



QR-Based Traceability as a Driver of Consumers' Willingness to Pay a Premium for Traditional Rice Varieties: Evidence from Tamil Nadu, India

Dr. K. Suganthi¹,

Principal, Vivekananda College of Arts and Science for Women, Sirkali (Affiliated to Annamalai University), Tamil Nadu, India¹

Mrs. P. Nisha²,

Assistant Professor of Business Administration, Vivekananda College of Arts and Science for Women, Sirkali (Affiliated to Annamalai University), Tamil Nadu, India²

S. Abinaya³, T. Sathiyavani⁴, S. Thahaseen Sameeha⁵, P. Nisha⁶

Department of Business Administration, Vivekananda College of Arts and Science for Women, Sirkali, Tamil Nadu, India (Affiliated to Annamalai University)^{3,4,5,6}

Abstract- Traditional rice varieties of Tamil Nadu, such as Seeraga Samba, Karuppu Kavuni and Mappillai Samba, are experiencing renewed consumer demand, yet buyers find it hard to verify whether the rice sold under these names is authentic, and farmers rarely capture the premium that consumers are prepared to pay. This study examines the role of quick response (QR) code-based traceability, relative to brand trust and product awareness, in explaining consumers' willingness to pay (WTP) a premium for traditional rice. A cross-sectional online survey was administered to 51 urban and semi-urban rice consumers in Tamil Nadu in September 2026. Five-point Likert constructs for awareness, trust in branding, QR acceptance and WTP were reliable (Cronbach's $\alpha = 0.66-0.91$). Spearman correlations showed that all constructs were positively related to WTP, with QR acceptance the strongest ($\rho = 0.61$). In a multiple regression explaining 60% of the variance in WTP, QR acceptance was the only significant predictor ($\beta = 0.70, p < 0.001$), while trust in branding ($\beta = 0.00$) and awareness ($\beta = 0.10$) were not significant once QR acceptance was controlled. The result was retained when 18 uniform-response cases were excluded ($\beta = 0.66, p = 0.002$). Half of the respondents (51%) were willing to pay a premium, most commonly up to 20% above the price of ordinary rice. The findings suggest that verifiable, scannable proof of origin may matter more than brand identity alone in converting



positive attitudes into premium-price intention. Given the small, non-probability sample, the results are indicative and should be validated with larger samples and real-purchase data.

Keywords- QR code traceability; willingness to pay; traditional rice; consumer trust; branding; food authenticity; Tamil Nadu

I. Introduction

Rice is central to the culture, diet and rural economy of Tamil Nadu. Before the Green Revolution, farmers cultivated hundreds of locally adapted varieties; high-yielding varieties and assured procurement later pushed many of these to the margins. In recent years, rising health awareness and interest in chemical-free food have created fresh urban demand for traditional varieties. The revival, however, has exposed a structural weakness: traditional rice usually moves through a long chain of village traders, millers, wholesalers and retailers, the consumer pays a high price, the farmer receives a modest one, and the buyer has little means of confirming that rice sold as “traditional” or “organic” is genuine.

This is a classic problem of information asymmetry in which quality cannot be observed by the buyer before or even after purchase (Akerlof, 1970). Such credence attributes are commonly addressed through brands, certification labels and, increasingly, digital traceability. QR codes are an attractive tool because they are low-cost, work on any smartphone, and can link a physical pack to a record of the farmer, variety, cultivation method and processing. Evidence from other food categories indicates that consumers accept QR-based traceability and may pay modestly more for it (Kim & Woo, 2016). Evidence on traditional Indian rice is, however, scarce, and it is unclear whether QR traceability adds explanatory power beyond brand trust, which has dominated the packaging and branding literature.

This paper therefore addresses the following research question: does consumers’ acceptance of QR-based traceability explain their willingness to pay a premium for traditional rice over and above their trust in branding and their awareness of traditional varieties? The study contributes (i) consumer-side evidence on traditional rice from the Cauvery delta region, where the crop is culturally and economically important, and (ii)



a test that separates the effect of QR acceptance from that of brand trust, which prior work has often treated together.

II. Literature Review and Hypotheses

1. Traceability and consumer acceptance

Kim and Woo (2016) extended the Technology Acceptance Model (Davis, 1989) to QR-code food traceability and reported that perceived usefulness and ease of use shaped consumers' intention to use the system. Later studies indicate that consumer trust in the effectiveness of a QR traceability system is a principal determinant of purchase intention for QR-labelled food, and that many consumers are willing to pay a price premium once they trust the system (npj Science of Food, 2022). Discrete-choice evidence on QR-linked and blockchain-verified information similarly reports positive but generally modest marginal willingness to pay (PLOS ONE, 2025). Together, these studies suggest that a scannable, verifiable record can convert abstract trust into price tolerance.

