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Farmers' preferences for papaya varieties and key attributes in north-eastern Karnataka: insights from conjoint analysis

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Abstract

This study focuses on identifying papaya varieties and the key attributes that influence farmers' preferences in North-Eastern Karnataka (NEK) to facilitate the successful adoption of crop varieties. The study was conducted with 80 papaya farmers and 20 market intermediaries, primarily employs conjoint analysis (CA) to evaluate farmers' varietal attribute preferences. The findings indicate that the "Red Lady 786" variety is the most preferred, cultivated by 61.25 per cent of farmers, followed by "Exp-15" at 23.75%. CA results reveal that the most important varietal attributes are market price (41.19%) and disease resistance (31.63%). Yield and shelf life are moderately important, while plant height is the least. The reliance on a single variety like Red Lady poses risks such as disease susceptibility and market volatility. For this, the study recommends promoting a diversity of papaya varieties, particularly those with improved attributes, to ensure resilience and sustainability in papaya cultivation. Demonstrations of promising new varieties developed by agricultural universities and research institutions are advised to raise farmer awareness.

Keywords: Attributes, conjoint analysis, relative importance, red lady

Introduction

Researchers are interested in knowing the attributes of crop varieties that are important to farmers to enable hassle free adoption. Thus, it is very important for researchers to be able to design their crop varieties based on preferred traits and position them to release successful crop varieties (Baidu-Forson *et al.*, 1997) ^[20]. All individuals including farmers while making a decision to purchase a good or a service evaluate attributes of all the competing products before making a final choice. This process is not explicit and the main consideration is perceived value maximisation. In many instances, farmers' varietal preferences based on attributes of a variety are ignored or based on some assumed requirement that eventually leads to rejection or non-adoption of varieties (Basavaraj *et al.*, 2015) ^[12]. The final choice is based on utility maximisation of the product or service. Varietal selection based on utility stands a better chance of adoption and up scaling on a large scale since it is essentially a consumer centric approach. In this context, a study was undertaken to quantify the papaya varietal attributes preferred by farmers using conjoint analysis. Papaya is an important fruit of tropical and subtropical region of the world and is known as "Melon Tree." Papaya belongs to the genus *Carica* of the family Caricaceae. Out of 48 species known the species *Carica papaya* L. is the most important and best known (Kumar *et al.*, 2023). India is

leading country in the production of bananas (33%), mangoes (22%), citrus fruits (12-13%) and papayas (6%) (FAO, 2024). India produced an estimated 5.29 million metric tonnes of papaya and Karnataka contributing over 7.63 per cent of the national output (APEDA-agriexchange 2024). The districts in the NEK region of Karnataka contributed 40.84 per cent to the state's overall papaya production. This region witnessed about 1.81 thousand hectares dedicated to papaya cultivation which accounts for 40.84 per cent of state's overall papaya area contributing to total production of 121.54 thousand tonnes (Horticulture Report 2023-24, Dept. of Horticulture). The marketing of papaya in North Eastern Karnataka is influenced by the variety grown, as different varieties cater to distinct market segments. Traditional varieties often find a place in local markets, where consumers are familiar with their taste and texture, while high-yielding varieties like 'Red Lady' are more commonly found in organized retail chains and export baskets due to their superior appearance, shelf life and consistency in quality (Reddy and Shivaraj, 2022) ^[30]. The choice of variety in farming is a crucial aspect that influences nearly every facet of crop production, from production to yield to even marketability, consumer choice and sustainability. Making the right choice for selection of variety is the key component to achieve higher productivity, good quality produce and economic viability in farming.

Against this backdrop, specific objectives were set

1. To identify the varieties grown in the study area
2. To assess the attributes of papaya varieties preferred by farmers.

2. Methodology

2.1 Sampling design

The study employed multistage random sampling technique. In the first stage, four districts Ballari, Koppal, Raichur, and Kalaburagi were selected based on the largest area under papaya cultivation within the North Eastern Karnataka

(NEK) region. In the second stage, two taluks from each district were selected based on their area under papaya cultivation and production potential, in consultation with officials from the Raitha Samparka Kendra (RSK) and the Taluk Horticulture Department of the respective taluks. In the third stage, ten farmers were randomly selected from each of these taluks to ensure representation across different villages. Thus the study's sample size consisted of 100 respondents, comprising 80 papaya cultivators and 20 market intermediaries.

