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A scale to measure the entrepreneurial capacities of turmeric growers in farmer producer organisations

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ABSTRACT

Farmer Producer Organisations provide smallholders with access to inputs, markets, and collective bargaining; however, the advantages rely on the ability of individual members to operate as entrepreneurs on their farms. There is a lack of crop-specific tools that reflect this ability among turmeric farmers. This research created and standardized a tool to assess the entrepreneurial capacities of turmeric producers linked to FPOs in Andhra Pradesh. Entrepreneurial capacity was defined through nine dimensions: achievement motivation, risk-taking ability, innovativeness, decision-making ability, self-confidence, managerial ability, feedback utilisation, leadership ability and problem-solving ability. A collection of 124 statements was created based on research and expert input. Editing based on Edwards' informal criteria lowered this to 90. Fifty-three judges evaluated each statement on a three-point relevance scale. Items with a relevancy weight of at least 0.85 and a mean relevancy score equal to or greater than the overall mean (2.549) were preserved, resulting in a total of 59 items. In an item analysis of 60 FPO farmers, all 59 items surpassed the critical ratio of $t \geq 1.75$ (range 2.52–7.10) and were kept. The ultimate scale revealed a Cronbach's alpha of 0.966 and a Spearman–Brown split-half coefficient of 0.980. The literature-driven item creation and expert relevance evaluations supported content validity. The tool can assist extension agencies and FPO managers in identifying capacity gaps within members and developing focused capacity-building initiatives.

Keywords: Entrepreneurial capacity, Farmer Producer Organisation, Turmeric, Scale construction, Relevancy test, Reliability

Introduction

Turmeric ranks among India's key spice crops, with the nation leading in global production, consumption and export of this crop. India represents an impressive 75% to 80% of worldwide turmeric production, farming more than 2.92 lakh hectares to yield between 1.06 million and 1.19 million metric tonnes each year (Spices Board of India, the Ministry of Commerce). Within the country, it functions as its principal consumer, consuming approximately 80% to 85% of its overall production to satisfy strong culinary and industrial needs. Even with this significant domestic use, India continues to be the top global supplier, maintaining a 62% to 66% share of the world's export value. In the past fiscal years, India exported between 1.56 lakh to 1.73 lakh metric tonnes of the "golden spice," earning \$333 million to \$413 million in yearly export revenue and accounting for roughly 7% of the overall spice export income for the country. At the farm level, however, adoption of recommended turmeric practices lags behind growers' knowledge of them (Gayathri *et al.*, 2025) [1] and growers report a range of perceived constraints (Sahoo *et al.*, 2023) [2].

Farmer Producer Organisations (FPOs) were established in India to assist small and marginal farmers in overcoming scale disadvantages through the aggregation of produce, inputs and bargaining strength (NABARD, 2020) [3]. Membership has been associated with higher income, savings, social participation and empowerment of members (Banik *et al.*, 2024; Sahoo *et al.*, 2024; Lephansha *et al.*, 2025) [4, 5, 6], although members' knowledge of their own FPO is often only moderate (Dalei *et al.*, 2025) [7]. An FPO, however, relies entirely on the abilities of its members. Cooperative marketing or processing initiatives thrive when participants establish objectives for their individual farms, embrace better techniques, make prompt choices and engage actively in collective endeavors. A member who sits back and waits for the organization to take action contributes very little. Bairagya *et al.* (2026) [8], for instance, found the entrepreneurial behaviour of members to be one of the main drivers of branding effectiveness in FPOs. Recognizing the entrepreneurial abilities of each member is thus essential for enhancing the organization as a whole.