2. Branding, certification and willingness to pay

Organic and origin-linked food studies show that premiums exist but vary with consumer knowledge, income and attitudes. Nandi et al. (2016) found that about 90% of surveyed consumers in Bangalore were willing to pay a premium for organic produce, with income, education and health consciousness as explanatory factors. An incentive-compatible experiment on organic rice in Indonesia found an average premium of roughly 20% (Grimm et al., 2023), and a Tamil Nadu study of geographical-indication products found that stated willingness to accept a premium was driven mainly by income and that organic production was valued more highly than certification alone (Journal of Consumer Sciences, 2026). Research on traditional rice in Kerala shows that consumer preference is shaped by sensory qualities and that the literature stops short of linking preference to a branded and verifiable offer (Sustainability, 2025).

3. Conceptual framework and hypotheses

The framework tested in this study is shown, together with the estimates obtained, in Figure 1 (Section 4.3). Awareness, trust in branding and QR acceptance are treated as correlated antecedents of willingness to pay a premium. Because a brand name is a



claim made by the seller, whereas a QR record is a claim that the buyer can inspect, we expect verifiability to carry more weight in the pricing decision than brand identity. We therefore hypothesise:

- **H1:** Consumers' acceptance of QR-based traceability is positively related to their willingness to pay a premium for traditional rice, controlling for trust in branding and awareness.
- **H2:** Consumers' trust in branded products is positively related to their willingness to pay a premium for traditional rice.
- **H3:** Willingness to pay a premium is associated with consumer characteristics (gender, age, education and household grocery expenditure).

III. Methodology

1. Research design and sample

A descriptive and analytical cross-sectional survey was used. A structured questionnaire was administered online through Google Forms and circulated through personal and farmer networks between 25 and 29 September 2026. Convenience sampling yielded 51 complete responses from urban and semi-urban buyers of rice in Tamil Nadu, with no missing values. The sample was young and predominantly female: 57% were below 25 years, 67% were women, 39% were students and 27% were employed, and 71% of households spent ₹10,000 or less per month on groceries. Because the sampling was non-probabilistic, the results describe the respondents surveyed and are not statistically representative of the state.

2. Measures

The instrument combined five demographic items with 24 perception and behaviour items. Constructs were measured on five-point Likert scales (1 = strongly disagree to 5 = strongly agree) and scored as item means: awareness (2 items; knowledge of nutritional benefits and ability to identify authentic rice), trust in branding (5 items; brand name, packaging, local brands, certification labels and willingness to switch), QR acceptance (5 items; intention to scan, perceived trust, convenience, influence on purchase and recommendation) and willingness to pay (3 items; premium for verified origin, priority of authenticity over price and support for farmer welfare). A separate categorical item recorded whether the respondent would pay a premium (yes / maybe / no) and the acceptable size of that premium.



Table 1. Reliability of the measurement scales (n = 51)

Construct	Items	Cronbach's α	Interpretation
Awareness	2	0.664	Tolerable (exploratory)
Trust in branding	5	0.890	Good
QR acceptance	5	0.906	Good
Willingness to pay	3	0.731	Acceptable

Note. $\alpha \geq 0.70$ is treated as acceptable and 0.60–0.70 as tolerable for short exploratory scales (Cronbach, 1951).

3. Data screening and analysis

Responses were checked for completeness and coding consistency. Responses giving the same rating to every Likert item (“uniform” responses) were identified in 18 of the 51 cases (35%). Because there was no independent basis for treating them as invalid, all cases were retained in the primary analysis, and the correlation, regression and group-comparison results were repeated on the screened sample (n = 33) as a robustness check. Analysis used percentage and mean–standard deviation summaries, one-sample t-tests against the neutral value of 3, Spearman rank correlation (appropriate for ordinal data), ordinary least squares regression with variance inflation factors (VIF) to check multicollinearity, and chi-square and Fisher's exact tests with Cramér's V for categorical associations. Calculations were run in Python (pandas, NumPy, SciPy). Hypotheses were tested at the 5% level.

