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Performance of the Public Agricultural Extension System in Disadvantageous Settings: Evidences from *Krishi Vigyan Kendras* in North Eastern Region of India

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Abstract

Krishi Vigyan Kendras (KVKs), the pivotal component of the Public Agricultural Extension System of the country has so far played a vital role in sustaining the largely agrarian based economy of North Eastern region. The present study aimed at assessing functioning of the North Eastern KVKs measured through individual performance of the Subject Matter Specialists (SMSs) working under different KVKs in the region. The sample of the study comprised of 231 SMSs (n=231) from 59 KVKs in the region. A composite job performance index (CJPI) was developed following principal component analysis approach to measure overall job performance of individual SMSs. The findings of the study suggest that there is ample scope of improving job performance of individual SMSs, as a large majority (81.81%) of them had only poor to medium level of performance as indicated by the CJPI scores. Job performance of SMSs was comparatively poorer in areas and activities requiring larger mass participation and production of scientific literatures. A multiple regression analysis revealed that socio-personal characteristics of the SMSs had only little (13%) influence on their job performance; participation in training and workshop contributed high. The supervising institutes of KVKs in partnership mode may undertake special programmes including workshops and trainings in a focused manner, especially in job areas where performance of the SMSs can be improved. It will add to the overall functioning of KVK system in North East region.

Keywords: KVK, SMS, composite job performance index, principle component analysis

The public agricultural extension system of the country since the last few decades has come under scrutiny and its performance has been thoroughly questioned (Sulaiman and Van den ban, 2000; Ferroni and Zhou, 2011). It is a vast network of extension service providers comprising of institutes under the Indian Council of Agricultural Research (ICAR), State Agricultural Universities (SAUs), Agricultural Technology Information Centres (ATICs), State Departments of Agriculture, Agricultural Technology Management Agency(ATMA)and most importantly the Krishi Vigyan Kendras (KVKs). The KVKs, in fact play the pivotal role in public agricultural extension system by bridging the gap between technology generation in laboratories and its adoption in the farmers' fields through a well-defined mechanism of technology evaluation, demonstration, capacity building of stakeholders, group and mass mobilization and distribution of critical inputs to the farmers.

In North East region, there is at present a network of 78 KVKs, spread across the eight North Eastern states, Arunachal Pradesh (14), Assam (25), Manipur (9), Meghalaya (5), Mizoram (8), Nagaland (9), Sikkim (4) and Tripura (4). The North Eastern economy is almost completely agrarian based and therefore vulnerable to the climatic vagaries. The topography of the region is disadvantageous and the ecology is fragile which is susceptible to

the environmental threats. Adoption of improved agricultural technologies, contingency planning in crop and livestock farming and climate smart farming in the present context of climate change, are therefore extremely essential for sustaining economy of the region. In the meagre presence of heavy industries coupled with lack of investment in the region, the KVKs play a vital role in sustaining the growth of North Eastern economy by disseminating profitable farming technologies to the farmers and imparting necessary skills to them for practicing as recommended.

The present day extension service delivery mechanism adopted by various organizations has become more or less Information Communication Technology (ICT)based but communication intervention and extension for technological application and transfer as undertaken by the KVKs is largely on individual and group contact basis. ICT gadgets although have reached almost every remote corner of the country, diffusion and internalization of improved farming technologies in large majority at the farmers' level is till date a challenge. Although four out of every five Indians use a mobile phone, one in every five Indians till date earn less than one dollar a day (Anon 2013, 2014).

Poverty, hunger and associated problems are prevalent in larger scales in North Eastern region where farming is constrained by different factors and is hardly considered as a profitable business venture by the practicing peasants. Amidst hardships faced in the region, the Subject Matter Specialists (SMSs) working in different KVKs of the North Eastern region undertake different activities in line with the KVK mandate of 'Technology Assessment and Demonstration for Application and Capacity Development' (TADA-CD). The present study aimed at appraising performance of the SMSs in different job areas, finding out the correlates Paul *et al.* of job performance and thereby draws policy implications, and suggests suitable measures for improving job performance of the SMSs and overall functioning of the KVKs in North East region.

