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Development of an index to measure the managerial competency of coconut growers in coconut-based farming system

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Abstract
The paper describes the entire methodology adopted for developing an index to measure the managerial competency of coconut growers in coconut-based farming system. The standardized index was developed by using the Normalized Rank Order Method recommended by Guilford. Ten possible indicators of managerial competence were gathered after thorough review of literature and expert consultation. Based on the ranks given by the judges, scale values of the indicators were found out. 87 sub items under the 10 indicators were subjected to relevancy test by sending it for expert content evaluation. Based on the Relevancy Percentage (RP), Relevancy Weightage (RW) and Mean Relevancy Score (MRS), 67 items were selected. The scale was administered to 40 non-respondent farmers for item analysis. The reliability of the scale was tested using test retest method and a coefficient value of 0.99 was obtained indicating higher reliability. The final scale consisting of 10 indicators and 55 sub items had practical applicability in measuring managerial competency of coconut growers in coconut based farming system.

Introduction
Coconut palm is grown in eighteen states and three Union Territories in India, providing employment to approximately 12 million people and thereby supporting their livelihood. As for India is considered total area under coconut cultivation is 2173.28 ha with 20308.70 million nuts production and 9345 nuts / ha productivity (GOI, 2020) [4]. Coconut palms are grown on the entire coastal belt in the country. Major share goes to Karnataka, Tamil Nadu and Kerala followed by Andhra Pradesh, Orissa and Maharashtra (NHB, 2022) [9].

Coconut gardens provide tremendous opportunities to optimize return per unit area by utilizing the interspace potential. Coconut-based farming system which involves growing compatible crops in the interspaces between coconuts and integrating with other businesses such as dairy, poultry, fisheries *etc.* has a lot of potential for increasing production and productivity per unit area, time, and inputs by making better use of resources such as sunlight, soil, water, and labour (Maheswarappa *et al.,* 2017) [7]. To maximize the farm's economic yield, all management methods and component production systems should be able to maintain high productivity, profitability, and sustainability of the existing coconut trees (Dhanapal, 2010) [3]. Developing farm management through improving farm managerial abilities of farmers is therefore an important aspect which is directly linked to farmers' success (Nell *et al*., 1998) [8].

Managerial competency, on the other hand, should enable farmers to administer the farm effectively. A farmer is managerially competent if he is able to determine the rules and procedures of the organization, determine the line of command or hierarchy of authority within the farm, recruit, train staff and allocate responsibilities, co-ordinate the production process i.e., meet production and supply schedules, cost and time targets and deal with government agencies and other firms such as input suppliers, credit and insurance providers, processors etc. The successful performance of the above entrepreneurial functions requires a certain level of knowledge, skills and attitudes acquired through training and experience. So, for developing higher managerial competency it is necessary to ensure better farm practice in general and coconut based in specific.

Considering the importance of managerial competency among coconut growers in coconut-based farming system, the present study aims to develop and validate an index to measure the same. The developed index can be used further for assessing the managerial competency of coconut growers in coconut-based farming system.

Materials and Methods
In the present study, Managerial competency is operationally defined as the ability of a coconut farmer to manage all components in the coconut-based farming system with efficient utilization of resources, using relevant skills and knowledge so that they can maximize the

productivity of the farm and thereby optimize their income. Managerial ability has important implications for farm growth (Alvores and Arias, 2003) [1]. The major objective of the study is to compare the managerial competency of coconut growers of Kerala and Maharashtra. A standardized index to measure the managerial competency of coconut growers in coconut-based farming system was developed by using the Normalized Rank Order Method recommended by Guilford (1954) [5]. The method consists of the following steps:

Identification of indicators
The possible indicators of managerial competency were gathered through exhaustive review of literature. After thorough investigation and in-depth comprehension, these indicators were consulted with the experts. Finally, 10 possible indicators of managerial competency were found and included in the procedure.

Selection of judges and their opinion
Thirty judges were selected both from Kerala and Maharashtra from agricultural universities, Krishi Vigyan Kendras and various research stations, constituting a group of sixty judges, to develop the managerial competence index. The selected indicators were sent to the judges through formal letter, personal contact and google forms. They were requested to provide their opinion on the applicability and significance of the indicators and to mark their relevancy in a three-point continuum, viz., More Relevant (MR), Relevant (R) and Less Relevant (LR) with scores 3, 2 and 1 respectively.

