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An Evaluation of Participatory Research: the Case of Maize Growers in Central Rift Valley of Ethiopia

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ABSTRACT

In the course of institutionalizing participatory research in the research system of the country for tangible impact on the client, the project on "Strengthening Technology Development, Verification, Transfer and Adoption through Farmers Research Group (FRG)" was implemented from 2004 to 2009. A group of farmers were established as maize FRG working on maize improvement in two districts. In order to evaluate the impact of the intervention by analyzing the changes observed as a result of the intervention, a cross sectional data were collected from a total of 180 randomly identified participants and non-participants. The results of inferential statistics performed revealed that there is a statistically significant difference between program and non-program participant households in terms of major cultivation practices. Program participants are found to have more productivity and income as compared to their counterparts. Further analysis is recommended using appropriate econometric models that addresses differences due to other factor.

Keywords: Central Rift Vally, FRG, maize, cultivation practices, productivity, income

1. INTRODUCTION

Program Description

In order for agricultural research to properly address farmers' bio-physical and socio-economic constraints and be impact oriented by addressing the needs of its clients, it has to be participatory. The Ethiopian Agricultural Research System has been trying to promote participatory research to develop and promote technologies with farmers' active involvement. Encouraging results have been observed in the process, particularly by improving interaction among stakeholders. This has brought up a need to further improve and institutionalize participatory research in the research system for quick and tangible research impact on the client. Because of this, the project entitled "Strengthening Technology Development, Verification, Transfer and Adoption through Farmers Research Group (FRG)" was implemented in the Central Rift-valley[4] of Oromia National Regional State from 2004 to 2009 (FRG, 2005). ([4]Centeral Rift Valley of Oromia (CRV) which largely encompasses the East Shewa Zone of Oromia and has about 40-60km wide and more than a thousand km length bounded by highland plateaus. The altitude ranges from 500 to 2000 m.a.s.l. and has a semi-arid type of climate. It has an erratic, unreliable and low rainfall is bimodal with the long rain from June to September. The farming system is characterized by mixed crop-livestock (Abule et al., 1998).

The major goals set in the project document were: (i) adoption of FRG approach and its utilization in other research centers, (ii) improvement of the livelihood of the target FRG members and (iii) increase in the production of major commodities of the farmers around the target FRG. One of the major commodities considered by the project was maize. In Ethiopia Maize (Zea mays) is mainly produced for local consumption. In addition leaves are used as feed for animals and the stake is used as fuel and for construction. Millions of people depend on maize as a stable food. In view of its high demand for food grains and high yield per unit area, maize has been among the leading food grains selected to achieve food self sufficiency in Ethiopia (Benti et al., 1993; cited in Chimdo et al., 2001). Hence maize is one of the top priority crops to which substantial resources are being allocated by the National Extension Package Program. Despite its importance, the national average yield of maize is around 20quintals/ha. This is really approximately half of the world yield average of 37quintals/ha (Chimdo et al., 2001).

Unlike the conventional research approach where farmers are considered as the end users of technology developed at research centers, the project involves Farmers Research Group directly in to the research process. The direct

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involvement of farmers into research makes the technology dissemination quicker and demand driven. Interested and hard working farmers who can conduct the experiment were identified as farmer researcher for on farm trial and adaptation of technologies to form maize FRG. Each of such groups of farmer had about 15-20 farmers who form FRG. Selection of households into the program involved local consultation (experts and administrators) and a non-random placement. In the first place, peasant associations were identified in the district based on certain criteria like their accessibility to road and availability of agricultural extension services and willingness of the farmers to participate and the opportunity and potential of the peasant associations for specific commodity of intervention.

Although, the whole process of FRG activities intended to develop farmers' capacity, scheduled farmer trainings occurred on regular basis. Working in groups, farmers would observe and discuss dynamics of the maize eco system and the crop development. The objective of these learning processes is to develop farmer expertise in crop management, in turn; it enables them to make their own decisions.

