

Impact of National Training on Sorghum Cultivation for Value-addition

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ABSTRACT

The study was conducted at Directorate of Sorghum Research, Hyderabad on 20 trainees comprising of agriculture officers from four state agricultural departments engaged in field extension to assess impact of the training programme conducted on sorghum value-added products and sweet sorghum. The data were collected through direct interactions with the participants and interview schedule. Results revealed that the learning index of the trainees was significantly correlated with their age, job experience, and level of satisfaction about training materials and atmosphere. Before training, majority of them (60%) belonged to medium knowledge level (between 16 and 30 knowledge score) who had more than double knowledge score (49-84) after the training. Knowledge gained was found to be highly significant at 0.001% level. The topics viz., improved package of practices for kharif and rabi sorghum cultivation followed by approaches for transfer of improved sorghum technologies, sweet sorghum as versatile bio-energy crop, major weeds of sorghum and their management and value-addition to sorghum with reference to its industrial uses and entrepreneurship development were perceived as more useful. The overall impact on the trainees was found to be highly significant and encouraging. This course will help them in their job to organize effective extension programmes and encourage small entrepreneurs at grass root level.

Key words: Impact of training; knowledge gain; sweet sorghum; technology transfer; usefulness of training; value addition

INTRODUCTION

Sorghum (*Sorghum bicolor* L. Moench) is a potential crop to grow well in harsh environments unlike fine cereals, wheat and paddy. It is an important staple food and fodder for livestock especially in semi-arid region. It is one of the principal sources of energy, protein, vitamins and minerals for millions of the poorest people in these regions. Recently, sorghum emerges as a source for bio-fuel and different value-added food products. However, the area under sorghum in India has declined significantly and the average productivity has increased (962 kg/ha in 2011-12) mainly due to adoption of improved production technologies by the farmers.

Adoption of technologies by the farmers is a key component in agricultural development. Several promising technologies are available in laboratories of the research institutes. However, low productivity, susceptibility to biotic, abiotic factors, timely use of inputs, crop management, marketing and its economics are the major concerns in sorghum promotion. To exploit the potential of the available promising technologies and overcome the clientele problems, technology transfer has to play a crucial role for well being of the small and marginal sorghum farmers. Transfer of technology is a

complex but very essential process in agriculture development. 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 (Chapke *et. al.*, 2013). 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 employment became important (Jha *et. al.*, 2002). 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. Against this backdrop, the present study on impact assessment of the model training course on sorghum was undertaken to improve the professional competence, upgrade the knowledge and develop technical skills on improved sorghum cultivation, value addition and sweet sorghum.

METHODOLOGY

A national model training course (MTC) on “Sorghum cultivation for value-added diversified products and sweet sorghum perspectives” was organized by Directorate of Sorghum Research (DSR), Hyderabad during September 23-30, 2013. Besides the

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technological aspects of improved sorghum production technologies, preparation and marketing of value-added products, nutritional benefits, forage and sweet sorghum, and innovative extension approaches were covered. Twenty agriculture officers from agriculture departments of major sorghum growing states and ICAR, namely, Maharashtra (45%), Andhra Pradesh (35%) Karnataka (15%) and Madhya Pradesh (5%) participated in this course. The training methodology used was interactive lecturette using audio-visual aids, brainstorming, visit to field demonstrations and research facilities of concerned national and international organizations. The trainees were also provided with reading materials, a compilation of the subjects covered in the training, and also publications of DSR on the selected topics. The impact of the training in terms of gain in knowledge, skill and attitude including its usefulness was measured before and after the training with the help of semi-structured questionnaire. Training needs were also assessed at the beginning of the programme. The degree of learning acquired from this training was also measured by arriving at the changes between the post-training and pre-training scores with the formula; Learning Index (LI) = $\frac{\{\text{Post-training score (\%)} - \text{pre-training score (\%)}\}}{\{\text{Pre-training score (\%)}\}} \times 100$. The standardized learning index obtained for each trainee was further studied in relation to pre-training reactions, biographical, organizational and psychological variables by using descriptive statistics, mean, frequencies, percentage, correlation and 't' test.

