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Assessment of competencies of postgraduate students for veterinary extension at Indian Agricultural Universities

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ABSTRACT

In Indian content of National Agricultural Research and Education System (NARES), agricultural extension connects agricultural research and farmers. Post-graduate teaching in Extension discipline across all agricultural universities prepares students to transfer relevant technologies to farming community and to conduct need-based research by inculcating desired competencies among students. The present study primarily focuses on assessing the overall competency fulfilment level of postgraduate extension students with respect to veterinary extension. The acquisition level of core competencies among students was compared with importance level of respective competencies associated by Livestock Extension professionals. The investigation was based on primary data compiled from 30 livestock extension professionals working in Uttarakhand and 210 postgraduates (M.Sc. and Ph.D.) students across ten agricultural universities of northern India. It was found that ten core competencies related to veterinary extension which were perceived as highly important by Livestock Extension professionals had low acquisition level among students. Out of the ten universities examined for competency fulfilment, only two universities had high level of competency fulfilment while four universities had low level of competency fulfilment. The overall competency fulfilment index of all ten universities was 0.522 indicating a competency fulfilment of just above average with respect to identified 24 competencies. The competency fulfilment index developed can be utilized by agricultural universities for competency mapping of livestock extension professionals and students for further investigations.

Keywords: Agricultural universities, Competency fulfilment, Extension education, Postgraduate students, Veterinary extension

Animal husbandry plays an important role in country's agricultural economy as it supports livelihood of more than two-third of the rural population and contributes about 4% of the GDP and 26% of the agricultural GDP from agriculture and allied sectors. At times of crop failures livestock sector also acts as a best insurance to the farmers. Despite its immense contribution in Indian economy, this sector is facing critical challenge of lack of trained extension professionals along with low productivity, prevalence of animal diseases, shortage of feed and fodder, inadequate infrastructure for marketing, processing and value addition (National Livestock Policy 2013).

Livestock extension is an important tool in achieving desired changes in animal production but there is huge absence of well-trained veterinary extension professionals who can deliver effective livestock extension services to farmers (Khoury 2011). Agriculture including Livestock sector has witnessed a paradigm shift in terms of information need by farmers. Today farmers need problem solving, customized, location specific, market driven and commodity specific information which in turn requires Extension professionals with core competencies in such areas. In majority of the developing countries including India, the public sector is mainly responsible for delivery of extension services to farmers, however majority of extension professionals lack core competencies required for effective and desired extension work (Rathod *et al*. 2012). Veterinary and animal science services are highly specialized and need well qualified extension professional with core competencies in Extension management, training and human resource development, communication along with subject matter knowledge, however past researches have shown that there exists a huge gap between acquired competencies and desired competencies among Extension professionals engaged in veterinary extension (Chander *et al*. 2010 and Hegde 2010). Thus, it becomes crucial to assess the present level of competencies and to identify desired core competencies among livestock professionals and

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extension students so that their training and education programs could be effectively designed.

MATERIALS AND METHODS

The present study was based on primary data collected from 30 livestock extension professionals working in Uttarakhand and 210 postgraduate students in Extension Education. To collect data from postgraduate students, ten universities of Northern India were selected randomly with all postgraduate students (M.Sc. and Ph.D.) of Extension Education discipline as the respondents.

An exhaustive and mutually exclusive list of extension competencies was prepared which were found to be crucial for performing veterinary extension field work on the basis of extensive review of literature. Two rounds of focused group discussion with experts and students were carried and response on relevancy were recorded. A final list of 24 extension competencies were prepared on the basis on mean relevancy analysis. These 24 veterinary extension competencies were further consolidated into four categories, viz. Extension Management, Communication, Training/ Human Resources Management and Subject Matter having six core competencies in each category. Livestock extension professional's perception regarding importance of identified extension competencies (how much importance a particular competency has, to carry out veterinary extension) and students' perception regarding acquisition of identified veterinary extension competencies (whether they can apply identified competency practically) was measured using a five-point Likert scale.

