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Relationship Between Level of Participation of Researchers, Extension Agents and Farmers in On-Farm Research Trials and Adoption of Technologies Case Study: Maize and Beans Producers, Kenya

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Abstract: This study was conducted to determine the relationship between level of participation of researchers, extension agents and farmers in on-farm research trial activities and level of adoption of technologies developed through that process. The study was based on technologies used to improve the productivity of maize and beans in southwest Kenya. The study used an ex-post facto research design with a survey methodology. It was designed to use three sets of questionnaires directly administered to farmers, extension agents and researchers to collect data from the researchers, farmers and government extension agents. Stratified random sampling technique was used to select 104 respondents. The study established that; there was a significant relationship between occupation of respondents and their level of participation; there was a significant difference between the level of involvement of farmers, extension agents and researchers with the mean participation of the extension agents being relatively high compared to the researchers and farmers in on-farm related activities. However, there was low level of interaction between the researchers, extension agents and farmers; and there was a significant relationship between agro-ecological zones (AEZs) and level of participation of farmers with farmers at higher AEZs having higher participation levels compared to the farmers at the lower zones. The study finally concluded that, there was a strong positive relationship between the level of participation and level of adoption. The study therefore recommends that extension agents and researchers should consider improving their level of participation in joint activities.

Key words: Participation in extension activities · On-farm research trials · Technology adoption

INTRODUCTION

Levels of participation in agricultural extension activities affect agricultural output, whereas effective interaction among farmers, extension agents, researchers and other stakeholders improve adoption of technologies [1]. On-farm trials are agricultural extension activities conducted as a process of adoptive research, which is a multi-disciplinary methodology for testing technologies for technical viability and socio-economic feasibility so as to improve adoption. Kenya Agricultural Research Institute in Kisii (KARI, Kisii), a regional research centre under which falls southwest Kenya region, has been using on-farm research trials since 1994 to facilitate transfer of technologies to the farmers [2]. This is aimed at achieving high adoption levels, so as to improve food productivity in the region. However the adoption rate has remained low.

A survey of farmer participatory research (FPR) approaches reveal that on-farm trials as was used before 1997 emphasized a lot of the researcher managed researcher implemented (RMRI) approach [3]. This overwhelming research participation overshadowed farmer and extension participation in technology generation and development, thereby leading to poor adoption rates. This also introduces a conflict of opinion among the research and extension, which can even lead to setting up of parallel on-farm trials [4]. The low adoption

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levels led to the improvement of the on-farm trial to involve the participation of researchers, extension and farmers in problem diagnosis, intervention and technology development process. This improved farmer participation as opposed to the former FPR approach that considered farmers as recipient of research ideas. The study reveals that the empowered farmers' productivity improved with a great margin.

Another study aimed at involving farmers in all stages of technology development in order to enhance adoption at the National Agricultural Research Centre, Kitale (NARC, Kitale) between 1994-2000, revealed that farmer participation in the various stages of technology development varied with community they came from, ethnic groups, frontline extension staff working with the farmers and the researcher team dynamics and the farmer research committees [5]. The study also revealed that the more time researchers spend with the farmers the better the understanding, sharing of ideas and the more the confidence to confide in each other as partners in technology development.

A study by [6] also indicates that attending several agricultural activities together tends to strengthen existing groups. The finding is also supported by [7] that the FSR approach enhanced cohesiveness among community members in North-Western Kenya. Regular on-farm research trials enable the participants to get acquainted with each other, which enable them to get along smoothly without conflicts.

A study conducted in southwest Kenya reveal that farmers' participation may be active in diagnostic stage, but their participation in the subsequent stages beyond diagnosis stage is crucial and affect adoption of the technology of on-farm trial [8]. The study also indicated that farmers' participation is crucial in research process since it allows farmers to take lead in diagnosing problems and generating feasible solutions. Use of farmer participation in all the stages of technology development improves the probability of adoption of technology since it creates the sense of ownership and credibility of the process among the farmers and other partners [9]. The first step in adoption according to [10] is internalization of the technologies by the farmers before they even start the testing and trial stages. Observation by [11] also indicated that ideas imposed on individuals are never viewed as important even if they are indeed very important.

