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ANALYSING AGRICULTURE EXTENSION SERVICES FOR MEDIA MIXES FOR TRANSFER OF TECHNOLOGY

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ABSTRACT

Keeping in view the gaining significance of agriculture information for farming community, agriculture universities and research stations are being developed and upgraded regularly to generate customised information to accelerate agricultural productivity. This process calls for effective and regular communication and diffusion of agriculture innovation from research stations to farming community through agriculture extension personnel (AEP), which acts as linkage mechanism between the research and farmers. As such, the job of AEP can be considered as most challenging as they act as a hub to transfer, persuade, motivate and convince the farmers to accept and implement the new technology and information using the most appropriate communication tools/ media mixes. For effective training of trainers (ToT), extension personnel should have sound knowledge of the subject-matter and be conversant with various communication methods and media to disseminate the information effectively and to ensure its effective adoption by the farming community under different socio-economic situations. In this regard, a research study with 141 respondents in the district of Jammu was undertaken by Department of Agriculture Extension System to find out various channels of communication tools used and preferred to use by AEP for effective transfer of technology process (ToTP). The validity and reliability tools along with analytical tools lime factor analysis were used to analyse the data. The paper concludes by offering strategies with respect to "Communication Tools Used for Transfer of Technology by AEP" variable that can be incorporated in the T&V extension system to increase the effectiveness of ToTP.

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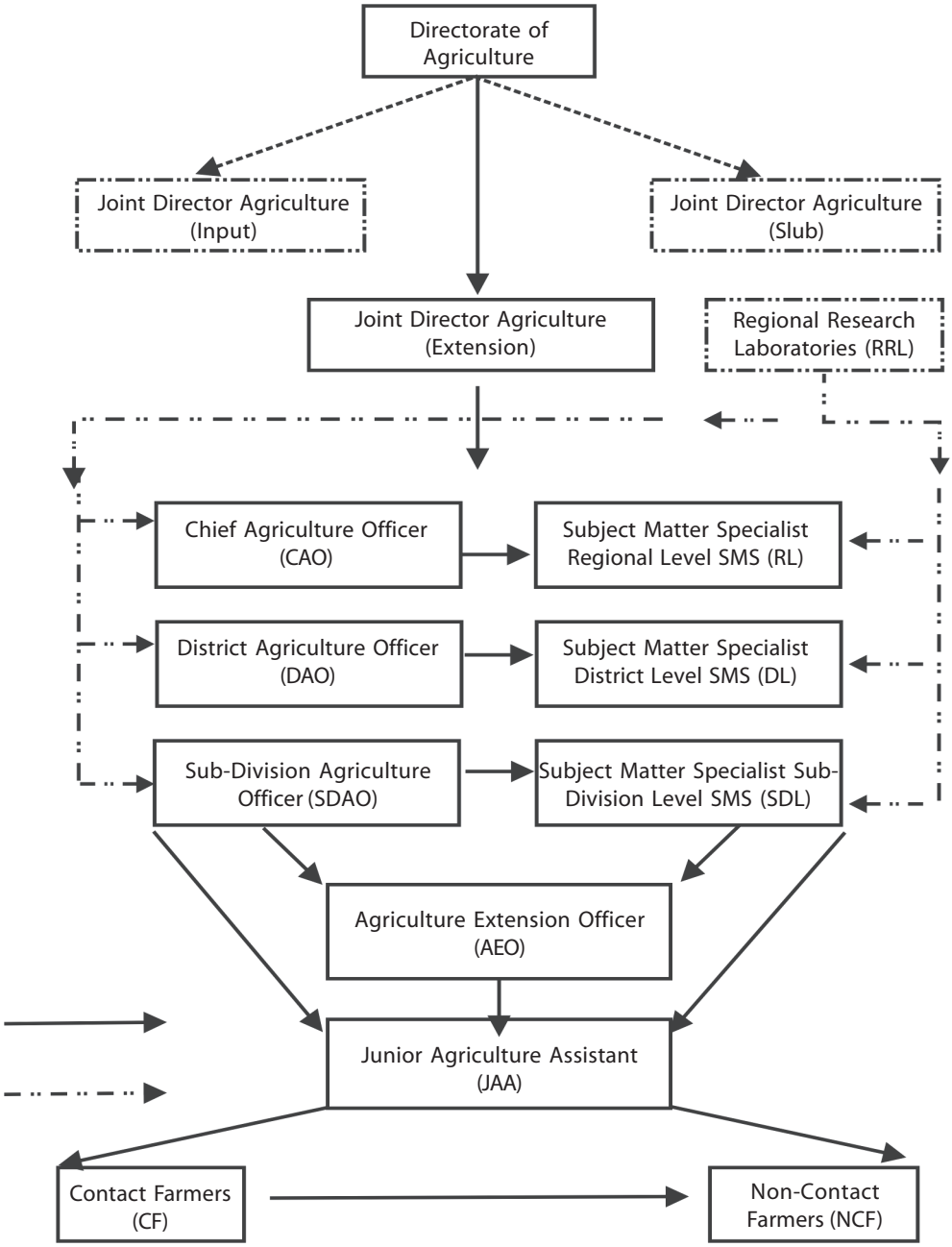
Introduction

