

---

# Effectiveness of Training on Improved Sorghum Production Technologies, Value-Addition and Sweet Sorghum Perspectives

Rajendra Rambhau Chapke<sup>1</sup>, Vilas Tonapi<sup>2</sup>

<sup>1</sup>Agricultural Extension Unit, ICAR-Indian Institute of Millets Research, Hyderabad, India

<sup>2</sup>ICAR-Indian Institute of Millets Research, Hyderabad, India

## Email address:

chapke@millet.res.in (R. R. Chapke)

## To cite this article:

Rajendra Rambhau Chapke, Vilas Tonapi. Effectiveness of Training on Improved Sorghum Production Technologies, Value-Addition and Sweet Sorghum Perspectives. *Agriculture, Forestry and Fisheries*. Vol. 8, No. 2, 2018, pp. 36-44. doi: 10.11648/j.aff.20190802.12

**Received:** September 25, 2018; **Accepted:** January 9, 2019; **Published:** June 10, 2019

---

**Abstract:** Training is an integral part of agricultural development process. The study was aimed to assess effectiveness of training which was imparted to improve competency of extension functionaries with latest knowledge and skills about latest sorghum (*Sorghum bicolor* L. Moench) production technologies. In this study descriptive, correlation, regression and t-test were used and all the extension officials participated in the training was included as population (N=36). Data were collected before and after the training course through direct interview and group discussions with help of experts-tested questionnaires. Results revealed that the participants' training needs were more of commercial-oriented like, value-addition, sweet sorghum, sorghum in rice-fallows and market-led extension. The results of Pearson's correlation coefficient showed that there was positive significant relation between job experience, trainings exposure to the trainees, level of satisfaction about the training, their age, education and their learning from this training. These variables appeared to be the best fit in the regression model ( $R^2 = 0.99075$ ). Majority of them (75%) had moderate level of satisfaction regarding entire training course. More than half of them (53%) had gained the knowledge almost three times more (61-80 knowledge score range) than the pre-training knowledge level (11-40 knowledge score range). The t-test results showed that there was significant difference (at the 0.01 level).

**Keywords:** Effectiveness of Training, Sorghum, Knowledge Gain, Satisfaction of Trainees, Usefulness of Training

---

## 1. Introduction

Agricultural-led development is cardinal to secure food and nutrition as well as generating economic growth. In India, the agricultural sector has been positioned centrally as almost 69% of the population are dependent and live in rural areas [4]. Recently, Doubling Farmers' Income Plan has been contemplated by the Government of India as one of the driving forces for the anticipated economic growth. Undoubtedly, agriculture remains crucial for economic growth in most the Asian country and suitable manpower as agricultural practitioners is one of the key components. Food habits and needs of the people are changing fast with their lifestyle and time. The need of food production is being enhanced with rapid growth of population. However, the nutritional, food and fodder security with available resources

and under changing climatic conditions are the big challenge in dryland areas of the country. Sorghum is potential crop to grow well in harsh environments unlike fine cereals, wheat and paddy. It is an important staple food and, fodder for livestock population, especially in resource-poor and semi-arid regions. Millets including sorghum are the principal sources of energy, protein, vitamins and minerals for millions of the poorest people in these regions. Now-a-days, sorghum emerges as a source for bio-fuel and raw materials for industrial products. In context of increasing quality production, adoption of technologies by the farmers has an important role in sorghum development. Several promising technologies are available in laboratories of the research institutes. However, low productivity, susceptibility to biotic, abiotic factors, lack of timely use of inputs, lack of crop management, lack of marketing and its poor economics are

the major concerns in sorghum promotion. To exploit the potential of the available promising technologies, process of technology transfer has to play a crucial role for wellbeing of the small and marginal sorghum farmers. Transfer of technology is a complex but very essential process in agriculture development [29]. The training of agricultural extension workers is an integral part of the overall agricultural production process [22]. There is challenge before extension agencies to develop competent human resources in the agriculture sector to serve large farming community under different agro-climatic situations [5]. The task is especially complex, given the need for extension services to address the challenges of climate change, food insecurity, gender inequality, and globalization of agriculture [7, 12, 23]. Village level extension personnel are the crucial link in the transfer of technology from research institutes to farmers' fields [20]. The capacity building of the extension managers and field extension functionaries of the different sorghum growing states and agriculture as a whole, and to create self-employments is became prime important [14]. Their competency can be enhanced by improving skills, updating latest technical knowledge and ultimately changing their attitude so that they can deliver their services effectively. Training is a part of development process, is widely recognized. For better understanding of the process with latest techniques, training is one of the major tools [3], [15].