This study support the observations by [12] and [13] that attending several agricultural activities sets in motion the development of local initiatives and programmes that progress with time, which will eventually ensure the groups remain intact.

On the potentiality of on-farm trial activities a study carried out in southwest Kenya to determine the effect of on-farm research trial using soil conservation technologies conducted between 1995-2000 indicated that although the general adoption of technologies were low, technologies disseminated through on-farm trial performed relatively higher than other participatory research approaches [14].

The objective of this study was to determine the level of participation of researchers, extension agents and farmers in on-farm trial activities and their relationship with level of participation and adoption of technologies developed through on-farm research trial. The study was necessary because the performance of agriculture has remained low even after using multidisciplinary approaches such as on-farm research trials to disseminate the technologies to the farmers.

MATERIALS AND METHODS

The study was carried out in KARI-Kisii regional research Centre's mandate area, an agriculturally productive area located in Southwest Kenya. This area lies in varied AEZs, calling for specificity in farming systems in the different AEZs. Some of the zones include UM, LH, LM. Specifically the study was carried in, Rikenye, Marani, Suneka, Kanyaluo, Kabondo and Kobodo.

The ex-post facto research design was used to establish level of participation of researchers, extension agents and farmers in on-farm trial activities and their relationship with level of adoption of technologies developed through on-farm research trial. A survey methodology was employed to collect data from the farmers, extension agents and researchers. Equal proportion stratified random sampling technique was used to identify two on-farm research sites in each of the three AEZs in the study area. From each of the on-farm sites, seven (7) farm household heads were randomly selected and interviewed. The same sampling technique was used to randomly identify 15 extension agents from each AEZ. The technique was used since it enables the survey research to cover the whole area adequately. A total of 17 technical scientists working in KARI-Kisii Regional Research Centre were interviewed. This made the number of people interviewed to be 104 respondents, which is above the minimum requirement for each major group suggested [15].

Data was analyzed using the computer based Statistical Package for Social Sciences (SPSS) version 10.0 for windows based on the study's objective at 5%

level of significance (α = 0.05). The items in the questionnaire and knowledge tests were scored in conformity with the hypotheses. Data was first subjected to descriptive statistics that generated frequencies, percentages, means and standard deviations. The hypothesis that "There is no significant relationship between the level of participation of researchers, extension agents and farmers and level of adoption of technologies developed through on-farm trials" was tested using one-way ANOVA (F-test), Pearson's correlation product moment coefficient and Chi-square. The level of participation of the farmers' researchers and the extension agents were computed and the real difference in level of participation by occupation tested using one-way ANOVA (F-test). Pearson's correlation product moment coefficient was used to determine the strength and direction of the relationship between farmers' level of participation and adoption levels. Chi-square was used to test the relationships between the level of participation and adoption of on-farm research trials.

Adoption of both maize and beans production techniques were used as the dependent variable. Beans were chosen, as it was the cheapest main source of plant protein in the area and its ability to yield after a short duration of time. Maize was picked because it was the main stable food crop in the area. Farmers were asked questions based on the production techniques including, planting materials used, farm management practices such as weed control, pest and disease control, fertilizer application and harvesting procedures, the approximate yield in 90kg bags and the post harvest technologies used to preserve the yields. The answers of the questions were then scored against the appropriate agricultural practices recommended for the production of the two crops. The scores were then grouped into four categories depending on what each farmer scored: very high, high, low and very low where: less than 25% was very low; 26%-50% was low; 51%-75% was high and 76% and above was very high.

