

Risk Cultures and Meat Traceability in The United States and Zambia

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Abstract

Food safety is a very important dimension of food science. Traceability is the other dimension of food safety that is based on risk and risk perceptions of “what/who.” Some science and technology scholars have referred to traceability as risk culture, indicating the kinds of risk perceptions that food firms and governance structures adopt in their effort to reduce harm to their systems. This article examines the types of risks that are deemed important by firms in Zambia and the United States of America. It specifically considers beef traceability and the kinds of social or political forces that have shaped the prioritization of these risks. This article shows that trust in regulatory intuitions or firms is tied to how consumers or the majority public, in each of these countries, view them. Because these two countries have different histories, and social and political needs, their view of risk is dependent on these forces. Using traceability as a tool for examining risk cultures can provide the kinds of risks that are considered important, how these countries regulate their food safety, how their dissimilar histories play a pivotal role in their current food system, and the kinds of improvements that can be applied to their food safety.

Keywords: food safety, risk cultures, food regulation, traceability.

1. Introduction

Traceability has become an important issue in recent years. With the growing need for manufacturer transparency and rising consumer advocacy groups, traceability has proven to be a useful tool in addressing these concerns along with manufacturers' desire to mitigate risk in their firms. This article examines food safety systems, particularly meat traceability systems, in Zambia and the United States of America (USA). It applies Douglas & Wildavsky's (1983) approach to risk culture by describing the social (and other) forces that influence the compensation of food safety systems and traceability. It shows how particular risk cultures shape the way, where, and how countries define risk. These definitions of risk differ in space and time and are set by regulatory systems even when they are understood differently by consumers. Some of the most important risks concerning food are environmental concerns, health, harvesting methods (this includes whether an animal was humanely treated and dispatched, and the kinds of processing methods that were used i.e. salting, curing, etc.), financial, nutrition, security, safety, and others. These are discussed, along with how other risks have been made visible by traceability.

2. Methods

This article is a desk study comprising a review of book chapters, journals, news articles, and empirical data. The empirical data is based on first-hand experience of being born and having lived in Zambia for 14 years. These sources were used to understand the type of food safety systems in both Zambia and the United States.

To further understand these food systems, Douglas & Wildavsky's (1983) approach to risk culture was applied to explain the kinds of risks that food systems in these two countries employ and why they employ them. Applying Douglas & Wildavsky's risk culture showed the ways in which food firms utilize them, especially through traceability. This lens helped situated the study as a comparative analysis of food safety systems from two different countries.

3. What is Traceability?

Traceability systems vary according to the type of food being traced, the type of firms that apply them, and the quantity of the product being traced. Fruits and vegetables, for example, can have bar codes that use Radio Frequency Identification (RFID), a technology that uses radio waves to communicate information about the product (Smith et al., 2008). Meat products can and do use this type of technology as well. For foods like grains, it is nearly impossible to trace the exact source at certain points of production. Therefore, firms use batch systems of traceability to ensure proper tracking or use analytical techniques such as Near Infrared spectroscopy (NIR) (Kondo, 2010).

Traceability itself is a combination of technologies used to track and trace foods at any point in their production and distribution. In this discussion, this article focuses on traceability that applies to beef for food safety purposes. As mentioned above, traceability is a combination of technologies; therefore, firms use it for different purposes and for mitigating different types of risk, like informing about the quality of the product or simply tracing it along the supply chain. This helps firms to be well-functioning and integrated while maintaining food safety standards.

A small-scale firm for example may not be able to afford traceability technologies that are intensive and require tracking of beef products at all levels of production and distribution. Even larger firms cannot adequately and accurately trace food products at all levels of production and distribution. Firms use traceability either due to regulatory obligations or the need for a well-integrated food system to prevent the firm from food safety risks. At a domestic and sometimes even international level, traceability is used to address different types of risk, be it financial or health/food safety risks.