Following the establishment of maize producing FRGs at different locations in the target districts, ATJK and Boset, pre-extension technologies and/or completed technologies were tested by farmers in a group with a guide of researchers. The research topics were identified by the community and facilitated by a multidisciplinary research team so that different kinds of farmers' problems are addressed. Inputs needed for the technology trial were provided by farmers and the project. The FRG approach intended to accelerate the technology dissemination process and create confidence in farmers developing their capacity to develop, modify and adopt agricultural technologies. Households who have been involved in FRG since 2007/08 were considered as participants in this study.

Methodology

Sample Size and Sampling Procedure

The minimum sample size was determined by applying a simplified formula provided by Yamane (1967), at 95% confidence level, 0.5 degree of variability and 90% level of precision. Considering the risk of non-response and lack of contact of the identified sample farmers, a 22% adjustment was made to the original sample size. Thus after making adjustment, the new sample size was 72 for participating households selected randomly using probability proportionate to sample size technique.

A second random sample of 108 farmers was drawn from the population of non-participating maize growers living in the same districts where the FRG project took place from a purposively selected PAs. In doing so these PAs were purposively identified using agro-ecological criteria to provide representation of maize dominating cropping system, assumed difference in terms of distance so that information exchange between FRG participant (treatment group) and non-FRG participant (control group) is minimized and accessibility of the selected PAs.

Only farmers producing maize and all FRG farmers who have worked on maize were represented in the random (Table 1).

Table 1: Sample size by peasant associations

			Farmers interviewed					
District	**Peasant associations**	**No. of maize FRG participants**	**FRG participants**		**Non-FRG participants**		**Total**	
			N	%	N	%	N	%
ATJK	Anano shisho	67	34	47	0	0	34	18.89
	Desta abijata	0	0	0	51	47	51	28.33
	Sub total	67	34	47	51	47	85	47.22
Boset	Dongore furda	40	20	28	0	0	20	11.11
	Dongore tiyo	36	18	25	0	0	18	10
	Hurufa kurkufa	0	0	0	57	53	57	31.67
	Sub total	76	38	53	57	53	95	52.78
	Grand total	143	72	100	108	100	180	100

Sources of Data and Methods of Data Collection

Both secondary and primary data were used for this study. Primary data were supplemented by secondary data obtained from government and non-governmental organizations. Secondary data for this study was obtained from annual reports, book, journals, FRG project reports and other published and unpublished documents from Zone and district agricultural offices, internet and other related sources. These data include information related to general feature, description of the study area, and status of maize crop cultivation. These data were collected directly by the researcher using checklist prepared and distributed to relevant offices prior to the operationalization of primary data collection.

Primary data were collected from the sample households by administering interview schedule. The interview schedule was pre tested by administering it to non-sample respondents. On the basis of the results obtained from the pre-test, necessary modification was made on the interview schedule. Both sampled FRG and non-FRG farmers in the selected enumeration area were visited and interviewed using interview schedule. In doing so, training was given to enumerators about the interview schedule and follow up was made to ensure that the process of data collection was smooth and complete. The survey was conducted from December, 2009 to January, 2010 under the supervision of researcher.

The interview schedule was designed to elicit information from a variety of topics including on household resource endowments, production, income, agricultural services and demographic characteristics of the respondents both at the time of the survey as well as before-interventions of the program using recall methods. Farmers had no difficulty remembering the pre-program data since these particular maize based FRG had been implemented recently (2008/9) in the target districts.

In addition to the interview schedule, FGDs were conducted with group of farmers; discussions were made with key-informants such as development agents (DAs), relevant agricultural professionals for issues requiring deep investigation. These informal techniques enabled the researcher to acquire useful and detailed information, which would have been difficult to collect through the interview schedule.

Analytical Methodology

For this study, descriptive and inferential analysis were computed and arranged in a way that allows one to quickly comprehend their meanings. The data were coded and entered to the computer for analysis.

Descriptive and inferential statistics are tools that enable us to compare and contrast different categories of sample units with respect to the desired characters so as to draw some important conclusions. These include mean, standard deviation, t-test and chi-square tests. In analyzing descriptive and inferential statistics, SPSS software version 16.0 was used.

