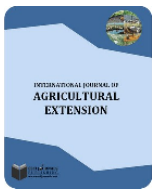

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THE EFFECTIVENESS OF FARMERS RESEARCH GROUP APPROACH IN POTATO TECHNOLOGY DISSEMINATION AND ADOPTION CASE STUDY OF WESTERN PART OF ETHIOPIA

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A B S T R A C T

This paper anticipated to identify the contribution of farmers research group (FRG) approaches in enhancing improved potato technology dissemination and adoption in western part Ethiopia Welemera district. Within the district two peasant administrative units namely Telecho and IlalaGojo were selected purposefully because of the presence of different FRGs operating in this two administrative units. A total of one hundred and thirty potato producers' farmers (54 from FRG members and 76 from non-members) were selected. In the selection, non-replaceable lottery method and proportional to size sampling techniques were used. The sampled respondents were interviewed by using structured interview schedule. To collect the qualitative data, group discussion was also undertaken with selected farmers, development agents and agricultural researchers. Statistical tests like chi-square, t-test, and one-way ANOVA were used to test the variation among the FRG and non-FRG. The statistical analysis for FRG members' respondents indicated that there is no significant difference of using improved potato technology packages. The adoption index score is 1 or 100% it means that all FRG members were adopted improved potato packages. The result of statistical analysis (ANOVA) indicated that there was significant variation (F= 34.47, P=0.000) among the adoption index score between the three categories at 1% level of significant, which indicates difference of adoption of potato technology packages among sampled non-FRG respondents. The overall finding of the study underlined that FRG approach has contributed to significant extent for adoption of improved potato production technologies. The most important thing point out by the respondents were non-FRG participant farmers have very great interest to be a member of FRG and also different stakeholders involvement is crucial to strengthen existing FRGs and in the establishment of new FRGs.

Keywords: Farmers research group, improved potato technology, participation.

INTRODUCTION

The Ethiopia is one of the least developed countries in the world with a total population of more than 90 million (CSA, 2016) of which about 82.72% lives in the rural areas (World Bank, 2012). Agriculture is the main sources of livelihoods for the majority of the people and contributes 46% of the growth national product (GDP), 84% export revenues, 85% of employment and contributes around 70% of the raw materials requirements for agro-based domestic industries. Increasing horticultural production will contribute for the commercialization of the rural economy and creation of many off-farm jobs (Lumpkin *et al.,* 2005). Potato is one of the horticultural crops, in general, and vegetable crops, in particular that play a key role as a source of food and cash income for small-land holder producers. As a food crop, it has a great potential to supply high quality protein within a relatively short period and is one of the cheapest source of energy. Potato produces 54% more protein per unit of land area than wheat and 78% more than rice (stevnson *et al.,* 2001).

In Ethiopia, the agricultural sector is largely subsistence and dominated by small scale farmers and yet it is the major source of food and livelihood for the majority of the population. However, the sector has not developed enough to change the livelihood of the rural community (Abera, 2001). Despite its lion share in the economy, the

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development of the sector has been slow for many decades. Many factors have been holding back the development of the sector and the major ones include adverse environmental condition, rapid population growth, traditional production inputs used by the farmers, ineffectiveness of extension system and weak linkage between research and dissemination partners and farmers. Despite the long term effort of agricultural technologies developments, most farmers resisted the technology adoption and continued practicing their traditional agriculture. Many studies indicated that adoption of the technologies generated through the conventional research process was minimal. The commonly mentioned reason for low uptake of the technologies by farmers was incompatibility of the technologies generated with the farmers real situations.

According to Ejigu & Pound (2002) and Abera & Fasil (2005), technologies generated on research station with limited involvement of farmers were not usually relevant because there were few opportunities to consider the socio-economic and agro-ecological circumstances of the end user.

