Full Length Research Paper

Farmers training effectiveness in terms of changes in knowledge and attitude: The case of Holeta, Melkassa and Debre zeit Agricultural Research Centres, Ethiopia

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Several agricultural technologies and high yielding varieties have been disseminated from the research centres operating under the umbrella of Ethiopian Institute of Agricultural Research such as: Holeta, Debre Zeit and Melkassa Agricultural Research centres. While the core functions of Ethiopian Institute of Agricultural Research (EIAR) are technology supply, popularization, national coordination and capacity building and policy development, the research and extension divisions of EIAR are responsible for transfer of technologies that are being developed in the respective research centres to farmers and other functionalities through training. There is, therefore, an alarming need to improve agricultural extension activities with the involved farmers through training. Therefore, the objective of this study was to the effectiveness of farmers' training in improving their knowledge and attitudes. One woreda was purposively selected from areas where each one of the three research centres is offering training to the farmers. Equal numbers of respondents of 40 trained and 40 untrained farmers from each of the three research centres were selected for the study. Quantitative data were collected from the respondents. Structured interview schedule was used for collecting the essential quantitative data from the sampled trained and untrained respondents. The quantitative data were analyzed using descriptive statistical tools and also chi-square t-test were employed. The major output of the study indicate that training offered by the three agricultural research centre significantly improved knowledge of potato, onion and durum wheat extension packages, attitude of farmers and level of practice of farmers compared to those of untrained sample farmers.

Key words: Farmers training, effectiveness, Ethiopia, research, onion, durum wheat, potato.

INTRODUCTION

Ethiopia is a country with a land mass 1.1 million km^2, an estimated population of about 77 million (Tsedeke, 2007). Agriculture is the most important enterprise, providing employment for more than 85% of the country's population and accounting for more than 40% of the total GDP and 90% of export earnings (Zeleke, 2000; Tsedeke, 2007). According to FAO data, close to 32 million ha of the total area is agricultural land but an average of approximately 12 million ha of this potential agricultural area is cultivated annually (CSA, 2006).

The country is agro-ecological, diverse and therefore produces wide range of crops and animals. Major crops include: cereals, roots and tubers, pulses, oilseeds, vegetables, fruits and cash crops such as: Coffee, cotton, tea, sugarcane and tobacco. This country ranks among the highest in Africa in its livestock resources. Cattle, sheep, goats, donkeys, chicken, camels, and honeybee are the major livestock species. The country also has rich water bodies and huge aquatic resources associated with

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them (Tsedeke, 2007). Among several institutions in the country, Ethiopian

Institute of Agricultural Research (EIAR) is engaged in agricultural research and extension activities covering all activities associated with crops and livestock production. The vision of EIAR is to see that all Ethiopians engaged in agriculture, agro-pastoralist, and all agriculture-related business become beneficiaries of improved and appropriate agricultural technologies (Tsedeke, 2007). The mission is to conduct research that will provide improved and appropriate agricultural technologies that will contribute to increased agricultural productivity and nutrition quality, sustainable food security, economic development, and conservation of the integrity of natural resources and the environment. EIAR's role would also include finding innovative and effective means of technology dissemination, in collaboration with its partners in extension, higher learning institutions, advanced research institutes, International Agricultural Research Centres, Non-Governmental Organizations, and Community-Based Organizations (Tsedeke, 2007).

Several agricultural technologies and high yielding varieties were released from the research centres operating under the umbrella of EIAR such as: Holeta, Debre Zeit and Melkassa Agricultural Research centres. While the core functions of EIAR are technology supply, popularization, national coordination, capacity building and policy development, the research and extension units of EIAR are responsible for transfer of technologies that are being developed in the respective research centres to farmers and other functionalities through training.

The research and extension department is charged with the responsibility to support these needs through effective farmers' training. Thus, quite significant amount of time and money has been spent on agricultural technologies dissemination/transfer through farmers' and development agents' training programs which have been organized by each Agricultural Research centre of EIAR. To have a clear assessment of these efforts, the evaluation of training is also an important part in the training process cycle.