Farmers, extension agents and researchers were asked to indicate their level of agreement to a set of statements based on on-farm trial participation. The statements covered technology generation stage; on-farm trial process it self; frequency of attendance of the on-farm research trial; priority setting stage; modification of technologies and dissemination process. To determined how active the researchers, extension agents and farmers were in participating in on-farm trial activities, the farmers, extension agents and researchers were asked questions based on activities that bring them together, such as, number of visits made to the farmers' fields, visits made to the extension agents offices by the researchers and the farmers, demonstrations made on-farm and on-station and attendance of the Barazas, Agricultural Society of Kenya (ASK) shows and workshops. The responses were then used qualitatively and quantitatively to describe the responses' participation.

RESULTS AND DISCUSSION

Adoption of Maize Production Techniques: Table 1 below present results on how farmers applied the maize production technologies. The results obtained indicated that out of the 42 farmers 23 (54.8%) used certified hybrid maize seeds from local shops. Others got seeds from friends, family members, or the previous crop. The farmers (66.7%) were also able to use different types of fertilizers during planting. The fertilizers the farmers used include, DAP, Farm Yard Manure, mixture of different types of artificial fertilizers and other organic fertilizers. However, only five farmers (11.9%) indicated that they top-dressed their crops. Thirty-nine farmers (92.9%) indicated that they did weeding two or more times. Thirty-two farmers (76.2%) indicated that they do not control pests or diseases at all. The main pest and disease control measures used by the farmers include uprooting the infected crops (16.7%) and use of insecticides (7.1%). Thirty-five farmers (83.3%) indicated that they sold most of the crop immediately without storing for long. This means that they did not use any of the long storage methods apart from the use of sacks. Due to the above practices the farmers' average yield recorded was 69.2% of the expected optimum yield.

Adoption of Beans Production Techniques: Table 2 present farmers' responses on how they applied beans production technologies. None of the farmers used certified beans seeds, while preferring to get seeds from, fellow farmers (31%), family members (28.6%), previous crop (26.2%) and local market (14.3%). On further investigation it was realized that almost all the shops visited did not stock certified bean seeds. Thirty-five farmers (83.3%) indicated that they planted beans as mix crop with the maize. Thirty-two farmers (76.2%) indicated that they never plant using any fertilizers since they had used fertilizers when planting maize. Forty farmers (95.2%) accepted that there was a lot of pest attack on the beans. They indicated the following methods as used to control the pests: indigenous methods (ash), artificial chemical

Table 1: Use of maize production technologies in southwest Kenya

Maize production technologies	F	%
Use of certified seeds	23	54.8
Other sources of seeds		
• Friends	6	14.3
• Family members	7	16.7
• Previous crop	6	14.3
Use of fertilizers during planting	28	66.7
• DAP	12	42.9
• FYM	8	28.6
• Mix	4	14.3
• Others	4	14.3
Use of top-dressing fertilizers	5	11.9
Proper weed control	39	92.9
Disease and pest control	10	23.8
• Cultural practice e.g. rogueing	7	16.7
• Chemical	3	7.1
Harvesting technologies	34	80.1
Post harvest technologies; Sold after harvest	35	83.3
Yield in percentage of maximum average yields		69.2

Table 2: Use of bean production technologies in southwest Kenya

Bean production technologies	F	%
Use of certified seeds	00	0.0
Source seeds		
• Fellow farmers	13	31
• Family members	12	28.6
• Previous crop	11	26.2
• Local market	6	14.3
Farming methods		
• Mix cropping	35	83.3
• Single stand crop	7	16.7
Use of fertilizers during planting / seed inoculation	10	23.8
Proper weed control	37	88.1
Disease and pest control	40	95.2
• Cultural practices	29	69.0
• Chemical	11	26.2
Harvesting technologies		
• Picking only the pods	39	7.1
• Uprooting the whole plants	39	92.9
Post harvest technologies. Sold after harvesting	32	76.9
Mean yield compared to the expected		15.6

methods while others indicated that a lot of rain suffocates the aphids. On the harvesting methods, the farmers indicated that they uproot the whole plant, which they dry and thresh, while three farmers (7.1%) indicated that they pick only the pods.

