



Expectation of participants in national dairy fair of India: A complete itemization by multivariate analysis

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Received: 2 November 2015; Accepted: 11 January 2016

ABSTRACT

For the sustainability and continuity of national level fair, expectation analysis is very much crucial and so at ICAR-NDRI, it was investigated in detail. Expectation analysis is widely analyzed in medical science sector but is usually ignored in agricultural research. Randomly selected farmers (60) out of participants (225) were taken for the present study. Participants responded in favour of the statements pertaining to infrastructural facilities, awards and recognition provided during the fair. Vast majority of the respondents (more than 9/10th) had medium to high expectation level from National Dairy Fair. Data on 12 variables were evaluated by using 2 multivariate statistical techniques, viz. principal component analysis (PCA) and standardized multivariate regression analysis (SMRA) method. Consequently, PCA yielded three components, which were named as, socio-economic motivational factor (PC 1), family-asset factor (PC 2), and educational factor (PC 3), and these factors explained 72.05% variance in the dataset. The findings of the (SMRA) method revealed that 'awards and recognition received', education, milk production, herd size, extension contact and 'mass media exposure' got the maximum weightage and had direct effect on expectation level of the respondents. The study implied that even the minutest expectation of the participants must be given utmost importance as participants act as ambassadors of national agricultural fairs, in their respective villages. Moreover, the present research will act as precedent for further research to measure expectation and study factors influencing it in the similar setup.

Key words: Expectation, Fair, Mela, PCA, SMRA

Fair in the life of farmers' is century old. Since, time immemorial, livestock fair is being organized in the Indian sub-continent i.e. Sonapur fair, which has its origins since ancient times of Chandragupta Maurya (340–298 BC), which is presently famed for its rustic charm and cattle trade and credited as Asia's biggest cattle fair (Govt. of Bihar 2015). So, following the old legacy and tradition, from 2009 Dairy Fair is being organized at NDRI (National Dairy Research Institute) main campus at Karnal, Haryana on a regular basis. The present study was conducted during February 25–27, 2015 in the 3 day event of the fair. In 2015 Dairy Fair, 225 participants took part in 29 categories for the competition including beauty contest for animals (2 teeth, 3–4 teeth and more than 4 teeth; adult category), milk production, paneer making and milking competition (NDRI press note, 2015). Total 477 animals comprised of cattle and buffaloes were in ring for competition. Progressive dairy farmers from various states of India including Delhi, Haryana, Punjab, Uttar Pradesh and Himachal Pradesh had

brought their best animals for competitions under different categories/age groups. For the sustainability of fair, expectation analysis is crucial. Zollinger and Krannich (2002) studied factors influencing farmers' expectations in Utah population of USA (n, 315) and found that the insight and anticipation of expectation is prime-essential for policy reorientation. The role of expectations in planning has received considerable attention in recent theoretical literature and so Schultz and Brownlee (1942) formulated two trials to determine 'expectation models' applicable to agriculture. Likewise, expectation analysis is widely used in medical science sector e.g., Lin *et al.* (2009) examined the patients' expectation at Chung Shan Medical University in Taiwan (n, 463) and the results of this research enabled the organization to identify where improvements are needed, from the patients' perspective as there had been service quality gaps in the reliability, assurance, and empathy. It is evident from previous studies (Das and Jain 2013, Das *et al.* 2014) that it did not give much importance to the necessity of quantifying expectation despite of decreasing popularity of the fair with the passage of time, as these studies were mainly focused on the economic parameters of the fair. So, it was felt that expectation measurement is a key concern to secure sustainability of the fair in a long run. In this backdrop, the present study was conducted with

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the following two objectives: i) To enlist the expectations of participants in National Dairy fair and delineate the determinants of the expectations with scientific parsimony.

MATERIALS AND METHODS

Sampling and data collection: The study was conducted in National Dairy Fair of ICAR-NDRI, Karnal in the year 2015 during February 25th-27th. Out of total 225 participants in competitions, 60 of them were selected by adopting random sampling technique. The interview schedule was constructed based on suggestions and opinion made by the experts and data were collected by personal interview method. The process of developing ‘expectation schedule’ started with selection of 39 statements by reviewing and visiting Agriculture/Livestock fair across the country and finally list of 24 relevant statements indicating “affirmative” or “negative” response were retained for semi-structured interview schedule. If respondents indicated “no,” they were directed to skip to the second item measuring expectation. The respondents were classified into groups, viz. low, medium and high on the basis ‘Cumulative Square Root Frequency’ method.