In evaluating an extension training program, one needs to consider that most training activities exist in a larger context of projects, programs, and plans. Raab et al. (1987) define training evaluation as a systematic process of collecting information for and about a training activity which can then be used for guiding decision making and for assessing the relevance and effectiveness of various training components. The objective of the study is to study the effectiveness of farmers' training in improving their knowledge and attitudes on the selected packages.

RESEARCH METHODOLOGY

A purposive sampling design was followed for the selection of the study research centres namely Holeta Agricultural Research centre, Debre Ziet Agricultural Research centre and Melkassa Agricultural Research centre. This judgmental sampling technique was followed

by the investigator due to the reason that these three agricultural research centres were the most important ones currently involved on technology generation and dissemination under EIAR system. Around each research centre, the study was undertaken in one Woreda, which was selected purposively from where the Agricultural Research centres had been executing training for the past three years to farmers. This judgmental sampling method was chosen based on the preliminary study undertaken by the investigator. Woreda welmera, Ada'a woreda and Adama woreda were selected for this study from the woredas where Holeta, Debre Zeit and Melkassa Agricultural Research centres had been offering training for the last three years, respectively. The woredas which were sufficiently close to the Agricultural centres to enable a series of visits to selected farmers by the researchers over a limited period of time was another criterion.

Holeta Agricultural Research centre offered training for farmers from different woredas on agricultural technologies related to barley, wheat, tef, faba bean, field pea, chickpea, linseed and potato during the last three years. The number of farmers who accessed improved agricultural technologies associated with different crops was found to be higher in Welmera woreda when compared with the other woredas. Therefore, training of potato package being the important one was chosen in the case of Holeta Agricultural Research centre to measure training effectiveness in this study. The reason for this was also attributed to the fact that Holeta Agricultural Research centre was coordinating national potato research and extension programs and actively involved on dissemination of potato packages nation wide.

Similarly, Debre Zeit Agricultural Centre had been offering training on improved agricultural technology packages on several crop and livestock related areas of development. The major technology dissemination areas were associated with durum wheat, chickpea, lentils, tef, and poultry and beef production. Further, durum wheat agricultural technology adoptions as well as disseminations were being coordinated nationally by Debre Ziet Agricultural Research Centre. Thus, training of durum wheat package was purposively chosen to assess training effectiveness study in the case of Debre Zeit Agricultural Research Centre. Among the Woredas, Ada'a woreda was found to be highly associated with the dissemination of durum wheat package.

On the other hand, Melkassa Agricultural Research Centre was highly engaged on adoption of onion production technology and nationally coordinating onion research. Therefore, the onion training program was purposively selected for this centre in order to study the effectiveness of the trainings that were being offered to the farmers by the centre. Adama woreda was selected for the study due to the reason that the highest frequency of farmers had training from Melkassa Agricultural Research Centre on onion package.

Holeta Agricultural Research Centre is located at a distance of 45 km from the capital city of the country, Addis Ababa. The centre is located at $8^0 30'E$ latitude and $9^0 00'N$ longitude with 2400 m altitude. Major soil type of the area was nitosols and vertisols. The Welmera woreda consists of 61% and 39% dega and weyna dega, respectively. Figure 1 and 2.

The study related to Debre Zeit Research Centre was contacted at Ada'a woreda (around Debre Zeit town). Ada'a woreda contains 3, 3 and 94% dega, weyna dega and kola (hot climate), respectively. The area is found 47 km from Addis Ababa with an average geographic coordinate of $8^\circ 44'N$ latitude and $039^\circ 01.5'E$ longitude and an average altitude of 1900 m above sea level. The study area consists of almost entirely of Alfisol/Mollisol and Vertisols with high clay content.

The Melkassa Agricultural Research Centre (MARC) is found near Awash Melkassa ($8^0 24'N$ latitude and $39^0 12'E$ longitude) that is 17 km southeast of Nazareth town and 117 km away from Addis Ababa. The area is situated at an altitude of 1550 m als. The soil of MARC farm had a dominantly loam and clay loam texture.

