

## Original Research Article

# Development and Standardization of Psychometric Tools to Measure the Perception of the Dairy Farmer's toward Dairy-Based Farmer Producer Companies

Sunil Kumar\* and Gopal Sankhala

Department of Dairy Extension, ICAR-NDRI, Karnal-132001, India

*\*Corresponding author*

## ABSTRACT

The present study was conducted to measure the perception of dairy farmers toward dairy-based farmer producer companies in India. In this perspective, a Likert type scale was constructed to measure the perception of dairy farmers. A list of 45 positive and negative (70:30) statements related the perception toward dairy-based FPCs was prepared and based on fourteen criteria suggested by Edward (1969), five statements were deleted and the remaining 40 statements sent to the 60 experts having vast knowledge in the field of farmer producer companies for a rating on five-point continuums. For the finalization of scale value, the total score of each statement was calculated based on an individual expert's score. The highest twenty-five percent of total statement value with the highest score and the lowest twenty-five percent of total statement value with the lowest score was considered for the scale. Finally, t value was calculated and the statements having at-value of more than 1.75 were selected and incorporated in the final schedule. Based on calculated values, 36 statements were selected and finally, the reliability and validity of the scale were also calculated because reliability and validity of the scale are important for the consistency of the

### Keywords

Cooperative system, non-public corporations, professionals

## Introduction

Farmer producer companies in India came into existence as a legal entity after the necessary modification of the Indian Companies act (1956) by adding section 9A in the year 2003. Farmer producer corporations are often seen as hybrids between non-public corporations and cooperative societies. The idea of the producer-company is intended to blend the productivity of a corporation with the spirit of traditional cooperatives (Trebbin & Hassler, 2012). The cooperative model is one of the choices available for producers to organise

themselves by value addition and business ownership to step up in the supply chain. However many inadequacies have infected the cooperative system in the region. (Sontakki, 2012). The Indian farmer is linked to the Indian shopper via numerous supply chains. The main activities of the FPO are procurement of inputs such as seeds, fertilisers and equipment, business links, training & networking, and financial and technical advice to farmers. FPO may recommend that small and marginal farmers and various small producers should be recruited to make their commercialism controlled by professionals. The FPO helps

farmers to produce a range of agricultural products. Farmer organisations provide additional effectiveness for small farmers to compete in the market and together they are in a stronger position to minimise transaction costs of accessing inputs and outputs, gaining the requisite market data, securing access to new technology and rolling into high price markets, enabling them to access high prices. (Stockbridge *et al.*, 2003). A Farmer Producer organisation provides small producers with a robust framework to organise themselves for effective links with markets. It enhance the small farmers negotiating power, allows extension programmes to be provided cost-effectively, and empowers participants to influence policies that impact their livelihoods. In order to resolve the limitations imposed by the limited size of individual farms, FPO members should use collective strength and bargaining power to obtain access to financial and financial capital. Major activities of FPO are the supply of inputs such as seed, fertilizer and machinery, market linkages, training & networking, and financial & technical advice.

In this context, the collectivization of small farmers has become even more important. Research increasingly shows that smallholders would be able to substantially increase their incomes from agriculture and allied activities if they participate in markets. As a result, the focus of agricultural development has been shifted from the enhancement of production to market connectivity of small and marginal farmers (Shepherd, 2007). Collective action approaches such as co-operatives and FPCs are expected to enhance incomes of farmers, reduce costs of production, create opportunities for involvement in post harvesting activities, enhance bargaining power of individual farmers (Agarwal, 2010), and provide access to formal credit facilities

to farmers (Braverman, Guasch, Huppi, & Pohlmeier, 1991). There has been several models of collective action approaches like farmer cooperatives societies, farmer interest groups, farmer organization, self help groups and commodity-based organizations, but many of them are facing a lack of long term viability, economic sustainability and efficient participation of farmers in various stages of organizational development and organization activities. As a result, they become short-lived, insignificant and unsustainable.