4. Where Traceability Begins

Traceability begins at different levels of production and distribution for different products. For beef/cattle products, traceability can begin pre-slaughter with branding and tagging of animals. During slaughter, parts of the animal, like the hide and the ears with tags are kept until certain processing stages. Post-harvest, many countries have adopted RFID. Other methods of tracking include paper and electronic records such as passports, brands, tattoos, tags, transponders, and biometric means of identification such as DNA fingerprinting or iris scanning (Smith et al., 2008).

4.1 Traceability in the United States: FSIS regulations require that slaughter plants keep the head and certain organs of slaughtered animals, along with any other parts or organs of the animal that can later be used for identification. This is because identifying primal and subprimal cuts of beef is very challenging. DNA fingerprinting technology is one among others that can accurately trace a cut from a specific animal. What DNA fingerprinting cannot do, however, is ascertain the harvest and growth method of the animal—was it grass-fed, organic, or antibiotic-free? According to Smith et al (2008) until six years ago, there was no compelling reason for the beef industry to adopt the use of DNA fingerprinting, specifically in the United States. Smith further shows how some slaughterhouses can claim to have a well-functioning traceability method, especially through labels, but by the time beef products get to consumers, the labels become meaningless (Smith et al., 2008).

They may become meaningless since the information found on the labels is not always read and neither is it understood by the average consumer. This not only points to how challenging traceability is but also how it is applied for different purposes. In the USA especially, a few consumers may be concerned about the harvest methods of beef products, while an agency like the United States Department of Agriculture may be concerned about the source of these products, especially if a disease outbreak were to occur. In some instances, traceability is important and may be applied as a risk management strategy by regulatory agencies.

4.2 Traceability in Zambia: Animals are either branded or tagged and these are used to individually identify them. This discussion specifically focuses on the identification of beef cattle, even though other livestock are tagged or branded (Animal Identification Act, 2010). This identity is tied to specific farmers. The Brands Act of Zambia outlines branding procedures, which are mainly used as a form of establishing property rights (The Laws of Zambia, 1913) as opposed to being a means of tracing cattle for food safety purposes. These branding procedures show which methods of branding can be used by farmers to identify and distinguish their cattle from

other farmers' cattle. For food safety purposes, farmers in other countries can and do use branding as a means of tracing which farms cattle came from in case of a disease. In Zambia, only a few farmers can supply their cattle commercially to large corporations even though these corporations may purchase their beef from smaller farmers as well (Zambeef, 2020). Small farmers also tend to sell their beef to local and smaller butchers. These butchers conduct visual inspections of the carcass, looking for any defects and disease signs. At such a level, traceability is not an immediate concern. Based on personal experience, my family was able to supply beef and pork to local butchers who conducted visual exams of the products we supplied them. These butchers merely asked how much per kilogram the products should be sold for.

5. Meat Traceability as a Form of Risk Culture

In the introduction of *Risk and Culture*, Mary Douglas and Aaron Wildavsky address the relationship between risk and culture in technology and science. Douglas and Wildavsky use examples of environmental and technological risks. The authors argue that complex social changes in western countries have led to values that the authors identify as sectarian. They associate three positive commitments with these values, including human goodness, equality, and goodness of mind and heart. Their main goal in addressing these values is to show that they have become more prominent in many western countries and that how issues surrounding risk are selected are based on social forces that underlie these values (Douglas and Wildavsky, 1983).

Douglas and Wildavsky argue that it is these social forces that aid countries in their path to development when addressing questions about acceptable risk. In this manner, cultural approaches shed light on how common agreements relate natural dangers to moral defects. The authors explain that dangers are selected based on the strength of social criticism. This criticism is of those in power and how they regulate and what they regulate. For example, if the public strongly cares about the dangers associated with environmental pollution, regulators implement proper regulation of environmental pollution.

