Research Tool

Indian Journal of Extension Education
Vol. 60, No. 2 (April–June), 2024, (89-94)

ISSN 0537-1996 (Print)
ISSN 2454-552X (Online)

Scale to Measure the Attitude of Fish Farmers Towards the APART Project in Assam

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ARTICLE INFO

Keywords: APART, Attitude, Fish farmers, Reliability, Scale product method

https://doi.org/10.48165/IJEE.2024.602RT2

Conflict of Interest: None

Research ethics statement(s):
Informed consent of the participants

ABSTRACT

A scale was constructed and standardized to measure the attitude of fish farmers towards scientific technologies demonstrated by "Assam Agribusiness and Rural Transformation Project (APART)" from May 2021 to September 2022 in APART-fishery operated districts of Assam using the 'Scale Product Method'. Sixty-five (65) experts responded unbiased to the 50 attitude statements related to recommended technologies of fish farming by the project. On the basis of scale values and Q values, only 28 statements were incorporated in the final attitude scale. When administered in a non-sample area, the reliability coefficient of the whole test was 0.90 using Rulon's formula. Moreover, when the constructed attitude scale was administered among 180 APART beneficiaries during July, 2022 to September, 2022, majority i.e. 87.22 per cent of the respondents had most favourable attitude towards technologies demonstrated by APART project which is depicts the impact of the development programme. This attitude scale can be applied practically for measuring the attitude of fish farmers under similar programmes which will aid policy-makers in right decision-making.

INTRODUCTION

Assam is a land-locked state with abundant water resources and shares about 2.4 per cent of the country's geographical area with 2.6 per cent population of the country (Anonymous, 2022). Being blessed with huge fishery resources and having the excellent tropical climate with average annual rainfall of over 1500 mm, it is undoubtedly one of the most potential states in India for the development of fisheries (Chand et al., 2022). Fish is also the staple food of the Assamese people. Despite of the favourable geo-social environment, the development of fisheries sector in Assam has not been impressive till recent past (Saikia et al., 2022). In nutshell, Assam is a sleeping giant as far as the fishery resources and level of utilisation are concerned. One of the probable reasons for that is the vulnerability of the state to the climate induced hazards like flood, drought, etc. which are adversely impacting the fishery sector of the state.

In the year 2018, the state has launched World Bank assisted 'Assam Agribusiness and Rural Transformation Project (APART)' with fisheries as a sub-component in it. It is pertinent to mention that, under the APART project some climate resilient interventions such as short duration fish farming, overwintering of seed, multiple stocking and multiple harvesting, hotel size fish production, paddy-fish integration, etc. have been introduced as adaptation strategies to climate change in different districts of Assam (Anonymous, 2018). At this junction a study was planned to construct a scale

Received 15-03-2024; Accepted 30-03-2024

to measure the attitude towards technologies demonstrated under APART project in selected districts of Assam (Saikia, 2023).

The level of positive or negative affect connected to a psychological item is referred to as attitude (Edwards, 1969). The development of attitude scale construction methods has been greatly influenced by the ground breaking work of Thurstone, Likert, and Guttman. Thurstone's (1928). Equal Appearing Interval Scale and Likert's (1932) Summated Rating Scale are two well-known methods for building scales. Both approaches have drawbacks, the first in obtaining a discerning response and the second in item selection. Thus, the "Scale Product Method," a mix of Thurstone's equal seeming interval scale for item selection and Likert's summated rating for determining the response on the scale as given by Eysenck and Crown (1949) was chosen to design the attitude scale. Chandra & Kumar (2007) developed scale to measure farmer's attitude towards improved agricultural practices in Uttaranchal hills. Similarly, Netravathia & Chauhan (2014) developed a scale to measure attitude of research scholars towards climate change studying in agricultural universities, Raj et al., (2022) measured the attitude of horse stakeholders towards horse keeping horse stakeholders from North-western India using similar methodologies. Thurstone's method is one of the methods for building the scales that is accessible and the scale was created using this process. In the current study, attitude was defined as the level of affective positivity or negativity related to adopted and non-adopted farmers' attitudes toward technology demonstrated under APART project under sub component of fisheries in Assam.