RESULTS AND DISCUSSION

Training needs related to sorghum development

The participants were asked about their training, needs on different aspects of improved sorghum cultivation. Responses were taken on a five-point continuum, very high, high, medium, low and no training need with assigning 4, 3, 2, 1 and zero score, respectively. It was converted into total score by multiplying with respective frequency of the respondents to each aspect. Total ten training needs related to sorghum were expressed by the participants at the beginning of the training (Table 1). Overall first preference was given by them to preparation of value-added food products and its marketing (72 total score), second to sorghum seed production technology (69 total score), third preference was for marketing of sorghum grains and fodder (68 total score) and the fourth was to effective transfer of technologies (67 total score) and fifth was to nutritional benefits of sorghum (64 total score). The sixth overall score assigned for crop management closely followed by crop protection, ethanol production from sweet sorghum, selection of location-specific crop production

technologies, and intellectual property right (IPR) and farmer's right issues. It showed that value-addition and marketing, and seed production of improved cultivars were prime important training needs in the present commercial oriented farming than the subsistence one. Reddy and Ratnakar (2013) also reported similar kind of training needs for extension functionaries of state development departments of the country.

Table 1: Training needs related to sorghum expressed by the participants

Training areas	Extent of training needs					Weighted Score
	Very high	High	Medium	Low	No	
Preparation of value-added food products and its marketing	12	6	2	0	0	72
Sorghum seed production technology	10	9	1	0	0	69
Marketing of sorghum grains and fodder	12	5	2	1	0	68
Effective transfer of technologies	7	11	2	0	0	67
Nutritional benefits of sorghum	8	9	2	1	0	64
Crop management practices	7	9	4	0	0	63
Crop protection technologies	5	12	3	0	0	62
Ethanol production from sweet sorghum	9	7	2	0	2	61
Selection of location-specific crop production technologies	7	11	1	1	0	58
IPR issues and Farmers right	4	7	1	1	7	40

Relationship of learning with socio-personal traits of trainees

The participants of the training were diverse in their age group as fifty per cent were of middle age followed by young (30%) and old (20%). Most of the trainees were post-graduate (65%) while only 35 per cent were graduate, which showed that this group was learned group. Much variation was not found in their annual income as fifty five per cent were having income of more than ₹ 3.00 lakhs. It may be due to getting good salaries as per their officer grades and seniority. All the trainees had more than 10 years of job experience and thereby they had better understanding about grass-root problems of the farmers which help them to learn better. Consequently, most of them had exposure of more than three training programmes related to agriculture. Their level of satisfaction regarding training material and method was found at moderate level which was expressed by 75 per cent of the participants. It was further felt relevant to study the relationship between these variables and learning index of the participants. Correlation among the above six variables with learning index was worked out and revealed that learning index of the trainees about course contents was inclined with increasing age, their job experience, and satisfactory training materials and atmosphere. It indicated that job experience with increasing age gave more insight into the subject. In other words, it can be stated that job experience with age was highly correlated with learning of the subject delivered in

the training. It is a fact that the effective learning could take place with satisfactory teaching materials and in favorable learning atmosphere. Chapke *et. al.*, (2006) also reported similar findings in their study. However, their education, annual income and training exposure were had correlation with the learning index (Table 2). The correlation indicated the relationship of one independent variable at a time with the dependent variable and did not indicate the intensity of the relationship. The data were therefore put to step-wise linear regression analysis considering six variables of learning as independent variables and learning index as a dependent variable. The result is presented in Table 3. The step-wise regression went up to two steps and finally, five variables of participants' profile: age, education, job experience, training exposure and their satisfaction level regarding the training were appeared in the optimum regression model (step II). These together explained 98.25 per cent of the total variation in learning from the training course with the 't' values being significant. It means that the one omitted variable contributed very meagerly to only 1.75% per cent of non-significant variation. Based on these findings it may be concluded that the five personal traits of the trainees contributed significantly in their learning of the course delivered in the training. This finding also indicated that these attributes were very important to consider while delivering the course contents. Some supportive measures like recreation and reading facilities need to be arranged to keep their interest up.