The authors further show that in matters of risk, the choice of which risks should be prioritized is a political decision and a distinct message about who should rule and what should matter. These risks are ranked based on what is perceived as dangerous and based on the values and belief systems discussed above. To further this view, this article discusses how firms can have specific risk cultures and thus have specific risk perceptions that reflect the firm's values. Firms that regulate or process food might thus act in ways that reflect their consciousness of the importance of having safe food-- a value that is often significant for the public. As Douglas and Wildavsky (1983) point out, risk cultures are not only based on social forces but power and/or political forces. I discuss below how these political forces have also played a big role in framing the risk cultures of both Zambia and the United States. This article also discusses how traceability, as a technological device, has been used to mitigate risks that firms and regulatory bodies deem as important.

6. History of Food Safety Regulation on Traceability and Risk Assessment Traceability and Risk in Zambia

The food industry in Zambia is largely unregulated in its informal sector. This informal sector is composed of vendors who are usually individuals and sometimes families. These vendors sell beef (and other foods) on the street and most of their products are “sourced from farmers, but.... most of these purchases might not be direct, but rather carried out by intermediaries on behalf of farmers. The...vendors state[d] that they source their products from middlemen or fellow traders” (Mwango et al., 2020). If beef and beef products were to be traced, it would be done via word of mouth and as seen here, the sale of these products goes through intermediaries which makes it even more challenging to trace foods to their sources.

Because these vendors sell a variety of products, they go through many intermediaries and may not have a proper method of tracing their food sources unless through word of mouth. Based on personal experience, for buyers and vendors, word of mouth is where consumers consult with vendors directly if they wish to know more about the beef they are purchasing. This may include asking the vendor the name of the farm/farmer or where the seller bought the piece of meat they are selling. Even so, the government has put in place regulations that broadly stipulate how these vendors are to conduct their businesses (Mwango et al., 2020), but none of these requirements deal with traceability. This is because traceability is not viewed as a risk mitigation tool in the informal food sector nor is it tied to the mitigation of other risks that may be perceived in this sector. However, vendors in this sector may from time to time use traceability via word of mouth in instances where food quality is in question. For example, if beef sourced from a particular farmer is diseased and can be visibly seen, vendors will refrain from purchasing from this farmer.

Zambia also has a formal sector that is regulated by the government along with other authorities. This formal sector dates back to colonial times when businesses were owned mainly by the colonial government. Private ownership of food businesses has since come to dominate the formal sector of Zambia’s economy. One of the largest agribusinesses and beef retailers that emerged in post-colonial Zambia is Zambeef. Zambeef not only supplies meats (beef, pork, chicken) to other retailers within and outside Zambia but has also reached concessional agreements with other retailers and is one of the most well-known and trusted meat suppliers in Zambia (Almas & Obembe, 2014). Zambeef sources its products from five of its farms and also from small and local farms (Zambeef, 2020).

Interestingly, Zambeef’s website discusses risk management strategies, pointing to the economic impacts of unmediated risk. For example, under the risk section of the website, Zambeef asserts that: the Group risk assessment has highlighted foreign exchange and interest rate risks as high impact risk areas on the business, and this has been duly noted in the Company’s debt reduction and efficient cash management strategy, which forms part of the current business plan and corporate strategy (Zambeef, 2020).

The website does not discuss the risk associated with food safety, showing that Zambeef focuses on the risk associated with debt and cash management. This may also point out that the risk related to food safety is not a matter that has to be outwardly stated because Zambeef is already addressing this issue as a company cultural

practice. As stated above, Zambeef is a well-known and trusted firm by the public. Zambian consumers rarely doubt the safety of meat supplied by Zambeef, unless the media portrays the company negatively (Almas & Obembe, 2014). Even so, food safety is not a risk that Zambian consumers are particularly concerned about (Hakobyn, 2014). Unlike American consumers, Zambian consumers are not concerned about the harvest method but are concerned about affordability and visual signs of quality and or safety. Zambian consumers who purchase beef from vendors on the street are already aware of the risk associated with buying from an individual vendor, i.e., the sanitary conditions in which the beef is being sold and the possibility of contamination (Hakobyn, 2014). Even so, these consumers prefer to buy such products because of affordability. The Zambian government does regulate the conditions in which such products are sold. This regulation, however, becomes more pronounced during riskier times of the year, namely when cholera outbreaks are common. Regulation here involves getting vendors off the street to prevent consumers from purchasing contaminated beef (and other foods). Several authorities such as the Zambian army and the Ministry of Health step in to contain the spread of cholera by getting vendors off the street (Maingaila, 2017). These authorities also collaborate with agencies like the World Health Organization (WHO) and Africa Centers for Disease Control and Prevention (Africa CDC) to provide clean and safe water (CDC, 2018).

