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Prediction of consumer preferences for groundnut quality based on a market derived preference index

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PREDICTION OF CONSUMER PREFERENCES FOR GROUNDNUT QUALITY BASED ON A MARKET DERIVED PREFERENCE INDEX

Contents

Abstract

Prediction of customer preferences for newly bred groundnut varieties is possible through a market derived preference index. Development of this methodology, and its application are presented in this paper.

Analysis of 370 groundnut market samples collected from 5 markets in India indicate that a set of seven quality characteristics explained around 65% of the variation in prices across lots. Using these estimated coefficients as weights, preference indices were predicted for 15 ICRISAT groundnut samples. Field verification of these 15 samples were assessed by traders who quoted hypothetical prices. Comparision between traders' hypothetical prices and predicted preferences showed poor correlation. Further investigations revealed traders' had diffculties in assessing new varieties. Further, preference indices were predicted for market samples and compared with the market price. It yielded satisfactory correlation coefficients.

This methodology shows some potential for large scale screening of newly bred groundnut varieties for customer preferences.

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Introduction

The central focus of this paper is to develop a methodology to predict consumer preferences for newly bred groundnut varieties. This study is based on the observation that, in any assembling market in India, there are substantial price variations across different lots of groundnut pods transacted on any market day. These variations are due to differences in the quality mix i.e., the combination of different quality characteristics, from one lot to another. Some of these quality factors have a positive and others a negative influence on price. If these quality

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characteristics are identified and their contribution to price quantified, the quality mix in any new variety can be assessed and customer preference can be predicted.

The objective of this paper is to quantify the influence of relevant quality characteristics on groundnut price and to predict customer preference for new groundnut varieties based on these estimates [1].

The paper is divided into four sections. In Section I the relationship between price and quality characteristics is estimated. Section II deals with the prediction of a customer preference index for 15 ICRISAT bred groundnut varieties. In Section III consistency tests are carried out to validate the predicted preference index. Summary and conclusions are presented in Section IV.

Estimation of Relationship between Price and Quality Characteristics

Identification of quality characteristics:

Since most groundnuts are processed for oil, demand for groundnuts is determined by factors affecting oil extraction. Groundnuts are also consumed in marginal quantities for confectionery purposes. Groundnut buyers, therefore, generally prefer characteristics reflecting good

quality and quantity of oil. Given our experience with groundnut markets, and after discussions with traders and breeders of groundnuts, the following seven quality characteristics were identified.

a. Shelling percentage;
b. Hundred seed weight;
c. Moisture content;
d. Percentage of shrivelled seeds;
e. Percentage of damaged seeds;
f. Percentage of infested pods; and
g. Oil content.

The first three characteristics are related to the quantity of oil out-turn and the last three are related to the quality of oil.

a. **Shelling percentage:** Higher shelling percentage (percentage of seed weight in pod weight) implies more kernels and less waste. Therefore, we hypothesize that prices increase with an increase in shelling percentage. An experienced buyer can estimate the shelling percentage by taking a handful of pods, throwing them up and judging their impact when they fall back into the palm; and also by shelling a few pods and examining the extent of seed development.

b. **Hundred seed weight:** Within a cultivar, seed size and weight depends upon the extent of seed maturity. It is

generally felt by traders that oil content is higher in fully developed seeds as compared to underdeveloped seeds. Therefore, traders prefer lots with higher seed weight over those with lower seed weight. Hence we expect prices to increase with an increase in hundred seed weight. Traders estimate seed weight by opening a few pods and examining the seeds.

c. **Moisture content:** Moisture content around 7% is acceptable. The maximum moisture content for the safe storage of pods is 9% and for kernels 7% (Feakin 1973). Therefore, we hypothesize that the higher the moisture content, the lower is the price. Buyers estimate moisture content by holding pods in the palm, and some times by pressing the seeds with fingers.

d. **Percentage of shrivelled seeds:** Traders believe that shrivelled seeds contain less oil and possibly more aflatoxin. Therefore, the higher the percentage of shrivelled seeds, the lower is the quantity of oil and hence the lower the price. Shrivelled seeds are distinguished by visual examination.

