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Factorial Analysis of Perceptual Understanding of Researchers towards Animal Cloning

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A B S T R A C T

Cloning is the latest development of specific assisted breeding in animal husbandry. The use of novel food technologies like genetic modification technology, nanotechnology and food irradiation technology have received mixed responses from the public. Perception is the degree to which information or ideas are perceived by the respondents. In this present work the perception of researchers towards animal cloning was carried out. The total of 180 respondents for investigation was utilized. Since the study was focused on animal cloning an ex-ante research design was used. The perspective wise score of each of the 180 researchers from sample area was undergone to factor analysis by Exploratory Factor Analysis (EFA) method using SPSS version 23. Most of the respondents perceived that they will trust animal cloning if its approved from the Government of India with a weighted mean score (81.00) and ranked first, and respondents also perceive that animal cloning in food production is good for growth of economy (WMS 66.44). The perception of the individuals change from time to time and situation to situation hence there is desperate need of wide publicity to bring the changes in the perceptions of public about animal cloned produces.

Introduction

Food being a constitutive of both cultural and individual identity (Gaskell, *et al.*,) the likelihood of consuming such products is correlated with discrete features comprising individual characteristics, socio-demographic variables (gender, type of family, religion and family background) and perception of individuals (Aizakhi *et al.*, 2011). Hallman *et al.*, in 2003 conducted a work to find out public perceptions of GM foods. 50.00 per cent of participants had knowledge that GM products were sold in the store and 25.00 per cent known that they had eaten GM products.

Anderson *et al.*, (2006) found that 50.00 per cent of respondents were worried about the unknown effects that GM products will have on our environment. More than half of

respondents (57.00%) thought that genetically modified products create environmental risks and only 28.00 per cent thought that genetically modified products were an efficient method of food production (Ayaz *et al,* 2011). Gaskell *et al.,* in 2005 reported that genetically modified (GM) foods and irradiated foods technology may not be accepted unless the proposed benefits of the applications seem to be positive such as health benefits, lower pesticide residues, and more environmental friendliness. The public demonstrates a relatively neutral and even positive perception of nanotechnology with an emphasis on its benefits (Brossard *et al.,* 2009; Cobb and Macoubrie, 2004; Gaskell *et al.,* 2005).

The Asian Food Information Centre conducted interviews in 2002 with 600 consumers in China, Indonesia and the Philippines (AFIC, 2003). This research found the majority of consumers were aware of the presence of biotechnology-derived foods in their everyday diets and there were not worried about this situation.

A majority of consumer reported that they believed they had eaten genetically modified foods, took no action to avoid such products and were willing to try samples of genetically modified foods. Brooks *et al.,* In 2011 used paired comparisons to find out consumers' awareness of and attitudes towards meat and milk from cloned cows and described that consumers were comparatively more aware of animal cloning than other reproductive tools; around 31.00 per cent of consumers were willing to consume meat and milk products from cloned animals.

A survey conducted by the Pew Initiative on Food and Biotechnology in 2004 found that 29.00 per cent of consumers indicated that they would purchase meat and milk from the offspring of cloned animals, but 35.00 per cent indicated that they would never buy milk from the offspring of cloned animals (Mellman Group, 2006). The potential for individuals to use the facts for their own health advantage or service are generally have positive attitudes towards genetic testing. Attitudes towards genetic testing vary with age, gender and educational level. Overall, younger people found to be have a higher attention in genetic testing, and have high positive attitudes. Men seem to have more positive attitudes towards testing (Laegsgaard, 2008).

Molster *et al.,* (2009) stated that higher the education higher the levels of genetic knowledge, which is related with a more promising attitude towards genetics in some work. Condit (2010) reported that more detailed information on the application of genetic tests may result in more concern and ambivalence.

The work conducted by Kasmo *et al.,* (2015) on the perception of human cloning among the Malaysian respondents showed that less than 58.20 per cent of the respondents perceived that human cloning is against religion and the perception is different from one religion to another religion.

Materials and Methods

The present study was conducted in total four premier research institutes of India, two ICAR research institutes i.e., ICAR-National Dairy Research Institute, Karnal and ICAR-Indian Veterinary Research Institute, Izatnagar and two state veterinary universities i.e. Tamil Nadu Veterinary and Animal Science University, Chennai and Karnataka Veterinary, Animal and Fisheries Sciences University, Bengaluru. From each institute 30 students (M.Sc/M.V.Sc/Ph.D) and 15 scientific faculties (scientist/professors) from Production, Processing, and Management

groups were selected randomly. Thus making total sample size 180 respondents for investigation. Since the study was focused on animal cloning an ex-ante research design was used. The data were collected through face to face interview through pretested semi-structured interview schedule.