Database and Methodology

The present study was conducted during 2012-13 to 2014-15 in North East region of India covering all the eight North Eastern states, namely Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim and Tripura. All the seventy-four districts in the region in which Krishi Vigyan Kendras (KVKs) already existed at start of the study were included in the sampling frame. A multistage stratified random sampling technique was followed to select respondents under the study. Only those SMSs who had undertaken the mandated KVK activities at least for the preceding three years were included in the sampling frame. A structured pretested questionnaire was mailed to all the KVKs to be responded by the SMSs of KVKs. Upon return of filled up questionnaires, they were screened in for complete responses and in the process a total of 231 SMSs (n=231) representing 59 districts/KVKs in the region were finally selected for the purpose of the study.

The study followed an ex-post facto research design. An ex-post facto design in the context of a social research seeks to reveal possible relationships by observing an existing condition or state of affairs and searching back in time for plausible contributing factors (Kerlinger and Rint, 1986). A composite job performance index (CJPI) was developed to measure job performance of individual SMSs of the KVKs under study. The CJPI consisted of the following six indicators:

Construction of the CJPI involved two steps: (1) elimination of bias of scale in selected indicators and (2) determination and assignment of weights to the indicators. Each of the indicators was normalized by subtracting the minimum value of the indicator from its actual value and then dividing it by the range (the difference between the maximum and minimum value of the selected indicator).

Assignment of arbitrary weights to indicators based on independent opinion and judgment of experts is subject to individual bias. The Principle Component Analysis approach was therefore followed in the present study to determine and assign weights to the selected indicators, as PCA helped in maximizing the sum of squares of correlations between indicators and the composite index. The Statistical Package for Social Sciences (SPSS), ver. 16 was used to run the PCA in order to obtain factor loadings and Eigen values. Only those extracted components having Eigen values > 1.00 for each of the six variables (Table 1) were considered for the next step of calculating weightage. Factor loadings of variables for each of the components

Table 1: Indicators of Composite Job Performance Index (CJPI)

Sl. No.	Area	Indicator	Indicator code	Description
1	Participatory technology evaluation	Technology assessment and refinement index	TARI	Total number of on far m trials conducted over three years/ Total number of on farm trials targeted over three years × 100
2	Participatory technology showcasing	Technology demonstration index	TDI	Total number of frontline demonstrations conducted over three years/Total number of frontline demonstrations targeted over three years × 100
3	Capacity building	Entrepreneurial skill enhancement index	ESEI	Total number of training courses organized over three years/ Total number of training courses targeted over three years × 100
4	Technology dissemination	Extension programmes	EP	Total number of individual contacts + Total number of group activities + Total number of mass outreach programmes in three years
5	Scientific productivity	Publications	P UB	(Total NAAS rating earned in three years/ Total number of research papers published in three years) + Total number of other publications including extension bulletins, leaflets/ folders, technical articles books and book chapters
6	Mass outreach	Beneficiary covered	COV	Total number of beneficiaries covered through individual, group and mass activities over a period of three years.

in the extracted component matrix and the rotated component matrix were used to calculate the weightage of the variables.

Values of the normalized indicators when multiplied with the weightage of the respective indicators, represented the weighted values of the indicators. A sum of weighted values of each of the six indicators represented the composite job performance index of respondents.

$$CJPI = TARI + TDI + ESEI + EP + PUB + COV$$

A stratification of CJPIs using cumulative cube root frequency method helped in differentiating the high performers from the low performers. Descriptive statistical tools like frequency, percentage, arithmetic mean and standard deviation and inferential statistical tools like correlation and regression were used in data analysis and interpretation.

Results and Discussion

The data in Table 2 reveal that as high as 60.17 percent of the respondent SMSs in the region belonged to different reserved categories (ST, SC and OBC), remaining only 39.83% did not have any reservation. The representation of women in the sample was quite high (42.86%). The mean age of respondent SMSs was only 36.4 yrs., as high as 91.78% belonging to young to lower middle age groups. Professional experience wise as high as 68.83% of the respondents had moderate level of working experience. They completed 3-6 yrs. of service as SMSs in KVKs. A majority (76.19%) of the SMSs had M.Sc. degree, 21.21% had Ph.D. degree. A majority (84.85%) of the SMSs were married.