METHODOLOGY

The present study was carried out in 2021–2022. The attitude scale was created using the approach recommended by the Likert (1932) for creating a summated rating scale. Fifty-eight (58) statements were gathered as a starting point for the scale development from the pertinent literature, major advisor, extension educators, and experts from the Assam Agricultural University, Assam Rural Infrastructure and Agricultural Services Society (ARIAS society), and the state Department of fisheries, government of Assam. The statements, thus selected, were edited on basis of the criteria suggested by Thurstone & Chave (1928); Wang (1932); Likert (1932); Edward & Kilpatrick (1948) and at last, 50 statements were selected as they were found to be non-ambiguous. A total of 150 judges were chosen from the different agriculture and fisheries education institute, KVK, Extension specialists all over the country and Judge's rating schedule in the form of "Google form" were distributed by email and WhatsApp. A letter of instructions was given to the judges to help them rate the statements as desired. Extension educators and professionals from various faculties from various Indian institutions made up the judges for the study. A panel of 150 judges were chosen to rate each statement's level of "strongly agree" to "strongly disagree" on a five-point equal seeming interval continuum. Out of the 150 experts, 65 were given the statements back after properly recording their opinions and putting them forth for examination.

The five points rating scale were given scores ranging from 1 for the strongly disagree to 5 for the strongly agree. The distribution's median value and the statement's quartile (Q) value were computed based on judgement. For each statement, the inter-quartile range Q = (Q3 or C75 - Q1 or C25) was calculated in order to determine the degree of ambiguity present in the statement.

$$S = L + \frac{0.5 - \sum pb}{pw} \times xi$$

Where, S = Scale value of statement, L = Lower limit of the interval in which the median falls, Σpb = Sum of the proportion below the interval in which the median falls, Pw = Proportion within the interval in which the median falls, i = Width of the interval which was assumed as equal to 1. The 75th centile was obtained by the following formula.

$$C75 = L + \frac{0.75 - \sum pb}{pw} \times xi$$

Where, C75 =Scale value of the statement, L = Lower limit of the interval in which the 75th centile falls, Σpb = Sum of the proportion below the interval in which the 75th centile falls, Pw = Proportion within the interval in which the 75th centile falls, i = Width of the interval and is assumed to be equal to 1. The 25th centile was obtained by the formula.

$$C25 = L + \frac{0.25 - \sum pb}{pw} \times xi$$

Where, C_{25} = Scale value of the statement, L = Lower limit of the interval in which the 25th centile falls, Σpb = Sum of the proportion below the interval in which the 25th centile falls, Pw = Proportion within the interval in which the 25th centile falls, i = Width of the interval and is assumed to be equal to 1.0

Then the interquartile range would be given by taking the difference between C_{75} (Q_3) and C_{25} (Q_1), thus, $\mathbf{Q = C_{75} - C_{25}}$

Only those statements that seemed to have median values greater than Q value were considered in the initial round of selection. In addition to Q, Thurstone and Chave (Edwards, 1957) described a supplementary criterion that could be utilized to reject judgments from scales constructed to use the equal appearing interval method. The statement with the lowest Q value was picked while several statements had the same scale values.

When there was strong agreement among the judges over how much they agreed or disagreed with a statement, the Q value is lower than the scale value. The statements that had median (scale) values that were observed to be higher than Q values were finally chosen. In contrast, statements with the lowest Q value are chosen when several of them have the same scale values. The following statements (Table 2) were ultimately chosen to make up the attitude scale based on the median and Q values.

To prevent response biases, which could lead to low reliability and undermine the scale validity, the final format of the attitude scale's 28 approved statements were rearranged at randomly. Out of the 28 statements that were chosen, 14 were indicative of a positive attitude, and the remaining 14 were indicators of a negative attitude. In order to gauge attitude, Likert (1932) used a summarised rating technique that included five columns to indicate a five-point continuum of agreement and disagreement to the items. Strongly agreed, agree, undecided, disagree, and strongly disagree were the five points on a continuum, with the positive statements having weights of 5, 4, 3, 2, and 1 and the negative statements having

weights of 1, 2, 3, 4 and 5. By combining the scores of each farmers responses to each statement, the overall attitude score for each farmer was calculated.

RESULTS

All 50 statements were given scale values and Q values. Finally, 28 statements were chosen based on the above specified criteria. These statement scale values ranged from 1.20 to 4.91, and their Q values from 0.60 to 5.36. (Table 1).

