IOSR Journal of Business and Management (IOSR-JBM)
e-ISSN: 2278-487X, p-ISSN: 2319-7668. Volume 18, Issue 8 .Ver. III (Aug. 2016), PP 49-56
www.iosrjournals.org

Impact of Training on Learners' Development and Performance: A Case Study with Reference to International Agricultural Research Institute, Hyderabad

K.D.V. Prasad[1*], Rajesh Vaidya[2], V Anil Kumar[3]

[1*]*Faculty of Commerce, RashtrasantTukadojiMaharaj Nagpur University, Nagpur (Corresponding Author)*
[2]*Associate Professor, Department of Management and Technology, Shree Ramdeobaba College of Engineering and Management, RamdeoTekdi, Gittikhadan, Katol Road, Nagpur – 444 013 (Maharashtra State), India*
[3]*Visiting Scientist, Bioinformatics and Statistics*

Abstract: *The study reports the results of impact of training on Learners' performance with reference to the training programs conducted at the International Agricultural Research Institute. Hyderabad.The sixindependent variablesApplication of Training, Job knowledge Enhancement, Analytical Tools, Resources, Motivation, New Competencies with one dependent variable Learners' improved Performance based on the knowledge gained from the training measured. The institute conducts in-house training programs on application of advanced crop improvement methods twice a year for the benefit of the researchers in India and some Sub-Saharan African countries working in the area of agricultural research in general and crop improvement in particular.The data was collected using a post-training survey of 200 trainee participants including 60 women and 140 men, from eight such training courses spread over three years to assess the training program impact on Learners' performance. The evaluation was done measuring the effect of the six above said independent variables of the training programs on the dependent variable performance. The descriptive analysis, correlationtechniques, inferential statistics, and multiple regression analysiswere applied to arrive atconclusions. To measure the reliability of thescale used for this study, and internal consistencies of the survey questionnaire, the reliabilitystatistics Cronbach's alpha and Spearman-Brown split-half reliability were used. The overall Cronbach alpha is 0.81 whereas Spearman-Brown static was 0.75and the Cronbach alpha value ranged from 0.64 to 0.71and Spearman Brown-Split Half reliability varied from 0.61 to 0.75 for all the 6independent and one dependent variable. The study concluded that the training impacts on Learner's performance positively and it also depends on the application of the learned techniques into regular use in their job assignments and regular work.*

Keywords: *Training, Cronbach's alpha, Spearman-Brown reliability, Impact, evaluation*

I. Introduction

Training evaluation is a vital aspect of any sort of training and its effect on the person in performing his/her job assignments more efficiently. Feedback is essential for the training organizers to know how they are progressing, also is crucial to the learner's confidence too. People's commitment to learning relies heavily on confidence and a belief that the learning is achievable, the way that training assessments are designed and delivered, and results presented back to the learners. Training evaluation is the systematic assessment of the worth or merit of some object or aim and the act of judging whether or not the activity to be evaluated is worthwhile in terms of set criteria.The rapid advancement in science, modernization of science and technological changes envisaged agricultural research sector to look for new methods of training in the area of crop improvement [1]. This is essential to change the dimensions of the training needs to cope up with those changes and to keep with the pace of rapid science development. There were very limited work has been reported on addressing the impact of training in the area of agricultural research using modern techniques. This study focussed on evaluating the impact of training program using six independent variables and its impact Learner's performance using post-training survey.

Training program evaluation is must for all training programs as the evaluation tools and methodologies help to determine the training program effectiveness and instructional interventions. Though the training evaluation is important, there is evidence that evaluations of training programs are often inconsistent or missing [2]-[5]. The main reasons for inadequate evaluations include: insufficient budget allocated; insufficient time allocated; lack of expertise; blind trust in training solutions; or lack of methods and tools [6].The evaluation of training is complex and involve several complex factors to measure the training interventions in respect of learning, transfer, and organizational impact. These factors are associated with the dynamic and rapid changes in technology knowhow and compelled the organizations like international agricultural research institute to envisage frequent changes in the structure, instructional methods and content of the trainings they

offer [7]. The more complex situation where training cannot not make any substantial change when organizational performance is constrained by the structure of the organization, local and national priorities, or legislation and policies [8].