Training needs for extension personnel can be defined in terms of gap between job requirement and job performance [18]. Identifying training needs is the diagnostic phase of the training process, as the doctor could not prescribe treatment before examining the patient and identify the type of disease. It is difficult to identify persons covered by training, training objectives, and program content, and the method of the training without having precise objective and training needs [19]. A training needs assessment provides the information needed for developing a training plan based-on the requirements of the participants [17]. Once the relative needs are determined and an appropriate listing of priorities is established, the available resources could be better utilized and made more productive [1].

It was stated that age, education level, training exposure and work experience of extension workers were significantly associated with effectiveness of the training and visits [20]. The success or failure of transfer of technology, to the great extent, depends on how effective the extension personnel are educating the farmers to adopt improved agricultural practices. There are many methods for assessing the effectiveness of the training. Changes in knowledge, skills and attitude which led to built-up confidence of the trainees can be assessed immediately after the training. Therefore, this study was undertaken.

Agricultural extension plays an important role in rural development; the success of agricultural extension work depends on competency (knowledge & skills) of the extension agent, who is the critical element in all extension activities. Extension agents should possess professional

competencies in many areas, which provide the critical skills and knowledge for them to perform the assigned work. As a result of the continuous changes in the knowledge and skills, extension agents need to cope up with these changes and changing requirements of the society through trainings [22].

It was suggested that when evaluating the effectiveness of training, individual employee's characteristics and the work environment must be considered along with program content, design, and implementation [26]. It was recommended that extension workers should be encouraged attending seminars, conferences, and additional courses in reputed institutions [13]. Those who had such exposure, had favorable attitude towards their profession and majority of them were satisfied with their jobs. Senior officers and progressive farmers were most frequently used them as source of latest information as well.

It was entrusted that the ability of an organization to adapt to changes was influenced by: competence, knowledge, skills, and abilities of its staff; value or the amount of importance the staff places on the role of these technologies to accomplish teaching and learning; technology support or the availability of quality facilities, equipment, technical support, and training [8].

In view of the above, this study has been conducted with objective to assess the effectiveness of the model training course and to assess perception of the trainees in order to use output of this course at their home back situations. More specifically, we examined the following issues:

1. Identify the training needs of the extension functionaries related to improved sorghum cultivation;
2. Identify the personal and professional characteristics of the extension functionaries;
3. Determine the existing skills and knowledge of extension functionaries in using sorghum production technologies;
4. Determine the relationships between trainees' characteristics, knowledge gained, level of satisfaction and effectiveness of the training in view of their training needs
5. Determine the level of satisfaction about the training course and their action plans for application of their learning at workplace

## 2. Materials and Methods

A national model training course (MTC) on "Best practices for sorghum cultivation and importance of value-addition" was organized by ICAR-Indian Institute of Millets Research (IIMR), Hyderabad during 20-27 September, 2016 in view to improve competency of extension managers and field extension officers of six major sorghum growing states of the country. The technological aspects of improved sorghum production technologies, preparation and marketing of value-added products, nutritional benefits, forage and sweet sorghum perspectives, and innovative extension approaches were covered. The training methodology used was interactive lecturette using suitable audio-visual aids, brainstorming, exposure to field demonstrations, group discussions and

research facilities of concerned national and international organizations. The trainees were also provided with reading materials on the subjects covered in the training, and also publications on the latest cultivation aspects.

In this study, a descriptive and personal interview method was used. Since, all the participants were working as extension functionaries as agricultural officers and were well qualified as they were selected for the job through public service competitive examination of respective states, all the 36 agriculture officers from agriculture departments of major sorghum growing states namely, Telangana (39%), Maharashtra (17%), Tamilnadu (17%), Madhya Pradesh (11%), Uttar Pradesh (11%) and Karnataka (5%) were selected as population of the study (N=36). Two semi-structured questionnaires were developed comprising open-ended questions and data sheet on personal, professional characteristics, their training needs and perception about the training course. First was developed for collection of data on demographical, personal and training needs before start of the training. Whereas, second was developed for assessing overall effectiveness of the course after training especially on of gain in knowledge, technical skills and attitude of the trainees. The questionnaires were earlier with pre-tested five non-participatory such officers and experts' guidance. As results of pretesting and experts' suggestions, minor changes were made in the questionnaires. To assess the effectiveness of the MTC,

$$LI = \frac{(\text{Post} - \text{training knowledge score} - \text{pre} - \text{training knowledge score})}{(100 - \text{Pre} - \text{training knowledge score})} \times 100$$

The LI was taken as dependent variable which was reflected as effectiveness of the training. Besides, their satisfaction about contents, experts, atmosphere, materials used and physical facilities; usefulness of the course and utilization plan at their work places was determined using five-point Likert-type responses where score was assigned as: 0=None, 1=Little, 2=somewhat, 3=Much, 4=Very much. Accordingly, the respondents were asked to give score against the statements given in each items on one to five-points continuum during post-training evaluation session. Quantitative data were analyzed using SPSS statistical tool. Descriptive statistics were computed for each variables related to personal and professional characteristics of the trainees. Pearson correlation coefficient and regression were employed to determine relationships among the dependent and independent variables.

