https://doi.org/10.56572/gjoee.2022.33.1.0001 *Gujarat Journal of Extension Education Vol. 33 : Issue 1 : June 2022*

A SCALE TO MEASURE CORE COMPETENCY OF EXTENSION FIELD FUNCTIONARIES IN LAND RESOURCE INVENTORY BASED WATERSHEDS

K. N. Ravi [1] and S. L. Patil [2]

1 Scientist (Agricultural Extension), Human Resource Development Division, ICAR-Indian Institute of Soil and Water Conservation, Research Centre, Ballari- 583 104
2 Principal Scientist (Agronomy), ICAR-Indian Institute of Pulse Research, Regional Station, Dharawad-580 005
Email: raviknswamy01@gmail.com

ABSTRACT

The scale development process is widely accepted and used as a quantitative tool to measure constructs in behavioural research. In the present paper, the objective was to develop core competency scale to measure the Knowledge, Attitude, Skills and other attributes of the extension field functionaries working under Land Resource Inventory based watersheds. A deductive scale development approach is adopted for construction of scale. Elaborative steps were followed to develop competency scale that should be parsimonious. In the present scale experts identified six major core competency domain areas like Planning, Communication, Technical, Program implementation, Professional and Information Technology competencies needed by extension field functionaries for effective execution of watershed activities. After judgment and content validity of the instrument, 38 items were selected for final scale and reliability was checked using Cronbach's alpha. The final scale is used to measure the competency gaps existing among extension field functionaries working in Land Resource Inventory based watersheds.

Keywords*: competency; watershed; land resource inventory; scale development*

INTRODUCTION

Competency is an integrated set of Knowledge, Attitudes and Skills (KAS) that allow one to effectively carry out the given work to the standards expected in the employment context (Lakai, 2014). Competencies of extension functionaries are considered important for problem solving and attaining the objective of any organization or programme (Sinha, 2021 and Yeragorla *et al.,* 2021). Therefore, the identification and assessment of competencies are crucial for capacity development (Borah & Devarani, 2022). The activities involved in the implementation of a watershed are multi-disciplinary and diversified. Further, change in the roles and responsibilities and working KAS has been observed between conventional and database-driven Land Resource Inventory (LRI) based new generation watersheds (Ravi, 2022), in recent times. LRI watersheds are those developed based on characterization of the nature of land resources, their constraints, inherent potential and suitability for various land-based crop enterprises, and other uses for preparing location-specific watershed plans, using advanced remote-sensing and GIS tools (Hegde, 2018). Therefore, a set of knowledge, attitude and skills are very quintessential to execute such type of advanced database driven watersheds. Hence, it is essential to develop a new scale using psychometric properties, to identify the competency level of Extension field functionaries working under database driven LRI based watersheds. Hence, new scale has been developed to quantitatively measure competency of the extension functionaries so that the required competency deficiencies were identified in different watershed domain areas at the beginning of the watershed programme execution. Subsequently planning were made accordingly for capacity building to the extension professionals to implement the LRI based recommended watershed works efficiently and effectively.

