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## Farmers' Perceptions of Quality of Groundnut: Vis-à-vis Farmers' Characteristics

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### Abstract

*Groundnut is an important oil seed crop of India. In spite of its high nutritive value, 80% of the total production is utilized for oil extraction. It has great potential for diversification to food uses. Maintenance of quality is one of the major concerns for diversification. Apart from visual characters, such as pod shape, size, color, cleanliness, etc., aflatoxin contamination in kernels is considered as an important criterion for judging the quality of groundnut. Aflatoxins are the toxic substances produced by strains of fungi belonging to *Aspergillus flavus* and *A. parasiticus*. Aflatoxin contamination has led to human and cattle health concerns, significantly influencing groundnut trade worldwide. Aflatoxin contamination in groundnut pods has been reported to be more prevalent in Junagadh district compared to other groundnut growing districts of India. Hence, the study was undertaken to assess the perceptions of farmers on quality of groundnut in Junagadh district of Gujarat State, India. The results indicated that majority of farmers had low perception of quality and there were significant differences between the perceptions of big farmers and small farmers. The characteristics of farmers: knowledge of aflatoxin management practices, innovativeness, and market orientation significantly influenced the perceptions. Based on the results suggestions are made to formulate strategies to increase the knowledge level of farmers on aflatoxin management practices of groundnut through appropriate extension approaches. Mass awareness campaigns to educate farmers and consumers on the ill effects of consumption of aflatoxin contaminated produce, providing incentive price to farmers, building of consumer demands for aflatoxin free and good quality groundnuts are needed.*

**Keywords:** Aflatoxin Contamination, Diversification, Groundnut Quality, Knowledge, Market Orientation, Perception

### Introduction

Groundnut (*Arachis hypogaea L*) is a major oil seed crop grown in about 100 countries covering 26.4 million hectares with a total production of 36.1 million tonnes of nuts in shell. The major groundnut producing countries are China, India, Nigeria, U.S.A., Indonesia and Sudan (ICRISAT, 2007). India has largest groundnut area, comprising 35% of global area and 28% of production (Freeman et al., 1999). Among all groundnut growing States of India, Gujarat stands first in terms of area and production. Groundnut is cultivated in an area of 1.91 million hectares with a production of 1.47 million tonnes in Gujarat. It is grown in almost all the agro-climatic zones of the State irrespective of soil, climate and rainfall pattern. In Junagadh district of Gujarat, groundnut is grown in 0.37 million hectares area with a production of 0.39 million tonnes and with an average yield of 1024 kg/ha (Sahu & Patoliya, 2005). It is cultivated by all types of farmers in different types of soils, mostly during rainy season (June-July to September-October).

Groundnut is important in the diets of rural people, because it is rich in protein (21-30%), fat (41-52%), and carbohydrates (11-27%). It has calcium, potassium, phosphorus, magnesium, and vitamin E. Groundnut haulms are nutritious and widely used for feeding livestock (Waliyar, 2006). Groundnut kernels contain more protein than meat and two and half times more than eggs and ten times more than any other vegetable food except for soybean (Gopalan et al., 1971, ¶ 2).

In most of the developed, as well as developing countries, 70-80% of the total groundnut production is used as food in a variety of forms. The situation is just reverse in India, where 80% of the total production is crushed annually for oil extraction, 11% used as seed, 8% as direct food and 1% for export. There is great potential for direct consumption of groundnut due to its high nutritive value. The development of

groundnut-based products will be widely accepted and appreciated by a large section of people, especially by the low-income groups. Moreover, with the rapid urbanization, there will be an ever increasing demand for packaged and processed snack food. Groundnuts are highly suitable for cheap snack food both in the natural state and after processing (Basu, 1997). Further, the diversification of groundnut from oil purpose to food uses will fetch more income to farmers, as the prices are higher for groundnut meant for food. Apart, from increasing local demand for groundnut as food, the demand for export is also increasing.