As mentioned above, financial/currency risk is the most prominent for food retailers in the region as the currency is unstable which greatly affects businesses. Zambeef does not discuss how its traceability system functions in its annual report. It does however show that it has a traceability system that helps its business remain integrated and well-functioning in that it keeps a record of its farm sources of beef animals. Zambeef's annual report shows that the business strictly follows safety procedures and mitigates food safety risks by implementing occupational health and safety practices (Zambeef, 2020). Some of these practices include training its employees on food safety and handling hazardous materials. These kinds of risks are therefore not as pronounced as financial risks.

As discussed above, Zambia focuses on financial risk due to the instability of the currency. This risk is also reflected in society more broadly in that most consumers are concerned with the availability of meat and its affordability as opposed to its safety. This risk frame is true for both the informal and formal sectors in that both focus on the financial risks associated with the sale of meat as opposed to its safety. In the informal sector, consumers trust the person selling in that they do not usually question where a product came from. The same is valid for the beef from Zambeef, as long as it is labeled as such, consumers do not question its safety. This social and/or cultural frame has driven the kinds of risks that businesses and firms have adopted in the Zambian market. The Zambian public also tends to trust institutions due to the cultural perception of authority.

According to a study conducted by Afrobarometer, most Africans trust institutions based on leadership: "If people think that officeholders are honest, they are likely to deem the institution trustworthy– and vice versa if they think officials are self-serving" (Afrobarometer, 2016). Africans also tend to trust local and less formal leadership. What makes the case of Zambia even more interesting is the fact that 55 percent of Zambia's population is illiterate

(Adsum foundation, 2011). With more than half of the population not being able to read and write, questions of trust in institutional leadership become much more challenging but also make the cultural perceptions more pronounced since culture does not require literacy.

6.1 Traceability and risk in the United States: Traceability in food regulation was formalized a decade ago. With the introduction of the Food Safety Modernization Act of 2011 (FSMA), traceability regulation became more widely used in policy circles as the need to trace foods due to fears of bioterrorism became more pronounced. Most of the literature points to this as the beginning of much scrutiny and attention to traceability, even though the focus is on the economic value of traceability systems. In the United States firms “build traceability systems to improve supply-side management, to increase safety and quality control, and to market foods with credence attributes (that are difficult for consumers to detect, such as whether a food was produced through genetic engineering)” (Golan et al., 2004). Fears of bioterrorism became more pronounced following September 11. This tragic event reframed how institutions regulate and what they regulate. For the food sector, this meant realizing that terrorism could occur in this sector and so regulation needed to address and prevent this. The public also expressed fear of terrorism, and traceability proved to be a useful tool to counter such fears. According to a report prepared for Congress on the effects of September 11 on the economy, the author, Gail Makinen (2002), refers to this fear of terrorism as a “crisis in consumer confidence.” The author also discusses how the Food and Agriculture sector was also affected in that the United States realized its vulnerability to bioterrorism within this sector. In this manner, bioterrorism became a cultural fear that political leaders selected in their regulation in that both the public and the government saw the need to have regulations that addressed bioterrorism (Makinen, 2002).

The meat/beef sector, however, has had a long history of informal tracing of animals, mainly to prevent the spread of disease (Golan et al., 2004). Some of these methods have included branding beef animals. The relationship between tagging and branding of animals to tracing beef/meat products is very complex in the US. While the United States Department of Agriculture (USDA) does require keeping certain parts of the carcass for traceability purposes, there is no direct relationship between tracing a live animal vs tracing the carcass or beef product. This is because traceability is a complex system in general: “even a hypothetical system for tracking beef, in which consumers scan their packet of beef at the check-out counter and receive information on the date and location of the animal’s birth, lineage, vaccination records, acreage of pasturage, and use of mammalian protein supplements, is incomplete” (Golan et al., 2004).

