Demand for and Awareness of Safely Produced Vegetables in India

S. Kathrin Kriesemer
Katinka Weinberger
M.L. Chadha
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Results of a scoping study conducted in November – December 2009

S.K. Kriesemer
K.M. Weinberger
M.L. Chadha

AVRDC – The World Vegetable Center
Shanhua, Taiwan
AVRDC – The World Vegetable Center is an international nonprofit research institute committed to alleviating poverty and malnutrition in the developing world through the increased production and consumption of nutritious, health-promoting vegetables.

About Research in Action

The Research in Action series disseminates the practical applications of the Center’s work in vegetable breeding, production, marketing, and nutrition. The series aims to encourage vegetable-based enterprise through the extension of information, ideas, technologies, and skills.

AVRDC – The World Vegetable Center
P.O. Box 42
Shanhua, Tainan 74199
TAIWAN

Tel: +886 6 583 7801
Fax: +886 6 583 0009

Email: info@worldveg.org
Web: www.avrdc.org

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Introduction

The demand for fresh fruit and vegetables is increasing in India due to higher incomes and ongoing urbanization leading to a change in lifestyle. Mittal (2007) reports that the national Indian annual per capita consumption of vegetables increased from 47.6 kg per person in 1983 to 76.1 kg per person in 1999-2000, and presents a projected domestic demand for vegetables of 94.3 kg and 102 kg per person for 2015 and 2020, respectively.

Because vegetable consumption in India is growing and is highly income elastic (Mittal 2006) it can be assumed that there is also an increasing effective demand for safe, uniform, and high-quality vegetables in India. For instance, consumer demand for safe vegetables was found to be highly income elastic in urban areas of Vietnam (Mergenthaler et al. 2008). With repeated incidences of pesticide residues detected in environmental samples, human tissues and fluids, dairy products, and fruit and vegetables it is assumed that consumer awareness about potential health impacts is increasing.

The value chain for fruit and vegetables in India is described as atomistic, with many intermediaries involved; supermarkets still play a minor role despite their increasingly important position in many developing countries (Fafchamps et al 2007). The authors’ findings indicate that the Indian value chain for non-staple crops provides basic services, assuring the provision of quantity rather than quality. They conclude that this might be due to consumers’ unwillingness to pay a premium for food safety, an attribute that might not be perceived as important by many poor customers (Fafchamps et al. 2007).

Urban demand is the first of four research topics suggested by Minten et al. (2009) that should be addressed to examine how changes in rural-urban food supply chains affect poverty. Most vegetable sales happen via many small retailers in wet markets, small shops, on mobile push carts, or along footpaths and roadsides.

In Jharkhand state, India, AVRDC – The World Vegetable Center is promoting vegetable production among tribal communities with the goal of diversifying diets and improving household nutrition. Over time, farmers also may be able to generate income from commercial vegetable production if suitable market opportunities are identified. AVRDC – The World Vegetable Center’s Regional Center for South Asia advocates integrated pest management (IPM) for safe vegetable production, and when IPM is successfully adopted, suggests that vegetables be labeled in a way to indicate the production method, e.g. as “safely produced.”

However, little is known about consumers’ shopping preferences in Jharkhand and neighboring West Bengal. The questions this study posed were: 1) to what extent could higher quality vegetables be marketed through these market channels; and 2) to what extent are urban wet market consumers aware of risks related to pesticide residues in food, and how does this translate

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1 These figures have to be treated with caution because they are based on an annual economic growth rate of 8% and do not take into account the recent global economic downturn.

2 See Bhatnagar (2001) for a review of studies conducted between 1960s and early 1990s; more recent studies include Kumari, Madan and Kathpal (2007), Kumari et al. (2004), Sanghi and Tewali (2001), Shahi, Nisha and Sharma (2005), Singh and Gupta (2002), and Subramaniam and Solomon (2006).
into their shopping behavior and in especially in their willingness to pay for vegetables free of pesticide residue?

**Methodology and data**

The scoping study on domestic market requirements consisted of qualitative and quantitative segments. For qualitative data collection, semi-structured interviews with vendors at market places and with key informants from the fruit and vegetable segment of the modern retail system were conducted. Results presented summarize the content of discussions. The quantitative part of the study used a survey format to collect information about respondents’ sociodemographic characteristics, their vegetable shopping behavior, and awareness and knowledge about health risks, quality labels, and criteria of importance for buying vegetables.

The interviews then focused on respondents’ willingness to pay for “safely produced” and “certified organic” eggplant (in 269 cases) and cauliflower (in 227 cases). A short paragraph was read out to respondents to inform them of the definition of “safely produced” and “certified organic” vegetables. Willingness to pay was elicited using the open-ended method (Walsh et al. 1984) by asking how much respondents would be willing to pay for the respective quality of vegetables.