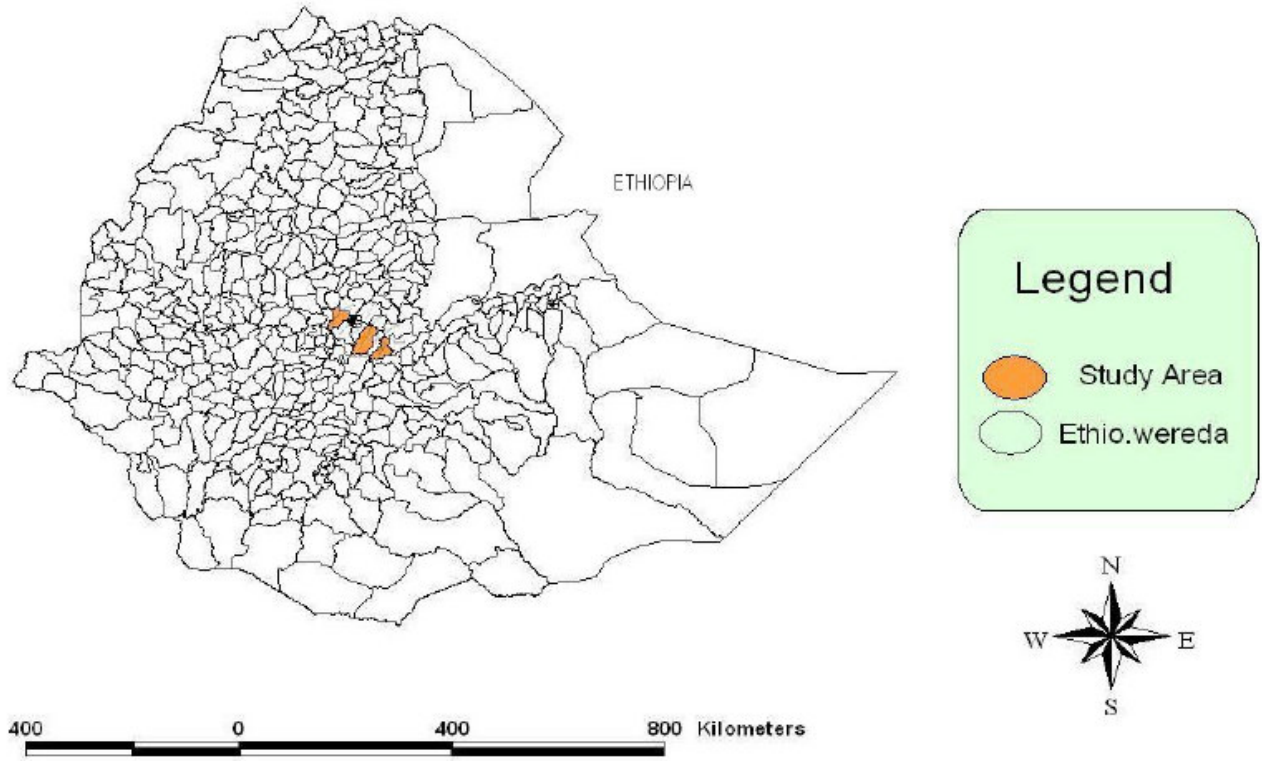The study related to Melkassa Agricultural Research Centre was

