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Determining smallholder farmers' preferences for Push-Pull technology dissemination pathways in western Kenya

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Abstract (167 words)

The push-pull technology (PPT) has widely been disseminated to control stemborer (*Chilo partellus* and *Busseola fusca*) and *Striga* weeds (*Striga hermonthica* and *Striga asiatica*) in maize fields in Kenya. This study examined farmers' preferences for various dissemination pathways in order to proffer better targeting of resources in an optimal dissemination strategy. The pathways considered were public meetings (*barazas*), radio, farmer field schools (FFS), field days (FD), farmer teachers (FT), the fellow farmers (FF) and print materials. Using a weighted score index and ordered probit regression, the different pathways were sequentially ranked as FD, FT, FFS, FF, print materials, Radio, and *barazas*. Marginal effects from ordered probit showed that farmers had the least preferences for *baraza* and radio pathways. The farmer categories with the highest preference for particular pathways were: less educated farmers for FD, farmers with small land sizes for FT, farmers belonging to groups for FFS, and young educated farmers for the print materials. This information is extremely important for targeting the different segments of farmers.

Key words: Push-pull technology, Stemborer, Striga, Dissemination pathways, preference,

1.0 Introduction (4404 words)

Cereal stemborers (*Chilo partellus* and *Busseola fusca*) and parasitic *Striga* weeds (*Striga hermonthica* and *Striga asiatica*) are a major challenge to sustainable maize production in some parts of Kenya accounting for 80 % and up to 100 % maize yield losses respectively especially under severe infestation (Khan et al 2001). The losses translate to an annual cash income loss of up to $ 40.8 million and presents great risk of food insecurity and poverty to the affected families (Khan et al. 2008; Midega et al., 2010). In response to these challenges, the International Centre of Insect Physiology and Ecology (ICIPE) in collaboration with other research organizations developed a habitat management strategy for controlling the stemborers and *Striga* simultaneously. This control strategy termed the 'push pull' technology (PPT) is based on stimulo-deterrent strategy where companion crops release behaviour modifying stimuli that manipulate the distribution and abundance of pests and/or beneficial insects for management of the pests (Cook et al. 2007; Khan et al. 2008; Midega et al., 2010). The technology is currently being practiced by about 25,000 smallholder farmers in East Africa and is being promoted through various dissemination pathways to improve output in cereal production while minimising negative environmental effects (Khan et al. 2008; Amudavi et al. 2008, 2009).

Since PPT is knowledge-intensive the potential for uptake would be limited especially among the smallholder farmers if appropriate dissemination pathways are not used to ensure its effective transfer. It has been shown that farmers preferences for dissemination pathways do exist and that the choice of dissemination pathway should not only be based on their effectiveness and capacity to reach larger number of farmers, but also according to their perceived credibility, relevance and preference among target audience (Gloy et al. 2000; Roderick et al. 2008). Rogers (1995) acknowledge that farmers are likely to be persuaded to adopt a technology by information pathways that they perceive as credible and reliable. This paper aims at evaluating farmers'

preferences for the different pathways used in the dissemination of the PPT technology in order to assist in development of a targeted dissemination strategy that would allow farmers to receive adequate information to enable them learn and make informed adoption decisions.

2.0 Materials and Methods

Primary data were collected from 491 respondents in four districts in Western and Nyanza provinces namely Homabay, Kisii, Busia and Bungoma in February and March 2009. These districts are mainly agriculturally based producing both cereal crops and livestock products. However, stemborer and *striga* weeds are a serious setback to sustainable cereal production which renders the area food insecure. Seven commonly used dissemination pathways considered were: *Barazas* (public gatherings), radio, farmer field schools (FFS), field days (FD), farmer teachers (FT), the fellow farmers (FF) and print materials (Brochure, leaflets and booklets) using a 3-point likert scale indicator with 1 = not preferred, 2 = somewhat preferred, 3 = most preferred. In addition, data on general household socio-economic characteristics, institutional and spatial factors was also collected.

