

EXTENSION AND ECONOMIC FACTORS AFFECTING ADOPTION OF IMPROVED AGRICULTURAL PRACTICES IN SINAI PENINSULA

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ABSTRACT

The research aimed to identify and analyze the socio-economic characteristics of Sahl El Tina selected farmers, to determine the status of selected improved agricultural practices adoption by selected farmers within their farming systems, and to estimate the factors that affect farm households' decisions to adopt selected improved agricultural practices. The research employed surveyed data of 150 farmers, The analytical tools were used statistical treatments such as percentages, means, and logistic regression analysis were applied to the data, The results of a logistic regression analysis showed that age of household head, education of household head, farmer 'owns' plots with any recommended practice, Household income, Farmer heard of improved practices, households' access to public extension services, households' access to Sahl El Tina extension services, farmer training, perception on improved practices influence on improved practices adoption at the 1% level, the number of information sources was significant at the 5% level .

Keywords: Adoption, improved agricultural practices, logictic regression analysis.

INTRODUCTION

Modern technologies such as improved varieties and chemical inputs have helped spur yields among some farmers, but these do not prevent erosion nor do many farmers possess the financial resources to use them. With increasing population and decreasing availability of new land to exploit, maintaining adequate fallows has become increasingly difficult and continuous cropping has become commonplace. This has resulted in a , (Vicious circle) of soil degradation, crop yield declines, further pressure on available lands to generate required food supplies, and often, migration out of agriculture. To address the many constraints faced by resource-poor hillside farmers, development NGOs and other organizations have increasingly promoted limited external input or (improved) agriculture technologies such as conservation tillage and the use of leguminous cover crops. It is widely believed that the cost of these technologies is low.

Innovations, not requiring large capital investments and relatively easy to implement, can help poor farm households become more productive by improving fallow management and increasing yields. Hence, the need for new perspectives has been called for in the study of the adoption and diffusion of sustainable agriculture, with focus on access to, and quality of information, the perception of innovations, and the institutional and economic factors

related to adoption. Smathers (1982) contended that farmers' attitudes toward conservation may be important in explaining why particular practices are currently used, observing that change is more easily accepted when viewed favorably by those it affects. Therefore it can be concluded, that it was likely that the successful adoption of conservation practices would be influenced more by a farmer's attitude and perception, than any other factor.

The selected practices included modern techniques of irrigation and drainage systems, crop management, crop rotation in salt affected soils, modern methods of feeding and care of farm animals, farm techniques for forage processing in the affected salt environments, modern technologies in dairy manufacturing and applications of fertilizers.

Objectives

The objectives were:

1. To identify and analyze the socio-economic characteristics of Sahl el Tina selected farmers.
2. To determine the status of selected improved agricultural practices adoption by farmers within their farming systems..
3. To estimate the factors that affect farm households' decisions to adopt selected improved agricultural practices.

Data and data source

This research was carried out in Sahl El Tina area, the source of data used was basically primary data. This involved the use of an interview schedule with a well designed structured questionnaires administered to the farmers, a total of one hundred and fifty (150) farming households were selected and interviewed for the research.

Study area

Sahl El Tina is an important area in Sinai Peninsula, It was selected to represent marginal ecosystem. The irrigation water was obtained from mixed water (Nile water + drainage waters) of El Salam Canal. The soil is characterized by severe salt affected, differs in depth and stratified profile layers. The soil salinity and salinity of irrigation water for these farms varied between 12.5 – 15.6 dS/m and 1.6-2.3 dS/m (1000-1100 mg/L), respectively. In addition, the poverty and inappropriate management practices beside the marginal soil and water resources are the problems of agriculture development in this area.

Methodology and analytical model

The descriptive statistics employed includes frequencies and percentages, this was used to analyze the socio-economic characteristics of the farmers. Logit model regression was used to determine the important factors that affect farmers' decisions to adopt improved agricultural practices. The logit model is given by the formula :

$$Y_i = \beta x_i + \mu \quad (1)$$

Where Y_i is equal to one (1) when a choice is made to adopt and zero (0) otherwise.

Note that X^* reflects the combined effects of the independent variables (x_i) at the threshold level.

