

Socioeconomic Factors Affecting the Adoption of Improved Agricultural Technologies among Women in Marakwet County Kenya

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Abstract

Previous results from the developing countries show that men and women do not adopt new technologies at the same rate or benefit equally from their introduction. Authors note that women in Africa continue to adopt high yielding varieties and improved management systems at low rates (Doss 2001). Certain agricultural technologies can easily be adopted by women than others. However this varies widely based on context and culture. The premise of this research is that Women vary in adoption of technology or innovations at their disposal and those particular technologies were adopted at a higher rate comparatively to others, although the set of technologies were packaged and disseminated together. The sociological, myths and other economic factors surrounding the adoption of agricultural technologies among women are unearthed in Marakwet. The specific objectives of the study were to determine the socioeconomic characteristics, rate associated with the adoption of the agricultural technologies in Marakwet. This study has an important significance considering the fact that most women participate in agriculture in developing countries. This research on agricultural technology adoption is therefore critical. There is need to ensure that gender concerns and women participants are integrated in all relevant projects by planners' and policy makers. Stratified random sampling was used to conduct the survey. The survey obtained 160 women from two targeted groups by the Women in Agricultural projects (WIA) under the Catholic Diocese of Eldoret. This was done such that the sample represented all farmers targeted by the project giving information on socio-economic characteristics, age, education levels, extension services, education, household size and the number of the technologies adopted among others. Quantitative and qualitative data analysis methods were used to analyze explanatory variables in this study such as education levels, household size, level of income, age, contacts with extension agents, Access to extension facilities, membership to groups or associations. The results show that such factors such as primary occupation, annual income, household size and membership of women's group showed a positive and very significant relationship with the women adoption of agricultural technologies. From the findings the women ranked such constraints as lack of access to land, lack of capital and credit facilities, non membership of women's group, non provision of information by the agricultural officers on agricultural production technologies, ineffective extension services and coverage among others, as major hindrances to effective achievement of the set objectives of improving the socioeconomic wellbeing of women farmers. It is recommended that the agricultural technologies should increase its activities to include tasks and decisions where women played an active role which include; health care, agricultural production (food crop and livestock production), and family nutrition. Land tenure issue should be revisited and relevant laws made which allows women farmer's access to land for agricultural production.

Keywords: gender characteristics, women, adoption, agricultural technologies, lack assets.

INTRODUCTION

Of all the hours worked throughout the world, women contribute about 66% (UN, 1990). Much of the work done is by women living in the rural areas. In the developing world, where more than a third of the total population is rural and female, women produce most of the food for domestic consumption (Anon, 1980). The sustainable production of food is the first pillar of food security. Millions of women work as farmers, farm workers and natural resource managers (Onyemobi 2000). In doing so, they contribute to national agricultural output,

maintenance of the environment and family food security (Brown et al 2001). Evidence from throughout the developing world indicates that men and women do not adopt new technologies at the same rate or benefit equally from their introduction. Authors note that women in Africa continue to adopt high yielding varieties and improved management systems at low rates (Doss 2001). Recent empirical studies in Ethiopia (Tiruneh et al 2001), Ghana (Doss & Morris 2001), Nigeria (Sanginga et al 2007), Malawi (Gilbert et al 2002) and Benin (Kinkingninhou-Médagbé et al 2008) all document

gender based disparities in adoption of improved technologies including improved seed, inorganic fertilizer, chemical insecticide etc. Some technologies appear to be more easily adopted by women than others; however this varies widely based on context and culture. For example, in Bangladesh Hallman, Lewis and Begum (2007) find women are more easily able to adopt improved vegetable varieties for homestead production than group poly-culture fishpond technologies because the former activity does not require women to leave their homestead and potentially expose them to sexual harassment. Had a similar intervention been conducted in parts of Africa where women's mobility is less restricted, or threats of sexual harassment are not as great or take different forms, the results of the intervention may have been quite different.

