

Participatory Assessment of the Stakeholders' Perceived attributes Associated with Tomato Production Techniques

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ABSTRACT

As an aftermath of globalization and trade liberalization the vegetable cultivation and marketing contribute to Indian economy in a bigger way as vegetable cultivation is an inseparable part of Indian cultivation. In recent era, among different types of vegetables Tomato is most favourable to all Indians as a table and processed vegetable. With an aim to increase the productivity of vegetable it is necessary to develop improved and sustainable varieties after considering the demand of different stakeholders of the concerned vegetable. The stakeholders associated with the production aegis of Tomato are growers, traders, consumers and above all the scientists who are the variety evolvers. With a view to know whether there exists differences among the preferences of different stakeholders or there are similarities among their preferences regarding Tomato, this study was conducted at Saguna gram panchayat of Nadia district and Kanchrapara municipality of North 24 Parganas District of West Bengal. The area was selected with the help of area sampling technique and the respondents were selected with the help of total enumeration technique for getting the consumers, traders and growers' responses in the selected area. Data were collected with the help of structured interview schedule. To analyse the collected data for drawing conclusion the analytical tools like co-relation co-efficient and factor analysis were used. The analysis was done in two divisions. The first was the comparison among the consumers and traders and second was the comparison among the farmers and scientists. In the comparison among the consumers and traders by computing co-relation co-efficient, the value was found significant. It indicates that the preference pattern varies from consumers to traders. The factor analysis revealed that in case of tomato cultivation, the numbers of identified factors were different for different types of stakeholders. It was also found that factors having same number had different loadings for different stakeholders. Breeder should go to the other stakeholders to ensure their participation in breeding process because practically they are the key actors and directors for adding sustainability to the tomato production process.

Key words: Perceived attributes, Stakeholders, Growers, Traders, Consumers, Breeders, Tomato production,

As an aftermath of globalization and trade liberalization the vegetable cultivation and marketing contribute to Indian economy in a bigger way as vegetable cultivation is an inseparable part of Indian cultivation. Among different type of vegetables, tomato occupies an important position. To increase the production of vegetable like tomato it is necessary to develop improved and sustainable variety by harmonizing the demand of different stakeholders. The paradox of agricultural research is that the agricultural scientists have been extremely successful in scientific innovations but these innovations have not been fully adopted by the farmers. The reasons for low acceptance of

generated technologies may be the lack of economic viability, operational feasibility, stability, compatibility with farmer's needs and situation.

Keeping these in view, a shift from prescriptive mode to a participatory mode has become inevitable for the growers of vegetables in India. Along with this assumption, the agricultural development starts with participatory assessment of needs, and preference in developing a research plan based on insights shared by insider and outsider in carrying out study on participatory technology development in vegetable like tomato which involves three main stakeholders (consumer, traders and growers) related to production and marketing system.

To have a comprehensive idea about a vegetable like tomato in totality, the differential preference pattern by stakeholders related to production and marketing system the present study was conducted. In recent decades, efforts to understand consumer attitudes, or overall buying behavior and the relative importance of various attributes in purchasing food have been widely explored (*Kiesel and Villas Boas 2007*), primarily with stated preference techniques such as Contingent Valuation (CV) and Choice Experiments (CE). In addition to that Credence attributes play an increasingly important role in consumer preference formation (*Zanoli et al. 2003; Combris et al. 2009*). The previous study of *Hamilton et al (2003)*, *Ernst et al. (2006)* and *Grunert et al. (2004)* had only reflected the consumers' preference on vegetables and fruits. In this context, the present study had envisaged the three stakeholders' (grower, trader and consumer) preference for vegetable (tomato) production and marketing.

METHODOLOGY

The present study was conducted in two villages of Chakdah block of Nadia district and in Kanchrapara Municipality of 24 Parganas (N) district in the state of West Bengal. The state West Bengal has more than 300 community development block and approximately 42,000 villages. Out of 17 blocks Chakdah block is selected progressively in Nadia district. In the Chakdah Block, two villages named Ghoragacha & Basantapur were selected. The villages are under Saguna Gram Panchayet. In district North 24 parganas, Kanchrapara Municipality was selected as a part of research carried out. Faculty of Horticulture under Bidhan Chandra Krishi Viswavidyalaya in Nadia district was also a part of research. Depending on the objectives of the study sampling was done in two steps, Step I-Area sampling and Step II-Respondent sampling.