### 3. Results and Discussion

#### *Training needs related to sorghum development*

Training needs related to sorghum which were expressed by the participants were assessed at the beginning of the training and prioritized on the basis of

before and after the training assessment method was followed. The data were collected with the first questionnaire before starting the programme. The participants were asked about their training needs on different aspects of improved sorghum cultivation. Responses of the trainees were taken to know training needs with five-point Likert-type tool as; very high, high, medium, low and no training needs with assigning 4, 3, 2, 1 and 0 score, respectively and converted it into weighted score by multiplying with respective frequency of the respondents to each training needs. At the end of the training, the data on gain in knowledge, skill and their perception were collected. The knowledge about sorghum cultivation was ascertained on three-point continuum i.e. full, partial and no with assigning two, one and zero score, respectively. The raw score was converted into the knowledge index (KI) using the following formula.

$$KI = \frac{\text{Obtained knowledge score}}{\text{Obtainable knowledge score}} \times 100$$

Differences in the means between knowledge before and knowledge after training were compared employing paired t-test. The 't' test was used to determine the difference between the knowledge gain before and after training course. The degree of learning acquired from this training was measured by computing learning index (LI) formula devised for calculating the learning score by Varghese, 2010.

weighted score as presented in Table 1. Overall, first preference was given by them to; (i) marketing of sorghum grains and fodder (155 weighted score), second to selection of location-specific crop production technologies (152 weighted score), third preference was to; four areas *viz.*, effective transfer of technology approaches, preparation of value-added food products and its marketing, nutritional benefits of sorghum, and farm machineries for dryland agriculture (149 weighted score) and the fourth was to; crop management practices (147 total score), and fifth was to sorghum seed production technology (145 weighted score). It was followed by crop protection technologies (130 weighted score) and ethanol production from sweet sorghum (128 weighted score). It shows that marketing, location-specific crop production technologies and its transfer, and value-addition were important training needs expressed by them in the present commercial farming scenario in order to make sorghum more remunerative. It is prompted that such type of training course needs to be focused more on commercial-oriented aspects of sorghum cultivation and transfer of technologies, rather traditional one. Reddy and Ratnakar (2013) also reported similar kind of training needs for the extension functionaries.

**Table 1.** Training needs related to sorghum expressed by the participants.

S. No	Training areas	Frequency (N=36)*					Weighted Score
		Very high	High	Medium	Low	No	
1	Marketing of sorghum grains and fodder	16	15	5	0	0	155
2	Selection of location-specific crop production technologies	13	18	5	0	0	152
3	Effective transfer of technology approaches	11	19	6	0	0	149
4	Preparation of value-added food products and its marketing	14	15	5	2	0	149
5	Nutritional benefits of sorghum	10	21	5	0	0	149
6	Farm machineries for dryland agriculture	12	17	7	0	0	149
7	Crop management practices	8	23	5	0	0	147
8	Sorghum seed production technology	11	17	6	2	0	145
9	Crop protection technologies	9	13	7	5	2	130
10	Ethanol production from sweet sorghum	9	11	9	5	2	128

\*Multiple responses.

### 3.1. Relationship of Learning with Characteristics of the Trainees

As per the demographical characteristics of the trainees (Table 2), they were diverse in their age group as more than half (58%) were of middle age group between 30 and 50 years with mean 38.80 and SD 9.32. One fourth of them were young (25%) aged between 18 and 30 years. More than fifty per cent of the trainees were graduates in agriculture and allied disciplines (53%) with mean 16.94 and SD 1.01, Remaining 47 per cent were post-graduate, which attributed that this group was well qualified. However, much variation was not found in their annual income as 61 per cent were having more than rupees (Rs.) 3.00 lakhs with mean 510666 and SD 133516 while, only 11 out of 36 participants (31%) had more than Rs. 6.00 lakhs. They were getting good salaries by virtue of their officer grades and seniority which could be a source of motivation towards their jobs. Of the 36 trainees, almost sixty per cent (58%) had up to 10 years of job experience as field extension officers and 42 per cent had more than 10 years of job experience with mean 12 and SD 9.62. They were experienced extension personnel having more than 10 years and thereby, they had better understanding about grass-root problems of the farmers and enabled them to learn better. Whereas, most of them (81%) had exposure of less than two training programmes related to agriculture with mean 2.5 and SD 6.26. It shows that they didn't expose to the latest improved cultivation practices. At the end of the training, their level of satisfaction regarding the major training components like, materials and methods was determined. It was found to be at moderate level rated by 75 per cent of the participants with mean 73.82 and SD 17.16. But, only seven of the 36 participants (20 %) had low satisfaction about the course. Their suggestions were recorded and would be vital inputs for further improvement of such course.