The major impediment to diversify groundnut from oil extraction to food uses is maintenance of quality of the produce. The characteristics features considered for evaluating the quality of groundnut are: pod shape; size, cleanliness, freedom from damage, absence of blind nuts for in-shell and grading for size or count: shape; ease of blanching; skin color and condition; resistance to splitting, moisture content; cleanliness, oil content and flavor of kernels (Tanna, 2002). Apart from the above characteristics, the aflatoxin contamination is considered as one of the important criterion for judging the quality of groundnut for export purpose.

Aflatoxins are the toxic substances produced by strains of fungi belonging to *Aspergillus flavus* and *A. parasiticus*. Since, early 1960's aflatoxin contamination has led to human and cattle health concerns, which influenced groundnut trade worldwide. Groundnut can be contaminated with aflatoxin at various stages before harvest, during harvesting, field drying, curing and in storage (Freeman et al., 1999). The future of groundnut lies in its use as a food crop by itself and in a variety of food products. This widens the health risks of aflatoxin contamination (Waliyar, 2006).

In general, farmers had low awareness (National Research Centre for Groundnut, 2004; Kumar, Thakur, & Desai,

2001; Kaaya & Harris, 2003) and low knowledge (ANGRAU, 1999) on aflatoxin contamination of groundnut. Kumar et al. (2001) revealed that lack of visual indication on the seed was the major factor for farmers' unawareness about aflatoxin contamination of groundnut seeds. Van, Van der, Subrahmanyam, and Boughton (1999) reported that aflatoxin contamination was a serious problem in Nampula province of Mozambique and the contamination occurred in both pre-harvest and post harvest phases. Aflatoxin contamination in groundnut pods was more prevalent in Junagadh district compared to other groundnut growing districts of India (National Research Centre for Groundnut, 2004).

Perception is mental organization and interpretation of sensory information. May (1969) concluded that people base their perceptions on experience and knowledge. Devi and Hall (2005) reported that farmers perceived fully formed, big, bold, spotless pods with high oil content and high shelling percentage as good quality groundnuts. The perceptions of farmers regarding inferior quality groundnut were pods with fungal growth, bitter to taste, rotten or sprouted and bad odor.

### **Purpose and Objectives**

The present study was conducted during 2005-06 rainy season as part of the doctoral degree work. The purpose of the study was to assess the farmers' perceptions of quality of groundnut. The specific objectives of the study were to:

1. Assess the perceptions of farmers regarding quality of groundnut,
2. Compare perceptions of small and big farmers on quality of groundnut, and to
3. Determine relationship between farmers' characteristics and their perceptions on quality of groundnut.

### **Methodology**

The study used a descriptive survey design. The population of the study included all the groundnut farmers of Junagadh district. Multi-stage random sampling was used for the study. In the first stage, out of fourteen talukas of Junagadh, three were selected based on highest area, production and aflatoxin contamination of groundnut. In the second stage, from each selected taluka, three villages were selected by random sampling. Separate village-wise lists of groundnut farmers were prepared with the help of village level worker and gram panchayat staff. In the third stage, twenty groundnut farmers were selected from each village by random sampling, making a sample size of 180 farmers, giving equal representation to big (>3 hectares farm size) and small farmers (up to 3 hectares farm size).

A research instrument was designed to fulfill the objectives of the study, which was divided into the following two sections.

#### *Farmers' Characteristics*

The characteristics, which may influence the perception of farmers, were selected based on review of literature, discussions with experts and extension staff. The characteristics considered were knowledge of aflatoxin management practices of groundnut (AMPG), adoption of AMPG, socio-economic status (Trivedi & Pareekh, 1963), age, farming experience (Bora, 1986), extension participation (Siddaramaiah & Jalihal, 1983), market orientation (Samantha, 1977), economic motivation (Moulik & Rao, 1965) and innovativeness (Nandapurkar, 1982). Suitable scales were developed for measuring knowledge and adoption of AMPG. For other characteristics, scales developed by other researchers given in parenthesis above were used with suitable modifications.

