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Food-Safety Awareness, Risk Perception and Willingness to Pay for Certified Low-Contaminant Vegetables in Delta State, Nigeria

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Abstract:

This study examined consumer and vendor/farmer awareness of potentially toxic elements and pesticide residues, perceived health risks, trust in food-safety assurance, and willingness to support safer vegetable supply in Delta State, Nigeria. A cross-sectional questionnaire dataset comprising 710 consumers and 96 vendors/farmers across Delta Central, Delta South and Delta North was analysed using frequencies, percentages, five-point Likert summaries and exploratory chi-square tests. Consumer heavy-metal awareness was 84.8% overall, while pesticide-residue awareness was 81.3%. Positive or conditional willingness to pay for certified low-contaminant vegetables reached 92.5%. Regulatory trust remained moderate and was lowest in Delta Central (mean 2.93). Vendors/farmers showed 83.3% heavy-metal awareness, 89.6% pesticide awareness, 76.0% willingness to adopt safer practices and 71.9% willingness to participate in certification. The findings identify a gap between hazard awareness and confidence in food-safety assurance, supporting risk communication linked to credible surveillance, traceability and practical support for safer production and marketing.

Keywords: food safety; heavy metals; risk perception; willingness to pay; vegetables; Delta State; consumer awareness

1. Introduction

Leafy vegetables are important components of healthy diets, but their safety can be compromised by potentially toxic elements (PTEs), pesticide residues and contaminated production or marketing environments. Consumer behaviour therefore depends not only on nutritional preference but also on awareness, perceived susceptibility, trust in institutions and the perceived effectiveness and affordability of protective actions. Food-safety knowledge is particularly important where consumers cannot visually distinguish contaminated produce from uncontaminated produce.

The present paper isolates the behavioural component of the wider Delta State thesis and asks whether consumers and vendors/farmers recognise contaminant hazards, whether perceived concern is accompanied by trust in market and regulatory assurance, and whether respondents are prepared to pay for or adopt safer practices. The approach is intentionally distinct from laboratory contaminant measurement: it focuses on the human and market dimensions that determine whether surveillance information is likely to translate into safer purchasing, handling and production behaviour.

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2. Literature Review

Food-safety behaviour is shaped by knowledge, risk perception, trust and the practical feasibility of protective action. Bolek (2020) showed that consumer knowledge and judgement influence food-safety decisions, while Glick et al. (2024) demonstrated the usefulness of health-belief constructs for predicting food choices. In sub-Saharan African food systems, Cudjoe et al. (2022) emphasised the importance of governance and food-safety assurance. These perspectives are relevant to vegetable contamination because awareness alone cannot establish the chemical safety of produce; consumers depend on credible monitoring, vendor practices and regulatory communication.

Household preparation can reduce some surface contaminants, but effectiveness varies by contaminant and method (Chung, 2018). Consequently, washing behaviour should be understood as one layer of exposure reduction rather than proof of safety. A market-level response therefore requires both informed consumers and upstream controls among farmers, vendors and regulators.

3. Case and Methodology

The survey covered Delta Central, Delta South and Delta North Senatorial Districts as shown in Figure 1.



Figure 1. Map of Delta State, and the specific study area locations

The consumer dataset comprised 710 completed records: 260 from Delta Central, 230 from Delta South and 220 from Delta North. The vendor/farmer dataset comprised 96 completed records: 36 from Delta Central and 30 each from Delta South and Delta North. The instruments assessed awareness of heavy metals and pesticide residues, perceived long-term health effects, trust in government and vendor information, vegetable preparation practices, willingness to pay (WTP) for certified low-contaminant vegetables, and willingness among vendors/farmers to adopt safer or certifiable practices.

Responses were summarised using frequencies and percentages. Five-point Likert items were interpreted through district-level means and conceptually related composites. Pearson chi-square tests were used as exploratory diagnostics for categorical associations when independence and cell-size assumptions were adequate. A conventional alpha of 0.05 was used, but inferential outputs were interpreted together with sample structure and the exploratory nature of the analysis.

