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Does Others' Health Count for Peanuts?

Health, Market Returns, and Pro-sociality

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Notices

Abstract

Individuals often make decisions considering both private returns and welfare impacts on others. Food safety decisions by smallholder agricultural producers exemplify this choice, particularly in low-income countries where farmers often consume some of the food crops they produce and sell or donate the rest. We conduct a lab-in-the-field experiment with peanuts producers in Senegal to study the decision to invest in food safety information, exogenously varying the degree of private returns (monetary or health-wise) and welfare impacts on others. Producers are willing to pay real money for food safety information even absent the potential for private returns, but willingness to pay increases with the potential for private returns. A randomized information treatment significantly increases willingness to pay in all scenarios. Our results shed light on the complex interplay between altruism and economic decisions in the presence of externalities, and point to the potential of timely and targeted information to address food safety issues.

Keywords: Food safety, health, market returns, pro-sociality, peanuts, Aflatoxin, Senegal

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Introduction

Foodborne disease-related deaths are estimated to be the highest per capita in Africa, causing 137,000 deaths and 91 million illnesses annually (Jaffe and Grace, 2020). Many food safety problems are visually undetectable, among which aflatoxins are a cause of particular concern. Aflatoxins are produced by the *Aspergillus flavus* fungus present in soils, which infects crops on farm and proliferates during storage with poor conditions. Aflatoxins affect crops that are important for both rural incomes and consumption in the region, including maize and groundnuts. Chronic exposure to aflatoxins increases liver cancer risk (particularly when Hepatitis B incidence is high), and has been associated with impaired growth in children and weakened immune function. At the extreme, acute exposure can be deadly (Gong et al., 2016; Liu and Wu, 2010; Marrone et al., 2016). Many countries in Sub-Saharan Africa have limited or no domestic regulations on aflatoxins, weak enforcement of regulations that do exist, and fragmented value chains with limited prospects for traceability, posing significant challenges to ensuring the safety of locally available food products.

Food production in many low-income countries relies on smallholder farmers in rural areas, endowing them with a pivotal role in determining food risk levels in local markets. Ensuring food safety and assessing regulatory compliance represent potentially significant costs for farmers and intermediaries. Additionally, there is often a lack of information on the consumer side regarding food quality, resulting in limited scope for product differentiation based on safety certification or signaling of quality investments by producers. Consequently, farmers may face limited economic incentives to address hazards, leading to a lack of investment in food safety and potentially explaining the prevalence of food hazards in products available for local consumption (Grace et al., 2020; Hoffmann et al., 2019; World Health Organization, 2015).

In this paper, we develop a lab-in-the-field experiment to explore whether alternative motivations for food safety can play complementary roles alongside economic incentives.

Within a context lacking enforced regulations and economic incentives, the tendency of farmers to undervalue the provision of safe food seemingly results in limited investments in quality, perpetuating pervasive food safety issues. We ask whether farmers value access to information on food safety when the information is most relevant for their own health, for the health of others in the community, or for receiving an economic benefit.

First, we investigate whether farmers are willing to pay real money for food safety information when there are no private returns, either monetary or health-wise, and when there are private monetary and/or health returns. We find that farmers are willing to pay relatively more when there are private returns, but are nevertheless willing to pay an economically non-trivial amount of money even absent the possibility of private returns. On average, farmers are willing to pay about 550 CFA to reveal food safety information (for 500g of peanut powder) when there are no private returns, more than the expected market value of the food products[1] or about 2.3% of average monthly gross income (DAPSA, 2022). When the potential for private monetary or health returns increases by 25%, farmers are willing to pay about 4% more for information about food safety.

Second, we test whether self-reported altruism and baseline awareness of aflatoxins are potential mechanisms for willingness to pay for food safety information, in situations with and without private returns. We find that farmers with higher self-reported altruism appear willing to pay slightly more in situations both with and without private returns relative to farmers with lower altruism, although this result is not statistically significant. Individuals with greater baseline awareness of aflatoxins are willing to pay significantly more in situations with lower private returns, in some cases entirely offsetting an average lower willingness to pay in these situations.

Third, we test the causal effect of providing detailed information about aflatoxins on farmers' willingness to pay. Before the experiment, all participating farmers were given a

[1]At the time of the experiment, the market value of one kilogram of groundnuts was 1,000 CFA francs

brief description of aflatoxins and their prevalence. After the first half of the experiment, farmers were then randomized to watch either an informative video about aflatoxins or a placebo video. The informative video provided detailed information about aflatoxins and harm to the human body resulting from exposure. We find that additional information about aflatoxins increases willingness to pay by 8.4% on average and increases the probability of being willing to pay for guaranteed information by 6.3%. This increase is relatively consistent regardless of the level of private returns in a given round.

A potential limitation of our design is that one's decision to pay to ensure the quality of one's output applies simultaneously to all usages. In some contexts, farmers can at least partially differentiate along food safety dimensions between production that they keep for their consumption and the production that they sell (Arslan and Taylor, 2009; Hoffmann and Gatobu, 2014; Kadjo et al., 2020). However, in the case of aflatoxin contamination which is visually undetectable and costly to test for, sorting of this kind is infeasible for a smallholder farmer.

To our knowledge, this paper is the first to introduce altruism as a mechanism influencing food safety within the local markets of low-income countries. The findings contribute to the literature on the willingness to pay (WTP) to mitigate health issues among rural African consumers. This contribution furnishes evidence of pro-social motivation in the realm of public health issues.

Previous studies conducted in African countries have highlighted that smallholder farmers, acting as consumers, demonstrate a willingness to pay for access to high-quality food (Chowdhury et al., 2011; De Groote et al., 2011, 2016; Meenakshi et al., 2012). Beyond financial and health motivations, our study recognizes pro-sociality as a factor that might drive farmers to value information about aflatoxin levels in their production. The experimental design allows us to explore the interactions between financial incentives, health concerns, and pro-social motivations, recognizing that these mechanisms are often interlinked in practice.

Farmers propelled by pro-social or altruistic motivations may invest in enhancing their groundnuts' quality despite the absence of direct financial gain. Their motivation lies in a desire to provide food that does not harm others. This aligns with observations in other domains, where farmers engage in pro-social activities related to their occupation, such as disseminating agricultural information (Behaghel et al., 2020) or endorsing sustainable agricultural practices (Bopp et al., 2019), even in the absence of financial incentives. Our results suggest that providing information serves as a means to encourage farmers to internalize the positive externality associated with supplying safe food. This, in turn, could lead to increased investments in technology and a safer food supply within the local markets of low-income countries.

The article first presents the institutional context of aflatoxins and groundnut production, along with the data used in the paper (Section 1). Section 2 provides a review of the research on the valuation of health and the impact of information provision and pro-sociality, which then motivates our conceptual framework. Section 3 describes our baseline survey, the experimental design, and presents results from pre-treatment rounds. Section 4 presents the design and causal effects of the information treatment. We present robustness checks in Section 5, and conclude by discussing implications for policy and future research in Section 6.

1 Institutional context and data

1.1 Aflatoxins in Senegalese groundnut production

Senegal ranks among the top ten groundnut exporters, with groundnut crops covering approximately 39.7% of cultivated land (and 81% of cash crops) in the country in 2022 (DAPSA, 2022). Consumed in various forms such as whole, powdered, and paste, groundnuts are integral to the country's dietary habits, particularly in zones dedicated to groundnut cultivation. Groundnut production is predominantly carried out by smallholder farmers organized within cooperative structures overseen and supported by state authorities.Apart from purchasing their members' production at the state-fixed price, cooperatives generally restrict their role to supplying inputs on credit and accepting repayments in kind. Beyond this, they offer little additional support Deutschmann et al. (2024). But aflatoxin contamination is a significant issue in Senegal. While not observable to the naked eye, a study by PACA (2017) reveals that approximately 36% of Senegalese groundnut production fails to meet European Union contamination standards, varying by region. This alarming statistic highlights that about one-third of groundnut production poses a significant health risk to consumers. Existing research indicates that adults in areas of Senegal with high per capita consumption of groundnuts and maize exhibit elevated aflatoxin biomarkers in their blood (Watson et al., 2015).

Aflatoxin contamination can occur at several stages, as crops are susceptible to *A. flavus* development during both growth and storage. Environmental conditions also significantly influence the likelihood of aflatoxin contamination (Deutschmann et al., 2024). Farmers can invest in technologies to upgrade the safety of their groundnuts, ensuring low levels of aflatoxins in their produce. Post-harvest, proper drying and storage are effective at reducing the development and spread of aflatoxins. Groundnuts must be adequately dried to reduce moisture content, and storage conditions must prevent moisture absorption and mold exposure. A recent study among Senegalese farmers demonstrated that better storage practices with high-quality hermetic bags can reduce the likelihood of high aflatoxin levels in groundnuts by 30% (Bauchet et al., 2021). Pre-harvest, farmers can use bio-control products to limit the growth of toxigenic *A. flavus* strains and prevent aflatoxin contamination from reaching crops (Bandyopadhyay et al., 2019; Deutschmann et al., 2024; Senghor et al., 2020).[2]

[2] In Senegal, the bio-control product Aflasafe was approved for commercial sale in 2019, and is now readily available to Senegalese farmers as a pivotal technology in the fight against aflatoxin contamination. The cost of Aflasafe for one hectare is 10,000 CFA ($16). The cost of purchasing enough hermetic bags for one hectare is approximately 24,000 CFA ($40). To contextualize these figures, the average yield of groundnut production in Senegal was reported to be 2,149 kg per hectare in 2021, with an average plot size of 2.4 hectares (DAPSA, 2021).

Hence, farmer investments in implementing good agricultural practices during cultivation, coupled with appropriate post-harvest handling techniques and storage procedures, can play a pivotal role in mitigating aflatoxin contamination. These investments can also benefit farmers in several ways. First, reducing aflatoxin levels (through improved practices and investments in inputs such as Aflasafe) could benefit farmers through better market prices. But except for exporters, who face stringent aflatoxin standards in international markets necessitating certification, buyers generally show limited concern for aflatoxin content. While some countries have implemented regulations to curb aflatoxins in food available to domestic consumers (Meneely et al., 2022), Senegal, like many low-income nations, lacks enforced standards for food crops. Only agro-industrial producers are regulated concerning aflatoxin levels, specifically for crude groundnut oil and groundnut paste. However, food control enforcement is notably deficient. Agro-industrial producers supply only a minority of groundnut products consumed by families, who often obtain them through less-regulated channels (PACA, 2017).

Second, farmers may themselves benefit from improved health outcomes resulting from consuming higher-quality groundnuts. In 2021, 21.6% of groundnut production was consumed by farmers themselves. But the decision to invest in technologies to combat aflatoxins is contingent on farmers' awareness of aflatoxin-related issues. While national-level awareness figures are unavailable, various studies in Senegal have addressed this issue. For instance, Arias-Granada et al. (2021) found that 20% of farmers in their sample were aware of aflatoxin, compared to 28% in the study by Bauchet et al. (2021). In our sample, 22% of farmers had heard of aflatoxins as a disease affecting groundnut crops, with about 10% citing health problems as its impact (See Table 1).