It was further felt relevant to study the correlation between their personal and professional characteristics with learning from the course. Pearson correlation

coefficients was computed to identify the relations between age, education, annual income, job experience, training exposure and their satisfaction about this training course with learning index and presented in Table 2. Results indicated that job experience ( $r=0.699$ ), and trainings exposure of the trainees ( $r=0.438$ ) as well as level of satisfaction about the overall training course ( $r=0.993$ ), were highly correlated with their learning index at 0.01 level of probability. Moreover, their age ( $r=0.368$ ) and education ( $r=0.348$ ) had significant correlation at 5% level of probability with the learning. However, their annual income had no correlation with the learning index. It inferred that job experience and trainings exposure of the trainees coupled with level of satisfaction enabled them to get more insight into the subject. It is a fact that the effective learning could take place with satisfactory teaching materials and in favorable learning atmosphere. Similar findings were also reported in the other study [5]. The correlation indicated only relationship between the independent variables with the dependent variable. It did not indicate the intensity of the relationship.

The data were therefore, subjected to regression analysis considering six variables as independent variables and learning index as a dependent variable. The multiple regression was applied including the variables related to participants' profile viz., age, education, job experience, training exposure, their satisfaction regarding with training and their learnings. Results are highlighted in Table 3. These variables appeared to be the best fit in the regression model ( $R^2= 0.99075$ ). These variables together explained 99.07 per cent of the total variation in learning from the training course and the 't' values were also found to be significant. Based-on these findings, it may be revealed that the above personal characteristics of the trainees are contributing significantly in their learning of the courses. It can be concluded that these variables are very important to be considered while organizing such type of training course.

**Table 2.** Personal profile of the participants of the MTC and its correlation with learning index (N=36).

Variable	Classification	Frequency (%)	Coefficient of correlation (r)
Age	Young (below 30 years)	09 (25)	0.368*
	Middle (30-50 years)	21 (58)	
	Old (above 50 years)	06 (17)	
	Mean	38.80	
	Standard deviation (SD)	9.32	
Education	Graduate	19 (53)	0.348*
	Postgraduate	17 (47)	
	Mean	16.94	
	SD	1.01	
Annual income	Below Rs. 3,00,000/-	03 (08)	0.163
	Rs.3,00,001 to Rs.6,00,000/-	22 (61)	
	Above Rs.6,00,000/-	11 (31)	
	Mean	510666	
	SD	133516	
Job experience	Up to 10 years	21 (58)	0.699**
	11-20 years	07 (20)	
	More than 20 years	08 (22)	
	Mean	12	
	SD	9.62	
Trainings exposure	Up to 2 trainings	29 (81)	0.438**
	3-4 trainings	03 (08)	
	More than 4 trainings	04 (11)	
	Mean	2.5	
	SD	6.26	
Satisfaction level	High	05 (05)	0.993**
	Medium	24 (75)	
	Low	07 (20)	
	Mean	73.82	
	SD	17.16	

**Table 3.** Results of regression analysis of personal profile of the participants of the MTC with learning index (N=36).

Variables	'b' value	't' value	'P' value	R <sup>2</sup>
Age	0.09255	-2.14714	0.040274	0.99075
Education	0.14694	-0.41343	0.682332	
Annual income	0.29306	1.165516	0.253307	
Job experience	0.03325	-0.64292	0.52533	
Trainings exposure	0.030127	0.482383	0.633155	
Satisfaction level	1.031065	29.59715	-3.213918	