Theoretical framework

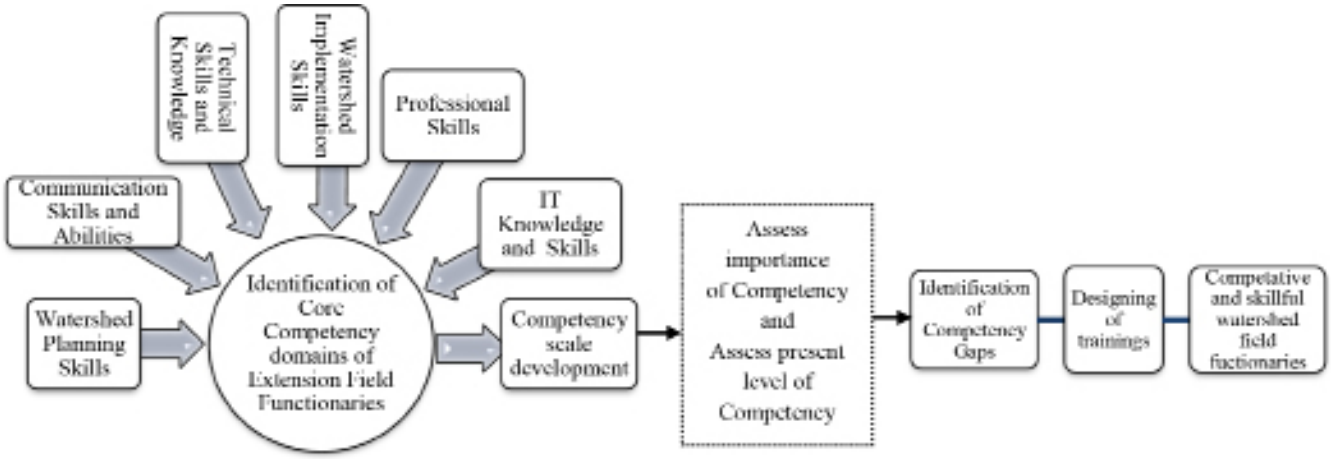

Fig. 1 Theoretical framework of competency scale development for new generation (LRI based) watersheds

Scales are the manifestation of latent constructs and are developed to measure behaviour, attitude, perception that are believed to subsist as a result of theoretical understanding (DeVellis, *et al.* 1991, Handage & Chander, 2021). Success of scale development depends on the ability to accurately and reliably operationalise the unobservable construct (Hinkin, 1995). Hence, a core competence in the watershed context is operationalised as the basic set of knowledge; attitudes and skills that enable the extension field functionaries to perform and execute new generation watershed (LRI based) activities more effectively and efficiently, as per the recommendations. Here the assumption is that improper implementation and management of watershed activities due to lack of KAS on different domains may cause early deterioration of watersheds and have a detrimental rather beneficial effect on environment and the society. Hence, highly competent human resource is of paramount importance for successful watershed management.

OBJECTIVE

To develop a scale to measure the competency levels of extension field functionaries for effective planning and implementation of new generation Land Resource Inventory based watersheds

METHODOLOGY

There are different methods of scale development practiced by researchers. But, in practice, steps within the different stages may be grouped and undertaken in the different combinations and sequences (Irwing, *et al.* & Hughes, 2018, Kyriazos & Stalikas, 2018). We selected and followed five steps for present scale development. The first step is the creation of items to assess the construct under examination. For the purpose a deductive scale development method was adopted and core competency was operationalised and related domains are identified and classified for generation of items using various primary and secondary sources. Meanwhile, a Focus Group Discussion (FGDs) with the watershed experts was conducted to finalize the items and sub-components (domains). Further, experts were asked to add items for each domain (core areas) as per the relevancy. The care must be taken to make sure that each domain area has at least four items to keep homogeneity of items within each construct as suggested by Harvey and Nilan, (1985). In the second step, 15 experts were asked to edit collected items using Edward and Kilpatrick, (1948), 14 principles. In the third step, content validation of the instrument was assessed. In the first round, essentiality of the items and domains were validated by computing the Content Validity Ratio (CVR) values, as procedure suggested by Lawshe, (1975). The judges were also asked to make necessary modifications, additions and deletions of the statement during judgement. Subsequently, computed CVR of each item using following formula developed by Lawshe, (1975).

CVR_i= CVR value for the i^{th} measurement item; n_e= number of experts indicating a measurement item is "*essential*"; N = total number of experts.

After establishing the CVR and retaining the items with acceptable level of significance, in the second round the instrument is redesigned with necessary modifications and subjected once again to the panel of judges to determine the relevancy of the scale by computing the Content Validity Index (CVI), suggested by Yusoff, (2019), thus, any fault that could have occurred in the first round gets revalidated in second round. CVI was calculated for item (I-CVI) and scale (S-CVI) by asking respondents to choose degree of relevance using 4 point continuum. (4 indicate highly relevant; 3

indicate relevant with minor revision; 2 indicate item needs major revision and 1 represent not relevant). However, during the calculation of CVI, the scale is dichotomized by recoding all responses with 3 and 4 as 1 and all responses with 1 and 2 as zero where 1 means 'relevant' and 0 means 'not relevant' as suggested by Lynn, *et al.* (1986), Yusoff, (2019), Handage and Chander, (2021). Following formula is used to calculate the CVI for both item and scale.