Under data analysis, weighted mean score (WMS) of each competency was calculated for both data set of livestock extension professionals and students by using standard formula of weighted mean score:

Weighted mean = $\Sigma wx / \Sigma w$

where, Σ, summation; w, weights; x, value

On the basis of mean and standard deviation, importance level of competencies associated by livestock extension professionals and acquisition level of respective core competencies among students was categorized as high,

Table 1. Categorization of veterinary extension competencies based on their perceived importance by livestock extension professionals and perceived acquisition by students

Competencies	Livestock extension professionals (n=30)			Students (n=210)		
	WMS	Rank	Category	WMS	Rank	Category
Extension management						
Planning and implementing development program	3.83	II	High	3.22	IV	Low
Technology evaluation	3.26	III	High	3.19	V	Low
Participatory extension methodologies	4.19	I	High	2.45	VI	Low
Management techniques	2.77	V	Medium	4.88	II	Medium
PERT and CPM applications in projects	2.12	VI	Low	4.95	I	High
Monitoring and evaluation	3.03	IV	Medium	3.78	III	Medium
Communication						
Production of projected and non-projected media	2.65	IV	Medium	3.11	IV	Medium
Developing livestock management projects	3.88	I	High	2.76	V	Low
Designing power point presentation/video media	3.15	III	Medium	4.05	I	High
Creating news stories, articles, farm bulletins and folders	2.48	V	Medium	3.69	II	High
Identification of opinion leaders	2.31	VI	Low	3.21	III	Medium
Organizing campaigns/exhibitions/group discussion	3.37	II	High	2.31	VI	Low
Training/Human resources management						
Preparation of HRD plans for extension organizations	3.19	VI	Low	1.92	IV	Low
Experiential learning methods	3.23	V	Medium	2.71	I	Medium
Training needs assessment	4.50	II	High	2.11	III	Medium
Designing effective training programs	4.79	I	High	2.56	II	Medium
Conducting Livestock Trainings at Village level	3.98	III	High	1.5	VI	Low
Entrepreneurship plan development	3.56	IV	High	1.77	V	Low
Subject Matter						
Risk based Inspection	1.99	V	Medium	1.26	V	Low
Tracing source and spread of diseases	3.03	II	High	1.22	VI	Low
Clinical procedures	2.10	IV	Medium	1.78	III	Low
Drug recommendation and management	3.55	I	High	2.09	II	Low
Diagnostic samples and tools management	2.34	III	High	2.13	I	Low
Current and updated livestock knowledge	1.56	VI	Low	1.28	IV	Low

Livestock extension professionals: Extension management (mean= 20.75, S.D.= 4.45), Communication (mean=19.23, S.D.=3.11), Training/ Human resources management (mean=23.69, S.D.=5.34), Subject matter (mean=15.55, S.D.=2.94).

Students: Extension management (mean=27.11, S.D.=7.88), Communication (Mean=22.19, S.D.=4.59), Training/ Human resources management (mean=18.48, S.D.=3.03), Subject matter (mean=15.24, S.D.=2.18).

medium and low. To measure overall competency fulfilment, an index was developed and validated. The first step was to collect and finalize indicators and sub-indicators. This was done by two rounds of focused group discussion with experts and students in which response on relevancy were recorded. On the basis of mean relevancy analysis, four indicators (Extension Management, Communication, Training and Human Resources Management and Subject Matter) and 24 sub-indicators (6 sub-indicators under each indicator) were selected. Data on each indicator was collected through a pretested structured questionnaire. The second step included development of sub-competency fulfilment index for each sub-indicator by normalizing the data using the formula: Sub Index = (Actual value – Minimum value) / (Maximum value – Minimum value).

Under third step, weights were assigned to the indicators by using Principal Component Analysis (PCA) with the help of statistical software SAS version 9.3. PCA analysis also consolidated the number of variables into few principal components. The assigned weights were then multiplied with each variable to calculate each principal component score by taking their linear summation. The PCA score of those principal components were considered for final teaching effectiveness index which explained more than 95% of total variation. The summations of average index scores of those selected principal components were chosen for final competency fulfilment index. After the final index was prepared, competency fulfilment for all ten agricultural universities was calculated and then it was classified into three categories namely, high, medium and low on the basis of individual competency fulfilment score. The classification was done using cumulative cube root frequency (CCRF) method. Finally, linear regression analysis was employed to test the validity of the competency fulfilment index. The R^2 value of 0.862 indicated that 86.2% of total variation was explained by sub-indicators. This shows that the regression model was valid and effective. The Durbin-Watson value of 1.652 indicated the independence of observation.