Mainly studies have been carried out on large-scale organizations involving large well-to-do farmers, excluding the budding organizations from the context, which are operational at a small scale level including the small and marginal farmers. Very few studies have been conducted to measure the perception of farmers toward farmer producer organizations. There are few studies on farmer producer organizations that measure the attitude, perception, and willingness of farmers toward farmer producer companies. So for their sustainable growth and group cohesiveness developments among farmers' producer companies shareholders, it is necessary to measure the perception of farmers toward farmers' producer companies.

## **Materials and Methods**

### **Scale development process**

The method of the summated rating was followed to construct a perception scale for measuring the perception of dairy farmers toward dairy-based farmer producer companies (Likert, 1932). The following procedure was considered for measuring the perception of dairy farmers towards dairy-based farmer producer companies and this procedure was also followed by Rai *et al.*, (2017), Kumar (2016).

### Collection of the statements and Editing

The collection of relative statements is the first step of the scale construction process. A tentative list of 45 statements relating to farmer producer companies and its overall benefit to farmers was collected through review literature, published report, and consultation with experts, who have expertise in farmer producer companies' related research work. Both positive and negative statements in the list were taken with care to reduce the effects of social desirability, positive response bias and to maintain the consistency of the respondents in answering the statements (Lal *et al.*, 2014).

These statements were edited as per the 14 informal criteria enunciated by Likert (1932) and Edwards (1969). Forty statements were retained after editing out of forty-five statements.

### Response to raw statements

A list of 45 statements was e-mailed and also handed over personally to 60 judges who have expertise in the area farmer producer companies to give a response on a 5-point continuum i.e. Strongly Agree (SA), Agree (A), Undecided (UD), Disagree (DA) and Strongly Disagree (SD) because five continuum process gives more freedom to experts for their choice (Edwards, 1969).

The judges were requested to read and analyze each statement carefully. After understanding statements and their purpose, experts rate them on a given five-point continuum indicating the suitability of the statements. Experts also requested to make necessary modifications in statements (editing, deleting), if they desired so. Thirty-eight judges mailed the questioner back with their response after fifteen days and their responses were considered for item analysis.

### Item analysis

Analysis of the statement is an important step while constructing valid and reliable scales (Lal *et al.*, 2014). The judges were requested to make their degree of response with each statement on a five-point continuum ranging from Strongly Agree (SA), Agree (A), Undecided (UD), Disagree (DA), and Strongly Disagree (SD) with a scoring of 5, 4, 3, 2, and 1; for positive statements and the scoring pattern was reversed i.e. 1, 2, 3, 4 and 5 for the negative statements. The total individual judge scores were calculated by summing up the score of each statement.

### Calculation of t-values

The scores of each respondent against each statement were entered in an excel file. After that, the score was arranged in a descending order based on the total individual scores. Two groups, i.e. high group and the low group were formed based on the total individual score for evaluating the individual statements. The higher group comprised the top 25 percent of judges with their total individual scores and the lower group comprised the bottom 25 percent of judges with their total individual scores (Mukesh *et al.*, 2016). Then, the t-values were calculated by discriminate the responses of higher and lower groups for each statement by using the t-value calculation formula (Edwards, 1969). Thus, out of 38 judges to whom the statements were administered to gating response for item analysis, 10 judges with the highest and 10 judges with lowest scores were used as criterion groups to evaluate each statement.

$$t = \frac{\bar{X}_H - \bar{X}_L}{\sqrt{\frac{\sum_{i=1}^n (X_H - \bar{X}_H)^2 + \sum_{i=1}^n (X_L - \bar{X}_L)^2}{n(n-1)}}$$

$$\sum (x_H - \bar{X}_H)^2 = \sum X_H^2 - \frac{(\sum X_H)^2}{n}$$

$$\sum (x_L - \bar{X}_L)^2 = \sum X_L^2 - \frac{(\sum X_L)^2}{n}$$

Where,

= The mean score on a given statement for the high group

= the mean score on a given statement for the low group

$\sum X_H^2$  = Sum of squares of the individual score on a given statement for high group

$\sum X_L^2$  = Sum of squares of the individual score on a given statement for low group

$\sum X_H$  = Summation of scores on the given statement for high group

$\sum X_L$  = Summation of scores on the given statement for low group

n = Number of the subject in the low and high group

t = the extent to which a given statement differentiates between the high and low group.