For the consumers and traders town Kanchrapara was purposively selected. Because of physical accessibility and also a number of vegetable consumers are present in this town. Out of 23 wards, ward number 16 was randomly selected. There are total six lanes in 16th number word. Out of six lanes one named Anil Rudra Sarani was randomly selected to get the consumers response. Total enumeration of the family living at this lane was followed to select the respondent as consumers. On the other side, good numbers of vegetables markets are operating here every day. There are total 5 market from which 2 markets namely "Tiktikir

Bazar" and Mondal Bazar" were purposively selected as consumers residing at 16th number ward use to visit those markets. For the traders, the permanent vegetable traders from the area Saguna Gram Panchayet were selected at the two above mentioned markets. So for growers' response, villagers were selected from this Gram Panchayet. There are 24 villages. Out of which 2 villages namely Ghoragacha and Basantapur were randomly selected. For the selection of growers total enumeration of vegetables growers in the village Ghoragacha and Basantapur was done. For the selection of scientists, the scientists of the Department of Genetics and Faculty of Horticulture in Bidhan Chandra Krishi Viswavidyalaya was selected purposively. The data were collected with the help of structured interview schedule through personal interview method. For preparation of schedule the attributes importance and their inclusion were finalized with the help of the stakeholders of the study area. The collected data were processed into the statistical tools like correlation coefficient and factor analysis for drawing conclusion.

RESULTS AND DISCUSSION

Table 1 & 2 show that Colour has got the most priority to both consumers and traders. Boiling quality is second important attribute to the consumers because boiling quality vary greatly from variety to variety. Traders think that flesh content is second important attribute because more flesh mean more weight which will give more income. Tightness is third important attribute to both of them as it is necessary for long time storage and transport. The calculated r value shows that there is insignificant difference among the consumers' and traders' choices regarding attributes. Choices may differ for some attributes but overall there are similarities among the choices of these two stakeholders.

According to the Table 3 and 4, Colour and Production got the 1st rank from the farmers because as per their opinion both are important for more income. Transport resistance is second significant attribute to the farmers, because they get more profit from those varieties which are not damaged during transport. Disease resistance is the third important attribute to them as disease can damage the total crop. This attribute is most important to the scientists as they think there is the scope for research work on this problem. Production got the second priority from the scientists. They give the third rank to Transport resistance. The co-relation

Table 1. Attribute importance of tomato as perceived by consumers and traders.

Attributes	Mean importance score		Importance Rank		Rank difference correlation co-efficient (r)
	Consumers	Traders	Consumers	Traders	
Size	3.38	3.44	7	4	0.37
Colour	3.88	3.98	1	1	
Shape	3.64	1.28	5	10	
Number of seeds	2.28	1.22	11	11	
Taste	2.66	3.32	9	5	
Self life storage	3.56	2.22	6	6	
Juice content	2.54	1.92	10	7	
Flesh content	2.70	3.94	8	2	
Price	3.66	1.36	4	8.5	
Boiling quality	3.82	1.36	2	8.5	
Tightness	3.68	3.68	3	3	

* Significant at .01 per cent level

coefficient value r shows that there exist significant differences between farmers and scientists in respect of attribute important for growing tomato.

Table 2. Rank ordering of attributes by consumers and traders

Rank	Consumers	Traders
1	Colour	Colour
2	Boiling quality	Flesh content
3	Tightness	Tightness
4	Price	Size
5	Shape	Taste
6	Self life storage	Self life storage
7	Size	Juice content
8	Flesh content	Price , Boiling quality
9	Taste	Shape
10	Juice content	Number of seeds
11	Number of seeds	-

According to Table 5, consumers want tomato varieties having much flesh content and less juice content. If juice content is much, it create problem during cutting. More flesh adds more taste to the 'curry' and 'salad' and also to the 'chutney'. Factor 2 accounted for 17.5 per cent of the total variance. Attributes 'Size', "Shape" and "Tightness" had loadings on the factor .580954, .8220107 and .507397 respectively. Consumers want tomato variety having medium size and shape for salad and chutney. Small size can be used for chutney, but it is not preferable for salad and large size can be used as salad but it's boiling quality is not good, so cannot be preferable for chutney or curry. Regarding shape, round or oval shape is preferable by the consumers because easy cutting and garnishing. Consumers want tightness because tight fruit can be cut properly and