Figure 1. Location of study *woredas* in Ethiopia.
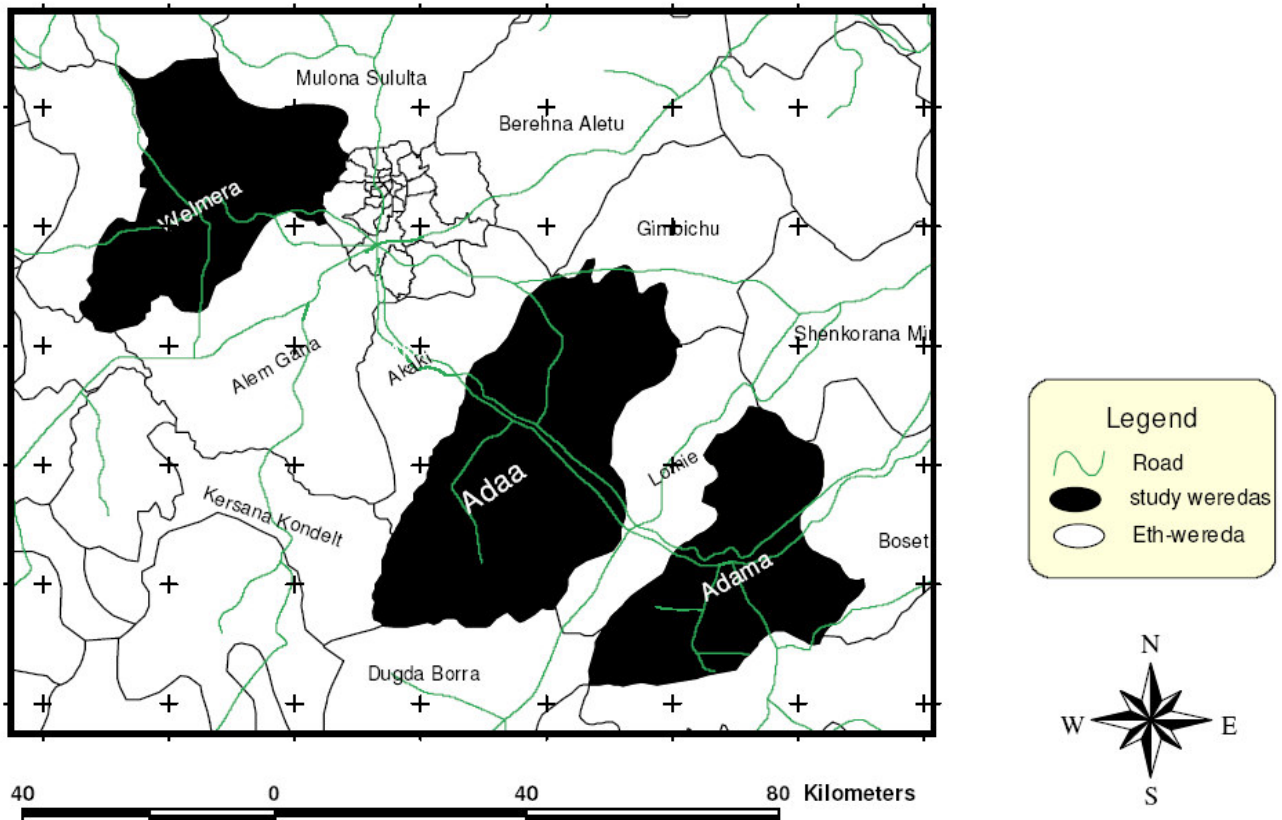

Figure 2. Detail view of location of study *woredas* in Ethiopia.

conducted at W. adama. The woreda consists of 31, 45 and 24% low land, mid-high land and high land, respectively.

Sampling, types and methods of data collection

A multistage sampling procedure was selected for the purpose of this study. From the 14 zones in Oromya region, East and West Shewa were chosen purposively. The research centres under EIAR namely Holeta, Debre Zeit and Melkassa Research Centres belonging to these zones were also chosen purposively. As described earlier, one woreda was purposively selected from areas where each one of the three research centres is offering training to the farmers. Equal numbers of trained and untrained respondents were used for this study. Therefore, from each one of the three woredas (Welmera, Ada'a and Adama) 40 trained and 40 untrained farmers were chosen for comparison purpose. The untrained farmers were selected from quite a significant distance away from where the trainings had been offered in order to avoid the cases of knowledge transfer from trained farmers to the untrained ones.