As already mentioned, job performance of respondent SMSs was measured through a composite job performance index which itself consisted of six different indicators-technology assessment and refinement index, technology demonstration index, entrepreneurial skill enhancement index, beneficiary covered, publications and extension programmes. The indicators were selected as fit to represent different areas of job performance of SMSs in line with the mandated activities of KVKs. The mean index scores in different areas of job performance indicate that achievement against assigned target was the best in participatory technology evaluation (0.10), followed by capacity building (0.07), participatory technology showcasing (0.06), mass outreach (0.05), technology dissemination (0.04) and scientific productivity (0.02) (Table 3). It is evident that job performance of SMSs was poorer in activities requiring larger number of beneficiary involvement. The farmers of North Eastern region of India are highly apathetic to the use of external farm inputs. They lack commercial orientation and mainly go for

Table 2: Socio-personal characteristics of respondent SMSs of North East region (n=231)

Sl. No.	Characteristic variable	Frequency	Percentage
1. Caste			
1.1.	General (Unreserved)	92	39.83
1.2.	Scheduled Tribe (ST)	86	37.23
1.3.	Other Backward Castes (OBC)	42	18.18
1.4.	Scheduled Caste (SC)	11	4.76
2. Gender			
2.1.	Male	132	57.14
2.2.	Female	99	42.86
3. Age (age in yrs.)			
3.1.	Young (25-35)	103	44.59
3.2.	Lower middle (35-45)	109	47.19
3.3.	Middle (45-55)	14	6.06
3.4.	Upper middle (>55)	5	2.16
4. Professional experience (in months)			
4.1	Moderately experienced (36-74)	159	68.83
4.2	Highly experienced (74-146)	64	27.71
4.3	Very highly experienced (146396)	8	3.46
5. Educational qualification			
5.1.	Graduate (B.Sc./ B.F. Sc./ B.V.Sc.)	6	2.60
5.2.	Post Graduate (M.Sc./ M.F.Sc./ M.V.S c.)	176	76.19
5.3.	Doctorate (Ph.D.)	49	21.21
6. Marital status			
6.1.	Married	196	84.85
6.2.	Unmarried	33	14.29
6.3.	Widow	2	0.87

Source: *Field Survey*

subsistence farming. Linguistically and culturally the North Eastern farmers are quite different from the rest of the country. Acceptance of research and development organizations among them is quite less. Under such a condition, it becomes quite challenging for the SMSs of KVKs in the region to involve and ensure active participation of farmers in extension programmes. The disadvantageous topography, extreme remoteness of a vast stretch of the region and connectivity issues further aggravate the problem and hinder mass outreach. These might have significantly contributed to comparatively poorer level of performance of SMSs in technology dissemination through extension programmes. Low level of scientific productivity of the SMSs, as observed in course of the study may be due to their poor scientific writing skills.

The CJPI scores of SMSs when stratified through cumulative cube root frequency method revealed that job performance of SMSs in North East region was predominantly low to medium as the large majority (81.81%) of the respondent SMSs belonged to very poor, poor and average categories of performers. As low as 18.19% of the SMSs showed higher level of performance in their assigned jobs; among them only 5.63% of the SMSs were very high performers (Table 4).

The CJPI scores when plotted on a two dimensional surface revealed that the distribution was normal and followed a bell-shaped curve (Fig. 1). Rogers (1962) in his pioneering effort to explain the adoption of innovation behaviour of farmers, reported that the variable innovativeness follow a bell-shaped curve. Many of the human traits are normally distributed and follow a bell-shaped curve (Singh *et al.*, 2006). Job performance of SMSs of KVKs in the present study was also found to follow the same pattern of distribution.

Table 3: Ranking of different areas of job performance according to index scores (n=231)

Sl. No.	Job performance area	Indicator	Mean score	SD	Rank
1.	Participatory technology evaluation	TARI	0.10	0.04	I
2.	Participatory technology showcasing	TDI	0.06	0.04	III
3.	Capacity building	ESEI	0.07	0.03	II
4.	Technology dissemination	EP	0.04	0.04	V
5.	Scientific productivity	PUB	0.02	0.03	VI
6.	Mass outreach	COV	0.05	0.06	IV

Source: *Field Survey*

Table 4: Distribution of SMSs of North East region according to their job performance (n=231)

Performance appraisal based upon	Performance category*	Score	Frequency	Percentage	Mean	SD
Composite job performance index (CJPI) (0-1 scale)	Very poor	<0.11	29	12.55	0. 17	0.06
	Poor	0.11-0.15	81	35.06		
	Average	0.15-0.21	79	34.20		
	High	0.21-0.28	29	12.55		
	Very High	>0.28	13	5.63		

Categories identified through cumulative cube root frequency method* **Source: *Field Survey*