Research on entrepreneurship has historically regarded innovativeness, proactivity and risk-taking as central elements of an entrepreneurial attitude (Covin & Slevin, 1989; Lumpkin & Dess, 1996; Chandra *et al.*, 2026) [10, 11, 9]. Research on farmers in India has broadened this concept to personal behavior, incorporating characteristics like achievement motivation, decision-making skills, self-assurance, managerial competence, leadership qualities and the application of feedback (Padhan *et al.*, 2024; Panigrahi *et al.*, 2025; Mukharjee *et al.*, 2025; Sonu *et al.*, 2025) [13, 14, 12, 15]. Recent tools have concentrated on companies or on agricultural

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cooperatives as a unit. For instance, Shukla *et al.* (2026) [16] assessed the entrepreneurial orientation of FPOs involved in secondary agriculture. What is still absent is a tool that assesses the abilities of the individual grower, centered on the specifics of one commodity and the grower's connections with an FPO.

The present study was therefore undertaken to develop and standardise a scale for assessing the entrepreneurial capacities of turmeric farmers of FPOs in Andhra Pradesh. The document outlines the process of creating and filtering the item pool, discusses the relevance and item evaluations and provides proof of the final instrument's reliability and validity.

Methodology

Entrepreneurial capacity referred to a turmeric grower's ability and eagerness to recognize and chase opportunities, assume calculated risks, implement and modify enhanced practices, make informed farming decisions, manage resources effectively, learn from feedback, take initiative within the FPO and resolve issues in turmeric production and marketing. The construct was divided into nine dimensions: achievement motivation, risk-taking ability, innovativeness, decision-making ability, self-confidence, managerial ability, feedback utilisation, leadership ability and problem-solving ability. The summated rating technique (Likert, 1932) [17] was chosen because each dimension is expressed through attitudes and self-reported behaviour that respondents can rate on a graded continuum.

Generation and editing of the item pool

Statements were drafted from a review of the literature regarding entrepreneurship, the entrepreneurial behavior of farmers and existing measurement scales developed for farmers (Jaryal *et al.*, 2024; Sawandkar *et al.*, 2026; Shukla *et al.*, 2026) [18, 19, 16]. They were supplemented by informal discussions with extension personnel, subject-matter specialists and FPO functionaries familiar with turmeric cultivation in the study area. This resulted in 124 statements. Each was evaluated based on the informal guidelines for attitude statements established by Edwards (1957) [20]: one idea per statement, straightforward language, avoidance of double negatives, exclusion of factual assertions and no items likely to be supported by nearly everyone or no one. Ambiguous, duplicated, or overlapping statements were rephrased or eliminated, resulting in 90 statements for expert evaluation. Both positively and negatively phrased statements were kept to reduce acquiescent responses. Negative items are scored in reverse for the final instrument.

Relevancy test

The 90 statements were sent to one hundred and ten experts in agricultural extension and allied disciplines working in state agricultural universities, ICAR institutes and development agencies. Each expert rated every statement on a three-point continuum: Most Relevant (3), Relevant (2) and Irrelevant (1). Experts were also invited to suggest rewording, additions or deletions. Completed schedules were received from 53 judges within one month (response rate 48.2%). For each statement, the relevancy weightage (R_W) and mean relevancy score (M_{RS}) were computed as follows:

$$R_W = \frac{3f_1 + 2f_2 + 1f_3}{3N}$$

$$M_{RS} = \frac{3f_1 + 2f_2 + 1f_3}{N}$$

Where f_1 , f_2 and f_3 are the number of judges rating the statement Most Relevant, Relevant and Irrelevant and N is the number of judges (53). The overall mean relevancy score (O_{MRS}) across the 90 statements was 2.549. Statements with $R_W \geq 0.85$ and $M_{RS} \geq O_{MRS}$ were treated as relevant. The retained statements were then refined in light of the judges' comments without changing their intended meaning.

Item analysis

The 59 relevant statements were presented to sixty FPO member farmers in Visakhapatnam district, Andhra Pradesh and were noted on a five-point scale from strongly agree (5) to strongly disagree (1), with scoring inverted for negative statements. Respondents were ordered by overall score and the top and bottom 27 percent (16 respondents each) constituted the high and low groups (Kelley, 1939) [21]. The critical ratio for every statement was calculated as:

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

Where n = 16 respondents in each group. Statements with $t \geq 1.75$ were retained.