Relevance of the indicators
The responses of the judges were tabulated and analyzed to calculate "Relevancy Percentage (RP)," "Relevancy Weightage (RW)," and "Mean Relevancy Score (MRS)" for all the indicators using the following formulas,

$$\text{Relevancy per cent} = \frac{(MR \times 3) + (R \times 2) + (LR \times 1) \times 100}{\text{Maximum possible score}}$$

$$\text{Relevancy Weightage} = \frac{(MR \times 3) + (R \times 2) + (LR \times 1)}{\text{Maximum possible score}}$$

$$\text{Mean Relevancy score} = \frac{(MR \times 3) + (R \times 2) + (LR \times 1)}{\text{Number of judges responded}}$$

Ranking of selected indicators
The same judges were requested to rank the selected indicators based on their relative importance in determining managerial competency.

Computing scale values
To determine the scale value of each item, ranked by judges, the centile position "P" based on the method suggested by Guilford (1954) [5] was worked out. The "C" value (value determined to each centile value), Rj value and finally scale value, i.e., Rc value, were worked out by using the following formula:

Rc= 2.357 Rj - 7.01

Relevancy of sub items of the indicators of managerial competence
Relevant sub items were identified for each indicator through exhaustive review of literature and expert opinion. The statements were edited using Edwards 14 principles. Based on the judges' responses of the sub items, on a three-point continuum, relevancy weightages were calculated for each of them. Then a pilot study was conducted among forty non-respondents to know their agreement or disagreement on the sub items to be included in the final format. For this purpose, 't-value' method was used. The items in the scale were administered to farmers to mark on a three-point continuum ranging from more relevant to less relevant with scores 3, 2 and 1 respectively. Based on the responses, the respondents were arranged in ascending order based on total score. Twenty-five per cent of the subjects with the highest score and twenty-five per cent with the lowest scores were selected. These two groups provided the criterion groups in terms of which item analysis was conducted and t-test was calculated. "t" value equal to or greater than 1.75 were considered for inclusion in the scale. This value indicates that the average response of the high and low-criterion groups to a statement differ significantly.

Validity of the scale
The validity of the scale is the accuracy with which an instrument measure what it is intended to measure. The validity of the developed scale was measured by content validity method.

Reliability of the scale
Reliability of a scale is the statistical measure of the reproducibility of the instrument (Litwin, 1995) [6]. There are different methods to assess the reliability of a scale. In the present study, test-retest method was used to know the reliability of the developed scale. The concept of test reliability is examined in terms of general, group, and specific factors among the items, and the stability of scores in these factors from trial to trial (Chronbach, 1947) [2]. In this method, the developed managerial competency scale was administered twice to the twenty respondents at fifteen days intervals, who are neither previously interviewed nor had a chance to come in the final sample of the study. The reliability coefficient was calculated with the help of Rulon's formula used by Guilford (1954) [5] as mentioned below.

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

where,
rtt = coefficient of reliability
d = difference in two scores
σ2d = variances of those differences
σ2t = variances of the total score

$$\sigma^2 d = \frac{\sum d^2 - (\sum d)2/n}{n}$$

$\sigma^2 d = \sum d^2 - (\sum d)$

$$\sigma^2 t = \frac{\sum t^2 - (\sum t)^2/n}{n}$$

Administration of the scale

The final standardized scale consisting of indicators and sub items will be administered on a five-point continuum ranging from, "Strongly agree", to "Strongly disagree" with scores 5, 4, 3, 2 and 1 respectively. The scale would measure the managerial competency of coconut growers in coconut-based farming system. Based on the scores obtained, the respondents will be categorized into, low, medium and high managerial competency classes using mean and standard deviation.

Development of Managerial Competency Index

After obtaining the scale values of individual components of managerial competence and total scale value, Managerial

Competency Index (MCI) was developed.

Results and Discussions
Identification of indicators and judges rating

After thorough review of literature and expert opinion, 10 indicators and 87 sub items of managerial competency of coconut growers were identified. The statements were framed using the 14 principles. They were sent to 60 judges for obtaining responses in a three-point continuum.