4. Results & Analysis

Table 1. Consumer awareness and willingness-to-pay indicators

District	N	HM aware (%)	Pesticide aware (%)	Positive/conditional WTP (%)
Delta Central	260	84.2	80.0	92.3
Delta South	230	88.7	83.9	93.0
Delta North	220	81.4	80.0	92.3
Overall	710	84.8	81.3	92.5

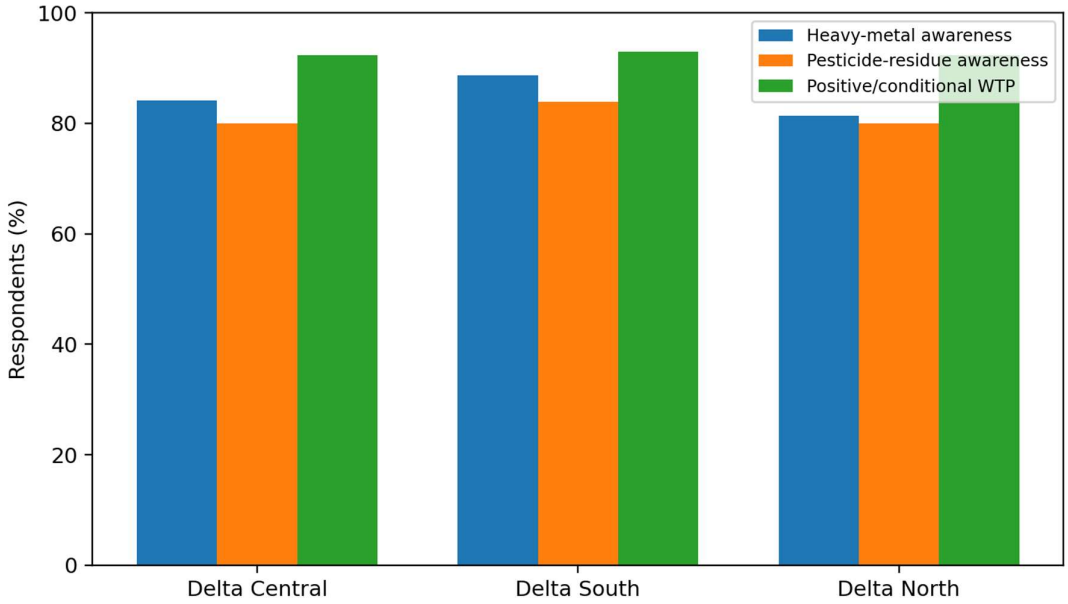


Figure 2. Consumer contaminant awareness and positive/conditional willingness to pay by district.

In Table 1 and Figure 2, heavy-metal awareness was substantial but not universal. Delta South recorded the highest heavy-metal awareness (88.7%), followed by Delta Central (84.2%) and Delta North (81.4%). Pesticide-residue awareness varied less, from 80.0% in Delta Central and Delta North to 83.9% in Delta South. In contrast, positive or conditional WTP exceeded 92% in every district, indicating strong stated demand for a safer, certified product option.

Exploratory chi-square analysis did not show strong evidence that heavy-metal awareness differed by district (χ^2=4.786, df=2, p=0.091) or by gender (χ^2=0.077, df=1, p=0.782). The result suggests that contaminant awareness is broadly distributed rather than confined to a single demographic or district. However, awareness was not equivalent to confidence in food-safety systems. Regulatory trust averaged 2.93 in Delta Central, 3.21 in Delta South and 3.11 in Delta North, while perceived concern about long-term effects remained high across districts.