Agriculture has been the main stay of India's population where about 58 per cent of the country's population depends on agriculture (Indian Economy, 2005). This sector provides input resources to various industries and contributes about 25 per cent to the country's GDP (Kunnumkal, 2004). Recognising the contribution of agriculture to the overall socio-economic development of the country, new technology for better farming is generated regularly at various agriculture research stations and agriculture universities (Veerasamy et. al,. 1994) .The technology transfer and its popularisation is indeed very crucial for translating the knowledge potential into a reality (Purushotham, 1994). Therefore, importance of right message at the right time and in right manner has become more imperative because there still exists big gap between what the farmers know and what they practise at their farm field (Srivastav, 2005; Kunnumkul, 2004; Bhagat et al 2002 and Bihari & Mishra, 2001).The literature authenticates that generally the new technologies are either not disseminated to the farming community or if disseminated are not properly reached, understood or adopted by the farmers. Various demographic characteristics of farmers (Jahagirdar and Sundaraswamy, 2002), poor functioning of extension agencies with respect to top-town approaches (Das & Saha, 2002), insufficient basic inputs such as seeds , fertilisers, pesticides, etc., (Dholakia and Dholakia, 1992), improper marketing facilities and casual attitude of extension professionals, lack of adequate information system to keep extension agents up-to-date on new technologies (Muhammed, 1999) are found to be some of the important reasons for ineffective implementation of the information dissemination. Though a number of extension agencies such as Community Development Programme (1952), National Extension Services (1953), Intensive Agriculture Area Programme (1964-65), High Yielding Varieties Programme (1966-67), Farmers' Training and Education Programme (1966-67), Agriculture Development Programme (1971), Operating Research Programme (1975), Small and Marginal Farmers Development Programme (1969-70), Training and Visit System (1974), and Krishi Vigyan Kendra (1974) (Kedia 2005; Kedia 2003 and Apparao 2002), etc., were established, by the government over a period of time, still the agriculture scenario has not properly developed in India.

The significant development in the field of agriculture extension services took place with the introduction of T&V extension system in 1974. Initially it was introduced in three States of the country i.e., Rajasthan, Andhra Pradesh and Madhya Pradesh States (Kumar, 1989) with the financial support from World Bank. Subsequently, it became a full-fledged extension system in the whole country.The agriculture extension system prevailing in Jammu district is working on a set principles of the training and visit extension system, which was introduced in 1984 in the State (Kumar, 1989). The 'T' of the T&V system implies training and transfer of know-how from

scientists to front line extension workers through SMS. The 'V' represents visits of extension personnel to the fields (Reddy, 1987) to guide contact farmers to implement new technology. The contact farmers (CF) subsequently transfer the message about the new information and technology to the non contact farmers (NCF). Thus the information under this system passes to the NCF through the channel SMS-AEO-JAA-CF (1). The T&V system employs a variety of communication methodologies viz. farm visits, home visits, demonstrations, radio talks, television talks, pamphlets, leaflets, newspapers, posters, charts, brochures, farmer's day at research stations, etc., (Bihari & Mishra, 2001 and Venugopalan & Perumal, 1992) to transmit the message from the place of production i.e. research station to its final destination i.e., farmers (Balakrishna & Ramachandra, 1994 and Narayana & Reddy, 1994). In addition to the selection of communication tools, the professional competence of AEP also plays a significant role in the ToTP. Both factors together contribute to the effective dissemination of the latest know-how and act as motivational tools to implement the newly developed technology. The extension personnel must keep abreast of upgraded technology and transfer the same to farmers by using methods /media or channels as communication linkages (Singh et al, 2003) for effective ToT. Taking into consideration the significant role of agriculture extension personnel in ToT, the present study was conducted to find out media mixes used and preferred by different AEPs for ToT to the farmers. Important factors suggesting communication methodology were sorted out using factor analysis to suggest the strategies to strengthen the ToTP and to bridge the information transfer and adoption divide.