The adoption level was relatively low despite the favorable farmer characteristics. This therefore means that the adoption level was affected by other factors other than the farmer characteristics. The study therefore investigated the relationship of level of participation of farmers, researchers and extension agents in on-farm research trials and adoption of maize and beans technologies developed through on-farm research trial.

Participation: The responses from the researchers, extension agents and the farmers are summarized in Table 3.

Frequency of Interaction: This looked at how often the farmers, researchers and extension agents participated in the activities such as visits by individual extension agents to farmers and researchers, visits by a group of extension agents to farmers and researchers, visits made to extension offices by researchers and farmers, on-farm and on-station trials and attending ASK Shows, Barazaas, Workshops and Seminars.

Visits Made by Individual Extension Agents to the Farmers and Researchers: The analyzed data indicate that more than half of the farmers (64.3%) were visited by individual extension officers only once in the past year while 28.6% were not visited. A few researchers (11.8%) were not visited by extension agents (Table 3). The researchers explain that most of the meetings (66.7%) they had were facilitated by the organizations sponsoring their research projects. The other visits were not formal. It was also learnt from the extension agents that it was easier to visit the researchers due to the near proximity of the research stations to the main road as compared to the farmers' fields.

Visits Made by a Group of Extension Agents to Farmers and Researchers: Eight out of the seventeen researchers interviewed (47.1%) were not visited by a group of extension agents in the past year. Twelve out of the forty-two farmers interviewed (28.6%) were not visited by a group of extension agents (Table 3). The researchers interviewed explained that most group visits by extension staff required proper organization and coordination.

Visits Made to Extension Offices by Researchers and Farmers: Nineteen out of the forty-two farmers interviewed (45.2%) indicated that they had not visited the extension offices in the past year. Four out of the seventeen researchers interviewed (23.5%) had not visited the extension agents' offices in the past year (Table 3). The researchers indicated that they visited the extension offices to collect data on the farms. Some of the extension agents explain that they had joint projects with the researcher sponsored by donors other than the government. Researchers with joint projects with the extension visited the extension agents several times in the past year.

Table 3: Number of times the farmers, extension agents and researchers have participated in agricultural activities in the past one-year*