Analytical framework: The methodology comprised multivariate statistical techniques, i.e. principal component analysis (PCA), which is simple, non-parametric method of extracting relevant information from confusing data sets. PCA is widely used data analysis technique—‘a black box’ that is widely used but poorly understood (Shlens 2005). For instance, researchers avoid the conditionality’s of using Kaiser’s criterion i.e. if there are less than 30 variables and communalities after extraction are greater than 0.7 or if the sample size exceeds 250 and the average communality is greater than 0.6 then only one can retain all factors with eigen values above 1 (Field 2005). Consequently, factors were identified using orthogonal rotation (varimax method as in Kaiser 1970) so that a smaller number of highly-correlated variables might be put under each factor and interpretation becomes simpler. In accordance with Kaiser’s criterion, all factors exceeding an eigen value of one were retained (Kaiser 1970). To examine the relationships between original variables, PCA was applied to the original set of 14 variables. But, as communalities after extraction was less than 0.7 for 2 variables, viz. age and caste; so these were purposively dropped. Later, computation of the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was done (Kaiser 1970). The KMO statistic is a Measure of Sampling Adequacy (MSA), both overall and for each variable. The overall index is symbolized as; For j, the measure of sampling adequacy is:

$$KMO = \frac{\sum_{i \neq j} \sum_{i \neq j} r_{ij}^2}{\sum_{i \neq j} \sum_{i \neq j} r_{ij}^2 + \sum_{i \neq j} \sum_{i \neq j} u_{ij}^2}$$

where, u_{ij}^2 are the squares of the off-diagonal elements of

the anti-image correlation matrix and r_{ij}^2 are the squares of the off-diagonal elements of the original correlations. If $u_{ij}^2 \cong 0.0$, the variables are measuring a common factor and $KMO \cong 1.0$. If $r_{ij}^2 \cong 0.0$, the variables are not measuring a common factor, and $KMO \cong 0.0$. The overall KMO measure of sample adequacy was given by the above formula taken over all combinations and $i \neq j$. The KMO index yields an assessment of whether the variables belong together psychometrically and thus whether the correlation matrix is appropriate for factor analysis. Bartlett test (Bartlett 1950) was performed in order to check whether the data set of 60 participants with 12 variables could be factored or not. Maxwell (1959) recommended that the test be used prior to the application of factor analysis. Bartlett’s Test of Sphericity (BTS) was computed by the formula:

$$BTS = [(N-1)/6 (2P+5) \text{Log}_e |R|]$$

where N, sample size; P, number of variables; and |R|, determinant of the correlation matrix.

Researchers criticize PCA because individuality of the variables is ignored and so, that problem was resolved by following (SMRA) method. Based on the result of PCA, only 12 variables were fitted in the final model. Before applying regression model the aptness was checked through R square value. As, regression coefficients: β showed the rate of change in the dependent variable brought about by each independent variable. The unstandardized regression coefficient (B) can be compared to the other coefficients only if the variables are in the same unit of measures. If not, the standardized regression coefficient, Beta (β), is more appropriate to use (Nardi 2006). So, the standardized β coefficients were used to compare the importance of each variable in predicting ‘expectation of the participants’ as unit of independent variables are different in the present study. β -values communicate the direction (positive or inverse) and the weightage of the independent variable relative to the other independent variables in explaining the variation of the dependent variable. β -value is interpreted as the size of the difference in the dependent variable that corresponds with a one-unit difference in the independent variable. If a coefficient were 0, it would indicate that the values of the dependent variable do not differ as the values of the independent variable increase or decrease. In such a circumstance, it would be concluded that there is no linear relationship between the two variables.