According to Tilahun *et al.* (2002), the well-intended top-down research effort often achieved little because it did not consider the biophysical and socio-economic conditions of the farmers. Therefore, recently the importance of involving stakeholders in research has been recognized to be crucial to maximize research impact. According to Elias (2005) research planning often failed to appreciate the participation of the stakeholders. However, over years of stakeholders‟ participation and client orientation in research planning, implementation, monitoring and evaluation have become an important concern and focus of attention. The conventional top-down research and extension systems, that assume scientists as knowledge generators, extension workers as knowledge conduits and farmers as passive knowledge recipients challenged over the past several years and opened the ground for looking and testing other alternatives. Especially, in the late 1990s, participatory methodologies that enhance active participation of small group of farmers in research emerged and become popular in many countries. This new methods of engaging or involving farmers in the research process was found to be an entry point for minimizing the existing wide gaps between research, extension and farmers which is a turning point to active participation of farmers and a means for matching needs and potential technologies developed in research centres.

To make stronger the link between farmers, extension service and researchers, alternative extension approaches like Farmers Research Group which helps to address the issues of all stakeholders have been considered as a participatory research approach.

METHODOLOGY

Description of the Study Area: Welmara is one of the districts in the Oromia Region of Ethiopia and located in West Shoa Zone about 21 km West of Addis Ababa, it is situated between 080 50' 04"N to 09°12' 55"N latitudes and 42° 55' 32"E to 43o 14' 19"E longitudes and at altitude of 2390 masl. The area has a bimodal rainfall pattern, receiving an annual rainfall more than 1060mm. The short rains extent from March to April, and the long rains from July to October. The two sub-distirict IlalaGojo and Telecho in welmera district are located at 43°02' 02"E to 43°05' 38"E longitudes and 09° 02' 34"N to 09° 06' 46"N latitude Farmers in the area are engaged in vegetable, crop-livestock mixed agriculture.

Sample Size and Sampling Procedure: Multi-stage sampling methods were employed. As a First step, one district and two sub-districts (Telecho and IlalaGojo) were selected purposefully because of the presence of different FRGs operating in the district. Then, from the two districts, a total of 217 potato growers were registered in the cropping season 2013/2014. Among the registered farmers, 150 were from Telecho sub-district and the remaining 67 from IlalaGojo sub-district. From Telecho sub-district 88 farmers were Non-FRG participants and 62 farmers belonged to Woleda Gudeni potato producer FRG. Among the registered farmers 67 from IlalaGojo sub-district 37 were non-FRG participants and 30 belonged to Didimtu Burka Misoma potato producer FRG. Using non replaceable lottery method and proportional to size sampling techniques 54 FRG members and 76 non FRG participant member farmers which, totally 130 samples respondents were selected.

Data Sources and Method of Data Collection: Using structured interview schedule, both qualitative and quantitative primary data were gathered from FRG participant farmers and non-participant farmers. Interview schedule and group discussions have been conducted to validate and strength the qualitative finding. Quantitative data of the survey result were also statistically analyzed by different analytical techniques these include t-tests, chi-square tests, one way ANOVA.

Adoption Index (AI) is the dependent variable for this study. Which shows to what extent the respondent farmer have used the more important practices out of the whole set of recommended package for potato production. The respondent farmers who use the recommended rate in the package were given 1 and 0 for those who did not was calculated by the following formula.

Adoption Index $= \sum_{i=1}^{N} = \frac{Fai+CAi+VAi+Cui\ X\ 100}{TNP}=$

Where: i=1, 2, 3…….n, and n= total number of farmers

Np = No of practices

AIi = Adoption index of the ith farmer

Fai = Amount of fertilizer applied per unit of area in the cultivation of improved variety of potato by ith farmer,

CAi = Amount of chemical (Fungicide) applied by ith farmer per unit of area in the cultivation of improved variety of Potato,

VAi=Varieties land coverage by i farmer farm

Cui= Frequency of cultivation practiced by ith farmer in a given cropping season.