Table 3. Attribute importance of tomato as perceived by growers and scientists

Attributes	Mean importance score		Importance Rank		Rank difference correlation co-efficient (r)
	Farmers	Scientists	Farmers	Scientists	
	3.97	3.74	1.5	5	*0.75
	3.36	3.51	7.5	9	
	1.89	3.54	12	8	
	3.52	3.48	7.5	10	
	3.86	3.80	3	3	
	3.78	3.45	5.5	11	
	1.63	2.64	14	14	
	1.73	3.22	13	12	
	1.92	3.74	11	5	
	3.81	3.93	4	1	
	3.78	3.74	5.5	5	
	2.36	3.90	10	5	
	3.97	3.90	1.5	2	
	3.34	3.09	9	13	

* Significant at .01 per cent level

Table 4. Rank ordering of attributes by growers and scientists

Rank	Growers	Scientists
1	Colour, production	Disease resistance
2	Transport resistance	production
3	Disease resistance	Transport resistance
4	Time required to fruiting, insect resistance	Skin thickness, insect resistance, Colour, Flesh content
5	Self life storage	Taste
6	Size	Size
7	Price	Self life storage
8	Skin thickness	Time required to fruiting
9	Flesh content	Juice content
10	Taste	Price
11	Juice content	Seed content
12	Seed content	-

Table 5. Attributes of tomato considered for the factors with corresponding rotated factor loadings (Respondent: Consumers)

Factor	Attribution	Rotated factor loading
Factor – 1 Intrinsic factor	Juice content	.931296
	Flesh content	.890091
Factor – 2 External appearance factor	Size	.580954
	Shape	.822107
	Tightness	.507397
Factor – 3 Intrinsic cum External appearance factor	Colour	.72671
	Number of seeds	.759470
	Taste	.570606
	Self life storage	.499540
Factor – 4 Intrinsic cum Economic factor	Price	.697872
	Boiling quality	-.866219

also can be stored for longer time. Factor 3 accounted for 14.9 per cent of the total variance. Attributes Colour, Number of seeds, Taste, Self life storage had loadings on the factor -.72671, 0.759470, 0.570606, 0.499540 respectively. Consumers use tomato as colouring agent in different curries also. When tomato used as salad red colour has extra garnish value. Consumers want varieties having less numbers of seeds because seeds hamper taste and garnish value also. They buy tomato for 2-3 days at a time, so they want longer self life storage to avoid economic loss due to spoilage. Factor 4 accounted for 9.9 per cent of the total variance. Attribute Price and Boiling quality had loadings on the factor 0.697872, -.866219 respectively. Consumers want tomato varieties having good boiling quality. Varieties which are ‘Deshi’ types boil early and equally. But hybrid types do not boil properly and also take more

time to boil. So they prefer ‘Deshi’ varieties rather than hybrid though there are another many good character in hybrid.

Table 6 presents the factor analysis of the attributes where the traders are the respondents. Factor 1 accounted for 20.5 per cent of the total variance. Attributes Juice content and Flesh content had loadings on the factor 0.950811, 0.960250 respectively. Traders want those varieties of tomato having less juice content and more flesh content as per consumers’ preference. Moreover if juice is high in amount, it may cause damage during transportation. Traders want varieties having more flesh because consumers demand it. Factor 2 accounted for 15.3 per cent of the total variance. Attributes Number of seeds and Taste had loadings on the factor 0.841260 and 0.800637 respectively. Traders prefer the tomato varieties having less number of seeds as consumer prefer it. But they are not much bothered about it as they think it is a secondary criteria. Traders prefer those varieties having more sweetness with little sour because consumers prefer it. Factor 3 accounted for 11.4 per cent of the total variance. Attribute Self life storage had loadings on the factor 0.888717. Traders prefer the tomato varieties having longer self life storage. They mostly purchase tomato from the field or whole sale market in one or two day’s gap. Again all products are not sold within one or two days. Sometime it takes more time to sale all the tomatoes. It is necessary to have a longer self life so that loss due to spoilage may not be occurred. Factor 4 accounted for 10.6 per cent of the total variance. Attribute Size had loadings on the factor 0.836808. Traders prefer medium sized

Table 6. Attributes of tomato considered for the Factors with corresponding Rotated Factor loading (Respondent Traders)