Questions about the latent constructs of the theory of planned behavior (Fig. 1) were integrated into the structured questionnaire, following the methodology suggested by Ajzen (2002). These questions inquired about respondents’ intention, attitudes, subjective norm, and perceived behavior control of “purchasing safely produced eggplant/cauliflower whenever it is available in the market places where they buy their vegetables at the price of ____ INR/kg.” Answers were recorded using a Likert scale from one to seven where positive and negative ends were interchanged from question to question (Francis et al. 2004). Unfortunately, no supermarkets granted permission to allow interviews on their premises.

![Figure 1: Theory of planned behavior](source: Ajzen and Madden (1986))

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3 The individual price each respondent indicated he/she was willing to pay.
The questionnaire was translated into Hindi and Bengali, back-translated into English to detect misunderstandings and incorrect translations, and pre-tested before interviewing 500 vegetable consumers face-to-face at wet markets in November–December 2009.

The cities of focus, Kolkata (capital of West Bengal) and Ranchi (capital of Jharkhand), were stratified into five and four areas, respectively, each containing about 20 quarters, of which one quarter was selected randomly for each area. Every seventh customer passing was approached by the interviewers and on average, 2.8 persons were approached before a candidate was identified who was willing to be interviewed. The paragraphs on quantitative survey results present the outcome of descriptive statistics. A multiple linear regression model was used for the theory of planned behavior variables.

**Results of qualitative interviews**

Interviewed experts agree that Kolkata is mainly supplied with vegetables from the state of West Bengal. West Bengal is one of India’s main vegetable production areas and is mostly self-sufficient in vegetables. According to data from the National Horticulture Board (2009), 17.6% of the country’s vegetables are produced in West Bengal. It is estimated that the wholesale markets Shealdah and New Market handle 400 and 100–125 tons of vegetables per day, respectively, and that at least 95% of vegetables reach the end consumer via traditional wet markets. However, this figure was not confirmed by the results of this study. As the wholesale markets are privately managed, no precise data on marketed volume is publicly available. Interviewed experts estimate the post harvest losses in the vegetable supply chain to be as high as 30-40% due to a lack of cold storage, primitive packaging, overloading of transport vehicles, and handling losses at the whole sale markets.

There are eight to ten main vendors in Shealdah who have been established in the market for several generations and have family links to Ranchi as well. During the months of May to September, crops like tomato, capsicum and cabbage are not cultivated in West Bengal and are imported from other states. Especially, green peas are imported from Jharkhand at this time. Crops for which there is considerable demand that is not yet satisfied are mainly “exotics” like broccoli, red cabbage, baby corn, Chinese cabbage, mushroom, red and yellow capsicum, asparagus, lettuce, leek, and lemongrass. The demand for green and yellow zucchini is considered to be lower.

The modern retail sector consists of hypermarkets and supermarkets (Food Bazar, more, Reliance Fresh, and Spencer’s [in alphabetical order]). Food Bazar, more, and Reliance Fresh operate a shop-in-shop system and are provided fruit and vegetables by a firm named Keventer Fresh Limited. Spencer’s sources its vegetables independently and is the only market that offers organic vegetables in Kolkata.

Labels certifying special quality aspects of vegetables (e.g. use of IPM in production, geographical origin) are not commonly known. Other labels such as “Nature’s Best” created by

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4 The statistic includes eggplant, cabbage, cauliflower, okra, peas, tomato, onion, potato, sweet potato, tapioca and other vegetables.
Spencer’s add value to the product through grading and packaging, but do not exist in the wet markets.

**Quantitative survey results**

**Respondents’ characteristics**

The survey yielded 497 usable questionnaires. In Kolkata, a total of 375 interviews were conducted and 122 vegetable shoppers in Ranchi were interviewed. The responses of 368 men and 129 women were collected, which approximately correspond to the gender shares of crowds in wet markets in Kolkata and Ranchi.

The mean age of respondents was 32 with ages between 14 and 75 years represented. The large majority of respondents (68%) were married; 27.4% have never married. Few respondents were divorced (2%), separated (0.6%), or widowed (1.8%) (Table 1).

