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Farmers preference towards various brands and problems faced by the farmers in obtaining quality tomato seeds

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Abstract
The predominance of tomato cultivation to know the Buying behavior of farmers, Brand Preference of farmers towards different tomato seeds, Factors influencing of purchasing of tomato seeds, Brand Switching behavior of farmers and constraints faced by farmers in Coimbatore district in hybrid seed marketing as well as cultivation of hybrid tomato. The primary data required for the study were collected through personal interview method with the help of a pre-tested interview schedule. Secondary data about the study area regarding agriculture and general information were collected from Government of Tamil Nadu. The primary and secondary data collected were tabulated, processed and subjected to statistical analysis. The multi-dimensional scaling technique was used to measure the preference level of the farmers. Farmers ranked top four attributes *viz*., brand, easy availability, stress tolerance and yield for Syngenta, Rasi, Mahyco, Namdhari and Indo American seed firms. Indo American and Namdhari preferred because of stress tolerance. Wide fluctuations in purchase of farmer's unstable brands are due to inconsistency in undertaking the promotional programmes coupled with less performance of farmers preference attributes. Besides every brand has its own salient feature in terms of cob filling and yield, (Syngenta), stress tolerance (Rasi), higher germination and early emergence (Mahyco) etc., and dealer's response to various promotional programmes of the seed firms. Besides the productivity differences among hybrid seeds are low hence farmers may switch over to other brands frequently.

Keywords: Tomato seeds, farmers preference, quality, yield

Introduction
India is the second largest producer of vegetables that account for 16 percent of the world production. More than 40 kinds of vegetables belonging to different groups, namely Cucurbits, Cole crops, Solanaceous etc., are grown in different agro climatic situations of the country. Major vegetables grown in India are Potato, Onion, Tomato, Cauliflower, Cabbage, Bean, Egg plants, Cucumber, Gherkin, Frozen Peas, Garlic and Okra. In India, the area under vegetables accounted for 94 lakh ha and with a production of 16.2 crore metric tonnes (Latha, 2018) [7]. Export of vegetables has increased from Rs. 4138.76 Crores in 2010-11 to Rs. 5462.93 Crores in 2012-13. The major importing countries of Indian vegetables are U.A.E, Pakistan, Sri Lanka, Nepal, and Bangladesh. Adoption of high yielding cultivars namely F_1 hybrids along with latest production technologies resulted in increased production through increased productivity. In recent years, Per capita consumption of vegetables has also increased from 293 grams to 363.2 grams per day (Pranav *et al*. 2023) [8].
Tomato (*Lycopersicon esculentum*) typically constitutes an essential part of the daily diet and it has great demand round the year. The commercial value of tomato in terms of direct consumption, processing as well as trade has risen substantially in recent years. Their economic importance has also increased by hybrid tomato replaced the open pollinated varieties. Hybrids produce higher yields, mature earlier with uniformity and which resulted in better fruit quality and resistant to disease. With all these advantages, majority of the farmers prefer to cultivate hybrids in spite of higher seed costs. Therefore, the quantity and quality of tomato seeds production has become most important to increases the market shares of the seed companies (Aneja 2017) [1].
The top ten major tomato producing countries are China, India, USA, Turkey, Italy, Egypt, Spain, Iran, Brazil and Mexico of the world area and production. China ranks first in an area under tomato 10 lakh hectares with annual production of 50 million tonnes fallowed by India ranks second in an area under 8.8 lakh hectare with annual production of 18 million tonnes.

With intensive cultivation of hybrids, the average yield under open field has been steadily increasing and the yield difference with developed countries was getting narrower (De and Iyengar 2014) [4]. The consumers were benefited by better quality of hybrids, in terms of eye appeal, keeping quality and all-important nutritional value. Realizing the benefits that accumulate in terms of productivity and the possibility of enhanced income, hybrid cultivation has become popular in traditional tomato cultivable land belts.