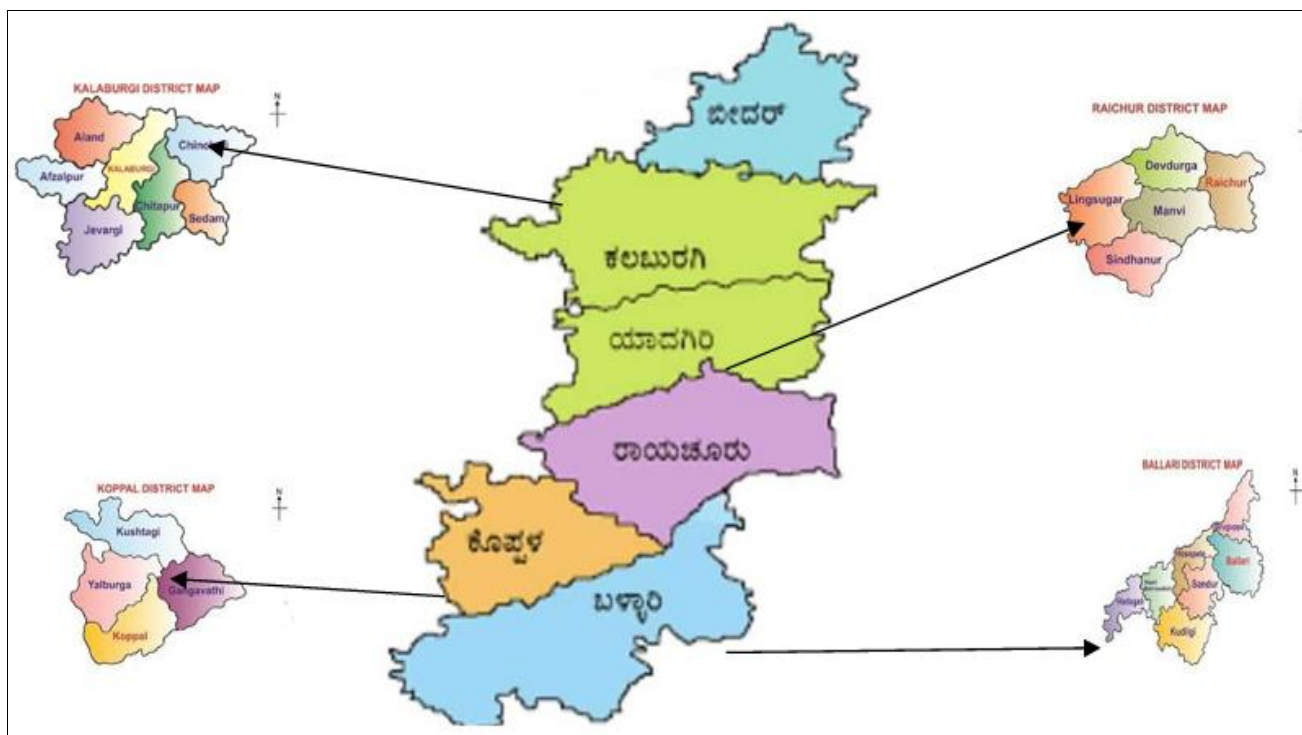


Fig. 1: Map showing the study districts

Conjoint analysis (CA)

Conjoint analysis (CA) as a technique is used for estimating the value people place on the attributes or features that define products (Louviere, 1991) [22]. In conjoint studies, respondents choose between alternative products or scenarios that display varying levels of selected attributes. Appropriately structured and repeated across a sample of respondents, these comparative evaluations can be used to calculate the part-worth utilities of each attribute. Part-worth utilities can be combined to estimate relative preference for any combination of attribute levels (Green and Srinivasan 1990) [13]. The term 'conjoint analysis' refers to an overall approach and group of quantitative techniques that can be used to determine respondents' preferences for the attributes that make up a product or service. Key components of conjoint studies are: (1) the product may be defined using an aggregate of features or attributes that take certain levels or values, (2) different levels of the attributes define different versions of the product under consideration; (3) product appraisal by individuals is a function of the value which they assign to the product's attributes, and (4) during the decision-making process, individuals appraise the worth of each combination, and their choice demonstrates prioritization among the different combinations of attributes.