IV. Results

1. Descriptive findings

Awareness of traditional rice was high: 90% of respondents had heard of traditional varieties, mostly through family and friends (78%) rather than social media (18%) or retail stores (2%). While 82% agreed that they knew the nutritional or medicinal benefits, only 69% agreed that they could identify authentic traditional rice. Health was the dominant purchase motive (80%). Only 6% bought directly from a farmer or producer organisation; the rest bought through supermarkets (37%), local markets (35%) or organic stores (22%). Notably, 18% of respondents who described themselves



as buyers named rice that was not a traditional variety or could not be identified, which illustrates the authenticity problem.

Table 2. Consumers' acceptance of QR-based traceability (n = 51)

Statement	Mean	SD	Agree (%)	Disagree (%)
I would scan a QR code on a product to learn more	3.49	1.03	66.7	13.7
QR-based information would increase my trust	3.63	0.85	68.6	5.9
I find QR codes convenient and easy to use	3.69	0.93	66.7	5.9
QR traceability would influence my purchase decision	3.80	0.85	76.5	5.9
I would recommend QR-traceable products to others	3.71	0.99	70.6	9.8

Note. Agree = ratings 4–5; disagree = ratings 1–2.

Table 3 presents the construct scores. All four constructs scored significantly above the neutral value of 3 ($p < 0.001$). Willingness to pay recorded the highest mean (3.75) and trust in branding the lowest (3.55). Among the trust items, certification labels were the strongest signal (73% agreement), ahead of a recognisable brand name (61%) and branded packaging (59%).

Table 3. Construct scores and one-sample t-tests against neutral (3)

Construct	Items	Mean	SD	t	p
Awareness	2	3.71	0.94	5.37	< 0.001
Trust in branding	5	3.55	0.77	5.08	< 0.001
QR acceptance	5	3.66	0.79	5.96	< 0.001
Willingness to pay	3	3.75	0.70	7.62	< 0.001



2. Willingness to pay a premium

Twenty-six respondents (51%) were willing to pay a premium for branded, QR-traceable traditional rice, 14 (27%) were undecided and 11 (22%) were not willing. The accepted premium was modest: 55% would pay up to 10% over the price of ordinary rice, 25% would pay 10–20% and 20% would pay more than 20%. Agreement was stronger on attitude items than on the direct premium question: 71% agreed they would pay more for verified farmer and origin information, 73% said authenticity and traceability matter more than price, and 75% would pay more if the brand supports farmer welfare. The gap between these attitudes and the 51% “yes” response suggests that not all positive attitudes will convert into purchases at a higher price.

3. Correlates of willingness to pay (H1 and H2)

Table 4. Spearman correlation matrix (n = 51)

Construct	1	2	3	4
1. Awareness	–			
2. Trust in branding	0.61***	–		
3. QR acceptance	0.65***	0.72***	–	
4. Willingness to pay	0.55***	0.46***	0.61***	–

Note. *** $p < 0.001$.

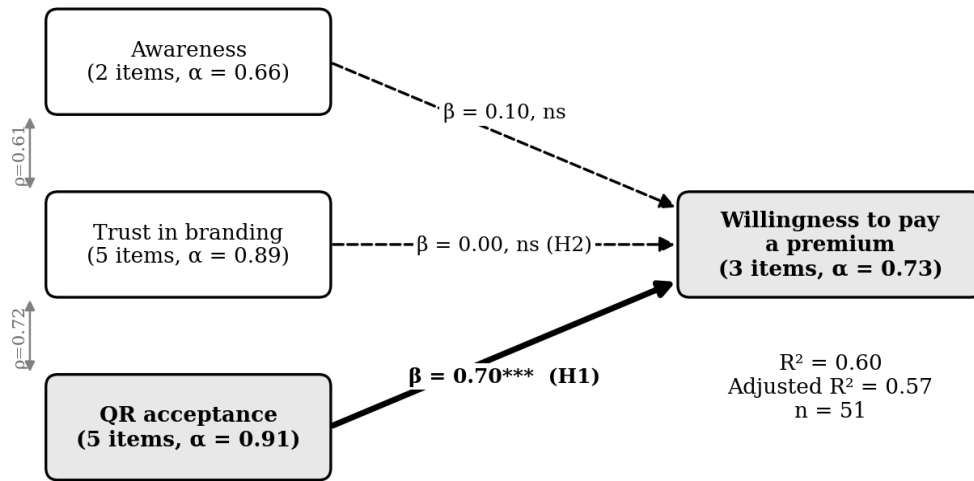
All constructs were positively and significantly correlated. Willingness to pay was most strongly related to QR acceptance ($\rho = 0.61$), followed by awareness ($\rho = 0.55$) and trust in branding ($\rho = 0.46$). The predictors were also strongly intercorrelated ($\rho = 0.61–0.72$), so a multiple regression was used to separate their contributions.