Relevancy testing

Based on the judges response, Relevancy Percent (RW), Relevancy Weightage (RW) and Mean Relevancy Score (MRS) were calculated for all 10 indicators and 87 statements. Those indicators having relevancy per cent more than 66.00 per cent, relevancy weightage of more than 0.66 and mean relevancy score of more than 1.75 were selected. All the 10 indicators were selected for the final scale based on the judges response (Table 1).

Table 1: Indicators selected based on relevancy test: Relevancy percentage (RP), relevancy weightage (RW) and mean relevancy score (MRS), (n = 10)

Sl. No	Indicators	Relevancy Weightage	Relevancy Percent	Mean Relevancy Score
1	Planning orientation	85.56	0.86	2.57*
2	Decision making	90	0.90	2.70*
3	Communication	81.60	0.81	2.45*
4	Resource utilization	86.12	0.86	2.58*
5	Diagnosis	78.89	0.78	2.37*
6	Technical capability	84.45	0.84	2.53*
7	Information seeking	78.33	0.78	2.35*
8	Risk management	86.11	0.86	2.58*
9	Marketing management	96.11	0.96	2.88*
10	Finance management	86.11	0.86	2.58*

*Indicators selected for final scale

Ranking of the selected indicators and computation of scale values

The same judges opinion were utilized to rank the selected indicators. Based on their responses, both ranks (r_i) and reverse ranks (R_i) were taken into consider and each component's ranking frequency was tabulated accordingly. To determine the scale value of each item, ranked by judges, the centile position "P" based on the method suggested by

Guilford was worked out. The "C" value (value determined to each centile value) and "Rj" value were calculated. Rj value is calculated by dividing the C value of a particular indicator by the total number of judges. Finally, scale value, i.e., Rc value, were worked out by using the following formula:

Rc= 2.357Rj-7.01

Table 2: Method of working the scale values based on the ranks given by sixty judges on ten indicators

| ri | Ri | Managerial competence indicators | | | | | | | | | | Sum | P | C |
		Planning orientation	Decision making	Communication	Resource utilization	Diagnosis	Technical capability	Information seeking	Risk management	Marketing management	Finance management			
1	10	30	24	0	0	2	0	2	1	1	0	60	95	8
2	9	20	18	5	2	0	0	3	5	3	4	60	85	7
3	8	4	12	4	4	0	2	8	15	7	4	60	75	6
4	7	0	0	18	32	0	9	1	0	0	0	60	65	6
5	6	1	0	22	5	24	8	0	0	0	0	60	55	5
6	5	0	3	0	17	3	18	5	4	2	8	60	45	5
7	4	0	1	0	0	14	5	18	22	0	0	60	35	4
8	3	3	0	9	0	5	15	20	0	5	3	60	25	4
9	2	2	1	2	0	7	2	0	13	30	3	60	15	3
10	1	0	1	0	0	5	1	3	0	12	38	60	5	2
$\sum f_{ji}$		60	60	60	60	60	60	60	60	60	60	600	500	50
$\sum f_{ji}C$		427	369	327	340	258	292	274	280	215	189	2881		
R_j		7.11	6.15	5.45	5.67	4.30	4.87	4.57	4.67	3.59	3.15	48.01		
Rc		9.76	7.48	5.83	6.34	3.12	4.46	3.75	3.99	1.44	0.41455	46.59		

r_i = Rank given by judges to 10 indicators
R_i = Rank values in the reverse order of rank
$\sum$ = Sum
P = Centile value
C = C values of respective rank
R_C = Scale value

Table 3: The computed scale values and ranking of ten indicators

Sl. No.	Indicators	Scale value	Rank
1	Planning orientation	9.76	1
2	Decision making	7.48	2
3	Communication	5.83	4
4	Resource utilization	6.34	3
5	Diagnosis	3.12	8
6	Technical capability	4.46	5
7	Information seeking	3.75	7
8	Risk management	3.99	6
9	Marketing management	1.44	9
10	Finance management	0.41	10