Results and Discussion

Description of Sample Households' Characteristics

Results of the descriptive and inferential analysis show that there were statistically significant differences between program and non-program households before intervention. The dummy variables described in table 2 showed statistical significance ($p<0.01$) between participants and non-participants for the sex of household head. Only about 15.3% of the participating individuals were households headed by women. 63.9 percent of total respondents are literates.

Table 3 shows that the mean differences between the participants and non-participants were significantly different in farm experience, family size, size of owned land, livestock ownership (in TLU), distance to the nearest market and distance to extension agents office. On average, participant households had more family size, farm experience, land and livestock.

Furthermore, households in the program were living relatively nearer to the office of extension agent and market place as compared to the non participants.

Table 2: Demographic characteristics of the sample households (for dummy variables)

Pre-intervention variables	Category	Participant (N=72)		Non participant (N=108)		Total (N=180)		χ^2
		N	%	N	%	N	%	
SEXHH	Female	11	15.3	3	2.8	14	7.8	9.410***
	Male	61	84.7	105	97.2	166	92.2	
EDULHH	Illiterate	25	34.7	40	37	65	36.1	0.1
	Literate	47	65.3	68	63	115	63.9	

Source: Own survey, 2010.

*Note: *** means significant at the 1% probability level.*

Table 3: Descriptive and inferential statistics of sample households (for continuous & discrete variables)

Pre-intervention variables	Sample Households *(N=180)*		Participant *(N=72)*		Non participant *(N=108)*		Difference in means		t-value
	Mean	STD	Mean	STD	Mean	STD	Mean	STD[a]	
AGEHH	40.194	11.124	40.972	10.538	39.676	11.517	1.296	1.664	0.765
FAMSIZE	7.478	3.426	8.264	3.254	6.954	3.452	1.31	0.507	2.582**
FAREXP	23.367	10.543	25.194	10.224	22.148	10.623	3.046	1.58	1.928*
TLDOWN	2.335	1.382	2.948	1.5	1.927	1.131	1.022	0.208	4.922***
TLU	15.49	13.727	19.678	15.706	12.698	11.483	6.98	2.156	3.238***
DISNMKT	1.267	1.084	0.872	0.787	1.53	1.175	-0.659	0.146	-4.503***
DISEXTO	0.82	0.822	0.416	0.355	1.095	0.93	-0.679	0.099	-6.819***
DPCRTO	0.712	0.748	0.696	0.542	0.723	0.861	-0.027	0.105	-0.235

Source: Own survey, 2010.

*Note: ***, ** and * means significant at the 1%, 5% and 10% probability levels, respectively*

STD: Standard Deviation

[a] *STD for mean difference =* $\sqrt{\frac{STD_1^2}{N_1} + \frac{STD_2^2}{N_2}}$

Farm Characteristics and the Tenure System

Land Holding and Tenure System

Land is one of the scarce factors of production whose supply is considered fixed. Added to this, the land tenure system can be a constraint to agricultural productivity (Mengistu et al, 2003). Land rights, whether owned, shared in or rented in, may determine farmers' adoption of improved seeds, use of inputs, investment in land improvements, or the productivity of land. The average cultivated land owned by the sample households was about 4.559 hectares for FRG farmers and 2.455 hectares for non-FRG farmers. The average size of land rented-in and the average land allocated for maize production by participant farmers was relatively greater than that of their counterparts (Table 4). This implies that program participant farmers seek for additional land other than owned land through the existing informal land tenure arrangements [5]. However, there was no statistically significant difference for the total land shared-in between the two groups. ([5]An informal land tenure arrangement here refers to the existing land rent-in/out and land shared-in/out practices underway in the study areas).

Given that participant farmers owned larger farm size than the non-participant farmers, one can say that land ownership has an influence on adopting new technologies. Larger farm size enables farmers to allocate more plots of land for maize cultivation and other crops too.