A weighted rank index was used to assess farmers' preference ranking for the seven PPT technology dissemination pathways by farmer category as shown in equation 1. The farmers were grouped into either adopters, non-adopters or both of these groups combined. The overall rank for each pathway was computed as; index = Sum of scores [3 for most preferred + 2 for somewhat preferred + 1 for not preferred] for each dissemination pathway divided by sum of scores [3 for most preferred + 2 for somewhat preferred + 1 for not preferred] for all preferences of all the dissemination pathways.

$$I_i = \begin{pmatrix} 3 \\ 2 \\ 1 \end{pmatrix} [\sum_{j-1}^{3} x_j]_j \,/\, \sum_{k-1}^{n} [\begin{pmatrix} 3 \\ 2 \\ 1 \end{pmatrix} \sum_{j-1}^{3} x_j]_k \qquad (1)$$

Where I_i is the ranking index, x_j is the number of respondents ranking pathway i in the jth rank, and k is the sum of ranks for n number of pathways.

To assess the factors influencing preference rakings, ordered probit model was used where the observed responses were represented by a variable Y_i denoting the preference rank given to each dissemination pathway by farmer i and took on j different values which are naturally ordered, in this case 3 values (j = 0, 1, 2). However, these observed values are assumed to derive from some unobservable latent variable Y_i*,

$$Y_i^* = X_i\beta + \varepsilon_i \qquad (2)$$

where X_i represents the observable individual specific factors, β is a vector of parameters to be estimated and ε_i is the stochastic-disturbance term whose distribution is estimated to be normal (Greene 2003). For ease of interpretation of results, marginal effects were estimated which shows the change in the likelihood that a respondent would “somewhat prefer” or “most prefer” (as opposed to “not prefer”) as a result of the unit change in that particular variable. The signs in the parameter estimates and their statistical inferences indicate the direction of the relationship (Verbeek 2004). The following empirical model was specified and used to estimate the relation between preference ranks and other attributes (farmer, institutional and spatial).

$$Prefrank = \beta_0 + \beta_1 Gender + \beta_2 Age + \beta_3 Prieduc + \beta_4 Seceduc + \beta_5 Pseceduc + \beta_6 Tenure + \beta_7 Lansiz + \beta_8 Pptadopt + \beta_9 Inclev2 + \beta_{10} Inclev3 + \beta_{11} Grpmember + \beta_{12} Distarmac + \beta_{13} Kisii + \beta_{14} Busia + \beta_{15} Bungoma + \varepsilon_i \quad (3)$$

The description, measurement and the *a priori* dependent variable effect expectations of the variables used in the model are presented in Table 1.

3.0 Results and Discussions

3.1 Sample summary statistics

Table 2 presents the descriptive statistics of the key variables describing farmers' and farm characteristics based on the four districts and the overall responses. Chi-square (χ^2) or *F*-tests were used where appropriate for statistical significance or otherwise. For most of the variables, the differences were statistically significant across the districts. Out of the total respondents, 84 % were adopters and 16 % non-adopters. Female farmers constituted 57 % and male 43 %. The mean age of the respondents was 44 years and the average household size was seven members. A majority of the respondents had at least attained primary level education (51.5 %) while the rest had secondary 35.5 %, post secondary 6.9 % and informal education 6.3 %. On overage, land sizes were 3.9 acres across all the regions and the average Tropical Livestock Units (TLU) was estimated to be 2.6 units. On average the respondents had received information about PPT from four pathways out of the seven that were assessed. Land was mainly owned (97.1 %) but without title deeds. About 86.5 % of the farmers belonged to organized groups. Household income was categorized into three levels and the results indicates that 31.4 % of the respondents fall under income level 1 (< Ksh 20,000), 35 % under income level 2 (Ksh 20,000 to ksh 40,000) and 33.4 % under income level 3 (> Ksh 40,000).

3.2 Weighted scores based dissemination pathway preferences

Table 3 shows farmers' preferences for the various dissemination pathways by farmer category and based on weighted rank index. The result shows that FDs were the most preferred dissemination pathways in all the three farmer categories, with an index of 0.171 for adopters, 0.167 non-adopters, and 0.170, the combined category. Farmer teachers and FFS were ranked second and third respectively across all farmer categories. The ranking for all the pathways was similar both in position and the score index in all categories of farmers (Table 3). The overall farmers' preferences for the FD compared to other pathways is because of their power to catalyze interactive learning among participants and the tendency to elicit interest of farmers more compared to other forms of dissemination and also because of their predominant use as a common extension technique by various agents and non-governmental organisation to disseminate information. These results corroborate the findings of Amudavi et al. (2008) who found that the farmers' propensity to seek new agricultural knowledge motivated farmers to attend the FDs and overall, it was favourably rated in terms of its effectiveness in information dissemination. .