e. **Percentage of damaged seeds:** The oil in damaged seeds tends to become rancid and therefore unacceptable to the consumers. Color and smell are affected and also the aflatoxin content increases. Therefore, the higher the percentage of damaged seeds, the lower is the customer

preference, hence the lower the price. Traders distinguish damaged seeds from good seeds on the basis of seed color.

f. **Percentage of infested pods:** Two types of pod infestation are noticed; a) pod borer, and b) pod scarification. In the case of the former, either the pods are hollowed out or kernels are damaged. In the case of the latter, the shell becomes weak as the outer layer of the shell is removed by the insects. In both situations, kernels tend to get damaged further during storage. Thus, pod infestation leads to seed damage and losses. It is hypothesized that a higher percentage of pod infestion is associated with a lower price. Pod infestation is recognized by visual examination.

g. **Oil content:** Oil content varies with the cultivar, the location where it is grown, and growing conditions. Quality characteristics such as shelling percentage, and seed weight have a linear relationship with oil content. It is hypothesized that the higher the oil content, the higher is the price. Experienced buyers are able to identify the cultivar, by inspecting the pods and seeds. From experience they also know which cultivar is grown in which area and whether it has a higher or lower oil content.

Sample collection

Two sets of groundnut pod samples along with price data were collected from Andhra Pradesh and Gujarat, prominent groundnut growing states in India.

- 163 postrainy season (irrigated) pod samples were collected during May 1984 from Adoni market in Andhra Pradesh.

- 207 rainy season (rainfed) pod samples were collected during January-February 1985, from 4 important groundnut markets in Gujarat i.e., Amreli, Savarkundla, Gondal, and Rajkot.

Measurement of relevant quality characteristics

The following procedures were followed to measure quality characteristics of the samples.

1. Pods were shelled and the weight of husks and kernels were taken to derive shelling percentage.

2. Kernels were sorted into shrivelled, damaged, and whole kernels, and the weights were taken to derive their percentage shares in total kernel weight.

3. Sound, matured kernel weight was measured and the number was counted to derive hundred seed weight.

4. Number of scarified and bored pods were counted to derive percentage number of infested pods in total pods.

5. Kernels were analyzed for oil and moisture content. Oil content was analyzed by Nuclear Magnetic Resonance Spectrometer method.

Statistical analysis

Multiple regression analysis was used to estimate the relationship between market price and various quality characteristics [2]. The estimated equation was as follows:

$$\log P_i = \beta_0 + \beta_1 \log SH_i + \beta_2 \log OL_i + \beta_3 \log SW_i + \beta_4 \log BG_i + \beta_5 SS_i + \beta_6 DS_i + \beta_7 PI_i + \beta_8 D_{1i} + \beta_9 D_{2i} + \beta_{10} D_{3i} + \beta_{11} D_{4i} + U_i$$

P_i = Price of i th sample (in Rs/Qtl)

SH_i = Shelling percentage of i th sample

OL_i = Oil content (% in seed) in i th sample

SW_i = Hundred seed weight of i th sample (in grams)

M_i = Moisture content (% in pods)

SS_i = Percentage of shrivelled seed weight in total seed weight for i th sample

DS_i = Percentage of damage seed weight in total seed weight for i th sample

PI_i = Percentage of infested pods in i th sample

D_1 to D_4 = Market dummies for i th sample

U_i = Error term.

Results

The means and coefficients of variation (C.V) for prices and quality characteristics are shown in Table 1. Higher shelling percentage and lower percentage of shrivelled seeds in Adoni market compared with markets in Gujarat may be explained by the fact that samples from Adoni represent the rabi crop. Since groundnut is irrigated in rabi season, pods tend to be uniformly well-developed.

Correlation coefficients between price and selected quality characteristics are presented in Table 2. In all the three sets, except hundred seed weight all the other quality characteristics showed expected relationship with price. Since correlation coefficents between quality characteristics are not high, multicolliniarity among

Table 1. Means and variability of relevant quality characteristics.