Reliability of the scale

When a scale regularly yields the same findings when used on the same sample, it is considered reliable. The accuracy and precision of the measurement tools define reliability. A split-half approach of testing reliability was applied in the current study. The 28 statements were split in half, with 14 odd-numbered statements in one side and the remaining 14 even-numbered statements in the other and were administered to 20 beneficiary farmers. These two subscales were correlated after each of the two

Table 1. Scale developed for measuring the attitude of farmers towards technologies demonstrated under apart fisheries ASSAM

S.No.	Statements		SA	A	U	D	SD	S	Q
1	I think that religious taboo against composite fish farming is present in India	F	3	9	14	28	11	4.91	1.73
		P	0.05	0.14	0.22	0.43	0.17		
		cp	0.05	0.19	0.41	0.84	1		
2	I avoid advising anyone to adopt composite fish farming	F	2	5	3	27	28	4.57	0.7
		P	0.03	0.07	0.05	0.42	0.43		
		cp	0.03	0.10	0.15	0.57	1		
3	Training provided by staff to farmers is not based on needs and interest of farmers	F	5	7	6	36	11	4.24	0.6
		P	0.07	0.10	0.09	0.55	0.17		
		cp	0.07	0.17	0.26	0.81	1		
4	APART project personnel are unprofessional to convince farmers to gain benefits of project activities	F	0	4	7	37	17	4.20	1.47
		P	0.00	0.06	0.10	0.56	0.26		
		cp	0.00	0.06	0.16	0.72	1.00		
5	I think that composite fish farming does not give more production per unit of investment	F	2	3	2	45	13	4.16	0.701
		P	0.03	0.05	0.03	0.71	0.20		
		cp	0.03	0.08	0.11	0.82	1.00		
6	APART project activities are irrelevant to accomplish needs of the majority of farmers	F	1	6	7	40	11	4.15	0.82
		P	0.01	0.09	0.10	0.61	0.17		
		cp	0.01	0.10	0.20	0.82	1.00		
7	APART project technologies are beyond capacity of small and marginal fish farmers	F	4	8	11	34	8	4.13	1.36
		P	0.06	0.12	0.17	0.52	0.12		
		cp	0.06	0.18	0.35	0.87	1.00		
8	APART Staff are not concerned about feedback and response of farmers	F	0	4	14	33	14	4.08	1.18
		P	0.00	0.06	0.21	0.50	0.21		
		cp	0.00	0.06	0.27	0.77	1.00		
9	Money spent on different development programmes is just wastage	F	0	3	11	39	12	4.05	0.83
		P	0.00	0.05	0.17	0.6	0.18		
		cp	0.00	0.05	0.22	0.82	1.00		
10	APART project activities are loss-making against cost of investment to the farmers	F	2	4	16	31	12	4.03	1.3
		P	0.03	0.06	0.25	0.47	0.18		
		Cp	0.03	0.09	0.34	0.81	1.00		
11	APART staff do not visit the beneficiaries fish farmers regularly	F	1	5	17	31	11	4.01	1.39
		P	0.01	0.08	0.26	0.47	0.17		
		cp	0.01	0.09	0.35	0.82	1.00		
12	APART project is more government friendly than farmers' friendly approach	F	1	9	14	39	2	3.98	1.38
		P	0.01	0.14	0.21	0.6	0.03		
		cp	0.01	0.15	0.36	0.96	1.00		
13	I think that FIG creates conflict among the member farmers	F	0	6	14	42	3	3.94	1.07
		P	0.00	0.09	0.21	0.65	0.04		
		cp	0.00	0.09	0.3	0.95	1.00		
14	APART project scientists are incapable of giving immediate solution to the farmers	F	1	7	6	36	15	3.72	0.91
		P	0.01	0.1	0.09	0.55	0.23		
		cp	0.01	0.11	0.20	0.76	1.00		
15	APART project helps in rising knowledge of modern fisheries technology among the fish farmers	F	12	44	4	3	2	1.97	0.73
		P	0.18	0.68	0.06	0.04	0.03		
		cp	0.18	0.86	0.93	0.97	1.00		
16	APART helps in diffusion of climate resilient technologies which helps the farmers to cope up with the climatic variability	F	14	39	11	1	0	1.96	0.83
		P	0.22	0.60	0.17	0.01	0.00		
		cp	0.22	0.82	0.99	1.00	1.00		

Table 1 contd...