3.3 Determinants of preference ordering and marginal effects

Tables 4 and 5 report the marginal effects for the probabilities of farmers ranking the pathways as "somewhat preferred" and "most preferred" as opposed to "not preferred". Gender was significant with respect to farmers' preference for FF, print and *Baraza* pathways. The marginal effect was positive for print material (ME = 0.064) implying that male farmers preferred information received from print materials compared to their female counterparts. Age had a negative influence on preference for print materials (ME = -0.004 for most preferred rank), while it had no significant influence on the other dissemination pathways. This observation can be attributed to the expertise that aged farmers have compared to the young ones, and often more

experienced and therefore more likely to adopt new farming methods without consulting external information sources. These results agrees well with findings by Gloy et al. (2000), Ngathou et al. (2005) and Roderick et al. (2008) who reported a decreasing preference for information source with advance in age. In developing countries like Kenya, older farmers may put less emphasis on print material probably due to low literacy levels among older farmers.

Level of education was significant for FD, print, radio and *Baraza*, but was insignificant in all the other pathways. The results indicate that more educated farmers preferred print materials and radio, but less on FD and *Baraza*. These results agree with what has been reported in literature (e.g. Pompelli et al. 1997). However, farmers with secondary and post secondary education preferred print materials and radio to *Baraza* probably because print materials contain more technical information that would require at least a farmer to have some formal education in order to be able to discern the contents (Gloy et al. 2000; Ngathou et al. 2005). It has been argued that some farmers with high levels of education tend to rely more on outside sources of information other than on their own experience and therefore are likely to get more knowledge through reading than from other sources(Ngathou et al. 2005).

Land size was inversely related to FT, but insignificant in all other pathways. The negative marginal effect (-0.012) for the most preferred rank indicates that personal information sources such as farmer teachers are less popular with large scale farmers. This result is consistent with those of Gloy et al. (2000) who reported decreasing preference for personal information sources with increase in farm size. However, Ford and Babb (1989) and Schnitkey et al. (1992) reported a positive association between farm size and personal information sources arguing that large farms had the capacity to mobilize resources to benefit from information provided by private extension providers and therefore more likely to prefer personal information. This kind of arrangement is seldom applied in the developing countries due to infrastructural and other

economic factors that are prohibitive to use of private extension agents and subsequently personal information (Muyanga and Jayne, 2006).

The technology use variable (*Pptadopt*) had a significant negative influence on FF but was not significant for the other pathways (Table 5) implying that adopters put less emphasis on fellow farmers as a dissemination pathway as compared to the non-adopters. This would be expected because PPT is a relatively complex technology and farmers consult other farmers for simple messages but as the message becomes complex, they will most likely seek information on its implementation from more technical sources. Membership of group (*Grpmember*) had a significant positive influence on both FFS and FF pathways. Farmers who were members of organized farming groups ranked FFS more favourably compared to those who were not in any organised group. The results suggest a need to encourage formation of farmers groups so that an intervention targeting the use of FFS as a dissemination pathway can be effective. Similar results are also observed in the FF pathway whereby "somewhat preferred "rank decreased by 6.2 % for farmers who belonged to organised groups as opposed to those who were not in such groups (Table 4). This is a valid observation because FFS are organised farmer groups where farmers come together to learn about new technologies in groups. The observation for the fellow farmer preference can also be qualified in the sense that, while in a group, farmers are more likely to learn from each other and hence the positive preference for FF as a dissemination pathway.

Distance to tarmac road (*Distarmac*) was significant in FT, FFS, radio and *Baraza* pathways but not significant for the rest (see Table 4 and Table 5) implying that poor proximity to the main tarmac resulted in farmers preferring FFS and radio as compared to FT and *Baraza*. Regional dummies representing study districts indicate variations in preferences for the seven pathways across the four districts. For example, farmers in Busia preferred FT (ME = 0.158) and FF (ME = 0.267) while Bungoma farmers put more emphasis on print material (ME = 0.163) all

compared to Homabay which was the reference district. This variation reflects the heterogeneous nature of the farmers in the four districts probably in terms of resource and other physical structure which might influence the preferences.

4.0 Conclusion and implications

This paper examined farmers' preferences for dissemination pathways and how various factors influenced farmers' choices for the information sources. In general this study has demonstrated that factors affecting farmers' preferences for different dissemination pathways are varied among the different pathways and that the significance of farm and farmer characteristics in explaining preferences depends on the information source. Although the majority of the farmers would prefer the FD as the pathway through which they would effectively receive information about the PPT, most of the other pathways evaluated had niches within different farmers with selected characteristics.