Reliability and validity

Cronbach's alpha was used to evaluate internal consistency. The split-half approach was also used: the items were split into even and odd-numbered halves, the Pearson correlation (r) between half-scores was calculated and the Spearman-Brown formula was used to adjust for complete length:

$$R = \frac{2r}{1+r}$$

Content validity was assessed using the item pool's nine dimensions and expert relevancy ratings. The analyses were carried out in MS Excel and SPSS.

Results and discussion

Relevancy analysis

Of the 90 statements evaluated by the 53 judges, 59 met both relevancy criteria, while 31 were dropped. Each of the nine dimensions retained six or seven statements (Table 1). R_W values for retained statements ranged from 0.86 to 0.94, whereas M_{RS} values ranged from 2.57 to 2.81. The highest-rated statement was "I identify problems in my turmeric farming before they become serious" (No. 53; R_W 0.94, M_{RS} 2.81), followed by statements about avoiding collective responsibility (No. 50; R_W 0.93) and monitoring crop progress (No. 38; R_W 0.92). Seventeen of the 59 statements are negatively worded and span eight dimensions; only achievement motivation contains none.

Table 1. Dimensional distribution of statements kept following the relevancy test ($N = 53$ judges)

S.No	Dimension	Items retained	Negative items	R_W range	M_{RS} range
	Achievement motivation	6	0	0.87–0.90	2.62–2.70
2.	Risk-taking ability	7	2	0.86–0.91	2.57–2.74
3.	Innovativeness	7	2	0.86–0.88	2.57–2.64

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S.No	Dimension	Items retained	Negative items	R_W range	M_{RS} range	
4.	4.	Decision-making ability	7	2	0.86–0.91	2.57–2.74
5.	5.	Self-confidence	7	2	0.86–0.91	2.57–2.74
6.	6.	Managerial ability	6	2	0.87–0.92	2.62–2.77
7.	7.	Feedback utilisation	6	2	0.86–0.90	2.57–2.70
8.	8.	Leadership ability	6	3	0.86–0.93	2.57–2.79
9.	9.	Problem-solving ability	7	2	0.87–0.94	2.60–2.81
		Total	59	17	0.86–0.94	2.57–2.81

Every dimension retained at least six statements after screening, so no dimension was lost. The strong ratings for problem anticipation (No. 53) and crop monitoring (No. 38) may reflect the long duration of the turmeric crop. In such a crop, early detection of rhizome rot, pest attack or nutrient stress largely decides the final yield and quality. The high rating for avoidance of group responsibility (No. 50) suggests that experts regard a member's willingness to carry FPO tasks as a defining part of entrepreneurial capacity in a collective setting, not an optional extra.

Two methodological points deserve attention. First, on a three-point continuum, R_W equals M_{RS} divided by three, so the two selection criteria are arithmetically the same test. The cut-off $R_W \geq 0.85$ corresponds to $M_{RS} \geq 2.55$, which is effectively the O_{MRS} of 2.549. The use of both indices follows convention in extension research, but the screening in this study rests on one threshold, not two. Second, the relevancy test establishes that experts judge the statements to be ap-

propriate. It does not show that farmers interpret or respond to them as intended. That evidence comes from the item analysis and reliability testing reported below.

Item analysis

None of the 59 relevant statements was removed, since all of them clearly distinguished between high and low scores in the pilot study of sixty farmers (Table 2). The critical ratios varied from 2.52 to 7.10 and all values exceeded the cut-off of $t \geq 1.75$ (Edwards, 1957) [20]. The utilization of expert recommendations (No. 41; $t = 7.10$), learning from the mistakes of the previous season (No. 43; $t = 6.68$) and enjoying attempting new strategies (No. 18; $t = 6.50$) were the strongest discriminators. Self-doubt about overseeing farm operations (No. 33; $t = 2.52$) and taking the initiative to plan FPO activities (No. 47; $t = 2.74$) were the weakest. With t -values ranging from 2.52 to 6.21, the 17 reverse-scored statements fared roughly as well as the positive ones.