Equation 1 represents a binary choice model involving the estimation of the probability of adoption of a given technology (Y) as a function of independent variables (X). Mathematically, this is represented as:

$$\text{Prob}(y_i = 1) = F(\beta x_i) \quad (2)$$

$$\text{Prob}(y_i = 0) = 1 - F(\beta x_i) \quad (3)$$

Where Y_i is the observed response for the i th observation of the response variable, X_i is a set of independent variables such as farm size among others, associated with the i^{th} individual, which determine the probability of adoption, (P). The function, F may take the form of a normal, logistic or probability function. The logit model uses a logistic cumulative distributive function to estimate, P as follows (Pindyck and Rubinfeld, 1998):

$$P(y = 1) = \frac{e^{\beta x}}{1 + e^{\beta x}} \quad (4)$$

$$P(y = 0) = 1 - \frac{e^{\beta x}}{1 + e^{\beta x}} = \frac{1}{1 + e^{\beta x}} \quad (5)$$

According to Greene (2008), the probability model is a regression of the conditional expectation of Y on X giving:

$$F(Y|X) = 1[F(\beta x_i)] + 0[1 - F(\beta x_i)] = F(\beta x_i) \quad (6)$$

The maximum likelihood method was used to estimate the parameters.

Using the logit model in this research is that, the farmer would decide to adopt improved agricultural practices in time when the combined effects of certain factors exceed the inherent resistance to change in him/her. The estimation procedure employed also resolves the problem of heteroscedasticity and constrains the conditional probability of making the decision to adopt technology to lie between zero (0) and one (1).

The empirical model for the logit model estimation is specified as follows:

$$Z_i = \text{Log} \frac{p_i}{1 - p_i} = \alpha + \beta x + \quad (7)$$

Where Z_i is the combined effects of X independent variables that promote or prevent farmers' decision to adopt improved agricultural practices.

The dependent variable was dichotomized with a value of 1 if a farmer was an adopter of improved practices and 0 if otherwise. The independent variables of the study were the gender, age of household head, Farmer marital status, Education of household head, and farming Experience of the household head, Number of household family members, the number of active members, the number of dependent family members, farm size, Farmer 'owns' plots with any recommended practice household income, farmer off farm income, Farmer heard of improved practices, households' access to public extension services, Number of information Sources, type of Information Source, frequency of Extension Contacts households' access to Sahl El Tina extension services, Farmer training The sole perception-related

variable was the farmer's perception of improved practices . Table 1 lists definitions of the variables and measurement methods

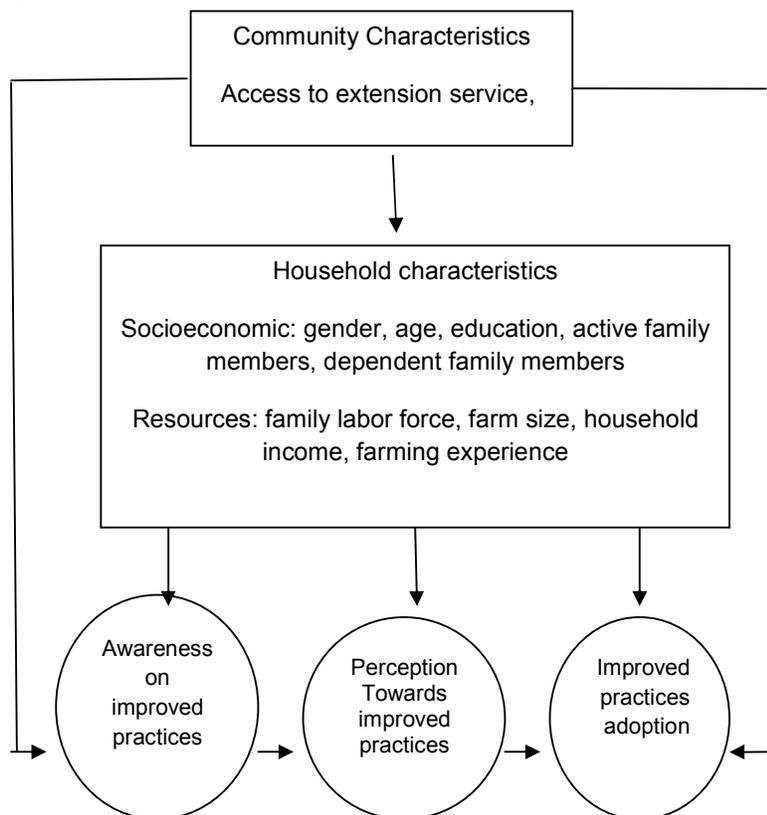
Table 1 Description of the variables used in the logit model