Several researchers highlighted in their evaluation about the training and its effect on job performance. According to Burke and Day(1986)[9] training positively influences the performance of the managers. As per Bartel(1994) [10] the investment in training increases the productivity. McIvor (1997) [11]argues that it influences organizational commitment, participant knowledge and organizational based self-esteem. Hamblin (1970) [12]defined evaluation of training as – Any attempt to obtain information (feedback) on the effects of training programme and to assess the value of training in the light of that information for improving further training.

Considering the several theories, aspects and complexities the research study proposed to evaluate the impact of the eight training programs spread over three years using 6above said independent variables to measure the effect of dependent variable theperformance.

II. Review of Literature

The Kirkpatrick (1976) developed four logical levels framework for training evaluation consisting of reaction, learning, behaviour and results. Most of the training programs evaluate reaction and learning levels and other two levels learning and behaviour often not done because of their complexities. Some researchers argue that training should result in some form of behaviour change [13].

Goldstein (1986) [14] defines evaluation as the systematic collection of descriptive and judgemental information necessary to make effective training decisions related to the selection, adoption, value and modification of various instructional activities. Hamblin (1974) [15] defined evaluation of training as any attempt to obtain information on the effects of training programme and to assess the value of the training in the light of that information. He described evaluation as a training aid and identified five levels 1) Reaction level 2) Learning level; 3) Job behaviour level; 4) Organization and 5) Ultimate value of evaluation. Williams (1976) [16] defines evaluation as the assessment of value or worth. He observes, value is a rather vague concept, and this has contributed to the different interpretations of the term evaluation. Rackham (1973) [17] offers perhaps the most amusing and least academic definition of evaluation, referring to it as a form of training archaeology where one is obsessively digging up the past in a manner unrelated to the future. Stufflebeam (2003) [18] defined evaluation as a study designed and conducted to assist some audience to assess an object's merit and worth. He came out with a method of evaluation known as CIPP which is Context, Input, Process, and Product Evaluation, which he presented at the 2003 Annual Conference of the Oregon Program Evaluators Network (OPEN).

Surinder Sethi and Preethi Agarwal [19] in their training impact studies in selected manufacturing units in Ahmednagar District of Maharashtrareported that the understand of in understanding employee's perceptions and reaction to training and development, it is the linking of those reactions to learning and job performance in day to day activities contribute to organizational benefits, employee behaviour, attitude and performance and suggested training needs to be conducted on regular basis. Training and Development, On the Job Training, Training Design and Delivery style have significant effect on Organizational Performance and all these have positively impacts the Organizational Performance [20]. Agnes Slavis (2014) [21] carried out a study in Central Eastern Europe to study the impact of training on organizational outcomes in total 633 companies in Hungary, Serbia, Slovenia and Slovakia based on the data of Cranet research network from 2008/2010 research period. The results show that in the examined four CEE countries companies on average spend 4-9 days yearly and about 4% of payroll costs on teaching and development of their employees. In a recent study on the impact of employees training on the job performance in Education Sector of Pakistan the researchers highlighted the important factors to maximize the benefits of the training [22]

Afsan Sultana et al. (2012) [23] used the regression analysis to examine the impact of training on employee performance in Telecommunication sector in Pakistan and concluded for any organization to succeed in achieving the objectives of its training program, the design and implementation must be planned and systematic, tailored towards enhancing performance and productivity.

Raja Irfan Sabir et al. (2014)[24] using regression analysis studied the impact of training on employee performance with reference to Electricity Supply Company in Pakistan and suggested that there is a positive relationship between feedback factors which is associated with the employees of the Company.

The regression analysis results of a recent study in pharmaceutical industry showed that, the training give to employees an opportunity to contribute a greater extent in the areas of performance and development indicating more training and more improvement in the performance [25].

In summary the literature suggests a strong relationship between training and its effect on performance on participant ability to improve his knowledge and there is a need to confirm this through empirical support. The purpose of the present study is to explore the relationship between the said six independent variables with

dependent variable on Learners perceived improved on his/her knowledge through the training. The present study elaborates and extends the previous research by measuring Learners performance using descriptive, inferential statistics and multiple regression methods in an International Agricultural Research Institute where the training is conducted. The hypotheses in this study specifically address the relationship between training as a whole with improved Learners' performance of the training course participant.

III. Objectives

Research Question

Does there any relation between training and enhanced Learner's performance?