Quality characteristics	Mean	C.V.[1]	Minimum	Maximum
Adoni market (n^2=163)				
Price (Rs/100 kg)	446.0	9.4	236.9	487.3
Shelling rate (%)	69.6	7.1	44.4	83.0
Oil content (% in kernel)	45.1	4.9	36.7	50.5
Hundred seed wt (gms)	29.6	14.8	17.8	38.6
Moisture content (% in pods)	6.2	8.3	3.9	9.7
Shrivelled seed wt. (%)	5.2	78.0	0.8	20.2
Damaged seed wt. (%)	2.5	206.2	0.0	29.4
Infested pods (%)	1.8	245.4	0.0	32.8
Gujarat markets (n =207)				
Price (Rs/100 kg)	476.0	6.9	330.0	540.0
Shelling rate (%)	65.4	7.9	39.2	74.1
Oil content (% in kernel)	46.6	4.5	40.9	52.9
Hundred seed wt. (gms)	36.6	14.1	22.9	57.4
Moisture content (% in pods)	5.3	6.2	4.0	6.8
Shrivelled seed wt. (%)	14.7	58.4	1.0	44.8
Damaged seed wt. (%)	1.9	194.9	0.0	46.7
Infested pods (%)	6.1	90.2	0.0	25.5
Adoni and Gujarat markets combined (n =370)				
Price (Rs/100 kg)	462.7	8.6	236.9	540.0
Shelling rate (%)	67.2	8.2	39.2	83.0
Oil content (% in kernel)	45.9	4.9	36.7	52.9
Hundred seed wt. (gms)	33.5	17.8	17.8	57.4
Moisture content (% in pods)	5.7	10.4	3.9	9.7
Shrivelled seed wt. (%)	10.5	79.7	0.8	44.8
Damaged seed wt. (%)	2.1	203.9	0.0	46.7
Infested pods (%)	4.2	130.3	0.0	32.8

1 = Coefficient of variation in %.
2 = Number of Observations.

Table 2. Correlation matrix of transformed variables

	Log price	Log shell%	Log oil%	Log 100 seed wt.	Shrivelled seed[1]	Damaged seed[1]	Log moisture	Infested pods[2]
Adoni market (N[3]=163)								
Log price	–							
Log shell%	0.58**	–						
Log oil%	0.19	0.06	–					
Log 100 seed wt.	0.32**	0.52**	0.06	–				
Shrivelled seed	0.42**	-0.56**	-0.20*	-0.34**	–			
Damaged seed	-0.61**	-0.35**	-0.03	0.05	0.11	–		
Log moisture	-0.27**	-0.19	-0.38**	-0.11	0.16	0.32**	–	
Infested pods	-0.45**	-0.09	-0.10	0.08	0.03	0.68**	0.01	–
Gujarat markets (N =207)								
log price	–							
Log shell%	0.69**	–						
Log oil%	0.24*	0.24*	–					
Log 100 seed wt.	-0.24*	0.01	0.12	–				
Shrivelled seed	-0.43**	-0.62**	-0.14	0.13	–			
Damaged seed	-0.37**	-0.11	-0.07	-0.03	-0.03	–		
Log moisture	-0.26**	-0.35**	-0.37**	-0.12	0.20**	0.06	–	
Infested pods	-0.37**	-0.32**	-0.04	0.24*	0.13	0.24*	0.05	–
Adoni and Gujarat markets combined (N =370)								
Log price	–							
Log shell%	0.40**	–						
Log oil%	0.30**	0.03	–					
Log 100 seed wt.	0.26**	-0.03	0.26**	–				
Shrivelled seed	-0.09	-0.65**	0.07	0.32**	–			
Damaged seed	-0.51**	-0.18	-0.07	-0.03	-0.03	–		
Log moisture	-0.42**	0.08	-0.48**	-0.48**	-0.30	0.21	–	
Infested pods	-0.20*	-0.34**	0.08	0.36**	0.30**	0.37**	-0.26**	–

1. % in total seed weight.
2. % in total pod number.
3. Number of observations.