Welmera woreda was in the mandate area of Holeta Agricultural Research Centres and the farmers trained by that the centres were included in the sample from this area. Ada'a woreda was under the area of Debre Zeit Agricultural Research Centres and hence the farmers included from this woreda were those who were trained by Debre Zeit Research Centres. Melkassa Agricultural Research centre was located in Adama woreda, and the farmers trained by the centre were selected from this woreda. The sample included 40 trained and 40 untrained farmers that were selected randomly from the three woredas of the list of farmers under each centre. Since training effectiveness study through measurement before and after training sessions is impossible due to availability of time, the untrained farmers were used as control which takes care of immanent changes over time. Untrained farmers were selected randomly, from the sampling frame creating using the list of farmers growing the selected crop, with the help of development agents and peasant association (PA) leaders. Furthermore, farmers research group members were avoided from the sampling frame. Since the topics selected for the study for the centres were 'potato package' (for Holeta research centre), 'durum wheat package' (for Debre Zeit research centre) and 'onion package' (for Melkassa Agricultural Research Centre) , the farmers who had participated in the respective trainings were only included in the preliminary lists that were prepared as well as in the sample. Under each research centre one woreda was selected and under each woreda two PA were selected (one for trained and the other for untrained sample farmers) purposively. The PAs which consisted of the highest numbers of trained farmers in the woreda were selected for the purpose of this study. This training effectiveness study was intended to be carried out through quantitative data collection methodology. Quantitative data was collected from the respondents.

Methods of data analysis

All the data were processed and analyzed using appropriate statistical tools to fulfill the objectives of the study. The quantitative data was analyzed using descriptive statistics like mean, frequency and t-test.

Definition of variables and hypotheses

The important variables investigated in the research were, dependent and independent variables. Dependent variable was a variable that was affected or explained by another variable. An independent variable was a variable that causes changes in another (Sarantakose, 1998).

The general objective of this study was to assess training effectiveness. Any farmers' training was intended to bring about desirable changes in the behavioral dimensions of the participants such as: Knowledge and attitude leading to better on-the-job performance. For the purpose of this study, two major behavioral dimensions were considered such as: Knowledge and attitude to reflect the training effectiveness. Knowledge and attitude were treated as dependent variables in this study.

Attitude measurement

Attitude was defined as "the degree of positive or negative effect associated with psychological objects like symbol, phrase, slogan, person, institution, ideal or ideas towards which people can differ in varying degrees" (Thurstone, 1946).

The focus of this parameter was on the attitude of farmers towards the technology offered by the EIAR centres. "Attitude was defined in this study as the degree of positive or negative feeling of farmers' towards technology that were offered to them by the three Agricultural Research centres of EIAR.

Farmers' attitude towards the technology packages was measured using a summated rating (Likert type) scale. The scale was prepared with larger number of items initially and subjecting them to editing and screening in the light of pre-testing so as to include only the relevant items reflecting both positive and negative effect on a five point continuum. The items covered on all aspects related to the application of the given technology. Before administration, the scale was tested for its content validity and sufficient levels of reliability based on the pre-test results.

The attitude of a respondent was measured by adding the total scores obtained for ten item in the scale, by attributing 4 score for 'strongly agree', 3 score for 'agree', 2 score for 'undecided', 1 score for 'disagree' and 0 score for 'strongly disagree' responses in the case of positive items. In the case of negative statements the scoring pattern was reversed. The total scores were calculated by adding individual scores that each respondent obtained for all statements.

The total scores of attitude varied from 0 - 40. For the descriptive analysis three categories such as: Low, medium and high were employed. Since the score range was 0 - 40, the respondents were categorized into three such as: Low (0 - 13), medium (14 - 26) and high (27 - 40) for analysis with the help of descriptive statistics and total score was used for correlation and regression analyses.

Knowledge measurement

Knowledge of trained and untrained farmers was measured using a "Teacher-Made Test". The test items included 14 questions related to onion, potato and durum wheat technology package under Melkassa, Holeta and Debre Zeit Agricultural research centre respectively. Though 11 question, some 14 answers were expected. The scoring pattern was 1 score for correct answer and 0 score for wrong reply. The respondents were asked the question and the answers were recorded. Later these answers were evaluated and their total knowledge scores were calculated. Since the score range was 0 - 14 the respondents were categorized in to three such as: Low (0 - 4), medium (5 - 9), and high (10 - 14) for further analytical purposes using descriptive statistics and total score was used for correlation and regression analyses.