Table 5. Multiple regression of willingness to pay (n = 51)

Predictor	B	SE	β	t	p	VIF
Constant	1.205	0.325	–	3.71	< 0.001	–
Trust in branding	0.002	0.149	0.002	0.01	0.991	3.11
QR acceptance	0.617	0.136	0.701	4.52	< 0.001	2.80
Awareness	0.074	0.100	0.100	0.74	0.461	2.10

Note. $R^2 = 0.60$; adjusted $R^2 = 0.57$. Dependent variable: willingness-to-pay construct score.

The model explained 60% of the variance in willingness to pay (adjusted $R^2 = 0.57$). QR acceptance was the only significant predictor ($B = 0.62$, $\beta = 0.70$, $p < 0.001$). Trust in branding and awareness were not significant once QR acceptance was held constant. VIF values of 2.1–3.1 indicate moderate overlap but no serious multicollinearity.



Solid bold line: significant path. Dashed lines: not significant (ns). *** $p < 0.001$.
Gender, age, education and grocery spend (H3) were tested separately by chi-square / Fisher's exact test.

Figure 1. Conceptual framework with standardised regression estimates ($n = 51$).
Correlation between awareness and QR acceptance: $\rho = 0.65$.

Robustness. After excluding the 18 uniform-response cases ($n = 33$), the pattern held but was weaker ($R^2 = 0.39$, adjusted $R^2 = 0.33$, $F(3, 29) = 6.23$, $p = 0.002$); QR acceptance again was the only significant predictor ($\beta = 0.66$, $p = 0.002$), and the bivariate correlation between trust in branding and willingness to pay fell to $\rho = 0.15$



($p = 0.413$). H1 is therefore supported robustly. H2 is supported only at the bivariate level in the full sample and not after controlling for QR acceptance, so it is treated as partially supported.

4. Consumer characteristics (H3)

Table 6. Willingness to pay (yes vs maybe/no) by consumer characteristic

Characteristic	χ^2 (df = 1)	p	Cramér's V	Fisher's p	p (screened)
Gender (female / male)	3.92	0.048	0.28	0.075	0.009
Age (< 25 / 25 and above)	1.02	0.313	0.14	0.400	0.126
Education (school / graduate)	1.24	0.266	0.16	0.368	0.266
Grocery spend ($\leq$ / $>$ ₹10,000)	0.05	0.828	0.03	1.000	0.730

Willingness to pay did not differ significantly by age, education or grocery expenditure. Gender showed a borderline association: 12 of 17 men (71%) were willing to pay a premium compared with 14 of 34 women (41%). The chi-square test was significant ($p = 0.048$), but Fisher's exact test, which is more appropriate for small cell counts, was not ($p = 0.075$). H3 is therefore not supported for education and expenditure and only tentatively supported for gender; given the small and unequal groups, the gender result should be treated as a lead for future research rather than an established difference.

V. Discussion

The central finding is that, among respondents who are already favourably disposed to traditional rice, acceptance of QR-based traceability explains willingness to pay far better than trust in branding or awareness. Brand trust correlates with willingness to pay, but its effect disappears once QR acceptance is controlled, and it was close to zero in the screened sample. A plausible interpretation consistent with the information-asymmetry argument is that a brand name is an unverifiable claim, while a QR record offers a claim the consumer can inspect; consumers appear to reward the second more than the first. This agrees with earlier work reporting that trust in the effectiveness of a



traceability system is a main driver of purchase intention for QR-labelled food (npj Science of Food, 2022) and that traceability information carries a positive, if modest, premium (PLOS ONE, 2025).

The data also point to an authenticity gap: although 82% claimed to know the benefits of traditional rice, only 69% felt able to identify the genuine product, and some self-declared buyers named non-traditional rice. Since 78% learned about these varieties from family and friends, and very few buy directly from farmers, the supply chain offers consumers few opportunities to verify what they buy. Certification labels were the strongest trust signal, which suggests that QR records are most credible when they display certificates or third-party verification rather than farmer-reported claims alone.