Table 4: Farm sizes (in ha) under different land tenure system for the respondents

Land tenure system	FRG (*N 72*)		Non-FRG (*N 108*)		Total Sample (180)		t-value
	Mean	STD	Mean	STD	Mean	STD	
Cultivated area owned	4.559	3.336	2.455	1.528	3.297	2.623	5.012***
Total land shared-in	0.083	0.333	0.102	0.33	0.094	0.33	-0.368
Total land rented-in	1.675	3.047	0.583	1.034	1.02	2.147	2.933***
Total land allocated for maize cultivation	2.175	1.709	1.494	0.97	1.767	1.354	3.067***

Source: Own survey, 2010.

*Note: *** means significant at the 1% probability level*

Cropping system

Maize, *teff*, haricot bean, sorghum, wheat, barley, field pea and chickpea were among the major crops grown in the study areas. The average land area in hectare under different crops is presented in table 5. In Central Rift-Valley, though it is possible to grow most of these annual crops, there was a difference in land allocation to individual crops. Maize took the leading share in terms of land allocation under both groups which is in line with the project's argument that this crop is a priority crop for farmers in the study areas (FRG, 2005). *Teff* and haricot bean were other important crops to which substantial land was allocated by participant and non participant farmers respectively.

A closer look at land allocation among different crops reveals that program participant and non-program participant farmers significantly differ in land allocation for major crops, maize, *teff* and haricot bean grown in the study areas. Participant farmers relatively allocate on average more land for these crops as compared to their counterparts (Table 5). This is, of course, attributed to the relative size of land ownership between the two groups as participant farmers owned relatively more land as compared to the non-participants.

Table 5. Area of cultivated land allocated in hectare among crops grown by respondents

Crop type	Total Sample (N=180)		FRG (N=72)		Non-FRG (N=108)		Difference in means		t-value
	Mean	SD	Mean	SD	Mean	SD	Mean	SD[a]	
Maize	1.767	1.354	2.175	1.709	1.494	0.97	0.681	0.24	3.067***
Teff	0.698	1.059	1.089	1.208	0.438	0.857	0.651	0.102	3.957***
Haricot bean	0.678	1	0.957	1.376	0.491	0.569	0.467	0.172	2.726***
Sorghum	0.121	0.268	0.141	0.302	0.108	0.244	0.033	0.164	0.805
Wheat	0.111	0.253	0.125	0.291	0.101	0.226	0.024	0.043	0.619
Barley	0.123	0.214	0.135	0.215	0.115	0.213	0.02	0.019	0.627
Field pea	0.01	0.053	0.012	0.06	0.009	0.047	0.003	0.024	0.36
Chick pea	0.04	0.159	0.052	0.201	0.032	0.124	0.02	0.017	0.813

Source: Own survey, 2010.

*Note: ***, ** and * means significant at the 1% probability level.*

STD: Standard Deviation

[a] *STD for mean difference* = $\sqrt{\frac{STD_1^2}{N_1}+\frac{STD_2^2}{N_2}}$

With regard to cropping pattern practiced by the respondents during the 2009/10 cropping season, the proportion of non-program participants who were practicing mono-cropping pattern for maize cultivation was more (48.6%) than program participants. On the other hand, the percentage of program participants practicing crop-rotation, inter-cropping and the combination of the two was larger as compared to the non-program participants (Table 6).

Table 6. Farmers practicing different cropping system for maize

Existing cropping pattern	Total Sample (N=179)		FRG (N=72)		Non-FRG (N=107)		χ^2
	N	%	N	%	N	%	
Mono cropping	65	36.3	13	18.1	52	48.6	21.016***
Crop rotation	33	18.4	16	22.2	17	15.9	
Inter cropping	33	18.4	16	22.2	17	15.9	
Crop rotation with intercropping	41	22.9	21	29.2	20	18.7	
Monoculture with double cropping	7	3.9	6	8.3	1	0.9	

Source: Own survey, 2010.