Third, providing higher-quality groundnuts in the local market reduces others' exposure to aflatoxins, addressing public health concerns. Pro-social farmers may find motivation in altruistic actions, as indicated by 5.5% of groundnut production being distributed (donated) to other households (DAPSA, 2021). Here also, however, farmers' behavior will crucially depend on their awareness of the health hazard associated with aflatoxins in human consumption.

1.2 A sample of groundnut producers in Senegal

We study these issues with a sample of groundnut farmers in the Thies region, specifically within the Mbour department. Farmers in this department engage in the cultivation of various crops, including groundnuts, although the intensity of groundnut cultivation is lower compared to farmers located more inland in regions like Fatick or Kaolack. In partnership with a local agricultural cooperative we surveyed 439 local groundnut farmers in August and September 2022. Of these, 302 were cooperative members actively involved in groundnut cultivation, while the remaining 147 were non-members residing in the same villages who were also engaged in groundnut cultivation.

The first three columns of Table 1 below present the average characteristics of the surveyed farmers. Most of them are men, with an average age of 54 and relatively low education levels. All surveyed farmers grew groundnuts in 2022, and 91% cultivated them in 2021. However, the year 2021 posed challenges for groundnut farmers in the Thies region due to a delayed rainy season and a prolonged break between the first and second rains, leading to varying harvest outcomes (ANACIM, 2021). Consequently, 75% of farmers who planted groundnuts in 2021 managed to harvest some. Additionally, some of them obtained minimal yields relative to the seeds sown, as reflected in the high standard deviation of the 2021 harvest quantities. In 2021, nearly all farmers kept a portion for personal consumption and relatively few sold a portion of their production. Approximately half donated a portion to other households or individuals, which accounted for approximately 10% of their production. Our sample shows a relatively low level of awareness of aflatoxins at baseline, consistent with the existing literature. Approximately 22% of the respondents had heard about aflatoxins, and merely 11% could identify health impacts as one of the effects of aflatoxin exposure. We construct variables related to preferences for pro-sociality, altruism, and risk aversion. The pro-sociality index is derived from farmers' responses to questions about their happiness after giving advice or helping fellow villagers, as well as a reciprocity-related question from the

Global Preferences Survey (Falk et al., 2018).[3] This index is computed as a weighted average of the standardized variables relative to the full sample, following Anderson (2008). The same method is used to create a risk aversion index.

Table 1: Descriptive statistics of sample farmers

	Full sample			C vs T
	Mean	Sd	N	Diff
Age (in completed years)	54.62	13.46	439	0.16
Male (1=Yes)	0.83	0.38	439	0.05
Years of education (in completed years)	3.23	4.89	439	0.15
Can read (1=Yes)	0.38	0.49	439	0.04
Can write (1=Yes)	0.35	0.48	439	0.04
Cooperative member (1=Yes)	0.67	0.47	439	-0.00
Quantity of seeds 2022 (kg)	87.73	61.22	397	-9.24
Size of groundnut plot (ha)	1.14	0.94	439	-0.11
Grew groundnuts in 2021 (1=Yes)	0.91	0.29	421	0.08***
Harvested groundnuts in 2021 (1=Yes)	0.75	0.43	383	-0.08*
Quantity harvested in 2021 (kg)	207.90	290.42	383	-47.21
Consumed part of production 2021 (1=Yes)	0.98	0.13	287	-0.01
Donated part of production 2021 (1=Yes)	0.49	0.50	287	0.09
Sold part of production 2021 (1=Yes)	0.12	0.33	287	-0.02
Share of groundnuts consumed	0.75	0.27	287	-0.00
Share of groundnuts donated	0.10	0.14	287	0.02
Share of groundnuts sold	0.06	0.19	287	-0.02
Heard of aflatoxin (1=Yes)	0.22	0.42	439	-0.02
Knows health impact of aflatoxin (1=Yes)	0.11	0.31	439	-0.03
Index of pro-sociality (standardized)	0.00	1.00	439	0.05
Index of risk preferences (standardized)	0.00	1.00	439	0.08

Source: Groundnut producers survey data, 2022.

2 Health, information and pro-social behavior

As farmers become more knowledgeable about the health risks associated with aflatoxins, they may change their decisions and motivations to invest in food safety measures. In addition to a potential financial motivation, we focus on health and pro-sociality as motivations that may play significant roles in farmers' decisions. In this section we review current evidence on related issues in low-income countries, and use this review to develop a simplified framework from which we derive a set of testable hypotheses.

[3]Described in the online appendix.

2.1 Review of evidence

Preserving their own health is a significant motivation for farmers. Recent research has shed light on the divergent approaches farmers adopt toward the crops they sell compared to those they consume. Hoffmann et al. (2023) investigate the effect of a modest premium on farmers' investment in Aflasafe. The premium offer increases the adoption of Aflasafe, driven by farmers consuming their own maize. In the absence of a premium, some farmers still purchase Aflasafe, indicating a desire to ensure safe maize for their own consumption. Another study by Hoffmann and Jones (2021) with maize farmers in Kenya reveals that farmers make more substantial investments in food safety practices when the produce is assigned for their own consumption rather than for sale. In Benin, working with maize farmers, Kadjo et al. (2020) show that when farmers perceive a risk to food safety, they are less inclined to treat maize intended for personal consumption with insecticide, as opposed to maize intended for sale. Several studies also show that farmers, as consumers themselves, value the safety of food. An experiment conducted by De Groote et al. (2016) with Kenyan maize growers demonstrates their willingness to pay extra for maize without aflatoxin. The same results are derived from a similar experiment made with rural consumers who most of the time are also producers, concerning maize in Zambia (Meenakshi et al., 2012), and staple crops in Uganda (Chowdhury et al., 2011). Together, these findings underscore that farmers indeed place a high value on access to safe food for personal consumption, exhibiting willingness across settings to incur costs to produce and consume safe food.

Pro-sociality may be another motivating factor for food safety investments. Some individuals are intrinsically motivated to act pro-socially, engaging in behaviors that benefit others. Pro-social individuals harbor an inherent desire to create positive externalities through their actions, propelled by altruistic motives without necessitating external incentives (Bénabou and Tirole, 2006). These individuals willingly invest resources to enhance the well-being of others, even in the absence of extrinsic rewards. The concept of altruism and its connection to the value individuals place on the safety of others have further been empirically examined by Jones-Lee (1991). This work emphasizes that people demonstrate altruistic behavior by valuing the well-being and security of others, even at a personal cost. Several studies have empirically explored whether individuals are willing to pay more to reduce risks for themselves and others (Araña and León, 2002; Gyrd-Hansen et al., 2016; Simonsen et al., 2021). In the field of agriculture, studies have investigated whether farmers' altruistic motivations and their influence on technology adoption decisions. In higher income countries, Sheeder and Lynne (2011) propose that farmers integrate both self-interest and concern for others when deciding to adopt new technologies. Chouinard et al. (2008) find that farmers are even willing to forgo their own profits to favor conservation farm practices. Evidence further suggests these behavior also exist in poorer settings. In Uganda, Behaghel et al. (2020) find that farmers exhibiting higher level of pro-social motivation were more likely to diffuse information to others regarding improved feeding of their cows. In rural Mozambique, a qualitative survey-based study of farmers by Crudeli et al. (2022) finds that pro-sociality is a crucial quality to qualify a producer as a good farmer and is further positively correlated with the adoption of innovations.

2.2 Conceptual framework

On the basis of this evidence, we now propose a simple conceptual framework to study these issues in the context of aflatoxins in Senegal. Consider a groundnut producing farmer who derives her utility from a portfolio of additively separable components associated with the use of her production for her home consumption (u_c), for donation to others (u_d) or to obtain income from market sales (u_m):

$$U(u_c, u_d, u_m) = u_c(g^c) + u_d(g^d) + u_m(g^m)$$

where g^c is the part of her production she consumes, g^d the part she donates, and g^m the part she sells. We consider these shares to be fixed. We acknowledge that assuming fixed shares for consumption, donation, and sales simplifies the complexity of real-world decision-making. In practice, farmers may adjust these allocations in response to changing circumstances, such as unexpected market conditions or production increase/decrease. However, this simplification is still useful in our analysis as it reflects stable decision-making patterns likely driven by persistent factors such as consumption needs, local social norms, and liquidity needs. By using fixed shares, we focus on the central decision farmers face—whether to acquire information about aflatoxin contamination—without over-complicating the model.

Aflatoxins exist in the area and can contaminate the farmer's entire production with a probability π. Whether her production is affected cannot be assessed from the naked eye, and her only response to this issue is to choose whether to acquire information through an appropriate test applied to a representative sample of her production. Let $I(v)$ capture this information, with $I = 0$ if she does not have the information, $I = 1$ if she does, and v the cost of the test which is fixed for the farmer's entire production. Each component of her utility is defined as follows:

Home Consumption: $u_c(g^c) = \alpha(g^c - \pi A(1 - I)g^c)$ — The utility she derives from the consumption of her production depends on her marginal utility of consumption (α), and is depreciated by the probability π that it is contaminated by aflatoxins. This depreciation however depends on her degree of awareness regarding the health hazard of aflatoxins A, with $0 \leq A \leq 1$ and $A = 0$ if the farmer is not at all aware of the health consequences of aflatoxin, in which case she incurs no dis-utility from consuming aflatoxin contaminated groundnut. This is true whether the farmer decides to acquire information ($I = 1$) or not. The depreciation of her utility is however maximized if she is fully aware of the negative consequences of aflatoxins, knows that there is probability π that her production is affected, but did not acquire the necessary information I to find whether she should effectively be concerned.

Donation: $u_c(g^d) = \beta(g^d - \gamma\pi A(1-I)g^d)$ — The utility she derives from donating her production depends on her marginal utility of donation (β) and follows the same pattern as that of consuming it, albeit with one difference: the disutility component is also mediated by the extent to which she cares for others' health captured by an altruism parameter γ, with $0 \leq \gamma \leq 1$ and $\gamma = 0$ if she is not at all concerned by the health of others.

Market sales: $u_c(g^m) = \delta(g^m \cdot p + (1-\pi)Ik \cdot g^m - \pi Ip \cdot g^m)$ — The utility she derives from selling her production depends on her marginal utility (δ), and on the per-unit price-premium that she may get if she acquires the quality information ($I = 1$) which shows no-contamination with probability $(1 - \pi)$ or whether she incurs a loss in her overall sales if her production is shown to be contaminated with probability π.