### *Perceptions of Farmers on Quality of Groundnut*

To measure the farmers' perceptions on quality of groundnut, a scale was developed based on the guidelines of Likert (1932), Edward (1957) and Patil, Swamy, and Patil (1996). The final scale consisted of 22 statements, grouped into three categories with responses on a five point continuum ranging from *strongly agree* = 5, *agree* = 4, *undecided* = 3, *disagree* = 2, and *strongly disagree* = 1. The content validity of the scale was established by the experts from Junagadh Agricultural University, National Research Centre for Groundnut, and State department of agriculture, Junagadh, Gujarat. The instrument was translated to Gujarati language taking care not to lose any information. The reliability of the scale was determined by calculating Cronbach's alpha coefficient based on pilot survey data. The reliability of the scale was 0.76.

Data were collected by personal interview of the respondents by the researcher. Data collection was carried out during 7.00 a.m. to 11.00 a.m. and 4.00 p.m. to 8.00 p.m. for a period of six months. Descriptive statistics, such as means and percentages were used. Wilcoxon's signed-rank test for big samples (Siegal, 1956) was used for testing the differences between the perceptions of big and small farmers, as the measurement of each perception statement was at ordinal level. Wilcoxon's *W* was converted to *Z* statistic for interpretation. The over all perception score for each farmer was computed by summing up the responses on each statement, which was at interval scale level. Spearman's product moment correlation, Frish's confluence analysis (bunch-map analysis) and step-wise regression were performed. Davis (1971)

conventions were used to ascertain the magnitude of relationship of correlation and Cohen (1988) descriptors were used to ascertain the effect size for  $R^2$ .

### **Results**

*Objective 1.* Assess the perceptions of farmers regarding quality of groundnut. The farmers were more sensible to visual quality characters compared to pre and post-harvest aflatoxin contamination (Table 1). They agreed that high shelling percent and uniform seed size indicate good quality groundnuts. They were unaware that grading improves the quality, spotless and bold pods indicate good quality groundnut. Farmers disagreed that presence of pods of other varieties, extraneous matter, discolored seeds, splits, immature, shriveled pods and pods with fungal growth indicate inferior quality groundnuts.

The farmers were unaware of the important ways and means of pre-harvest and post harvest aflatoxin contamination of groundnut. They disagree that the end of the season drought for more than 20 days leads to aflatoxin contamination. However, in practice this is an important reason for aflatoxin contamination. The farmers' ignorance of this fact was due to the lack of visual symptoms of aflatoxin contamination. The similar finding was reported by Kumar et al. (2001). The delayed harvesting was one of the major reasons for post harvest aflatoxin contamination of groundnut. But, the farmers disagree with this aspect because delayed harvesting was a routine practice due to shortage of labour during peak season for small and big farmers equally. Hence, there were no significant differences in their perceptions on this aspect.

Table 1  
*Comparison of Small and Big Farmers' Perceptions on Quality of Groundnut*