Fig 1: Organisational Set Up of T&V System and Research Extension Linkage



TOT within T&V system and to CF

Linkage of T&V extension workers with RRL

Source: Directorate of Agriculture (2002)", Report on Work Responsibility of Extension Staff", Department of Extension, Directorate of Jammu, Jammu.

Methodology

Two blocks (Samba and Vijaypur), from command area were selected on census bases and two blocks (R.S. Pura and Marh), from non–command area were selected on the basis of recommendations made by the agriculture experts. In the second stage, a list of agriculture extension personnel comprising 146 persons, with 11 subject matter specialists (SMS), 16 agriculture extension officers (AEO) and 114 junior agriculture assistants (JAA) was procured from the Department of Agriculture. Lastly, the self-developed tested structured questionnaire was distributed to all the 146 extension personnel. Out of 146 questionnaires, 141 were recovered back which came to 97 per cent response rate. The final 141 respondents include 11(SMS), 16 (AEO) and (114) JAA. The demographic profile of the 141 respondents is given in Table 1.

Table 1: Demographic Profile of the Agriculture Extension Personnel

A.	Gender	1.	Male	135
		2.	Female	6
B.	Age	1.	25- 35 years	28
		2.	35-45 years	51
		3.	45-55 years	57
		4.	Above 55 years	5
C.	Qualification	1.	B.Sc	107
		2.	M.Sc	25
		3.	Ph.D	---
		4.	Any Other	9
D.	Experience	1.	5-10 years	19
		2.	10-15 years	21
		3.	15-25 years	89
		4.	Above 30 years	12
E.	Income	1.	₹ 5000-10000	3
		2.	₹ 10000-15000	62
		3.	Above ₹15000	76

Reliability and Validity

Internal consistency of the scale "Communication Tools Used for Transfer of Technology by AEP" measured on the basis of Cronbach Alpha Values (CAV), suggests above average reliability, with Cronbach score of 0.70. To further support the results split–dividing the sample of 141 respondents into 3 equal halves carried out half reliability- sub-sample I (1-47), sub-sample II (48-94) and sub-sample III (95-141). The highest value of Cronbach value was found for sub-sample III i.e., 0.77 followed by sub-sample II (CAV= 0.68) and sub-sample I (CAV= 0.58) which suggested the usability of the scale for further analysis (Table 2).

Table 2: Cronbach Alpha Values for Sample, Sub-sample 1, Sub-sample 2 and Sub-sample 3 for Communication Tools

Variable Name		Communication Tools used by AEP for ToT		
Cronbach Alpha Values	Sample	Sub-sample		
		1	2	3
	0.70	0.58	0.68	0.77

In addition to reliability, validity of the instrument used for strengthening the credence of the study, was also checked. The basic measures of validity namely face and content, were checked at the pre-testing phase of the study. In the present study, construct and convergent validity were carried out. The construct validity was checked out using factor analysis. The Kaiser-Meyer-Olkin (0.63) and total Variance Explained Value (57.00 per cent) supported the construct validity of the scale. Further, majority of the factor statements scored high factor loading values under five factors (Table 3) which consequently further supported the construct validity of the scale. Further to make the scale more valid association among the three important statements namely,'PCP is best way of giving information to farmer about latest agriculture development ','PCP is more useful for farmers as they get detailed information on practical solutions to their problems' and 'PCP is generally used to transfer the technology for the first time to improve knowledge and skills'(Table 4) were measured to check convergent validity. The degree of correlation co-efficient among all the three statements of the scale were found to be quite significant at 0.01 level of confidence (Table 4) which supported and strengthened the prevalence of interrelationship among the selected statements and thus fulfilling the condition of convergent validity.

Table 3: Factor Loading Values (F LV), Mean Score Value (MSV), Grand Mean Score (GM) and Communality Values (CV) Under Communication Tools

S. No.	Statement No.	Factor =F	Statements	FLV	MSV	GM	CV
1	15	F1	Training is given on the latest developments in the agriculture sector	0.77	3.84	3.49	0.64
2	11	F1	TV is regularly used to disseminate information about new technology	0.73	3.85		0.65
3	17	F1	For effective ToT print media is used	0.62	2.79		0.56
4	1	F2	PCP is the best way of giving information to farmers about latest agricultural developments	0.71	4.20	4.15	0.53
5	9	F2	Inadequate funds create problems in organising TP on time	0.70	3.94		0.50
6	13	F2	Training is given in local language	0.52	4.09		0.58
7	2	F2	PCP is more useful as they get detailed information on practical solutions to their problems	0.50	4.28		0.48
8	7	F2	PCP is effective for ensuring implementation of the disseminated technology	0.50	4.24		0.47
9	3	F3	PCP is preferably used to transfer the technology at the first time to improve knowledge and skills	0.80	3.98	4.02	0.68

(Contd...)