Once, validation process completed, the scale with final items were checked for reliability. In the fourth step the Cronbach's alpha was used to measure the reliability (internal consistency) of the present scale using following equation with a sample of 45 respondents working under LRI based watersheds.

Here N is equal to the number of items, $\bar{c}$ is the average inter-item covariance among the items and $\bar{v}$ equals the average variance.

In the fifth step, the final survey scale items were used for the collection of data using Likert type 5-point continuum to assess the perceived and present competency level of the watershed extension field functionaries and in the sixth step, the obtained data is categorised in 5 point scale using range values.

RESULTS AND DISCUSSION

The instrument is designed to measure competency level of extension field functionaries based on their perception in six core competency domains identified for the present study. The following are the results of each step followed during scale construction.

Step-I - Identification of core competency domains and collection of items

Based on extensive literature survey, assessing the roles and responsibilities of watershed functionaries as per guidelines of the Sujala-III watershed project, a six core competency domains were identified by an expert group. Each of the six core competency domains of watershed was operationalised based on the targets given in the watershed programme (Table 1). Further a total of 48 items were collected and generated from all six core competency domains assigned to measure competency of watershed field functionaries (see Table 3).

Table 1: Operational definition of all six competency domain areas identified for scale construction.

Sr. No.	Core competency domain	Operationalisation of each core competency domain
1	Planning competency	It is defined as an attitude and skills possessed by the watershed field functionaries for identification and prioritisation of the watershed activities based on the need of the local people during the watershed planning phase.
2	Communication competency	It is defined as the ability of the watershed field functionaries to communicate watershed programme activities, intentions and feedback through speaking or writing to the stakeholders as intended/desired by the project implementing agency.
3	Technical competency	It is defined as the basic subject matter knowledge and operational skills possessed by watershed field functionaries' for successfully implementing watershed activities, designs and structures at the field level.
4	Progarmme implementation competency	It is defined as the ability of the watershed field functionaries to effectively execute watershed activities to achieve the implementation of activities as per planning.
5	Professional (Organisational and Management) competency	It is defined as the ability of watershed field functionaries to organise, coordinate and manage available time and resources (human and material) efficiently and effectively for better implementation of planned watershed activities.
6	Information Technology competency	It is defined as the ability of the watershed field functionaries to effectively use technology tools such as Computer, TV, Mobile and Radio etc., for effective dissemination and management of the watershed activities.

Step-II – Editing of items

A Focus Group Discussion with the watershed experts were conducted to finalize the items collected and edited as per the discussions and suggestion drew from the discussion. Edward and Kilpatrick (1948), 14 principles were followed meticulously to re-write the wordings of each item. Care should be taken that statements should be simple, understandable and as short as possible, and the language used should be familiar to target respondents. Meanwhile 48 statements were re-written and grouped as per the expert suggestions into different domain (sub-components) of core competence.

Step-III: Content validation of the instrument:

Relevance and representativeness are the two key aspects of content validation (Pilot, *et al.* and Beak, 2006,

Handage and Chander, 2021). Content validity refers to the adequacy with which a measure assesses the domain of interest (Hinkin, 1995). Once the classification/grouping of items on each competency domain was finalised the items were validated based on the essentiality in each core competency domain using questionnaire survey tool. In order to assess the essentiality of the statements in each domain, the survey response were collected on essentiality of the KAS measured to the performance of the job by asking experts/judges whether the statement in the domain area is "*essential"* or *"useful but not essential"*. In the present study 15 watershed experts were identified as judges and responses were collected to analyze the content validity of the each individual item and scale for selection or rejection of item. Subsequently, calculated Content Validity Ratio (*CVR*) of each item using formula developed by Lawshe, (1975). Based on the results and CVR value suggested by Lawshe, (1975), the minimum value for 15 judges was 0.49 at a 5% significant level (Table 2). After content validation out of 48 items, 10 items which did not satisfy the 5% level were deleted from inclusion in final scale items. The remaining 38 accepted competency items of all six core competencies include watershed planning competency had six statements each; communication competency had seven statements each; technical competency had nine statements each; watershed programme implementation had seven statements each; professional competency had five statements each and information technology competency had four statements each were finalized for measuring competency scale. In the second round I-CVI and S-CVI both are computed and the results are indicated in the Table 2. For selection of items the I–CVI and S-CVI vales of more than 0.78 are considered are appropriate and otherwise the items will be rejected, as suggested by Lynn, (1986).