RESULTS AND DISCUSSION

Socio-personal and economic profiles of the respondents: The study conducted on the profiles of the respondents (Table 1) revealed that more than half of the respondents (51.66%) belonged to middle age group, having qualification level of middle to college education (65%) and had mean experience of 16.45 years. Majority of the participants belonged to Other Backward Class (OBC) category (56.67%). The average annual family income of the respondents was ₹ 217,790 and if the value is divided

Table 1. Socio-personal and socio-economic profiles of the respondents, n=60

S. No.	Variables	Categories	Frequency	Mean
1.	Age (years)	Young (up to 35)	16 (26.67)	41.68
		Middle (36 to 50)	31 (51.66)	
		Old (above 50)	13 (21.67)	
2.	Category (Caste)	Gen (1)	21 (35.00)	
		OBC (2)	34 (56.67)	
		SC (3)	05 (08.33)	
3.	Education	Illiterate (0)	0 (00.00)	3.28
		Functionally literate (1)	3 (05.00)	
		Primary (2)	18 (30.00)	
		Middle (3)	15 (25.00)	
		Secondary (4)	12 (20.00)	
		Higher secondary (5)	7 (11.67)	
4.	Experience in dairy	College education (6)	5 (08.33)	16.45
		Low (<13)	17 (28.33)	
		Medium (13-20)	27 (45.00)	
5.	Family-size	High (>20)	16 (26.67)	5.83
		Small (<5 members)	11 (18.33)	
		Medium (5-7 members)	41 (68.33)	
6.	Annual family income (in Rupees ₹)	Large (>7 members)	08 (13.34)	217790
		Low (<175946)	16 (26.67)	
		Medium(175946-244370)	26 (43.33)	
7.	Land-holding (in acres)	High(>244370)	18 (30.00)	5.59
		Marginal (up to 2.5)	04 (06.67)	
		Small (2.51-5)	29 (48.33)	
8.	Social participation	Medium (5.1-10)	21 (35.00)	8.76
		Large (>10)	06 (10.00)	
		Low (<5.41)	09 (15.00)	
9.	Mass media exposure	Medium (5.41-8.95)	20 (33.33)	15.28
		High (>8.95)	31(51.67)	
		Low (<9.52)	05 (08.33)	
10.	Extension contact	Medium (9.52-16.97)	34 (56.67)	13.98
		High (>16.97)	21 (35.00)	
		Low (<8.34)	08 (13.33)	
11.	Awards	Medium (8.34-15.23)	32 (53.34)	3.55
		High (>15.23)	20 (33.33)	
		Low (<3)	26 (43.33)	
12.	Herd size	Medium (3-5)	20 (33.34)	15.25
		High(>5)	14 (23.33)	
		Low (<11)	12 (20.00)	
13.	Area under fodder production (acres)	Medium (11-18)	33 (55.00)	1.78
		High (>18)	15 (25.00)	
		Small (<1.25)	11 (18.33)	
14.	Milk production (litres/ day)	Medium (1.25-1.85)	24 (40.00)	90.96
		Large (>1.85)	25 (41.67)	
		Low (<75)	23 (38.33)	
		High(>140)	07 (11.67)	

Note: The conversion of livestock holding for the herd-size was done on the basis of scoring pattern suggested by National Accounts Statistics (1961) of Central Statistical Organisation, New Delhi. *Figures in parentheses in column 4 indicate percentages to total.

by the mean family-size of 5.83, the per capita income is ₹ 37,356.78, which is much below the national level per capita income i.e. ₹ 68,747 (Central Statistics Office 2013). From this, it is evident that the one of the most prosperous farmers' group of the country couldn't match national level per capita income. They were prosperous farmers' that can be justified by the secondary data, as average number of livestock owned per farm households in Haryana and Punjab

was 3.24 and 3.56, respectively (NSSO 2014b), while those who participated in the fair had average herd size of 15.25. At all-India level, average monthly income per agricultural household during the agricultural year July 2012–June 2013 was estimated as ₹ 6,426 (NSSO 2014a) and this value is almost one third of average monthly income per household of the participants i.e. ₹18,149.17. Thus, the findings asserted that the participants were way ahead than the fellow

Table 2. Expectations of the participants in the Dairy Fair (n=60)