Table 3 *(Contd..)*

S. No.	Statement No.	Factor =F	Statements	FLV	MSV	GM	CV
10	10	F3	Radio is regularly used to disseminate information about new technology	0.64	4.05		0.61
11	4	F4	PCP is an expensive communication tool as large number of persons are needed to disseminate information	0.82	3.27	3.33	0.68
12	5	F4	Training programmes through PCP are time-consuming process	0.67	3.39		0.55
13	23	F5	The methodology used for ToT to farmers ignores farmers' needs	0.72	2.62	3.20	0.67
14	8	F5	The TP for farmers are organised regularly	0.68	3.78		0.64

Table 4: Statement-wise Degree of Correlation Coefficient and Mean Score Values for Statements

Statements	PCPs are the best communication tools	PCPs are more useful for giving detailed information	PCPs are preferably at the initial stage of NT dissemination
PCPs are the best communication tools	1	-	-
PCPs are more useful if detailed information is given regarding NT	.459** p=.000	1	-
PCPs are preferably at the initial stage of NT dissemination	.462** p=.001	.368** p=.009	1
Mean score values	4.20	4.28	3.98

**0.01 level of confidence.

Data Analysis and Findings

The factor analysis with principal component method was used to identify the most relevant items of the variable farmers. The factor analysis condensed the 23 statements into 15 under five factors namely, Training, Television and Print Media (4 statement), Personnel Contact Programmers (5 statements), Other Recurrent Information Source: PCP and Radio (2 statements), Problems of PCP (2 statements and, Customised Knowledge (2 statements). Out of 4 statements of the factor first one statement, namely 'The methodology used for ToT to farmers is designed on the basis of problems faced by the farmers'; scored factor loading value 0.37 was deleted for further analysis. The remaining 14 statements under 5 factors are discussed as below:

Factor 1-Training, Television and Print Media: In the process of agriculture development, new farming technology is considered as the prime mover (Narayana and Reddy, 1994) which inturn needs to be communicated effectively to the farming community through different extension systems (Balakrishna and Ramachandra, 1994). The different extension systems use various types of communication tools such as individual contacts, group contacts and mass media (Venugopalan & Perumal, 1992), for transferring agriculture innovation to the farmers. It is authenticated in the literature that farmers do not normally adopt the entire package (Narayana and Reddy, 1994). Therefore, the task of extension workers is most challenging as they have to persuade, motivate and convince the farmers to accept their advices using the most appropriate communication methodology (Balakrishna and Ramachandra, 1994). In the present study an attempt has been made to find out AEP's preference for different categories of communication channels for delivering agriculture information to the farming community. 'Communication tools' the first factor, scored factor loading values (FLV) i.e., 0.77 and 0.73 and mean score value (MSV) i.e., 3.84 and 3.83, for the two statements viz. 'training is provided on latest developments taking place in the agriculture sector' and 'television is regularly used to disseminate information about new developments, respectively. From the high factor loading values it is clear that training and television are very significant for effective ToTP and it is clearly reflected from their above average mean score values (training=3.84 and television =3.83), Print media (FLV=0.62) though important for ToTP, mean score value (2.97) suggests its average usage in the technology diffusion purposes. Thus, in order to enhance the efficiency of present extension system, appropriate combination of all the three media i.e., print media, electronic media and personnel contacts must be used for increasing the ToT efficiency. The communality values viz. 0.64, 0.65, 0.56, for the statements training ,television and print media, respectively show the close association of all the three items with the factor 'Training, Television and Print Media'.

Factor 2-Personnel Contact Programmes: Though, AEPs use multiplicity of communication

tools for transferring agriculture innovations among farmers, the persons who design the message, develop or select the channels for transferring the message to the target users are considered as the most significant method for transferring the new developments to the target users (Roy & Archana, 1994). Factor second christened as 'Personnel Contact Programmer (PCP)' reflects the significance of PCPs, as face-to-face media, the extension personnel are able to solve any sort of queries of farmers regarding the new technology instantly in their local language (Kher, 1991). Table 3 indicates the FLV (ranging between minimum of 0.50 to maximum of 0.71) for all the selected five statements grouped under the second factor. The high mean score values i.e., 4.20, 4.09, 4.28, and 4.24, for the statements viz.' PCPs are the best way of giving information to farmers' and 'training is given in local language',' PCPs help to give detailed information about NT', 'PCPs ensure implementation of the technology disseminated to the users, respectively authenticate the effectiveness of PCP for disseminating new technology to the farmers. The high FLV 0.70 of the third statement of this factor i.e., 'inadequate funds create problems in organising training programmes on new technology' (Table 3) brings the attention to the need for sufficient funds for organising regular and updated personnel contacts programmes for the target users. The 3.98 MSV for the third statement indicates that although funds are available for organsing the regular PCP, more funds for organising more and more PCPs to reach the maximum number of farmers are needed.