With the above background this study has the following objectives:

- To determine the Impactof a training on Learners' performance
- To evaluate whether the objectives were achieved.
- To find out the factors effecting the performance

Based on the identified problem, research question and the objectives the following hypotheses were formed:

H_1: Training participants perceive that training program has positive impact on Learners performance

H_2: Training participants perceive there are some level of differences in independent variables on impact of Learners' performance

The quality of the actual needs assessment might increase training program effectiveness and delivery, therefore increased on performance [26]. Conducting need assessment is the fundamental to the success of a training program. However, even perfect training needs assessment does not guarantee training effectiveness [27]. Thus, we hypothesized our focus on the above indicated six independent variables to measure the dependent variable. The nature of training program is also hypothesized to have a relationship with perceptions of training effectiveness on Learners' performance [28].

IV. Methodology

4.1 Theoretical Framework

The dependent variable in this study is Learners' Performance(now onwards referred as 'Performance') of training program and six independent variables used in this study areApplication of Training, Job knowledge Enhancement, Analytical tools, Resources, Motivation, New competencies (Figure 1)

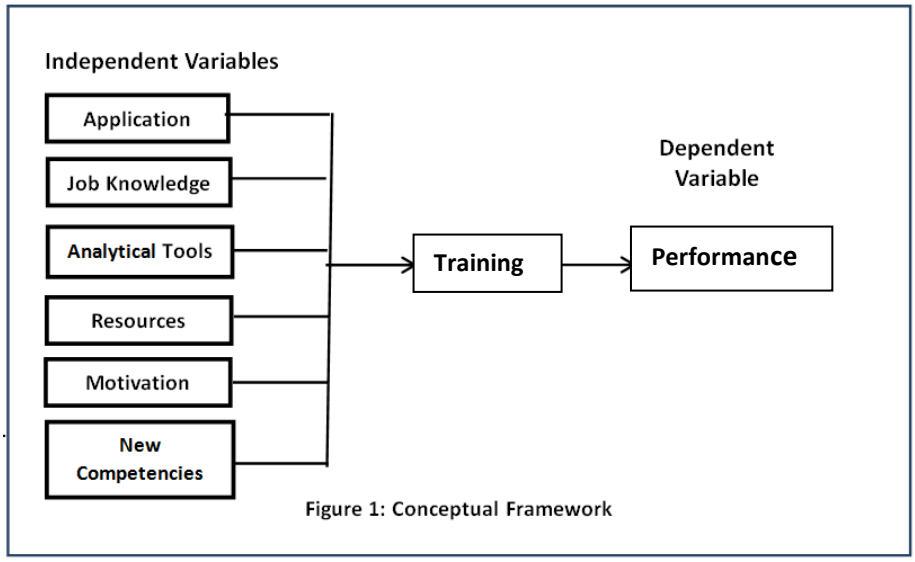

Figure 1: Conceptual Framework

V. Data Collection

5.1Sample Size

The research sample size is of 200 participants who attended the training program spread over three years (2008-2010) across India and some overseas African Countries. The participants are more diverse and represent CSIR Research Centres, State Agricultural Universities, Private sector and small and medium seed companies, Research Foundations, Governmental organizations/institutes of India and Sub-Saharan African Countries. The demography of the participants provided in Tables 1 and 2.

Table. **1** Demography of research sample

Response	Frequency	Percent
Male	140	70
Female	60	30
Total	200	100

Table 2. Sample description

Age Group	Sample size
20-29	30
30-34	68
35-39	70
>40	32

5.2 ***Research instrument***

The *research instrument used* for the survey is a structured undisguised questionnaire – a main source for the primary data collection. Secondary data was collected from various published books, web sites & records pertaining to the topic. The Impact training questionnaire was divided two sections – in the first section, background information/personal details of the respondent were collected. The Section-II of questionnaire was used to collect the information on six independent variables and a dependent variable, post training Learners' Performance. This part contains 53 questions, related to Topic specific independent variables – Application of Training, Job knowledge enhancement, Analytical tools, Resources, Motivation, New competencies and a dependent variable performance. The respondents were asked to choose the most appropriate 'top-of-the-mind' response for each statement based on their post-training judgment. The researcher has identified 40 factors Effect the performance at the institute. The factor analysis was used to reduce the factors to 7 using SAS 9.4 ver (Table 3).

