is predominantly based on their traditional economy: i.e., animal products such as dairy products, meat, and blood (Martin, Petrucka, & Buza, 2014). However, because of the scarcity of these products, the Maasai began consuming grains, mainly maize, as well as beans. Although cattle are considered an index of social status, its meat is expensive and rarely eaten (Smith, 2016). To date, milk remains the main food consumed in the morning by most Maasai families (MB: personal observations) and the Maasai do not use any long-term food-storage techniques.

Our study was conducted among 148 Maasai (52 females) aged 18–82 years ($M = 44.0$, $SD = 16.8$). Some older Maasai did not know their exact age, but we estimated their ages with the help of the translators. The Maasai were approached in their villages by the researchers and their translators. All adults were invited to participate in a set of scientific studies for an incentive.

#### 2.1.2. The Yali

The Yali are an indigenous tribe from West Papua, Indonesia, who live in the Eastern Highlands of Baliem Valley alongside many other indigenous tribes. Our data were collected among the inhabitants of small villages surrounding Piliam village. The Baliem

Valley is characterized by a montane tropical climate. Although the rainfall distribution does not show seasonality, the Baliem River levels tend to fluctuate, which contributes to seasonal floods and droughts (Haberle, Hope & DeFretes, 1991).

The Yali are recognized as a group with very little or no contact with Western tourism. The Yali were contacted only recently by missionary expeditions in the 1950s and are considered a traditional horticultural society that produces most of their food in gardens where they practice shifting cultivation (Koch, 1974). The Yali food economy practices were described by Milliken (1994), i.e., food supply labor is divided between the sexes and men tend to hunt while women harvest and cultivate. Their diet consists mostly of staples like sweet potato, taro, rice, sugar cane, and bananas, but they also grow some leafy vegetables.

The Yali breed pigs, which are considered an important index of social status (Sorokowski, Sorokowska, & Danel, 2013). Nevertheless, as raising a pig is very expensive, the Yali rarely consume pork, mainly during ceremonies. Meat is also acquired through hunting. The Yali men hunt for birds and small marsupials, such as tree kangaroos. They hunt only during the full moon (MM: personal observation); Therefore, hunting is not a substantial source of protein in their diet. The Yali also do not use any long-term food-storage techniques.

Our study was conducted among 69 Yali (24 females) aged 18–75 years ($M = 39.9$, SD = 14.6). Some older Yali did not know their exact age, but we estimated their ages with the help of the translators. The Yali were approached in their villages by the researchers and their translators. All adults were invited to participate in a set of scientific studies for an incentive.

#### 2.1.3. Polish citizens

The sample of Polish citizens was gathered in Poznań, which is one of the biggest and richest cities in Poland. We conducted our study only among the residents of Poznań to preserve the homogeneity of the sample. According to Henrich, Heine, and Norenzayan (2010), Poles are considered a Western, educated, industrialized, rich and democratic (WEIRD) society. Most psychological studies are conducted in WEIRD societies, and all of the studies concerning human approaches to waste were conducted in this type of society. The Polish sample was used as a reference point for the Maasai and Yali to highlight differences in judgments towards food-wasting behavior between industrialized and traditional societies. Differences between industrialized societies and traditional ones cannot be reduced solely to differences in characteristics provided by Henrich et al. (2010). We expected, however, that potential differences in moral judgments of food wasting could be acknowledged to differences in physical and social ecologies of each population. Our study was conducted among 171 Poles (82 females) aged 20–82 years (M = 36.9, SD = 14.6). Poles were approached on the street in Poznań and asked to participate in the study. No incentives were paid. The study was conducted in a quiet place near where the researchers initially met the participants.

### 2.2. Procedure

We created a suitable method to assess moral judgments among different populations. Regarding the cultural characteristics of our samples, we considered that the purpose of the study should be as clearly understood for illiterate participants in traditional societies as for those in Western societies.

We started with an assumption that different immoral behaviors could be graded on the level of their intensity; i.e., some behaviors are considered more immoral than others are (Clifford, Iyengar, & Cabeza, 2015). Cultures differ in their perception of what is immoral and to what extent (Graham et al., 2016). We assumed that differences in moral judgments would be reflected in the way participants assessed the severity of a set of immoral behaviors.