Relevancy of sub-items of the indicators of managerial competency
Based on the sixty judges' responses, relevancy weightages were calculated for all the statements. Those sub-items having relevancy per cent more than 66 per cent, relevancy weightage of more than 0.66 and mean relevancy score of more than 1.75 of the judges were selected. Finally, a total of 67 statements were selected and the rest were rejected. After that, data were collected from 40 non-respondent coconut growers and marked in a three-point continuum ranging from more relevant to less relevant with scores 3, 2 and 1 respectively. The selection of items for the final scale was done after calculating the t-value. Those statements with t-value greater than 1.75 were selected and included in the managerial competency scale. Table 4 shows that out of 87 items of various indicators, 67 items were selected based on relevancy ie., relevancy percent, relevancy weightage and mean relevancy score and the rest 20 were omitted. Further analysis of selected 67 statements was done by applying 't-test' to see agreement or disagreement among the judges and it was found that, 12 statements were rejected

and hence total 55 statements were included in the final format of index. Relevancy percent, relevancy weightage, mean relevancy score and t-value of the sub items are shown in table 5.

Standardization of the scale
The developed scale was standardized by establishing its validity and reliability. The content validity of the scale was established through exhaustive literature review of the items for inclusion in the scale, and experts' consultation. To know the reliability, the developed scale was administered twice to 20 respondents at 15 days intervals. Thus, two sets of scores were obtained for each of the 20 respondents. By calculating the coefficient of correlation between the two sets of managerial competence scores, an estimate of the stability of measurement called the stability reliability coefficient was obtained. The coefficient of reliability was calculated by Rulon's formula and was found to be 0.999. Thus, the scale developed was found to be highly reliable. To understand this procedure, we can examine the statements of the scale in the following table.

Table 4: Indicator wise total number of items included

Sl No.	Dimensions	Total number of items included	Total number of items selected on the basis of relevancy	Total number of items rejected on the basis of relevancy	Total number of items rejected on t test	Total items rejected	Items included in the final format
1	Planning orientation	9	7	2	1	3	6
2	Decision making	10	8	2	2	4	6
3	Communication	7	6	1	1	2	5
4	Resource utilization	5	5	0	1	1	4
5	Diagnosis	9	6	3	1	4	5
6	Technical capability	8	7	1	1	2	6
7	Information seeking	11	7	4	2	6	5
8	Risk management	11	8	3	1	4	7
9	Marketing management	10	8	2	1	3	7
10	Finance management	7	5	2	1	3	4
	Total	87	67	20	12	32	55

Table 5: Relevancy percent (RP), Relevancy Weightage (RW), Mean Relevancy Score (MRS) and t-test of the sub items of managerial competency