Table 3: List of Independent variables to study the dependent variable Performance used in the study

Variable	Description	Factors
1	Application of Training	6 factors use of training tools in laboratory, field, analysis etc.
2	Job knowledge enhancement	6 factors, increased knowledge and ease of doing the job, etc.
3	Analytical Tools	6 factors, course manuals, software, Analytical tools, etc.
4	Resources	6 factors infrastructure, software and hard ware, etc.
5	Motivation	5 factors, new areas of research, projects, etc.
6	New Competencies	5 factors, dissemination, New Research Practices, etc.
7	Performance (dependent Variable)	6 factors Project funding, Teaching Efficiency, Research Efficiency, Overall improvement, Improvement in Research

5.2 Data analysis

Methods of Data Analysis: In our empirical investigation we have applied statistical techniques to analyse the data for drawing inductive inferences from our research data. To ensure the data integrity the authors have carried out necessary and appropriate analysis using relevant methods on our findings. The descriptive statistics are used to summarise the data and to investigate the survey questionnaire, formulating the hypotheses the inferential statistics were employed. To measure the central tendency such as means, variance and standard deviation we used the dispersion methods.

Reliability methods*:* To measure the internal consistency reliability of our research instrument, the survey questionnaire and to maintain similar and consistent results for different items with the same research instrument, we used the reliability methods Spearman Brown split-half reliability static where items are randomly divided the items into two groups. After administering the questionnaire to a group of people the total score each divided group was calculated to estimate the correlation between the total scores. To further confirm, the reliability of our research instrument we have used the Cronbach's Alpha a mathematically equivalent to the average of all possible split-half estimates [29]. The Statistical Analytical System (SAS) was used to measure the central tendency, measures of variability, reliability statistics, correlations, parametric tests and to predict the dependent variable training program effectiveness based on independent variables multiple regression analysis carried out [30].

Reliability test of the questionnaire

The Likert-type scale with items 2-5 was used for the independent dimensions (where 1=Strongly Disagree Enough, 2=Disagree, 3=Neutral, 4=Agree and 5=Strongly Agree).The reliability statistic Cronbach's alpha coefficient value was calculated for internal consistency of the instrument, by determining how all items in the instrument related to the total instrument [29], [30]. This instrument was tested on a pilot group of 50 training participants. They were asked to fill out the 55-questions, and requested to select the appropriate answer on 5-point Likert Scale. After analysing their responses from the pilot study with SAS program, the Cronbach's alpha static was found to be 0.75 suggesting a strong internal consistency. Two months later, the same instrument was used with 200participants to collect the responses. Four questions were dropped out from a set of 51 questions because of unsatisfactory Cronbach's alpha coefficient values. The overall Cronbach's alpha for the questionnaire with a set of 51 questions was 0.81, and the increase was an effect of dropping the questions with low C-alpha values. The reliability statistics values were presented in the Table ranged from 0.64 to 0.74(Table 4). A second reliability measure called Spearman Brown Split-Half Reliability Coefficient was computed to assure the reliability of the scale items. The obtained overall Spearman Brown Split-Hall Reliability was 0.75 suggesting strong reliability of the instrument. The Table 4 presents the computed C-Alpha Static, Spearman-Brown Split-Half (odd-even) correlation and Spearman Brown Prophecy values.

Table 4: Reliability statistics of the variables used in the study

Variable	Description	C-alpha	Split-Half	Prophecy
1	Application of Training	0.65	0.61	0.67
2	Job knowledge enhancement	0.66	0.63	0.72
3	Analytical Tools	0.67	0.61	0.75
4	Resources	0.71	0.68	0.80
5	Motivation	0.64	0.65	0.73
6	New Competencies	0.71	0.64	0.74
7	Performance (dependent Variable)	0.69	0.62	0.74
	Over all	0.81	0.75	0.85

VI. Results

To assess the independent variables effect on the dependent variable Performance based on 6 variables – Application of Training, Job knowledge |Enhancement, Analytical tools, Resources, Motivation, New competencies the primary data gathered through questionnaire was analysed. The calculated Mean, Standard Deviation and Standard Error values based on the primary data collected from the respondents (n=140, men and n=60 women) are presented in Table 5. The results in Table 5 indicate the objective to find the impact of training on performance fulfilled (performance mean = 3.99). The estimated values of Standard Error ranged from 0.02 to 0.05 with the overall SE value of 0.03 are relatively small, gives an indication that the mean is relatively close to the true mean of the overall population (Table 5).