Table 2 : List of core competencies and item selected after two rounds of content validity test are listed below

Sr. No.	Core competencies	I-CVR	I-CVI	Interpretation
A	**Planning competency**			
1	Preparation of contingency plan during programme planning	0.60	0.80	Accepted
2	Establishment of credibility and create a rapport with the village communities	0.73	0.87	Accepted
3	Watershed works will be planned by integrating a gender perspective	0.73	0.87	Accepted
4	Setting goals and objectives in the watershed planning phase	0.73	0.87	Accepted
5	Watershed planning must be location-specific based on urgent needs of local demands and socio-economic conditions of the watershed	0.87	0.93	Accepted
6	Baseline survey in the watershed	0.73	0.87	Accepted
7	Knowledge on watershed common guidelines	0.47	0.73	Rejected
		S-CVI	0.87	
B	**Communication competency**			
8	Ability to read, write and speak in local language	0.60	0.80	Accepted
9	preparation and sharing of reports and bills on watershed works (weekly, monthly, quarterly and yearly) without much delay	0.20	0.60	Rejected
10	Listening skills and listening to the user groups	0.60	0.80	Accepted
11	Promote and convince the farmers easily, to adopt recommended livelihood practices/structures in watershed	0.60	0.80	Accepted
12	Co-ordination among various levels of watershed management functionaries	0.73	0.87	Accepted
13	Identify and communicate the wrongly implemented structures to the concerned team	0.60	0.80	Accepted
14	Use of traditional communication channels to sensitize beneficiaries about importance of watershed activities	0.60	0.80	Accepted
15	Communicate watershed activities regularly to cover news agencies and publish success stories for creation of awareness among large mass	-0.20	0.40	Rejected
16	Regularly sharing the watershed related data among the collaborating departments	0.60	0.80	Accepted
		S-CVI	0.81	

Sr. No.	Core competencies	I-CVR	I-CVI	Interpretation
C	**Technical competency**			
17	Ability to conduct PRA	0.73	0.87	Accepted
18	Preparation of survey estimates (survey and leveling)	0.60	0.80	Accepted
19	Preparation and execution of DPR (Detailed Project Report)	1.00	1.00	Accepted
20	Knowledge and application of Land Resource Inventory (LRI)	0.73	0.87	Accepted
21	Effective use of Decision Support System (DSS)	0.60	0.80	Accepted
22	Applications of Land Capability Classification (LCC) maps	-0.20	0.40	Rejected
23	Calculation and interpretation of basics of hydrology of watershed (rainfall, run-off, evaporation, infiltration and soil loss etc.)	0.33	0.67	Rejected
24	Planning and design of agronomical measures (tillage, mulching, in-situ moisture conservation etc.)	0.73	0.87	Accepted
25	Planning and design of water harvesting structures and its constructions	0.60	0.80	Accepted
26	Procedure for construction of live bunds Understanding of details of Thematic maps of watershed and its units	0.07	0.53	Rejected
27	Understanding cropping pattern and its system of the locality	0.60	0.80	Accepted
28	Details of forest tree species of the locality	0.60	0.80	Accepted
		S-CVI	0.84	
D	**Watershed programme implementation competency**			
29	Implementation should be based on SUJALA guidelines	0.73	0.87	Accepted
30	Preparation of survey and budget estimation for execution of various watershed activities	0.60	0.80	Accepted
31	Collects labourers and executes works	0.07	0.53	Rejected
32	Reinvention during implementation of watershed activities, if required	0.60	0.80	Accepted
33	Record measurements (MB) and maintain muster rolls	0.73	0.87	Accepted
34	Ability to manage community conflicts during implementation	0.60	0.80	Accepted
35	Organisation of regular training to stakeholders	0.60	0.80	Accepted
36	Regular monitoring and evaluation of watershed activities	1.00	1.00	Accepted
		S-CVI	0.85	
E	**Professional competency**			
37	Building up a network of technical support agencies	0.20	0.60	Rejected
38	Delegation of responsibilities to lower staff as and when needed	0.60	0.80	Accepted
39	Regular field visits	0.60	0.80	Accepted
40	Ensure integration with other line department and local institutions for convergence of activities	0.60	0.80	Accepted
41	Ensure active participation of stakeholders in watershed programme	0.87	0.93	Accepted
42	Association with watershed associations / Village Forest Committees and other social institutions	0.47	0.73	Rejected
43	Conducting physical checks, guiding field staff, scrutinizing plans and estimating for ready execution	0.87	0.93	Accepted
		S-CVI	0.85	
F	**Information technology competency**			
44	Presentation making using Microsoft excel	0.20	0.60	Rejected
45	Use of whats app mobile application to interact with various watershed stakeholders	0.60	0.80	Accepted
46	Regular interaction with local broadcasting agencies (TV/FM) for mass communication on watershed development activities	0.60	0.80	Accepted
47	Demonstration of success stories to user groups through video/film for effective participation of user groups	0.73	0.87	Accepted
48	Understanding and Application of remote sensing and GIS tools (LRI Maps, Atlases etc.)	0.73	0.87	Accepted
		S-CVI	0.83	