The total worth of a particular product is then determined by the different part-worth of each attribute level (Sayadi, Roa and Requena, 2005) [32]. The goal is to understand what specific values of attributes producers consider while making decision pertaining to papaya variety purchase. CA can also be used to predict choices for future products and services. It assumes that a product can be "broken down" into its component attributes (Hair *et al.*, 2006; Rao, 2008) [15, 29]. For example, a plant variety has attributes such as high yield, disease resistance, market price, keeping quality and plant height etc. The values that individuals place on a crop variety are equivalent to the sum of the utilities they derive from all the attributes making up the crop variety. Further, CA assumes that the preference for a product and the likelihood to purchase it is in proportion to the utility an individual gains from the product. Unlike traditional approaches where respondents are asked to estimate how much value they place on each attribute, CA attempts to break the task into a series of choices or ratings. These choices or ratings, when taken together, allows to compute the relative importance of each of the attributes studied (Mafuru *et al.*, 2007) [23]. Further, markets continue to change as new varieties are introduced, etc. In such instances, in the traditional approach a new survey needs to

be conducted every time a major change takes place in the market to find out how people feel about the changes and how it will affect their purchases. With CA, the new product or changes to existing products can be incorporated into the simulation model to obtain predictions of how buyers will respond to the changes. In most markets, these models can maintain their accuracy for two or three years before you need to conduct a miniversion of the original study to determine if any adjustments must be made to the model. Instead of "stated importance", conjoint analysis uses "derived importance" values for each attribute or feature. The ability to use the results to develop market simulations models to evaluate existing varieties into future is the other advantage of using CA technique. Application of CA technique is done in three phases: collection of trade-off data through a survey, statistical analysis of the data and simulation. In the present study conjoint analysis is carried out to evaluate the underlying responses that the respondents consciously or sub-consciously place on each attribute. For example, a rational farmer growing papaya will prefer higher market price per kg of fruit, if all other things are equal (quality, features, etc.). What researchers do

not know about each farmer is his or her level of sensitivity to these differences. A farmer who always chooses variety with better disease resistance over variety with low disease resistance, regardless of yield level, obviously places more value on disease resistance than yield level. CA allows the researchers to compute the relative value between these options and all other options considered in the research design. The attributes and their levels considered in the study are presented in table 2.1.

Conjoint analysis has also been used to support negotiations about the elements of contracts. Greenhalgh and Neslin (1981) ^[14] tested and verified the applicability of conjoint analysis for ascertaining the preferences of management, unions and employees in a labour contract bargaining situation. Klosowski *et al* (2001) ^[21] used conjoint analysis to assess the attitudes of U.S. farmers toward coordinated ecosystem management and economic policy tools for promoting ecosystem management and the results showed that while farmers had generally positive attitudes toward ecosystem management, they were likely to have muted responses to tax incentives.

Table 1: Attributes and its levels considered by papaya farmers for conjoint analysis

Sl. No.	Attributes	Attribute levels
1	Yield	High Medium
2	Disease resistance	High Low
3	Market price	High(>Rs.12 per kg) Medium(Rs.6-12 per kg) Low(<Rs.6 per kg)
4	Shelf life	Good(>7 days) Average(3-7 days) Poor (<3 days)
5	Plant Height	Tall Dwarf

3. Results and Discussion

3.1 Identification of varieties grown in the study area

It is essential to enlist the varieties grown in the study area and assess the attributes valued by farmers. This information will guide future cultivar development and improvement in production strategies. Understanding these factors helps in

identifying key drivers of varietal adoption which provides insights into optimizing papaya cultivation practices to meet both farmer needs and consumer demand. A survey was conducted to elicit the perceptions of papaya growers on the varieties grown in the region and the findings are documented in Table 2.