** significant for P < 0.01.
* significant for P < 0.05.

explanatory variables is not expected in the regression estimate.

The regression results based on the model described earlier are shown in Table 3. In Adoni (Estimation I) the equation explains 57% of the variation in price while in Gujarat (Estimation II) it explains 71% [3]. The coefficients for shelling percentage, oil content, moisture content, and damaged seed weight are nearly similar in both these estimates. Hundred seed weight has a negative coefficient, but is insignificant in Gujarat. Although shriveled seed and infested pods show negative relation in both the estimates, their coefficients are significant only in Adoni. Estimation III (Adoni and Gujarat markets together) explains 65% of the variation in prices. In this estimation all the explanatory variables have expected signs. All variables other than moisture content and shriveled seed came out significant. As expected, market dummies in estimation II and III are significant indicating significant absolute price differences between these markets.

Prediction of Customer Preferences for New Varieties

Based on the above estimates, a customer preference index was derived for 15 ICRISAT groundnut samples in the following manner.

Table 3. Market price as a function of quality characteristics of groundnuts - multiple regression coefficients.

Variable description	Estimation I[1]	Estimation II[2]	Estimation III[3]
Intercept	3.6330	3.7924	3.4434
Quality characteristics			
Log shelling %	0.3363**	0.4142**	0.3680**
	(3.0)	(8.5)	(6.9)
Log oil% (kernel)	0.2009	0.1872**	0.2304**
	(1.5)	(2.8)	(3.2)
Log 100 seed weight (gms)	0.1160**	-0.0193	0.0852**
	(2.6)	(0.7)	(3.3)
Log moisture (% in pods)	-0.0386	-0.0208	-0.0244
	(0.4)	(0.4)	(0.5)
Shrivelled seed wt.	-0.0042**	0.0000	-0.0008
	(2.5)	(0.0)	(1.3)
Damaged seed wt.	-0.0084**	-0.0064**	-0.0085**
	(4.5)	(8.2)	(10.5)
Infested pods	-0.0038*	-0.0005	-0.0015*
	(2.0)	(0.8)	(2.1)
Dummy variables for markets			
Amreli	-	0.0362**	0.0617**
		(4.3)	(4.3)
Savarkundla	-	0.0792**	0.1225**
		(7.2)	(10.9)
Gondal	-	0.0399**	0.0611**
		(5.2)	(4.1)
Rajkot	-	-	0.0247
			(1.6)
Adoni	-	-	-
R^2	0.57	0.71	0.65
F ratio	32.2	51.1	62.0
No. of observations	163	207	370

1. Adoni market; 2. Gujarat markets; 3. Adoni and Gujarat markets combined.
4. Figures in parentheses are 't' values

** significant for $P < 0.05$; * significant for $P < 0.01$

- Samples were analyzed for all quality characteristics specified in the estimation.

- The amount found for a particular quality characteristic was multiplied by its corresponding regression coefficient to get a weighted value for that quality.

- The weighted values of all the quality characteristics were added according to the functional form used in the estimation. This gives the predicted value of customer preference.

- Taking the sample with the lowest predicted value as base, an index was computed for all the samples. This index reflects customers relative preferences for these 15 samples.

- Ranks were given to these index values in descending order.

With the above procedure, three sets of customer preference indices were computed (Table 4) for these 15 samples by using the three sets of regression coefficients reported in Table 3.

Correlation coefficients between these three indices are high (Table 5). Index C registered a correlation coefficient of 0.94 with indices A and B as against 0.84 between indices A and B. Rank correlation coefficients also

Table 4. Estimated preference indices and traders' preference index for 15 ICRISAT groundnut samples.