*Note: ***, ** and * means significant at the 1% probability level.*

Maize Production Practices

Maize Cropping Calendar

According to the result from focus group discussions (FGD) with both program and non-program participants, there was a similar cropping calendar practiced by the two groups in the study areas. This was actually due to the similarities in the farming system among the selected peasant associations within the study districts. An interesting point, as it can be observed from table 7 below, was that farmers start selling of their produce immediately after harvest in spite of the low price prevails in the market after harvesting. This is due to several factors which might stem from low level of saving from previous year making them incapable of fulfilling all the necessary expenses required at this particular time.

As indicated in Table 7, an overlapping of activities was meant only to indicate that the starting time of an activity was determined by the rain condition of a particular cropping season. Land preparation starts in January and ends in April if on-set of rain was early. In case rain is delayed, planting is done from April to June for the same reason (Table 7).

Table 7. Cropping calendar for maize cultivation in the study areas

Activities	Months											
	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
Land clearing & preparation					—	—	—	—				
Sowing/ Planting								—	—	—		
Hoeing									—	—	—	
Weeding										—	—	—
Harvesting	—	—	—									
Threshing			—	—	—	—	—	—	—			
Marketing			—	—	—	—	—	—	—	—	—	
Seed preparation for next year[6]	—	—	—		—	—	—					

Source: own PRA result, 2010.
Note: in Ethiopia September is the beginning of the New Year

([6]Two periods of seed preparation observed in the table simply indicate that own saved seed preparation started during harvesting even before threshing begins but in case if seed is to be from other sources, farmers usually start seed preparation after they engage in land preparation.)

According to group discussion results, the starting time of an activity is determined by the rain condition of a particular cropping season which moves slightly for and backward across the indicated months based on the time of on-set of rain.

Land Preparation, Fertilizing, Hoeing, Weeding and Phytosanitory Practices

Land preparation, planting, fertilizing, hoeing, weeding and phytosanitory practices (insect, pest and disease control) are the major maize production activities conducted sequentially. When both groups were compared, there was statistically significant difference (P>0.01) in the frequency of plowing, fertilizing and weeding for maize cultivation (Table 8). Program participants had more rate of operation in these aspects as compared to the non-program participants indicating the probable difference in cultivation practices incurring more input for a better output.

The average plowing frequency done with a pair of oxen was 4.083 and 3.5, the minimum and maximum being two and six for program participant and non-participant respectively. Similarly, the average fertilizing and weeding frequency done with the use of human labor was 1.2 and 0.5 and 2.194 and 1.538 respectively with a minimum and maximum being zero and two for fertilization and zero and four for weeding for program and non-program participants respectively.

Table 8. Frequency of maize cultivation operations by program and non-program participants

Maize cultivation practices	Total Sample		FRG (N=72)		Non-FRG (N=106)		Difference in means		t-value
	Mean	SD	Mean	SD	Mean	SD	Mean	SD[a]	
Plowing	3.736	0.769	4.083	0.707	3.5	0.72	0.583	0.589	5.361***
Fertilizing	0.809	0.644	1.208	0.627	0.54	0.501	0.671	0.185	7.583***
Hoeing	1.528	0.775	1.611	0.761	1.472	0.783	0.139	0.238	1.179
Weeding	1.803	0.767	2.194	0.493	1.538	0.807	0.657	0.299	6.731***
Spraying	0.21	0.407	0.25	0.436	0.179	0.385	0.071	0.064	1.14

Source: Own survey, 2010.

*Note: ***, ** and * means significant at the 1% probability level.*

STD: Standard Deviation

[a] *STD for mean difference* = $\sqrt{\frac{STD_1^2}{N_1} + \frac{STD_2^2}{N_2}}$

Utilization of Improved Maize Seed and Types of Maize Varieties

The result of the study (Table 9) shows that almost all (98.6%) program participants were using improved maize seed. Whereas, only 62 per cent of non-program participants were using improved seeds of maize. Even though most of the farmers were using different types of improved maize varieties, out of the program participant who were using improved seed, majority of them (81.7%) reported that they were using Melkass-2 maize variety, where as the corresponding percentage of non-program participants using the same variety was considerably low (7.6%). When non-program participants were asked for their low use of this improved variety, lack of access was cited as the only reason.