PROBLEM STATEMENT

Rural women in particular are responsible for half of the world's food production and produce between 60-80% of the food in the developing countries.(FAO, 2006) Despite their contribution in Agriculture, women are frequently under-estimated and overlooked in development strategies. Food and Agricultural organizational studies demonstrated that while women in most developing countries are in main stay of the Agricultural sector, they have been the last to benefit from prevailing economic growth and development process. During the process of technology transfer, focusing on the women in agriculture project, it was observed that women vary in adoption of technology or innovations at their disposal. It was also observed that particular technologies were adopted at a higher rate comparatively to others, although the set of technologies were packaged and disseminated together. The myths surrounding the adoption of agricultural technology should be unearthed, given the fact that Marakwet community is primarily patriarchal whereby the man is exalted while the women are subordinate, therefore understanding and critiquing the surrounding factors would assist in policy framework towards adoption of agricultural technologies by women in the region and elsewhere..

OBJECTIVES OF THE STUDY

The broad objective of this study was to determine the impact of gender socioeconomic characteristics on adoption of agricultural production technologies. The specific objectives are to;

- i. Determine the socio economic characteristics of women, costs, benefits associated with the adoption of the agricultural technologies.
- ii. Evaluate the method of transfer of technologies and the level of adoption of the different WIA technologies by the women.
- iii. To determine the factors affecting the rate of adoption of agricultural technologies among Women in Agriculture.

- iv. Formulate policies to ensure sustainability of women agricultural production.

JUSTIFICATION OF THE STUDY

The study was useful in providing information to assist in advocating for planning programs that are gender responsive and thereby contribute to overall agricultural production and food security in the country. It also aims at enticing other scholars to do further research to support in the development of gender sensitive policies and program strategies that will assist in developing tools for gender mainstreaming. This provided encouragement and support to the elimination of barriers that inhibit women from attaining their full potential. This research provided disaggregated data on women's contribution to Agricultural production under the Women in agricultural projects WIA.

SIGNIFICANCE OF THE STUDY

Considering the fact that most women participate in agriculture in developing countries, this research on agricultural technology adoption is critical. There is need to ensure that gender concerns and women participants are integrated in all relevant projects by planners' and policy makers as well as organizations involved. This research results supports the need to improve living standards of women by upgrading their production capacity.

SCOPE OF THE STUDY

This study was conducted in Marakwet county Kenya. The study was focused on determining the impact of gender socioeconomic characteristics on adoption of agricultural production technologies. It also focused on the access of extension agents, occupation, household size, Education and the level of income and how these factors influenced the number of technologies adopted under the Women in agriculture projects.

SAMPLING TECHNIQUES

Stratified random sampling was used to conduct the survey. The study area was divided into stratas. These represented the two divisions in the county namely; Kapsowar and Chebiemit. The two basing on the target area of the Women in Agriculture projects under study. Out of the 2 divisions 80 members were selected from each division using simple random sampling technique's. Four groups participated in the study-two from Kapsowar Division and two from chebiemit Division. 40 members were randomly selected from the group. Primary data were collected through interview schedule technique using questionnaire. Participatory workshops were also conducted for the selected sample and all the feedback from the workshop and subjected to analysis. Secondary data were obtained from WIA [women in Agriculture] offices, relevant literature and government offices, like central bureau of

statistics ministry of agriculture county offices, and NGO's. The survey target 160 women randomly selected from the different groups targeted by the WIA project under the Catholic Diocese of Eldoret.

Empirical Model Specification

The Logit model based on cumulative logistic probability Logistic probability functions was used. Logit model assumes that the underlying stimulus is a random variable which predicts the probability of technology adoption. The behavioral model is $Y_i = g[\text{li}]$, Where Y_i is the observed response for the i th observation. That is binary variable $Y_i = 1$ for adoption and $Y_i = 0$ for non-adoption. The probability of technology adoption model is implicitly specified as follows;

$$Y = f(X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8, X_9, e) \quad (1.1)$$

Where Y = Probability/Rate of adoption
 X_1 = Age in years, X_2 = Farm size (in hectares)
 X_3 = Number of years spent in formal education, X_4 = Primary occupation (dummy, 1 if farmer, 0, otherwise), X_5 = Annual income level (in N), X_6 = Household size, X_7 = Membership of women's association/group/cooperative (dummy, 1 if a member, 0, otherwise), X_8 = Residence location (dummy, 1 Kapsowar, 2 Chebiemit), X_9 = Number of contacts with extension officer.

Three functional forms of the model, linear, double-log and semi log were tried to determine the equation that has the best fit. The values of the R^2 and F- test were used to evaluate the overall explanatory power of the regression model. The significance of the parameter estimates was evaluated by means of t-test at 1% and 5% level of significance.