India was one of the top three vegetable seed producing countries in Asia practicing hand pollination, others being China and Thailand. In India, commercial seed production for export on a commercial scale was organized and started from 1970s by two private companies. A number of medium and small sized companies have begun to operate now in this venture covering seed production in most of the solanaceous and cucurbitaceous crops for domestic and export markets (Schreinemachers, 2021) [9]. They include Namdhari Seeds, Mahyco, Indo American Hybrid Seeds, Golden Seeds, Rasi Seeds, Dow Seeds, Oriental Biotech, Unicorn Biotech, etc. Custom production for export was mainly for companies in US, Europe and Japan ((FAO, ECA and AUC 2020) [5]. Tamil Nadu ranks ninth place in production of tomato among the states. Tomato occupies around 0.25 lakh hectares in the State with an average yield of 30-40 tonnes per hectare and an annual production of around 3 lakh tonnes (Coomes *et al.* 2015) [3]. The major tomato producing districts in Tamil Nadu are Coimbatore, Dharmapuri, Erode, Salem, Krishnagiri, Theni, Dindigal and Vellore. Coimbatore is the second largest tomato producing district of Tamil Nadu in terms of area and production. In Coimbatore district, tomato is cultivated in Alandurai, Karamadai, Mettupalayam, Kinnathukadavu, Velandhavaalam, Pollachi, Nachipalayam, Arisipalayam, Thrimalayampalayam, Chettipalayam etc. In Coimbatore market, more than 65% of the hybrid tomato is transacted. Hybrid tomatoes are most preferred among the market functionaries because of its longer shelf life (Gnanasekaran and Vijayalakshmi, 2014) [6].

India ranks second in world tomato production and it is steadily increasing to meet the needs of growing consumption and industry demand. Several tomato hybrid seeds are released by various seed companies and widely cultivated in major tomato growing areas of country and state. The buying behavior and preference of those tomato seeds by farmers vary from region to region and agro-climatic conditions based on suitability, yield parameters, availability of seeds in time and technical guidance to cultivate the crop. Seed producing firms need consistent periodical feedback information about the buying behavior and preference of their seed by the farmers. Such studies of the preference of seeds would help to reorient the product strategy by the seed firms and develop new hybrids suit to the region. With this background, the broad objectives of the study is designed to analyze the buying behavior aspects of tomato seeds by the seed producing firms, with the objective of Farmers' preferences for different brands and the challenges they have in finding high-quality tomato seeds

Materials and Methods

Selection of Study Area

The total area covered by tomato in Tamil Nadu is 0.25 lakh ha during 2013-14, major tomato producing districts are Coimbatore, Dharmapuri, Erode, Salem, Krishnagiri, Theni, Dindigal and Vellore. Among the eight districts, Coimbatore district was purposively selected, which accounted tomato area of 3033 ha.

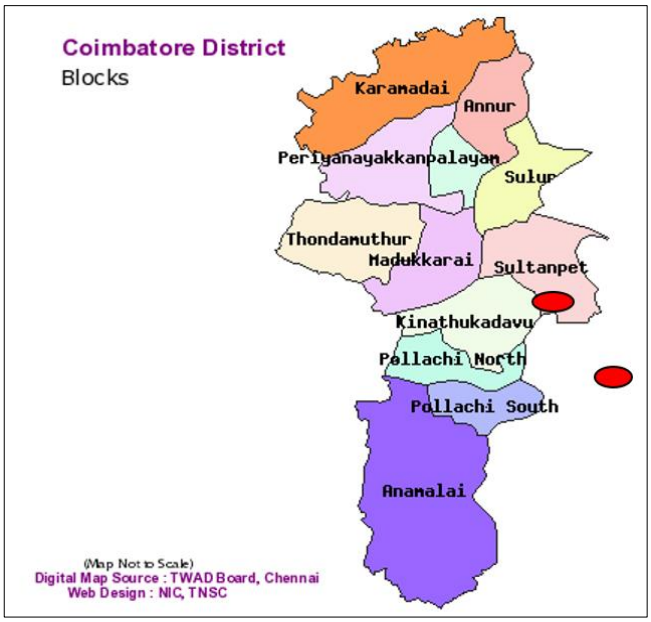

Fig 1: Coimbatore District map showing the Eleven Blocks

Sampling design

A multi stage sampling process was resorted to collect the data. Based on the maximum area under tomato, two blocks were selected from the Coimbatore district (first stage) and six villages were selected from each block (second stage). From each village 10 farmers were selected at random (third stage), and the total sample size was 120 farmers. The list of selected blocks, villages and selection of farmers are presented Table 1.