Thus, the farmer's decision to invest v in acquiring information I depends on the comparison of her overall utility with and without this information. If she does not invest in obtaining information regarding the contamination of her production by aflatoxin, her overall utility is given by:

$$U(g_m, g_c, g_d|I=0) = \alpha(g^c - \pi A g^c) + \beta(g^d - \gamma\pi A g^d) + \delta g^m \cdot p \tag{1}$$

In turn, if she decides to acquire the information regarding whether her production is contaminated or not, her overall utility is given by:

$$U(g_m, g_c, g_d|I=1) = \alpha g^c + \beta g^d + \delta g^m \cdot p + \delta(1-\pi)k \cdot g^m - \delta\pi p \cdot g^m - v \tag{2}$$

Combining Equations 1 and 2, the farmer's maximum willingness to pay for obtaining information regarding the quality of her groundnut is given by:

$$v^* = \alpha\pi A \cdot g^c + \beta\gamma\pi A \cdot g^d + \delta((1-\pi)k - \pi p) \cdot g^m \tag{3}$$

This simplified framework leads to a series of testable predictions. First, the farmer's willingness to pay $v*$ to test for the quality of her production increases with the share of her production that she dedicates to home consumption: $\frac{\partial v*}{\partial g^c} = \alpha\pi A > 0$. The strength of this relationship positively depends on the marginal utility that she derives from consuming groundnuts (α), the probability that her production is contaminated with aflatoxins (π), and her level of awareness of the health hazard associated with the consumption of aflatoxin-contaminated groundnuts (A).

Second, the farmer's willingness to pay for the test also increases with the part of her production that she donates: $\frac{\partial v*}{\partial g^d} = \beta\gamma\pi A > 0$. As for donation, this relationship is strengthened by the probability that her production is contaminated and by her awareness of the negative consequences associated with donation of aflatoxin-contaminated products. Comparing the farmer's willingness to pay in relation to home-consumption and to donation further yields to $\frac{\partial v*}{\partial g^c} - \frac{\partial v*}{\partial g^d} = \alpha - \beta\gamma$. Assuming that one's marginal utility for home consumption is at least equal to that of donation ($\alpha \geq \beta$), and with one's valuation of others' health (γ) is at most equal to one, the farmer's willingness to pay for the test of production should more strongly respond to increases with the part she dedicates to home consumption (g^c) than with the part she intends to donate (g^d).

Third, with respect to the groundnuts she sells on the market, the farmer's willingness to pay for a test of her production no longer depends on her awareness of the health hazard (A): $\frac{\partial v*}{\partial g^m} = \delta((1-\pi)k - \pi p)$. Instead, it is driven by the combined effects of the probability that her production is contaminated and the prices she can expect from selling non-tested groundnuts (p) or selling groundnuts that have been certified to be free of aflatoxins ($p + k$). Accordingly, her willingness to pay increases with the part she dedicates to market sales only if the price premium associated with safe groundnuts is greater than the likelihood that her groundnut is contaminated, valued at the market price for non-tested groundnuts: $\frac{\partial v*}{\partial g^m} > 0$ if $k > \frac{\pi p}{1-\pi}$.

3 WTP for food-safety information among Senegalese farmers

Building on the above conceptual framework, we designed and implemented a willingness to pay experiment to assess the relationship between farmers' awareness of aflatoxin issues (A) and/or their pro-social attitudes (γ) on the one hand, and their willingness to invest in the acquisition of information regarding the contamination of their product on the other hand. Our experiment further differentiates these behaviors across the different possible uses of groundnuts: consumption (g^c), donation (g^d), and sales (g^m).

In the following paragraphs we first describe the willingness to pay experiment and its implementation, then briefly discuss our estimation strategy, and finally present the results of the experiment. The results presented in this section are limited to the first six rounds of our experiment, after which we randomly introduced an additional information treatment which we describe and analyze in Section 4.

3.1 Baseline survey and enrollment in the experiment

Each farmer selected within our sample was first administered a short survey collecting socio-demographic information, details on their crops, information about the last commercialization and the current growing seasons for groundnuts, and their awareness of aflatoxin. For the latter, we asked whether respondents had ever heard of aflatoxins and, if they did, what they knew about their consequences. We also elicited farmers preferences and behaviors related to donation,[4] risk aversion and pro-sociality, adapted from surveys conducted in similar settings such as Behaghel et al. (2020).[5]

[4]Enumerators emphasized that these donations did not include those made out of obligation (such as *Zakat*, the compulsory charity in Islam) or expectation (such as *Sarakh*, charity for purification purposes) and instead included those that were entirely voluntary and meant to reflect genuine acts of altruism without any personal gain in return.

[5]The online appendix provides additional details regarding the elicitation/measurement of these attitudinal variables.

Once the questionnaire was completed, farmers were read the following short statement: *"Aflatoxins are a type of toxin present in some groundnuts and have a long-term impact on health. They can cause liver cancer if consumed over a long period. Aflatoxins are present in 1/3 of the groundnut production in Senegal according to a recent study."* With this information – which corresponds to the parameter π in our conceptual framework – we aimed to help farmers better understand the potential benefits and risks associated with paying to reveal the level of aflatoxins in the groundnuts presented, albeit with the type of minimal information that one may be exposed to in a standard real life setting. We emphasized the liver-related effects of aflatoxin exposure to highlight the personal health risks individuals face and thus center the analysis on individual health risk perception. This statement also served to anchor participants on a common belief about the value of π.

As compensation for survey participation, farmers were offered 1,000 CFA (approximately $1.5), presented as a token of appreciation for their time. Farmers were then given the option to participate in a decision game involving groundnut powder.Beyond compensating farmers for their participation in the survey, this payment informally provides an initial endowment for participants to engage some of their own resources in the experiment, provided they agree to take part. Giving money at the end of the survey, prior to the experiment, helps mitigate potential distortions from the house money effect that can result from providing an endowment at the start of the experiment (Corrigan and Rousu, 2006).

3.2 WTP experiment

We then implemented a willingness-to-pay experiment to assess how much farmers in our sample were willing to pay to access information about aflatoxin contamination of groundnuts in their possession, and measure how this willingness to pay varied across their intended use of these – own consumption, donation or market sales. We use a Becker-Degroot-Marschak (BDM) auction mechanism (Becker et al., 1964) that we adapt to our context and analytical needs.[6] In particular, we designed our experiment to assess how farmers' WTP is affected by the intended use of their groundnuts, through exogenous changes in their consumption, donation, and sales: g^c, g^d, g^m. Exogenous variation in the allocation of groundnuts across rounds was introduced to control for selection bias and facilitate the identification of behavioral responses. Allowing participants to choose their allocations each round would have confounded the effect of the distribution itself with individual preferences.

Consumption, donation and sales allocations: g^c, g^d, g^m — We presented farmers with four 125 grams bags of groundnut powder, totaling 500 grams. We explained that these four bags could be used for three different purposes: personal consumption, donation to local Talibes,[7] or sale at the local market price (p = CFA 125 per bag) with a potential quality premium if the groundnut powder is safe for consumption (k = CFA 75 per bag). Importantly, in a given round, farmers themselves were not able to decide on the allocation of bags across the three different purposes. Instead, they were informed about the allocations to consumption (g^c), donation (g^d), and market sales (g^m) using an allocation card which was randomly drawn without replacement among 15 possible allocations – each card representing one allocation of four groundnut bags between consumption, donation and sale.[8]

Farmers' investment behavior: $v*, I, p, k$ — Once given a card, farmers were asked to state their willingness to pay to learn whether the aflatoxin content of the four groundnut

[6] In generic terms, BDM auctions are implemented as follows: a player is asked to submit a bid for the purchase of a good, which is then compared to a randomly generated number. If the bid is higher than the random number, the player keeps the good and only pays the value of the random number. If the bid is lower the player cannot purchase the good. This approach is deemed incentive-compatible as it introduces real economic consequences to stated preferences, thereby enhancing the reliability of responses (Lusk and Shogren, 2007).

[7] In Senegal, Talibes are young boys studying at a Koranic school who typically beg for food and money.

[8] See card in the online appendix.

bags was high or low. Farmers were able to choose any amount between a minimum of CFA 0 and a maximum of CFA 1000. They were informed that one round would be selected randomly with a corresponding price V drawn. If their proposed offer was greater than the randomly drawn price (V), the farmer paid the price and was informed whether the groundnut powder was safe for consumption.[9] As a result, farmers found themselves in either one of the following four cases:

1. The farmer has chosen not to pay for the food safety information ($v* = 0$) and is guaranteed to receive the allocated bags without knowing the aflatoxin content. She keeps any bags allocated for personal consumption, donates any bags intended for donation via the research team, and receives payment for selling any bags intended for sale to research team at the market price of CFA 125 per 125 gram bag. To avoid any logistical complications, the research team managed donation to local schools and paid farmers for market sales directly.

2. The farmer is willing to pay a price greater than zero, but the proposed amount is lower than the randomly drawn price ($v* < V$): the farmer is not willing to pay a price as high as the one randomly chosen, and the same outcomes as the first case apply.

3. The farmer is willing to pay a price greater than zero, and the proposed amount is equal to or higher than the randomly drawn price ($v* \geq V$): she pays price V and obtains information on the food safety of the groundnut powder that was given to him. If the information reveals that the aflatoxin content is low, she keeps any bags for personal consumption, donates to Talibes via the research team, and sells any bags intended for sale to the research team at a market premium of $p + k = 200$ CFA per 125 gram bag (instead of $p = 125$ CFA if she had not obtained the information). However, if information reveals that the aflatoxin content is high, i.e. that the groundnuts are unsafe for consumption, the research team keeps all bags to destroy them.

[9] In practice, only groundnuts fit for consumption were offered, though the farmers were unaware of this.

4. The farmer is willing to pay $v* = 1000$ CFA, the maximum price, to guarantee she will receive food safety information. The same outcomes as the third case apply.

Prior to the real experiment, enumerators conducted two initial rounds using biscuits instead of groundnuts to familiarize participants with the game's mechanics. The experimental design was developed through two rounds of piloting to ensure it was accessible and understandable to participants. Visual aids were used throughout, and two initial training rounds were conducted using biscuits instead of groundnuts to simulate the experimental choices. These training rounds could be repeated as needed as farmers were asked to express understanding the tasks and decisions before proceeding with the experiment. The actual WTP experiment was then repeated 12 times, with random changes (without replacement) in the allocation parameters g^c, g^d, g^m across each round. Participants were informed that only 1 out of their 12 decisions would be randomly chosen for effective monetary and in-kind payoffs at the end of the game, as summarized in Figure 1.[10]

3.3 Estimation strategy

Using data from the experiment we investigate farmers' WTP for information regarding the safety of the groundnut powder and, in line with our conceptual framework, whether their WTP responded to exogenous changes in the allocation of the groundnut powder. In this section we focus on the first six rounds of the game with six observations per farmer who participated in the experiment (analysis for the following six rounds, after the information experiment, is presented in Section 4). For each round j, our main outcome variable is farmer i's WTP to obtain information regarding the safety of the groundnut powder she was provided: v^*_{ij}. The key independent variables of interest are the shares of bags exogenously allocated to the farmer's own consumption ($\bar{g}^c = \{0, 1/4, 1/2, 3/4, 1\}$), to donation ($\bar{g}^d = \{0, 1/4, 1/2, 3/4, 1\}$), or to market sales ($\bar{g}^m = \{0, 1/4, 1/2, 3/4, 1\}$), with ($\bar{g}^c + \bar{g}^d + \bar{g}^m = 1$). The upper bar (–) indicates that the values of these variables are controlled

[10]The online appendix provides the full script of the experiment

by the experimenter, and not reflect farmers characteristics or choices.