The results show that factors which positively favour preference for a particular information source in a given region might not necessary translate to similar preference by farmers in other regions. Important characteristics of local populations may be masked by generalizing from regional data. The variability that can exist in land characteristics, farmers' perceptions, and socioeconomic conditions within regions implies that broad-based use of dissemination approaches for delivering agricultural information may not be appropriate. This would be particularly critical in order to avoid cases of dis-adoption (or non-retention) of promising intervention strategies on the basis of applying a dissemination pathway that could be unpopular among farmers in certain regions. Therefore it is important to understand the socio-economic and other demographic factors within a given region prior to using a particular information transfer mechanism. This implies that a 'one-size fits all' approach is clearly not appropriate in the dissemination pathways for the PPT technology. It has been suggested that

disseminators should consider targeting smaller and specific segments of the population other than focusing on relatively large geographical areas when disseminating information (Gloy et al. 2000).

Therefore, since it is not a one size fits all game, the challenge is to strive to understand the dominant strata of clients before finally deciding on the most effective PPT dissemination pathway to employ for a clear understanding of the technology that would engender widespread adoption.

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Table 1. Description of dependent and explanatory variables and their expected signs as used in the ordered probit model

Variable	Description	Expected sign
Dependent Variable		
Prefrank	0 = not preferred, 1= somewhat preferred, 2 = most preferred	
Explanatory variables		
Gender	Gender of the main farmer (1 = Male, 0 = Female)	±
Age	Age of the farmer in years (continuous)	-
Noeduc	1 if farmer has no formal education, 0 if otherwise (omitted category)	-
Prieduc	1 if farmer has primary education, 0 if otherwise	+
Seceduc	1 if farmer has secondary education, 0 if otherwise	+
Pseceduc	1 if farmer has post secondary education, 0 if otherwise	+
Tenure	Land owner ship (1 = Owned, 0 = otherwise)	+
Landsiz	Total land size in acres (continuous)	+
Pptadopt	If the farmer has adopted PPT (1 = Yes, 0 = No)	+
Inclev1	1 if farm income is < Ksh 20,000, 0 if otherwise (omitted category)	+
Inclev2	1 if farm income is Ksh 20,000 to Ksh 40,000, 0 if otherwise	+
Inclev3	1 if farm income is > Ksh 40,000, 0 if otherwise	+
Grpmember	1 if a farmer is in an organised farmers' group, 0 if otherwise	±
Distarmac	Distance from the farm to the nearest tarmac road (km)	±
Hbay	Dummy for Homabay district (1 = Yes, 0 = No) (omitted category)	±
Busia	Dummy for Busia district (1 = Yes, 0 = No)	±
Bungoma	Dummy for Bungoma district (1 = Yes, 0 = No)	±
Kisii	Dummy for Kisii district (1 = Yes, 0 = No)	±

Table 2. Descriptive statistics and frequencies for selected farmers' and farm characteristics per study district and for the overall sample

Demographic variable[1]	Respondents districts[2]						
	Sample N =491	Homabay N = 122	Kisii N = 122	Busia N = 122	Bungoma N = 122	*F*-statistic	$\chi 2$
Gender of the farmer (%)							7.32**
Female	57	62	59	60	47		
Male	43	38	41	40	53		
PPT adoption (%)							10.52***
Adopted	84	80	80	93	83		
Not adopted	16	20	20	7	17		
Education level of the farmer (%)							34.62***
No formal education	6	8	10	7	1		
Primary education	52	57	59	51	40		
Secondary education	36	27	26	33	54		
Post secondary education	7	7	6	9	5		
Household income category (%)							42.18***
Level 1 (< Ksh 20,000)	31	48	31	27	20		
Level 2 (Ksh 20,000 to Ksh 40,000)	35	38	37	29	36		
Level 3 (> Ksh 40,000)	33	13	32	44	44		
Others							
Ownership of land (%)	97	96	98	94	100		8.99**
Group membership (%)	87	89	79	96	82		17.27***
Age of the farmer (years)	44 (11.5)	43.7 (10.9)	41.5 (10.2)	46.0 (12.4)	45.4(11.8)	3.88***	
Household size (persons)	7 (3.2)	6.5 (2.9)	6.5 (2.4)	7.4 (3.1)	8.0 (4.0)	7.32***	
Total land size (acres)	3.9 (3.7)	3.5 (3.7)	3.2 (2.3)	4.2 (2.8)	4.7 (5.2)	4.03***	
Tropical Livestock Units (TLU)	2.6 (2)	3.3 (2.4)	1.7 (1.2)	2.5 (1.9)	3.0 (2.3)	16.31***	
Distance to tarmac (Km)	4.9 (5.4))	2.3 (3.1)	4.7 (4.8)	5.2 (4.9)	7.5 (6.9)	21.1***	
Number of pathways used	3.7 (1.6)	3.2 (1.4)	3.5 (1.9)	4.1 (1.4)	4.1 (1.4)	8.56***	