RESULTS AND DISCUSSION

Perception of livestock extension professionals and students regarding importance and acquisition of veterinary extension competencies: Among six competencies under 'Extension Management', three competencies namely 'Planning and implementing development program', 'Technology evaluation' and 'Participatory extension methodologies' were perceived under high category of importance by livestock extension professionals, however these three competencies were perceived under low category of acquisition by students. This indicates that these three competencies are important for veterinary extension but are not being acquired by students. The two competencies 'Management techniques' and 'Monitoring and evaluation' were categorized under medium category of importance and acquisition by livestock extension professionals and students respectively.

Out of six competencies under 'Communication', two competencies namely 'Developing livestock management projects' and 'Organizing campaigns/exhibitions/group discussions' were perceived under high category of importance by livestock extension professionals, however these two competencies were perceived under low category of acquisition by students. This indicates that majority of students believe that they cannot formulate relevant livestock projects and organize awareness campaigns, exhibitions or group discussions addressing practical needs of livestock farmers. Two competencies 'Designing power point presentation/video media' and 'Creating news stories, articles, farm bulletins and folders' were categorized under high category of acquisition by students which clearly indicates that teaching pedagogy is effective in inculcating these two competencies among students.

Two competencies under Training/Human Resources Management, namely 'Conducting livestock trainings at village level' and 'Entrepreneurship plan development' were perceived under high category of importance by livestock extension professionals and low category of acquisition by students, however other two competencies 'Training needs assessment' and 'Designing effective training programs' were perceived under medium category of acquisition by students. Thus, it is evident that majority of students know how to assess the training needs of farmers along with the theory of designing effective training but lack in know-how of practically organizing livestock farmers training at field along with developing an effective plan for entrepreneurship. Among six competencies under Subject-matter, five competencies were perceived under low category of acquisition by students which were perceived as important by livestock extension professionals. This shows that students have poor command over Livestock subject matter especially 'Tracing source and spread of diseases', 'Clinical procedures' and 'Drug recommendation and management'.

Competency fulfilment measurement through competency fulfilment index: It is evident from Table 2 that 97.86% of total variance was explained by selected principal components. So, final competency fulfilment index was based on PCA score of these 24 components.

The overall mean competency fulfilment score of 0.522 indicates competency fulfilment of just above average. This also indicates that universities teaching-learning environment had enabled students to acquire nearly 50% of competencies, which clearly shows a gap between teaching pedagogies and acquisition of competencies.

Based on CCRF based categorization, it was found that almost equal number of students categorized competency fulfilment as medium (36.35%) and low (35.32%) while only 28.33% of students categorized competency fulfilment under high category. This indicates that the competency fulfilment among students ranged from low to medium level. Overall, when all ten universities were categorized as high, medium and low based on mean and standard deviation of competency fulfilment index. It was found that

Table 2. Eigen values and cumulative proportion of the principal components considered for calculating competency fulfilment index

Competencies (sub-indicators)	Eigen-values	Cumulative
Participatory extension methodologies*	0.6234	0.2312
Planning and implementing development program*	0.6221	0.3515
Technology evaluation *	0.6018	0.4201
Developing livestock management projects**	0.5223	0.5472
Organizing campaigns/exhibitions/ group discussion**	0.5122	0.6221
Conducting livestock trainings at village level ***	0.5016	0.7305
Training needs assessment ***	0.4988	0.8135
Designing effective training programs***	0.4981	0.8203
Clinical procedures****	0.4873	0.8684
Entrepreneurship plan development***	0.4869	0.8831
Risk based inspection****	0.4553	0.8844
Production of projected and non-projected media**	0.4302	0.8934
Designing power point presentation/ video media**	0.4279	0.9137
Monitoring and evaluation*	0.4211	0.9229
Management techniques*	0.4092	0.9416
Tracing source and spread of diseases****	0.4003	0.9437
Diagnostic Samples and tools management****	0.3661	0.9444
PERT and CPM applications in projects*	0.3653	0.9588
Creating News stories, articles, farm bulletins and folders**	0.3210	0.9591
Drug recommendation and management****	0.2998	0.9602
Current and updated livestock knowledge****	0.2112	0.9687
Identification of opinion leaders**	0.2081	0.9690
Preparation of HRD plans for extension organizations ***	0.1992	0.9731
Experiential learning methods***	0.1073	0.9786