Quality items/statements	Overall (n = 180)	Big (n = 90)	Small (n = 90)	z	p
I. Visual characters	2.61	2.94	2.22		0.01
a. Good quality groundnut are:					
Spotless pods	2.42	2.89	1.96	4.22*	
High shelling percentage	3.42	3.62	3.23	1.84	
Big bold pods	2.55	2.73	2.37	1.70	
Uniform seed size	3.40	3.70	3.09	2.57*	
Grading improves the quality of groundnut	2.26	2.67	1.73	4.56*	
b. Inferior quality groundnut are:					
Presence of high percentage of pods with fungal growth	2.80	3.33	2.22	4.88*	
Presence of high percentage of damaged pods	3.04	3.58	2.46	3.80*	
Presence of immature and shriveled pods	2.58	2.95	2.16	3.07*	
Presence of discolored seeds	2.20	2.43	1.90	3.18*	
Presence of high percent of splits in the produce	2.39	2.65	2.06	3.67*	
Presence of high percent of extraneous matter	2.14	2.38	1.80	4.73*	
Presence of high percent of pods of other varieties	2.08	2.41	1.64	4.95*	
II. Pre-harvest aflatoxin contamination (AC)	2.47	2.86	1.92		
The quality of groundnut is affected badly due to AC	2.61	3.01	2.08	4.09*	
AC of groundnut occurs at any time during pre-harvest stage of groundnut	2.85	3.48	2.07	6.02*	
Mechanical injury to pods during inter-cultural operation leads to AC	2.40	2.74	1.91	4.05*	
End of season drought for more than 20 days leads to AC	2.01	2.23	1.62	3.19*	
III. Post harvest AC	2.45	2.57	2.13		
AC occurs at any time during post harvest operations	2.57	2.84	2.14	3.32*	
Delayed harvesting is one of the major reason for AC	2.18	2.31	1.87	2.53	
Mechanical damage to pods during harvest leads to AC	2.54	2.86	2.02	4.12*	
Stacking the harvested plants before proper drying leads to AC	2.56	2.91	2.01	4.40*	
Improper drying of pods before storage leads to AC	2.48	1.79	1.88	4.83*	
Improper storage of groundnut pods leads to AC	2.38	2.74	2.87	4.66*	

Note. Interpretive scales: 4.26-5.00 = *strongly agree*; 3.26-4.25 = *agree*; 2.26-3.25 = *undecided*; 1.26-2.25 = *disagree*; 1.25 or less = *strongly disagree*.

*Objective 2.* Compare perceptions of small and big farmers on quality of groundnut. The perceptions of big and small farmers revealed significant differences, except in high shelling percent, big bold

pods and delayed harvesting is one of the major reasons for aflatoxin contamination (Table 1). The big farmers agreed that good quality groundnuts were mainly uniform seed size and high shelling percent, and poor

quality groundnut were presence of damaged and broken pods, presence of pods with fungal growth and presence of immature and shriveled pods. The big farmers agree that the quality of groundnut was deteriorated due to aflatoxin contamination, and contamination can occur at pre-harvest stages of groundnut crop. They disagree that improper drying of pods before storage leads to aflatoxin contamination.

The small farmers agreed that good quality groundnuts means high shelling percent and uniform seed size. They disagree that good quality groundnut were spotless and grading improves quality of groundnut. They opined that even the pods with spots and without grading were sold at the same price, hence they feel that presence of spots and grading does not make any difference to quality. They disagreed that pre and post harvest operations may lead to aflatoxin contamination of groundnut, as they were not aware that contamination occurs in groundnut due to these operations. They also disagreed that presence of discolored seeds, extraneous matter and pods of other varieties deteriorate the quality of groundnuts. They disagreed that mechanical injury to pods and end-of-season drought lead to aflatoxin contamination.

Over all, farmers had low awareness on aflatoxin contamination of groundnut. This was due to lack of awareness on the potential ill effects of consumption of aflatoxin contaminated groundnut, groundnut based products, and groundnut haulm to human and cattle respectively. The markets were not concerned with contaminated produce, as the market neither rejected contaminated produce, nor provided incentives to contamination free produce. There were no restrictions for the sale of contaminated groundnut in the local markets, since there was no resistance from the consumers. Aflatoxin management demands additional resources of farmers in terms of inputs, labor, and time. Even if the farmers were ready for this additional

investment, his produce was treated at par with the contaminated produce in the local market. These results were in congruence with the results of Devi and Hall (2005).