Importantly, as we chose to limit the number of parameter variations that farmers had to deal with during the experiment, we kept constant the expected share of unsafe groundnut ($\bar{\pi} = 1/3$), the benchmark market price for each bag ($\bar{p} = 125$), and the price premium if the groundnut was revealed to be safe ($\bar{k} = 75$). Each of these parameters are fixed at realistic levels given the local context. As a result of fixing these parameters, we are unable to empirically identify several of our framework parameters of interest summarized in Equation 3. First, without variations in $\bar{\pi}$, $\bar{k}$ and $\bar{p}$, the market sales-related term of Equation 3 is empirically reduced to differences across farmers in their marginal utility derived from these sales δ. Similarly, with the value of $\bar{\pi}$ fixed across farmers, we are unable to estimate the effect of its variation on farmers' WTP when bags are to be consumed or donated for instance. Accordingly, the empirical translation of Equation 3 in our conceptual framework is limited to the following simplified version:

$$v^* = \alpha A \bar{g}^c + \beta \gamma A \bar{g}^d + \delta \bar{g}^m \tag{4}$$

The values of the parameter estimates are then to be interpreted conditional on the parameter values $\bar{\pi} = 1/3$, $\bar{p} = 125$ and $\bar{k} = 75$. Our main interest is to assess whether farmers are willing to pay real money for food safety information when there are no private returns as driven by the composite $\beta\gamma A$ parameter. To this end, we rely on a gradual approach starting with the benchmark model described in Equation 5:

$$v^*_{ij} = c + \beta \bar{g}^d_{ij} + \mu_j + \tau i + \varepsilon ij \tag{5}$$

where μ_j is a set of round-order fixed effects accounting for farmers' eventual learning or fatigue as they play more rounds. We further account for individual round-invariant characteristics through a set of individual-level fixed effects τ_i which notably account for differences in awareness (A) and pro-sociality (γ) across individuals as reported in Table 1.[11] In turn, the constant parameter c captures the effect of allocating groundnut powder to the other two possible usages ($\bar{g}^c$ and $\bar{g}^m$), and thus corresponds to the combination of the reference parameters α and γ.

In Equation 6 we further decompose the effect of the groundnut usage allocation across the three possible alternatives, through the introduction of the share allocated to farmers' own consumption $\bar{g}^c_{ij}$, such that the constant term only includes the effect of the remaining alternative: $\bar{g}^m_{ij}$. Accordingly, parameters α and β are now more closely aligned with that of Equation 4, measuring the effect of respectively allocating groundnut powder to consumption (α) or donation (β) as compared to allocating it to market sales ($c = \gamma$).

$$v^*_{ij} = c + \alpha\bar{g}^c_{ij} + \beta\bar{g}^d_{ij} + \mu_j + \tau_i + \varepsilon_{ij} \tag{6}$$

Last, we leverage data from our baseline survey to assess how awareness of aflatoxins and pro-social preference contribute to farmers' marginal utility of donation, as per our conceptual framework's $\beta\gamma A$. We measure awareness of aflatoxins (A) through farmers' answers to two separate questions asking whether they had ever heard of aflatoxins before (22%) and whether they listed health issues as possible consequences (11%). We also use two separate measures of pro-sociality. First, we use the pro-sociality index based on farmers' responses to questions related to their feeling of happiness after giving advice or helping fellow villagers as described in section 1.2. Second, we use the collected values of farmers' WTP for the safety of their groundnuts in the rounds where the groundnut powder was exclusively allocated to donation ($\bar{g}^d = 4$).[12] The corresponding model is specified in Equation 7, where we separately estimate

[11]We further account for the non-independence of observations across rounds for a given farmer through a composite error term $\varepsilon ij = \vartheta_i + \xi_{ij}$ where ϑ_i is an individual-level clustered component. All our results rely on cluster-robust standard errors estimates.

[12]This last measure is only available for about half of the farmers in our sample: those for whom this

the marginal contribution of awareness (β^1) and pro-sociality (β^2) on farmers' WTP for information when the number of bags allocated to donation is increased:

$$\begin{aligned} v^*_{ij} = c + \alpha^0\bar{g}^c_{ij} + \alpha^1(A_i \times \bar{g}^c_{ij}) + \alpha^2(\gamma_i \times \bar{g}^c_{ij}) \\ + \beta^0\bar{g}^d_{ij} + \beta^1(A_i \times \bar{g}^d_{ij}) + \beta^2(\gamma_i \times \bar{g}^d_{ij}) + \mu_j + \tau_i + \varepsilon_{ij} \end{aligned} \tag{7}$$

We estimate Equations 5, 6 and 7 with a standard OLS estimator for ease of results' interpretation and possible comparison with other related studies. In Section 5 we discuss the robustness of this approach as compared to a Poisson Pseudo Maximum Likelihood estimator.

3.4 Results: WTP for others' health

We show parameter estimates from Equations (5) and (6) in Table 2. Columns (1) and (3) examine the impact of a decrease in private returns, represented by an increase in the donation component of the allocation (Equation 5, while columns (2) and (4) further account for the composition of the private returns, controlling for the amount allocated to consumption.

Our results support the idea that farmers value their private returns more than that of others. In columns (3) for instance, we find that farmers are willing to pay CFA 22 less for allocations that include at least one bag donated, as compared to allocations where no bag is to be donated. Results from columns (2) and (4) help refine these interpretations. We find no significant effect when the share of bags to be donated increases, compared to a shift in the share sold (Column 2). This suggests a stronger preference for one's own health than for the market premium one may obtain from selling safe groundnuts ($k = 75$). Our results are however unchanged between Columns (3) and (4) where the independent variables are binary indication of "at least one bag" being used for a given purpose. Overall, and in line with our conceptual framework, we interpret these results as indicative of $\beta\gamma A < \alpha A$ and $\beta\gamma A \leq \delta((1 - \pi)k - \pi p)$ when $\bar{\pi} = 1/3$, $\bar{p} = 125$ and $\bar{k} = 75$.

specific allocation (randomly) fell within the first six rounds of the game.

Table 2: WTP to access food-safety information

	OLS **Share of bags**		OLS **At least one bag**	
	(1) WTP	(2) WTP	(3) WTP	(4) WTP
Donation	-21.723**	-13.260	-21.504***	-21.281***
	(10.728)	(12.140)	(7.107)	(7.325)
Consumption		16.422		0.986
		(12.233)		(6.847)
Mean WTP	523	523	523	523
D.=C.		0.02		0.01
FE	Indiv. & Round	Indiv. & Round	Indiv. & Round	Indiv. & Round
Clustered SE	Indiv.	Indiv.	Indiv.	Indiv.
Observations	2634	2634	2634	2634

Note: Panel restricted to the first 6 rounds. All results are obtained from OLS regressions of the WTP with round and individual fixed effects, and standard errors are clustered at the individual level. In columns (1) & (2), *Donation* represents the share of groundnut bags allocated to donation, and *Consumption* represents the share allocated to consumption. In columns (3) & (4), *Donation* represents the presence of at least one bag for donation, and *Consumption* represents the presence of at least one bag for consumption. In the second part of the table, the first row presents the mean willingness-to-pay (WTP) for the first 6 rounds. The second row presents the p-value for the F-test of $D = C$. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

We next decompose our estimates of the conceptual framework parameter in Table 3, where we allow the effect of bags allocated to donation to vary across farmers with lower or higher baseline knowledge of aflatoxins (which indicate by A^- and A^+, respectively), and across farmers with lower/higher levels of pro-sociality (γ^- and γ^+), as per Equation (7). Considering aflatoxins awareness, we distinguish between farmers who are genuinely knowledgeable about the harmful effects of aflatoxins and those who are less aware by incorporating their survey responses regarding their awareness of aflatoxins and specific awareness of its health effects. For pro-sociality, we construct an index based on three elicitation questions, as described in Section 1.2. Following Anderson (2008), this index is computed as a weighted measure of multiple standardized variables relative to the full sample.

Results from Columns (1) and (2) of Table 3 indicate that farmers who are aware of or who understand the effects of aflatoxins (A^+) exhibit a significantly higher WTP when there is an increase in the share of bags for donation: $\beta A^+ > \beta A^-$. This increase in WTP is large and surpasses the decrease observed when the share of bags for donation increases. These results suggest that awareness of aflatoxins' effects mitigates the disparity between own consumption and others' consumption. In other words, farmers who are more knowledgeable about aflatoxins' health impacts seem to value private returns and returns to others relatively more equally. Interestingly, they do not have a significantly higher WTP when there is an increase in consumption ($\alpha A^{+} = \alpha A^{-}$).

These awareness-related results contrast with our results related to pro-sociality, at least as per our elicited measure of pro-sociality. We find no evidence of any significant differences across farmers with lower/higher baseline pro-sociality: $\beta\gamma^{+} = \beta\gamma^{-}$ and $\alpha\gamma^{+} = \alpha\gamma^{-}$.

It is plausible that our elicitation questions may not effectively capture pro-sociality or, more importantly, altruism, which should manifest in the experiment through donation behavior. To isolate altruism rather than broader pro-sociality, we then focus on the rounds dedicated solely to pure donation. This is somewhat akin to a standard dictator game Forsythe et al. (1994), in which one participant (the "dictator") decides how to divide a sum of money between themselves and another participant (the "recipient"), who has no influence on the decision. This game is commonly used to study altruism, as it highlights the tension between selfishness and generosity in decision-making. In our case, when farmers face a situation where all bags are donated to others, the farmer decides whether and how much money to allocate to ensure food safety for others. None of the actions benefit the farmer directly. To rank farmers based on their level of altruism, we calculate the average amount paid during this round and create a binary variable. This variable equals 1 if the farmer's WTP (willingness to pay) during this round exceeds the average, and 0 otherwise. Table A2 in Appendix reports estimates analogous to 3, this time using this dictator game measure albeit limited to the subset of farmers for which it is available in the first six rounds. We find significant positive evidence that farmers with greater willingness to pay (WTP) in the full donation round exhibit higher WTP for food safety when the donation is increased in other rounds. This increase offsets the initial decrease induced by the donation component.