Practice measurement

Skill can be measured only by performance test. Data collection was done when the crop was not in the field. Skill test can not be done and if skill has to be measured it needs testing at each stage

Table 1. Knowledge of trained and untrained farmers under three agricultural research centers.

S/ No.	Research center	Trained		Untrained		t-value
		N	Mean	N	Mean	
1	Debre Zeit	40	10.57	40	6.08	8.83***
2	Melkassa	40	9.56	40	7.75	3.62***
3	Holeta	40	10.55	40	7.02	5.67***

***Significant at $P \leq 0.01$ levels of significance
Source: own survey data (2007/8).

of farming which is beyond the scope of this study. However, practice was assessed as they responded but the accuracy of it can not be fully accepted to represent scale.

Thus, the practice of trained and untrained farmers under Melkassa, Holeta and Debre Zeit Agricultural Research centres was tested. Practice was not a dependent variable for final analysis, but was incorporated to generate some useful information. Practice was operationalized as the application of the knowledge in the real life situation. The practice of farmers was measured based on the recommended package. To test the practice of trained and untrained farmers, seven questions related to onion, potato and durum wheat technology package were used. These seven questions had seven answers. The scoring pattern was 1 score for correct answer and 0 score for wrong reply.

The respondents were asked the question and the answers were recorded. Later these answers were evaluated and their total practice scores were calculated. Since the score range was 0 - 7 the respondents were categorized in to three such as: Low (0 - 2), medium (3 - 5), and high (6 - 7) for further analytical purposes. This testing of practice was based on farmers' perception on their own practice, and hence it was not used as a valid measurement for further analysis. Practice/skill has to be observed for performance, but it was not possible to do it in the off season for crop cultivation.

RESULTS AND DISCUSSION

Effectiveness of training

To investigate the effectiveness of farmers training in improving their knowledge, attitude and practice of durum wheat, potato and onion extension packages 120 trained and 120 untrained farmers were in the study. From each research centres area 40 trained and 40 untrained farmers were used for this study. The advantage of assessing a knowledge, attitude and practice after training of farmers on a given agro-technology is one of the tools for infor-mation on the effectiveness of training (Adhikarya, 1997).

In this study, improvements in knowledge, attitude and practice of durum wheat, onion and potato extension packages that were disseminated by Debre Zeit, Melkassa and Holeta Agricultural Research centres, the frequency and percentage of respondents were obtained. The frequency and percentage of respondents ranged from low, medium to high categories. The differences between frequencies of respondents in the low, medium and high ranges were compared by using chi-square. This was to check the significance level of frequency of

respondents that were classified in different categorizes (low, medium and high) within trained or untrained sample framers separately. Moreover, the significance differences between knowledge, attitude and practice of trained and untrained farmers were analyzed using t test.

Knowledge

A 'Teacher - made test' was prepared and administered to look at knowledge of the trained and untrained farmers, as discussed in methodology chapter. The answer of the farmers were evaluated and categorized into three levels such as: Low (1 - 4), medium (5 - 9) and high (10 - 14) based on the score ranges. The means of the knowledge of trained and untrained farmers were compared using paired t-test and are presented below in Table 1.

The t-test clearly showed that there was highly significant ($p \leq 0.01$) difference between mean score of knowledge of trained and untrained farmers who obtained training in potato, onion and durum wheat extension packages at Holeta, Melkassa and Debre Zeit Agricultural Research centres, respectively (Table 2). As can be seen from the Table 2, knowledge test indicated that the trained farmers had better level of knowledge when compared to the level of knowledge that untrained farmers had on the durum wheat, potato and onion extension packages that were provided by Debre Zeit, Holeta and Melkassa Agricultural Research centres, respectively. This finding is in agreement with the findings of Kefyalew (2006) that training kept the trained farmers more informed and updated.