Factor 3-Other Recurrent Information Source- PCP's and Radio: To accelerate high agriculture productivity in the present agriculture scenario, the agriculture information has been gaining more consideration among farming community (Momen & Halim, 1994). Now farmers have become more conscious to acquire and utilise the new technology (Waghdhare & Wakde, 1989) received from different information sources more regularly. Keeping in mind the source preference of the target users, the present extension system utilises two important communication mixes to deliver the information in the most effective manner which include PCPs and Radio. Factor 3 draws attention on PCPs and radio for giving regular and continuous information about new developments to the users. The factor analysis grouped two important statements viz.;'PCPs are used for the first time to transfer new technology' and 'Radio is regularly used to disseminate information about new technology' with 0.80 and 0.64 FLV, respectively. Further, the 3.98 and 4.05 MSVs of the statements- 'PCPs are used at first time to transfer new technology ' and 'Radio is regularly used to disseminate information about new technology' respectively specify the role of PCP and radio in giving the new and modified farm technologies to the farmers for enhancing their farm productivity.

Factor 4-Problems of PCP: Although seeing the ongoing significance and usage of technical and mechanical devices (Roy & Archana,1994) person–to-person flow of information remains the most common mode of dissemination of farm know-how(Roy &

Archana, 1994 and Ambastha & Singh,1981). The statement 'PCP is the best way of giving information to farmers' (FLV=0.71) of factor second supports this statement. But, at the same time some problems or implications are associated with the organisation of PCP. The fourth factor of the 'communication tool'viz 'problems associated with PCP'draws the attention towards it.This factor comprises two statements viz. 'PCP is expensive' and 'PCP is time-consuming' with 0.82 and 0.67 FLV's and 3.27 and 3.39 MSV, respectively, stating the problems associated in organising the PCP for the users. Further, communality values shown in Table 3 represent the importance of the items into the factor.

Factor 5-Customised Technology: The methodology (adopted by AEP for transfer of technology) based on the needs and requirements of the target users is greatly responsible for the success or failure of the technology dissemination process (Meena, Chandra & Chaudhary, 2002). It is authenticated that the intensive transfer of production technology without adequate socio-economic aspect has led to disappointment and ineffective adoption of technology by the users at their farm field (Gautam, 1994). The factor 5 which is christened as 'Customised Technology', in this connection brings the attention for providing the need-based technology to the farmers to increase the ToT efficiency. The high FLV i.e. 0.72 of the statement 'the methodology used for ToT to farmers ignores farmers' needs' stressed that importance should be given to the farmers' needs while developing and transferring the technology to them, but the low mean score 2.62 elicits that the present extension system gives nix attention to the needs of the farmers during the ToTP. Though the high FLV (0.66) and above average MSV (3.78) of the statement 'regular TP are organised for the farmers' indicates AEP organises training programmes regularly, as the training is not given as per the needs of the farmer, the efforts of AEP get wasted. Therefore, it is suggested that in order to increase the ToTP efficiency the present agriculture extension system must deliver and develop technology as per the needs and requirements of the target users.

Discussion

An efficient extension services is one of the major requirements for a progressive farming system. It is important not only for spreading the knowledge of improved agriculture practices but also for providing regular help and guidance to farmers to help them to understand new technology and motivate them to adopt it with greater zeal and efficiency (Balakrishna & Ramachandra, 1994, Lakshminarayana & Veerabhadraiah, 1992 and Ray et al, 1982). Depending upon the nature and number of farmers, the present extension system is utilising a combination of communication tools namely personnel contact programmes (farm visits, demonstrations, training programmes and group discussions), print media (newspapers and pamphlets), and electronic media (radio and television) for transfer of technology.