Overall, results presented so far provide broad support for our conceptual framework's main predictions: farmers are more willing to invest in food safety when they can extract

Table 3: WTP to access food-safety information: Awareness and pro-sociality

	OLS **Share of bags**		OLS **At least one bag**	
	(1) WTP	(2) WTP	(3) WTP	(4) WTP
Donation	-26.280*	-24.246*	-23.588***	-22.676***
	(13.877)	(13.090)	(8.567)	(7.841)
Consumption	6.459	15.687	-0.149	3.925
	(13.597)	(12.905)	(7.568)	(7.118)
Donation × Heard of aflatoxins	60.365**		10.617	
	(26.960)		(15.946)	
Consumption × Heard of aflatoxins	47.196		4.258	
	(31.134)		(17.371)	
Donation × Knows of aflatoxins		108.484***		10.629
		(30.360)		(21.454)
Consumption × Knows of aflatoxins		17.694		-32.057
		(39.928)		(25.759)
Donation × Index Pro-sociality	3.327	5.009	2.782	3.106
	(11.873)	(11.926)	(8.237)	(8.173)
Consumption × Index Pro-sociality	5.151	7.510	7.518	7.797
	(12.619)	(12.539)	(6.848)	(6.793)
Mean WTP	523	523	523	523
Mean aflatoxins knowledge	0.22	0.11	0.22	0.11
D+ D × A + D × γ=0	0.15	0.00	0.49	0.68
C+ C × A + C × γ=0	0.05	0.29	0.48	0.42
D+ D × A + D × γ =C+ C × A + C × γ	0.49	0.28	0.29	0.69
FE	Indiv. & Round	Indiv. & Round	Indiv. & Round	Indiv. & Round
Clustered SE	Indiv.	Indiv.	Indiv.	Indiv.
Observations	2634	2634	2634	2634

Note: Panel restricted to the first 6 rounds. All results are obtained from OLS regressions of the WTP with round and individual fixed effects, and standard errors are clustered at the individual level. In columns (1) & (2), *Donation* represents the share of groundnut bags allocated to donation, and *Consumption* represents the share allocated to consumption. In columns (3) & (4), *Donation* represents the presence of at least one bag for donation, and *Consumption* represents the presence of at least one bag for consumption. *Heard of aflatoxins* is a dummy variable equal to 1 if the farmer has heard of aflatoxins prior to the experiment. *Knows of aflatoxins* a dummy variable equal to 1 if they knew before the start of the experiment that aflatoxins have a negative effect on health. *Index pro-sociality* is a standardized weighted index of 3 variables on the elicitation of pro-sociality, following a GLS weighting procedure as described in Anderson (2008). Second part of the table: The first row presents the mean willingness-to-pay (WTP) for the first 6 rounds. The second row presents the mean knowledge for the chosen variable related to aflatoxins awareness among the sample. The third, fourth and fifth rows present the p-value for the F-test of significance. The sixth row presents the level of fixed effects (Individual and round). The seventh row presents the level of the clustered standard errors, and the eighth row presents the number of observations. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

private returns from these investments, and particularly when there are private health returns. This is not necessarily indicative of lack of care for others' health as, at the extensive margin, most would nevertheless invest some amount to test for the safety of their groundnuts, even when the full four bags are to be donated. Further, farmers' awareness of aflatoxins (and particularly for those who have not just heard of it but also know the health consequences of it) is a strong mediator of these effects: among farmers with a higher baseline awareness level, one no longer finds evidence of lower WTP for food safety information when the share to be donated is increased.

4 Impact of increased awareness on WTP for food safety information

This section presents results obtained from the following six rounds of our experiment, where we exposed a randomly chosen subset of farmers to an awareness treatment intervention designed to significantly increase their awareness of the health hazards associated with the consumption of aflatoxin-contaminated products. By studying the effects of this treatment, we further aim to inform of the effects of large-scale information campaigns in real-life settings.

4.1 Experimental design

We introduced the awareness treatment midway through the experiment, after farmers had completed their 6th round. At this time, farmers were informed that they would be given a short break during which they would watch an 8-minute video. Half of the farmers (Control group) were randomly selected to watch a comedy video unrelated to aflatoxins. The other half (Treatment group) were shown an informative video on aflatoxins, presented in Wolof by a leading Senegalese scientist working on aflatoxins in Senegal. The aflatoxins video provided comprehensive information on the health effects, the causes and the reasons for the high prevalence of aflatoxins found in Senegalese groundnut production.[13] After the video break, farmers were invited to resume the WTP experiment for another 6 rounds, following the exact same procedure as the first six rounds. From the standpoint of our conceptual framework, the effect of the video treatment can only affect farmers' awareness level (A), and is limited to the random subset that were selected to watch the informative video.

The randomly assigned video treatment led to two groups of similar size (214 farmers in the Control group, 225 in the Treatment one) and average characteristics. As reported in Table 1 above, group-level means are statistically indistinguishable from one another for most of the variables collected at baseline. By chance, we find that farmers in the treatment

[13] The complete script is presented in the online appendix.

group were 8 percentage point more likely to have experienced a positive groundnut harvest in 2021. Descriptive statistics on farmers' willingness to pay (WTP) are presented in Table A1 in the appendix showing that there are no significant differences in WTP between the treatment and control groups during the first six rounds (before the videos were shown).

4.2 Impact of increased awareness on farmers' overall WTP for food-safety information

Figures 2 and 3 in the Appendix provide a first set of evidence regarding the impact of the Treatment video. Figure 2 displays the evolution of round-level average WTP in Treatment (red) and Control (blue) groups, throughout the 12 rounds of the experiment. We find no differences in the first 6 rounds, where the average WTP in both groups hovers between CFA 500 and CFA 550. In the Control group, round-level average WTP remains stable in rounds 7 to 12 compared to the first six rounds. In contrast, the Treatment group average WTP increases by about CFA 50 in round 7, and remains stable at about CFA 600 until round 12 when the experiment was over.

Beyond the evolution of the average WTP, Figure 3 presents the changes in distribution of WTP before and after the video break, and separately for Treatment and Control groups. We find no clear evidence of differences in the distribution of WTP across Treatment and Control groups before farmers were given the 8mn video break. Remarkably, nearly all (98%) farmers in both the control and treatment groups chose to pay a positive amount in all rounds of the game, and approximately 15% of farmers consistently offered the maximum amount (Table A1). Comparing the upper (pre-video) and lower (post-video) panels of Figure 3 reveals a discernible shift in the distribution of WTP after the video, although limited to the Treatment group. There, one finds more individuals willing to pay the maximum amount (red-shaded cells), smaller number of individuals willing to pay the minimum amounts (blue- to purple-shaded cells), and no clear differences appear for the intermediate segments (yellow- to beige-shaded cells).

Insights from Figures 2 and 3 are further supported by estimates of the video's impact on farmers' WTP, through a Difference-in-Difference approach described by:

$$v_{ij}^{*} = \delta^{0} + \delta^{1}(\bar{A}_i \times L_{ij}) + \mu_j + \tau_i + \epsilon_{ij} \tag{8}$$

where $\bar{A}_i$ equals 1 if individual i was exposed to the informative video (Treatment group) and zero otherwise, and L_{ij} equals 1 if the observation pertains to a round j that was played after the video break (i.e. after round 6) and zero otherwise. We estimate the overall treatment effects on willingness to pay (WTP), through three separate measures of the outcome variable : WTP in levels, a binary variable equal to one if the participant was willing to pay for certainty ($v* = 1000$), and a binary variable indicating whether one's WTP is higher or lower than the median WTP.

We present the results of this analysis in Table 4. These results confirm the graphical evidence: the video increases WTP among treated farmers. Treated farmers are willing to pay about 8% more on average after seeing the video (column 1). Treated farmers are more willing to pay for certainty about food safety (column 2) and more willing to pay above the median control-group farmer in the pre-period (column 3).

Our results align with the literature showing the positive impact of food safety and/or food quality information campaigns on consumers' WTP in low-income countries. Using BDM mechanisms and hedonic testing in rural Nigeria, Oparinde et al. (2016) show that information provision increased consumers' WTP for bio-fortified cassava. With a similar approach, Banerji et al. (2016) find that providing consumers with information on the benefits of high-iron pearl millet in rural India led to an increase in their WTP. Meenakshi et al. (2012) combine stated and revealed preference methods with an initial endowment and show that an information campaign on the nutritional value of bio-fortified maize significantly increases farmers' WTP. Closer to our setting, Magnan et al. (2021) find that providing information on aflatoxins and its prevention in Ghana significantly increased food safety practices in a sample of groundnut farmers.

Table 4: Impact of increased awareness on farmers WTP to access food-safety information: DID

	OLS	LPM	
	(1)	(2)	(3)
	WTP	WTP=1 000 FCFA	Above median WTP
Post video	15.225	0.009	0.008
	(15.319)	(0.021)	(0.031)
Treatment × Post	44.183***	0.063***	0.077***
	(16.198)	(0.023)	(0.028)
Mean WTP outcome	526.53	0.22	0.31
FE	Indiv. & Round	Indiv. & Round	Indiv. & Round
Clustered SE	Indiv.	Indiv.	Indiv.
Observations	5268	5268	5268

Note: Column (1) presents results obtained from OLS regressions of the WTP with round and individual fixed effects, and standard errors are clustered at the individual level. Column (2) and (3) present the result of a linear probability model on the WTP with round and individual fixed effects, and standard errors are clustered at the individual level. *Post video* is a dummy variable equal to 1 if the round is played after having watched the video. *Treatment* is a dummy variable equal to one if the farmer is in the treatment group and 0 otherwise. In the second part of the table, the first row presents the mean of the outcome of the column. The second row presents the level of fixed effects (Individual and round). The third row presents the level of the clustered standard errors, and the last row presents the number of observations. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

4.3 Increased awareness and farmers' WTP: Mechanisms

In this subsection we leverage our conceptual framework to delve one step deeper in the underlying mechanisms driving these results. We build on our analytical framework and on the results presented in Section 3 to investigate how an increased awareness of aflatoxins issues ($\bar{A}$) affects farmers' WTP when their groundnuts are dedicated to home consumption (g^c), donation (g^d), or market sales (g^m). We further investigate how farmers' pro-sociality and prior awareness affect their choices in these different situations.