Table 1: List of selected villages and No. of Respondents in selected District.

S. No	District	Blocks	Villages	No of Farmers
1.	Coimbatore	Kinathukadavu	Muthur	10
			Govindhapuram	10
			Solanur	10
			Varadanur	10
			Kovilpalayam	10
			Devarayapuram	10
		Madhukarai	Nachippalayam	10
			Pichanur	10
			Arisipalayam	10
			Seerapalayam	10
			vallukuparai	10
			Maleripalayam	10
Total				120

Method of data collection

The data required for the present study were collected using well structured and pre-tested interview schedule. The data required for the study were collected by personally interview method. The data collected from the sample farmers included general characters like age, educational status, family type, experience in farming and tomato farming, land particulars, cropping pattern, different brand seeds used, and some of attributes farmers are looking in a hybrid tomato is buying

behavior, factors influencing the purchase of hybrid, farmers preference brand switching behavior and constraints faced by farmers for growing quality tomato.

Apart from the primary data, information from secondary sources like government institutes, government publications, other publication and annual reports were also collected.

Tools of analysis

The collected data were analyzed with reference to the objectives set forth for the study. The analytical techniques employed in this study are explained.

1. Conventional (Percentage) analysis
2. Factor analysis
3. Marko chain analysis
4. Garrett ranking technique
5. Multi-dimensional scaling technique

Results and Discussion

The present study was undertaken to analyze various aspects relating to the buying behaviour of tomato seeds at farmers level. The data collected from the sample farmers were tabulated and analyzed using appropriate statistical tools with reference to the objectives set forth earlier.

General characteristics of farmers

The general characteristics of sample farmers may have a significant impact on the purchase of hybrid tomato seeds. Hence the data on the general characteristics of sample farmers such as experience in farming, experience in tomato farming, family type, types of soil, sources of irrigation, total cultivable land etc., were analyzed.

Experience in farming

It could be observed form Table 2 that overall about 52.50 per cent farmers had experience of more than 30 years in farming, 31.67 per cent of sample farmers had experience of 21-30 years, 11.67 per cent of farmers had experience of 10-20 years and only 4.17 per cent of them had less than 10 years of experience. On the whole majority of farmers in the sample had vast experience in farming.

Table 2: Experience in Farming

District	Experience in Farming (Years)				Total No of Famers
	<10	10 to 20	21 to 30	>30	
Coimbatore	5 (4.17)	14 (11.67)	38 (31.67)	63 (52.50)	120 (100.00)

(Figures in the parenthesis indicate percentage to total)

Experience in tomato farming

It could be observed from the Table 3 that, most of the sample farmers 43.33 per cent had 10-15 years of tomato farming experience, followed by 30 per cent with 16-20 years of tomato farming experience and 20.83 per cent of them had more than 21 years of tomato farming experience while only 5.83 per cent of them had less than 10 years of tomato farming experience.

Table 3: Experience in Tomato Farming

District	Experience in tomato Farming (Years)				
	<10	10 to 15	16 to 20	>21	Total No. of Famers
Coimbatore	7 (05.83)	52 (43.33)	36 (30.00)	25 (20.83)	120 (100.00)

(Figures in the parenthesis indicate percentage to total)

Farmer's preference towards particular brand of hybrid tomato seeds

The farmers were asked to express their preference towards hybrid tomato seeds provided by hybrid companies. The major attributes discussed with farmers were brand, yield, stress tolerance, easy availability, credit, and price of seeds.

It could be inferred from the data, the attribute wise mean score indicated that farmers in Coimbatore district preferred Hybrid tomato seeds with brand (4.14) followed by easy availability (4.05), and stress tolerance (3.88). The farmers expressed satisfaction with regard to yield (3.69), credit (2.32) and price (2.17) respectively.

Company wise mean score indicated that farmers highly preferred Syngenta (3.63), followed by Mahyco (3.53) and Rasi (3.50) and while just satisfied with regard to Indo American (3.41) and Namdhari (3.29).