		Number of times participated in the activities in the last one year							
		0	1	2	3	4	5	>5	Total
Visits by extension	Farmers f	12.0	27.0	03.0	00.0	00.0	00.0	00.0	042
	%	28.6	64.3	7.1	00.0	00.0	00.0	00.0	100
	Research f	02.0	07.0	06.0	01.0	01.0	00.0	00.0	017
	%	11.8	41.2	35.3	05.9	05.9	00.0	00.0	100
Group visit by extension	Farmers f	12.0	19.0	11.0	00.0	00.0	00.0	00.0	042
	%	28.6	45.2	26.2	00.0	00.0	00.0	00.0	100
	Research f	08.0	05.0	03.0	01.0	00.0	00.0	00.0	017
	%	47.1	29.4	17.6	05.9	00.0	00.0	00.0	100
Visit to extension offices	Farmers f	19.0	14.0	09.0	00.0	00.0	00.0	00.0	042
	%	45.2	33.3	21.4	00.0	00.0	00.0	00.0	100
	Research f	04.0	06.0	04.0	02.0	01.0	00.0	00.0	017
	%	23.5	35.3	23.5	11.8	05.9	00.0	00.0	100
Demonstration on-farm	Farmers f	06.0	21.0	09.0	06.0	00.0	00.0	00.0	042
	%	14.3	50.0	21.4	14.3	00.0	00.0	00.0	100
	Extension f	05.0	04.0	05.0	17.0	13.0	01.0	00.0	045
	%	11.1	08.9	11.1	37.8	28.9	02.2	00.0	100
	Research f	01.0	02.0	04.0	06.0	03.0	01.0	00.0	017
	%	05.9	11.8	23.5	35.3	17.6	05.9	00.0	100
Demonstration on-station	Farmers f	29.0	11.0	02.0	00.0	00.0	00.0	00.0	042
	%	69.0	26.2	14.8	00.0	00.0	00.0	00.0	100
	Extension f	32.0	06.0	04.0	03.0	00.0	00.0	00.0	045
	%	71.1	13.3	08.9	06.7	00.0	00.0	00.0	100
	Research f	00.0	01.0	03.0	05.0	04.0	03.0	01.0	017
	%	00.0	05.9	17.6	29.4	23.5	17.6	05.9	100
Barazaas	Farmers f	02.0	02.0	03.0	03.0	07.0	10.0	15.0	042
	%	04.8	04.8	07.1	07.1	16.7	23.8	35.7	100
	Extension f	01.0	00.0	00.0	04.0	14.0	20.0	06.0	045
	%	02.2	00.0	00.0	08.9	31.1	44.4	13.3	100
	Research f	10.0	05.0	01.0	01.0	00.0	00.0	00.0	017
	%	58.8	29.4	05.9	05.9	00.0	00.0	00.0	100
Shows	Farmers f	15.0	27.0	00.0	00.0	00.0	00.0	00.0	042
	%	35.7	64.3	00.0	00.0	00.0	00.0	00.0	100
	Extension f	04.0	29.0	10.0	02.0	00.0	00.0	00.0	045
	%	08.9	64.4	22.2	04.4	00.0	00.0	00.0	100
	Research f	00.0	10.0	05.0	02.0	00.0	00.0	00.0	017
	%	00.0	58.8	29.4	11.8	00.0	00.0	00.0	100
Workshops	Farmers f	08.0	25.0	07.0	02.0	00.0	00.0	00.0	042
	%	19.0	59.5	16.7	04.8	00.0	00.0	00.0	100
	Extension f	00.0	03.0	15.0	24.0	03.0	00.0	00.0	045
	%	00.0	06.7	33.3	53.3	06.7	00.0	00.0	100
	Research f	00.0	03.0	04.0	07.0	03.0	01.0	00.0	017
	%	00.0	17.6	23.5	41.2	17.6	05.9	00.0	100

*f - Frequency, % - Percentages

On-Farm and On-Station Trials: Thirty-six out of the 42 farmers interviewed (85.7%), 89.9% of extension agents and 84.1% of researchers interviewed had attended an on-farm trial once or more times. On the contrary, twenty-nine farmers (69%) and 32 extension agents (71.1%) had not attended any on-station research, while every researcher interviewed (100%) had participated in the on-station research once or more times.

Attending ASK Shows, Barazaas, Workshops and Seminars: Fifteen farmers (35.7%) had not attended any agricultural shows in the past year. They explain that most shows are organized far a way from their homes. Ten researchers (58.8%) had not attended the Barazaas in the past year (Table 3). They explain that, the Barazaas are found in the villages and that they were rarely invited. Every extension agent and the researcher interviewed

Table 4: Extension agents and Researchers level of agreement to statements relating to their level of participation in on-farm trials*