Sample No.	Index A[1]		Index B[2]		Index C[3]		Traders' Index	
	Value	Rank	Value	Rank	Value	Rank	Value	Rank
11	133.7	2	112.0	2	120.2	1	107.9	4
1	133.4	4	112.2	1	118.9	2	111.7	1
14	133.1	5	110.4	6	118.5	3	103.0	14
15	133.0	6	110.8	4	118.3	4	103.5	13
13	134.3	1	111.0	3	117.8	5	111.0	2
12	133.5	3	106.5	10	116.7	6	110.9	3
6	120.4	8	109.4	7	115.9	7	107.0	5
8	123.9	7	110.5	5	114.1	8	106.6	6
10	119.1	9	107.5	8	111.9	9	106.2	9
5	112.5	11	106.6	9	106.6	10	106.4	8
4	114.9	10	103.4	12	105.1	11	106.5	7
9	108.9	13	104.5	11	103.8	12	103.6	12
7	100.0	15	102.9	13	102.7	13	100.5	15
2	112.0	12	101.1	14	100.1	14	105.6	10
3	106.7	14	100.0	15	100.0	15	104.9	11

1. Using Adoni market estimates.
2. Using Gujarat markets estimates.
3. Using Adoni and Gujarat markets combined estimates.

Table 5. Matrix of simple and rank correlation coefficients between estimated preference indices and traders' index for 15 newly bred ICRISAT varieties.

	Index A	Index B	Index C	Traders' index
		*** Simple Correlations ***		
Index A	-			
Index B	0.82	-		
Index C	0.94	0.94	-	
Traders' index	0.59	0.35	0.46	-
		*** Rank Correlations ***		
Index A	-			
Index B	0.83	-		
Index C	0.92	0.92	-	
Traders' index	0.62	0.45	0.44	-

confirm these results (Table 5). This implies that all three data sets would produce similar indices. For instance, if one is interested in choosing the seven best varieties out of 15 samples, six samples would be common in all the three indices. Further analysis and discussion are confined to index C only.

Validity Tests for Predicted Preference Index

To verify whether the predicted index truely reflects the preferences of groundnut customers, an assessment of these 15 samples was requested from 14 traders in Badepally and Mahbubnagar markets, prominent groundnut markets in the Telangana region of Andhra Pradesh. These traders were requested to give a hypothetical price in line with the current ruling market price. For each sample simple mean of all the traders' price was derived [4]. Taking the sample with the lowest mean price as base, a traders' index was computed and ranks were given in descending order (Table 4).

A comparison of traders' index and predicted index C is presented in Figure 1. Similarly, a comparison of ranks between these two indices are presented in Figure 2. Samples 1 and 10 have the same ranks in both the indices (Figure 2). Samples 7, 11, 14 and 15 received lower predicted ranks than what traders assessed, while the opposite is true for the remaining samples [5].

Figure 1. Valuation of 15 groundnut varieties according to estimated preference index and trader's preference index. (The number with the dot indicates the sample number).

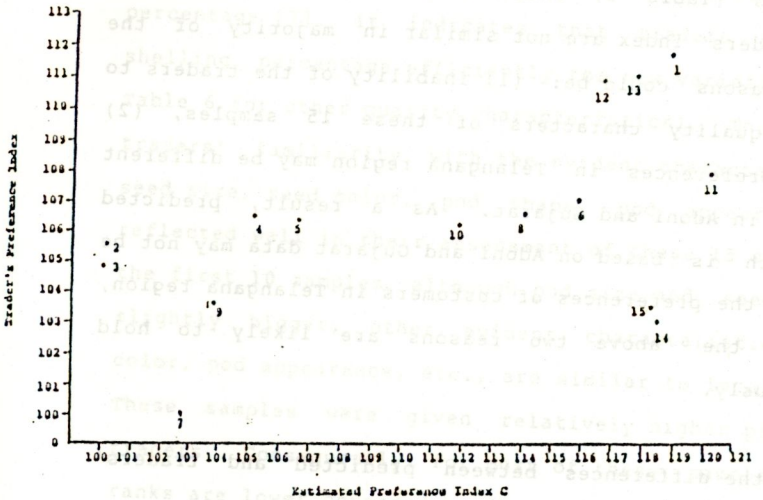
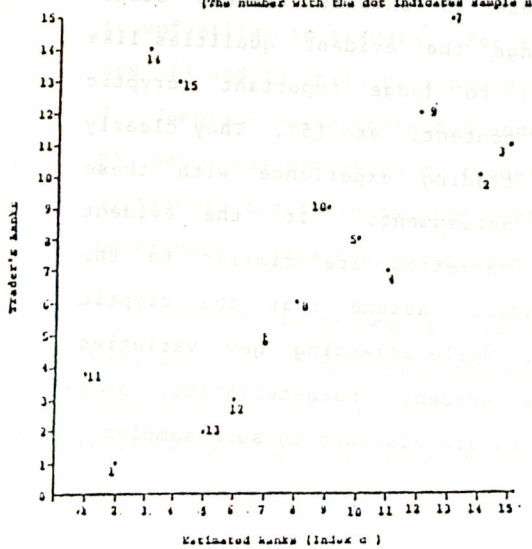