Table 5: Association of socio-personal characteristics to job performance of SMSs (n=231)

Sl No.	Independent variable	Correlation coefficient (r)	Regression coefficient (b)	t value
X1.	Age	0.10	0.03	0.29
X2.	Professional experience	0.00	-0.03	-0.30
X3.	Caste	0.19**	0.19	2.71**
X4.	Marital status	0.02	-0.03	-0.51
X5.	Educational qualification	0.03	-0.02	-0.22
X7.	Gender	-0.09	-0.16	-2.43*
X8.	Participation in workshop/ conference/ seminar	0.21**	0.16	2.34*
X9.	Team-man-ship	0.11*	0.04	0.47
X10.	Communication skill	0.08	0.04	0.49
X11.	Participation in training programmes	0.22*	0.15	2.27*

Note: *Dependent variable – Composite job performance*

*R^2= 0.13, F= 3.20**; *Significant at 0.01 level of probability; **Significant at 0.05 level of probability*

Four variables-caste, participation in workshop/ conference/seminar, team-man-ship and participation in training programmes had positive and significant relationship with job performance of SMSs as indicated by their respective correlation coefficients (Table 5). The socio-personal characteristics of the SMSs had only a lesser influence on their job performance as indicated by the findings of the study. A multiple regression analysis suggests that caste, gender, participation in workshop/conference/ seminar and participation in training programmes were the socio-personal variables significantly associating to overall job performance of the SMSs. A negative value of t (-2.43, p<0.005) as calculated for gender indicates that the women SMSs were comparatively better in terms of their performance in the mandated activities of KVKs. The eleven socio personal variables included in the study altogether contributed only 13% to job performance of SMSs, indicating that remaining 87% variability in job performance was exerted by organizational, environmental and other factors.

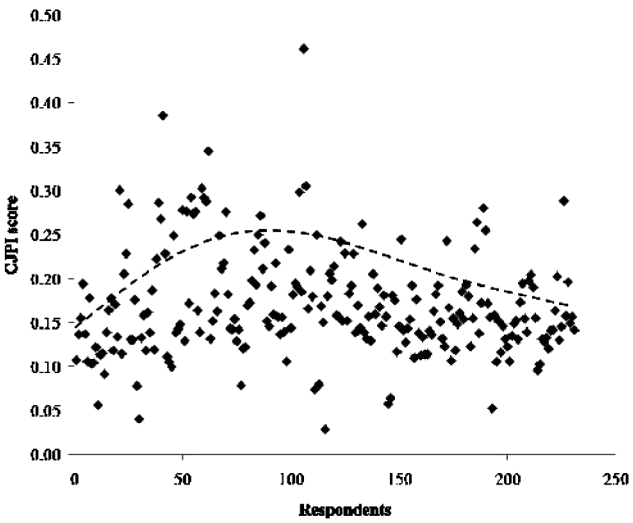

Fig. 1: Distribution of respondents according to their level of job performance (n=231)

Conclusion

The present study brought into focus some crucial points to be considered in formulating policies related to KVKs and their functioning.

1. A larger majority of the SMSs working in the different KVKs of North East region produced only low to average level of performance, implying that there remains huge scope of enhancing their performance and thereby improving the overall functioning of KVK system in the region as a whole. A thorough investigation should be made into the factors specifically hindering performance of the individual SMSs.
2. Lower level of job performance of SMSs coupled with the finding that participation in seminars, workshops, conferences and training programmes were significantly associated to job performance of the SMSs clearly suggests that there is a need to organize at regular intervals training programmes and workshops for the SMSs in a focused way by the supervising authorities of KVKs. The host institutes of KVKs in the region and Agricultural Technology Application Research Institute (ATARI), Zone-III may consider organizing in partnership mode such programmes at regular intervals.
3. The SMSs need to carefully intensify field visits, undertake more group activities and organize programmes for larger mass outreach as their performance in extension activities was found to be poorer when compared to the other areas of performance.
4. The area of job performance, namely scientific productivity ranked the lowest, implying that there is a need for the SMSs to produce more and more scientific literatures, especially leaflets/ folders, training manuals and extension bulletins covering important aspects of improved farming technologies for the benefit of farmers and other field level extension functionaries. Special kinds of workshops and training programmes may be organized by the host institutes and the ATARI in the region for improving scientific writing skills of the SMSs.

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