Statements		SA	A	U	D	SD	Total
Extension agents must participate in the initial stages of technology generation.	Extension f	30	10	0	2	3	45
	%	66.7	22.2	0	4.4	6.7	100
	Research f	11	5	1	0	0	17
	%	64.7	29.4	5.9	0	0	100
Farming system on-farm research cannot be carried out without the Extension agent	Extension f	4	29	0	5	7	45
	%	8.9	64.4	0	11.1	15.6	100
	Research f	2	3	0	10	10	17
	%	11.8	17.6	0	58.9	5.9	100
Extension agents can conduct on farm trials without the research	Extension f	11	23	3	3	5	45
	%	24.4	51.1	6.7	6.7	11.1	100
	Research f	2	4	1	5	5	17
	%	11.8	23.5	5.9	29.4	29.4	100
Researchers are often busy to go to the field more frequently	Extension f	9	15	1	7	13	45
	%	20	33.3	2.2	15.6	28.9	100
	Research f	4	4	1	6	2	17
	%	23.5	23.5	5.9	35.3	11.8	100
Farmers must participate in the in priority setting stage	Extension f	38	7	0	0	0	45
	%	84.4	15.6	0	0	0	100
	Research f	15	2	0	0	0	17
	%	88.2	11.8	0	0	0	100
Modification of technologies must involve the farmers, extension agents and researchers	Extension f	37	7	0	0	0	45
	%	82.2	15.6	0	0	0	100
	Research f	15	2	0	0	0	17
	%	88.2	11.8	0	0	0	100
Farmers must not understand the technology prior to implementing them	Extension f	0	3	1	23	18	45
	%	0	6.7	2.2	51.1	40	100
	Research f	0	0	0	2	15	17
	%	0	0	0	11.8	88.2	100
Involving extension agents in priority setting is very necessary	Extension f	29	9	0	6	0	45
	%	64.4	20	0	13.3	0	100
	Research f	11	2	1	3	0	17
	%	64.7	11.8	5.9	17.6	0	100

*SA -Strongly Agree, A- Agree, U -Undecided, D -Disagree, SD -Strongly Disagree
%-Percentage, f-frequency

indicated that they had attended workshops and seminars. Eight farmers (19%) had not attended trainings organized by extension agents and researchers (Table 3).

Level of Participation: The following Table 4 indicates how extension agents and researchers responded to the statements on their level of participation.

Thirty out of the forty-five extension agents interviewed (66.7%) and 64.7% of researchers interviewed agreed with the statement that, extension agents must participate in the initial stages of technology generation (Table 4). Extension agents (64.4%) agreed with the statement that Farming System On-farm Research cannot be carried out without the participation of an extension agent while only five researchers (29.4%) agreed. This introduces a conflict of opinion among the research and extension, which can even lead to setting up of parallel on-farm trials. The conflict was confirmed when the extension agents interviewed (51.1%) agreed with the statement that, extension agents can conduct on-farm research trials without the participation of the researchers and while only six researchers (35.3%) agreed with the statement (Table 4). Such conflicts of ideas when reflected to the farmers would do more harm than good to the farmers, as both parties would be competing to take the farmers attention.

Eight out of the 17 researchers (47%) and 33.3% of the extension agents agreed with the statement that researchers are often too busy to go to the field more frequently (Table 4). This might explain the researchers' low participation on extension organized activities such as, visits to extension offices (Table 3). The researchers indicated that they would only go to the farmers' field if their on-station schedule permitted and that they had a socio-economic Department to link them with farmers.

Table 5: F-test results for the differences in the number of times participated in on-farm trial activities

Occupation	N	Mean	SD	df	F-ratio
Extension	45	2.93	1.01	06	0.000
Researchers	17	1.53	0.87		
Farmers	42	2.67	1.05		
Total	104	2.60	1.11		

p< 0.05

Table 6: Chi-Square Results on the level of farmers' participation by agro-ecological zones

Agro-Ecological zones	Lower highland	Upper midland	Lower midland	Totals
Very low	02	00	06	08
Low	00	03	05	08
High	04	09	03	16
Very high	08	02	00	10
Total	14	14	14	42

* p <0.05 Chi-square value = 26.025*, df = 6, p = 0.000

Fifteen out of the 17 researchers (88.2%) and 84.4% of extension agents strongly agreed with the statement that farmers must participate in priority setting stage of technology generation (Table 4). This improves uptake and utilization of the generated technology. Farmers' organisations should be involved in the main stream decision making right from the Divisional level to the National level. Only three extension agents (6.7%) and none of the researchers agreed with the statement that farmers must not understand technologies prior to implementing them. However, before farmers are able to evaluate and try out the technologies for adoption, they must fully understand the technologies and have interest in them.