For certain US consumers, information like lineage and vaccination history is important, especially for health purposes. Other consumers may also be concerned about the direct impact of food consumption on the environment (Nguyen et al., 2019). Some consumers also wish to know this information to support businesses that do not use certain hormones and businesses that use cattle that yield organic beef. Information on harvest methods presents a financial risk for firms as they understand their brand image matters to consumers. It is because

of these different risk frames and situational factors that traceability has to be specific to a particular point in the supply chain or even during processing.

For Ngyugen et al. (2019), these situational factors are tied to how consumers perceive organic and or environmentally friendly meat products in that these situational factors are also relevant to consumer public health concerns. Already, these situational factors show the benefit of tracing beef back to the harvest process. They also show the differing reasons for having a traceability system for both consumers and firms. From a food safety standpoint, both consumers and firms are also equally concerned with traceability even though the burden of having such a system in place lies with the firm. This is because firms are required to have such a system in place (though not intensive) while not every consumer is concerned about the safety or the harvest method of the beef they consume, and neither are they in a position to require or implement traceability even though they can apply political pressure for firms to implement traceability processes. Intensive here refers to having a thorough traceability system which is not required by law, especially for foods that the Food and Drug Administration (FDA) does not consider high-risk. High-risk foods according to the FDA list include cheeses, leafy greens, fruits, etc. This list does not contain beef as a high-risk food as it is under the USDA's jurisdiction. Processors are minimally required to have traceback information or keep records of where they source their beef animals.

Different types of beef are traced differently in the United States. For comminuted beef, processors can source their animals from different farmers and countries and combine them into one product. Even beef products sourced outside the United States can be labeled as "Product of US" if they were merely processed here. This is especially misleading in traceability that is consumer-friendly traceability (like labeling) as it does not tell the consumer the [original] source of the product. Under Country-of-Origin Labeling (COOL) regulations in 2013, the USDA has been trying to put in place regulation that requires labeling where an animal was born, raised, and slaughtered. Thus far, though, it has failed to do so because Mexico and Canada under the World Trade Organization (WTO) rules stated that this requirement would be economically burdensome to them (Federal Trade Commission, 2020). COOL labeling was established in 2002 to help consumers identify the country of origin for certain products including their harvest methods and how they were processed. COOL law is required for retailers such as grocery stores and club warehouses. COOL labeling includes having labels that state the name of the country of origin and information on how the product was processed such as hatched, grass-fed, etc. COOL was signed into law at a time when Bovine Spongiform Encephalopathy (BSE) cases were rampant (USDA, 2020).

The WTO under its Sanitary and Phytosanitary Measures (SPS agreement) does have provisions for countries to impose trade-related considerations related to health (WTO, 2002). These considerations state that measures should not unjustifiably discriminate against trade partners to restrict trade. Where traceability is concerned, such a consideration makes it difficult to impose regulations such as COOL, as seen in the case of the US vs Canada and Mexico. For traceability purposes, COOL labeling for beef products would be advantageous to consumers

who wish to know the true origins of a meat product and for producers to verify whether a meat product was harvested humanely, grass-fed or certified organic (Crandall et al., 2013).

For regulatory bodies in the US, high-risk foods tend to be fruits and vegetables (FDA, 2020) and therefore warrant a risk-based approach to food safety such as traceability. As for beef/cattle products, the Federal Meat Inspection Act (FMIA) of 1906 (amended 2014) prohibits the sale of adulterated livestock and ensures sanitary slaughtering procedures. The FMIA does not explicitly mention tracing or traceability. Instead, the Act mentions recordkeeping (which is a form of traceability) which mainly applies to transactional records. This shows how the use of the word traceability is relatively recent and how it is still in its infancy in the meat industry. The Bioterrorism Act of 2002 reveals a more insightful background of traceability. The Act itself does not mention traceability, but under its guidance for implementation by the Food and Drug Administration (FDA), the Act states that all restaurants and food facilities are to be registered with the FDA as “registration will help provide FDA with information on the origin and distribution of food and feed products and thereby, aid in the detection and quick response to actual or potential threats to the US food supply” (FDA, 2006), alluding to a form of tracking and tracing.