S.No.	Statements		SA	A	U	D	SD	S	Q
17	APART project motivated remarkably to increase area under fish culture	F	13	43	7	2	0	1.95	0.76
		P	0.20	0.66	0.10	0.03	0.00		
		cp	0.20	0.86	0.96	1.00	1.00		
18	I favor integrated rice fish farming to improve economy of small and landless farmers	F	16	38	5	4	2	1.94	0.86
		P	0.24	0.58	0.07	0.06	0.03		
		cp	0.24	0.82	0.9	0.96	1.00		
19	APART project contributes significantly in raising living standard of the fish farmers	F	14	44	5	2	0	1.92	0.74
		P	0.21	0.68	0.08	0.03	0.00		
		Cp	0.21	0.89	0.97	1.00	1.00		
20	The project provided the platform to farmer to interact with their beneficiaries fellow farmers	F	17	39	8	1	0	1.9	0.86
		P	0.26	0.60	0.12	0.01	0.00		
		Cp	0.26	0.86	0.98	1.00	1.00		
21	APART project helped to increase awareness of farmers about quality fish seeds and improved techniques	F	20	32	9	1	3	1.89	1.08
		P	0.31	0.49	0.14	0.01	0.05		
		Cp	0.31	0.80	0.94	0.95	1.00		
22	Fishery farmers producer company formation under APART project is a very good step towards community mobilization	F	17	43	4	1	0	1.86	0.78
		P	0.26	0.66	0.06	0.01	0.00		
		Cp	0.26	0.92	0.98	1.00	1.00		
23	APART project helps in diffusion of good fisheries practices among the fish farmers	F	18	42	4	1	0	1.85	0.81
		P	0.27	0.65	0.06	0.01	0.00		
		Cp	0.27	0.92	0.98	1.00	1.00		
24	Poly culture (Carp-mola) system improve the house hold nutritional security	F	20	38	6	1	0	1.84	0.94
		P	0.30	0.58	0.09	0.01	0.00		
		Cp	0.30	0.88	0.98	1.00	1.00		
25	I am adopting fishery as a profession to meet livelihood	F	20	41	2	1	1	1.81	0.88
		P	0.30	0.63	0.03	0.01	0.01		
		Cp	0.03	0.93	0.97	0.98	1.00		
26	The community based beel fisheries management improve livelihood of farmers	F	27	35	2	1	0	1.67	1.04
		P	0.41	0.53	0.03	0.01	0.00		
		Cp	0.41	0.94	0.98	1.00	1.00		
27	I favor composite fish farming to improve economy of small and landless farmers	F	33	28	2	2	0	1.5	1.06
		P	0.50	0.44	0.03	0.03	0.00		
		Cp	0.50	0.94	0.97	1.00	1.00		
28	I am confident that composite fish farming is a profitable venture in fish farming	F	46	16	1	2	0	1.2	0.8
		P	0.71	0.25	0.01	0.03	0.00		
		Cp	0.71	0.96	0.97	1.00	1.00		

(*Note:* SA=Strongly Agree, A=Agree, UD= Undecided, D=Disagree, SD=Strongly Disagree)
f- Frequency, p-Proportion, cp- cumulative frequency, S- Scale value, Q- Quartile value

sets of statements was regarded as a distinct scale. Rulon's formula (Guilford, 1954) was used to compute the coefficient of reliability, which came out to 0.90 and was significant at 1% level of probability (Table 2). The scale created was therefore judged to be quite reliable and significance which shows that it is accurate in gauging farmers attitudes on the technologies used by APART- fishery Assam. Calculation using Rulons Formula:

$$\text{rtt} = 1 - \frac{\delta^2 d}{\delta^2 t}$$

$$\delta^2 d = \frac{\sum d^2 - \frac{(\sum t)^2}{20}}{20}$$

$$\delta^2 t = \frac{\sum t^2 - \frac{(\sum t)^2}{20}}{20}$$

Where,

Σd=-66, Σd2=410, t=2544, Σt2=325470 n=20,

$$\delta^2 d = \frac{\sum d^2 - \frac{(\sum t)^2}{20}}{20}, \quad \delta^2 d = \frac{410 - \frac{4356}{20}}{20} = 9.61$$

Similarly, $$\delta^2 t = \frac{\sum t^2 - \frac{(\sum t)^2}{20}}{20}, \quad \delta^2 t = \frac{325470 - \frac{6471936}{20}}{20} = 93.7$$

Therefore, according to formula

$$\text{rtt} = 1 - \frac{\delta^2 d}{\delta^2 t} \quad \text{rtt} = 1 - \frac{9.61}{93.7} = 0.8975 = 0.90$$

Validity of the scale

The validity of a test depends upon fidelity with which it measures what it is expected to measure (Kerlinger, 1967). The scale content validity was examined. It is the delegation or sampling adequateness of an estimating instrument's substance, content, issue, and subjects. This method was used to the current scale to

Table 2. Reliabilities of scale

No. of respondents	Score of odd statement (Xo)	Score of even statement (Xe)	d = (Xo – Xe)	d^2	t = (Xo+Xe)	t^2
1	60	64	-4	16	124	15376
2	67	68	-1	1	135	18225
3	69	70	-1	1	139	19321
4	59	65	-6	36	124	15376
5	58	61	-3	9	119	14161
6	70	70	0	0	140	19600
7	66	67	-1	1	133	17689
8	60	63	-3	9	123	15129
9	66	69	-3	9	135	18225
10	58	69	-11	121	127	16129
11	65	70	-5	25	135	18225
12	61	66	-5	25	127	16129
13	63	64	-1	1	127	16129
14	63	66	-3	9	129	16641
15	67	66	1	1	133	17689
16	52	63	-11	121	115	13225
17	62	64	-2	4	126	15876
18	65	67	-2	4	132	17424
19	61	65	-4	16	126	15876
20	47	48	-1	1	95	9025
	1239	1305	-66	410	2544	325470

determine the scale content validity. It was anticipated that the current scale would have achieved content validity because the disposition's general validity had been established for the topic under review through academic literature and professional judgments.