Figure 2. Predicted ranks and trader's ranks for 15 groundnut varieties (The number with the dot indicates sample number).



Comparision of these results and the correlation coefficients (Table 5) indicates that the predicted index and the traders' index are not similar in majority of the cases. Reasons could be: (1) inability of the traders to assess the quality characters of these 15 samples, (2) customer preferences in Telangana region may be different from those in Adoni and Gujarat. As a result, predicted index which is based on Adoni and Gujarat data may not be reflecting the preferences of customers in Telangana region, and (3) the above two reasons are likely to hold simultaneously.

Resolving the differences between predicted and traders' indices

At the time of assessing these 15 samples traders stated that they can easily judge the evident qualities like shelling percent but fail to judge important cryptic characteristics like oil content, etc [6]. They clearly stated that they need some trading experience with these varieties for correct assessment. If the evident characteristics of the new varieties are similar to the existing varieties, traders assume that the cryptic qualities are also similar. While assessing new varieties if they found unfamiliar evident characteristics, as a matter of caution, low prices are assigned to such samples.

For the 15 samples, shelling percentage estimated by traders is not significantly different from actual shelling percentage [7]. It indicates that traders can estimate shelling percentage efficiently for new varieties also (see Table 6 for other quality characteristics). The extent of traders' familiarity with the evident characteristics like seed size, seed color, pod shape, pod appearance, etc., reflected well in their assessment of these 15 samples. For the first 10 samples, although pod size and seed size are slightly bigger, other evident characteristics like seed color, pod appearance, etc., are similar to local varieties. These samples were given relatively higher preference by traders. Consequently, for most of these samples traders' ranks are lower compared to the estimated rank numbers. For the last two samples, besides thick shell and unfamiliar pod appearance, seed color is a very pronounced dark red which is unfamiliar to traders. For these samples traders ranks are 13 and 14 while corresponding predicted ranks are 3 and 4. Sample 7 which contained abnormally high moisture (Table 6) was less preferred by traders [8]. This low preference by traders for these samples reflected in higher rank number in traders' index over predicted index.

Traders' inability to assess cryptic characteristics was noticed in another study conducted among 12 traders in Gujarat state and 4 traders in Andhra Pradesh. In this study each trader was asked to give a hypothetical price for four varieties under two situations; (1) without any

Table 6. Values of the specified quality characters for 15 newly bred ICRISAT varieties.[1]