For meat products, the Bioterrorism Act expands the roles of the USDA’s Food Safety Inspection Service (FSIS) to inspect international meat products at the point of entry and point of origin (BTA, 2002). Though the guidelines focus on adulteration, they also show how regulation on traceability is broad yet, can be applied to more specific foods. It further shows how an emphasis on traceability is placed on preharvest procedures and not so much on post-harvest. In 2020 however, the FDA amended FSMA to include more specific requirements for traceability such as additional record-keeping for riskier foods like fruits and vegetables.

Looking at Tyson Foods, one of America’s largest suppliers of beef shows that its approach to food safety varies greatly compared to Zambia’s Zambeef. The Tyson website, for example, states that “Our Food Safety and Quality Assurance Team is passionate about making great food safe. Safe food requires a culture that puts safety first. This means responsibility for food safety lies with everyone from the plant floor to the CEO's office” (Tyson Foods, 2020). Unlike Zambia’s Zambeef, Tyson directly addresses its food safety policy.

6.2 Traceability as a Risk Management Tool: In Zambia and the United States, disease outbreaks in beef animals have provided a motive to trace the animals themselves to maintain a disease-free and a sound food safety system. This is especially the case for zoonotic diseases and diseases like Mad Cow which affect human beings. Arriving at this ‘sound’ food safety system is not straightforward as it involves mitigation of risk and defining which risks deserve to be addressed over others. One cannot simply reach a point of absolute food safety as there is always room for improvement (Thomas, 2010).

The BSE cases (bovine spongiform encephalopathy) that caused the recalls in the US have highlighted the importance of traceability systems and not just in one sector of the food industry. In 2008, for example, 143 million pounds of beef were recalled even though there was no confirmed illness due to the threat of BSE (FSIS, 2008). With the earlier BSE cases in 2003, the secretary of agriculture implemented a program that identified the

diseased animal within 48 hours of discovery (Becker, 2007). This was done to mitigate the risk observed with the BSE cases. Since then, the US has implemented these programs in all states (Becker, 2007). On a social level, consumer groups have expressed concern over the BSE cases (Fox et al., 2005) as they were widespread in the media. To a certain level, consumers have also played a role in pushing for consumer-friendly traceability systems such as bar codes that point back to harvest methods in retail settings. In wanting to know the harvest methods of beef, consumers have also influenced firm accountability and transparency since some firms have based their brand image on being able to trace their beef back to specific farms and to specific harvest methods that are certifiable (CSPIC, 2021).

Risk management, as a component of food safety, has since become very important, especially in the United States. For example, when there is a common foodborne illness, traceability comes in handy in allowing for the source of the contamination to be determined. Without traceability, this identification of the source of contamination would be difficult. Another example of this is when in 2006 Canada reported its sixth case of BSE and part of its investigation was to trace the affected animal's offspring. Since the United States imported beef cattle from Canada, such an investigation was important as the US could temporarily block imports from Canada (Becker, 2006). In these examples, managing risk means containing the spread of disease using traceability.

As mentioned before, the definition of risk is dependent on the type of risk and how the regulatory bodies define it. Both the United States Department of Agriculture (USDA) and the Food and Drug Administration (FDA) implement risk management programs through traceability programs, though sometimes voluntary. As seen in FSMA, food importers can choose to participate in programs that trace food products (FDA, 2020). This shows how both the USDA and the FDA perceive this risk as not too burdensome by making it voluntary. It also shows a kind of emphasis on the importance of economic gain and or economic risk-- if more importers are tasked with applying traceability procedures, they may not be able to participate in trade with other countries, limiting economic gain.