DATA ANALYSIS

Quantitative and qualitative data analysis methods were used to analyze the data. Chi-square test were used to test the null hypothesis of independent variables, which were size of land, level of income, age, access to formal education, membership of rural credit organizations and groups, and number of contacts with extension agents. The degree of association between women's personal and socioeconomic characteristics and the rate of adoption of technologies was determined using the OLS multiple regression technique.

RESULTS AND DISCUSSIONS

Awareness Level, Source of Information and Rate of Adoption of Agricultural Programs

The technologies to women groups in Marakwet county are vital to the development of the region. Table 1.1 reveals that high awareness level does not imply high adoption rates. This is evident in such programs as cassava processing into pancake, and cassava flour, processing and utilization of soya bean into flour paste, and soya-meal, ground nut

processing into ground nuts flour, and processing of fresh tomatoes into tomato paste; which recorded high awareness values of 65.24%, (6.32%), 71.83% (13.67%), 68.64% (23.54%), with the corresponding low adoption rates presented as values in brackets. Technologies adoptions were very efficient as source of information about the new technologies. The women attributed the low adoption rates of these technologies to complexity of the processing methods, lack of access to land, high cost of processing materials, non-conformity with the traditional food value system, high cost of crops used for processing and low market /profit of the products.

Table 1.1. Distribution of women according to awareness level, source of information and rate of adoption of various technologies

Type Technology	Percentage awareness level		Source of awareness	Percentage rate of adoption	
	Aware	Not-aware		Adopted	Not-adopted
Cassava processing into pancake, and cassava flour	65.24	34.76	WA and MOA	6.32	93.68
Tree nurseries	82.15	17.85	WA, Fr, Rn	79.64	20.3
Processing and utilization of soyabean into flour paste, and soya-meal.	85.32	14.68	WA, MSG, Fr	26.54	73.46
Ground nut processing into groundnut flour	71.83	28.17	WA, Fr	13.67	86.33
Groundnut butter	56.34	43.66	WA, MSG	4.32	95.68
Processing of fresh tomatoes into tomato paste	68.64	31.36	WA	23.54	76.46
Processing and storage of melon	46.92	53.08	WA, Rn, Fr	43.75	56.25
Dry season vegetable gardening/organic sacks/kitchen gardens	83.45	16.55	WA, MSG	68.46	31.54

Source: field survey 2007

Where WA= WIA agents, FR= friends, MSG= members of social groups and Rn= relations MOA=, ministry of agriculture

Socioeconomic Costs of Adoption on Gender of Household Members

Women involvement in the agriculture showed some socioeconomic costs on different gender groups of the family as shown in table 1.2. It increased workload for all members of the household, thereby allowing less time for reproductive functions of women and girls, and for the education of boys and girls.

Table 1.2. Distribution according to socio-economic costs of women participation in the agriculture on intra-household dynamics

Socio-Economic Costs	Men	Women	Boys	Girls
Increased workload	2	1	1	1
Decreased decision making power	1	4	3	3
Less time for reproductive functions	4	1	3	2
Less time for education	4	4	2	1
Decreased leisure time	3	1	2	2
Less time for social activities	4	2	4	4
Higher dependency	1	4	3	2

Source: Field survey 2007.

Where; 1=mostly affected, 2 = moderately affected, 3 = less affected and 4 =not affected

This is in recognition of the fact that these children help out either in the processing or marketing activities of the products. It decreased decision-making power of men especially with respect to use of productive resources, and allocation of income realized through the agricultural activities. In addition, higher dependency of men on their wives for economic support was recorded as a result of women involvement in agriculture programme. These have lowered men's self esteem and have often led to shift in gender roles and family squabbles.

Positive Impacts of Adoption of Agricultural Programs on Women's Lives

Results in table 1.3 shows some positive impacts of the agricultural programs on the socioeconomic wellbeing of the women irrespective of the region of residence.