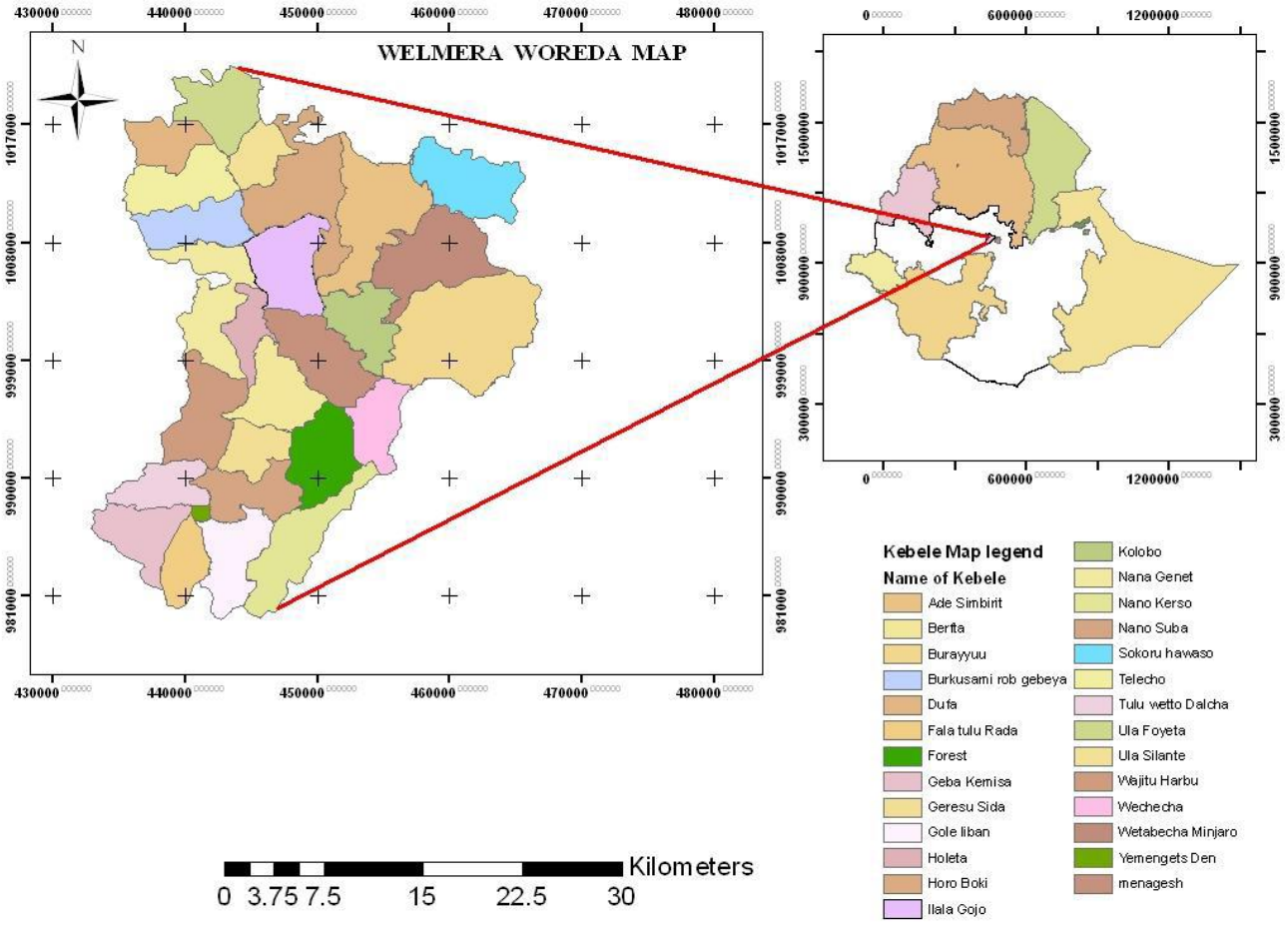

Figure 1. Study site map.

Table 1. Some of very important recommended improved technology package of potato production.

Name of package	Abbreviation	Recommended rate
Fertilizer rate	FR	165Kg UREA, 195DAP/ha
Chemical (Fung.) application	CA	times spray 50-55, 70-75days
Varieties	VA	Gudeni and Jaleni
Cultivation frequency	CF	2 times 35-40, 60-70days

RESULTS AND DISCUSSION

In order to know the level of adoption of each respondent the Adoption Index score was calculated. Before any calculations, the technology packages were listed and weighted. Equal weights were given to all technology packages considered through discussion

with researchers and development agents in the study area. A total of four improved production packages were used.