We first assess the effect of the randomized increase in farmers' awareness through the approach described in Equation 6, except that we now introduce exogenous variation in farmers' awareness through exposure to the informative video: $A = \bar{A}$. In Equation 9 below, parameter estimates $\hat{\alpha}^1$ and $\hat{\beta}^1$ indicate how this awareness treatment differentially affected farmers' WTP depending on the extent to which farmers' groundnuts were to be used for consumption or donation.

$$v^*_{ij} = c + \beta^0 \bar{g}^d_{ij} + \beta^1(\bar{A}_i \times \bar{g}^d_{ij}) + \mu_j + \tau_i + \varepsilon_{ij} \tag{9}$$

$$v^*_{ij} = c + \alpha^0 \bar{g}^c_{ij} + \alpha^1(\bar{A}_i \times \bar{g}^c_{ij}) + \beta^0 \bar{g}^d_{ij} + \beta^1(\bar{A}_i \times \bar{g}^d_{ij}) + \mu_j + \tau_i + \varepsilon_{ij} \tag{10}$$

Finally, we explore in Equation 11 how the effect of the awareness treatment was in part mediated by farmers' baseline awareness level (A_i) as well as their level pro-sociality (γ):

$$\begin{aligned} v^*_{ij} = c &+ \alpha^0 \bar{g}^c_{ij} + \alpha^1(\bar{A}_i \times \bar{g}^c_{ij}) + \alpha^2(\bar{g}^c_{ij} \times \gamma_i) + \alpha^3(\bar{A}_i \times \bar{g}^c_{ij} \times A_i) + \alpha^4(\bar{A}_i \times \bar{g}^c_{ij} \times \gamma_i) \\ &+ \beta^0 \bar{g}^d_{ij} + \beta^1(\bar{A}_i \times \bar{g}^d_{ij}) + \beta^2(\bar{g}^d_{ij} \times \gamma_i) + \beta^3(\bar{A}_i \times \bar{g}^d_{ij} \times A_i) + \beta^4(\bar{A}_i \times \bar{g}^d_{ij} \times \gamma_i) \\ &+ \mu_j + \tau_i + \varepsilon_{ij} \end{aligned} \tag{11}$$

For ease of interpretation of parameter estimates associated with interacted variables we limit ourselves to observation collected in rounds 7 to 12 for this specification.[14]

Results from the estimation of Equations 9 and 10 are presented in Table 5 below, where we leverage all 12 rounds of data to estimate our parameter of interest through a DID estimator.[15] The results suggest that the average effect of information fully compensates the negative coefficient associated with the share of bags for donation. We do not however find evidence of heterogeneous treatment effects in response to the share of bags to be donated: the treatment seems to have strongly and positively affected treated farmers' WTP in all scenarios, regardless of the groundnut allocation in a given round.

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[14]Relying on the DID framework used in Section 4.2 to estimate predictions from our analytical framework on all 12 rounds of data would lead to uninterpretable estimates associated with quadruple interactions of variables.

[15]Qualitatively similar results are found when restricting the sample to the last six rounds only to estimate parameters values of Equations 9 and 10 – see Table 5 in the appendix.

Table 5: Impact of increased awareness on farmers WTP to access food-safety information

	OLS		OLS	
	Share of bags		**At least one bag**	
	(1)	(2)	(3)	(4)
	WTP	WTP	WTP	WTP
Post video	21.802	23.166	17.632	31.053
	(16.367)	(19.374)	(16.686)	(19.607)
Treatment × Post	46.081***	38.785*	45.149**	30.786
	(17.626)	(21.258)	(17.476)	(20.699)
Donation	-20.687*	-11.903	-19.740***	-20.222***
	(11.045)	(12.292)	(7.628)	(7.760)
Donation × Post	-19.335	-20.921	-3.360	-6.202
	(18.618)	(21.530)	(11.716)	(11.683)
Donation × Treatment × Post	-4.393	2.898	-0.752	2.314
	(20.607)	(24.301)	(13.302)	(13.476)
Consumption		17.459		-2.653
		(12.648)		(6.920)
Consumption × Post		-2.736		-16.835
		(22.798)		(13.025)
Consumption × Treatment × Post		14.589		18.137
		(26.858)		(14.786)
Mean WTP Control group	527	527	527	527
D+ P + T × P+ D × T × P=0	0.13	0.09	0.07	0.07
C + P + T × P+ C × T × P=0		0.00		0.00
C+ P + T × P+ C × T × P = D + P + T × P+ D × T × P		0.15		0.10
FE	Id. & Rd.	Id. & Rd.	Id. & Rd	Id. & Rd.
Clustered SE	Id.	Id.	Id.	Id.
Observations	5268	5268	5268	5268

Note: All results are obtained from OLS regressions of the WTP with round and individual fixed effects, and standard errors are clustered at the individual level. *Post video* is a dummy variable equal to 1 if the round is played after having watched the video. *Treatment* is a dummy variable equal to one if the farmer is in the treatment group and 0 otherwise. In columns (1) & (2), *Donation* represents the share of groundnut bags allocated to donation, and *Consumption* represents the share allocated to consumption. In columns (3) & (4), *Donation* represents the presence of at least one bag for donation, and *Consumption* represents the presence of at least one bag for consumption. In the second part of the table, the first row presents the mean willingness-to-pay (WTP) for the first 6 rounds. The second, third and fourth rows present the p-values for F-tests of joint significance. The fifth row presents the level of fixed effects (Individual and round). The sixth row presents the level of the clustered standard errors, and the last row presents the number of observations. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Finally, we present in Table 6 the parameter estimates of Equation 11, where we restrict the sample to the last six rounds only to avoid quadruple interactions and facilitate interpretation. We do not find evidence of significant differences in treatment effects of the information campaign on one's WTP to pay for food safety when groundnuts are to be donated, across those with lower/higher initial knowledge or pro-social orientation. If anything, the point estimates associated to the triple interaction parameter associated to donation are negative, suggesting that the information campaign had a relatively smaller effect on the WTP of farmers who had higher knowledge of aflatoxins and/or higher pro-social orientation at baseline. These parameter estimates are however very imprecisely estimated and statistically not distinguishable from zero within standard margins of errors.[16]

Overall, results from the randomized exposure to the informative video align with the evidence obtained from the first six rounds when considering baseline awareness, highlighting the important effect of information on farmers' WTP for food safety information, and particularly so when it concerns the health of others. This effect may be more pronounced for farmers with low initial level of awareness. We do not find evidence that pro-sociality is an important mediator of these effects. Alternatively, a second explanation could be that the lack of significant heterogeneity regarding pro-sociality may reflect an empirical issue, if the indicators used only weakly (or very noisily) relate to the true underlying altruistic attitudes of the farmers for instance. However, we find similar results when we use a survey-based index or a behavior actually observed in one specific round of the game (the full donation round), such that insignificant results may indeed reflect an absence of pro-social motivation mechanism. A third possible explanation is the general limited variation in pro-sociality levels across the farmers in our sample. In particular, if farmers have high pro-social attitudes to start with, an information campaign may be particularly effective at changing farmers' behavior. The fact that nearly all farmers do exert positive WTP for food safety information

[16] We find similar results upon relying on our alternative dictator game measure of pro-sociality – see Appendix Table A3.

Table 6: Impact of increased awareness on farmers WTP to access food-safety information: Awareness and pro-sociality (observations restricted to the last 6 rounds)

	OLS		OLS	
	Share of bags		**At least one bag**	
	(1) WTP	(2) WTP	(3) WTP	(4) WTP
Donation	-36.021***	-33.469***	-32.551***	-26.667***
	(13.301)	(12.327)	(7.288)	(6.662)
Consumption	21.877	20.776	-5.617	-6.212
	(14.243)	(13.785)	(7.977)	(7.648)
Donation × Heard of aflatoxins	24.315		34.799*	
	(40.334)		(19.266)	
Consumption × Heard of aflatoxins	21.502		-15.427	
	(47.199)		(28.219)	
Don. × Heard of aflatoxins × Treat.	-23.775		-11.580	
	(47.594)		(23.733)	
Cons. × Heard of aflatoxins × Treat.	-60.420		12.609	
	(57.799)		(32.856)	
Donation × Knows of aflatoxins		39.960		11.219
		(53.368)		(26.909)
Consumption × Knows of aflatoxins		23.064		-22.000
		(35.570)		(25.629)
Don. × Knows of aflatoxins × Treat.		-76.335		-7.861
		(72.915)		(37.416)
Cons. × Knows of aflatoxins × Treat.		-68.818		24.480
		(75.880)		(42.403)
Donation × Index Pro-sociality	23.853	24.376	9.592	12.729
	(17.057)	(17.042)	(7.929)	(8.101)
Consumption × Index Pro-sociality	10.415	11.748	7.693	7.216
	(13.632)	(14.582)	(9.590)	(9.674)
Don. × Index Pro-sociality × Treat.	-16.793	-17.219	-8.905	-12.142
	(22.675)	(22.795)	(11.399)	(11.606)
Cons. × Index Pro-sociality × Treat.	-22.057	-23.161	-20.170*	-19.807
	(20.200)	(20.914)	(12.124)	(12.271)
Mean WTP	564	564	564	564
Mean aflatoxins knowledge	0.22	0.11	0.22	0.11
$D + D \times A + D \times A \times T + D \times \gamma + D \times \gamma \times T = 0$	0.39	0.27	0.64	0.45
$C + C \times A + C \times A \times T + C \times \gamma + C \times \gamma \times T = 0$	0.51	0.62	0.34	0.66
$D + D \times A + D \times A \times T + D \times \gamma + D \times \gamma \times T =$ $C + C \times A + C \times A \times T + C \times \gamma + C \times \gamma \times T$	0.99	0.65	0.60	0.87
FE	Indiv. & Round	Indiv. & Round	Indiv. & Round	Indiv. & Round
Clustered SE	Indiv.	Indiv.	Indiv.	Indiv.
Observations	2634	2634	2634	2634

Note: Panel restricted to the last 6 rounds. All results are obtained from OLS regressions of the WTP with round and individual fixed effects, and standard errors are clustered at the individual level. In columns (1) & (2), *Donation* represents the share of groundnut bags allocated to donation, and *Consumption* represents the share allocated to consumption. In columns (3) & (4), *Donation* represents the presence of at least one bag for donation, and *Consumption* represents the presence of at least one bag for consumption. *Treatment* is a dummy variable equal to one if the farmer is in the treatment group and 0 otherwise. *Heard of aflatoxins* is a dummy variable equal to 1 if the farmer has heard of aflatoxins prior to the experiment. *Knows of aflatoxins* a dummy variable equal to 1 if they knew before the start of the experiment that aflatoxins have a negative effect on health. *Index pro-sociality* is a standardized weighted index of 3 variables on the elicitation of pro-sociality, following a GLS weighting procedure as described in Anderson (2008). In the second part of the table, the first row presents the mean willingness-to-pay (WTP) for the first 6 rounds. The second row presents the mean knowledge for the chosen variable related to aflatoxins awareness among the sample. The third, fourth and fifth rows present the p-value for the F-test of significance. The sixth row presents the level of fixed effects (Individual and round). The seventh row presents the level of the clustered standard errors, and the eighth row presents the number of observations. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

in the full donation (dictator game) round, along with the large and continued effect of an 8 minute video on farmers' WTP for others' health together suggest that farmers do care about others' health when they are made aware that their behavior can affect it. The effect seems somewhat different for home consumption: even with limited levels of information, farmers' WTP for food safety information increases more with consumption than for other needs, which is more aligned with a risk aversion issue in the face of a very imprecisely-defined health hazard.

This implication resonates with the work of Jones-Lee (1991), who observes that individuals strike a balance between their own well-being and the well-being of others when making safety-related decisions, expressing altruism in the context of safety concerns. Overall, our research emphasizes the complementary relationship between information provision and altruistic behavior, underscoring the importance of well-informed individuals contributing to safety initiatives for the greater good. This highlights the critical role of awareness and education in influencing farmers' economic decisions and suggests that increasing awareness about aflatoxins could enhance the effectiveness of interventions in promoting safer agricultural practices.