*Objective 3.* Determine the relationship between the farmers' characteristics and their perceptions on quality of groundnut. The correlation between the farmers' characteristics and their perception on quality of groundnut (Y) were calculated (Table 2). Based on Davis conventions, the association between perceptions of farmers with their characteristics, knowledge on AMPG was very strong ( $\rho = 0.78$ ), whereas innovativeness ( $\rho = 0.68$ ), adoption of AMPG ( $\rho = 0.59$ ), extension participation ( $\rho = 0.56$ ), and economic motivation ( $\rho = 0.54$ ) were substantial. The moderate associations were seen with market orientation ( $\rho = 0.48$ ) and socio-economic status ( $\rho = 0.42$ ) whereas, low and negative associations were seen with age ( $\rho = -0.26$ ) and farming experience ( $\rho = -0.15$ ). Further, the correlation between the characteristics indicated a very strong association between knowledge and adoption ( $\rho = 0.75$ ), innovativeness ( $\rho = 0.75$ ), market orientation and socio-economic status ( $\rho = 0.75$ ). Whereas, substantial associations were observed between innovativeness and extension participation ( $\rho = 0.67$ ), market orientation ( $\rho = 0.67$ ), adoption of AMPG ( $\rho = 0.66$ ), economic motivation ( $\rho = 0.65$ ), and socio-economic status ( $\rho = 0.61$ ). The associations were also substantial between knowledge and extension participation ( $\rho = 0.62$ ), market orientation ( $\rho = 0.58$ ) and economic motivation ( $\rho = 0.56$ ), between adoption and extension participation ( $\rho = 0.55$ ), market orientation ( $\rho = 0.53$ ), between extension participation and socio-economic status ( $\rho = 0.64$ ), between market orientation and extension participation ( $\rho = 0.60$ ), and between economic motivation and market orientation ( $\rho = 0.60$ ). The results clearly indicated that knowledge and innovativeness

have strong influence on farmers' perceptions.

Table 2

*Correlation between Farmers' Perceptions on Quality of Groundnut and Their Characteristics*

Farmers characteristics	Y	X <sub>1</sub>	X <sub>2</sub>	X <sub>3</sub>	X <sub>4</sub>	X <sub>5</sub>	X <sub>6</sub>	X <sub>7</sub>	X <sub>8</sub>
X <sub>1</sub> = Knowledge	0.78								
X <sub>2</sub> = Adoption	0.59	0.75							
X <sub>3</sub> = socio-economic status	0.42	0.43	0.38						
X <sub>4</sub> = Age	-0.26	-0.26	-0.14	-0.10					
X <sub>5</sub> = Farming experience	-0.15	-0.20	-0.09	-0.08	0.53				
X <sub>6</sub> = Extension participation	0.56	0.62	0.55	0.64	-0.30	-0.30			
X <sub>7</sub> = Market orientation	0.48	0.58	0.53	0.75	-0.16	-0.14	0.60		
X <sub>8</sub> = Economic motivation	0.54	0.56	0.45	0.46	-0.23	-0.14	0.49	0.60	
X <sub>9</sub> = Innovativeness	0.68	0.75	0.66	0.61	-0.30	-0.17	0.67	0.67	0.65

Prior to regression analysis, inter-correlations were calculated to check for multicollinearity among the characteristics. The multicollinearity is shown by very strong correlations between characteristics indicated by coefficients of 0.80 or above (David, 1970). None of the characteristics showed multicollinearity based on the above criterion. Hence, it was further tested by the method of Frisch's confluence analysis (Koutsoyiannis, 1977). The dependent variable, perception was regressed on each one of the characteristics separately and obtained all the elementary regressions; the results were examined based on *a priori* and

statistical criteria ( $R^2$ , standard error and regression coefficients). Accordingly, out of nine characteristics, except farming experience, all others were selected as explanatory variables to estimate the relationship using stepwise regression analysis procedures. The squared multiple correlation ( $R^2$ ) values were calculated to determine the amount of cumulative variance these characteristics accounted for in the perception. Findings for the regression analysis of perceptions of farmers were presented in Table 3.