These are varieties, fertilizer application rate, chemical spraying, cultivation frequency, (Table1). The sample respondents' adoption index scores were categorized into three adopter groups namely non-adopter, low and high adopter. The actual adoption index score ranges from 0 to 1. Adoption index score of 0 point implies non-adoption of the overall improved potato production package. Statistical analysis of ANOVA indicated that there was significant variation (F= 34.47,P=0.000) among the adoption index score between the three categories at 1% level of significant which indicates difference of adoption of potato technology packages among sampled non-FRG (Table 2).As indicated in Table 2, non-adopter accounts for 65.78% with the mean adoption index of 0.0000. This indicated that non adopter was not practicing any of the recommended package and the technologies in the production year of 2013. Next to non-adopters, low and high adopters constituted about 28.95 %. Low adopters have mean adoption index of 0.4670 while 5.26% high adopters obtained adoption index of 0.0956.

Table2. Distribution of non-FRG member's respondents by adoption category of improved potato adoption.

Adoption Categories	N	%	Adoption Index Score	Mean	SD	F-value	P-value
Non-adopters	50	65.78	0.00	0.000	0.0000		
Low adopters	22	28.95	0.01-0.30	0.4670	0.0685		
High adopters	4	5.26	0.31-1	0.0956	0.0076		
Total	76	100	0.00-1	0.2212	0.2212	34.47***	0.000

*** = significant at 1% level.

Table 3. Distribution of FRG member's respondents by adoption category of improved potato technologies.

Adoption Category	N	%	Adoption Index Score
High adopters	54	100	1
Total	54	100	

FRG member's respondents indicated that there is no significant difference of using improved potato technology packages. If adoption index score is 1 or 100% it implies all FRG members adopted improved potato technology packages (Table 3).

Therefore, the results of the statistics applied to assess the difference between FRG members and non-member farmers in the use of improved technology package such as improved potato cultivars, recommended fertilizer rate, recommended chemical (fungicide) application, recommended cultivation frequency summarized in different forms as follow.

In the last twelve to fifteen years different improved varieties of potato were introduced in to the farming system of the study area. However, during the study period farmers made a dramatic shift away from producing their local potato variety and cereal crop.

The survey result shows that 100% of the survey respondents from FRG members were growing improved Gudene and Jalene potato varieties whereas from non-FRG member's respondent 18.4% growing improved varieties 81.6% cultivated their local potato and cereals (Table 4).

The statistical analysis of Chi-Square tests Table revealed that the existence of significant difference between FRG members and Non- FRG groups at 1% significant level (Table 4).

For its yield advantage and resistance to late blight farmers preferred to grow improved potato variety named Jalene. In general, sample respondents have selected three most preferred attributes which can be used for selecting among improved varieties of potato. These attributes include yield advantage, diseases resistance and market demand (Table 5).

Table 4. Improved potato cultivars.

Farmers category	N	Yes	No	Yes (%)	No(%)	$\chi 2$	p= value
FRG	54	54	-	100	-		
Non-FRG	76	14	62	18.4	81.6		
Total	130	68	62	52.31	47.69	84.218	0 .000

*** ($\chi 2$=84.215a, p=0.000) significant 1% level

Table 5. Famers preference attributes to Jalene potato varieties

Criteria	Percentage of respondents
Yield advantage	92
Disease resistant	75
Market demand	100

Fertilizer usage: Fertilizer application is one of the most important practices recommended by the agricultural research system and proper application of the recommended rate is important to obtain the required yield. The two commonly used fertilizers by all the respondent are UREA and DAP. DAP is applied once at planting while urea was applied in spilt, the first one at planting and the second applied at first cultivation after planting. The group discussion explained that farmers are very excited by immediate and fast vegetative growth in response to UREA applied at time of first cultivation than the response of DAP.

Among FRG members there were significant variation on the application of fertilizer in type and rate as 100% of the members of FRG used the recommended type and rates. However in non-FRG members there is a huge gap only 32.9% used the recommended rate of fertilizer (Table 6).

Table 6. Adoption of recommended fertilizers.