### 3.2. Gain in Knowledge About Latest Sorghum Technologies

Knowledge is considered as key inputs in development process. Latest knowledge of the extension functionaries about sorghum production technologies has also vital role in transfer of technology. Therefore, knowledge before and after this course on different aspects of sorghum cultivation was ascertained. Results revealed as alluded in Table 4 that majority of the trainees (61%) belong to medium knowledge with score range between 11 and 40 before training (mean 25.64 and SD 15.42). At end of the training, the majority of them (53%) had gained the knowledge almost three times more (61-80 knowledge score range) with mean 74.96 and SD 14.69 than the pre-training knowledge (11-40 knowledge score range) under medium category. Moreover, 31 per cent trainees had gained the knowledge almost double (81-92 knowledge score range) than the pre-training knowledge score (41-58 knowledge score range) under high knowledge category. More number of trainees were found under high knowledge category (31%) than pre-training (22%). Observations during data

collection exercise as well as group discussions indicated that almost all were unaware of the recent scientific practices, value-added food products and the sweet sorghum. It is also confirmed that overall knowledge level increased substantially by almost three-fold more after-training in all the three categories, low (52-60 score range), medium (61-80 score range) and high (81-96 score range) over the pre-training categories viz., low (4-10 score range), medium (11-40 score range) and high (41-58 score range), respectively.

The t-test was applied to determine difference between the knowledge before and after training about sorghum production technologies as an effectiveness of the training. The calculated 't' value was found to be highly significant (t=82.97) which shows there were significant difference (at the 0.01 level). It could be inferred that the trainees had gained significantly higher knowledge about the subjects delivered in the training. This finding is supported by the other authors [11] stating that training had significant impact on trainees in terms of knowledge gained. Therefore, it is advisable to extend such training opportunities to other field functionaries to augment their knowledge base.

**Table 4.** Distribution of the participants according to knowledge level.

Knowledge level	Pre-training		Post-training	
	Score	Frequency	Score	Frequency
Low	4 -10	6 (17)	52 - 60	6 (17)
Medium	11 - 40	22 (61)	61 - 80	19 (53)
High	41 - 58	8 (22)	81 - 96	11 (31)
Range	4 - 58		52 - 96	
Mean	25.64		74.96	
SD	15.42		14.69	
t-value	82.97**			

Figures in parentheses indicate per cent.

### 3.3. Satisfaction of the Trainees Regarding MTC Training

Training is one of the important education processes which facilitate adult learning. Teaching materials, atmosphere, subject matter, participants and experts are the major components which can create conducive learning environment. To know the effectiveness of these components, the participants' perceptions were determined on satisfaction regarding the training methodology, materials used and atmosphere. Their perceptions are illustrated in Table 5. The results revealed that out of the 36 participants; majority of the participants felt that atmosphere was excellent and very good (36%) to exchange ideas freely with faculty members, similarly medium of instructions was excellent (36%), training methods was very good (50%), use of audio-visual aids was excellent (42%) and very good (44%), and timely information of day to day activities was very good (42%). These apart, contents was much relevant expressed by 47% and, adequacy of contents, sequencing of contents as well as

duration of the training and practical orientation was rated as very good (38%). All together, these findings were directly reflecting about the favorable as well as satisfactory environment in relation with their learning as shown in the above Table 2. It was also reported that audio-visual communication was socially appreciated as positive, personal and informal [10]. It was further expressed by the trainees that all the aspects of sorghum development could not be covered in details within eight days of time, and practical aspects were much useful than theory for them in order to solve the field problems of farmers at their work places. In addition, they suggested some requirements like, recreation and reading facilities need to be arranged to keep their interest up. Similar studies are also suggested that the optimal teaching strategy depends on the type of target audience taught. Some degree of flexibility would be required [6]; [9]; [25]. These findings would be viable inputs for future training programme of such extension officers.

**Table 5.** Satisfaction perceived by the trainees regarding training.

S. No	Item	Excellent	Very Good	Good	Satisfactory	Poor
1	Atmosphere to exchange ideas freely with faculty members	13 (36)	13 (36)	9 (25)	1 (2)	0
2	Medium of instruction	13 (36)	12 (33)	10 (27)	1 (2)	0
3	Training methods	8 (22)	18 (50)	9 (25)	1 (2)	0
4	Use of audio-visual aids	15 (42)	16 (44)	5 (14)	0	0
5	Timely information of day to day activities	14 (38)	15 (42)	7 (19)	0	0
6	Duration of the training	7 (19)	14 (38)	11 (31)	4 (11)	0
7	Relevance of contents	6 (17)	17 (47)	13 (36)	0	0
8	Adequacy of contents	10 (28)	14 (38)	10 (28)	2 (6)	0
9	Sequencing of contents	7 (19)	14 (38)	9 (25)	6 (17)	0
10	Practical orientation	4 (11)	8 (22)	14 (38)	8 (22)	2 (6)

Figures in parentheses indicate percentage.