Sample No.	Shelling %	Oil (%)[2] (kernel)	Hundred seed weight (grams)	Moisture (%) (pods)	% of Shrivelled seed weight[2]	% of damaged seed weight[2]	Infested pods %
1	74.0	44.4	42.3	8.1	7.8	0.5	0.0
2	68.0	36.2	30.2	6.9	7.6	6.4	6.1
3	64.2	35.2	31.2	6.4	17.1	3.4	10.2
4	66.3	37.4	33.2	7.0	10.5	1.7	8.9
5	68.9	39.7	31.1	6.4	11.4	0.9	20.7
6	67.5	47.4	47.1	7.7	29.1	0.0	3.3
7	67.6	43.2	36.7	30.1	22.5	1.2	30.7
8	69.4	48.2	34.2	7.9	13.1	1.7	3.2
9	66.6	39.9	29.3	6.4	15.6	2.2	17.0
10	69.7	45.7	42.0	9.6	17.9	3.1	7.0
11	73.1	44.4	50.8	5.5	6.9	0.0	9.9
12	69.6	42.8	62.6	4.9	4.6	3.5	6.3
13	70.6	43.6	40.9	5.4	4.1	0.0	1.2
14	70.9	43.9	48.7	5.2	9.4	0.8	2.6
15	71.7	44.3	45.8	5.6	7.9	1.0	2.7

1. values derived from laboratory test.
2. % in total seed weight.

information on quality, and (2) with information on shelling percentage and oil content. Among these four varieties, Gujarat traders were familiar with two varieties while Andhra Pradesh traders were familiar with only one variety.

On the whole, in Gujarat lower prices were assigned when the samples were presented together with information on quality while the opposite is true in Andhra Pradesh (Table 7). This was explained by the traders as follows: when the information was not available it was assumed that the cryptic characters, particularly oil content, were similar to locally traded samples. When the information on oil content was provided they realized that oil content was below expected levels, hence, the price was reduced. Interestingly the rate of decline was higher for familiar samples (local and JL 24) when compared to new samples i.e., (FDRS 10 and FDRS 18). Traders stated since they cannot estimate the cryptic characters for new varieties, to avoid risk of loss they give a low price until they gain some experience. Therefore, they gave very low prices for FDRS 10 and FDRS 18 at the first instance, but they realised later these were better than they expected.

Andhra Pradesh traders in contrast to Gujarat traders, quoted higher prices when quality information was provided. When samples were shown without information they assumed that the oil content was similar to locally grown varieties. When quality data was provided they realised that these samples contained 2 to 3% more oil than they expected.

Table 7. Percentage increase/decrease in traders' hypothetical price for four groundnut varieties when information on quality are provided compared to the hypothetical price given when information was not provided.

Trader No.	Groundnut varieties 1	2	3	4
Gujarat				
1	- 6.3	-15.8	- 5.9	-11.1
2	- 8.4	- 4.8	- 5.0	- 5.0
3	- 2.9	- 1.0	+16.5	+13.3
4	-33.3	-40.0	- 3.0	-12.5
5	- 1.1	- 2.2	-25.2	- 3.4
6	- 1.0	- 2.0	+11.8	- 1.8
7	0.0	+ 0.4	- 4.5	- 2.2
8	+ 4.2	0.0	+ 4.4	+ 1.7
9	- 8.4	- 4.9	0.0	+ 0.4
10	- 5.1	- 2.7	- 5.7	+ 5.7
11	- 5.0	- 2.1	+ 3.9	+ 4.4
12	+ 2.2	+ 2.1	-10.0	+ 2.2
Average	- 5.1	- 6.1	- 2.2	- 0.4
Andhra Pradesh				
1	- 3.4	- 1.9	+ 0.5	+ 6.1
2	- 4.6	+ 1.2	0.0	0.0
3	+ 5.2	+ 9.0	+20.0	+22.1
4	- 2.4	0.0	+ 6.6	+ 2.6
Average	- 1.4	+ 1.9	+ 6.7	+ 7.6

\- indicates decline in price when information on quality are provided
\+ indicates increase in price when information on quality are provided.

Therefore, they quoted a higher price when the information was provided.

This analysis shows that the traders are unable to judge cryptic characteristics of unfamiliar groundnut varieties. This inability could be one of the major reasons for low correlation between predicted index and traders' index.

To over come this limitation, a validity test was conducted. Market samples with price data were collected from Mahaboobnagar market. These samples were analyzed in the laboratory for the specified quality characteristics and three sets of preference indices were predicted using the three sets of regression coefficients presented in Table 6. The predicted indices showed fairly satisfactory correlations with the market price (Table 8) [9]. It implies that predicted preferences truly reflect the consumer preferences.