As Douglas and Wildavsky show, there is a ranking of risks involved with each government and in this case, a regulatory body. The authors call this risk assessment. In the case of the US, the FDA has a food traceability list where foods (mainly fruits and vegetables) are ranked according to the level of risk. The FDA also mentions how this risk assessment was created in consultation with the public. The BSE cases and major recalls related to beef have also seen the application of traceability methods used for fruits and vegetables to be used for beef. In Zambia, the ranking of risks is evident with the prioritization of financial risk over food safety risk, especially in the formal sectors. The informal sector uses traceability to ensure the quality of beef. It also prioritizes disease prevention (Maingaila, 2017).

7. Other Roles of Traceability and Conclusions

Because the United States market is extremely large, traceability has played a role in accountability for firms and businesses. It has also created market opportunities for firms and businesses who identify themselves as being

sustainable, environmentally friendly, or even organic. If consumers wanted to know how sustainable or environmentally friendly a business is, they would use traceback systems such as barcodes and labels (organic, non-GMO, etc.), tools that are readily available to them. In this manner, consumers are not doing the tracing themselves but trust that for an item to bear any one of these labels, it must have passed through certified methods of regulation and approval, especially for certifiable information like organic.

In terms of food safety, traceability would also function as a means of assigning blame in case of an outbreak and to also prevent further damage by the consumption of contaminated products. In this manner, traceability has been used to treat only a particular set of risks and not others, as discussed above. In the case of Zambia, traceability has played a far less dominant role, even for riskier foods (Riskier foods universally tend to be ready-to-eat foods, perishable

foods, and undercooked foods. Zambian consumers tend to cook most of the foods they consume, reducing the risk of consuming microbiologically contaminated food. Zambian consumers also tend to consume fewer dairy products). Traceability has mainly been used by vendors and industry (Zambeef) and not so much by consumers to maintain a well-functioning food system (Hakobyn, 2014).

As Douglas and Wildavsky (1983) point out, what drives these choices of risk prioritization is power and social criticism and the strength of this criticism. In a sense, what society prioritizes or is concerned about ends up becoming what is prioritized by regulators. In this case, United States consumers care about the safety of the food they consume due to [negative] historical associations of science and technology and have therefore applied pressure for regulators to amend how food safety issues are regulated. When it comes to trust in food institutions, Americans generally distrust food manufacturers (Lang, 2013). This refers to the fact that the US public generally has a distrust of institutions, science, and technology. Authors like Kianoosh (2019) point to the Second Great Awakening in the 19th century as the beginning of American distrust in science. This distrust has continued to this day and can be observed in the necessity of auditing systems and even at the very core of traceability. For Zambian consumers, the negative history of science and technology does not exist. Instead, consumers trust both individuals and firms. This is especially evident when consumers do not question the source of beef, especially from Zambeef.

These examples of Zambia and the US have shown that risk management and risk mitigation are defined by food regulatory agencies within each country and sometimes by consumer perception of this risk. Even the definition of traceability differs within the contexts of these two countries. For Zambia, traceability does not exist as a consumer accountability tool for firms as it does in the US. For US consumers, traceability has to be much more intensive and further than a brand name in that some consumers are interested in knowing the harvest methods, while in Zambia consumers are content with knowing simply that the beef was produced by Zambeef. This points to the cultural frames through which consumers and in turn regulatory bodies have interpreted risk. Even so, it is the regulatory bodies that have shown whose definition of risk matters the most.

Using Wildavsky and Douglas' approach to risk culture, the United States has seen a stronger social criticism of its scientific/food institutions. This is seen where the public mistrust of science and other institutions establishes systems that make such institutions credible in the eyes of consumers. This has not been the case in Zambia because the American public has associated or perceived more dangers within their food system than the Zambian public. These dangers have also seen traceability as a possible solution. Perhaps the Zambian public could also associate the same dangers were it not for financial issues.

8. Notes

This study is part of a master's thesis submitted to Virginia Polytechnic and State University and has been presented at several international conferences.

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