Perception towards animal cloning is the degree to which information or ideas are perceived by the respondents about animal cloning (Parameswaranaik, *et al.,* 2015). Individual's perception about animal cloning was measured by exclusively developed perception scale by following likerts scaling technique (Likert *et al.,* 1932). The validity and reliability test was done in study area but with non-sample respondents in order to avoid testing effect. Finally the scale is of fifteen statements and the response for each statements was rated over a five point continuum which ranged from strongly agree to strongly disagree.

The perspective wise score of 180 researchers from sample area was undergone to factor analysis by Exploratory Factor Analysis (EFA) method using SPSS version 23 launched in 2015. Factor analysis is an interdependence technique for identifying clusters of latent variables for a large number of variables in order to bring scientific parsimony. The perspective was used for determining latent factors governing cloning technology of the j^{th} respondent by using the given formula:

$$Y_j = \sum_{f=1}^{f=n} a_{j,f} X_f \; ; f = 1,2,3, \ldots, n$$

Y_j : Perspective of j^{th} respondent
$a_{j,\ f}$: Scoring of the f^{th} perspective by j^{th} respondent
X_f: f^{th} perspective
n: Number of perspective statement

Results and Discussion

Brief on personal and socio-economic profile of respondents

Pooled data showed that more than half (67.92%) of the respondents were young age. 73.75 per cent of the respondents were male. More than half (56.95%) of the respondents were residing in rural areas. When come to religion aspect, 79.70 per cent were Hindus, 13.50 per cent were Muslims, and 06.81 per cent were belonging to other category. In marital status, 80.83 per cent of respondents were unmarried. About three-fourth (72.50%) of the respondents were in nuclear family. In food habit, 60.00 per cent were non-vegetarians, followed by 30.00 per cent were vegetarians, and 10.00 per cent were eggarians.

Most of the respondents perceived that they will trust animal cloning if its approved from the Government of India with a weighted mean score (81.00) and ranked first. Is might be that the researchers believe that still there is need of regulations to authenticate the cloning products. Cloning technology will helpful for saving valuable Germplasm of indigenous breeds (WMS 80.89), the statements portraits the perception of researchers in animal cloning which will helpful in the conserving the germplasm. Respondents also perceive that Cloned animal derivatives are superior to normal animal derivatives with a weighted mean score 77.33. Contradictly researchers also perceive that Animal cloning technology may introduce new organisms that may harmful to society (WMS 75.11).

Animal cloning in food production is good for growth of economy (WMS 66.44),Cloning should be introduced more gradually, even if it missing some of its benefits(WMS 67.44), these two statements were least perceived by

the respondents as the feels that the animal cloning will helpful to meet the food requirement of future. The perception of the individuals change from time to time and situation to situation hence there is desperate need of wide publicity to bring the changes in the perceptions of public about animal cloned produces. Mellman Group in 2006, Laegsgaardin 2008, Parameswaranaik, in 2019 and Brooks *et al.*, in 2011 have come up with similar findings in their studies.

Table.1 Overview of responses based on respondent's perception towards animal cloning (n=180)

S. N	Statements of perception	Weighted mean	Rank
1	Cloning technology will helpful for saving valuable Germplasm of indigenous breeds	80.89	2
2	The meat, milk and milk products from cloned animals and its off springs is safe to eat	70.33	7
3	Cloned animal derivatives are superior than normal animal derivatives	77.33	3
4	I trust animal cloning if its approved from the Government of India	81.00	1
5	Animal cloning in food production is good for growth of economy	66.44	14
6	Cloning should be introduced more gradually, even if it missing some of its benefits	67.44	13
7	Animal cloning in food production is needed to meet the future food demands	67.89	11
8	Animal Cloning has potential to significantly enhance overall herd genetics and population and helps to restore the endangered and extinct animal species	67.56	12
9	Animal cloning should be allowed If the majority of people were in favour of it	69.67	9
10	If anything went wrong with animal cloning it would be a worldwide Catastrophe	71.78	5
11	Animal cloning technology may introduce new organisms that may harmful to society	75.11	4
12	Animal cloning will reduce genetic diversity to an unacceptable level	68.33	10
13	Animal cloning results in animals being viewed as ‘‘objects’’ to be produced as opposed to being valuable in and of themselves	70.11	8
14	Even if cloning animals has benefits it is fundamentally unnatural	62.33	15
15	Deciding on the issue of cloning animals is so complex that public consultation about it is a waste of time	71.33	6