Table 5: Intra and Overall Ranking of Most Preferred Source of Communication Devices

			Communication Devices	Per cent	Intra (Ranking)	Overall (Ranking)
A.	Personnel contacts programmes	1.	Farm Visit	54.14	First	First
		2.	Demonstration	38.32	Second	Third
		3.	Training programmes	36.67	Third	Fourth
		4.	Group discussion	34.48	Fourth	Sixth
B.	Print media	1.	Newspapers	35.14	First	Sixth
		2.	Pamphlets	28.57	Second	Eighth
C.	Electronic media	1.	Radio	38.33	First	Second
		2.	Television	29.33	Second	Seventh

The present study has found PCPs as the most commonly used source among all the media to transmit information to farmers despite the fact that problems in terms of time, money and persons are highly associated with it. The agriculture extension personnel hold the view point that personnel contact programmes are the best form of media to bridge the transfer of technology gap, which exists in the agriculture extension system (Bhagat et al, 2002 and Kher et al, 2002). Even studies (Sharma, 1993 & 1994 and Patel & Gaur, 1993 & 1994) conducted from the farmers' perspective evinced that information disseminated through the ground level extension workers is the most credible source of information for farmers. Among the three personnel contact programmes, farm visit is considered to be most effective (54.14 per cent) followed by demonstration (38.32 per cent), training programmes (36.67 per cent) and group discussion (34.47per cent) (Table 5). Similar results with respect to farm visits were noted in Hisar district of Haryana (Singh et al, 2003). Although organising regular training programmes are important for effective transfer of technology, huge money, skilled manpower and time factors restrict the organisation of trainings frequently and regularly. As such agriculture extension personnel has placed it at fourth position. Group discussions, the other best communication tool used for technology dissemination purposes under personnel contact programmes, have been given rank six by AEP, on the basis of their importance and usage (Table 5).

Among electronic media, television is the most used communication method for ToT in comparison to the radio.This is also reflected from the statement viz.,'television is regularly used to disseminate information about new developments' which falls in factor 1 and

"Radio is regularly used to disseminate information about new technology' which falls in factor 3. However, AEP have given seventh rank to television and second to radio. The latter is the second most preferred source among all the communication sources used for transferring new technology as it allows to reach the masses irrespective of obstacles of illiteracy, topology, etc. (Sandhu & Shukla, 1981). In the, study, radio is also given the second rank among the impersonal cosmopolite by opinion leaders (Nath et al, 2001). These leaders perform the similar function of technology dissemination to farmers like the AEP do in an informal manner. Television is ranked the seventh among the communication tools used for ToT purpose.The fixed telecasting of agriculture programmes, regular power cuts and non-availability of television sets at home among the majority of farmers might have caused to rank television the seventh. Further, factor loading values (Table 3) indicate that print media is highly used in the ToT in the present extension system. Among the three media, posters (36.67 per cent) ranked highest. Newspapers (35.14 per cent), the important component of print media used for transfer of technologies ranked at fifth place. Though it is very in expensive way of communicating the information to a wide range of farmers, this media is generally not much preferred as majority of them are illiterate. The educational and financial constraints restrict the AEP to use pamphlets (28.57 per cent) for disseminating the new technology and as such this communication media has been ranked eighth. In short, it can be concluded that most preferred and mostly used source is personnel contact programmes and print media by agriculture extension personnel. On the other hand, contrasting result was noted for electronic media. Presently AEP use television more regularly to deliver information but at the same time prefer to transmit information through radio programmes and vice- versa. In addition to aforesaid results, the study found that lack of customised technology is the basic reason for transfer of technology gap whereas kher et al (2002) and Bhagat et al (2002) studies indicate that transfer of information from one level to another level is the main reason of transfer of technology gap.

Implications

The study has both research and managerial implications for selecting appropriate communication tools and bridging the transfer of technology gap. The development of customised technology reflects the research implication of the study. The study found that there is a need for agriculture scientists to develop new agriculture techniques on the basis of needs and requirements of the target users, which can enhance the degree of adoption of the technology and subsequently help in bridging the ToT gap.The managerial implication of the study relates to selecting appropriate communication tools and strengthening basic extension activities. In this regard there is a need for agriculture extension agencies to adopt well-established model-AIETA (Awareness, Interest, Evaluation, Trial and Adoption) to help farmers in their decision-making process. All the five stages, if pursued properly, can guide