### 3.4. Usefulness of the Training Programme

The deliberation of the course was made keeping training needs in view as mentioned by the participants at the beginning. Perception of the trainees about the course content were considered to study their usefulness of the training. The usefulness of the course content was assessed on the basis of weighted mean score and ranked them on the basis of top score. Total seven out of 26 topics were enlisted as per the rank given by the trainees in Table 6. Data shows that the foremost preferences was given to; (i) value-addition in sorghum with reference to its industrial uses, (ii) improved package of practices of rainy (*kharif*) and post-rainy (*rabi*)

sorghum cultivation for dryland areas, followed by, (iii) sweet sorghum as versatile bio-energy crop, (iv) sorghum pests and their management, (v) market-led extension approaches, (vi) sorghum in rice fallows, disease and their management and (vii) suitable extension strategy for sorghum development. Most of the needs of the trainees (as mentioned in Table 1) were covered in the course and also depicted in the ranking of the usefulness. The results indicated that besides, crop production technologies, new aspects like, value-addition, sorghum in rice fallows, sweet sorghum and market-led extension were found to be very useful which need to bring in attention of the policy makers and research managers for sustainable development of this

crop. Commercial orientation of sorghum cultivation was also reflected to keep pace with current cropping competition. The participants felt that the training was highly useful for them to improving work productivity. It was stated

in this line that most of the trainees' attitude was towards commercial agriculture than the conventional one [16] and [27]. These observations are in support of the findings reported by others authors [30].

*Table 6. Perceived usefulness of the course content of the training.*

S. No	Topic	Rank
1	Value-addition to sorghum: Potential of sorghum for industrial uses in India and entrepreneurship development	I
2	Sorghum research, development and its potential under dryland conditions	II
3	Sweet sorghum – A versatile bioenergy crop its juice quality and other diversified products- syrup, jaggery production	III
4	Major sorghum pests and their management	IV
5	Market-led extension approaches for sorghum and value-addition	V
6	Sorghum cultivation in rice-fallows: A new opportunity	VI
7	Extension strategy to promote dryland agriculture with special reference to sorghum and other minor millets	VII

\*Multiple responses.

### 3.5. Action Plans Prepared by the Trainees for Implementation

In general, it was observed that the trainees could not implement or use their knowledge and skills at their back-home situation due to several reasons. It was reported that the main difficulties faced by extension agents regarding technical services providing to farmers were; lack of resources, poor knowledge regarding improved agricultural technologies, illiteracy among the farmers and communication problems [2]. Therefore, an attempt was made to ensure to use knowledge and skills learnt by the participants from this course and asked them to develop their learning-based work-plan which is suitable for their respective areas and analyzed the data using frequency and per cent. All the work plans were discussed and refined by multidisciplinary team of scientists after thorough

discussions. They mostly liked to introduce innovative technologies at their work places as depicted in their action-oriented plans (Table. 7). They would like to introduce value-addition to sorghum including other millets food products as mentioned by half of the participants (50%). It is followed by dissemination of latest post-rainy sorghum technologies (36%) and introduction of sweet sorghum (31%). A few of them were prepared plan to introduce scented sorghum (19%), plant protection measures on sorghum to be undertaken on large areas (14%), and introduction of sorghum cultivation in rice-fallows and forage sorghum (8%) including plan for imparting training to farmers and their subordinates. Th policy makers need to pay attention for implementation of such latest knowledge-based action plans in different agro-ecologies.

*Table 7. Action plans prepared by the participants for implementation at their work place.*

Sl. No	Plan for implementation	Frequency*	%
1	Introduction of value-addition in sorghum and other millets food products	18	50
2	Dissemination of post-rainy sorghum technologies	13	36
3	Introduction of sweet sorghum	11	31
4	Introduction of scented sorghum	7	19
5	Plant protection measures to be undertaken on sorghum	5	14
6	Introduction of sorghum cultivation in rice-fallows	3	8
7	Introduction of forage sorghum	3	8
8	Such type of training will be organized for farmers and subordinates	2	5

\*Multiple responses.

At end of the training, more than fifty percent of the participants suggested to incorporate more field demonstrations and laboratory visits in the training course (81%). Other suggestions offered by them were; process of preparation of sorghum food products need to be demonstrated in details (75%) and emphasis needs to be given on process of ethanol production from sweet sorghum and its market opportunities (72%). They also suggested that such type of training needs to be organized before starting the crop season (67%). Whereas, only 31 per cent of the trainees suggested that emphasis may be given on crop and soil management aspects. It is depicted

from the above discussions that practical aspects of training need more focus which gives indication towards the principles of extension education as learning by doing and seeing is believing. This finding is supported by other researchers [5] and [27]. They also expressed their happiness about acquiring latest knowledge of different aspects of sorghum development and said that such course will help them to organize effective extension programmes. This kind of motivation is very important to field extension functionaries in their job performance for greater accomplishment [24].