Similarly, with regard to fertilizer utilization, there was a statistically significant difference observed between program and non-program participants. Majority of program participant households were found using fertilizer as compared to their counterparts.

Table 9: Proportion of respondents using seed, fertilizer and types of varieties

Types of inputs	Use status	Participant (N=72)		Non participant (N=108)		Total (N=180)		χ^2
		N	%	N	%	N	%	
Seed	Use improved seed	71	98.6	67	62	138	77.1	32.303***
	Not use improved seed	1	1.4	41	38	42	23.3	
Fertilizer	Use fertilizer	63	87.5	60	55.5	123	68.3	20.372***
	Not use fertilizer	9	12.5	48	44.5	57	31.7	
Types of improved varieties used		(N=71)		(N=67)		(N=138)		
	BH540	6	8.5	9	13.4	15	10.8	
	Melkasa-1	2	2.8	0	0	2	1.4	
	Melkasa-2	58	81.7	5	7.5	63	45.6	
	Melkasa-6 QPM	2	2.8	4	3.8	6	4.4	
	Other Melkasa varieties	2	2.8	2	1.9	4	2.9	
	Awassa[7]	0	0	3	4.5	3	2.2	
	Pioneer	0	0	0	0	0	0	
Use but not know name of the variety		0	0	6	8.9	6	4.4	
	Local	1	1.4	38	36.2	39	28.3	

Source: Own survey, 2010.

*Note: ***, ** and * means significant at the 1% probability level.*

([7] Farmers call this variety Awassa otherwise it is not the name given by the National Variety Releasing Committee)

Seeding and Fertilizer Application Rate

Table 10 shows proportion of sample households, participants and non-participants who were using the recommended application rate for seed and fertilizer inputs. Accordingly, about 60.1 and 75.6 per cent of the sample respondents reported that they used the recommended seeding and fertilizer rate respectively. More precisely, 70.4 and 95.2 percent of program participants reported that they were using according to the recommended application rate for seed and fertilizer respectively. The corresponding figure for the non-program participants was considerably low (49.3 and 55.0 percent for seed and fertilizer respectively), whereas the remaining indicated that they used different seeding and fertilizer rates which is below and above the recommended rate depending on their past experiences and other reasons.

Most of the participant farmers, when asked to rank the major sources of information about recommended seeding and fertilizer application rate, reported the FRG program, extension agents and researchers as their main sources. On the other hand, the non-program participants who claimed to have been using the recommended seeding and fertilizer application rates indicated that they obtained information from extension agents, other farmers, NGOs and family.

Table 10. Distribution of respondents' using the recommended application rate[8] and types of inputs used

Application rate		Participant (N=71)		Non participant (N=67)		Total (N=138)		χ2
		N	%	N	%	N	%	
Seed	Apply as per recommendation rate	50	70.4	33	49.3	83	60.1	11.542***
	Apply more than recommendation rate	19	26.8	21	31.3	40	29	
	Apply less than recommended rate	2	2.8	13	19.4	15	10.9	
		N=63	%	N=60	%	N=123	%	
Fertilizer	Apply as per recommendation rate	60	95.2	33	55	93	75.6	27.115***
	Apply less than recommended rate	3	4.8	24	40	27	22	
	Apply more than recommended rate	0	0	3	5	3	2.4	

Source: Own survey, 2010.

*Note: ***,means significant at the 1% probability level.*

[8]Recommended application rate here refers to the application rate recommended by research center for Central Rift-Valley areas where the study districts are located.

Weed, Insect, Pest, and Disease Management

Weed, insect, pest, and disease management is one of the important activities in maize cultivation practices. Very low numbers of respondents (Table 11) were observed using both herbicide and chemical spray in order to control weed, insect, pest, and disease. Looking more precisely, there is no statistically significant difference (at α=0.05) observed between the two groups (participant and non-participant) in following spraying control methods. When respondents were asked for the reason of less use of spraying technique, low weed infestation and enough available family labor for control were cited as major reasons.