agriculture extension personnel to select appropriate communication tools and contribute to bridge the ToT gap. The awareness stage, which exposes the farmers to the new technology and innovations, suggests AEP to use mass media communication tools namely radio, television and print media. Among these stress should be given more to radio and television tools as majority of farmers are neo-literates. Group meeting, group discussion and farm visit will be the best tools to fulfill the objectives of interest stage. As such application of these tools can help the farmers in interacting with AEP to satisfy their varied queries. Evaluation, considered as the most critical stage in the adoption of technology as farmers try to compare the knowledge against the facts, per se, they need to be assured of what is learned and seen, indeed, is workable. These types of experiences can help them remove all their doubts pertaining to implementation of the new technology. Result demonstration and farmers interaction in this stage can reinforce their interest through tangible evidences. The trial stage demonstrates the results of implementation of the technology learned in the fields with the help of AEP. As such again farm visits would be the most appropriate method in this stage. Extension personnel should continue to support their efforts to help farmers realise the benefits for long, once they start adopting the learned technologies. Recognition programmes and farmers' competition can be used to encourage farmers to continue adopting the same and other better technologies. Per se, proper feedback from the farmers needs to be taken from time to time to make ToT an effective process (Compbell, 2006). In addition, the study also reflects that organisation of regular training programmes, regular supply of basic inputs, providing marketing facilities to farmers and other related activities should also be strengthened for better agriculture productivity. The effective application of AIETA and other suggested activities demands proper attention on the financial resources. It is suggested that government should allocate certain proportion of agriculture budget to perform these basic functions without any interlude. The government could think of involving NGO's in sharing the financial and managerial responsibility of the agriculture extension agencies.

Limitations and Future Research

All feasible efforts have been made to maintain objectivity, validity and reliability of the study but still the presence of subjectivity could not be ruled out. The study is restricted to the Jammu district only and as such can be extended to Jammu Province or different States to evaluate the agriculture extension services system for further research. The study being AEP-oriented has ignored the farmers' perspective regarding their preferences for different communication tools used by agriculture extension personnel for transfer of technology. Thus, dyad approach could be used in the future research to understand farmers' perception with respect to communication tools preferred by them for effective transfer of technology process, consequently bridging the technology chasm.

References

1. Ambastha, C.K and K.N. Singh (1981), "Communication Pattern of Scientists: A System Analysis", *Indian Journal of Extension Education,* Vol.17, No.1 and 2, pp: 22-30.

2. Apparao, Gummadi (2002), "Contact Farmers in Extension Services", *Agriculture Extension Review,* Vol. 14, No.3, pp. 22-24.

3. Balakrishna B and Ramachandra K.T (1994), "Relative Effectiveness of Two Modes of Lecture Presentation- A Field Experiment", *Indian Journal of Extension Education,* Vol 30, No. 1 to 4, pp. 25-34.

4. Bhagat, G.R ; M.S. Nain and S.K. Kher (2002), "Knowledge and Adoption Gap of Wheat Technology in Jammu", *Journal of Research,* Sher–E-Kashmir, University of Agricultural Sciences and Technology of Jammu, Vol. 1, No. 2, pp. 192-196.

5. Bihari, Bankey and Mishra A.S. (2001), "Information Revolution in Indian Agriculture", *Manage Extension Research Review,* Vol .11, No.2, pp. 62-69.

6. Compbell, A. Dunstan and Clair Barker St. (2006), "Selecting Appropriate Content and Methods in Programme Delivery", http://www/Fao.org/docrep/w5830E/w5830eoa.htm, Last visited 15-2-2006.

7. Dholakia, Bakul H and Dholakia Ravindra H (1992), "Technical Progress in Indian Agriculture Temporal Analysis", *Vikalpa,* Vol17, No.2, pp. 25-34.

8. Gautam, D.S (1994), "Adoption Constraints of Production Resources", *Indian Journal of Extension Education,* Vol 30, No. 1 to 4, pp. 116-118.

9. Indian Economy (2005), "Indian Economy Overview", http://www.economywatch.com/indianeconomy/index.html, Last visited 16-2-2006.

10. Jahagirdar, A.K and B. Sundaraswamy (2002), "Adoption of Recommended Practices of Tomato Cultivation", *Agricultural Extension Review,* Vol. 14, No.3, pp. 12-16.

11. Kher, S.K; Patel R.B and Bhagat G.R (2002), "Practice Wise Knowledge Gap of Farmers and Extension Functionaries in Transfer of Paddy Cultivation Technology", *Journal of Research,* Sher–E-Kashamir University of Agricultural Sciences and Technology of Jammu, Vol. 1, No.2 , pp. 187-191.

12. Kher,S.K(1991), "Adoption Behaviour of Rain-fed Maize Growers", *Maharashtra Journal of Extension Education,* Vol.10, No.2 , Pp. 271-273.