S.No.	Statements	f	%
1	Permanent shed should be made for the animals to protect animals from extreme weather	59	98.33
2	Trophy and Award money both should be given	57	95.00
3	Award should be given by renowned personalities like: CM, Governor, Agricultural minister etc.	53	88.33
4	Multimedia, such as documentary films and VCDs should be made in each category of competition in order to educate farmers	51	85.00
5	Green fodder should be chopped properly	48	80.00
6	Electronic media coverage of the fair should be more	45	75.00
7	Animal who has won in particular category shouldn't be allowed to participate for next two years	43	71.67
8	Pamphlet should be distributed containing the book list and price	40	66.67
9	Proper bedding for animals to prevent it from any type of injuries in the shed	39	65.00
10	Farmers should be sensitized about 'milk adulteration detection Kit' developed by NDRI	36	60.00
11	Compilation of addresses of all the participants in one booklet should be done to promote farmers to farmer extension	35	58.33
12	By default enrolment of all the participants should be made for getting 'Dairy Samachar'- a publication from NDRI	33	55.00
13	Sahiwal and other indigenous categories should be judged separately	30	50.00
14	There should be a competition for dairy farm innovations also and innovative farmers can be promoted as farmers professors or role models	27	45.00
15	Folk drama should be organized for the entertainment and education at evening time	24	40.00
16	Book related with progressive dairy farming should be available at reasonable price	21	35.00
17	Lighting and ventilation facilities in the animal shed should be improved	19	31.67
18	Milking competition for goat should be started	16	26.67
19	More outlet of drinking water facility for animals should be arranged	14	23.33
20	Bathing and cleaning shed for animal should be more in number	12	20.00
21	The platform for loading and unloading of animals should be more	9	15.00
22	More female farmers should be encouraged to participate in the Fair	7	11.67
23	Top dairy farmers throughout the country should be figured out and should be given due recognition in the fair	5	8.33
24	Dairy Quiz should be conducted during the fair	4	6.67

farmers of the country but were lagging behind in terms of national level per capita income. Average land-holding was 5.59 acres and a sizeable portion of it was used for fodder production i.e. 1.78 acres. Most of the respondents (51.67%) were having high level of social participation because of the participation in major social organization like Cooperative Society, Gram Panchayat etc. Majority of the respondents (56.67%) had medium level of mass media exposure because of their access to newspaper, radio, television, krishi/dairy fairs, cattle shows/ exhibitions etc. More than four-fifth of the respondents (86.67%) had medium to high level of extension contact because of their contact with progressive farmers, veterinary extension officer, agriculture extension officer, agriculture development officer, KVK officials, cooperative officials, bank personnel and NGOs. Majority of them (56.67%) had won moderate to high number of awards at various level before participating in NDRI Dairy Fair, 2015. Whopping number (80.00%) of participants had medium to high level of livestock-holding with mean herd-size of 15.25. Exactly 50% had medium level of milk production with mean value 90.96 l/ day.

Expectation of participants from National Dairy Fair:

A perusal of Table 2 shows that the majority of the respondents had very high expectation from the 'National Dairy Fair' organizing committee. Even though the participants were satisfied by the existing facilities available presently, there were few expectations that need to be addressed such as, 98.33% of the participants felt that 'permanent shed should be made for the animals to protect animals from extreme weather', 95.00% suggested that 'trophy and award money both should be given' to attract more potent participants as trophy and award money were supposed to give them social and economic contentment, respectively. More than 88% endorsed the statement that award should be given by renowned personalities like, Chief Minister (CM), Governor, Agricultural minister etc. as it may bring more social recognition to them. Participants strongly responded in favour of statements, a) Multimedia, such as documentary films and Video Compact Discs (VCDs) should be made in each category of competition in order to educate farmers (85.00%) and this expectation was in line with the other research, as in Gujarat's Krishi Mahotsava Documentary films and VCDs on extension education prepared by the state agricultural universities are distributed free of cost to the farmers or the gram panchayats

Table 3. Categorical distribution of participants according to their overall expectation level, n=60

Variable (Expectation level) [range=0-24]	Respondents (n=60) Frequency	Percentage
Low expectation level (<8.34)	05	08.33
Moderate expectation level (8.34-16.45)	17	28.33
High expectation level (≥16.45)	38	63.34

(Shah *et al.* 2013); b) Green fodder should be chopped properly (80.00%); c) electronic media coverage of the fair should be more was opined by 75.00% as electronic media coverage of their effort was giving them identification among the young generation. Animal who has won in particular category should be barred to participate for next two years was supported by 71.67% of the participants as few of the 'livestock owners' were getting award for the same animals year after year and thus omitting out chance for other participants to win. Interestingly, for the same statement 28.33% of the participants disagreed and later during the award ceremony it was noticed that the majority of them had managed to clinch award. Bulk of the respondents felt that, farmers should be sensitized about 'milk adulteration detection Kit' developed by NDRI (60%), as milk adulteration was ruining their business, 'compilation of addresses of all the participants in one booklet should be done (58.33%)' to promote farmers to farmer extension and

all the participating farmers should be enrolled for getting 'Dairy Samachar'- a publication from NDRI, by default (55.00%), to update themselves.