Table 2: Papaya varieties cultivated in the study area

Sl. No.	Variety	No. of respondents	%	Preferential Rank
1	Red Lady 786	49	61.25	I
2	Exp -15 (15'No.)	19	23.75	II
3	WS – 46 (Welcome)	04	5.00	III
4	Sweet Charlie	03	3.75	IV
5	Surya (Sunrise solo)	03	3.75	V
6	Arka Prabhat	02	2.50	VI
	Total	80	100.00	-

The findings of the table recorded that Red Lady 786 is the most popular papaya variety preferred by 49 (61.25%) respondents, followed by Exp -15 preferred by 19 (23.75%) respondents, WS – 46/Welcome preferred by 4 (5%) farmers, while Sweet Charlie and Surya each have a choice of 3 (3.75%). Arka Prabhat preferred by 2 (2.5%) respondents is the least popular. The least preferred varieties viz. Sweet Charlie, Surya and Arka Prabhat highlighted a significant preference for the other varieties mentioned in the aforesaid section.

The attributes of majorly grown variety are depicted using a radar chart in Fig.1. As shown in Table 2. Red Lady is the most preferred variety due to its higher market price, longer shelf life which makes it suitable for long distance transport and year-round demand that ensures a sustained income flow for the farmers. Additionally, being a F1 hybrid from a prominent seed company, it does not create bias among the growers regarding the quality of planting material and is a reliable source of gynodioecious type of papaya.

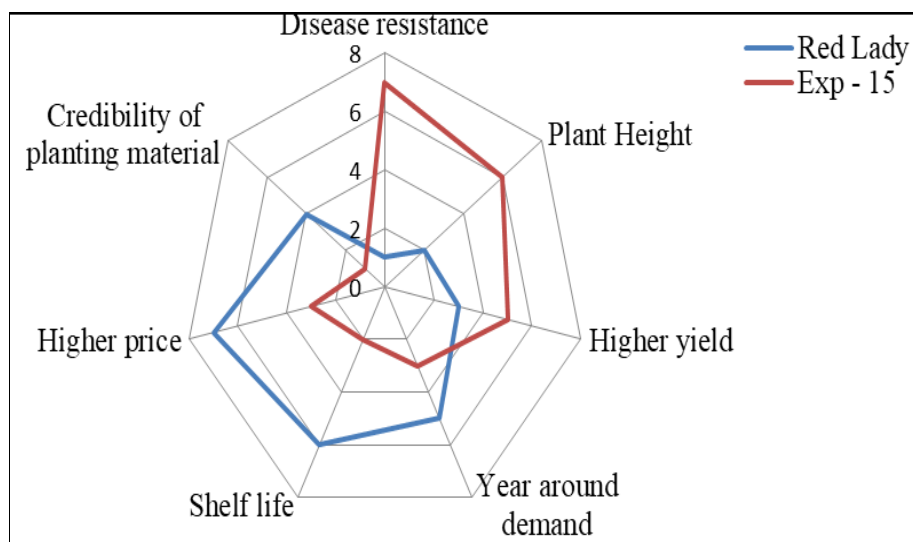


Fig 2: Comparison of attributes of papaya varieties

Another variety Exp-15, is gradually gaining popularity among the growers due to its higher resistance to Papaya Ring Spot Virus disease which reduces the cost of plant protection chemicals and also number of sprays required. This variety is particularly suitable for the farmers who are practicing intercropping of papaya with arecanut, as it grows quickly and provides shade to areca seedlings. Although Exp-15 is an open pollinated variety and does not guarantee cent per cent gynodioecious plants it is known for its higher number of fruits per plant and in turn higher yield.

3.2 The attributes of papaya cultivars preferred by farmers

The selection of specific papaya varieties in the study area is strongly influenced by attributes such as disease resistance, yield level, plant height, market price and shelf life, etc. Therefore, an effort was made to determine the specific

preferences that papaya farmers have regarding these characteristics. The cards generated for conjoint analysis were distributed to sample farmers in the district according to the sampling method. The farmers were asked to score the cards displayed. Table 3 presented the average partworths and the relative importance of the attributes of the papaya varieties in the study districts. A higher positive or lower negative partworth's indicates, ceteris paribus, a higher perceived utility of that particular attribute.

The results depicted that market price and disease resistance were the two key attributes preferred while selecting a variety by producer. The market price of the variety had the greatest influence, accounting for about 41.19 per cent of relative importance. A price above Rs.12 per kg was the most preferred with a utility value of 2.095, whereas a price below Rs. 6 per kg was the least preferred, with a utility value of -3.639 among sample farmers in the study area.