Step-IV: Reliability test of the instrument

After obtaining and finalizing the content validity using two round validation method. The final statements were subject to data collection in a non-sample LRI based Sujala-III watershed and Cronbach's alpha was calculated to measure the reliability (internal consistency) of the present scale using a sample of 45 respondents. For the present competency scale the value of Cronbach alpha is 0.810 (see table 4) which is considered as good according to George and Mallery, (2019).

Table 4: Reliability test results for competency scale

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.810	.817	38

Step-V: Finalisation of instrument for field level data collection

After achieving desired content validity and reliability, instrument was adopted for final use to collect data at field level. For this purpose, we developed an interview schedule using a 5-point Likert type scale adopted by Ghimire, *et al.* (2016), Sasidhar and Suvedi, (2016), in their competency assessment studies to rate the competence level of the field functionaries. The participants were asked to indicate the importance of each activity (item) using a five-point Likert-type scale as follow: 1 = Not important; 2 = Somewhat important; 3 = Average; 4 = Important and; 5 = Very important. Further, to obtain the present competence level of field functionaries participants were asked to indicate their choice in five-point Likert type continuum on each scale item as follow: 1= Very low; 2=Low; 3=Moderate; 4 = High and; 5=Very high.

Step-VI: Categorization of perceived competency level

Descriptive statistics, mean score and standard deviation of each sub-indicator (items) were calculated. Mean score of core competency was obtained by dividing the total score of sub-component with number of items in each sub-component. The overall core competence is measured by taking mean of all six sub-components. The mean score further categorised into 5 categories. Finally, the perceived importance of competency and present competence level was categorised by a range of values as, Not important/Very Low (1-1.80), Somewhat important/Low (1.81-2.60), Average/ Moderate (2.61-3.40), Important/High (3.41-4.20), Very important/Very High (4.21-5).

CONCLUSION

The present scale can be utilized by the watershed project formulating agencies, Human Resource Development organizations and researchers to assess perceived importance and the present level of competence of extension functionaries working in LRI based new generation watersheds. Further, scale identifies existing competency deficiency areas among the functionaries at the beginning of watershed implementation and help organizations to develop curriculum for training and capacity building activities in watershed programmes. Thus, it save both time and money for the organizations and also produce competent human resources for proper execution of LRI based watershed activities to produce maximum impact in terms of watershed stability and sustainability.

IMPLICATION

Scale helps to identify the competency of extension functionaries on different domains of LRI based watersheds thus helps to formulate curriculum and capacity building programmes for extension functionaries for effective monitoring and execution of site-specific LRI activities.

ACKNOWLEDGEMENT

We sincerely acknowledge ICAR and Indian Institute of Soil and Water Conservation for providing facilities and also Watershed Development Department, Karnataka for externally funding the project for Monitoring and Evaluation of World Bank funded Sujala-III project.

CONFLICT OF INTEREST

No conflict of Interest Exist among the Authors

REFERENCES

Borah, P., and Devarani, L. (2022). Competency of faculty members in online teaching of agricultural undergraduates during COVID-19 pandemic: A study in North-East India. *Indian J. Ext. Edu.* 58(1);21-25.

DeVellis, R. F. (1991). Scale development: Theory and applications (Applied Social Research Methods Series, Vol. 26). Newbury Park, CA: Sage Publications.