Sl. No	Sub items	RW	RP	MRS	t-value
I	**Planning orientation**				
1	Scheduling short- and long-term activities in the coconut farm	0.86	86.66	2.6	1.79*
2	Anticipation of input requirements over a production period	0.81	81.1	2.43	1.78*
3	Utilization of land effectively in the coconut farm	0.82	82.77	2.48	1.90*
4	Plan division of work by proper utilization of labourers	0.68	68.88	2.06	2.01*
5	Prediction of income targets over a particular production period	0.80	80.00	2.4	1.25
6	Planning of harvest of both main crop and inter crop whenever market rates are higher	0.73	73.88	2.21	2.04*
7	Anticipation of probable pest and disease incidence in the farm	0.78	78.88	2.36	1.86*
II	**Decision making**				
8	Adoption of good agricultural practices in the coconut farm	0.81	81.11	2.43	1.78*
9	Identification of best management practices for coconut	0.84	84.44	2.53	1.83*
10	Identification of suitable intercrops in the farm	0.89	89.44	2.68	2.21*
11	Identification of best management practices for the intercrops	0.86	86.11	2.58	2.09*
12	Identification of best management practices for livestock involved in the farming system	0.78	78.88	2.36	2.23*
13	Make good decision on new technologies to be used in the farm	0.82	82.77	2.48	0.61
14	Choosing from different alternatives of inputs and resources	0.81	81.66	2.45	1.77*
15	Choosing from different market opportunities	0.83	83.88	2.51	1.40
III	**Communication**				
16	Establishing good, clear and honest communication with others	0.87	87.22	2.61	1.86*
17	Enhance the capacities and capabilities of labourers with proper coordination	0.75	75.55	2.26	1.79*
18	Ability to listen to others as well as take suggestions to improve the performance of the farm	0.83	83.88	2.51	1.41
19	Maintaining good relationship with buyers and sellers for buying farm inputs and selling farm produce	0.76	76.66	2.30	2.21*
20	Establish communication with extension workers and government officials	0.8	80	2.40	2.25*
21	Maintaining good relationship with farm input suppliers	0.74	74.44	2.23	1.98*
IV	**Resource utilization**				
22	Completion of all farm activities in best possible time with full utilization of resources	0.72	72.22	2.16	1.87*
23	Purchasing seeds and planting materials with minimum cost and maximum efficiency	0.82	82.22	2.46	2.52*
24	Using fertilizers and plant protection chemicals at minimum cost and maximum efficiency	0.85	85.55	2.56	1.99*
25	Choosing cultivation practices that lead to efficient land utilization in the farm	0.77	77.77	2.33	1.86*
26	Using technologies that make efficient use of resources	0.88	88.88	2.66	1.34
V	**Diagnosis**				
27	Identification of major pests and diseases affecting coconut palms	0.77	77.22	2.31	1.79*
28	Identification of major pests and diseases affecting intercrops in the farm	0.81	81.66	2.45	3.05*
29	Identification of nutrient deficiency symptoms of coconut palms	0.80	80.55	2.41	2.21*
30	Identification of nutrient deficiency symptoms of inter crops	0.82	82.77	2.48	1.33
31	Identification of different diseases affecting livestock and poultry in the coconut-based farming system	0.76	76.11	2.28	1.83*
32	Identification of up and down in growth and development cycle of all crops	0.78	78.33	2.35	2.47*
VI	**Technical capability**				
33	Improving soil properties before starting cultivation in the coconut farm	0.81	81.66	2.45	0.69
34	Providing good irrigation facilities in the coconut farm	0.85	85	2.55	2.11*
35	Using proper technologies for intercultural operations in the coconut farm	0.77	77.77	2.33	2.12*
36	Using good technologies for weed management in the farm	0.79	79.44	2.38	2.44*
37	Using good technologies for pest management in the farm	0.82	82.77	2.48	2.27*
38	Using good technologies for disease management in the farm	0.87	87.77	2.63	3.52*
39	Harvesting coconuts at right time using innovative technologies	0.82	82.77	2.48	2.05*
VII	**Information seeking**				
40	Accessing different information regarding cultivation and management in the coconut farm	0.78	78.88	2.366	2.01*
41	Collect information on input prices and market	0.87	87.77	2.63	4.11*
42	Collect information on demand and supply forces existing in the market	0.83	83.88	2.51	1.96*
43	Accessing information on different subsidies and credit facilities provided by government	0.82	82.22	2.46	1.82*
44	Accessing information on different livestock management practices	0.81	81.66	2.45	1.82*
45	Accessing information on government policies on agriculture	0.84	84.44	2.53	1.25
46	Ability to learn about possible value addition of the farm produce	0.82	82.22	2.46	1.05
VIII	**Risk management**				
47	Managing risks on unavailability of inputs in the coconut farm	0.81	81.66	2.45	3.86*
48	Devising strategies to face various climatic challenges affecting the farming system	0.84	84.44	2.53	2.13*
49	Devising strategies to face unpredictable crop losses in the farm	0.80	80.55	2.41	2.19*
50	Managing risks on unavailability of market for the produce	0.80	80.55	2.41	2.27*
51	Effective management of production risks	0.77	77.77	2.33	2.05*
52	Effective management of financial risks	0.75	75.55	2.26	1.98*
53	Quick analysis and solving of different risk situations which have never been faced before	0.77	77.22	2.31	0.28
54	Managing menace of monkeys and other wild animals	0.79	79.4	2.38	1.83*