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>divorced</td>
<td>2.0</td>
</tr>
<tr>
<td>married</td>
<td>68.0</td>
</tr>
<tr>
<td>never married</td>
<td>27.4</td>
</tr>
<tr>
<td>separated</td>
<td>0.6</td>
</tr>
<tr>
<td>widowed</td>
<td>1.8</td>
</tr>
<tr>
<td>missing</td>
<td>0.2</td>
</tr>
<tr>
<td>Total</td>
<td>100.0</td>
</tr>
</tbody>
</table>

The level of education was relatively high with about 38% of respondents indicating having a bachelor degree of arts, science, or commerce (Table 2). Taking into consideration the fact that only every third person who was approached was willing to be interviewed, this hints towards the presence of a self-selection bias that is likely in sampling designs where respondents are approached in public.

<table>
<thead>
<tr>
<th>Highest level of education …</th>
<th>…of respondent</th>
<th>…of respondent’s spouse (if married)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>Valid %</td>
<td>Frequency</td>
</tr>
<tr>
<td>Illiterate or literate without formal education or less than primary</td>
<td>34</td>
<td>6.8</td>
</tr>
<tr>
<td>Primary or middle</td>
<td>47</td>
<td>9.5</td>
</tr>
<tr>
<td>Matriculate or intermediate</td>
<td>131</td>
<td>36.5</td>
</tr>
<tr>
<td>BA/BS/Bcom</td>
<td>188</td>
<td>38.1</td>
</tr>
<tr>
<td>MA/MSc/MCom</td>
<td>43</td>
<td>8.7</td>
</tr>
<tr>
<td>Professional degree or diploma</td>
<td>51</td>
<td>10.3</td>
</tr>
<tr>
<td>Answer not applicable</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Missing</td>
<td>3</td>
<td>7</td>
</tr>
</tbody>
</table>
Vegetable shopping intervals and frequencies
Vegetables were purchased fresh and frequently in the sampled markets with 35% of respondents buying vegetables every day, 25% visiting the market five or six times per week, and 20% four times a week (Table 3). Twelve and a half percent came to the market three times a week and shoppers who bought vegetables once or twice a week were less than 2% and 6% of the sample, respectively.

The median vegetable purchasing frequency was five times per week and the mean number of shopping stops per month was 21. Table 4 shows the frequencies of shopping stops grouped into incidents of up to ten stops per month, up to 20 stops per month, and so on.

Table 3: Shopping intervals (N=497)

<table>
<thead>
<tr>
<th>Interval</th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daily</td>
<td>172</td>
<td>34.6</td>
<td>34.7</td>
<td>34.7</td>
</tr>
<tr>
<td>6 times a week</td>
<td>37</td>
<td>7.4</td>
<td>7.5</td>
<td>42.1</td>
</tr>
<tr>
<td>5 times a week</td>
<td>89</td>
<td>17.9</td>
<td>17.9</td>
<td>60.1</td>
</tr>
<tr>
<td>4 times a week</td>
<td>98</td>
<td>19.7</td>
<td>19.8</td>
<td>79.8</td>
</tr>
<tr>
<td>3 times a week</td>
<td>62</td>
<td>12.5</td>
<td>12.5</td>
<td>92.3</td>
</tr>
<tr>
<td>Twice a week</td>
<td>29</td>
<td>5.8</td>
<td>5.8</td>
<td>98.2</td>
</tr>
<tr>
<td>Once a week</td>
<td>9</td>
<td>1.8</td>
<td>1.8</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>496</td>
<td>99.8</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Missing</td>
<td>1</td>
<td>0.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>497</td>
<td>100.0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 4: Shopping stops per month (N=497)

<table>
<thead>
<tr>
<th>Number of shopping stops</th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 10</td>
<td>58</td>
<td>11.7</td>
<td>11.7</td>
<td>11.7</td>
</tr>
<tr>
<td>Up to 20</td>
<td>211</td>
<td>42.5</td>
<td>42.5</td>
<td>54.1</td>
</tr>
<tr>
<td>Up to 30</td>
<td>209</td>
<td>42.1</td>
<td>42.1</td>
<td>96.2</td>
</tr>
<tr>
<td>Up to 40</td>
<td>14</td>
<td>2.8</td>
<td>2.8</td>
<td>99.0</td>
</tr>
<tr>
<td>Up to 50</td>
<td>4</td>
<td>0.8</td>
<td>0.8</td>
<td>99.8</td>
</tr>
<tr>
<td>Up to 60.</td>
<td>1</td>
<td>0.2</td>
<td>0.2</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>497</td>
<td>100.0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Importance of different market types
Almost 90% of respondents used the local daily wet markets for their vegetable purchases, followed by street vendors and closest smaller supermarkets that were frequented by approximately 21% and 19% of respondents, respectively (Table 5). Weekly or biweekly markets and specialized vegetable shops were less frequented (15% and 14%, respectively). Very few respondents indicated using big supermarkets (hypermarkets, 6%) or specialized organic shops for their vegetable shopping. Only two respondents purchased directly from a vegetable producer.