George, D. and Mallery, P. (2019). IBM SPSS Statistics 26 Step by Step: A Simple Guide and Reference. (6th ed.). Routledge, New York. https://doi.org/10.4324/9780429056765

Ghimire, R. P. (2016). Assessment of core competencies of agricultural extension professionals in Nepal.

PhD Thesis, Michigan State University. https://d.lib.msu.edu/etd/4212/datastream/OBJ/download/Assessment_of_Core_Competencies_of_Agricultural_Extension_Professionals_in_Nepal.pdf

Handage, S and Chander, M. (2021). Development of an instrument for measuring the student learning outcomes: A content validation process. *Indian J. Ext. Edu*. 57(3);1-7.

Harvey, R. J., Billings, R. S. and Nilan, K. J. (1985). Confirmatory factor analysis of the job diagnostic survey: Good news and bad news. *J. App. Psy*. 70;461–468.

Hegde, R., Niranjana, K. V., Srinivas, S., Danorkar, B. A. and Singh, S. K. (2018). Site-specific land resource inventory for scientific planning of Sujala watersheds in Karnataka. *Current Science*. 115(4);644-652.

Hinkin, T. R. (1995). A review of scale development practices in the study of organizations. *Journal of management*. 21(5);967-988.

Hinkin, T. R. (2005). Scale development principles and practices.In Richard A. Swanson, Elwood F. Holton (Eds), Research in Organizations: Foundations and Methods in Inquiry. Pp; 167-180.

Irwing, P. and Hughes, D. J. (2018). Test Development. In P. Irwing, T. Booth, & D. J. Hughes (Eds.), The wiley handbook of psychometric testing: A Multidisciplinary reference on survey, scale and test development, V.I (pp. 4-47). Hoboken, NJ: Wiley.

Kyriazos, T. A. and Stalikas, A. (2018). Applied psychometrics: The steps of scale development and standardization process. *Psychology*, 9(11);2531.

Lakai. D., Jayaratne, K. S. U., Moore, G. E. and Kistler, M. J. (2014). Identification of current proficiency level of Extension competencies and the competencies needed for Extension agents to be successful in the 21st century. *J. Human Sci. and Ext*. 2(3);32-44.

Lawshe, C. H. (1975). A quantitative approach to content validity. *Personnel psychology*. 28(4);563-575.

Lynn, M.R. (1986). Determination and quantification of content validity. *Nursing Research* 35(6);381-385.

NAAS. (2017). Mitigating land degradation due to water erosion. Policy Paper No. 88 National Academy of Agricultural Sciences, New Delhi: 20 p. http://www.indiaenvironmentportal.org.in/files/file/Mitigating%20Land%20Degradation%20due%20to%20Water%20Erosion.pdf

Ravi, K. N., S. L. Patil, Hrittick Biswas, M. N. Ramesha, B. S. Naik, P. R. Ojasvi, Ravi Duppal, M. Prabhavathi, Suresh Kumar, and A. S. Morade. (2022). "Land Resource Cards: An innovative approach to empower farmers for site-specific farm resource management. *Indian J. Ext. Edu*. 58 (1);106-110.

Sasidhar, P. V. K. and Suvedi, M. (2016). Assessment of core competencies of livestock extension professionals in India. Urbana, IL: USAID-Modernizing Extension and Advisory Services (MEAS). https://meas.illinois.edu/wp-content/uploads/2016/11/MEAS-EVAL-2016-Core-Competencies-Livestock-Extension-Suvedi-and-Sasidhar-July-2015.pdf

Sinha, S. K., Gupta, S. K., Nain, M. S. and Kumar, G. A. K. (2021). Attributes contributing core competencies: A study of KVK personnel in Bihar and Jharkhand states. *Agri. Eng*. 14;11-39.

Yeragorla, Venkata Harikrishna, Patel, J. B. and Vinaya Kumar, H. M. (2021) Development of a scale to measure the attitude of extension personnel towards e-extension. *Guj. J. Ext. Edu.* 32(1):34-37.

Yusoff, M. S. B. (2019). ABC of content validation and content validity index calculation. *Resource*. 11(2);49-54.

Received : February 2022 : Accepted : May 2022