Table 3 Attributes of papaya cultivars preferred by sample farmers in study area

Sl. No.	Attributes	Attribute levels	Utility	Relative importance (%)
1	Market price	High (>Rs.12 per kg) Medium (Rs.6-12 per kg) Low(Rs.<6 per kg)	2.095 1.544 -3.639	41.19
2	Disease resistance	High resistance to PRSV Low resistance to PRSV	3.373 -3.373	31.63
3	Yield	High(>50kg/plant) Medium(<50kg/plant)	0.803 -0.803	13.99
4	Shelf life	Good (>7 days) Average (3-7 days) Poor (<3 days)	1.311 0.085 -1.225	8.87
5	Plant height	Tall Dwarf	-0.391 0.391	4.32
Total				100.00

Note: PRSV – Papaya Ring Spot Virus

Plant height has the least importance accounted only 4.32 per cent. However, disease resistance has a significant influence estimated for 31.63 per cent. Variety highly resistance to Papaya Ring Spot Virus was most preferred, with a utility value of 3.373, while yield is the third most influential factor in the farmer's decision to choose afore mentioned variety. Whereas the shelf life of fruits more than 7 days was preferred (utility value of 1.311) over those with

an average shelf life fruit between 3-7 days (utility value of 0.085). Similar results were obtained by Ajaykumar et.al., 2024 in their study on pigeonpea wherein farmers primarily inclined towards attributes such as output price, crop duration, resistance to pests and diseases and yield levels. Farmers prioritized varieties with higher output prices and shorter crop durations.

4. Conclusion

The study underscored the predominant preference for the Red Lady 786 and Exp –15 varieties among papaya growing farmers in North-Eastern Karnataka. Farmers showed a significant inclination towards varieties that offer higher prices, higher yields and disease resistance. While the Red Lady variety meets these critical attributes. Farmers' reliance on a single papaya variety in the study area poses a risk to biodiversity and resilience in papaya cultivation. Heavy reliance on a few varieties may increase vulnerability to pests, diseases and market fluctuations. To mitigate this, demonstrations should be conducted on new promising varieties to educate farmers about alternative high-potential varieties developed State Agriculture Universities' and Indian Council of Agricultural Research institutions.