We prepared a set of five pictorial items (see Appendix), which were expressed in the form of behaviors: i.e., beating someone, stealing, killing, saying bad things about someone, and lying. Some cultures consider these behaviors to be immoral (Graham et al., 2013). Each item included a corresponding image to simplify the judgment process. A sixth pictorial item illustrating food waste was added to the set to evaluate moral judgments toward food-wasting behavior.

Each participant was presented with the set of all pictorial items in a random sequence and asked to choose the worst behavior from the set (see Fig. 1). After selection, the item was removed from the set and participants had to choose the next worst behavior. We repeated this method until the last two items. The corresponding images simplified the selection of items by enabling the participants to point at the exact item. The Yali and Maasai easily understood our method, commented spontaneously about their choices, and provided their rationale. The whole procedure did not last longer than 2 min.

We assumed that people who perceived wasting food as a very immoral behavior would judge this behavior as worse than lying, stealing, or saying bad things about someone. This assumption is consistent with Haidt's (2001) definition of moral judgments as evaluations of actions (good vs. bad). The Maasai and Yali use both descriptions, i.e., good or bad, in a similar context to Western societies.

#### 2.2.1. Coding of results

Each item in our set was graded according to how severely it was perceived. The most immoral behavior was graded as 6 points, followed by 5 points for the next most immoral behavior, and so on until the last one, with 1 point. This method could be extended to the population level by counting the mean score of judgments in a certain group.

## 3. Results

A Kruskal-Wallis test was conducted to evaluate the differences in food wasting moral judgments among three ethnic groups (Maasai, Yali and Poles). There was a statistically significant difference between the groups ($H(2) = 102.189$, $p < 0.001$, Maasai $Mdn = 3$, Yali $Mdn = 2$, Poles $Mdn = 1$). We conducted post-hoc tests to test pairwise comparisons. We found that Maasai had

**Fig. 1.** Researcher conducts the study with a Yali man.

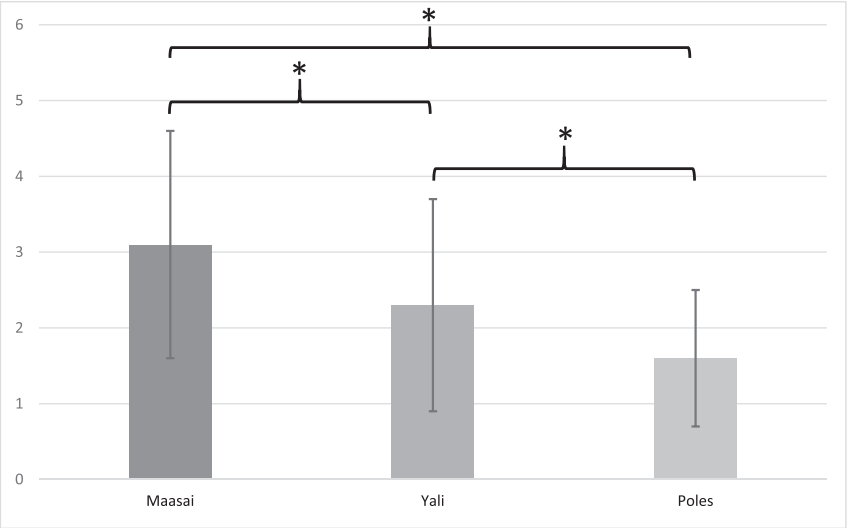


**Fig. 2.** Mean values with standard deviation for moral judgments towards food-wasting behavior across the tested populations. Note: The higher the mean value, the harsher moral judgments are toward food wasting in a society. (*$p > .001$).

significantly harsher moral judgments to both Yali ($p = 0.003$) and Poles ($p < 0.001$). Furthermore, we found that Yali had significantly harsher moral judgments to Poles ($p < 0.001$).

Additionally, to test for co-variates, we performed an analysis of covariance (ANCOVA) using participants' sex (male vs. female) and ethnic group (Maasai vs. Yali vs. Pole) as independent variables, age as the control variable, and food-wasting score as the dependent variable.

The tested model did not show any significant effect for participants' sex ($F1,308 = 0.16$, $p = .69$, $\eta 2 < .01$). However, we found a significant effect for the ethnic group ($F2,308 = 31.7$, $p < .00001$, $\eta 2 = .17$): the Maasai scored higher in our scale ($M = 3.1$, $SD = 1.5$) than did the Yali ($M = 2.3$, $SD = 1.4$) and Poles ($M = 1.6$, $SD = 0.9$). Additionally, the Yali scored higher than did Poles (all $p > .001$, post-hoc least significant difference test). These results are presented in Fig. 2.