Table 1.3: Distribution according to positive changes in the lives of women resulting from participation in the agricultural program by region of residence

Perceptions	Percentage response by region	
	Kapsowar	Chebimit
Financially independent	89.32	93.27
Acquisition of property	32.54	4.65
Increased financial contribution to household needs	100	100
Increased financial contribution to children's education	64.32	96.87
Enhanced decision making power	85.43	72.4
Higher respect from husband	42.43	56.21
Improved household food & nutrition security	100	100

Source: field survey 2007

Assessment of the impacts by region of the women shows higher impacts on rural women than their urban counterparts. This could be as a result of higher incidence of female-headed-households in the rural areas than in urban cities which in most cases are

caused by husband' migration to the cities. All the respondents reported improvement in such areas as family food security and increased financial contribution to household needs. This is in consonance with the cultural gender relations in the household, which allocates to women the function of family upkeep. The impact on children's education was greater for female children than for the males. To some women, it meant higher respect from their husbands as a result of their ability to provide money for family upkeep when the husband's pocket has dried out. This has increased family peace and harmony.

Determinants of Rate of Adoption of Agricultural Technologies by Women

Statistically, the semi log functional model was accepted as the lead equation since it produced more significant variables at both 5% and 1% levels, had the highest adjusted R^2 value, f-ratios, were relatively better and the signs of the coefficients were consistent with a priori expectations. The results of the OLS multiple regressions, which analyzed the effects of major personal, socioeconomic characteristics of the women on the rate of adoption of the agricultural technologies, are presented below.

Regression Analysis

The results of the OLS multiple regressions, which analyzed the effects of major personal, socioeconomic characteristics of the women on the rate of adoption of the agricultural technologies, is presented below. The R^2 represented the measure of variability in adoption of technology that is accounted for by the predictors (independent variables). R^2 was 0.5 indicating that 52.8% variation in adoption of technologies was explained by the characteristics. AN adjusted R^2 of 0.313 was obtained. Table 1.4 shows the estimates of β values and gives an individual contribution of each predictor to the model. The β values for age had a negative coefficient thus negative relationship. However the farm size, education, occupation, income, household size, membership, location, contacts with extension officer positive, had positive relationship. The negative and positive b values indicate the direction of relationship between predictors and outcome. The model was then specified as:-

$$\text{Rate of technology adoption (A)} = -1.794 - 0.006X_1 + 0.084X_2 + 0.1087X_3 + 0.8432X_4 + 0.0413X_5 + 0.0442X_6 + 0.056X_7 + 0.1384X_8 + 0.6054X_9 \quad 1.2$$

The regression result shows that such factors as primary occupation, annual income, household size and membership of women's group showed a positive and very significant relationship (at 1% probability level) with the women adoption of the WIA technologies. Other characteristics that had positive and significant effects on adoption of the WIA

programs by women are educational attainment, and number of contacts with WIA agents. this positively affected the rate of adoption of technologies. The significance of the household size shows that women with larger household size will have the needed labor required for these activities in addition to having more mouths to feed and more income needs. Women with farming as primary occupation adopted the agricultural technologies higher since these programs are tailored towards agricultural activities. Age recorded a negative but non-significant

relationship with the adoption of agricultural technologies. This implies that the older the women, the lesser the likelihood of adopting the technology. The region of residence did not affect the adoption of the technology. Farm size showed positive but non-significant relationship with the rate of agricultural technology adoption. This could be explained by the fact that most of the introduced technologies are based on "value adding" (processing), with just a few being based on agricultural production of the women.

Socioeconomic Factors Affecting the Adoption of Improved Agricultural Technologies among Women in Marakwet County Kenya

Table 1.4: Regression Results on Gender Characteristics

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95% Confidence Interval for B		Correlations			Collinearity Statistics	
		β	Std. Error	Beta			Lower Bound	Upper Bound	Zero-Order	Partial	Part	Tolerance	VIF
1	(Constant)	-.264	1.414		-.187	.854	-3.197	2.669					
	Age	-.08	.276	-.072	-.318	.754	-.660	.485	.176	-.068	-.047	.414	2.416
	Farm size	.304	.162	.405	1.875	.774	-.032	.640	-.188	.371	.275	.459	2.177
	Education	-.025	.026	-.189	2.124	0.08	-.079	.029	.005	-.198	-.139	.541	1.850
	Occupation	-.109	.222	-.115	3.115	.001	-.570	.353	.363	-.104	-.072	.386	2.591
	Income	.298	.158	.418	3.073	.003	-.029	.625	.158	.373	.277	.438	2.284
	Household size	-.056	.093	-.114	2.173	.002	-.248	.137	-.022	-.127	-.088	.598	1.673
	Membership	.309	.109	.625	3.001	.009	.084	.535	.304	.518	.417	.444	2.253
	Location	.231	.212	.195	4.103	.288	-.209	.670	-.077	.226	.160	.667	1.498
	Contacts with Extension officer	-.422	.283	-.348	1.998	.047	-1.009	.164	-.018	-.303	-.219	.394	2.536