$\Sigma$  = Summation

### Reliability of the scale

The reliability of the scale is the most important and essential step in scale construction. If a scale gives consistently the same results when applied to the same sample then it is reliable. To measure the reliability of the scale final set of the 42 statements which represent the perception of dairy farmers towards dairy-based farmer producer

companies was administered on a five-point continuum to a fresh group of 30 dairy farmers of the non-sample area. Reliability was calculated by using the formula of Spearman (1910) and Brown (1910).

$$r_{SB} = \frac{2r_{hh}}{1+r_{hh}}$$

But split-half coefficients do not give the same information as the correlation between two forms given at different times (Cronbach, 1946). So, Cronbach's alpha ( $\alpha$ ) was used which is the most widely appreciated coefficient for assessing the internal consistency of the developed scale to measure awareness of tribal dairy farmers (Cronbach, 1951). The formula is:

$$\alpha = \frac{K}{K-1} \left( 1 - \frac{\sum_{i=1}^k \sigma^2 y_i}{\sigma^2 X} \right)$$

Where,

K = Number of items in the scale

$\sigma^2 y_i$  = the variance of item I for the current sample of respondents

$\sigma^2 x$  = the variance of the scale

If the Cronbach's alpha value is: “ $\geq 0.9$  – Excellent,  $\geq 0.8$  – Good,  $\geq 0.7$  – Acceptable,  $\geq 0.6$  – Questionable,  $\geq 0.5$  – Poor, and less than 0.5 – Unacceptable” to assess awareness (George and Mallery, 2003). To calculate the Cronbach's alpha value for reliability test, SPSSv21 statistical software was used in this study.

### Validity of scale

Validity refers to the credibility of the constructed scale. It is defined as the accuracy with which a scale measures, which is intended to measure (Lindquist, 1951). The

content validity of the developed scale was tested which is the representative or sampling adequacy of the content, the substance, the matter, and the topics of a measuring instrument.

The content validity of the scale was also verified by experts' judgment and it is representative or sampling adequacy of the content. Scientists and scholars in favor of the use of the following approach to specify that ratings of 1 and 2 are considered "content invalid," while ratings of 3 and 4 are considered to be "content valid" in calculating S-CVIs (Lynn, 1986).

**Results and Discussion**

**Calculation of t-value**

The t value was calculated with the help of above mention procedure, for example, Statement-1 in (Table 1): FPCs enhance farmers backward and forward linkage, the t value of this statement was calculated like below-given procedure:

$$\bar{X}_H = \frac{49}{10} = 4.9, \quad \bar{X}_L = \frac{42}{10} = 4.2$$

$$\sum (x_H - \bar{X}_H)^2 = \sum X_H^2 - \frac{(\sum X_H)^2}{n} = 249 - \frac{(49)^2}{10} = 8.9$$

$$\sum (x_L - \bar{X}_L)^2 = \sum X_L^2 - \frac{(\sum X_L)^2}{n} = 178 - \frac{(42)^2}{10} = 1.6$$

$$t = \frac{4.9 - 4.2}{\frac{\sqrt{(8.9+1.6)}}{10(10-1)}} = 2.342$$

The t-value indicates the extent to which a given statement differentiates between the high score and low score groups (Edwards, 1969). Table:1 describes the of t value for the

first statement of Table 2 and for subsequent statements the procedure remains the same and only the frequency column value changes, which determines the overall t-value (Table 2).