## 4. Discussion

Previous research found that people living in WEIRD countries recognize the immorality of food-wasting behavior (e.g., Graham-Rowe et al., 2014). Nevertheless, research considering the cultural differences that shape these judgments is lacking. The results of the present study suggest that moral judgments towards food-wasting behavior vary among cultures. Poles' judgments towards wasting food tend to be less harsh than these of the Maasai and Yali. In addition, the Maasai and Yali also judge food-wasting behavior differently, with the harshest judgments from the Maasai.

In the light of the results we obtained we suggest that cultural differences in moral judgments of food wasting are the result of cultural adaptation. As Boyd, Richerson & Henrich (2011) describe it (2010), cultural adaptation is a process of shaping various behavioral patterns among populations, reflecting ecological challenges. Both physical and social ecology could shape moral judgments of food wasting.

Physical ecology includes climatic variability, with high climatic variability resulting in food scarcity (due to severe droughts and the deaths of livestock) (Wheeler & von Braunm 2013). Severe moral judgments of food wasting could serve as a cultural adaptation to prevent individuals from wasting food in ecologies with food scarcity. Moral judgments, however, are not determined solely by physical ecology (Douglas, 2003; Wilk, 2001). Social ecology includes political organization and lifestyles, which may also shape moral judgments toward food wasting. Evans (2011), for example, notices different social norms, which makes people waste their food. These reasons include healthier lifestyle (where people eat high variety of foods, but are being left with many leftovers) or erratic work day (where food is bought but there is no time to prepare it properly). In another work, Evans, Campbell and Murcott (2012) pointed out that food wasting problems are being more apparent in political and social debate due to national and international governance, policy shifts and activists such as Tristram Stuart (2009).

In sum, both physical and social ecology could be responsible for cultural variation in moral judgments of food wasting. Still, this is an initial evidence of differences in food wasting moral judgments and future research may demonstrate more nuanced factors as a better explanation of these differences.

The Ngorongoro Maasai judged food-wasting behavior more harshly than did the Yali and Poles, which may be because of their struggle with an unstable food economy. The NCA is influenced by high climatic variation, which causes disturbances in cultivation as well as in pastoralism. The Maasai were historically affected by cattle diseases (Field, Moll, & Sonkoi, 1997, pp. 181–199) and droughts (Homewood, Homewood & Rodgers, 2004). In 1997/1998, an El Nino event caused a drought that affected cattle grazing in the lowlands of the NCA. The Maasai were pressured to graze their stock on wetter higher levels, which caused disease in smaller livestock (Boone, Galvin, Smith, & Lynn, 2000). In 2009, another enormous drought substantially added to the Ngorongoro Maasai's food scarcity problems. The NCA administration reported that 30–40% of local stock died as a consequence of this drought. To preserve wildlife, the Endulen Maasai are prohibited to cultivate in the NCA. All of these above factors resulted in a high level of food insecurity among the Maasai. The Maasai continue to struggle with climate variability, cattle disease, unpredictable markets, and unfavorable policies (Kipuri & Sorensen, 2008). Maasai children are frequently undernourished and reproductive-age women suffer from anemia because of the general scarcity of food and a lack of fruits and vegetables in their diet. The Maasai's maize and milk diet is insufficient for maintaining normal hemoglobin levels in reproductive-age women. Martin et al. (2014) reported that 29% of

reproductive-age women in their sample suffered anemia. Although the NCA administration has been provisioning local Maasai families with maize, food insecurity currently remains a key challenge for this population (Galvin, Boone, McCabe, Magennis, & Beeton, 2015). These experiences could maintain the Maasai's harsh judgments toward food-wasting behavior.

The Yali also have to deal with food insecurity. The Yali experienced severe food shortages during the El Nino event of 1997/1998, which caused droughts, water shortages, and fires. However, the Yali forest ecology enabled their fast recovery. A wet climate favors the regrowth of cultivation fields. During natural disasters, the Yali can subsidize their regular diet with so-called famine foods, such as yams, leaves, and wild fruits (Boissire, 2002). The Yahukimo Regency in Papua Province, Indonesia, where the Yali tribal villages are located, is considered one of the most vulnerable to food insecurity in the whole country (World Food Programme, 2015). Although the Yali do not suffer from famine nowadays, their recent history was marked by natural disasters. Their harsh moral judgments towards food-wasting behavior might reflect the ecological history of food insecurity among the Yali.