Infact, this indicates that the untrained farmers also know something about these extension packages intro-duced into the area by the research centres. They can learn from the existing environment such as: Informal discussion with the trained farmers, by observing trained farmer's farm activity and from their life experience. However, from the result obtained, it could be seen that training kept the trained farmers more informed and updated on extension packages disseminated by Agricultural Research Centres.

The result, then, indicated that in terms of improving the knowledge of farmers the training organized by the Debre Zeit, Holeta and Melkassa was effective. Moreover,

Table 2. Knowledge of trained and untrained farmers under three agricultural research centres.

S/ No.	Research centre	Trained		Untrained		t-value
		N	Mean	N	Mean	
1	Debre Zeit	40	10.57	40	6.08	8.83***
2	Melkassa	40	9.56	40	7.75	3.62***
3	Holeta	40	10.55	40	7.02	5.67***

***Significant at $p \leq 0.01$ levels of significance.
Source: own survey data (2007/8).

Table 3. Attitude of trained and untrained farmers under three Agricultural Research centres.

S/ No.	Research centre	Trained		Untrained		t-value
		N	Mean	N	Mean	
1.	Debre Zeit	40	27.60	40	22.92	3.62***
2.	Melkassa	40	28.87	40	22.85	3.72***
3.	Holeta	40	28.55	40	20.85	4.79***

*** Significant at $p \leq 0.01$ levels of significance
Source: own survey data (2007/8).

the experts seemed to be able to transfer the required levels of knowledge for a specific technological package, which is the key factor to implement extension packages.

Attitude

The attitude of 120 trained and 120 untrained farmers was measured using a Likert type scale with 10 statements. The scale permits measurement of degree of positive or negative attitude towards durum wheat, potato and onion extension packages that was introduced by Debre Zeit, Holeta and Melkassa Agricultural Research centres, respectively. The differences between low, medium and high category of trained and untrained farmers' attitude of durum wheat, potato and onion extension packages was compared by chi-square. The mean scores trained and untrained farmers' attitudes were analyzed using paired samples t-test. The results of the analysis are presented below in Table 3.

The mean scores of attitude of trained farmers from Debre Zeit, Melkassa and Holeta Agricultural Research centre were significantly ($p < 0.001$) improved due to trainings offered on durum wheat, onion and potato extension packages (Table 3). Trained farmers had favorable attitude towards introduced durum wheat, onion and potato extension packages compared to the untrained farmers. Training rather enhances decision making by enabling the capacity to analyze information.

Under Debre Zeit Agricultural Research centre, the higher percentage of untrained respondents in the medium category indicates that the changes in attitude may not only be due to training but also due to information flow in the area. In MARC, although the larger number respondents were found to be categorized in high category for both trained and untrained farmers, the frequency of trained respondents was significantly higher than that of untrained ones in the same category. This could demonstrate that training that was offered by Melkassa Agricultural Research centre significantly improved the attitude of farmers towards improved onion extension package. This was in line with the findings of Kefyalew (2006) who stated that undergoing training by formal institutions and exposing oneself to the scientific information, it helps the individual to think rationally and seek new scientific information in all aspects of his/her life. Probably, the group situation in training and the group dynamics thereupon might have also influenced the participants to have an attitude change in the favorable direction.

Practice

The practice was operationalized as the application of the knowledge obtained from the training in the real life situation as stated by the respondents. The practice of farmers was measured based on their responses on application concerning the recommended durum wheat, potato and onion extension packages that were disseminated from Debre Zeit, Holeta and Melkassa Agricultural Research Centres, respectively. The differences between the low, medium and high category of trained and untrained farmers' practice was compared using chi-square and the means of practice of trained and untrained farmers was analyzed using paired samples t-test. The results of this test are displayed below in Table 4. The results presented in Table 4 clearly showed that

Table 4. Practice of trained and untrained farmers under three Agricultural Research centres.