IX	Marketing management				
55	Analysing current market trends	0.78	78.33	2.35	1.80*
56	Analysing demand and supply forces existing in the market	0.85	85.5	2.56	2.74*
57	Ability to sell products directly to consumers	0.81	81.66	2.45	1.89*
58	Avoiding the interruption of unwanted marketing channels	0.77	77.77	2.33	2.05*
59	Identification of new markets for the products	0.82	82.22	2.46	1.86*
60	Providing good storage facilities so that produce can be stored to sell whenever prices are high	0.82	82.77	2.48	3.86*
61	Making value added products for more market gain	0.81	81.11	2.43	1.77*
62	Providing cool storage facilities for perishable commodities	0.79	79.44	2.38	1.32
X	Finance management				
63	Accessing financial and credit facilities from various credible sources	0.75	75	2.25	2.47*
64	Managing high labour and input cost	0.77	77.7	2.33	2.07*
65	Availing subsidies and different credit facilities provided by the government	0.84	84.44	2.53	2.19*
66	Maintaining records on investments and production costs	0.8	80	2.4	2.14*
67	Maintaining records on expenses and income	0.86	86.11	2.587	0.95

Table 6: Reliability of the managerial competence scale (n = 20)

Sr. No.	Initial scores (Xo)	Scores after 15 days (Xe)	d (Xo –Xe)	d²	t (Xo + Xe)	t²
1	383	388	5	1	771	594441
2	361	365	4	16	726	527076
3	370	372	2	4	742	550564
4	344	350	6	36	694	481636
5	358	367	9	81	725	525625
6	337	348	11	121	685	469225
7	336	331	-5	25	667	444889
8	378	384	6	36	762	580644
9	371	380	9	81	751	564001
10	354	374	20	400	728	529984
11	183	175	-8	64	358	128164
12	158	162	4	16	320	102400
13	177	167	-10	100	344	118336
14	158	168	10	100	326	106276
15	180	189	9	81	369	136161
16	160	152	-8	64	312	97344
17	171	163	-8	64	334	111556
18	179	171	-8	64	350	122500
19	171	181	10	100	352	123904
20	164	158	-6	36	322	103684
Total	5293	5345	52	1490	10638	6418410

Administration of the scale

The final standardized scale which measure the managerial competency of coconut growers in coconut based farming system consisted of 10 indicators and 55 sub items. The scale can be administered on a five-point continuum ranging from, strongly agree, agree, undecided, disagree and strongly disagree with scores 5 to 1 (Table 7).

Development of managerial competency index

A scale to measure the managerial competency index (MCI) was developed. To find out the managerial competency index, the following formula was used.

Managerial Competency Index (MCI) =

$$\left\{ \frac{R1}{M1} * W1 + \frac{R2}{M2} * W2 + \cdots \frac{Rn}{Mn} * W10 \right\} * 100$$

Where,

R1, R2, Rn= Obtained score for each respondent for the particular item

M1, M2, M10= Potential score of the respondent for the particular item

W1, W2, W10 = Ratio Scale Value of the item to total scale value of the scale

Table 7: The final standardized scale to measure managerial competency

Sl. No.	Indicators	SA	A	UD	D	SD
I	**Planning orientation**					
1	Scheduling short- and long-term activities in the coconut farm					
2	Anticipation of input requirements over a production period					
3	Utilization of land effectively in the coconut farm					
4	Plan division of work by proper utilization of labourers					
5	Planning of harvest of both main crop and inter crop whenever market rates are higher					
6	Anticipation of probable pest and disease incidence in the farm					
II	**Decision making**					
1	Adoption of good agricultural practices in the coconut farm					
2	Identification of best management practices for coconut					
3	Identification of suitable intercrops in the farm					
4	Identification of best management practices for the intercrops					
5	Identification of best management practices for livestock involved in the farming system					
6	Choosing from different alternatives of inputs and resources					
III	**Communication**					
1	Establishing good, clear and honest communication with others					
2	Enhance the capacities and capabilities of labourers with proper coordination					
3	Maintaining good relationship with buyers and sellers for buying farm inputs and selling farm produce					
4	Establish communication with extension workers and government officials					
5	Maintaining good relationship with farm input suppliers					
IV	**Resource utilization**					
1	Completion of all farm activities in best possible time with full utilization of resources					
2	Purchasing seeds and planting materials with minimum cost and maximum efficiency					
3	Using fertilizers and plant protection chemicals at minimum cost and maximum efficiency					
4	Choosing cultivation practices that lead to efficient land utilization in the farm					
V	**Diagnosis**					
1	Identification of major pests and diseases affecting coconut palms					
2	Identification of major pests and diseases affecting intercrops in the farm					
3	Identification of nutrient deficiency symptoms of coconut palms					
4	Identification of different diseases affecting livestocks and poultry in the coconut-based farming system					
5	Identification of up and down in growth and development cycle of all crops					
VI	**Technical capability**					
1	Providing good irrigation facilities in the coconut farm					
2	Using proper technologies for intercultural operations in the coconut farm					
3	Using good technologies for weed management in the farm					
4	Using good technologies for pest management in the farm					
5	Using good technologies for disease management in the farm					
6	Harvesting coconuts at right time using innovative technologies					
VII	**Information seeking**					
1	Accessing different information regarding cultivation and management in the coconut farm					
2	Collect information on input prices and market					
3	Collect information on demand and supply forces existing in the market					
4	Accessing information on different subsidies and credit facilities provided by government					
5	Accessing information on different livestock management practices					
VIII	**Risk management**					
1	Managing risks on unavailability of inputs in the coconut farm					
2	Devising strategies to face various climatic challenges affecting the farming system					
3	Developing strategies to face unpredictable crop losses in the farm					
4	Managing risks on unavailability of market for the produce					
5	Effective management of production risks					
6	Effective management of financial risks					
7	Managing menace of monkeys and other wild animals					
IX	**Marketing management**					
1	Analysing current market trends					
2	Analysing demand and supply forces existing in the market					
3	Ability to sell products directly to consumers					
4	Avoiding the interruption of unwanted marketing channels					
5	Identification of new markets for the products					
6	Providing good storage facilities so that produce can be stored to sell whenever prices are high					
7	Making value added products for more market gain					
X	**Finance management**					
1	Accessing financial and credit facilities from various credible sources					
2	Managing high labour and input cost					
3	Availing subsidies and different credit facilities provided by the government					
4	Maintaining records on investments and production costs					