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5 A shopping stop is each incident of purchasing vegetables at different types of markets.
The same order of importance is found when looking at numbers of shopping stops. The total number of shopping stops for one month is presented in Table 5. Those who use daily wet markets for their vegetable shopping went to the wet market 19 times a month. Vegetable shops, weekly/biweekly markets, street vendors and small supermarkets were frequented 5 to 6 times a month by those who usually purchase there.

<table>
<thead>
<tr>
<th>Market type</th>
<th>Number of respondents using this market type</th>
<th>Percent of respondents using this market type</th>
<th>Mean shopping stops per month (if respondent uses market type)</th>
</tr>
</thead>
<tbody>
<tr>
<td>daily wet market</td>
<td>444</td>
<td>89.3</td>
<td>19.0</td>
</tr>
<tr>
<td>street vendor</td>
<td>104</td>
<td>20.9</td>
<td>6.2</td>
</tr>
<tr>
<td>closest small supermarket</td>
<td>92</td>
<td>18.5</td>
<td>6.4</td>
</tr>
<tr>
<td>weekly/biweekly wet market</td>
<td>75</td>
<td>15.1</td>
<td>5.4</td>
</tr>
<tr>
<td>vegetable shop</td>
<td>71</td>
<td>14.3</td>
<td>5.3</td>
</tr>
<tr>
<td>big supermarket</td>
<td>29</td>
<td>5.8</td>
<td>4.3</td>
</tr>
<tr>
<td>organic shop</td>
<td>8</td>
<td>1.6</td>
<td>3.7</td>
</tr>
<tr>
<td>directly from farmer</td>
<td>3</td>
<td>0.6</td>
<td>3.0</td>
</tr>
<tr>
<td>others</td>
<td>2</td>
<td>0.4</td>
<td>2.0</td>
</tr>
</tbody>
</table>

**Distance to different market types**

Local vegetable shops and street vendors, who are mostly mobile vendors, were the closest to consumers’ homes (340 to 470 meter distance on average) (Fig. 2). Daily and weekly/biweekly markets and small supermarkets were approximately 1.2 km distance to the consumers’ homes, while vegetable shoppers who wanted to purchase from hypermarkets or directly from the farmer needed to travel 3.4 to 6 km on average.

**Volume and monetary share of different market types**

The figures of amounts of vegetables purchased at different market places confirm the importance of wet markets previously highlighted (Fig. 3). Volume-wise, a share as large as 86% is purchased via daily wet markets, which corresponds to 73% of the financial market share. Although small supermarkets occupy only 4% of the market volume, according to these findings, 11% of the money for vegetables was spent here. Similarly, weekly/biweekly markets and street vendors sold 4% and 3% of vegetables respectively but occupied 6% and 5% of the financial market. Big supermarkets, vegetable shops, and specialized organic shops can be considered as niche markets for vegetables as they occupy less than 3% of the market for both volume and financial share. Differences in shares in terms of volume and money are explained by different average selling prices.
Figure 2: Distance to market types (in meters from respondent’s home)

Figure 3: Volume (left) and monetary (right) share of market types in vegetable sales (N=494)
Quantities purchased and expenses
Per month, respondents purchased 45 kg of vegetables on average, which corresponds to 289 g of vegetables purchased per capita and day.

From the quantities purchased and the money spent at different market types (mean figures are displayed in Table 6) the average vegetable prices were calculated and results hint toward higher prices for vegetables sold in supermarkets and organic shops compared with those sold at daily wet markets, by street vendors, and in vegetable shops. This is a plausible pattern but can be seen only as indicative, as the prices are recall data for one month pooled for all vegetables. A more detailed collection of retail prices per vegetable at different market places would result in more precise results but was beyond the scope of this study.

On average, households spent INR 1,539 (SD 1,204) per month on vegetables and INR 2,910 (SD 1,626) for other food items. The mean total food expense per household was INR 4,464 (SD 2,217) and consequently, the share of vegetables in the total food expenditure was 33%. In comparison, the average vegetable share in total food expenditure for urban Jharkhand and urban West Bengal was 16% and 14% respectively (calculated from Government of India 2008).