References

1. Ajayakumar, Patil SS, Reddy BS, Hiremath GM, Goudappa SB. Preference analysis of pigeonpea varietal attributes among farmers and traders in Kalyana Karnataka region: A conjoint analysis approach. *Asian J Agric Ext Econ Soc.* 2024;42(5):404-411.
2. Anonymous. *Annual Report 2023-24*. Bengaluru: Department of Horticulture, Government of Karnataka, Lalbagh; 2024. p. 41-44.
3. Anonymous. FAOSTAT. Food and Agriculture Organization of the United Nations; 2024. Available from: <https://www.fao.org/faostat/en/>
4. Anonymous. Agricultural and Processed Food Products Export Development Authority (APEDA); 2024-25. Available from: <https://agriexchange.apeda.gov.in/>
5. Bhumika S, Chandrakar MR, Koshta AK, Jaiswal P. An economic analysis of papaya production in Durg district of Chhattisgarh. *Pharma Innov J.* 2022;11(8):90-93.
6. Biswas S, Kumar S, Rai AK, Nayak MM. An economic analysis of production of papaya in Bilaspur district of Chhattisgarh. *Int J Chem Stud.* 2019;7(3):2786-2788.
7. Datarkar SB, Darekar AS, Dangore UT, Parshuramkar KH. Economics of production and marketing of mango in Gadchiroli district of Maharashtra. *Int Res J Agric Econ Stat.* 2014;5(2):278-283.
8. Dhakane IP. The effectiveness of grape production under different vine growing conditions. *World Agric Econ Rural Sociol Abstr.* 2005;23(6):505.
9. Fare R, Grosskopf S, Norris M, Zhang Z. Productivity growth, technical progress, and efficiency change in industrialized countries. *Am Econ Rev.* 1994;84(1):66-83.
10. Farrell MJ. The measurement of productive efficiency. *J R Stat Soc Ser A.* 1957;120(3):253-281.
11. Gajanana TM, Sudha M, Saxena AK, Dakshinamoorthy V. Post-harvest handling, marketing and assessment of losses in papaya. *Acta Hort.* 2010;851:92-98.
12. Basavaraj G, Parthasarathy Rao P, Achoth L, Lagesh, Pokharkar VG, Gupta SK, Kumar AA. Understanding trait preferences of farmers for post-rainy sorghum and pearl millet in India: A conjoint analysis. *Indian J Agric Econ.* 2015;70(1):1-12.
13. Green PE, Srinivasan V. Conjoint analysis in marketing: New developments with implications for research and practice. *J Mark.* 1990;54(4):3-19.
14. Greenhalgh L, Neslin SA. Conjoint analysis of negotiator preferences. *J Conflict Resolut.* 1981;25(2):301-327.
15. Hair JF, Black WC, Babin BJ, Anderson RL, Tatham RL. *Multivariate Data Analysis*. 6th ed. Upper Saddle River (NJ): Pearson Education; 2006.
16. Hemambara HS, Yogesh MS. Production and marketing problems of papaya growers in North Karnataka. *IOSR J Bus Manag.* 2014;16(7):20-23.
17. Jagadeesh S, Ashok D, Chandana BM. Resource use efficiency analysis for watermelon production in Haryana and Karnataka. *Int J Agric Ext Soc Dev.* 2024;7(4):354-357.
18. James KN. An assessment of factors influencing adoption of improved mango varieties as an adaptation to climate variability in Kibwezi Division, Kenya [MSc thesis]. Kenya: Kenyatta University of Agriculture and Technology; 2010.
19. Javedmiyan, Kumar D. Economics of papaya in Bidar district of Karnataka. *J Pharmacogn Phytochem.* 2017;6(4):879-881.
20. Baidu-Forson J, Ntare BR, Waliyar F. Utilizing conjoint analysis to design modern crop varieties: Empirical example for groundnut in Niger. *Agric Econ.* 1997;16(3):219-226.
21. Klosowski R, Stevens T, Kittredge D, Dennis D. Economic incentives for coordinated management of forest land: A case study of southern New England. *For Policy Econ.* 2001;2:29-38.
22. Louviere JJ. *Analyzing Decision Making: Metric Conjoint Analysis*. Sage University Papers Series on Quantitative Applications in the Social Sciences, No. 07-067. Newbury Park (CA): Sage Publications; 1991.
23. Mafuru JM, Norman DW, Fox JS. Consumer perception of sorghum variety attributes in the Lake Zone, Tanzania. In: *AAAE Conference Proceedings*; 2007. p. 171-176.
24. Mukund. Supply chain management of mango in NEK region [MSc (Agriculture) thesis]. Raichur: University of Agricultural Sciences; 2018.
25. Nadkarni MV, Deshpande RS. Agricultural growth, instability in productivity and rainfall: Case of Karnataka. *Econ Polit Wkly.* 1982;17(52):127-134.
26. Nayak AK, Nahar S, Dinesh K. An economic analysis of marketing of banana (*Musa paradisiaca* L.) in Durg district of Chhattisgarh. *Int Res J Agric Econ Stat.* 2018;9(1):1-8.
27. Pawan D, Singh IJ, Rai KN. Cost-benefit analysis of ber cultivation in Rohtak district of Haryana. *Indian J Agric Mark.* 2002;16(2):49-52.
28. Ramachandra, Vinod Kumar. Production and marketing of papaya in Kaushambi district of Uttar Pradesh, India. *Trends Biosci.* 2013;6(3):311-312.
29. Rao VR. Developments in conjoint analysis. In: *Handbook of Marketing Models*. International Series in Operations Research and Management Science. Vol. 121. New York: Springer; 2008. p. 23-53.
30. Reddy S, Shivaraj B. Marketing channels and price spread of papaya in Karnataka. *J Agribus Dev Emerg Econ.* 2022;12(2):158-175.
31. Sanat Kumar S, Ravi Shrey, Choudhary VK. Prospects of papaya production in Raipur district of Chhattisgarh. *Pharma Innov J.* 2023;12(7):1476-1479.
32. Sayadi S, Roa MCG, Requena JC. Ranking versus scale rating in conjoint analysis: Evaluating landscapes in mountainous regions in southeastern Spain. *Ecol Econ.* 2005;55:539-550.