Notes:
[1] Socioeconomic characteristics of the farmer and farm characteristics; [2] Figures in the parenthesis are the standard errors associated with the means for the continuous variables; and [3] Pathways for information dissemination; FD = Field days, FT = Farmer Teachers, FFS = Farmer Field Schools, FF= Fellow farmers
*** $P< 0.01$, ** $P<0.05$, * $P<0.1$

Table 3. Farmers' perception for the various dissemination pathways by farmer category based on a weighted rank index

Pathway[3]	Farmer category														
	Adopters[1]					Non adopters[1]					Combined[1]				
	1	2	3	n	Ranking[2]	1	2	3	n	Ranking[2]	1	2	3	n	Ranking[2]
FD	12	106	295	413	0.171	2	21	52	75	0.167	14	127	347	488	0.170
FT	32	89	291	412	0.167	6	17	53	76	0.167	38	106	344	488	0.167
FFS	45	86	281	412	0.163	7	23	46	76	0.160	52	109	327	488	0.163
FF	35	192	186	413	0.151	4	31	39	74	0.153	39	223	225	487	0.151
Print	112	198	102	412	0.125	18	36	22	76	0.131	130	234	124	488	0.126
Radio	87	256	70	413	0.125	16	45	14	75	0.124	103	301	84	488	0.125
Baraza	213	163	33	409	0.098	37	33	5	75	0.099	250	196	38	484	0.098

Notes:

N = Number of farmers ranking the pathway.

[1]1=not preferred; 2=somewhat preferred; 3=Most preferred.

[2]Ranking index = Sum of [3 for most preferred + 2 for somewhat preferred + 1 for not preferred] divided by [3 for most preferred + 2 for somewhat preferred + 1 for not preferred] for all preferences of all the dissemination pathways.

[3]FD = Field days, FT = Farmer Teachers, FFS = Farmer Field Schools, FF = Fellow farmers

Table 4. Marginal effects (ME) and their corresponding standard errors for "somewhat preferred" preference rank for the seven pathways

Variable[1]	Pathways[2]													
	FD		FT		FFS		FF		Print		Radio		*Baraza*	
	ME	SE	ME	SE	ME	SE	ME	SE	ME	SE	ME	SE	ME	SE
Gender	-0.015	0.036	0.037	0.027	0.014	0.027	0.061**	0.030	0.001	0.005	0.005	0.005	0.063**	0.034
Age	0.000	0.002	-0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.002
Prieduc	0.170**	0.077	-0.016	0.055	0.033	0.057	-0.032	0.063	0.001	0.004	0.021	0.016	-0.009	0.072
Seceduc	0.094	0.087	-0.029	0.059	0.012	0.061	0.016	0.067	-0.010	0.016	0.003	0.012	-0.089	0.079
Pseceduc	0.071	0.111	-0.031	0.076	0.049	0.073	0.035	0.075	-0.094	0.074	-0.066	0.071	-0.172*	0.102
Tenure	0.058	0.096	0.022	0.082	0.028	0.085	0.050	0.107	0.001	0.009	0.011	0.035	0.022	0.106
Landsiz	-0.006	0.006	0.007**	0.004	0.004	0.004	0.000	0.004	0.000	0.000	0.000	0.001	-0.006	0.005
Pptadopt	-0.022	0.049	0.001	0.035	0.006	0.036	0.091**	0.049	0.000	0.001	0.007	0.012	-0.014	0.047
Inclev2	-0.033	0.039	-0.022	0.030	0.037	0.031	0.000	0.001	0.032	0.034	-0.001	0.005	0.030	0.038
Inclev3	-0.040	0.054	-0.047	0.040	0.028	0.043	-0.003	0.008	0.034	0.044	-0.016	0.019	0.140	0.036
Grpmember	-0.037	0.055	0.044	0.040	-0.068**	0.036	-0.062*	0.037	0.002	0.007	0.014	0.021	-0.034	0.050
Distarmac	-0.005	0.003	0.005**	0.002	-0.011***	0.003	0.001	0.003	0.000	0.000	0.002	0.001	0.016***	0.003
Busia	0.111**	0.050	-0.105***	0.037	-0.014	0.040	-0.199***	0.050	-0.050**	0.026	0.000	0.010	0.196	0.034
Bungoma	0.066	0.055	0.082**	0.037	0.011	0.042	0.047	0.041	-0.021	0.019	-0.010	0.014	0.099	0.048
Kisii	-0.072	0.050	-0.004	0.039	0.206***	0.027	-0.061	0.047	-0.001	0.003	-0.026	0.024	0.139	0.042