Table 5: Mean, standard deviation and standard error values of the primary data

Sl. No.	Variable	Mean	SD	SE
1	Application of Training	3.90	0.49	0.05
2	Job knowledge enhancement	3.99	0.32	0.03
3	Analytical Tools	3.99	0.35	0.03
4	Resources	4.04	0.24	0.02
5	Motivation	4.08	0.24	0.02
6	New Competencies	4.06	0.36	0.04
7	Performance	3.99	0.29	0.03

Correlation studies: The correlation analysis was carried out to measure the relationships between the variables (Table 6). The Application of Training, Job Knowledge Enhancement, Motivation and New Competencies positively correlated with Performance (r=0.34, 0.23, 0.47, 0.37, p <0.01). Analytical Tools and Resources are negatively correlated with performance (r= -0.09, -0.021, < p<0.01), this may be effect of lack of resources and infrastructure and tools at the Learner's organization. Overall the correlations are moderate and with the available data we cannot conclude that the differences in means are statistically significant (Table 6).

Table6: Correlation among the study variables

	Applica-tion of Training	Job Knowledge enhancement	Analytical Tools	Resources	Motivation	New Compe-tencies	Performance
Application of training	1.00						
Job Knowledge Enhancement	0.05	1.00					
Analytical Tools	0.35**	0.15	1.00				

Resources	0.03	-0.17	0.78**	1.00			
Motivation	0.35**	0.37**	0.10	0.13	1.00		
New Competencies	0.45**	0.11	0.23*	0.10	0.40**	1.00	
Performance	0.34**	0.23*	-0.09*	-0.21**	0.47**	0.37**	1.00
**Correlation is significant at prob< 0.01; *Significant at prob< 0.05; Source: Survey Data							

Multiple regression analysis

We carried out the multiple regression analysis to predict the value of a dependent variable outcome, Performancebased on the value of six independent variables, and to measure the causeand effect relationship between independent and dependent variables (Table 7).With the p-value of zero to four decimal places, the model is statistically significant. The R-squared is 0.75, meaning that approximately 75% pf the variability of performance is accompanied for by the variables in the model and in this case 75% of the variability of performance is accounted for by the model, even after taking into account the number of predictor variables in the model. The coefficients of each variable indicates the amount of change one could expect in Performance given a one-unit change in the value of that variable, given that all other variables in the model are held constant. If we consider the variable lecture, we would expect an increase of 0.475 in the Performance score for every one unit increase in Application of training assuming that all other variables in the model are held constant. To compare the strength among the coefficients the standardized beta coefficient values computed (Table 8). The Motivation has largest beta value (0.44817) and Analytical Tools have smallest beta value (-0.32352). Considering the beta value of Motivation, one standard deviation increase in Motivation leads to 0.44817 standard deviation increase in predicted performance, with the other variables held constant. In the same way one standard deviation increase in the absence of Analytical Tools leads to 0.032352 standard deviation decrease in performance with other variables in the model held constant, and so on. From the values of the estimated regression coefficients the sample regression equation can be written as:

$$Y=1.866+0.475_{application}+0.089_{knowledge}-0671_{AnalyticalTools}+0418_{Resources}+0.495_{Motivation}-0.221_{Competencies}$$

Table 7. Results from Multiple Regression Analysis (Analysis of Variance)

Factor	Model	R	R Square	AOVA F VALUE	P Value
Performance	1	0.866291	0.75	18.598	<.000

Table8: Results from Multiple Regression Analysis

Variables	Coeff B	SE of B	Beta	t-value	P-Value
Constant	1.866	1.477		1.263	0.210
Application of training	0.475	0.318	0.15144	1.496	0.138
Job Knowledge Enhancement	0.089	0.218	0.04345	0.410	0.683
Analytical Tools	-0.671	0.356	-0.32352	-1.884	0.063**
Resources	0.418	0.323	0.21257	1.292	0.200
Motivation	0.495	0.108	0.44817	4.586	0.000**
New Competencies	-0.221	0.070	-0.27312	-3.179	0.002**

The multiple regression analysis also carried out on overall Training and its effect on overall Performance and the results are presented in Table 9. The parameter estimates from the regression analysis and from the standardized beta value 0.58256 indicates that an increase one standard deviation of stress factor causes 0.58 standard deviation increase in performance, indicating a positive impact of training on Learners performance.