Brand switching behavior of farmers in tomato seeds

Markov Chain analyses were used to analyze the structural change in any system whose progress through time can be measured in terms of single outcome variable (Dent, 1967). In this study, the brand switching behaviors of tomato seed farmers were analyzed using the Markov Chain model. This analysis involves developing a Transitional Probability Matrix 'P' whose elements, P_{ij} indicate the probability of brand switching from i^{th} brand to j^{th} brand over a time. The diagonal elements P_{ij} where i = j measures probability of the brand to retain its loyalty position or the loyalty of the farmers to the particular branded tomato seed in Coimbatore district.

In this analysis, brand switching were treated as random process with the selected brands of farmers purchase assuming that the average purchase of tomato seed in the Coimbatore district in any year depends only on the purchase in the previous year and this dependence were same among all the years.

Markov analyses were employed to assess the brand switching behavior of farmers of the selected seed Company in Coimbatore district. The 5 years purchase details of the selected brands were used to estimate the transitional probabilities. The major seed firms selling tomato seeds in Coimbatore district are Syngenta, Rasi, Mahyco, Namdhari, and Indo American

The Transitional Probability Matrix is presented in Table 5 which indicates a broad indication of brand switching pattern of tomato seeds of the selected firms in the districts. The row elements in the transitional probability matrix provide the information on the extent of loss in brand preference on account of competing tomato seed brands. The column elements indicate the probability of gains in volume of purchase from other competing brands by the specific seed company and the diagonal elements indicate probability of retention of the previous brands of the respective tomato seed company.

It is inferred from Table 5 that Syngenta were the most stable brand among the major tomato seeds brands in the Coimbatore district as reflected by its probability of retention of 50.29 per cent of the previous share. This is plausible as the Syngenta and other firms promptly undertaken the major three promotional programs, advertisement campaign, retailers meeting and posters and banners. The most unstable brands among the tomato seeds are Mahyco, Namdhari, and Indo American care with zero per cent retention. Next to Syngenta, other brands and Rasi retained 21.53 per cent and 61 per cent

of previous share in the Coimbatore districts respectively. In terms of gains Syngenta brand gained 100 per cent of Indo American previous market share and simultaneously lost 43 per cent of its previous share to Rasi. Similarly other firms gained 75 per cent from Mahyco and lost 29 and 10 per cent to Namdhari and Mahyco respectively.

Table 5: Transitional probability matrix for tomato seeds purchase in Coimbatore district

Firms	Coimbatore District					
	Syngenta	Rasi	Mahyco	Namdhari	Indo American	Others
Syngenta	0.5029	0.4319	0.0000	0.0000	0.0652	0.0000
Rasi	0.1928	0.2153	0.0638	0.4709	0.0572	0.0000
Mahyco	0.0000	0.2447	0.0000	0.0000	0.0000	0.7553
Namdhari	0.0000	0.0000	1.0000	0.0000	0.0000	0.0000
Indo American	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Others	0.0000	0.0000	0.0974	0.2926	0.0000	0.6100

Factors Influencing the Farmers of Purchasing Hybrid Tomato seeds

Farmers were asked about the factors which are influenced by them in purchasing of hybrid tomato seeds in Coimbatore district and the results are presented in Tables 6.

Table 6: Factors Influencing Purchase of Hybrid Tomato among Farmers in Coimbatore District

Company	Factors Influencing Purchase of Hybrid Tomato among Farmers					
	Past Experience	Reference From Fellow Farmer	Insistence of the Retailer	Advertisement Campaign	Demonst rations	Number of Farmers
Syngenta	9 (22.50)	14 (35.00)	9 (22.50)	5 (12.50)	3 (07.50)	40
Rasi, pio	6 (30.00)	6 (30.00)	3 (15.00)	3 (15.00)	2 (10.00)	20
Mahyco	6 (30.00)	6 (30.00)	4 (20.00)	2 (10.00)	2 (10.00)	20
Namdhari	2 (10.00)	4 (20.00)	4 (20.00)	7 (35.00)	3 (15.00)	20
Indo American	3 (15.00)	3 (15.00)	5 (25.00)	6 (30.00)	3 (15.00)	20