Source: Field Data, (2007)

Dependent Variable: Y-Rate of technology adoption

Factors Constraining Women Active Adoption of Agricultural Technologies

From the study findings summarized in table 1.6, the women ranked such constraints as lack of access to land, lack of capital and credit facilities, non

membership of women's group, non provision of information by the agricultural officers on agricultural production technologies, ineffective extension services and coverage among others, as major hindrances to effective achievement of the set objectives of improving the socioeconomic wellbeing of women farmers

Table 1.5. Factors Constraining Women in the WIA Program

Barrier Indicators	Percentage ratings		
	Very Serious	Serious	Not serious
Lack of capital and credit facilities	73.52	20.21	6.27
Lack of Labour for operation	34.41	56.26	9.33
Incompatibility of the technology to local norms	61.57	23.11	15.32
Husband's negative influence	12.43	35.25	52.32
Lack of access to land	84.72	14.24	1.04
Non membership of women's group	79.36	13.42	7.22
Low demand for the processed products	12.34	37.47	50.19
High cost of agricultural inputs for processing limits the profit	54.31	35.54	10.25
High level of extension agents turnover	67.42	24.16	8.41
Limited information outlet and market situation of processed products limit their spread and profitability	12.81	41.03	46.16
Time consuming and tedious nature of the processing methods	66.43	27.32	6.25
Non centrality in the location of the processing equipment	51.31	14.35	34.34
Non provision of information by the agricultural production technologies	87.53	11.27	1.16
High cost of adequate processing and storage equipment	63.24	23.53	13.23
Ineffective extension services and coverage	73.35	18.42	8.23

Source: Field Survey: 2007

CONCLUSION

The significance of the household size shows that women with larger household size have the needed labor required for these activities in addition to having more mouths to feed and more income needs. They seek alternative ways of diversifying their livelihood to earn additional income. Higher income level affords the opportunity of acquiring the needed inputs and equipment needed for the processing activities. The adoption of agricultural technologies does not ensure effective coverage of women since it was designed not to target individual women but women's group, thereby excluding extension coverage to such women who may have reasons (either religious or social) for not belonging to any primary group. In addition, the women described the programs as ineffective extension services delivery system since it neglects women agricultural and livestock production problems, as well as other constraints faced by women farmers. The agricultural technologies which has concentrated on value adding of agricultural products, has achieved much success in uplifting the socioeconomic wellbeing of both urban and rural women beneficiaries. However, this program neglects most of the agricultural activities engaged in by women such as food crop and livestock production. In addition, some of the programs disseminated by the programme recorded low adoption rates because they were considered as not relevant to the socioeconomic needs of the women. Again ineffective clientele extension coverage limits women participation and adoption of agricultural programs. Therefore, there is need to build on the successes of the agricultural programs to raise the subsistence agricultural production of women by incorporating into the programme, the agricultural production needs of women in such areas as food crop farming and livestock keeping. Inadequate access to credit facilities was one of the factors that limited women from adopting the technologies in question. Most of the women lacked the collateral necessary for accessing credit facilities.

RECOMMENDATIONS

Rural women's roles and constraints need to be fully understood and reflected in the project design, but all necessary information may not be available at project preparation, interventions and strategies may to be based on less than ideal data. Women farmers should be adequately represented among the farmers groups and their voices are heard in demand for agricultural knowledge and technology. The agricultural technologies should enlarge its clientele coverage to include women-non-members of primary societies so as to avail them the opportunity of adopting the technology. The agricultural technologies should increase its activities to include tasks and decisions where women played an active role which include; health care, agricultural production (food crop and livestock production), and family nutrition. The

enlightenment campaign on the need for husbands to assist women in family upkeep as well as allow their wives greater control over their income should be carried out. Land tenure issue should be revisited and relevant laws made which allows women farmer's access to land for agricultural production.

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