**Final selection of items**

A total, forty-two statements were used for t-value calculation but the statement those having t- value greater than 1.75 only selected for their inclusion in the perception scale, and others were rejected (Likert, 1932, and Thurstone 1961). Thus, only thirty-six (27 positive and 9 negative) statements were incorporated in the final perception scale for measuring the perception of dairy farmers toward dairy-based farmer producer companies. A quick look at Table 2 indicates that the majority of the respondents had a medium to a high level of positive perception about dairy-based farmer producer companies and it evident from their higher mean score of each statement. The t-values are significant at a 5% level of significance.

Both type statements, positive (+) and negative (-) were incorporate in scale to reduce the effects of social desirability and positive response bias. Statement numbers 10, 18, 22, 23, 24,25,29,30, and 34 were negative and the rest of them were positive (Table 2). 6 statements, with a t-value of less than 1.75 were dropped from the further process of scale development.

**Reliability and validity of the scale**

To quantify the reliability and validity of the scale, different methods were worked out. The coefficient of correlation was used for reliability testing between odd and even scores and it was 0.763 and the Spearman-Brown coefficient value was 0.862 (Table 3), which was found to be significant at 1% level, thereby testifying to the reliability of the scale.

**Table.1** Calculation of t-value for evaluating the difference in the mean response to a perception statement by a high group and a low group

Response Category	High group					Low group				
	x	x <sup>2</sup>	f	fx	fx <sup>2</sup>	x	x <sup>2</sup>	f	fx	fx <sup>2</sup>
SA	5	25	9	45	225	5	25	2	10	50
A	4	16	1	4	16	4	16	8	32	128
N	3	9	0	0	0	3	9	0	0	0
D	2	4	0	0	0	2	4	0	0	0
SD	1	1	0	0	0	1	1	0	0	0
SUM			10 n <sub>H</sub>	49 ΣX <sub>H</sub>	241 ΣX <sub>H</sub> <sup>2</sup>			10 n <sub>L</sub>	42 ΣX <sub>L</sub>	178 ΣX <sub>L</sub> <sup>2</sup>

\*Strongly Agree (SA), Agree (A), Undecided (UD), Disagree (DA) and Strongly Disagree (SD); X is respective weightage for a particular response in 5 point continuum; f is the frequency in the high group, and a low group

**Table.2** Reliability and validity statistics of the scales developed

<b>Cronbach's Alpha</b>		Part 1	Value	0.865
			N of Items	18
<b>Part 2</b>			Value	0.861
			N of Items	18
			Total N of Items	36
<b>Correlation between forms</b>				0.763
Spearman-Brown coefficient		Equal length		0.862
		Unequal length		0.862
Content validity		S-CVI value		0.884

**Table.3** Final statements of perception scale and their analysis

S. No.	Statement	Critical value (t)	Mean	SD
1	FPCs enhance farmers backward and forward linkage	2.342	3.79	0.670
2	Members of FPCs have better accessibility to agricultural services.	2.927	3.68	0.758
3	Membership of FPCs help to enhance knowledge about good agricultural practices.	2.971	4.10	0.628
4	Membership of FPCs enhance individual bargaining power.	3.341	3.86	0.599
5	FPCs help in reducing transport cost of members.	2.324		0.506
6	FPCs have well developed processing facilities.	2.424	3.57	0.640
7	FPCs help in eliminating middlemen from value chain.	2.074	3.78	0.632
8	FPC provide ensured price and suitable market of produce to farmers.	2.197	3.18	0.640
9	Quick, digital and transparent payment system.	3.985	3.15	0.496