Table 2: Personal profile of the participants of the MTC and its correlation with learning index

Variable	Classification	Frequency (%)	Coefficient of correlation (r)
Age	Young (below 30 years)	06 (30)	0.974***
	Middle (30-50 years)	10 (50)	
	Old (above 50 years)	04 (20)	
	Mean	37.5	
Education	Graduate	07 (35)	-0.187
		13 (65)	
	Mean	16.3	
	SD	0.98	
Annual income	Below ₹ 2,00,000/-	02 (10)	0.376
	₹ 2,00,001 to ₹ 3,00,000/-	07 (35)	
	Above ₹ 3,00,000/-	11 (55)	
	Mean	364000	
Job experience	Up to 10 years	14 (70)	0.864***
		02 (10)	
	More than 20 years	04 (20)	
	Mean	9.03	
Trainings exposure	Up to 3 trainings	16 (80)	0.160
		03 (15)	
	More than 6 trainings	01 (05)	
	Mean	2.4	
Satisfaction level	High	01 (05)	0.813***
		15 (75)	
	Medium	04 (20)	
	Low	04 (20)	
	Mean	83.9	
	SD	13.76	

Table 3: Results of regression analysis of personal profile of the participants of the MTC with learning index

Variables	'b' value	't' value	'P' value	R ²
Step I				
Age	1.55489	7.90	0.0000	0.9825
Education	-1.99968	-2.11	0.0551	
Job experience	0.33966	1.97	0.0699	
Trainings exposure	-0.11649	-0.55	0.5884	
Satisfaction level	0.35367	3.94	0.0017	
Annual income	0.18009	0.18	0.8615	
Step II				
Age	1.55327	8.18	0.0000	0.9825
Education	-1.95883	-2.20	0.0447	
Job experience	0.35065	2.26	0.0400	
Trainings exposure	-0.11402	-0.56	0.5816	
Satisfaction level	0.35281	4.08	0.0011	

Gain in knowledge

Knowledge of the participants on latest technologies included in the course was measured before start of the training and immediately after exposing the respondents to the complete course content. The knowledge 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) by using the formula (KI= Obtained knowledge score/Obtainable knowledge score x 100). Differences in the mean knowledge gain score before and after exposure were compared by using paired 't' test and are presented in Table 4. It was revealed that majority of the trainees (60%) belonged to medium knowledge score range between 16 and 30 before training who had more than double score (49-84) after the training. Knowledge score range increased substantially after training in all the three categories, low (45-48 score range), medium (49-84 score range) and high (85-96 score range), over the pre-training categories viz., low (9-15 score range), medium (16-30 score range) and high (31-34 score range), respectively. The calculated 't' value was found to be highly significant at 0.001 per cent level. It could, therefore, be inferred that the trainees had gained significantly higher knowledge about the subjects delivered in the training. The impact of the training in terms of knowledge was found to be highly significant. Ghosh and Pandey (2003) have reported in the similar line that training had significant impact on trainees in terms of knowledge gained, and suggested 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	9 - 15	4 (20)	45 - 48	5 (25)
Medium	16 - 30	12 (60)	49 - 84	11 (55)
High	31 - 34	4 (20)	85 - 96	4 (20)
Range	9 - 34		45 - 96	
Mean	23.48		66.96	
SD	7.40		17.79	
t-value	11.1*** (p < 0.001)			

Satisfaction of the trainees regarding training

Teaching materials, atmosphere, subject matter, participants and experts were the major components in any learning process. To know the effectiveness of these components, the participants were asked to provide their perception as satisfaction regarding the training methodology, materials used and atmosphere on five point continuum namely, excellent, very good, good, satisfactory and poor with assigning 4, 3, 2, 1 and zero score, respectively in a post-training evaluation session.