Summary and Conclusions

Groundnut prices vary from one lot to another in assembling markets on any day due to variations in the quality mix, reflecting preferences of groundnut users for certain qualities over others. If these quality characteristics are identified and quantified, the estimates serve as weights for the mix of relevant qualities for predicting the overall

Table 8. Matrix of correlation coefficients between market price and estimated preference indices of weighted average quality characteristics.[1]

(N = 22)

	Market price	Index A[2]	Index B[3]	Index C[4]
Market price	1.00			
Index A	0.58	1.00		
Index B	0.82	0.67	1.00	
Index C	0.67	0.98	0.76	1.00

1. For 22 market samples collected from Mahabubnagar market in Andhra Pradesh.
2. Using Adoni market estimates.
3. Using Gujarat market estimates.
4. Using Adoni and Gujarat market combined estimates.

customer preference of any new groundnut variety.

A total of 370 groundnut pod samples with price data were collected from 5 markets in Andhra Pradesh and Gujarat states in India. Multiple regression analysis indicated that around 65% of the variation in prices across lots can be explained by a set of seven quality characteristics. Using these estimated coefficients as weights, three sets of customer preference indices were predicted for 15 ICRISAT groundnut samples. These indices were highly correlated indicating that all of them produce similar indices. For field verification, traders' index was also prepared based on the hypothetical prices given by traders. It showed low correlation with predicted indices due to traders difficulties in assessing new varieties which are unknown to them. Preference indices predicted for market samples showed fairly satisfactory correlation with market prices implying that the predicted preferences properly reflect the consumer preferences.

This methodology offers potential for large scale screening of newly bred groundnut varieties for consumer preferences.

Notes

[1] This methodology was developed by von Oppen (1976) and applied for predicting preference index for newly bred sorghum varieties; von Oppen (1978a), (1978b), von Oppen and Jambunathan (1978), Bapna and von Oppen (1980), von Oppen and Rao (1982), and Rao and von Oppen (1983).

[2] Generally, levels of prices and quality characteristics vary from day to day, and from market to market. When samples are collected on different days from different markets they have to be standardized for comparability. In an earlier study von Oppen (1976) the daily averages of price and each of the quality characteristics were considered as reference values. The difference between actual observation and the reference value was used for analysis. In the present study, since each market was covered on one day, dummy variables for markets are included in the estimation. Only in Adoni market samples were collected on two successive days. As there was not much variability either in price or quality characteristics between these two days, they are considered as one day.

[3] For a detailed discussion on the Adoni market estimates see Narasimham et al. (1985).

[4] To reduce the weightage of extreme cases (cases in which either very high or very low prices were given) in the representative price, Robust mean is also computed. Since simple mean and Robust mean are same, simple mean is retained for analysis. For details on Robust mean see Tiku and Singh (1981).

[5] Since ranks were given in descending order, one must understand that the higher the rank number, the lower is the customer preference.

[6] An earlier study by von Oppen (1978a) on sorghum index has also identified the same problem. Analysis of the hypothetical prices given by traders for 92 sorhum samples showed that only the evident characteristics reflected in the traders assessment while none of the cryptic characteristics contributed significantly.

[7] Traders were also asked to estimate the shelling percentage for each sample. For each sample simple average of all the traders has been considered as traders' shelling percentage. t-tests indicated that the traders' shelling percentage is not significantly different from actual shelling percentage ($t=1.05$; $df=28$).

[8] Laboratory test indicated that sample 7 contained 30% moisture. By the time it was shown to traders it lost part of that moisture due to a 4 days time lag.

[9] In Mahaboobnagar market commercial grades are asigned to all lots offered for sale. Buyers offer single price to all lots which have the same grade specification. Therefore, all lots with the same grade specification get the same price inspite of variations in quality. For our purposes of prediction , instead of taking each lot as an observation, all the lots with the same grade specification are treated as a single observation by calculating weighted average qualities (quantity sold in each lot is the weight).

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