10	Very little or no role of members in decision making activities of FPCs (-)	2.475	3.94	0.736
11	The main objective of FPCs is to maximize benefits of members.	4.645	3.18	0.677
12	FPCs help in capacity building of its members.	3.242		0.758
13	FPCs enhance employment opportunities in rural areas.	3.634	4.18	0.628
14	Due to lack of awareness among members, only few people take benefit of FPC.	3.576	3.89	0.599
15	FPCs enhance societal status of individual	3.964	3.78	0.506
16	FPCs help in increasing self-confidences, change attitude and behaviour of members toward dairy farming.	4.471	3.54	0.640
17	FPCs encourage group cohesion among the farmers.	4.001		0.636
18	FPC creates lot of conflict among the farmers (-)	2.967	3.74	0.636
19	FPCs is the ideal platform to bridge gap between extension personnel and farmers.	2.961	3.12	0.474
20	FPCs enhances the buying capacity of farmer.	3.985	4.18	0.832
21	FPCs is a latent tool for women empowerment	2.390	4.00	0.483
22	FPC not able to supply of needed input to farmers at right time on competitive price (-)	2.071	1.78	0.474
23	Rule and regulation of FPC are very difficult (-)	2.131	1.65	0.496
24	FPCs not have political influences (-)	1.801	1.81	0.639
25	Only large farmers benefited through FPCs (-)	2.142	1.75	0.632
26	FPC help members to overcome from production and marketing risk of dairy farming	3.555	4.01	0.709
27	Leadership quality is the major factor for successful running of FPCs	2.132	3.58	0.552
28	All members have equal power and right in FPCs on resources and decision making	2.925	3.43	0.504
29	Membership of FPCs is not beneficial to farmers (-)	2.321	1.41	0.490
30	FPCs is creating discrimination among members (-)	1.986	1.13	0.490
31	Farmers feel empowered after joining FPCs.	4.124	3.87	0.474
32	FPC developed entrepreneurship ability and habit among the members.	5.112	4.21	0.639
33	Input provide by FPC have good quality and competitive price then other similar seller of these product in market.	5.985	3.90	0.533
34	Practically, FPC is not easy to register and run successfully (-).	2.076	1.75	0.736
35	FPCs help in enhance the producer share in consumer rupees.	5.679	4.14	0.526
36	Finally, FPC enhance the socio-economic status of members and help in providing livelihood security to farmers.	5.859	4.32	0.501

$$\gamma_{SB} = \frac{2r_{hh}}{1 + r_{hh}} = \frac{2 * .763}{1 + .763} = 0.862$$

Reliability was re-authenticated by Cronbach's alpha value, which is as follows:

$$\alpha = \frac{K}{k-1} \left( 1 - \frac{\sum_{i=1}^k \sigma^2 y_i}{\sigma^2 x} \right) = \frac{36}{35} \left( 1 - \frac{12.78}{87.12} \right) = 0.877$$

These values implied scale was consistent in measurement. Overall content validity (S-CVI value) of the scale was 0.884 (Table 3), which indicated that the scale was content-wise valid for administrating to the target respondents.

### **Administration of the scale**

The final scale consisting of 36 statements (table 4) can be administered to the dairy farmers on five-point continuums viz., strongly agree (SA), Agree (A), natural (N), disagree (DA), and strongly disagree (SDA) with a score of 5, 4, 3, 2 and 1 respectively for positive statements and opposite scoring pattern for negative statements. The complete possible highest and lowest score ranges from 180 to 36. The highest value will indicate that dairy farmers have a high level of perception towards dairy-based farmer producer companies.

The present study has revealed the power of the psychometric tool to assess the state of awareness among tribal dairy farmers. It has concentrated among the individual on the different important aspects of climate change to determine the state of awareness among the livestock rearing community of Himachal Pradesh. The authors put forward the application of the „degree of freedom rule“ for selecting the statements based on t-values, as it makes the statement selection more stringent and authentic than Edward's rule of

thumb. The proper use of the Cronbach alpha coefficient for reliability has been done with the utmost care. Then, scale-content validity index values (S-CVIs) should be calculated by following Lynn's methodology. This methodological approach to measure awareness can be followed by researchers and stakeholders to quantify the awareness or any other psychological aspect of a participant towards any extension program.

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