Table.2 Total variance explained

Components	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative%	Total	% of Variance	Cumulative %
Outcome factors	2.935	19.565	19.565	2.935	19.565	19.565
Safety factors	2.290	15.269	34.833	2.290	15.269	34.833
Democratic factors	1.900	12.665	47.498	1.900	12.665	47.498
Futuristic factor	1.551	10.338	57.836	1.551	10.338	57.836
Opposing factor	1.304	8.691	66.527	1.304	8.691	66.527
Conservation factor	1.173	7.817	74.344	1.173	7.817	74.344
Socio-economic factor	1.071	7.143	81.487	1.071	7.143	81.487

Table.3 Structured Factor Matrix (SFM)' with Communalities (h2) (n=180)

Statements	Component							
	1	2	3	4	5	6	7	h^2
Saving valuable germplasm of indigenous breeds	-0.114	0.115	-0.008	0.075	-0.018	**0.885**	0.091	0.917
Cloned animal derivatives are superior	**-0.596**	-0.331	0.072	0.135	0.002	-0.446	-0.087	0.742
Missing out	-0.300	0.350	0.536	**0.657**	-0.294	0.346	0.256	0.792
Good for growth of economy	0.010	0.205	0.026	0.008	0.090	0.185	**0.888**	0.894
Approved from GOI	0.260	-0.077	**0.751**	0.054	-0.018	-0.012	0.069	0.865
Future food demand	0.066	-0.474	0.361	**0.648**	0.090	-0.224	-0.356	0.823
Endangered and extinct animal species	**0.712**	-0.270	0.021	-0.078	-0.225	-0.286	0.069	0.634
People were in favour	-0.524	0.431	**0.790**	0.200	-0.112	0.073	-0.224	0.839
Worldwide Catastrophe	0.189	**-0.859**	-0.407	-0.024	-0.142	-0.291	-0.183	0.848
Harmful to society	**0.897**	-0.277	-0.135	-0.104	0.019	-0.186	0.115	0.843
Unacceptable level	-0.471	0.490	0.440	0.454	0.240	0.555	**-0.566**	0.872
Opposed to being valuable	-0.043	0.056	-0.051	-0.290	**0.851**	-0.103	-0.090	0.788
Fundamentally unnatural	-0.010	0.145	-0.133	-0.074	**0.770**	0.138	0.210	0.708
Public consultation	-0.022	0.143	0.064	**-0.788**	0.210	-0.008	-0.019	0.835
Safe to eat	-0.157	**0.829**	-0.036	-0.119	0.082	0.117	-0.005	0.824

Exploratory factor analysis of researchers towards animal cloning

Suitability test of data for conducting exploratory factor analysis

Before extraction of the exploratory factors, several tests were performed to evaluate the fitness of the researchers response data (n=180) from sample area for EFA. The battery of tests included Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy and Bartlett's Test of Sphericity (BTS). The KMO was employed to figure out whether employing factor analysis to extract latent variables was appropriate or not.

There were 15 statements encompassing perspective and none of the statements were dropped because either their factor loadings

were ≤0.50 or communalities were ≤0.60. So, the final EFA KMO statistic obtained in this study was approximately 0.5. Kaiser's specified calibration of the value and according to it, KMOs of the sample selected in this study was adequate for EFA. The BTS was significant (p<.001) with 1085.486 at 105 df and so factor analysis was established to be apposite.

Exploratory factor analysis following principal component factoring with promax rotation

After checking suitability of the data among 180 researchers from sample area, EFA was performed to devise outcome following principal component factoring and promax rotation (Table 1). From Table 1 it is evident that seven factors (Eigen values ≥1) explained 81.487 per cent variance in the data set, which is pretty above the customary level of 60 per cent. Seven factors are also evident from the scree plots (Fig.1). Only variables with factor loadings (factor-variable correlations) >0.50 were used in selecting the factors. Commonly used methods of EFA require estimation of communality values before the process of factor extraction. So, variables having communalities after extraction >0.6 was chosen for the present study.

It would be worth mentioning that primarily 15 statements comprising perspectives were taken and all the statements were selected because they could cross both factor loadings and communalities benchmark. In 1st run EFA 7 different types of latent broad perspectives were identified based on Eigen values ≥1 viz., outcome factors (3 statements), safety factors (2 statements), democratic factors (2 statements), futuristic factors (3 statements), opposing factors (2 statements), conservation factors (1 statement) and socio-economic factors (2 statements) perspectives (Table 2).

Majority of respondents Perceive that they will trust animal cloning if it is approved by GOI, meanwhile researchers also perceived that even cloning is beneficial but it is fundamentally unnatural. The economic and political benefits of comprehending customer's perceptions will be important to successfully placing the product in the market.

These perceptions may vary from time to time based political, social and environmental (climate change) factors. In addition to the perception willingness to pay for cloned animals versus traditional ones is also a vital part to determine the future of food products from animal cloning.

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