*, Extension management related competency; **, Communication related competency; ***, Training related competency and ****, Subject matter related competency.

Table 3. Overall competency fulfilment index and individual competency fulfilment index of Agricultural Universities (n=210)

University	Number of Respondents	Competency fulfilment Index
Indian Veterinary Research Institute, Bareilly, Uttar Pradesh (IVRI)	15	0.69
National Dairy Research Institute, Karnal, Haryana (NDRI)	15	0.67
Govind Ballabh Pant University of Agriculture and Technology, Pantnagar, Uttarakhand (GBPUAT)	32	0.57
Indian Agricultural Research Institute, New Delhi (IARI)	20	0.59
Punjab Agricultural University, Ludhiana, Punjab (PAU)	26	0.53
Chaudhary Charan Singh Haryana Agricultural University, Hisar, Haryana (HAU)	21	0.46
Sher-e-Kashmir University of Agricultural Sciences and Technology, Jammu, Jammu and Kashmir (SKUAST)	15	0.48
Chandra Shekhar Azad University of Agriculture and Technology (CSAUAT), Kanpur, Uttar Pradesh	17	0.33
Sam Higginbottom University of Agriculture, Technology and Sciences, Naini, Prayagraj, Uttar Pradesh (SHUATS)	15	0.39
Banaras Hindu University, Varanasi, Uttar Pradesh (BHU)	34	0.51

Overall competency fulfilment index=0.522.

out of ten universities, four universities have medium, four universities have low level of competency fulfilment and only two universities have high level of competency fulfilment. This again confirms the poor acquisition of competencies among students.

The present study had assessed the importance and extent of acquisition of core competencies required for effective veterinary extension based on perception of livestock extension professionals and postgraduate students of Extension Education pursuing their degree programs in Indian agricultural universities. Overall it was found that ten core competencies related to veterinary extension namely 'Planning and implementing development program', 'Technology evaluation', 'Participatory extension methodologies', 'Developing livestock management projects', 'Organizing campaigns/exhibitions/group discussion', 'Conducting livestock trainings at village level', 'Entrepreneurship plan development', 'Tracing source and spread of diseases', 'Drug recommendation and management' and 'Diagnostic samples and tools management' were perceived as very important for veterinary extension at field but the acquisition of these competencies by students was found to be low. These findings were concordant with the findings of Ramesh *et al.* (2016) who also noted that students of agricultural universities lack essential competencies for effective Extension work due to ineffective teaching pedagogy.

The present study also assessed the competency fulfilment of extension teaching-learning system in agricultural universities with respect to Veterinary extension

by formulating and validating a competency fulfilment index on the basis of twenty-four core competencies. This index clearly reflects the overall competency fulfilment level of all universities under study. The index can be further used by researchers to assess competency fulfilment of their respective universities. Secondly the universities whose competency fulfilment index was found under low category; they can reorient their teaching methodologies on the basis of twenty-four competencies under study. Furthermore, this index can contribute in formulation of competency-based framework for effective teaching. The findings of competency fulfilment level are in line with XI Agricultural Science Congress Report (2013) and The Fifth Deans' Committee Report of Agricultural Education Division, Indian Council of Agricultural Research (2017) which reported that postgraduates of Indian agricultural universities lack in certain essential extension competencies. This lack often results in unemployment or poor employability as well as ineffective work performance in the field.

It is now high time that Extension management realizes the essential competency domains which are required by extension professionals, Also, it is crucial to reorient Extension teaching pedagogy so that students can acquire desired core competencies effectively so that Extension education becomes more competency and skill based to yield effective Extension services.

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