Table 6: Monthly purchases calculated for actual customers (N as indicated in brackets)

<table>
<thead>
<tr>
<th>Market Type</th>
<th>Mean Purchase (kg)</th>
<th>Mean Amount Spent (INR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>daily wet market</td>
<td>42.8 (442)</td>
<td>1251</td>
</tr>
<tr>
<td>weekly/biweekly wet market</td>
<td>12.9 (74)</td>
<td>569</td>
</tr>
<tr>
<td>closest small supermarket</td>
<td>10.7 (92)</td>
<td>896</td>
</tr>
<tr>
<td>street vendor</td>
<td>7.5 (103)</td>
<td>376</td>
</tr>
<tr>
<td>vegetable shop</td>
<td>6.4 (69)</td>
<td>274</td>
</tr>
<tr>
<td>big supermarket</td>
<td>7.4 (29)</td>
<td>751</td>
</tr>
<tr>
<td>organic shop</td>
<td>5.1 (8)</td>
<td>453</td>
</tr>
<tr>
<td>other</td>
<td>4.0 (1)</td>
<td>150</td>
</tr>
<tr>
<td>directly from farmer</td>
<td>2.1 (3)</td>
<td>160</td>
</tr>
</tbody>
</table>

Relevant selection criteria
Respondents were asked to judge the importance of nine criteria for the selection of vegetables they purchase. Answers were collected using a five point Likert-scale: “very important” (5), “important” (4), “not sure” (3), “little/not important” (2), and “not important at all” (1). Most respondents agreed that good visual appearance (i.e. absence of spots and defects) (mean score 4.63, SD 0.758), cleanness (mean score 4.62, SD 0.705), a low price (mean score 4.52, SD 0.965), and nice color (mean score 4.39, SD 0.883) are criteria that they consider (Table 7). The trust in vendor received some positive attention (mean score 3.62, SD 1.359) but had the highest standard deviation, which indicates divergent points of view about this criterion. The criteria information provided on the label, packaging, presence of a quality label and information about the geographical origin of the product were considered less important, with mean scores below 2.52 and standard deviations below 1.140.

The standard deviations for both the expenditures for vegetables and other food items were found to be high. However, cases with very high expenses appeared plausible, bearing in mind the close coexistence of very rich and very poor people in India.
Table 7: Most important selection criteria (N=495)

<table>
<thead>
<tr>
<th>Selection criteria</th>
<th>Mean score</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Good visual appearance</td>
<td>4.6</td>
<td>0.76</td>
</tr>
<tr>
<td>Cleanness</td>
<td>4.6</td>
<td>0.71</td>
</tr>
<tr>
<td>Low price</td>
<td>4.5</td>
<td>0.97</td>
</tr>
<tr>
<td>Nice color</td>
<td>4.4</td>
<td>0.88</td>
</tr>
<tr>
<td>Trust in vendor</td>
<td>3.6</td>
<td>1.36</td>
</tr>
<tr>
<td>Information on label, quality label, geographical origin, packaging</td>
<td>2.5</td>
<td>&lt;1.14</td>
</tr>
</tbody>
</table>

Note on scores: 5 = very important, 3 = not sure, 1 = not important at all

Awareness of health risks and quality labels
Thirty-seven percent of respondents had heard of unsafe vegetables that pose a risk to their personal or their families’ health.

Twenty percent had heard of quality labels that indicate vegetables are free of pesticides but less than 2% had ever purchased such vegetables. Similarly, 19% had heard of labels that certify vegetables from organic agriculture. However, only 5% knowingly purchased organic vegetables while 3% did not purchase such vegetables and 9% didn’t pay attention to whether the vegetables they bought were organic or not.

Of all vegetables that were purchased on the day of interview, labels on vegetables were only present in four cases (0.8%).

Concerns and fears
Respondents were asked to rate the importance of several concerns and fears they have in mind when buying vegetables (Table 8).

Table 8: Rating of concerns and fears (percentage of responses, N=495)

<table>
<thead>
<tr>
<th>Concern</th>
<th>Very important</th>
<th>Important</th>
<th>Not sure</th>
<th>Not important</th>
<th>Not important at all</th>
<th>Never heard of</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contamination with microbes (e.g. pathogens like Salmonella, E. coli)</td>
<td>67.7</td>
<td>26.6</td>
<td>3.2</td>
<td>1.0</td>
<td>1.2</td>
<td>0.2</td>
</tr>
<tr>
<td>Contamination with pesticide residues</td>
<td>30.2</td>
<td>31.0</td>
<td>20.6</td>
<td>11.9</td>
<td>4.4</td>
<td>1.8</td>
</tr>
<tr>
<td>Contamination with mycotoxins</td>
<td>39.0</td>
<td>25.5</td>
<td>21.2</td>
<td>7.7</td>
<td>2.8</td>
<td>3.8</td>
</tr>
<tr>
<td>Vegetable may be genetically modified</td>
<td>7.5</td>
<td>14.1</td>
<td>35.3</td>
<td>20.6</td>
<td>9.7</td>
<td>12.9</td>
</tr>
</tbody>
</table>