S/ No.	Research centre	Trained		Untrained		t-value
		N	Mean	N	Mean	
1	Debre Zeit	40	5.90	40	3.12	10.40***
2	Melkassa	40	6.02	40	3.95	6.71***
3	Holeta	40	6.67	40	4.35	8.80***

***Significant at p < 0.01 levels of significance
Source: own survey data (2007/8)

Table 5. Knowledge, attitude and practice of trained and untrained farmers under three agricultural research centres (N=240).

Variables	Farmers	t-test					
		N	Mean	SD	SEM	df	T
Knowledge	Trained	120	10.229	2.797	0.255	119	9.967***
	Untrained	120	6.954	2.361	0.216		
Attitude	Trained	120	28.342	7.261	0.663	119	7.020***
	Untrained	120	22.208	6.841	0.625		
Practice	Trained	120	6.200	1.274	0.116	119	14.689***
	Untrained	120	3.808	1.451	0.133		

***,Significant at p < 0.01 levels of significance
Source: own survey data (2007/8)

the mean scores of practice of trained farmers on durum wheat, onion and potato extension packages were significantly (P < 0.01) higher under all the three agricultural research centres. The results presented showed that the training improved the levels of application of the scientific principles in durum wheat, onion and potato production due to trainings that were being offered by Debre Zeit, Melkassa and Holeta Agricultural Research centres.

Knowledge, attitude and practice test using pooled data

To further analyze the effectiveness of farmers training in improving their knowledge, attitude and practice over the centres of research operating under the umbrella of Ethiopian Institute of Agricultural Research the data were pooled together. The combined data which consists of three variables knowledge, attitude and practice of 120 trained farmers were analyzed using descriptive statistics such as: Frequency, percentage chi-square as well as paired t-test. The summary of paired comparison test is displayed below in Table 5.

The t-test result clearly showed that the mean score knowledge of trained farmers on extension package was significantly higher (p < 0.01) than the mean score knowledge of untrained farmers. This confirmed that the training offered by EIAR was effective in terms of improving knowledge of farmers. On the other hand the comparison between attitude of trained and untrained

respondents using paired difference test indicated that the attitude of trained farmers significantly (p < 0.01) improved by the training offered by the centres. Similarly, the mean score of practice of trained farmers on extension packages was found to be highly improved when compared to untrained farmers practice of the same extension package. The paired comparison between the mean score of practice of trained and untrained sampled farmers showed that trained farmers are able to perform better than untrained ones.

In general, the knowledge, attitude and practice test clearly indicates that training significantly improved knowledge of farmers, improved attitude towards the packages and application of technology related to durum wheat, onion and potato production technology.

Conclusion

The knowledge, attitude and practice level of the sample trained farmers in Holeta, Debre Zeit and Melkassa Agricultural Research centres are presented in this study. The attitude of trained farmers was found to be significantly higher for farmers who obtained training from Melkassa, Holeta and Debre Zeit Agricultural Research centres and were classified as medium category, but significantly higher percentage of farmers' knowledge and practice which were classified in the highest category. The data presented in this study showed that untrained farmers knowledge, attitude and practice were found to

be lower than the level of knowledge, attitude and practice that the trained farmers had acquired. It was observed that the significant numbers of untrained farmers' knowledge, attitude and practice level on extension packages were categorized in the medium range for all the three research centres. The survey data obtained from the three study area were combined together to look at the factors influencing the knowledge and attitude of the trained farmers who obtained trainings from the three research centres under EIAR. The result showed that education of farmers, wealth status, level of aspiration, information seeking behavior; extension contact and family size were the most importance independent variables which had significant influence on the knowledge of trained farmers. Whereas education and level of aspiration of trained farmers were the only two independent variables which had significant effect on the attitude of farmers for packages. The result clearly shows that the trainings offered by the Agricultural Research Centres were effective in terms of knowledge of technologies and attitude of trained farmers towards the extension packages. Trainings that had been conducted by the three research centres has shown to improve the knowledge, attitude, and practice of the trained farmers when compared to that of untrained farmers in the study area.

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