5 Robustness

In this section we discuss several possible caveats limiting the interpretation of results presented in Sections 3 and 4 and, where relevant, discuss additional sets of results. We group these into the following three categories: those related to the mechanisms identified, those related to the design of the experiment, and those related to the econometric estimators used.

5.1 Mechanisms

We highlight pro-sociality as a key mechanism driving the observed increase in willingness to pay when groundnuts are allocated to others. Our experimental design provides a robust framework to examine this phenomenon. To explore the reliability of our findings, we also investigate whether non-altruistic preferences, such as stated risk aversion, impact willingness to pay for donation. To assess this, we create an index of risk aversion based on survey data, specifically using questions on risk perception in life and agriculture drawn from the Global Preferences Survey (Falk et al., 2018). We replicate Table 2 interacting the variables with a risk aversion index. Table A4 demonstrate that being risk averse does not appear to significantly influence willingness to pay when groundnuts are allocated for donation, nor when we additionally control for consumption share.

5.2 Experimental design

We discuss two possible sources of biases that may derive from the experiment itself.

First, one may question whether farmers truly believed that the research team would give them contaminated groundnuts or donate contaminated groundnuts to children. In fact, only groundnuts fit for consumption were offered in our experiment, although the farmers were unaware of this.[17] While we cannot measure farmers' beliefs in the experimental setting we placed them into, their willingness to pay real money does suggest that they generally believed there was some positive probability of contamination. Further, the fact that their WTP is affected by the different uses of the groundnuts they were allocated is incompatible with a belief that all groundnuts were free of contamination. Last, upon being exposed to the information campaign, farmers did increase their WTP, a result that is also incompatible with a belief that all groundnuts were suitable for consumption. Thus, it is unlikely that farmers in general did not believe that paying for information on the safety of the groundnut powder was not worth any money. If anything, if some farmers did not believe that some of the groundnuts would be unsuitable for consumption, their WTP should be lowered and our results should be interpreted as lower bounds of their true WTP.

Second, we acknowledge the potential for anchoring bias in our experimental setting.

[17]For evident ethical reasons, all groundnut powder bags were previously tested for their level of aflatoxin content and only those that satisfied the European norm of 2 ppb (the strictest in the world) were effectively kept for the experiment.

Anchoring refers to a cognitive bias where individuals rely too heavily on the first piece of information they encounter when making decisions (Brewer and Chapman, 2002; Li et al., 2021). In our context, participants may have been influenced by initial allocations or card presentations, potentially skewing their subsequent choices. We conduct two robustness tests to assess the extent to which anchoring effects may bias our results. First, we test for the stability of our main parameter estimates upon introducing the groundnut usage allocations that farmers were given in the previous round. Second, we test for the stability of our estimates upon controlling for the round order instead of the unordered round fixed effects we use in our preferred specifications. Results are showing that our main results remain unchanged upon introducing these controls (tables available in the online appendix).

5.3 Estimators

Throughout our analysis we rely on Fixed Effects OLS estimators. We check for the robustness of these results using Poisson Pseudo Maximum Likelihood (PPML). This approach enables non-linear specification and further handle zeros values of the dependent variables, which is suited given the distribution of our outcome. In particular, this estimator handles nonnegative outcomes and frequent zeros, which aligns with the nature of our outcome variable. This model allows us to control for fixed effects and is robust to assumptions about the underlying data distribution, making it a reliable choice even if our data follows a bimodal distribution (Hoang and Wooldridge, 2024). It also helps mitigate potential biases that could result from the combination of log-linearization and heteroscedasticity (Chen and Roth, 2024; Silva and Tenreyro, 2006). We do not find any meaningful changes with respect to the results obtained from the OLS estimator (tables available in the online appendix).

6 Conclusion

Health risks associated with aflatoxins have long been documented in the scientific literature, yet the awareness of these risks remains inadequate among producers and consumers in low-income countries. Local authorities and governments have implemented limited and ineffective policies to address this issue.

In light of this context, the main objective of our research is to explore strategies that could incentivize producers to invest in higher safety standards for their products, particularly in local markets where regulatory and enforcement capacities may be lacking. We interpret producers willingness to pay to access food-safety information of their production as an expression of altruism driven by the desire to protect consumers without immediate monetary expectations from the local market. Our findings provide evidence that farmers are willing to pay a premium for groundnuts with low levels of aflatoxins when they are fully aware of its harmful effects. Providing comprehensive information about aflatoxins significantly increases farmers' willingness to pay for accessing food-safety information, regardless of whether they are intended for personal use or sale.

Our findings provide valuable insights into food safety and quality upgrading in the context of missing markets. Senegalese farmers may hesitate to invest in quality upgrading due to the lack of financial incentives in the local market. However, when considering aflatoxin contamination as not merely an economic concern but a public health problem, farmers may find additional motivation to take action. Informing farmers about the adverse effects of aflatoxins could serve as a catalyst for investment in quality upgrading, driven by farmers' concern for their own health and the well-being of consumers, some of whom may be their neighbors.

One potential limitation of our research design is that the decision to invest in information about food-safety applies jointly to all uses. In some contexts, farmers may be able to sort based on observable signals of food safety, meaning decisions are not fully joint. Yet, in contexts like the case of aflatoxins, sorting on observable signals is relatively infeasible.

In light of these research findings, policymakers could capitalize on this knowledge to develop interventions that promote food-safety and encourage producers to adopt higher safety standards for the greater good of society. Ensuring access to comprehensive information can be a crucial step towards fostering a culture of safety-based altruism, where producers prioritize consumer welfare and actively contribute to safer food production practices.

Online appendix

Supplementary information can be found online at this link

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A Appendix

A.1 Figures

Figure 1: Payoff tree

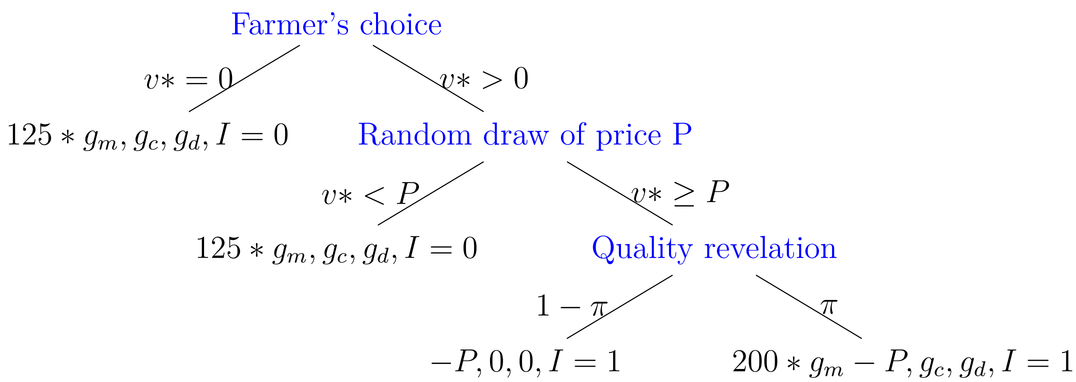
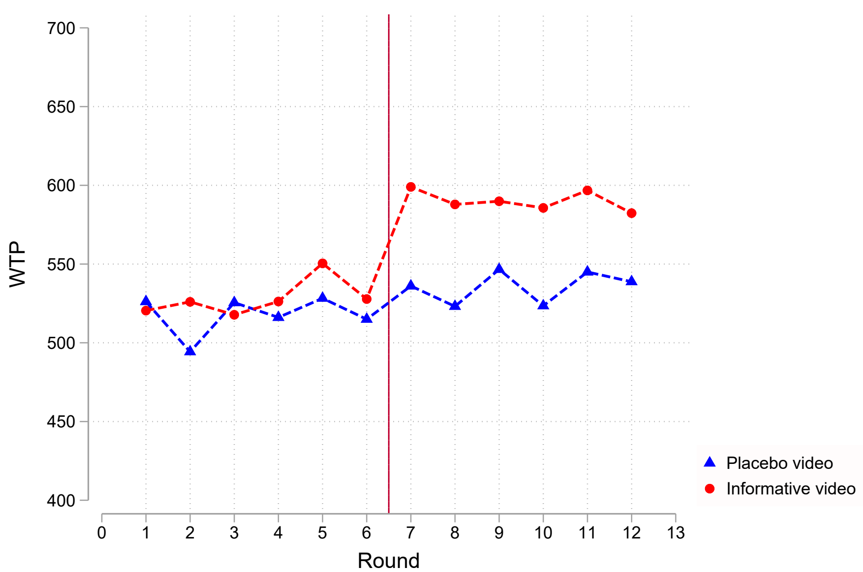
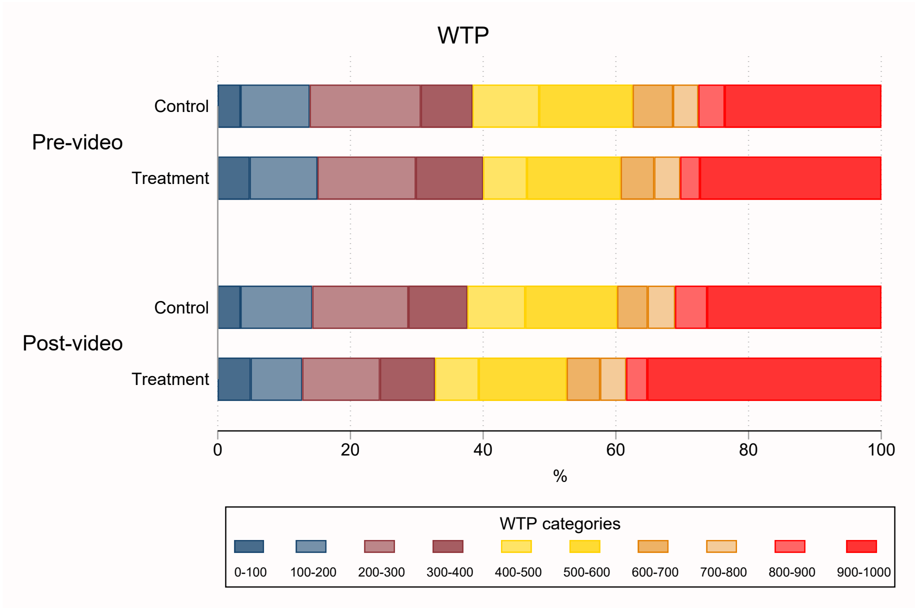


Figure 2: Average WTP for food-safety information, by round



Source: Authors' data

Figure 3: Distribution WTP for food-safety information, by treatment status



Source: Authors' data

A.2 Tables

A.2 Descriptive statistics

Table A1: Descriptive statistics of farmers WTP for food-safety information

	Full sample	Control	Treatment	
	Mean	Mean	Mean	Diff
Always WTP > 0	0.98	0.98	0.98	0.00
Always WTP=1 000 FCFA	0.15	0.12	0.18	0.05***
WTP	543.27	526.53	559.19	32.65***
WTP before video	522.96	517.55	528.11	10.56
WTP after video	563.57	535.51	590.26	54.75***