Topics were selected from different types of food products with microbes being more frequently a problem in poultry products, and mycotoxins in cereals and pulses. Still 94% of respondents considered the contamination with microbes as important or very important in vegetables, and 65% thought mycotoxins were important to very important concerns they have in mind while shopping for vegetables. Contamination with pesticides was considered important or very important by 61% of respondents. Genetic modified vegetables were judged to be an important to very important fear and concern by 22% of respondents.
Willingness to pay

Overall, 41% of respondents were willing to pay more for safely produced vegetables while 41% wanted to pay the same price and 17% were willing to pay less than what they usually pay for their cauliflower and eggplant.

The mean real prices on the day of the interview for eggplant and cauliflower were 16.3 INR/kg and 16.9 INR/kg, respectively (Table 9). Consumers were willing to pay 16.4 INR/kg for “safely produced” eggplant and 18.4 INR/kg for “certified organic” eggplant on average.

Table 9: Actual prices and willingness to pay for “safely produced” and “certified organic” eggplant (N=254) and cauliflower (N=213), (in INR)

<table>
<thead>
<tr>
<th>Vegetable</th>
<th>Mean price</th>
<th>Willingness to pay for</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>today</td>
<td>“safely produced”</td>
</tr>
<tr>
<td></td>
<td>(if today’s price is unknown) last time</td>
<td>vegetable</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“certified organic”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>vegetable</td>
</tr>
<tr>
<td>Eggplant</td>
<td>16.3 (4.18)</td>
<td>16.4 (5.20)</td>
</tr>
<tr>
<td>Cauliflower</td>
<td>16.9 (5.63)</td>
<td>18.3 (6.16)</td>
</tr>
</tbody>
</table>

Note: numbers in brackets are standard deviations

The average prices consumers were willing to pay for cauliflower were slightly higher, namely 18.3 and 20.0 INR/kg for “safely produced” and “certified organic” cauliflower, respectively. The increases in price consumers were willing to pay are higher for “certified organic” (14% for eggplant and 20% for cauliflower) compared with “safely produced” vegetables (6% for eggplant and 12% for cauliflower) (Table 10).

Table 10: Percentage consumers are willing to pay more for “safely produced” and “certified organic” eggplant (N=254) and cauliflower (N=213), (in %)

<table>
<thead>
<tr>
<th>Vegetable</th>
<th>“safely produced” vegetable vs. today’s or last time’s price</th>
<th>“certified organic” vegetable vs. today’s or last time’s price</th>
<th>“certified organic” vegetable vs. “safely produced” vegetable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eggplant</td>
<td>6.20 (.325)</td>
<td>13.66 (.354)</td>
<td>8.98 (.162)</td>
</tr>
<tr>
<td>Cauliflower</td>
<td>11.71 (.347)</td>
<td>20.05 (.377)</td>
<td>11.16 (.677)</td>
</tr>
<tr>
<td>Both vegetables</td>
<td>9.00 (.349)</td>
<td>16.62 (.366)</td>
<td>7.97 (.156)</td>
</tr>
</tbody>
</table>

Note: numbers in brackets are standard deviations

Comparing the two vegetables, eggplant and cauliflower, a two tailed t-test for equality of means revealed no significant difference (for “safely produced”: t = -1.712, p = 0.088; for “certified organic”: t = -1.897, p = 0.058) in the change in willingness to pay as compared to the real price. Therefore, the two vegetables were considered together in the following regression analysis.

Reasons for willingness to pay

Respondents gave no or one to three reasons for their respective willingness to pay which were coded and summarized (Table 11 and 12). Almost half of the respondents (48%) who are willing to pay a higher price for organic vegetables do so out of health concerns. Close to one- fifth value the concept of “guarantee,” “proof,” “safety,” and “trust” that they associate with certified organic vegetables. One of the respondents explained that he was willing to pay more for organic vegetables “because the certified organic vegetables […] have been fully checked before certification. This gives us assurance and comfort to consume these vegetables in our daily life."
feel they are safe for my children, too." About 14% of respondents felt that organic vegetables are “good,” “natural,” and “pure” or just perceived them as “better” than ordinary vegetables.