Table 9: Parameter estimates from the regression analysis: Training vs Performance

Factor	Label	Parameter Estimate	Standard Error	T value	Pr > |t|	Standardized Estimate
Performance	Constant	2.66755	0.45003	5.93	<.0001	0
Training	Training	-0.82273	0.18621	-4.42	<.0001	0.58256

Therefore based on the results we accept the $\mathbf{H_1}$: Training participants that training program has positive impact on Learners performance and $\mathbf{H_2}$: Training participants perceive there are some level of differences in independent variables on impact of Learners' performance (Table 8)

VII. Discussion

The purpose of the present study was to see the impact of training on Learners' Performance using the post-training survey questionnaire. The hypotheses were formulated to measure whether the participating in training will improve the Learners' Performance. The results of the study supported the two hypotheses and the

inferential calculations found significant association between those course participants who strongly agreed that they improved their efficiency and received effective coaching and felt application of Training, Job knowledge enhancement, Analytical tools, Resources, Motivation, New competencies has positive impact on their performance. This is in line with the findings of a similar study carried out by Debra Truitt [31]. These results agree with those of Subramanian (2010) [32], Iqbal (2011) [33] Neeraj*et al*. (2014) [34] studied the evaluation of training using descriptive, inferential statistics and regression model.

The results of the questionnaire demonstrated a strong relationship between training program variables – Application of Training, Job knowledge enhancement, Analytical tools, Resources, Motivation, New competencies. This finding also supports the case studies that discussed the training program characteristics and training program effect on performance in organizations [35] [36].

The research did not find any significant differences between the younger and older training participants even in overall training program efficiency. The women participants are more positive training participation attitudes than men. Further future research may address this gender-related disparity when conducting future training courses.

In summary authors researched the hypotheses that the six independent variables effect on the dependent variable Learners' Performance and the results have supported the hypotheses. However given the nature and scope of the study, there are some limitations to this study.

Survey research use self-reported instruments will have some problems associated with its use as these are not complete and reliable. However, the author demonstrated a way to over the come problem of such instruments through reliability statistics maintaining strong internal consistency of the instrument as confirmed by both Cronbach's alpha and Spearman-Brown split-half reliable static at overall and at independent level using ordinal data.

A major limitation to the interpretation of the results is with the instrument i.e. survey questionnaire. The questionnaire was distributed at the end of the training all the course participants. However, even those who have not attended all the sessions would have rated the scale even for the session the participant not attended. Most of the trainee participants are very frank to rate the sessions as most of them are employees and mature, and even commented exactly what they expect from the training. We are appreciative of the participant's comments which are really helpful to change the course methodology accordingly. When compared the first course survey with the eighth course, the authors humbly claim from survey responses the huge improvement in the course delivery. We believe, still there is a scope for improving the training methodologically, and it is very important to note that the authors have not able find any suitable literature on evaluating the impact of training program in the agricultural field attempting empirically to answer questions related to the crop improvement training which involved teaching of modern aspects like advanced molecular plant breeding methods, genomics for crop improvement, sequence analysis and data analysis using high-end computing. Most the of the participants expressed the training is relevant to their present role and will enhance the confidence to pursue their job related research more aggressively, in particular data analysis which most of the participants are not well-versed and happy to receive all the software they practiced during the training.

Future research could build on studying the results by measuring quantitatively actual increase in performance of the performing the jobs and measuring the gender-related disparity. When training is perceived by the employee to be relevant and useful, the results will be demonstrated by improved efficiencies – in this case the course participants writing successful proposals for funding, and transferring the knowledge to the fellow colleagues. We have observed from the open-ended question on the survey about the length of the training program, most of the participants have given unique answers increasing the training from two to three weeks. This strengthens our position to make case for increasing funding for such training courses with the donor agencies.

To conclude, the data were collected supported our hypotheses that the training program positively correlated with the performance of participants positively. The study was conducted with sample size of 200 training course participants from the eight training courses spread over three years, with two-weeks of period. The training course content will change to some level in each course, and is need based. The only limitation is the authors have considered only the common topic areas for formulate the across the courses. As the training is spread over three years, even instructor, lecture also will change at least for some sessions. Further this training estimated performance using independent variables.

The overall Performance of the program as per this study is very good and improvement is needed in certain areas like more time for Application of Tools and the topics related to Job Knowledge Enhancement and most advanced technologies of the area concerned. The authors humbly claim study has been an important first step in this line of research addressing the training issues in modern crop improvement research.

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