Among the studied groups, Poles judged food-wasting behavior as the least immoral. This finding sits well with our hypothesis because Poles profit from the modern industrialized food economy. According to the Global Food Security Index (The Economist Intelligence Unit, 2012), Poland took the 29th place in food security rankings (for comparison, Indonesia is the 71st and Tanzania is the 94th). The Index includes Poland in the group of nations with high food security. In recent history, Poles living in Poznań (our sample consists of the residents of Poznań only) experienced higher levels of food insecurity. In 1956, protesters demanded lower food prices during an uprising (Poznań June) (Makowski, 2001). Although food security in Poznań used to be lower than it is nowadays, it seems that after 1956 it was never as low as the food security of the Maasai or the Yali. This high level of food security is reflected in Poles' mild moral judgments towards food-wasting behavior.

Our procedure did not include gathering data concerning people's rationale for their judgment; nevertheless, participants were eager to share their rationale with the researchers after the official procedure. The Maasai showed their outrage at the thought that someone could intentionally waste food. They called such people lunatics. Some Maasai judged wasting food as being more immoral than killing another person because they thought that wasting food caused more deaths than killing a person per se. The Yali reacted similarly and described wasting food as bad because it is better to give it to someone else or feed their pigs with the leftovers. However, Poles rarely described wasting food as an immoral behavior. If they did, they mostly argued that wasting food was bad because many people worldwide suffer from hunger and it negatively affects the environment.

Future studies should also control for the value of foods in each culture, as wasting specific food items may elicit different moral judgments. For example, different types of food have some moral meaning: i.e. cattle for African pastoralists (Hutchinson, 1992), pigs for New Guinea horticulturalists (Sorokowski et al., 2013) and bread for Poles (Rabikowska, 2010).

In conclusion, the present study suggests that ecology can influence moral judgments towards food-wasting behaviors. We conducted our research among three cultures. Two of these cultures are considered traditional societies where agricultural practices are still not influenced by modern industry. Our study implies that a low moral concern towards food-wasting behavior might be specific only to WEIRD countries (Cox & Downing, 2007; Graham-Rowe et al., 2014), which struggle with issues of over-consumption (Humphery, 2010). This kind of data may influence future interventions to improve food waste management and to minimize its environmental and social impact (Isenhour, 2010; Spaargaren & Oosterveer, 2010). To sum up, we suggest that eliciting people's moral concerns toward food-wasting behavior could help minimize their food-wasting behaviors by intensifying perceived social pressure (Graham-Rowe et al., 2015).

## Conflicts of interest

None.

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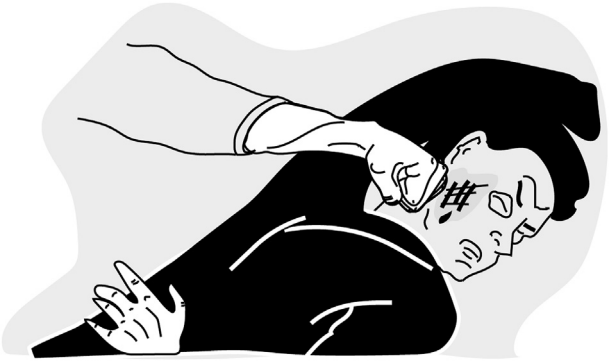
## Appendix. List of pictorial items

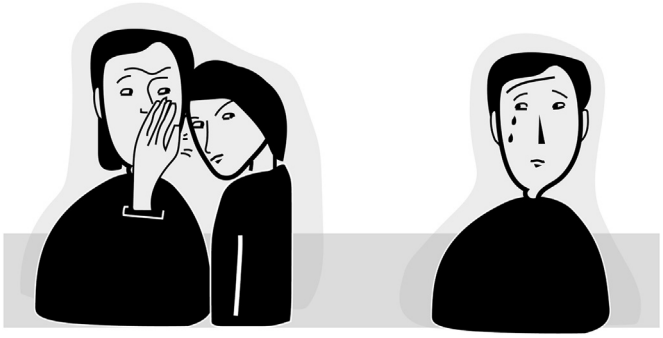
1 Beating someone



2 Stealing

3 Killing

4 Saying bad things about someone



5 Lying

6 Food wasting

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