(Figures in the parenthesis indicate percentage to number of farmers in each row)

It could be inferred from the Table 6 that factors influencing to purchase Syngenta seeds are reference from fellow farmer (35.00 per cent), past experience (22.50 per cent), and insistence of retailers (22.50 per cent). Rasi seeds the farmers are influenced by reference from fellow farmers (30.00 per cent), past experience (30.00 per cent), and insistence of the retailers (15.00 per cent). Mahyco influenced by following factors such as insistence of retailers (20.00 per cent), reference from fellow farmer (30.00 per cent) and past experience (15.00 per cent). In case of Namdhari seeds farmers are influenced by advertisement campaign (35.00 per cent), reference from fellow farmers (20.00 per cent), and insistence of the retailers (20.00 per cent). Finally, Indo American seeds farmers are influenced by advertisement campaign (30.00 per cent), insistence of the retailers (25.00 per cent) and reference from fellow farmers (15.00 per cent).

Constraints faced by farmers in cultivation of hybrid tomato seeds

A number of constraints were reported to be faced by farmers in cultivation of hybrid tomato. They were identified and the relative importance of the major factors as perceived by the farmers was assessed and the results are presented in Table 7.

Table 7: Constraints Faced by Farmers in cultivation of Hybrid tomato

Firms	Constraints						
	Low Yield	Non Availability of Credit	High Seed Cost	Climatic Challenges	Poor Germination	Marketing Problems	Total No. of Farmers
Syngenta	1 (03.30)	9 (30.00)	9 (30.00)	1 (03.30)	6 (20.00)	4 (13.30)	30
Rasi	2 (06.70)	3 (10.00)	9 (30.00)	5 (16.70)	2 (06.70)	9 (30.00)	30
Mahyco	4 (20.00)	5 (25.00)	10 (50.00)	0 (0.00)	0 (0.00)	1 (05.00)	20
Namdhari	4 (20.00)	4 (20.00)	5 (25.00)	0 (0.00)	7 (35.00)	0 (0.00)	20
Indo American	5 (25.00)	0 (0.00)	8 (40.00)	0 (0.00)	0 (0.00)	7 (35.00)	20

It could be inferred from Table 7 that while cultivating hybrid tomato, the major constraints faced by the sample farmers in Coimbatore district were poor germination, non-availability of credit, climate changes, low yield, high cost of seeds and marketing problem in that order. Among the sample farmers more than 72 per cent of farmers realized poor germination followed by high seed cost 67 per cent and non-availability of credit 62 percent. As hybrid tomato cultivation require a substantial amount of money, majority of farmers could not get credit from the official agencies and they have to depend on non-institutional sources which charges higher interest. Both bore well and open well forms the major source of irrigation in Coimbatore districts. Tomato is being cultivated predominantly under rain fed condition (70-80 percent of

area). Periodical drought and inadequate rainfall in these districts force the farmers to reduce their area under cultivation and also productivity is widely affected. High seed costs have been felt by 40 per cent of farmers as it leads to high cost of cultivation. Wide fluctuation in price of tomato contributed for low profitability of tomato growers. The cost of seeds varied from Rs 130-225 per kg of seed depending on the brands. Non-availability of adequate credit, coupled with poor germination of seeds of certain firm may contribute for low yield as pronounced by 50 per cent farmers. Thus major constraints are poor germination, non-availability of credit, climatic challenges, low yield and marketing problem, respectively.

Conclusion

It is clear that the best packing and labeling, availability at the appropriate time, longer credit period, and higher dealers' margin are also important, and that these may be the main aspects of promotion that need to be taken care of for achieving consistent performance. Farmers preference, company image, and brand performance are important attributes of dealers' preference, and they even had a significant impact on the performance of leading brands. In order to better promote the products, promotional events such as retailer meetings, advertisements, and posters and banners should be increased. In addition to trials and demonstrations, free sample distribution should be included while evaluating the items' potential in the particular area. Advertising campaigns and demonstrations are proven to be the key aspects that need to be strengthened with adequate budget allocation, even in the face of recommendations from other farmers, past experience, and the dealer's insistence.

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