13. Kedia Onkar (2005), "Extension Services –Key to Agriculture Growth", visited on 28-12-2005, http// www.embassof indiajakarta.org/context php?sd=88.

14. Kedia, Onkar (2003), "Extension Services Key to Growth of Agriculture", *Kurukshetra,* Vol. 51, No. 10, pp. 43-45.

15. Kumar, Vijay (1989), "Impact of Training and Visit System World Bank Agriculture Produce: A Case Study of Marh and R.S. Pura Sub-Division of Jammu District", Unpublished thesis , University of Jammu, pp. 10-11.

16. Kunnumkal, Mathew.C (2004), "Transfer of Rural Technology for India's Growth Model", *Journal of Rural Development,* Vol. 23 No. 1, pp: 99-113.

17. Lakshminarayana, M.T. and V. Veerabhadraiah (1992), "Extension Teaching Methods Used by Field Extension Functionaries", *Indian Journal of Extension Education,* Vol. 28, No.3 and 4, pp. 34-37.

18. Meena, R.P, Subhash Chandra and Meenakshi Chaudhary (2002), "Adoption of Weather Forecast by Contact Farmers", *Agricultural Extension Review,* Vol. 14, No. 3, pp. 6-16.

19. Momen, Md. Abdul Miah and Abdul Halim (1994), "Flow of Agriculture Information", *Indian Journal of Extension Education,* Vol. 30, No. 1 to 4, pp. 91-96.

20. Muhammed, Amin (1999), "Improved Seed Production and Technology Transfer to Farmers in the NENA Region", http://www.Fao.org/WAICNET/FAOINFO/AGRICULT/AGPS/cyprws/paper7.htm.

21. Narayana, G.Siva and S. Jayarama Reddy (1994), "Correlates of Adoption of Recommended Technologies", *Indian Journal of Extension Education,* Vol. 30, No. 1 to 4, pp.138-139.

22. Patel, G.M and R.A. Gaur (1993&1994), "Credibility of Information Sources as Perceived by Trained and Untrained Farmers", *Gujarat Journal of Extension Education,* Vol. 4 and 5, pp. 22-56.

23. Purushotham. P (2005), "Appropriate Technology for Employment Generation in Agro Industries", *Kurukshetra,* Vol. 53, No. 10, pp. 6-10.

24. Ray, A.K, A.S. Sirohi; B.P. Sinha and K. Vijayaragavan (1982), "Impact of Training and Visit System of Extension on Tribal Farms in Hoogly District –A Case Study", *Indian Journal of Extension Education,* Vol .18, No.1 and 2, pp. 59-65.

25. Roy, Sumita and Jyoti Archana (1994), "Parameters of Effective Communication for Adoption of Smokeless Chulha", *Indian Journal of Extension Education,* Vol 30, No. 1 to 4, pp. 62-75.

26. Reddy, D.B. Eswara (1987), "Recent Developments in the Transfer of Agricultural Information in India," *in* P.P. Deshmukh (ed), Information System for Agricultural Sciences and Technology, Published by B.V.Gupta, New Delhi, pp.111-120.

27. Sandhu D.K and A.N Shukla (1981), "Content Analysis of Tiranjan Programme of AIR Jullundur", *Indian Journal of Extension Education,* Vol. 37, No 1 and 2, p.p. 75-80.

28. Sharma, F.L (1993 &1994), "Sources of Information in the Adoption of Improved Maize Cultivation Practices", *Gujarat Journal of Extension Education,* Vol. 4 and 5, pp. 35-37.

29. Singh, Bharat, R.S. Narwal and J.S. Malik (2003), "Communication Linkages Used by Extension Personnel for Transfer of Farm Technology to Farmers", *Indian Economic Panorama,* Vol. 12, No.4, pp. 29-30.

30. Srivastava, Alok (2005), "INFOTAINMENT: An Approach to Make Communication Effective", *Kurukshetra,* Vol. 53, No. 10, pp. 32-34.

31. Veerasamy, V; Satapathy C. & Apparao (1994), "Information Input, Processing and Output Behaviour of Extension Personnel", *Indian Journal of Extension Education,* Vol. 30, No.1-4, pp. 35-41.

32. Venugopalan, M and G. Perumal (1992), "Applicability of Dryland Technologies as Viewed by Extension Personnel", *Indian Journal of Extension Education,* Vol.28, No.3 and 4, pp. 22-27.

33. Waghdhare, K.W and W.T. Wakde (1989), "Factors Responsible for the Entrepreneurial Skill of the Farmers", *Maharashtra Journal of Extension Education,* Vol .8, pp. 221-224.