Factor	Attribute	Rotated factor loading
Factor – 1 Intrinsic factor	Juice content	.950811
	Flesh content	.960250
Factor – 2 Intrinsic factor	Number of seeds	.841260
	Taste	.800637
Factor – 3 Factor – 4 External appearance factor	Self life storage	.888717
	Size	.836808
Factor – 5 Intrinsic cum economic factor	Price	.559461
	Boiling quality	.856844
Factor- 6 External appearance factor	Colour	.744233
	Shape	.551512
	Tightness	.517013

tomato varieties because consumers prefer it. Factor 5 accounted for 10.1 per cent of the total variance. Attribute Price and Boiling quality had loadings on the factor 0.559461 and 0.859844 respectively. Traders want red colour and round or oval shape because consumers prefer this quality. Traders want varieties having much tightness to avoid damage during transportation.

Table 7 presents the factor analysis of the attributes where the growers or farmers are the respondents. Factor 1 accounted for 24.7 per cent of the total variance. Attributes "Taste", Seed content, Juice content, Flesh content and Price had positive loadings on the factor 0.559881, 0.830203, 0.86062 and 0.772761 respectively. Farmers want those varieties having good taste as well as the other attributes. They think that the consumers first see the appearance. But before buying they consider the price and seed content as tomato is used as salad purpose also. If seeds are more it will not be favourable for salad. Juice content should be moderate in amount. If juice content is high it causes damage during transportation. If juice content is low it causes early drying of fruits and shrinkage occurs. Flesh content should be more because consumers demand it. Farmers always want good price, but it is not always possible as demand and availability of tomato vary from time to time. Factor 2 accounted for 15.9 per cent of the total variance. Attributes Disease resistance and Pest resistance had positive loadings on the factor

Table 7. Attributes of tomato considered for the Factors with corresponding Rotated Factor loadings (Respondent: Farmers)

Factor	Attribution	Rotated factor loading
Factor – 1 Intrinsic cum economic factor	Taste	.559881
	Number of seeds	.893570
	Juice content	.830203
	Flesh content	.867062
	Price	.772761
Factor – 2 Crop protection factor	Disease resistant	.965213
	Pest resistant	.974787
Factor – 3 Intrinsic cum External appearance factor	Colour	-.746429
	Transport resistance	-.869877
Factor – 4 Intrinsic factor	Time required for fruiting	-.638039
	Self life storage	.797073
Factor – 5 External appearance factor	Skin thickness	.773943
	Size	.886069
Factor – 6 economic factor	Productivity	.915557

0.965213 and 0.974787 respectively. Farmers want to cultivate those varieties which are resistant to diseases and pests. They have to pay a considerable amount of money to protect the crop from diseases and pests. They cannot get return up to the mark. Factor 3 accounted for 12.5 per cent of the total variance. Attributes Colour, Transport resistant and Time required for fruiting had positive loadings on the factor 0.746429, -0.869877 and -0.638039 respectively. Factor 4 accounted for 9.8 per cent of the total variance. Attributes Self life storage, Skin thickness had positive loadings on the factor 0.797073 and 0.773943 respectively. Tomato is a perishable product. For distant transportation and home storage, Self life storage of tomato should be higher to avoid the loss. Tomato varieties with more skin thickness have naturally more self life storage because shrinkage due to water loss is less in this type of tomato variety. Factor 5 accounted for 8.3 per cent of the total variance. Attributes Size has loadings on the factor 0.886069.

Table 8 presents the factor analysis of the attributes where the scientists are the respondents. Factor 1 accounted for 22.9 per cent of the total variance. Attributes Seed content, Juice content, Production had loadings on the factor 0.485373, 0.686239 and 0.850915 respectively. Scientists give importance increasing the production and maintaining the juice content. Factor 2 accounted for 14.7 per cent of the total variance. Attributes Colour, Transport resistant and Flesh content had loadings on the factor 0.835297, 0.637087 and 0.643453 respectively. Colour is important to the scientist because it is important for good appearance. Scientists consider transport resistant to some extent. They also think about the flesh content. Factor 3 accounted for 12.2 per cent of total variance. Attributes Size and Taste had loadings on the factor 0.843072 and 0.835749 respectively. Scientists think that large size with good taste is necessary for consumers demand. Factor 4 accounted for 11.5 per cent of the total variance. Attributes Disease resistance, Pest resistance and Price had loadings on the factor .0.787657, 0.671075 and 0.622622 respectively. Scientists think that diseases and pests cause a considerable loss to vegetable like tomato. The new varieties must have power to resist pest infestation and there is a large scope of research in this field. Scientists opined that for good varieties with more production, higher price can be paid. Factor 5 accounted for 8.2 per cent of the total variance. Attributes Time required for fruiting and Skin thickness had loadings on the factor -0.804062 and 0.621016