Table 2. Vendor/farmer awareness and adoption indicators

District	N	HM aware (%)	Pesticide aware (%)	Adopt safer practices (%)	Certification (%)

Delta Central	36	83.3	88.9	80.6	72.2
Delta South	30	86.7	93.3	70.0	73.3
Delta North	30	80.0	86.7	76.7	70.0
Overall	96	83.3	89.6	76.0	71.9

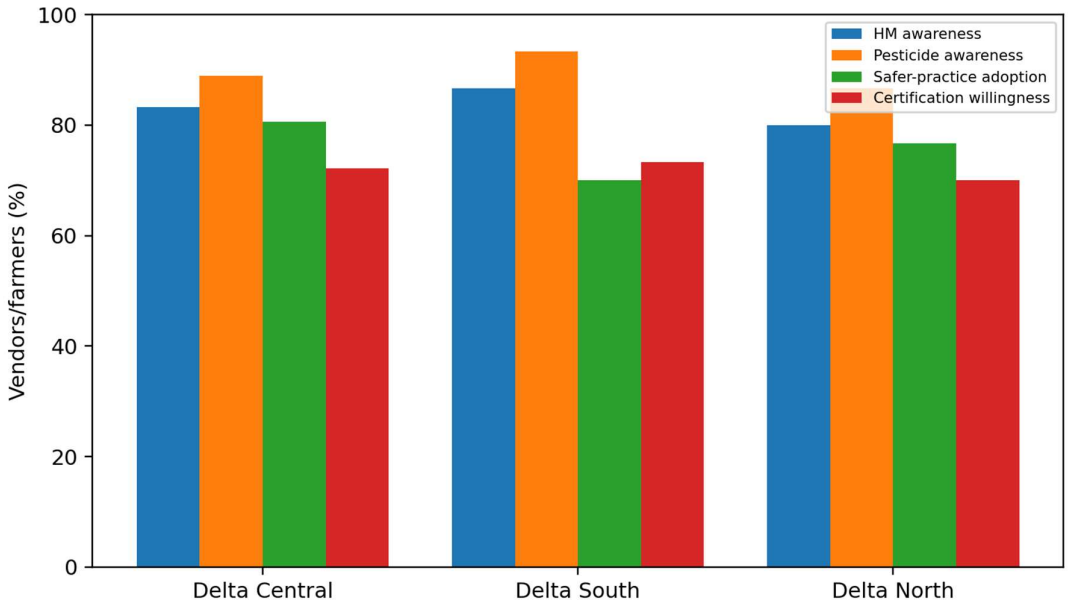


Figure 3. Vendor/farmer awareness, safer-practice adoption and certification willingness.

Findings in Table 2 and Figure 3 shows that vendor/farmer awareness was also high, particularly for pesticide residues (89.6% overall). Yet willingness to adopt safer practices (76.0%) and certification (71.9%) was lower than awareness. Delta South illustrates the clearest awareness-to-action gap: it had the highest contaminant awareness but the lowest stated safer-practice adoption (70.0%). Delta Central showed the highest adoption response (80.6%) despite the lowest regulatory-trust mean among consumers. These contrasts imply that information campaigns should be paired with feasible production guidance, monitoring and incentives rather than assuming that awareness automatically changes practice.

The combined consumer and vendor evidence supports a two-sided food-safety strategy. Consumers appear receptive to certified low-contaminant vegetables, while a majority of vendors/farmers express willingness to participate in safer systems. The limiting issue is therefore not absence of concern; it is the credibility, affordability and operational availability of certification, surveillance and traceability.

5. Conclusion

Consumers and vendors/farmers in Delta State showed substantial awareness of vegetable contamination hazards and high perceived health concern. Consumer WTP for certified low-contaminant vegetables was especially strong, but regulatory and vendor trust remained moderate. The vendor/farmer results likewise showed that awareness exceeded willingness to adopt or certify safer practices. Food-safety programmes should therefore integrate risk communication with credible market surveillance, source traceability, practical farmer/vendor training and transparent certification

mechanisms. The behavioural evidence should complement, rather than replace, laboratory monitoring of PTEs and other contaminants.

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The author declares no conflict of interest related to this study.

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