Table 3

*Stepwise Regression of Farmers' Perceptions on Quality of Groundnut with Their Characteristics*

Farmers characteristics	B	Beta	F	Sig.
Knowledge	1.57 (0.20)	0.24	58.60	0.000
Market orientation	0.42 (0.30)	0.01	1.93	0.165
Innovativeness	3.31 (0.85)	0.07	14.85	0.000

*Note.* Figures in the parenthesis are the standard errors of regression coefficients; adjusted  $R^2 = 0.59$ ; Constant = 24.51; Standard error of estimate = 14.04.

Three characteristics were found to explain perceptions of farmers on quality of groundnut. The characteristics explained 60% of the cumulative variance,  $R^2$ , in perception. Knowledge on AMPG explained the greatest variance (56%), while innovativeness explained 3%, and market orientation explained 1%. Adjusted  $R^2$  was found to be 59%. Based on Cohen's descriptors the large effect size was observed. Hence, perception of farmers on quality was explained by knowledge of management practices, innovativeness and market orientation of farmers.

### Conclusions and Recommendations

The farmers were indifferent to quality aspects of groundnut due to various factors such as low knowledge, low socio-economic status, low extension participation and low economic motivation. The knowledge on AMPG has evolved as an important characteristic of farmers, which significantly influenced the perception. Hence, efforts are to be made to increase the knowledge of farmers on AMPG through various extension approaches such as individual contacts, group contacts, discussions and farmers trainings.

The state department of agriculture had to conduct training programmes for farmers on post harvest management of groundnut, as it is very critical to avoid aflatoxin contamination. Identifying the innovative farmers and involving them in quality groundnut production by reducing aflatoxin contamination is very important as it is significantly influencing the perception.

Stakeholders such as farmers, traders, processors, and consumers had to be educated through mass awareness programmes by the department of agriculture about the ill effects of consumption of aflatoxin contaminated products. In order to prevent the trade in aflatoxin contaminated products specific policies especially legislative measures for the maintenance of minimum quality standards of groundnut produce are to be formulated. Mechanization has to be encouraged by providing soft loans for the purchase of groundnut diggers and threshers as the labour shortage resulted in delayed harvesting, which increased the chances of aflatoxin problem. Incentive price has to be provided for aflatoxin free groundnuts compared to contaminated groundnuts on the part of the government, so that farmers are encouraged to produce contamination free produce. Consumer demand has to be created to aflatoxin free and good quality groundnut through educational programs and effective marketing by the traders and processing groups.

The problem of aflatoxin contamination has to be viewed in a holistic context and necessary partnerships had to be forged between research institutions, State department of agriculture, marketing agencies, NGOs, farmers groups, consumers groups and other stake holders to evolve the strategies to address the aflatoxin problem.