variable	type	measurement
Dependent variable Yi	Binary	1 if farmer has adopted, otherwise 0
Independent variables		
Gender	Binary	1 if household head is male, otherwise 0
Age of farmer	Continuous	Age of the farmer (years)
Farmer marital status	Dummy	Farmer's marital status [0=single 1=Married 2=Divorced/Widowed]
Farmer Education	Discrete	Formal education of the farmer (years of schooling)
Farming experience of Farmer	Continuous	Farming experiences of the household head (years)
Number of household members	Discrete	Number of household members (Persons)
Members in work age	Discrete	Number of working (aged 15–60 yrs) members in the family (persons)
Members out of work age	Discrete	Number of dependent (aged <15 or >60 yrs) members in the family (persons)
Farm size	Continuous	Amount of land under cultivation
Farmer 'owns' plots apply any the recommended practice	Binary	If farmer 'owns' plots with any recommended practice [0=No, 1=Yes]
Household income	Continuous	Amount of money earned by the family members in a year
Farmer off farm income	Binary	If farmer has off-farm income sources [0=No, 1=Yes]
Farmer heard of improved practices	Binary	If farmer has heard of improved practices [0=No, 1=Yes]
Households' access to public extension services	Binary	1 if at least 1 family member has access to extension services, otherwise 0
Number of Information Sources	Discrete	Number of farming information sources available to farmer
Type of Information Source	Dummy	Information from extension agent / Farm organizations /NGOs, neighbors & friends
Frequency of Extension Contacts	Dummy	Frequency that farmer has had contacts with extension staff [0=None, 1=Few, 2=Many]
Households' access to Sahl El Tina extension services	Binary	1 if at least 1 family member has access to Sahl El Tina extension services, otherwise 0
Farmer training	Binary	If farmer had other training in pest control[0=No, 1=Yes]
Perception on improved practices	Binary	1 if the household head perceives that improved practices can improve income, otherwise 0

RESULTS AND DISCUSSION

The framework provided in figure 1 forms the basis for selecting relevant variables influencing improved practices adoption in the studied area.

Figure1. Improved practices adoption framework



Farmers Characteristics

The characteristics of respondent farmers are listed in Table 2. The average age of the House hold head was 44.67 years, with 99% of the household heads being male. The average education of the household head was (12.01 years of schooling); average farming experience was around 27.60 years. The average farm size was 6.91 feddan there was an average of 2.26 active members (aged 15–60 years) in each household and an average of 2.17 dependent members (aged < 15 years or > 60 years) per household.

Table 2. Descriptive statistics of farmers Characteristics by adopter and no adopter Groups

Variable (units)	Mean		
	All farmers	adopters	Non adopters
Individual variables			
Age of household head (yrs)	44.67	42.16	49.47
Education of household head (yrs)	12.01	12.75	10.92
Farming experience (yrs)	27.60	25.08	23.70
Household variables			
Active members (persons)	2.26	2.37	2.07
Dependent member (persons)	2.17	2.37	2.17
Farm size(feddan)	6.91	6.68	7.34
Household income(1000LE)	32.72	33.67	32.19

Source: questionnaire data, 2015.

The average household income was around 32. 72 thousand L.E. It is evident from Table 2 that the average farm size of the non-adopter was 7.34 feddan while, it was only 6.68 feddan in the case of adopters.