## 4. Conclusions

The results of this study stated that there is positive significant relation between job experience, trainings exposure to the trainees, level of satisfaction about training, their age, education and their learning from this training. It is confirmed that middle aged extension personnel with enough experienced up to 10 years could perceive latest knowledge well under satisfied learning environment. The knowledge and skill acquired from this course will enable them to disseminate latest knowledge on sorghum cultivation, introduction of commercial-oriented aspects like, value-addition, sweet sorghum and sorghum in rice fallows in their respective areas. Thus, this course helps to improve their job performance. With this exposure, confidence and motivation was built-up among them to introduce and educate the sorghum farmers through various action plans. It is stated that such type of training is much needed to improve competencies of extension functionaries of state development departments in the context of changing sorghum and agricultural scenario as a whole. Training is an education process which should be continued with technology advancement and need to replicate such type of training for non-beneficiaries to strengthen their capacity. The findings of this study could be useful to policy makers, research and development agencies who strive to boost-up livelihood of sorghum farmers.

## Acknowledgements

The financial support received from the Directorate of Extension, Ministry of Agriculture and Farmer Welfare, Government of India, New Delhi for organization of this training course is gratefully acknowledged. The cooperation of the trainees from six state agriculture departments for participation in this course and sharing the data is also acknowledged.

## References

- [1] Ali Baygi, A. H., Zarafshani, K. and Chizari M. 2000. Educational and Support Needs of the Agricultural Extension Agents in Isfahan Province, Islamic Republic of Iran. *J. Agr. Sci. Tech.* Vol. 2: 137-141.
- [2] Arshad Farooq, Muhammad Ishaq, Nisar Ali Shah and Robina Karim. 2010. Agricultural Extension Agents and Challenges for Sustainable Development (A Case Study of Peshawar Valley). Technology Transfer Institute, PARC, Tarnab, Peshawar – Pakistan. *Sarhad J. Agric.* Vol 26, No.3, 2010.
- [3] Caley, L. and Hendry, E. 1998. Corporate Learning: Rhetoric and Reality, *Innovations in Education and Training International*, 35 (3), pp 241-247.
- [4] Chandramouli, C. 2011. Census of India 2011: rural urban distribution of population. Ministry of Home Affairs, New Delhi, India. Retrived: [http://censusindia.gov.in/2011-prov-results/paper2/data\\_files/india/rural\\_urban\\_2011.pdf](http://censusindia.gov.in/2011-prov-results/paper2/data_files/india/rural_urban_2011.pdf).
- [5] Chapke, R. R., Pandit, N. C., Das, S. K., Biswas, C. R. and Jha, S. K. 2006, Impact of training on plant protection of jute, *Indian Journal of Extension Education*, Vol. 42 (1&2): 133-135.
- [6] Childers, T. L., Houston, M. J. and Heckler, S. E. 1985. Measurement of Individual Differences in Visual Versus Verbal Information Processing, *Journal of Consumer Research*, 12: 125-134.
- [7] Christoplos, I. 2010. Mobilizing the Potential of Rural and Agricultural Extension. Office of Knowledge Exchange, Research and Extension, Food and Agricultural Organization of the United Nations and Global Forum for Rural Advisory Services, Rome.
- [8] Dooley, K. E. and Murphy, T. H. 2000. College of Agriculture Faculty Perceptions of Electronic Technologies in Teaching. Available at: <http://pubs.aged.tamu.edu/jae.pdf>. Vol.42.42-02-01.pdf
- [9] Frey, D. K. 1994. Analysis of Students' Perceptual Styles and Their Use of Multimedia, *Perceptual and Motor Skills*, 7, pp 643-649.
- [10] Gale, S. 1990. Human Aspects of Interactive Multimedia Communication, *Interacting with Computers*, 2: 175-189.
- [11] Ghosh, P. K. and Pandey, K. N. 2003. Impact of training on knowledge of farmers about improved rice cultivation technologies, *Indian J. of Ext. Edu.*, Vol. XXXIX (1&2): 108-110.
- [12] Haug, R., Worku, T., Lemma, T., Berg, T., Phiri, A. R., Banda, J. W., Kaunda, E. E., Hella, J., Kamile, I. and Schulz, C. E. 2009. High Global Food Prices Crisis or Opportunity for Smallholder Farmers in Ethiopia, Malawi and Tanzania. Noragric report no 50, Norwegian University of Life Sciences, Elanders Novum, Norway.
- [13] Halilu Emmanuel. 2012. Assessment of the Training Needs Among Agricultural Extension Workers In Gombe State Agricultural Development Programme. Vocational & Technology Education Programme, Abubakar Tafawa Balewa University, *Bauchi. Journal of Technical, Vocational & Engineering Education*, Vol. (5) March, 2012.
- [14] Jha, R. K., Sharma, G. R. and Pandey R. K. 2002. Appropriateness of training for rural youth, *Indian J. of Ext. Edu.*, Vol. XXXVIII (3&4): 214-216.
- [15] Jones, N. and Robinson, G. 1998. Do Organizations Manage Continuing Professional Development? *Journal of Management Development*, 14 (1): 197-207.
- [16] Kavwanga E. S. Yambayamba, Sebastian Chakeredza, Aissetou Yaye, James Aucha and Joyce P. Macala. 2013. Effectiveness of Agricultural and Natural Resources Management Training in Zambia, *The Journal of Agricultural Education and Extension*, 19 (1): 37-51.
- [17] Mahmoodi M., Pezeshki-Rad G. and Chizari M. 2011. Identifying Training Needs of Agriculture and Natural Resources Faculty Members in Using Information Technology. *J. Agr. Sci. Tech.*, Vol. 13: 979-987.
- [18] Nongtdu, G., Bordoloi R., Saravanan R., Singh R. and Singh, N. U. 2012. Training Needs of Agricultural Extension Personnel in Meghalaya. *Indian Journal of Hill Farming* 25 (1): 1-8. Available at: [www.kiran.nic.in](http://www.kiran.nic.in).