Notes: [1]See Table 1 for description of explanatory variables

[2]FD = Field days, FT = Farmer Teachers, FFS = Farmer Field Schools, FF= Fellow farmers

*** Significant at 1 %, ** significant at 5 % and * significant at 10 %

Table 5. Marginal effects (ME) and corresponding standard errors (SE) for "most preferred" preference rank for the seven pathways

Variable[1]	Pathways[2]													
	FD		FT		FFS		FF		Print		Radio		*Baraza*	
	ME	SE	ME	SE	ME	SE	ME	SE	ME	SE	ME	SE	ME	SE
Gender	0.018	0.042	-0.059	0.043	-0.022	0.044	-0.091**	0.045	0.064**	0.034	0.035	0.027	0.022*	0.013
Age	0.000	0.002	0.002	0.002	0.000	0.002	-0.001	0.002	-0.004***	0.002	0.000	0.001	0.000	0.001
Prieduc	-0.205**	0.093	0.025	0.088	-0.053	0.091	0.047	0.094	0.046	0.069	0.121**	0.054	-0.003	0.025
Seceduc	-0.115	0.108	0.046	0.092	-0.019	0.099	-0.023	0.100	0.147**	0.080	0.104	0.065	-0.028	0.023
Pseceduc	-0.088	0.142	0.047	0.113	-0.084	0.134	-0.054	0.123	0.272**	0.122	0.203*	0.113	-0.038**	0.015
Tenure	-0.068	0.110	-0.035	0.124	-0.044	0.128	-0.070	0.142	0.014	0.094	-0.085	0.099	0.007	0.031
Landsiz	0.007	0.007	-0.012**	0.006	-0.007	0.006	0.000	0.007	0.003	0.005	-0.002	0.004	-0.002	0.002
Pptadopt	0.026	0.059	-0.002	0.056	-0.010	0.057	-0.125**	0.062	-0.004	0.045	0.026	0.033	-0.005	0.017
Inclev2	0.040	0.047	0.034	0.047	-0.060	0.049	0.009	0.037	-0.047	0.050	-0.004	0.029	0.011	0.014
Inclev3	0.047	0.063	0.073	0.059	-0.047	0.073	-0.037	0.049	-0.051	0.070	-0.049	0.035	0.083	0.034
Grpmember	0.045	0.068	-0.068	0.058	0.117**	0.067	0.099	0.064	0.029	0.048	-0.111**	0.052	-0.013	0.021
Distarmac	0.006	0.004	-0.008**	0.004	0.018***	0.005	-0.002	0.004	-0.001	0.003	0.011***	0.003	0.005**	0.001
Busia	-0.138**	0.064	0.158***	0.052	0.023	0.063	0.267***	0.061	-0.172***	0.035	0.076*	0.043	0.118	0.035
Bungoma	-0.080	0.068	-0.139**	0.066	-0.018	0.068	-0.072	0.065	0.163***	0.058	-0.040	0.036	0.042	0.025
Kisii	0.084	0.058	0.006	0.061	-0.471***	0.061	0.087	0.065	-0.014	0.047	0.175***	0.050	0.066	0.029

Notes: [1]See Table 1 for description of explanatory variables

[2]FD = Field days, FT = Farmer Teachers, FFS = Farmer Field Schools, FF= Fellow farmers

*** Significant at 1 %, ** significant at 5 % and * significant at 10 %