To prevent biases that could lower the reliability and diminish the validity of the scale, 28 chosen statements from the final format of the attitude scale were sorted at random. Fourteen (14) of them expressed an unfavourable attitude, while 14 of them exhibited a favourable attitude. In order to obtain replies from respondents, Likert (1932) proposed a five-point continuum. With respect to the favourable assertions, they were strongly agree, agree, undecided, disagree, and strongly disagree, with respect to the unfavourable statements, they were 1, 2, 3, 4, and 5. The scale was administered in Kamrup, Nagaon, Jorhat, Sonitpur and Cachar district of Assam covering 180 APART beneficieries.

Under the project, the beneficiaries engaged into different modules viz., composite fish farming and integrated rice cum fish farming in different districts, They were getting quality inputs like improved varieties of fishes namely Jayanti rohu instead of local rohu fingerlings, Amur common carp instead of local common carp, incorporation of high value crops like fresh water prawn as bottom feeder. Apart from this beneficiaries were supplied with protein rich floating feed, medicines for pond management. It is revealed that majority (87.22%) of the fish farmers had most favorable attitude towards recommended technologies of APART-fishery. While 10.56 and 2.22 per cent of them had more favorable and moderately favorable attitude towards the recommended technologies of Apart Fishery. Interestingly data revealed that none of the farmers shows less favorable and least favorable attitude towards the recommended technologies of APART-fishery (Table 3). It can be concluded that all the farmers had most favorable to moderately favorable attitude towards recommended technologies of APART-fishery. The beneficiaries received higher income in terms of fish production and greater market preference for improved varieties of fishes, high value fishes like fresh water prawn production with great market demands.

Table 3. APART fishery project degree of favorableness to farmers

Category	Frequency	Percentage
Moderately favourable (72.9 to 95.2)	04	2.22
More favourable (95.3 to 117.6)	19	10.56
Most favourable (117.7 to 140)	157	87.22
Total	180	100.00

DISCUSSION

The purpose of this study was to evaluate the validity and reliability of the measurement tool that we used to collect the data for our investigation as mentioned in previous section, measurements must be consistent across several instances in order to be considered reliable. The 14 rules in Likert & Edward's (1969) criteria help to make statements easier to understand, prevent ambiguity, and give a comprehensive summary of the content. The S and Q values will be useful in the subsequent statement selection process. When two statements have the same S value, the one with the lower Q value will be included. The statements with a S value greater than Q values will be included. The three main aspects of a measuring tool to evaluate are its validity, reliability, and practicability (Sahu, 2013). The researchers (Kumar et al., 2015; Kumar et al., 2016; Shitu et al., 2018; Gupta et al., 2022; Vijayan et al., 2023) employed a variety of techniques to estimate validity and reliability. When the scale administered to five districts of Assam namely Jorhat, Kamrup, Nagaon, Cachar and Sonitpur covering 180 beneficiaries farmers of APART, it was found that majority (87.22%) had

positive attitude on the scale developed for this purpose. The Rulon's formula (Guliford, 1954) was used to compute the coefficient of reliability of scale developed for attitude of APART beneficiaries came out to 0.90 and was significant at 1% level of probability.

CONCLUSION

Beneficiary fish farmers of APART had positive attitude and benefitted from APART programme in terms of improving their socio-economic condition in the society. The aim of this study was to provide insight into the attitude level of fish farmers towards the project. As observed, the surveyed fish farmers had most favorable to moderately favorable attitude towards the recommended fish farming technologies of APART-fishery. This may be attributed that fish farming with new technologies under the project had wider adaptability, earning avenue for unemployed youth and it provides financial stability during the time of emergency for inclining. The produced tool has a reliability coefficient of 0.90, indicating that it is very consistent and thus applicable in a wide range of situations. This tool, with suitable modifications, can be used to examine farmers' attitudes towards any implemented development project. Therefore, it will help the policymakers to formulate future strategies for implementing any sustainable aquaculture practices.

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