<table>
<thead>
<tr>
<th>Table 11: Reasons for higher WTP for “certified organic” vegetables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
</tr>
<tr>
<td>&quot;Organic vegetables are good for health&quot;</td>
</tr>
<tr>
<td>Guarantee, proof, safety, reliability, trust</td>
</tr>
<tr>
<td>Good/better, pure, natural</td>
</tr>
<tr>
<td>Free of chemicals/pesticides</td>
</tr>
<tr>
<td>Better taste</td>
</tr>
<tr>
<td>Better for children/the family</td>
</tr>
<tr>
<td>More difficult to produce/higher production costs</td>
</tr>
<tr>
<td>Better visual appearance</td>
</tr>
<tr>
<td>Quality</td>
</tr>
<tr>
<td>More nutritious</td>
</tr>
<tr>
<td>Other reasons (summarized)</td>
</tr>
</tbody>
</table>

Further reasons stated by respondents were the absence of chemicals and pesticides (7%), a better taste (4.5%), and better for the family and safe for children (3%). Eight respondents acknowledged that organic vegetables are more difficult to produce due to higher production costs and that farmers needed to work harder to cultivate them. Better visual appearance, better quality, and higher nutrient contents were also among the reasons for a higher willingness to pay for certified organic vegetables.

Most of the respondents who were willing to pay more for “safely produced” vegetables compared with “certified organic” vegetables did so because they didn’t know or had never heard of certified organic vegetables (6%) (Table 12). Others doubted the existence of such vegetables in general or said that organic vegetables did not exist at the market places that they used (4%). Almost 4% admitted that they could not afford vegetables other than the cheapest, and almost 3% simply did not trust the organic certification. Others responded that all vegetables are the same/are good anyway or that they prefer safely produced vegetables because they believe they are locally produced and fresh.

<table>
<thead>
<tr>
<th>Table 12: Reasons for higher WTP for “safely produced” vegetables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
</tr>
<tr>
<td>I don't know/have never heard of organic vegetables</td>
</tr>
<tr>
<td>Doubt if organic vegetables exist/no organic vegetables exist here on the market</td>
</tr>
<tr>
<td>&quot;I can't afford to pay more&quot;/&quot;I go for the cheapest&quot;</td>
</tr>
<tr>
<td>&quot;I don't trust the organic certification&quot;</td>
</tr>
<tr>
<td>&quot;All vegetables are the same/are good.&quot;</td>
</tr>
<tr>
<td>Safely produced vegetables are fresh and/or locally produced</td>
</tr>
<tr>
<td>Other reasons (summarized)</td>
</tr>
</tbody>
</table>

Note: In six cases no reasons or conflicting answers were given.
Using the theory of planned behavior to explain willingness to pay
The following results apply for respondents’ willingness to pay for “safely produced” eggplant and cauliflower. “Certified organic” vegetables were not considered in this part of the study.

Responses to questions measuring intention, subjective norm, perceived behavior control and attitudes were recoded such that all positive answers scored on the higher end of the Likert scale and were checked for internal consistency.

Cronbach’s Alpha for perceived behavior control (.630) could have been improved by dropping two items from the construct (Table 13). Interestingly, these two items measure the respondents’ beliefs about the controllability of the behavior. The reliability analysis showed respondents were more confident about their so called self-efficacy (how difficult it is to perform the behavior and how confident respondents are that they could do it) as compared to the controllability (whether performing the target behavior is up to the respondent). As the reliability coefficient was sufficiently high (> .6 as suggested by Francis et al. [(2004)], the items measuring controllability were not dropped from the analysis. Likewise, all items were retained for behavioral intention and attitudes that had Cronbach’s Alphas of .595 and .703, respectively. Subjective norm questions had a consistency coefficient of .449 before and .470 after dropping one question from the list. Subsequently, overall scores were computed by calculating the mean for each construct as suggested by Francis et al. (2004).

Table 13: Consistency results for theory of planned behavior constructs

<table>
<thead>
<tr>
<th>Construct</th>
<th>Valid N</th>
<th>Number of questions</th>
<th>Cronbach’s Alpha</th>
<th>Items dropped to improve Cronbach’s Alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Behavioral Intention</td>
<td>487</td>
<td>3</td>
<td>.595</td>
<td>0</td>
</tr>
<tr>
<td>Attitudes</td>
<td>488</td>
<td>4</td>
<td>.703</td>
<td>0 (1 suggested)</td>
</tr>
<tr>
<td>Subjective Norms</td>
<td>486 (482)</td>
<td>2 (3)</td>
<td>.470 (.449)</td>
<td>1</td>
</tr>
<tr>
<td>Perceived Behavioral Control</td>
<td>487</td>
<td>5</td>
<td>.630</td>
<td>0 (2 suggested)</td>
</tr>
</tbody>
</table>

Note: Figures in brackets indicate results before dropping items from analysis to improve Cronbach’s Alpha

All constructs correlated significantly with each other (Table 14). The scores for intention, attitudes, subjective norm, and perceived behavior control ranged from 1 on the negative end to 7 on the positive end. Except for the attitudes, the mean scores were slightly above the neutral level score, 4 (4.71 to 4.98), indicating the respondents had a very weak but positive point of view regarding these constructs. Their attitude scored slightly higher (5.33).