More than fifty per cent of the participants expressed (Table 5) that atmosphere to exchange ideas freely with faculty members (65%), timely information of day to day activities (65%), medium of instructions (60%), training methods (60%) and use of audio-visual aids (60%) were excellent. However, duration of the training and practical orientation was rated as very good. It was further clarified by them that all the aspects of sorghum development could not be covered in details within eight days duration and practical aspects were much important than theory for them to solve the field problems of farmers. It will be viable inputs for future training programme for extension officers.

Table 5. Satisfaction of the trainees regarding training

Item	Excellent	Very Good	Good	Satisfactory	Poor
Atmosphere to exchange ideas freely with faculty members	13 (65)	6 (30)	1 (5)	0	0
Medium of instruction	11 (55)	6 (30)	3 (15)	0	0
Training methods	12 (60)	4	3 (15)	1 (5)	0
Use of audio-visual aids	12 (60)	5 (25)	3 (15)	0	0
Timely information of day to day activities	13 (65)	5 (25)	2 (10)	0	0
Duration of the training	2 (10)	13 (65)	3 (15)	2 (10)	0
Relevance of contents	9 (45)	7 (35)	2 (10)	2 (10)	0
Adequacy of contents	9 (45)	5 (25)	6 (30)	0	0
Sequencing of contents	7 (35)	7 (35)	5 (25)	1 (5)	0
Practical orientation	4 (20)	8 (40)	4 (20)	3 (15)	1 (5)

Figures in parentheses indicate percentage

Usefulness of the training programme

All the lectures delivered, including practicals conducted during the training were considered for this study. The deliberation of the course was made with taking care of training needs of the participants. The usefulness of the course content was assessed on the basis of rank-wise preference of the each topic by the trainees at end of the training. The data in Table 6 revealed that the foremost preferences as per usefulness of the topics was given to; improved package of practices for *kharif* and *rabi* sorghum cultivation followed by transfer of improved sorghum technologies, sweet sorghum as

versatile bio-energy crop, sweet sorghum production technologies, major weeds of sorghum and their management, value-addition to sorghum with reference to its industrial uses and entrepreneurship development, grain storage including insect-pest and their management, and sorghum improvement for unexploited commercially important products. More or less needs of the trainees expressed as above (Table 1) were also depicted in the ranking of the usefulness order. Results indicated that besides, crop production technologies, new approaches transfer of technology, marketing, value-addition and new avenues like, sweet sorghum were found to be very useful which need to bring in sharp focus for sustainable development of the crop. The topics such as, prospects for sorghum bio-fortification, status of sorghum genetic resources management, legislations ensuring protection of plant varieties, sorghum cultivation in rice-fallows and farmers right issues related to sorghum were listed at the lowest rank. This may be due to their more research oriented in nature than direct application in the farmer's fields and less applicable in their working areas like, sorghum cultivation in rice-fallows. However, the participants felt that the training was highly useful for them in improving work productivity. These observations are in support of the findings reported by Vijayaragavan *et. al.*, (2002).

Table 6: Perceived usefulness of the course content of the training

Topic	Rank
Improved package of practices for <i>kharif</i> and <i>rabi</i> sorghum cultivation	I
Transfer of improved sorghum technologies	II
Sweet sorghum – A versatile bio-energy crop its juice quality and other diversified products syrup, jaggery production	III
Sweet Sorghum Production Technologies for Enhancing Crop Productivity and Bio-energy Production	IV
Major weeds of sorghum and their management	V
Value-addition to sorghum: Potential of sorghum for industrial uses in India and entrepreneurship development	VI
Sorghum storage Insect-pest and their management	VII
Sorghum improvement for unexploited commercially important products	VIII
Production and designing of sweet sorghum for bio-fuel and high biomass	IX
An overview of sorghum research, development and its potential under dryland conditions	X
Disease management in sorghum and sweet sorghum	XI
Know your Sorghum Pests and Their Management	XII
Improved genotypes and heterosis in <i>rabi</i> sorghum	XIII
Economics of sweet sorghum cultivation for bio-fuel production	XIV
Genetic improvement in <i>kharif</i> sorghum and latest <i>kharif</i> cultivars	XV
An effective extension approaches for transfer of dryland farm technologies – Experiences and implications	XVI
Principles of Quality Seed Production and Maintenance in Sorghum	XVII
Alternate uses of millets and scope for entrepreneurship	XVIII
Current status of sweet sorghum – industries experiences	XIX
Sorghum: An important forage crop	XX
Food contamination and its management	XXI
Nutritional benefits of sorghum with special emphasis on value addition	XXII
Value Chain Analysis of Dryland Agricultural Commodities	XXIII
Prospects for sorghum bio-fortification	XXIV
Status of Sorghum Genetic Resources Management in India	XXV
Legislations ensuring protection of plant varieties and seed quality in India	XXVI
Sorghum cultivation in rice-fallows: A new opportunity	XXVII
Farmers right issues related to sorghum cultivation	XXVIII