1. Implications

For producers, farmer groups and brand developers, the results suggest prioritising a simple, single-step QR experience that shows the farmer, variety, cultivation method, processing date and any certification, over spending on brand identity alone. Roughly one respondent in three was neutral or unconvinced on scanning intention and ease of use, so usability matters. Pricing should be conservative: most respondents would accept a premium of up to 20%, and a ceiling of 10–20% over ordinary rice appears a sensible starting range to be validated in a market pilot. Policy makers and extension agencies could support low-cost shared traceability infrastructure for small farmers, who cannot individually bear certification and technology costs.

Limitations and Future Research

The findings must be read with caution. First, the sample is small ($n = 51$) and was drawn by convenience; it skews young, female and student/employed, and under-represents older and higher-income households. Second, willingness to pay is stated intention, which commonly exceeds actual purchase behaviour. Third, a substantial share (35%) of responses were uniform, which can inflate correlations and reliability; although the main result survived their removal, effect sizes were smaller. Fourth, the awareness scale had only two items. Fifth, because the constructs were measured in the same survey, common-method bias and reverse causation (consumers who are already willing to pay may rate QR codes more favourably) cannot be excluded, and the data cannot establish causality. Future studies should use probability samples across several districts, larger samples that permit structural equation modelling, choice experiments



or incentive-compatible auctions to measure real willingness to pay, and field pilots in which QR-labelled and unlabelled packs are sold at different prices.

VI. Conclusion

This study examined how QR-based traceability, brand trust and awareness relate to consumers' willingness to pay a premium for traditional rice in Tamil Nadu. QR acceptance emerged as the only significant predictor of willingness to pay, while brand trust and awareness did not add explanatory power once QR acceptance was considered. Half of the consumers surveyed were prepared to pay a premium, generally of up to 20%. Although limited by sample size and sampling method, the evidence suggests that verifiable origin information could be a more effective lever than branding alone in helping small farmers capture a fair price for traditional rice. Larger, probability-based and behavioural studies are needed to confirm these indications.

Declarations

- **Author contributions:** S. Abinaya, T. Sathiyavani and S. Thahaseen Sameeha designed the survey, collected the data and carried out the analysis. P. Nisha supervised the study and reviewed the manuscript. All authors read and approved the final manuscript.
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- **Ethics approval and consent to participate:** The study was an anonymous, voluntary online questionnaire survey of adult consumers conducted for academic purposes. No personally identifying information is reported in this paper.
- **Data availability:** The anonymised survey data that support the findings are available from the corresponding author on reasonable request.
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References

1. Akerlof, G. A. (1970). The market for “lemons”: Quality uncertainty and the market mechanism. *Quarterly Journal of Economics*, 84(3), 488–500.
2. Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika*, 16(3), 297–334.
3. Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 13(3), 319–340.
4. Grimm, M., et al. (2023). Consumers’ willingness to pay for organic rice: Insights from a non-hypothetical experiment in Indonesia. *Australian Journal of Agricultural and Resource Economics*, 67(2). [complete author list, pages and DOI]
5. Kim, Y. G., & Woo, E. (2016). Consumer acceptance of a quick response (QR) code for the food traceability system: Application of an extended technology acceptance model (TAM). *Food Research International*, 85, 266–272. <https://doi.org/10.1016/j.foodres.2016.05.002>
6. Nandi, R., Bokelmann, W., Gowdru, N. V., & Dias, G. (2016). Factors influencing consumers’ willingness to pay for organic fruits and vegetables: Empirical evidence from a consumer survey in India. *Journal of Food Products Marketing*, 23(4), 430–451. <https://doi.org/10.1080/10454446.2015.1048018>
7. [Add authors]. (2022). Consumer purchase intention towards a quick response (QR) code for antibiotic information: An exploratory study. *npj Science of Food*, 6, 15.
8. [Add authors]. (2025). Consumer willingness-to-pay for blockchain-based QR code traceability of leafy greens. *PLOS ONE*. [add DOI]
9. [Add authors]. (2025). Traditional rice varieties, consumer segmentation, and preferences: A case study from Kerala, India. *Sustainability*, 17(12), 5467. <https://doi.org/10.3390/su17125467>
10. [Add authors]. (2020). Blockchain in agriculture traceability systems: A review. *Applied Sciences*, 10(12), 4113. <https://doi.org/10.3390/app10124113>
11. [Add authors]. (2026). Assessing consumer valuation of geographical indication labels through awareness, preferences, and willingness to pay. *Journal of Consumer Sciences*. [add volume, pages, DOI]