Status of improved practices adoption

Among the respondent farmers, 64.7% were adopters of improved practices adoption and 35.3% were non-adopters, Table 3 showed that among the respondent farmers ,only five had adopted improved practices 7 years ago. After observing the success of this innovator of improved practices neighboring farmers also started to adopt improved practices. The results show that 19% of farmers adopted improved practices during the early years of improved practices promotion (5–6 years ago); the majority of farmers (44%) adopted improved practices(4–5 years ago), and only 13% adopted

Table 3. Status of improved practices adoption

Adoption decision	F	%
Not adopt (0)	53	35.3
Adopt (1)	97	64.7
Innovators(7 years)	5	5.2
Early adopters (5–6 years)	18	19
Early majority (4–5 years)	43	44
Late majority (3 years)	18	18.8
Laggards (<3 years)	13	13

Source: questionnaire data, 2015

Logit analysis of improved practices adoption

An important purpose of this research was to explore the important factors that influence farmers' decisions to adopt improved practices. To this end, logit regression analysis was performed (Table 4). The obtained log likelihood ratio is 46.37 and the chi-square statistic for the goodness of fit of the model is 194.48, significant at the 0.01 level. The pseudo R2 value of the model is 0.72 which reflect that the variables in the model are able to represent about 72 percent of the probability of farm households' decisions to

adopt or not to adopt agricultural improved practices .Thus, the overall model is significant and the explanatory variables used in the model are collectively able to explain the farmers' decisions regarding the adoption of improved practices the results of the adoption model indicate that ten variables: Age of household head, Education of household head, Farmer 'owns' plots with any recommended practice, Household income, Farmer heard of improved practices, Households' access to public extension services, Households' access to Sahl El Tina extension services, Farmer training, Perception on improved practices affect Improved practices adoption (at the 0.01 level).the Number of information Sources was significant at the 0.05 level, Age of household head was found to have a negatively relationship with the probability of adoption of improved agricultural practices (Table 4).

Table 4. Logit regression model estimates of coefficients associated with improved practices adoption

Variables	B	S.E	Wald	Sig	Exp(B)
Constant	0.604	0.171	12.521	0.00	1.830
Gender	1.937	0.660	8.623	0.231	6.939
Age of household head	-0.953	0.212	19.540	0.001**	0.910
Farmer marital status	0.778	0.655	1.447	0.229	0.445
Education of household head	0.240	0.067	2.632	0.02*	1.271
Farming experience of household head	-0.021	0.014	2.135	0.144	0.980
Number of household members	0.260	0.095	7.530	0.135	0.771
Active members	0.349	0.201	3.856	0.289	1.483
Dependent members	0.320	0.218	2.156	0.142	1.377
Farm size	0.134	0.077	2.975	0.085	0.0875
Farmer 'owns' plots with any recommended practice	4.602	0.585	61.796	0.00**	99.382
Household income	0.291	0.249	2.752	0.009**	1.112
Farmer off farm income	-1.072	0.709	2.288	0.342	0.130
Farmer heard of improved practices	3.494	0.541	41.685	0.008**	32.926
Households' access to public extension services	0.812	0.358	5.158	0.007**	0.444
Number of Information Sources	0.497	0.198	6.310	0.04*	1.644
Type of Information Source	0.059	0.158	0.138	0.710	0.943
Frequency of Extension Contacts	0.638	0.839	0.577	0.447	0.529
Households' access to Sahl El Tina extension services	2.278	0.395	33.260	0.004**	9.753
Farmer training	3.266	0.523	39.026	0.006**	26.215
Perception on improved practices	2.104	0.867	12.029	0.001**	8.865
log likelihood ratio			46.33		
chi-square			194.48		
R ²			0.72		

Note. **Significant at 1% level; *Significant at 5% level.

Source: questionnaire data, 2015

It was significant at the 1 percent level indicating some lack of receptivity of older farmers toward newly introduced technologies, the farm household level of education was had a positive relationship with the probability of adoption and significant at 1 percent level. The implication of this is that farm households with well educated members like to adopt modern agricultural production technologies than those without. This is consistent with the literature that education creates a favorable mental attitude for the acceptance of new practices. Access to information through extension services reduces the uncertainty about a technology's performance hence may change individual's assessment from purely subjective to objective over time thereby facilitating adoption. Related to this access to extension services was also found to be positively related to the adoption of improved agricultural practices and was found to be significant at 1 percent level. This means that farm households are more likely to adopt improved agricultural practices if they have access to extension services and have training also the results demonstrate that farmers' perception of improved agricultural practices is very significant in terms of improved agricultural practices adoption decisions. It is logical to expect that if a farmer has a positive perception of improved agricultural practices. Next to the perception, household income was an important factor in terms of adoption decisions. This reflects the fact that farmers with higher income are more likely to adopt risky technology compared with those with a low income.