Suggestions of the participants

Just after completion of the training, the participants were asked to give suggestions for making the training more effective in future. It is observed that more than fifty percent of the participants favoured to have more field demonstrations and laboratory visits during the course (60%), other suggestions included process of preparation of sorghum food products need to be delivered in details (55%) and detailed discussion on process of ethanol production and its market opportunities (45%). Only thirty five and 15 per cent of the trainees suggested that emphasis may be given on crop and soil management aspects in details and training should be organized before starting the crop season, respectively (Table 7).

It is clear from these results that field and laboratory visits, and process of preparation of sorghum food products are more important for easy understanding and gaining knowledge. On perusal of the findings, it is indicative that the practical aspects of training should have been emphasized which give indication towards the principles of extension education as learning by doing and seeing is believing. The possible reasons behind such suggestion were the urge for more skill-oriented and need-based training programme.

Table 7: Suggestions offered by the participants for further improvements

Suggestion	Frequency	%
More field demonstration and laboratory visits are needed during the training	12	60
Process of preparation of sorghum food products need to be demonstrated in details	11	55
Emphasis needs to be given on process of ethanol production and its market opportunities	9	45
Crop and soil management aspects needs to be discussed in details	7	35
Such type of training needs to be organized before starting the crop season	3	15

Follow-up of the training programme

In the follow-up session of the programme, the feedback of the participants were collected through their interactions with all the resource persons. Most of them highlighted the importance of the training with a demand to deliver one aspect of sorghum development in eight-days period. They also said that the time schedule of the same was very much appropriate. They expressed their happiness about acquiring latest knowledge of different aspects of sorghum development. Most of the participants were already expressed that this course will help them to organize effective extension programmes like, *krishi mela*, Awareness camp, field day, field demonstrations and trainings for the farmers and small entrepreneurs at grass root level. This kind of motivation is very important to field extension functionaries in their job performance for greater accomplishment. This observation is also supported by Singh *et. al.*, (2002). However, the

participants emphasized on increase in frequencies of field and lab visits, and demonstration in the curriculum. They also drew the attention to make available seeds of the high yielding varieties, and information on processing and marketing of sorghum food products. All these opinions and suggestions can be utilized as input to make any such type of training course more effective and successful in future.

CONCLUSION

It could be concluded that the participants had acquired latest knowledge on the improved sorghum production technologies, value-added food products, sweet sorghum and topics covered in the training. The training had a positive impact on them by increasing their understanding and practical aspects of the course content. The knowledge and skill acquired from this course will enable them to disseminate latest knowledge on sorghum cultivation and value-addition in their respective area and thus helps to improve their job performance. With this exposure, they had got confidence and motivation to educate the farmers in their area about importance of sorghum in resource-poor conditions for their livelihood. However, there is always scope for improvement. It was also suggested that practical aspect of the training programme may be strengthened by increasing the number of practical classes, demonstrations and field visits. It is stated that this type of training is much needed to improve competencies of extension functionaries of state development departments in the context of changing agricultural scenario.

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REFERENCES

Chapke, R.R., Bhagwat, V.R. and Patil, J.V. 2013. Sorghum cultivation for value-added diversified products and sweet sorghum perspectives. Directorate of Sorghum Research, ICAR, Hyderabad, India (ISBN: 81-89335-46-4): 175 pp.

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.

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.

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.

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.

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): 24-30.