Table 2. R_W , M_{RS} and critical ratio (t) of all the statements

No.	Statement	R_W	M_{RS}	t -value
I	Achievement motivation			
1	I set higher production targets for my turmeric crop before every season.(+)	0.89	2.68	5.48
2	I willingly take up challenging activities that can improve my turmeric farming. (+)	0.89	2.68	3.17
3	I continue working towards my farming goals even when turmeric cultivation becomes difficult. (+)	0.89	2.66	4.18
4	I try to achieve better results from my turmeric crop than the previous season. (+)	0.87	2.62	4.32
5	I make every effort to benefit from opportunities that improve my turmeric farming. (+)	0.89	2.66	5.29
6	Achieving the farming goals I set gives me satisfaction. (+)	0.90	2.70	4.44
II	Risk-taking ability			
7	I am willing to invest in potentially profitable turmeric farming practices even when the outcome is uncertain. (+)	0.86	2.57	5.01
8	I take calculated risks when I believe they can improve my turmeric farming. (+)	0.86	2.58	4.62
9	I am prepared to try a new turmeric production practice after carefully assessing its possible benefits and risks. (+)	0.91	2.74	5.06
10	I am willing to explore a new market for my turmeric produce when I expect better returns. (+)	0.89	2.66	5.25
11	I go ahead with a promising turmeric practice even when its results are uncertain. (+)	0.87	2.60	6.33
12	Fear of financial loss prevents me from trying better turmeric farming practices.(-)	0.87	2.62	5.49
13	A previous setback discourages me from taking similar risks again in turmeric farming.(-)	0.91	2.72	5.93
III	Innovativeness			
14	I look for better ways to carry out my turmeric farming activities. (+)	0.88	2.64	4.11
15	I readily accept useful new ideas that can improve my turmeric farming. (+)	0.88	2.64	4.28
16	I introduce improved practices in my turmeric farm without waiting for most other farmers to adopt them. (+)	0.86	2.57	3.56
17	I adjust newly introduced practices to suit the conditions of my turmeric farm. (+)	0.86	2.58	5.48
18	I enjoy trying different approaches to improve my turmeric farming. (+)	0.87	2.60	6.50
19	I am reluctant to change my usual turmeric farming practices. (-)	0.87	2.62	5.35
20	I lose interest in a new turmeric farming practice once I face difficulty with it. (-)	0.87	2.62	3.19
IV	Decision-making ability			