- [19] Omoregbee, F. E. and Ajayi, M. T. 2009. Assessment of Training Needs of Extension Staff of Agricultural Development Programme (Adp), Edo State, Nigeria. Department of Agricultural Economics & Extension Services, Faculty of Agriculture, University of Benin, PMB 1154, Benin-city, Edo State, Nigeria. ISSN 1119-7455.
- [20] Radhakrishna, R. B. and Yoder, E. P. 1994. Village Extension Workers (VEWs), Agricultural Extension Officers and Contact farmers perception of VEW visit under the Training and Visist System. Proceedings of 10<sup>th</sup> Annual Meeting of the Association of International Agriculture and Extension Education, Arligton, USA, March 24, 25 & 26, 1994.
- [21] Reddy, V. G. and Ratnakar, R. 2013. Training needs of extension personnel in development departments, *Compendium*, National Seminar on "Futuristic Agricultural Extension for Livelihood Improvement and Sustainable Development", EEI, ANGRAU, Hyderabad, India: 330-336.
- [22] Saleh, J. M., Man, N., Salih, M. H., Hassan, S., Nawi, N. M. and Mohammed, S. J. 2016. Training Needs of Agriculture Extension Officers in Iraq. *International Jou. of Scientific and Research Publications*, Vol. 6 (2): 146-152.
- [23] Scoones, I. and Thompson, J. 2009. Farmer First Revisited: Innovation for Agricultural Research and Development, Sussex, UK: Institute for Development Studies.
- [24] Singh, N., Vijayaragavan, K. and Sinha, B. P. 2002. Impact of training interventions on motivational levels of agricultural scientists, *Indian J. of Ext. Edu.*, Vol. XXXVIII (1&2), pp 24-30.
- [25] Smith, S. M. and Woody, P. C. 2000. Interactive Effect of Multimedia Instruction and Learning Styles. *Teaching of Psychology*, 27 (3): 220-223.
- [26] Tracey, J. B., & Tews, M. J. 1995. Training effectiveness: Accounting for individual characteristics and the work environment. *CoRnell Hotel and Restaurant Administration Quarterly*, 36 (6): 36-42. doi: 10.1177/001088049503600615.
- [27] T. Rajula Shanthly and Thiagarajan, R. 2011. Interactive Multimedia Instruction Versus Traditional Training Programmes: Analysis of their Effectiveness and Perception, *The Journal of Agricultural Education and Extension*, 17 (5): 459-472.
- [28] Varghese, T. 2010. ICAR Guidelines for Organization of Model Training Course, New Delhi: Indian Council of Agricultural Research: pp 6.
- [29] Verma, S. 2007. Technology transfer: A complex but necessary process, *Everymans Science*, XLII (2): 89-90.
- [30] Vijayaragavan, K., Singh Premlata and Wasan Monika. 2002. Impact of training modules for management development in extension organizations, *Indian J. of Ext. Edu.*, Vol. XXXVIII (3&4): 133-138.