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**References**

- ANGRAU. (1999). Aflatoxin contamination in groundnut. *Report on sample survey and awareness survey*. Regulakonta, Andhra Pradesh. Acharya N.G.Ranga Agricultural University: Author.
- National Research Centre for Groundnut. (2004). Aflatoxin contamination in groundnut: Mapping and management in Gujarat, Andhra Pradesh and adjoining areas. *Project completion report (2000-2003)*. Junagadh, India: Author.
- Basu, M. S. (1997). Mitigating challenges of food and nutritional security in India - not merely a peanut approach. *Indian Farming*, 47(9), 24-29.
- Bora, S. P. (1986). *Management attributes of farmers as related to profitability in farming: A study conducted in Chakdah Block of West Bengal*. Unpublished doctoral dissertation, Bidhan Chandra Krishi Viswavidyalay, West Bengal.
- Cohen, J. (1988). *Statistical power analysis for the behavioural sciences* (2nd ed.). Hillsdale, NJ: Lawrence Erlbaum Associates.
- David, S. H. (1970). *Regression and econometric methods*. New York: John Wiley and Sons Inc.
- Davis, J. A. (1971). *Elementary survey analysis*. Englewood, NJ: Prentice Hall.
- Devi, R. K., & Hall, A. (2005). *Socio-economic determinants of farmer's practices and perception in groundnut based livelihood systems in Andhra Pradesh. Analysis of their implications for reducing aflatoxin contamination*. Retrieved May 15, 2006, from [http://www.aflatoxin.info/staad\\_reports.asp](http://www.aflatoxin.info/staad_reports.asp)
- Edward, A. L. (1957). *Techniques of attitude scale construction*. New York: Appleton Century-Crofts.
- Freeman, H. A., Nigam, S. N., Kelley, T. G., Ntare, B. R., Subrahmanyam, P., & Boughton, D. (1999). *The world groundnut economy: Facts, trends and outlook*. Patancheru, India: ICRISAT.
- Gopalan, C., Ramasastry, B. V., Balasubramanian, S. C., Narasingarao, B. S., Deosthale, Y. G., & Pant, K. C. (1971). *Nutritive value of Indian foods*. National Institute of Nutrition, Hyderabad: Indian Council of Medical Research.
- International Crop Research Institute for Semi Arid Tropics (ICRISAT). (2007). *Groundnut (peanut)*. Retrieved May 24, 2007, from <http://www.icrisat.org/GroundNut/GroundNut.htm#1>
- Kaaya, A. N., & Harris, C. (2003). Aflatoxin contamination in groundnut in Uganda. *International Arachis Newsletter*, 23, 24-25.
- Koutsoyiannis, A. (1977). *Theory of econometrics* (2nd ed.). London: Macmillan Education Ltd.
- Kumar, V. K. K., Thakur, R. P., & Desai, S. (2001). Prevalance of aflatoxin contamination in groundnut in Tumkur district of Karnataka, India. *International Arachis Newsletter*, 21, 37-39.
- Likert, R. A. (1932). A technique for the measurement of attitudes. *Archives of Psychology*, 140-155.
- May, R. (1969). *Love and will*. New York: Norton.
- Moulik, T. K., & Rao, C. C. S. (1965). *Self-rating scale for farmers measurement in extension research*. New Delhi: Indian Agricultural Research Institute, 49-58.
- Nandapurkar, G. G. (1982). *Small Farmers: A study on their entrepreneurial behaviour*. New Delhi: Metropolitan Bank Co. Pvt. Ltd.

- Patil, S. L., Swamy, S. B., & Patil, V. G. (1996). Development of scale to measure perception of farmers about usefulness of NAEP. *Maharashtra Journal of Extension Education*, 15, 125-131.
- Sahu, D. D., & Patoliya, B. M. (2005). Assessment of efficient groundnut cropping zones in Gujarat, India. *International Arachis Newsletter*, 25, 48-51.
- Samantha, R. R. (1977). A study of some agro-economic, socio-psychological and communication variables associated with repayment behaviour of agricultural credit users of nationalized banks. Unpublished doctoral dissertation, Indian Agricultural Research Institute, New Delhi.
- Siddaramaiah, B. S., & Jalihal K. A. (1983). A scale to measure extension participation of farmers *Indian Journal of Extension Education*, 19(3-4), 74-76.
- Tanna, T. (2002). Quality considerations for export of oilseeds. In M. Rai, H. Singh, & D. M. Hedge, (Eds.), *Oilseeds and oils: Research and development needs* (pp. 347-354). Hyderabad: Indian Society of Oilseeds Research.
- Trivedi, G., & Pareekh, U. (1963). *Manual of the socio-economic status scale (Rural)*. New Delhi: Manasayan.
- Van, W. P. S., Van der, M. P. J. A., Subrahmanyam, P., & Boughton, D. (1999). Aflatoxin contamination of groundnut in Mozambique. *International Arachis Newsletter*, 19, 25-27.
- Waliyar, F. (2006). *Aflatoxin*. Retrieved May 15, 2006, from <http://www.aflatoxin.info/introduction.asp>