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No.	Statement	R_W	M_{RS}	t -value
21	I compare different alternatives before deciding on important activities in my turmeric farming. (+)	0.88	2.64	5.32
22	I consider the likely outcome of each option in turmeric farming before making a farming decision. (+)	0.86	2.58	4.60
23	I make important decisions at the appropriate time in my turmeric farming. (+)	0.87	2.62	5.22
24	I select the option that best suits the conditions of my turmeric farm. (+)	0.91	2.74	3.97
25	I carry out my turmeric farming decisions firmly once I have made them. (+)	0.86	2.57	4.95
26	I find it difficult in turmeric cultivation to choose between different farming options. (-)	0.87	2.62	3.67
27	I avoid making important decisions related to my turmeric farming. (-)	0.88	2.64	4.74
V Self-confidence				
28	I am confident in my ability to manage my turmeric farming successfully. (+)	0.87	2.60	5.40
29	I can handle unexpected problems in my turmeric farming with confidence. (+)	0.90	2.70	3.65
30	I believe I can learn and apply new skills that improve my turmeric farming. (+)	0.91	2.74	4.09
31	I can confidently discuss turmeric farming matters with agricultural experts or FPO officials. (+)	0.88	2.64	5.28
32	I trust my ability to overcome difficulties in turmeric farming. (+)	0.91	2.72	3.73
33	I doubt my ability to manage important activities in my turmeric farming. (-)	0.91	2.72	2.52
34	A setback in turmeric farming reduces my confidence in handling future situations. (-)	0.86	2.57	3.39
VI Managerial ability				
35	I plan the activities of my turmeric farming before the season begins. (+)	0.87	2.62	4.39
36	I organise the resources needed for my turmeric farming in time. (+)	0.90	2.70	5.13
37	I make efficient use of the available resources in my turmeric farming. (+)	0.88	2.64	6.21
38	I regularly monitor the progress of my turmeric crop and farming activities. (+)	0.92	2.77	5.10
39	I begin important farming activities without proper planning. (-)	0.87	2.62	4.03
40	I rarely review the progress of my turmeric farming activities. (-)	0.91	2.72	4.72
VII Feedback utilisation				
41	I use the suggestions given by agricultural experts to improve my turmeric farming. (+)	0.87	2.62	7.10
42	I make changes in my turmeric farming based on useful feedback received from my FPO. (+)	0.86	2.58	5.42
43	I improve my turmeric farming practices after identifying mistakes in the previous season. (+)	0.89	2.68	6.68
44	I review the results of my farming decisions to improve future performance. (+)	0.90	2.70	3.73
45	I ignore suggestions from experts or my FPO on improving my turmeric farming. (-)	0.89	2.66	4.37
46	I rarely review my past farming experiences before planning the next turmeric season. (-)	0.86	2.57	6.21
VIII Leadership ability				
47	I willingly take the initiative to organize turmeric farming activities in FPO. (+)	0.90	2.70	2.74
48	I help resolve differences among FPO turmeric farmers to maintain good cooperation. (+)	0.91	2.72	4.28
49	I motivate other growers to adopt beneficial turmeric farming practices. (+)	0.88	2.64	4.48
50	I avoid taking responsibility for group activities in turmeric farming in FPO. (-)	0.93	2.79	4.37
51	I avoid taking the lead when the turmeric farmers need someone to coordinate group activities. (-)	0.86	2.57	3.46
52	I avoid helping to solve disagreements among FPO turmeric farmers. (-)	0.87	2.62	3.60
IX Problem-solving ability				
53	I identify problems in my turmeric farming before they become serious. (+)	0.94	2.81	4.78
54	I try to find the root cause of a problem before attempting to solve it. (+)	0.89	2.68	5.33
55	I look for practical ways to overcome problems in my turmeric farming. (+)	0.87	2.60	3.08
56	I put suitable solutions into practice to overcome turmeric farming problems. (+)	0.89	2.66	3.46
57	I continue trying different solutions until the problem in turmeric farming is resolved. (+)	0.87	2.60	4.99
58	I ignore small problems in my turmeric farming until they become difficult to manage. (-)	0.90	2.70	5.59
59	I find it difficult to deal with unexpected problems in my turmeric farming. (-)	0.91	2.72	4.17

R_W = relevancy weightage; M_{RS} = mean relevancy score (O_{MRS} = 2.549); t = critical ratio between the upper and lower 27 per cent groups ($n = 16$ each), computed after reverse-scoring the negative statements. That no statement was eliminated at this stage reflects the strict relevancy screening that preceded it, but it also means the 1.75 threshold did no screening work in this sample and the scale remains long at 59 items. Item selection and reliability were also estimated on the same 60 respondents, so both estimates are likely optimistic.