Table 11. Proportion of respondents using spraying

Types of inputs used		Participant (N=72)		Non participant (N=108)		Total (N=180)		χ2
		N	%	N	%	N	%	
Herbicide	Use herbicide spray	12	16.7	16	14.8	28	15.6	0.113
	Not use herbicide spray	60	83.3	92	85.2	152	84.4	
Chemical	Use chemical spray	5	6.9	4	3.7	9	5	0.955
	Not use chemical spray	67	93.1	104	96.3	171	95	

Source: Own survey result, 2010.

Harvesting and Post-harvest Activities

In the study areas, according to the FGD results, harvesting time for maize starts from September determined by the on-set and off-set of rain condition. Maize is commonly harvested and threshed manually. Post-harvest handling is one of the important crop management practices. Care given to the harvested crops enables farmers to get better market prices, reduce unnecessary losses, derive higher level of utility for consumption, and improve their bargaining power in the market.

Sample respondents were asked whether or not they have been exposed to any of harvesting and post harvesting innovations. Accordingly, majority of the respondents (Table 12) from both groups reported that they were not exposed to these innovations. However, when the difference between the two groups (participants and non-participants) was checked, statistically significant difference (at ?=0.01) was observed between them with regard to their exposure to storage innovation in which FRG participants were found to have more exposure to this innovation as compared to their counterparts.

Table 12. Distribution of respondents exposed to harvesting and post-harvesting innovations

Harvesting & Post-harvest handling innovations	Participant (N=72)		Non participant (N=108)		Total (N=180)		χ^2
	N	*%*	*N*	*%*	*N*	*%*	
Exposed to harvesting innovations	6	8.3	4	33.4	10	5.6	1.765
Not exposed to harvesting innovations	66	91.7	104	96.3	170	94.4	
Exposed to storage innovations	20	27.8	5	4.6	25	13.9	19.355***
Not exposed to storage innovations	52	72.2	103	95.4	155	86.1	
Exposed to marketing innovations	5	6.9	3	2.8	8	4.4	1.766
Not exposed to marketing innovations	67	93.1	105	97.2	172	95.6	

Source: Own survey result, 2010.

*Note: ***,means significant at the 1% probability levels.*

Maize Productivity

Table 13 present descriptive statistics results of sample households based on their maize productivity. The average maize productivity of the sample households was 22.4 quintals per hectare. Further analysis revealed that there is statistically significant difference in average yield per hectare between program and non-program participants. Program and non-program households had a productivity of 25.3 and 20.5 quintals per hectare respectively. This tells us that households in the program are better off in terms of productivity as compared to their counterparts.

Table 13. Maize productivity for program and non-program participants (Qt/ha)

Crop type	Total Sample		FRG		Non-FRG		Difference in means		t-value
	Mean	SD	Mean	SD	Mean	SD	Mean	SD[a]	
Maize	22.4	15.7	25.3	15	20.5	15.9	4.8	2.2	2.1**

Source: Own survey, 2010.

*Note: ** means significant at the 5% probability level.*

[a] *STD for mean difference =* $\sqrt{\frac{STD_1^2}{N_1} + \frac{STD_2^2}{N_2}}$

Total Production, Consumed, Marketed and Net Income

Figure 1 shows the mean yield produced, consumed, sold and net income generated by the participants and non-participants from the 2008/9 production season. Accordingly, the results of the survey show that participant farmers had higher mean yield, consumption, marketed and net income of 52.8, 17.8, 34.9 quintals and 13,499 Birr respectively as compared to the non-participants of 26.8, 13.8, 13.2 quintals and 6,065 Birr respectively. These results are also statistically significant at a 5% probability level.