Precisely, 50% of the farmers advocated that 'indigenous category' should be bifurcated into 'Sahiwal and other indigenous categories and both should be judged separately' as Sahiwal was high yielder among indigenous breed. Only handful participants backed the statements like a) more female farmers should be encouraged to participate in the fair (11.67%), b) top dairy farmers throughout the country should be figured out and should be given due recognition in the fair (8.33%) and c) dairy quiz should be conducted during the fair (6.67%), this may be due to the reason that these expectation related statements were not directly related with their personal interest.

In finding out the overall expectation level of the respondents towards National Dairy Fair (Table 3), it was found that roughly 2/3rd of the participants (63.34%) were having high expectation level, while only 8.33% of the respondents were in the category of low expectation level. However, 28.33% of the respondents were found in the category of having medium expectation level. The results indicated that 55 respondents were having medium to high expectation level from National Dairy Fair. That means respondents were much interested in participating in the fair and were expecting more from it.

Empirical and latent findings of the study through Principal Component Analysis (PCA) and standardized multivariate regression analysis (SMRA) method: If the sample size is less than 250, Kaiser's criterion is accurate when the number of variables is less than 30 and

Table 4. Showing 'Rotated Component Matrix' with Communalities (h^2), eigen values, cumulative explained variance and respective Standardized Beta Coefficients (β) value through Standardized Multivariate Regression Analysis (SMRA) model

Rotated Variables	Component Matrix					
	Component			SMRA Value		
	1	2	3	h^2	β	t
Award	0.885	0.042	-0.024	0.786	.930	4.752***
Extension contact	0.885	0.054	-0.026	0.787	.636	1.909*
Milk production	0.874	-0.148	0.094	0.795	.845	4.566***
MME	0.863	0.103	-0.142	0.776	.615	2.197**
Herd size	0.83	-0.131	0.179	0.738	.727	1.926*
Income	0.751	0.273	-0.266	0.709	.364	4.149***
Social participation	0.735	0.306	-0.259	0.701	.196	1.576
Experience	0.593	0.448	0.393	0.707	.504	3.462***
Family-size	-0.511	0.618	0.241	0.701	-.054	-1.789*
Land	0.436	0.598	-0.396	0.705	.264	1.224
Fodder land	0.551	0.556	0.324	0.718	.328	2.461**
Education	-0.013	-0.014	0.878	0.771	.853	3.010**
Eigen values	5.897	1.432	1.317		R Sq.713	
Cumulative explained variance in %	49.142	61.075	72.050		F-stat37.676***	

*, ** and ***, depict value is significant at 10, 5 & 1% levels, respectively (2-tailed). Full nomenclature of the variables are, Awards and recognition received, Extension contact, Milk production (litres/day), Mass media exposure (MME), Herd size, Annual family income (in Rupees), Social participation, Experience in dairy farming (in years), Family-size, Land-holding (in acres), Area under fodder production (acres) and education respectively.

communalities after extraction are greater than 0.7 (Field 2005), which was the case for present data set. The KMO statistic obtained in this study was .801. Kaiser's (1974) set calibration of the index and according to it, KMOs in the .80s is 'meritorious,' so the sample selected in this study was adequate for factorial analysis. The Bartlett's test of Sphericity was significant ($P < .01$) and so factor analysis was found to be suitable. Table 4 shows rotated factor (Varimax) matrix of independent variables with factor loadings for each variable. The communality column shows the total amount of variance of each variable retained in the factors. In total, 12 variables were incorporated in PCA, of which 3 principal components with eigen values greater than 1 were retained for further analysis. Three factors explained 72.05% variance in the dataset. A closer look at each column of Table 4 helps to define each component according to the strongly associated variables. The first component explains 49.14% variance and integrates variables viz. awards and recognition received, experience in dairy farming, annual family income, social participation, mass media exposure, extension contact, herd size and milk production (litres/ day) (Table 4). Thus principal component (PC 1) represents socio-economic motivational factor, which incorporates 8 initial variables. Principal components (PCs) 2 and 3 explained 11.933 and 10.975% variance respectively. PC 2 is correlated with family-size, land-holding (in acres) and area under fodder production. PC 3 on the basis of high factor loading and high communality, one variable i.e. education was chosen to interpret this factor and its factor loading was 0.878. Thus, the three principal components were named as socio-economic motivational factor (PC 1), family-asset factor (PC 2) and educational factor (PC 3).