Table 8. Attributes of Tomato considered for the Factors with corresponding Rotated Factor loadings (Respondent: Scientists)

Factor	Attributes	Rotated factor loading
Factor – 1 Economic cum Intrinsic factor	Number of seeds	.485373
	Juice content	.686239
	Production	.850915
Factor – 2 External appearance cum Intrinsic factor	Colour	.835297
	Transport resistance	.637087
	Flesh content	.643453
Factor – 3 External appearance cum Intrinsic factor	Size	.843072
	Taste	.835749
Factor – 4 Crop protection Cum economic factor	Price	.787657
	Time required for fruiting	.671075
	Disease resistant	.622622
Factor – 5 Intrinsic factor	Insect resistant	-.807062
	Price	.621016
Factor – 6 Intrinsic factor	Self life storage	.889838

respectively. Scientists give a look on more skin thickness because consumers prefer it. They think that for better fruiting time required for fruiting may be more. Factor 6 accounted for 7.5 per cent of the total variance. Attributes Self life storage had loadings on the factor 0.889838. Principal Component factor analysis was found that for the same vegetable numbers of identified factors were different for different types of

stakeholders. In some cases numbers of factors are same but attributes under same factor were different for different types of stakeholders. It was also found that factors having same number had different loadings for different stakeholders.

CONCLUSION

It can be concluded that preference pattern for Tomato differs from stakeholder to stakeholder. In many cases farmers' view is different from the consumers' view. Consumers' perception of quality is influenced by the product's intrinsic attributes as well as by extrinsic indicators and cues provided by the seller of the product (Caswell et al. 2002). Scientists do not consider the other stakeholders equally during the variety development process. They give the weightage to those attributes which fulfill their research purpose mainly. This can not give success up to the mark. Breeder should consider all types of stakeholders related to a vegetable from production to consumption. Breeder should go to the other stakeholders to get their participation in breeding process because practically they are the key actors for giving sustainability to a vegetable and breeders are the prime movers of this process. So, there is a need of concerted effort to integrate the activities of growers, scientists, consumers after giving due importance to the prerogative of every stakeholders related with the tomato production and consumption system to usher a new era of market led extension.

REFERENCES

- Caswell, J. A.; Noelke, C. M. and Mojduszka, E. M. (2002) Unifying Two Frameworks for Analyzing Quality and Quality Assurance for Food Products. In Global Food Trade and Consumer Demand for Quality, ed., B. Krissoff, M. Bohman, and J. A. Caswell, pp.43-61. New York, NY: Kluwer Academic/Plenum Publishers.
- Combris, P.; Bazoche, P.; Giraud-Héraud, E. and Issanchou, S. (2009) Food choices: What do we learn from combining sensory and economic experiments? *Food Quality and Preference*. **20**(8): 550-557.
- Ernst, S.; Batte, M. T.; Darby, K. and Worley, T. (2006) What Matters in Consumer Berry Preferences: Price? Source? Quality? *Journal of Food Distribution Research*. **37**(1): 68-71.
- Grunert, K. G.; Bredahl, L., and Brunsø, K. (2004) Consumer perception of meat quality and implications for product development in the meat sector: A review. *Meat Science*. **66**: 259-272
- Hamilton, S.; Sunding, D. L. and Zilberman, D. (2003) Public goods and the value of product quality regulations: the case of food safety. *Journal of Public Economics*. **87**: 799-817.
- Kiesel, K.; and Villas-Boas, S.B. (2007) Got Organic Milk? Consumer Valuations of Milk Labels after the Implementation of the USDA Organic Seal. *Journal of Agricultural & Food Industrial Organization*. **5**(1): 27-37.
- Zanoli, R.; Gambelli, D. and Naspetti, S. (2003) Il posizionamento dei prodotti tipici e biologici di origine italiana: un'analisi su cinque paesi. *Rivista di Economia Agraria [Journal of Agriculture Economics]*. **58**(4):477-510.