Source: Authors' data

A.2 Additional Tables

Table A2: Valuation of health and altruism relatively to financial gain and altruism for the first 6 rounds

	OLS		OLS	
	Share of bags		**At least one bag**	
	(1)	(2)	(3)	(4)
	WTP	WTP	WTP	WTP
Donation	-84.774***	-74.756***	-40.233**	-36.061**
	(23.266)	(21.201)	(15.725)	(15.010)
Consumption	-14.364	3.540	15.225	20.198
	(28.331)	(26.267)	(14.964)	(14.276)
Donation × Heard of aflatoxins	58.282		3.940	
	(40.513)		(27.122)	
Consumption × Heard of aflatoxins	89.454		11.074	
	(57.568)		(28.587)	
Donation × Knows of aflatoxins		6.135		-42.987
		(40.758)		(34.054)
Consumption × Knows of aflatoxins		-32.787		-45.172
		(59.053)		(40.569)
Donation × WTP DC above average	156.208***	158.066***	56.749**	60.194**
	(35.473)	(37.471)	(24.116)	(24.139)
Consumption × WTP DC above average	-10.790	-2.546	-63.249***	-58.441***
	(42.707)	(44.988)	(21.757)	(21.068)
Mean WTP	523	523	523	523
Mean aflatoxins knowledge	0.22	0.11	0.22	0.11
D+ D × A + D × γ=0	0.00	0.00	0.45	0.57
C+ C × A + C × γ=0	0.31	0.57	0.23	0.05
D+ D × A + D × γ =C+ C × A + C × γ	0.17	0.04	0.06	0.11
FE	Indiv. & Round	Indiv. & Round	Indiv. & Round	Indiv. & Round
Clustered SE	Indiv.	Indiv.	Indiv.	Indiv.
Observations	1170	1170	1170	1170

Note: Panel restricted to the first 6 rounds and does not include rounds from which we derive the Dictator Game measure (i.e., rounds were all bags are donated). All results are obtained from OLS regressions of the WTP with round and individual fixed effects, and standard errors are clustered at the individual level. In columns (1) & (2), *Donation* represents the share of groundnut bags allocated to donation, and *Consumption* represents the share allocated to consumption. In columns (3) & (4), *Donation* represents the presence of at least one bag for donation, and *Consumption* represents the presence of at least one bag for consumption.*Heard of aflatoxins* is a dummy variable equal to 1 if the farmer has heard of aflatoxins prior to the experiment. *Knows of aflatoxins* a dummy variable equal to 1 if they knew before the start of the experiment that aflatoxins have a negative effect on health. *WTP DC above average* is a dummy variable equal to 1 if the farmer proposed a WTP higher than the average WTP proposed in the round where all bags were allocated to donation (Dictator Game). Second part of the table: The first row presents the mean willingness-to-pay (WTP) for the first 6 rounds. The second row presents the p-value for the F-test of significance. The third row presents the level of fixed effects (Individual and round). The fourth row presents the level of the clustered standard errors, and the last row presents the number of observations. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table A3: Impact of increased awareness on farmers WTP to access food-safety information: Awareness and pro-sociality restricted to the last 6 rounds

	OLS		OLS	
	Share of bags		**At least one bag**	
	(1)	(2)	(3)	(4)
	WTP	WTP	WTP	WTP
Donation	-51.145	-44.669	-31.868**	-25.540**
	(32.975)	(30.579)	(13.235)	(12.481)
Consumption	26.509	32.183	-14.763	-13.834
	(25.814)	(25.390)	(15.515)	(15.070)
Donation × Heard of aflatoxins	87.291**		72.645**	
	(37.175)		(28.566)	
Consumption × Heard of aflatoxins	75.875		17.697	
	(70.303)		(43.186)	
Don. × Heard of aflatoxins × Treat.	-137.945*		-75.852*	
	(70.860)		(40.948)	
Cons. × Heard of aflatoxins × Treat.	-121.115		-30.424	
	(98.977)		(59.388)	
Donation × Knows of aflatoxins		49.284		39.364
		(35.730)		(30.157)
Consumption × Knows of aflatoxins		39.049		12.644
		(52.698)		(34.436)
Don. × Knows of aflatoxins × Treat.		-135.720		-55.572
		(99.568)		(57.288)
Cons. × Knows of aflatoxins × Treat.		-110.026		-24.198
		(123.287)		(72.720)
Don. × WTP DC above average				
Cons. × WTP DC above average				
Don × DC above average × Treatment	28.246	14.398	16.952	3.412
	(46.475)	(46.601)	(29.576)	(30.407)
Cons × DC above average × Treatment	46.931	33.100	42.966	39.469
	(56.581)	(60.816)	(37.398)	(39.506)
Don × WTP DC above average	-0.554	10.336	-11.081	-1.921
	(41.924)	(45.572)	(23.706)	(25.289)
Cons × WTP DC above average	-52.488	-42.885	-23.058	-21.408
	(42.405)	(48.327)	(29.289)	(32.632)
Mean WTP	562	562	562	562
Mean aflatoxins knowledge	0.22	0.11	0.22	0.11
D+ D × A + D × A × T + D × γ + D × γ × T=0	0.41	0.35	0.42	0.43
C+ C × A + C × A × T + C × γ + C × γ × T =0	0.75	0.67	0.88	0.92
D+ D × A + D × A × T + D × γ + D × γ × T= C+ C × A + C × A × T + C × γ + C × γ × T	0.55	0.63	0.64	0.63
FE	Indiv. & Round	Indiv. & Round	Indiv. & Round	Indiv. & Round
Clustered SE	Indiv.	Indiv.	Indiv.	Indiv.
Observations	1170	1170	1170	1170

Note: Panel restricted to the last 6 rounds. All results are obtained from OLS regressions of the WTP with round and individual fixed effects, and standard errors are clustered at the individual level. *Treatment* is a dummy variable equal to one if the farmer is in the treatment group and 0 otherwise. Second part of the table: The first row presents the mean willingness-to-pay (WTP) for the first 6 rounds. The second row presents the p-value for the F-test of significance. The third row presents the level of fixed effects (Individual and round). The fourth row presents the level of the clustered standard errors, and the last row presents the number of observations. $^*p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

A.2 Robustness: Mechanisms

Table A4: Valuation of health and altruism relatively to financial gain for the first 6 rounds: Risk aversion

	OLS			
	Share of bags			
	(1) WTP	(2) WTP	(3) WTP	(4) WTP
Donation	-21.734**	-13.329	-21.510***	-21.249***
	(10.742)	(12.156)	(7.106)	(7.300)
Donation × Index risk	0.452	-1.340	-5.055	-6.213
	(10.305)	(11.063)	(6.594)	(6.700)
Consumption × Index risk		-3.587		-5.326
		(10.910)		(6.478)
Consumption		16.344		0.681
		(12.255)		(6.891)
Mean WTP	523	523	523	523
D+ D × I.R=0	0.14	0.34	0.01	0.01
C+ C × I.R=0		0.46		0.63
C+ C × I.R=D+ D. × I.R		0.13		0.08
FE	Indiv. & Round	Indiv. & Round	Indiv & Round	Indiv. & Round
Clustered SE	Indiv.	Indiv.	Indiv.	Indiv.
Observations	2634	2634	2634	2634

Note: Panel restricted to the first 6 rounds. All results are obtained from OLS regressions of the WTP with round and individual fixed effects, and standard errors are clustered at the individual level. In columns (1) & (2), *Donation* represents the share of groundnut bags allocated to donation, and *Consumption* represents the share allocated to consumption. In columns (3) & (4), *Donation* represents the presence of at least one bag for donation, and *Consumption* represents the presence of at least one bag for consumption. *Index risk* is a risk preference variable created as a standardized weighted index of 5 indicator variables on risk perception in life and agriculture, following a GLS weighting procedure as described in Anderson (2008); it is equal to one if the index score is above the median and zero otherwise. Second part of the table: The first row presents the mean willingness-to-pay (WTP) for the first 6 rounds. The second row presents the p-value for the F-test of significance. The third row presents the level of fixed effects (Individual). The fourth row presents the level of the clustered standard errors, and the last row presents the number of observations. *$p < 0.10$, **$p < 0.05$, ***$p < 0.01$.

Table A5: Impact of increased awareness on farmers WTP to access food-safety information: Risk aversion

	OLS		OLS	
	Share of bags		**At least one bag**	
	(1) WTP	(2) WTP	(3) WTP	(4) WTP
Donation	-42.373***	-31.926***	-24.427***	-25.693***
	(9.945)	(11.712)	(6.255)	(6.319)
Donation × Index risk	16.494	15.487	9.626	10.399*
	(12.292)	(13.848)	(8.352)	(5.886)
Donation × Index risk × Treat.	-0.142	-0.772	7.082	
	(17.632)	(20.317)	(11.831)	
Consumption		21.026*		-7.051
		(12.753)		(7.155)
Consumption × Index risk		-2.121		-18.129*
		(17.278)		(10.996)
Consumption × Index risk × Treat.		-0.379		10.186
		(22.978)		(13.333)
Mean WTP	564	564	564	564
D+ D × I.R=0	0.14	0.39	0.18	0.08
C+ C × I.R=0		0.41		0.06
C+ C × I.R=D+ D. × I.R		0.11		0.54
FE	Indiv. & Round	Indiv. & Round	Indiv & Round	Indiv. & Round
Clustered SE	Indiv.	Indiv.	Indiv.	Indiv.
Observations	2634	2634	2634	2634

Note: Panel restricted to the last 6 rounds. All results are obtained from OLS regressions of the WTP with round and individual fixed effects, and standard errors are clustered at the individual level. *Post video* is a dummy variable equal to 1 if the round is played after having watched the video. *Treatment* is a dummy variable equal to one if the farmer is in the treatment group and 0 otherwise.*Index risk* is a risk preference variable created as a standardized weighted index of 5 indicator variables on risk perception in life and agriculture, following a GLS weighting procedure as described in Anderson (2008); it is equal to one if the index score is above the median and zero otherwise. In columns (1) & (2), *Donation* represents the share of groundnut bags allocated to donation, and *Consumption* represents the share allocated to consumption. In columns (3) & (4), *Donation* represents the presence of at least one bag for donation, and *Consumption* represents the presence of at least one bag for consumption. Second part of the table: The first row presents the mean willingness-to-pay (WTP) for the first 6 rounds. The second, third and fourth row presents the p-value for the F-test of significance. The fifth row presents the level of fixed effects (Individual and round). The sixth row presents the level of the clustered standard errors, and the last row presents the number of observations. *$p < 0.10$, **$p < 0.05$, ***$p < 0.01$.

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