Reliability

The 59-item scale showed high internal consistency, with a Cronbach's alpha of 0.966 (Table 3). In the odd-even split, the two halves had alphas of 0.934 (30 items) and 0.930 (29 items) and correlated at $r = 0.961$, giving a Spearman-Brown coefficient of 0.980. Alpha for the individual dimensions ranged from 0.872 (managerial ability) to 0.933 (risk-taking ability), so dimension scores may be used provisionally, pending factor analysis (Table 4). Corrected item-total correlations ranged from 0.29 (No. 33) upward and no statement fell below the conventional 0.20 floor.

Table 3. Reliability statistics of the Entrepreneurial Capacities Scale ($n = 60$)

Statistic	Value
Number of items	59
Cronbach's alpha (whole scale)	0.966
Alpha, part 1 (odd items, 30)	0.934
Alpha, part 2 (even items, 29)	0.930
Correlation between halves (r)	0.961
Spearman–Brown coefficient	0.980
Guttman split-half coefficient	0.980

Table 4. Dimension-wise internal consistency

Dimension	Items	Cronbach's alpha
Achievement motivation	6	0.890
Risk-taking ability	7	0.933
Innovativeness	7	0.903
Decision-making ability	7	0.917
Self-confidence	7	0.885
Managerial ability	6	0.872
Feedback utilisation	6	0.902
Leadership ability	6	0.914
Problem-solving ability	7	0.918

An alpha of 0.966, however, is above the range usually considered ideal. Values above about 0.95 can signal redundancy among items rather than better measurement (Streiner, 2003) [22] and alpha rises with the number of items in any case. Pairs such as Nos. 40/46, 29/59, 13/34, 48/52, 38/40, 35/39, 44/46 and 50/51 are near-mirror statements that overlap in content. A shorter version, built by removing the statements with the lowest item–total correlations or through factor analysis on the main sample, would be easier to administer in the field without loss of reliability.

Limitations of the study

Content validity was based on expert judgement and construct validity has not yet been tested through factor analysis or correlation with related measures such as economic motivation or innovativeness scores. The nine-dimension structure is theoretical and should be confirmed with exploratory or confirmatory factor analysis on the main sample of 240 respondents. Test–retest reliability was also not assessed, although it has been reported for comparable Likert-type scales in extension research (Sawandkar *et al.*, 2026) [19]. The pilot sample of 60 was drawn from a single district and included farmers who do not grow turmeric, although the statements refer to turmeric farming. The discrimination and reliability estimates should therefore be re-checked on the turmeric-growing main sample.

Scoring of the scale

Positive statements are scored 5, 4, 3, 2 and 1 from strongly agree to strongly disagree, and the 17 negative statements are scored in reverse (1 to 5). A respondent's total score can therefore range from 59 to 295. Dimension scores range from 6 to 30 for six-item dimensions and from 7 to 35 for seven-item dimensions. Respondents can be grouped into low, medium and high categories using the mean $\pm$ standard deviation.

Conclusion

This study produced a 59-item, nine-dimension scale to measure the entrepreneurial capacities of turmeric growers associated with FPOs. Statements were screened by 53 experts and then tested for discrimination and internal consistency. The instrument can help extension functionaries and FPO managers identify which capacities are weak among members. For example, it can show whether members lag in

risk-taking, feedback utilisation or leadership, so that training and handholding can be targeted accordingly. Future work should test the factor structure of the scale, examine its relationship with marketing behaviour and farm income, and adapt it for other commodity-based FPOs.

Highlights

- A nine-dimensional tool was developed to assess the entrepreneurial capacities of turmeric growers who are members of Farmer Producer Organizations (FPOs) in Andhra Pradesh
- 59 statements passed the relevancy threshold ($R_W \geq 0.85$, equivalent to $M_{RS} \geq$ overall mean of 2.549) after 53 experts rated 90 edited statements on a three-point continuum.
- In a pilot survey, all 59 statements discriminated ($t = 2.52\text{--}7.10$); the scale's Spearman–Brown split-half coefficient was 0.980, and its Cronbach's alpha was 0.966.

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