SA-Strongly Agree, A-Agree, UD-undecided, DA-Disagree, SDA-Strongly Disagree

Table 8: Ranks corresponding to C-Scale values for different numbers of things ranked

Number ranked	C-scale values								
	1	2	3	4	5	6	7	8	9
10	..	10	9	7-8	5-6	3-4	2	1	
11	..	11	9-10	8	5-7	4	2-3	1	
12	..	12	10-11	8-9	6-7	4-5	2-3	1	
13	13	..	11-12	9-10	6-8	4-5	2-3	..	1
14	14	..	12-13	9-11	7-8	4-6	2-3	..	1
15	15	14	13	10-12	7-9	4-6	3	2	1
16	16	15	13-14	11-12	7-10	5-6	3-4	2	1
17	17	16	14-15	11-13	8-10	5-7	3-4	2	1
18	18	17	15-16	12-14	8-11	5-7	3-4	2	1
19	19	18	16-17	12-15	9-11	5-8	3-4	2	1
20	20	19	16-18	13-15	9-12	6-8	3-5	2	1
21	21	20	17-19	14-16	9-13	6-8	3-5	2	1
22	22	21	18-20	14-17	10-13	6-9	3-5	2	1
23	23	22	19-21	15-18	10-14	6-9	3-5	2	1
24	24	22-23	20-21	15-19	11-14	6-10	4-5	2-3	1
25	25	23-24	20-22	16-19	11-15	7-10	4-6	2-3	1
26	26	24-25	21-23	17-20	11-16	7-10	4-6	2-3	1
27	27	25-26	22-24	17-21	12-16	7-11	4-6	2-3	1
28	28	26-27	23-25	18-22	12-17	7-11	4-6	2-3	1
29	29	2728	23-26	18-22	13-17	8-12	4-7	2-3	1
30	30	28-29	24-27	19-23	13-18	8-12	4-7	2-3	1

Conclusion

The scale to measure the managerial competency index was found to be reliable and valid. The scale consists of ten indicators namely, Planning orientation, Decision making, Communication, Resource utilization, Diagnosis, Technical capability, Information seeking, Risk management, Marketing management and Finance management with scale values of 9.76, 7.48, 5.83, 6.34, 3.12, 4.46, 3.75, 3.99, 1.44 and 0.41 respectively. The scale also consists of 55 sub items. The developed scale can be administered on a five-point continuum ranging from 'strongly agree' to 'strongly disagree' to measure the managerial competency of coconut growers in coconut-based farming system. To improve the scale's usability and applicability, it is suggested to validate it in different demographics.

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