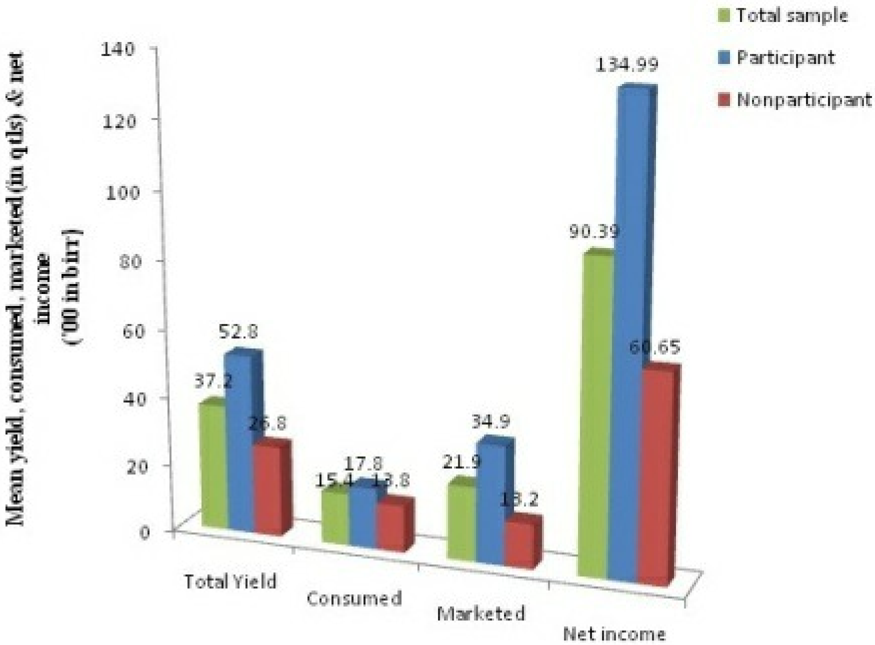

Figure 1. Total production and utilization of maize by participant and non participant households

Conclusions and Policy Implications

Summary and Conclusions

This study provides crucial insights into and important evidence on the impact of Farmer Research Group (FRG) implemented in the Central Rift Valley of Oromia on the maize FRG farmers using cross sectional data collected for the same purpose during 2010GC. Descriptive and inferential statistics, the study evaluated the program implemented by two research centers, ATARC and MARC, under Oromia Agricultural Research Institute and the Ethiopian Institute of Agricultural Research funded by Japan International Cooperation Agency between 2004 and 2009.

The objective of the study was to provide evidence for policymakers, donors, farmers, and implementing actors on whether the FRG approach can contribute to household productivity and income.

A random sample size of 72 program households was selected randomly using probability proportionate to sample size technique. A second random sample of 108 farmers was drawn from the population of nonparticipating maize growers living in the same districts where the FRG project took place from a purposively selected PAs. In doing so, these PAs were purposively identified using agro-ecological criteria to provide representation of maize dominating cropping system, assumed difference in terms of distance so that information exchange between FRG participant and non-FRG participant is minimized and accessibility of the selected Pas.

Thus, the primary data for this study was collected from a 180 households from program and non-program areas in ATJK and Boset districts using a structured questionnaire. The study also examined the process of program targeting and availability of baseline data, and found that household assignment to the program was a non-random selection process and baseline data were not available.

Results of descriptive analysis revealed that there was a statistically significant difference between program participant and non participant households in terms of major cultivation practices. Significant numbers of program participants were using improved maize varieties, better maize cropping system, and more rates of plowing, fertilizer and weeding. On the other hand, no statistically significant difference observed between program and non program participants in the use of spraying technique for weed, insect, pest and disease control. Similarly there was no statistically significant difference in terms of their exposure and use of harvesting and post harvest innovations between program participant and non participants except storage. Program participants found to have more exposure to storage techniques than their counterparts.

Policy Implications

As it can be observed from the descriptive and inferential statistics results, this study has found the evidence that participation in FRG had a very important role of improving livelihood of the farmers. This sends an encouraging signal for program designers, implementers, and funding agencies. However, it is recommended that adopting interventions that follow a value chain approach is very important that makes the program more comprehensive in bringing significant change not only in the production but also in the subsequent livelihood outcomes.

This descriptive and inferential result, however, hardly tell us whether the observed difference is exclusively because of the program as comparisons are not yet restricted to households who have similar characteristics. Hence, further analysis is recommended using appropriate econometric models that address this issue.

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