CONCLUSION

The variables that affecting the adoption of improved agricultural practices were age of household head, education of household head, farmer 'owns' plots apply any of the recommended practice, Household income, Farmer heard of improved practices, households' access to public extension services, households' access to Sahl El Tina extension services, farmer training, perception on improved practices were the significant variables that affect the decisions of farm households in Sahl El Tina to adopt improved agricultural practices.

REFERENCES

- Boahene, K., Snijders, T.A.B. & Folmer, H. (1999). An integrated socio-economic analysis of innovation adoption: The case of Hybrid Cocoa in Ghana. *Journal of Policy Modeling*, 21(2), 167-184
- Caswell, M., Fuglie, K., Ingram, C., Jans S. & Kascak C. (2001). Adoption of Agricultural production practices: Lessons learned from the US. Department of Agriculture Area Studies Project. US Department of Agriculture, Resource Economics Division, Economic Research Service, Agriculture Economic Report No. 792. Washington DC

- Harper, J. K., Rister, M. E., Mjelde, J. W., Drees, B. M. & Way, M. O. (1990). Factors influencing the adoption of insect management technology. American Journal of Agricultural Economics, 72(4), 997-1005
- Hill, L. & Kau, P. (1973). Application of multivariate probit to a threshold model of grain dryer purchasing decisions. American Journal of Agricultural Economics, 55, 19-27.
- McNamara, K. T., Wetzstein M. E., & Douce G.K. (1991). Factors affecting peanut producer adoption of integrated pest management. Review of Agricultural Economics, 13, 129-139.
- Nkonya, E., T. Schroeder, & Norman D. (1997). Factors affecting adoption of improved maize seed and fertilizer in northern Tanzania. Journal of Agricultural Economics, 48(1), 1-12.
- Pindyck, S. R. & Rubinfeld, L. D. (1998). Econometric Models and Economic Forecasts, 4th Edition. New York: McGraw-Hill.

العوامل الاقتصادية والارشادية المؤثرة على تبني الممارسات الزراعية المحسنة في

شبه جزيرة سيناء

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يؤدي تبني المزارعين للتقنيات الزراعية الحديثة دورا بارزا في جعل الزراعة المصرية أكثر إنتاجية ، ويستهدف البحث تحديد تصور مزارعي سهل الطينة المبحوثين لأرباحية استخدام الممارسات الزراعية المحسنة ، وتحديد درجة تبني هؤلاء المزارعين لهذه الممارسات وتطبيقها في مزارعهم ، وذلك باستخدام بيانات تم جمعها من ١٥٠ مزارع تم اختيارهم من مزارعي سهل الطينة بطريقة عشوائية وقد تم استخدام الأساليب الاحصائية الوصفية والمعاملات الاحصائية المختلفة مثل النسب المئوية والمتوسطات الحسابية ونموذج الانحدار اللوجيستي في تحليل البيانات واستخلاص النتائج .
وقد أشارت نتائج تحليل نموذج الانحدار اللوجيستي الى أن عمر المزارع ، والمستوى التعليمي للمزارع ، وإمتلاك المزارع لقطعة أرض مطبق بها أيا من الممارسات الموصى بها ، ومعرفة المزارع بالممارسات المحسنة ، وعلاقة المزارع بالخدمات الارشادية العامة ، وعلاقة المزارع بالخدمات الارشادية الموجودة في سهل الطينة ، وتدريب المزارع ، وتصور المزارع لأرباحية الممارسات المحسنة كلها من العوامل الأكثر تأثيرا على تبني الممارسات المحسنة وذلك عند مستوى معنوية ١% ، بينما تأثر تبني المزارعين للممارسات الحديثة بعدد مصادر المعارف والمعلومات الزراعية التي يستقى منها المزارع معلوماته عن الممارسات المحسنة وذلك عند مستوى معنوية ٥% ، ومما سبق يتضح أن كل العوامل السابقة هي المؤثرة على قرار تبني المزارع للممارسات الزراعية المحسنة في منطقة سهل الطينة بشبه جزيرة سيناء.
الكلمات المفتاحية: (التبني - الممارسات الزراعية المحسنة - تحليل الانحدار اللوجستي - سهل الطينة) .