Farmers category	N	Yes	No	Yes (%)	No(%)	χ2	p= value
FRG	54	54	-	100	-		
Non-FRG	76	25	51	32.9	67.1		
Total	130	79	51			59.636a	0 .000

*** (χ2=59.636a, p=0.000) significant 1% level

The statistical analysis of Chi-Square Tests Table revealed that the existence of significant difference between FRG members and Non- FRG members on application of fertilizer at 1% significant level (Table 6).

Fungicides usage: In study area, late Blight and bacterial wilt are critical disease problems in potato production. The incidence and severity varied from season to season, year to year and variety to variety of any particular crop. Research recommends 2kg of Ridomil or Mancozeb per hectare to control late blight. Farmers in the study area applied fungicide and recommended cultural management practices released by research.

The latter include among others, crop rotation and using diseases free seeds. During the group discussion farmers mentioned that disease tolerant varieties need spraying of fungicide to get higher yield. The survey result shows that 100% of FRG members and 90.8% of non-FRG members used fungicide to control potato leaf rust this implies that there is no difference between FRG members and non-members farmers application of fungicide (Table 7).

Table 7. Adoption of application of fungicides.

Farmers category	N	Yes	No	Yes (%)	No(%)	χ2	p= value
FRG	54	54	-	100	-		
Non-FRG	76	69	7	90.8	9.2		
Total	130	123				75.277	0 .0221

*** (χ2=5.277a, p=0.0221) Not significant

The statistical analysis of Chi-Square Tests Table revealed that there is no significant difference between FRG members and Non- FRG members on fungicide application (Table 7)

Cultivation Frequency: In the study area, farmers practice cultivation along with weeding. Regarding the number of cultivation, research recommended 2-3 times in a production season. First cultivation should be performed 30 days after planting supported by UREA application. Survey result showed that, 92.6% of the survey respondent from members of FRG, practices cultivation 2 to 3 times while 84.2% from non-FRG members practice 2 to 3 times (Table 8). Unlike other practices, there is no much variation among farmers in frequency of cultivation used between FRG members and non-members. As well as the frequency of cultivation used by sample potato grower farmers was almost similar to the agricultural research center recommendation, which is 2-3 times of cultivation in one production season.

Table 8. Cultivation frequency.

Farmers category	N	Yes	No	Yes (%)	No(%)	χ2	p= value
FRG	54	50	4	92.6	7.4		
Non-FRG	76	64	12	84.2	15.8		
Total	130	123				72.055	0 .152

*** (χ2=2.005a, p=0.152) Not significant

The statistical analysis of Chi-Square Tests Table revealed that there is no significant difference between FRG members and Non- FRG members on frequency of cultivation (Table 8).

CONCLUSION AND RECOMMENDATIONS

The study area is found in one of the four districts which are well known by potato production in Ethiopia. The main focuses of this study was to assess the role of FRG in adoption of improved potato technologies The sample size of the study was 130respondents, out of which54 members were from FRG and the remaining 76 were from non-FRG members. There was significant variation (F= 34.47,P=0.000) among the adoption index score between the three categories at 1% level of significant which indicates difference of adoption of potato technology packages among sampled non-FRG.As indicated, non-adopter accounts for 65.78% with the mean adoption index of 0.0000. This indicated that non adopter was not practicing any of the recommended package and the technologies in the production year of 2013. Next to non-adopters, low and high adopters constituted about 28.95 %. Low adopters have mean adoption index of 0.4670 while high adopters constituted about 5.26% mean adoption index were 0.0956.

In general, this study found that participated with FRG creates more favorable condition to the adoption of improved potato production technology package and had contributed to significant improvements of farmers participation in identifying their problem and found solution. As a result, on-participant FRG farmers showed high interest of to become FRG participants. In light of findings this research study develops following recommendation;

1. The established FRGs still getting improved potato technology package adoption through verification, demonstration and popularization. Since this approach is encouraging others to join the FRG program, it's role should be strengthened to address participatory methodology using multidisciplinary team approach. Hence this practice will boost the potato yield and improve the livelihood of the poor farmers.

2. FRG approach which served as a platform and brought together the end users farmers, agricultural researchers and extension workers for better dissemination and adoption of improved agricultural technologies, was found effective in convincing non-participant farmers to participate in the approach. Hence this type of organization is fundamental in changing the outlook of farmers.

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