Table 14: Correlation results for theory of planned behavior constructs

<table>
<thead>
<tr>
<th>Variable construct</th>
<th>I</th>
<th>SN</th>
<th>A</th>
<th>PBC</th>
<th>Mean</th>
<th>SD</th>
<th>Possible range</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td>4.87</td>
<td>1.255</td>
<td>1-7</td>
</tr>
<tr>
<td>SN</td>
<td>.541 ***</td>
<td>-</td>
<td></td>
<td></td>
<td>4.71</td>
<td>1.370</td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>.363 ***</td>
<td>.305 ***</td>
<td>-</td>
<td></td>
<td>5.33</td>
<td>1.114</td>
<td></td>
</tr>
<tr>
<td>PBC</td>
<td>.102 *</td>
<td>.130 **</td>
<td>.638 ***</td>
<td>-</td>
<td>4.98</td>
<td>1.093</td>
<td></td>
</tr>
</tbody>
</table>

Note: * p < 0.05, ** p < 0.01, *** p < 0.001; I = Intention, SN = Subjective Norm, A = Attitudes, PBC = Perceived Behavioral Control
Using multiple linear regression revealed that the theory of planned behavior model was able to explain 35% (adjusted $R^2 = .349$) of the variance of consumers’ intention to purchase “safely produced” vegetables (Table 15). The standardized beta values indicate the unique importance of the independent variables. This means that the dependent variable $I$ (intention) will increase by 0.463 standard deviations when the independent SN (subjective norm) increases by one standard deviation while all other independents are held constant.

### Table 15: Regression results

<table>
<thead>
<tr>
<th>Variable</th>
<th>Standardized Beta</th>
<th>t</th>
<th>$R^2$</th>
<th>Adjusted $R^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Constant)</td>
<td></td>
<td>7.02</td>
<td>.353</td>
<td>.349</td>
</tr>
<tr>
<td>SN</td>
<td>.463 ***</td>
<td>11.94</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>.331 ***</td>
<td>6.63</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PBC</td>
<td>-.169 ***</td>
<td>-3.51</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$; SN = Subjective Norm, A = Attitudes, PBC = Perceived Behavioral Control

### Conclusions

The criteria consumers used to choose their vegetables do not favor the rapid diffusion of vegetables with quality labels or indications of a certain geographical origin. At the same time, the awareness about potential health risks and already existing quality labels was relatively low. Respondents only have a weak positive intention to purchase eggplant and cauliflower at the rate they indicated themselves. Therefore, the promotion of safely produced vegetables from Jharkhand will require large-scale provision of information about the content and purpose of a quality label.

Big supermarkets or hypermarkets as well as organic shops and direct marketing between farmers and consumers are still niche markets in Kolkata and Ranchi in terms of the share of consumers using these markets as well as the quantities purchased. Street vendors, however, are well-established independent retailers. Options to establish a direct market chain from producers in Jharkhand to urban consumers via street vendors could be examined for feasibility. Advantages of involving street vendors would be (1) a possible poverty-reducing impact because street vendors probably belong to a poorer segment of the population themselves, and would benefit from increased incomes; (2) street vendors are in direct contact with consumers and could therefore act as extension agents, distributing information about the quality of vegetables produced in Jharkhand; and (3) street vendors are mobile and visible in the streets so that advertisements fixed to their push carts would easily be seen by many consumers. Possible disadvantages are (1) an assumed low level of education being a threat to the diffusion of correct information; and (2) their independent mode of operation making control difficult and opening options for fraud.

The insights of this study on the marketing potential of vegetables from tribal Jharkhand should be complemented with economic studies on the actual costs of production and marketing of those vegetables to see if the price consumers are willing to pay is profitable for farmers.
Although the method to elicit willingness to pay from respondents is the most conservative as it usually results in lowest rates of willingness to pay (Venkatachalam 2004), respondents still had only a weak positive intention to actually purchase eggplant or cauliflower at the rate they indicated themselves. This justifies the use of the open-ended method and underlines the usefulness of additional probing with questions on respondents’ intention, attitude, subjective norm, and perceived behavior control. Suggested questions to measure the subjective norm failed to yield consistent results. A closer look into why subjective norm had an unsatisfactory consistency coefficient and how measuring subjective norm in comparable contexts could be improved are research questions for the future.
References