To assess the individual weightage of the variables (SMRA) method was followed. The dependent variable in the SMRA model was expectation and it was measured by assigning equal weightage to each of the 24 items in the expectation questionnaire (0 for dissentive response and 1 for affirmative response having range from 0 to 24 for a particular respondent). The R Square statistic in the model summary Table 4 indicates that 71.30% ($R\text{-Square} = .713$) of the variation in the expectation can be attributed to these 12 variables having F-stat value 37.676, which is significant at 1% level and it implies that model has high explanatory power. Standardized coefficients (β) are best when comparing variables measured in different units, which is the case in the present study. The results (Table 4) revealed that awards and recognition received ($\beta = .930$), education (.853), milk production (.845), herd size (.727), extension contact (.636), and mass media exposure (.615) had the maximum weightage or the strongest coefficient among all the 12 selected variables. So, those participants who had received more awards, having higher education and were producing more milk had maximum expectation. Personal cosmopolite (extension contact) and impersonal cosmopolite (mass media exposure) factors were also playing pivotal role along with herd size in defining

expectation of the participants as β -values implies that the higher the positive coefficient value higher would be the expectation. In the model, the coefficient for awards and recognition received is .930. This indicates that for everyone-percentage increase in the awards rate, there is a predicted increase in the expectation by nearly 1 times (.930). A regression coefficient with a negative sign indicates that a one-unit increase in the independent variable is associated with a predicted decline in the dependent variable; so, as the family-size increases expectation decrease by -.054 units.

The study concludes that average monthly income/household of the participants was almost 3 times higher than all-India level average monthly income per agricultural household indicating the farmers with better socio-economic background visit the national fairs and hence, motivation is required from resource poor farmers for participating in the event. The participants expectation was to get recognition from top administrators like CM, Governor, Agricultural minister etc. as it may give more social recognition to them. In expectation questionnaire, participants were indifferent for few statements, this may be due to the reason that these expectations were not directly related with their personal interest. A large chunk of respondents (more than 9/10th) had medium to high expectation level from National Dairy Fair. That clearly indicated that respondents were fairly interested in participating in the fair and were having high expectation from it. The application of PCA has identified three major components viz. socio-economic motivational factor (PC 1), family-asset factor (PC 2) and educational factor (PC 3) out of a set of 12 variables in which the (PC 1) explained nearly half of the variance and was comprised of 8 variables. The high expectation could be credited to explanatory variables, that is awards and recognition received, milk production, income and experience as these variables had the strongest test of significance in the standardized regression equation used in the prediction or explanation of the expectation. Thus, from SMRA model it can be deduced that more the win ability (inferred from highest significance value of awards and recognition received), more is the expectation. Mass media exposure and extension contact were significant at 5 and 10% level, respectively, and hence, improvement of personal cosmopolite (extension contact) and impersonal cosmopolite (mass media exposure) variables had direct effect on expectation level of the respondents. Family-size was negatively significant with the expectation and with its increase expectation decreased by -.054 units, this was due to the fact that with increase in family-size the respondents' liability towards their family increased, eventually preventing the respondents from participating in far-flung fair thus restraining their exposure and social participation. The study implied that even the minutest expectation of the participants must be considered otherwise sustainability facet may get jeopardized. Moreover, fair should be devotedly organized throughout the country in view of its colossal benefit in the life of the

farmers as large number of progressive farmers from across the country participated in it and fair provided them a platform for interaction with fellow farmers, policymakers, scientists and technologists. Researchers have pointed out the fact of decreasing popularity of the fair with the passage of time and hence measuring expectation, factors influencing it and standing up to expectation becomes quintessential for the sustainability and continuity of fair in the long run.

ACKNOWLEDGEMENT

Authors are indebted to the unknown referee for the invaluable suggestions without which the article's 'locus classicus' could not be justified.

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