The Level of Participation and Occupation: Data analysis by cross-tabulation using Chi-square test, revealed a significant relationship between occupation of respondents and how they scored on level of participation of researchers and extension agents (Chi-square value = 27.692, df=6, P< 0.05). Further analysis to determine the level of statistical differences in the number of times extension agents, researchers and farmers participated in the on-farm trial activities indicated that there was a significant difference between the level of participation of the respondents (Table 5). The mean participation of the extension agents ware relatively high compared to the researchers and farmers. This finding requires that researchers should find the best way to improve their participation in on-farm trial activities that bring them together with farmers and extension agents.

Relationships Between the Agro-Rcological Zones and Farmers' Level of Participation: Data analysis by cross-tabulation using Chi-square test, revealed a significant relationship between ecological zones and level of participation of farmers. (Chi-square value = 26.025, df=6, P< 0.05). The Chi-square results are presented in Table 6.

The findings indicate that farmers at higher agro-ecological zones had higher participation levels compared to the farmers at the lower agro-ecological zones. This may be so because the prevailing conditions in higher AEZs support agricultural activities. The farmers in these areas are therefore motivated to work hard compared to the farmers in lower ecological zones, who are discouraged whenever their crops fail due low rainfall amounts.

Relationships Between the Agro-ecological Zones and Level of Adoption: Analysis by cross tabulation using chi-square test, revealed a significant relationship between the level of adoption and agro-ecological zones (Chi-square value = 12.867, df=6, P< 0.05). The results are presented in Table 7.

The results indicate that the farmers at high ecological zones adopted the agricultural technologies developed through on-farm research trial better than the farmers at the lower zones. This may be so because their levels of participation in the agricultural activities were also higher compared to the farmers at the lower ecological zones.

Relationships Between the Level of Participation and Level of Adoption: Analysis using Pearson's, correlation coefficient (r) two-tailed test indicated that there was a significant positive relationship between adoption of on-farm trial technologies and level of participation in on-farm trial activities. (r=0.782). From the results (Table 8) it can be concluded that there was a strong positive relationship between level of participation and level of adoption of on-farm trial technologies.

Table 7: Chi-Square Results on the level of adoption by agro-ecological zones

	Agro ecological zones			
Level of adoption	Lower highland	Upper midland	Lower midland	Totals
Very low	02	02	06	10
Low	01	03	05	09
High	05	06	03	14
Very high	06	03	00	09
Total	14	14	14	42

* P <0.05 Chi-square value = 12.867*, df = 6, P = 0.045

Table 8: Means, Standard Deviations and r-test Analysis for the relationship between the level of adoption and level of participation

	N	Mean	SD	r value	p value
Adoption level	42	55.0476	6.0766	0.782	0.000
Participation level	42	11.5952	4.9191		

r> 0.7, p< 0.05

The null hypothesis (there is no significant relationship between the level of participation and level of adoption of technologies of on-farm trials) was therefore rejected. It was then concluded that there was a significant positive relationship between the levels of participation of the researchers, extension agents and farmers in on-farm trial activities and level of adoption of technologies of on-farm trials. That is the higher the level of participation of farmers, extension agents and researchers the higher the adoption level of technologies of on-farm trial. That is enhancing farmer, extension and research participation at the technology generation stage, priority setting stage, technology trial stage, technology modification stage, dissemination and implementation stage and technology monitoring and evaluation stage improves adoption of technologies.

CONCLUSION

In view of the data analysis and results discussed, the study concluded that, there was a significant relationship between level of participation of farmers, extension agents and researchers who participated in on-farm research trials as was organized by KARI-Kisii and their occupation, agro-ecological zones and adoption of technologies disseminated through the on-farm trial technologies. There was also low level of interaction between the researchers, extension agents and farmers. This explains the low adoption levels of the on-farm trial technologies. Therefore to improve adoption levels of farmers more effort should be put to improve participation of researchers and a stronger linkage between farmers, extension agents and farmers.

Recommendations: The study therefore recommends that extension agents and researchers should consider improving their level of participation in joint activities to improve farmer, extension and research linkages thereby improving uptake of agricultural technologies.

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