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Factors Affecting Smallholder Farmers' Perception Regarding Their Use of Soil Conservation Practices: Evidence from Farming at Qamata Irrigation Scheme, South Africa

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ABSTRACT Using a case study research design, this paper evaluated factors determining smallholder farmers' perceptions on the use of soil conservation technologies at Qamata Irrigation Scheme, Eastern Cape in South Africa. According to the empirical results, perception is highly relevant in adoption decision-making, interacting significantly positively with age, marriage, farmers' education, incomes, awareness and participation in extension services. The indication is that older, more educated, married farmers with increased income have more likelihood of improved perception. Further, farmers who are aware of the soil technologies introduced by extension services are also those who participate in their use, thus affirming the significance of perception in the adoption process. The suggestion therefore is that encouraging farmers' education and incomes, awareness and participation in extension programs, as well as encouraging more youth to take up farming, will increase positive perceptions, consequently leading to improved adoption by farmers.

INTRODUCTION

Although perception is somewhat subjective, it is nevertheless a major factor responsible for the behavior of individuals, including farmers. Perception could be defined as the views individuals have about a certain problem, new idea or a newly introduced technology. According to Meijer et al. (2015), farmers' perception concerning a technology is tightly related to their knowledge of that technology. Although knowledge here is defined as factual information and comprehension of the operations of the new innovation and what it offers (Meijer et al. 2015), this is however, arguable because one may not need facts and operational understanding for knowledge to lead to perception. This is why there is positive and negative perception. Most times, what leads to negative perception is inaccurate understanding about a new technology, while positive perception can be the result of accurate understanding. Therefore, the knowledge inferred in the above is said to be mere awareness. Meijer et al. (2015) therefore define perception as farmers' views regarding any new technology based on their felt needs and previous or past experiences.

The fact that positive perceptions precede technology adoption is well supported in literature. Meseret (2014) argues that perception of soil degradation factors and the way to avoid them is a necessary requirement for farmers' investment in conservation measures. Ervin and Ervin (1982) state that once a problem due to erosion is perceived the farmer then chooses to adopt or not adopt a conservation practice(s). Asafu-Adjaye (2008) also maintains that it is only after a positive perception of problems due to soil erosion that the decision on a certain soil conservation practice(s) is made by farmers. Citing a number of studies (Shiferaw and Holden 1998; Mbaga-Semgalawe and Folmer 2000), Amsalu and De Graaff (2007) emphasize that the effect of farmers' perception of erosion problems on their decisions to adopt conservation measures is well documented in the literature. In

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this regard, Knowler and Bradshaw (2007) also citing several literature (Gould et al. 1989; Napier and Camboni 1993; Traore et al. 1998), argue that farmers' perception of soil problems is frequently found to correlate positively with soil conservation practice adoption like no-till technology.

According to Ighodaro (2012), positive perception is of high importance in social science research, because it assists in explaining farmers' problems as they affect them. Farmers who hold positive perceptions of problems are said to be more willing to invest in conservation efforts (Amsalu and De Graaff 2007). In fact, Sidibe (2005) posits that farmers who have a good perception of soil degradation are most likely to adopt the use of Zai (a water and soil conservation technique introduced for soil conservation in the northern areas of Burkina Faso) more than those who lack such perception. Legesse et al. (2013) argue that an understanding of perception and individual households or communities' adaptation modes in an area does not only provide better location-specific insights, but it also assists to generate additional information important to policy and interventions to address challenges of sustainable development. Farmers' perception of soil or land degradation by erosion, as suggested by Zegeye et al. (2010), reporting De Graaff (1993), is a principal social factor that is relevant when considering options to decide to control soil losses.

Similarly, the perceived extent of actual or potential physical erosion on a farm is capable of motivating the owner of the farmland to use a control measure (Asafu-Adjaye 2008). In other words, perception may be regarded as a vital factor that propels or impedes appropriate adoption of recommended innovations for change. According to Duvel (1991), inappropriate or non-adoption of recommended practices is the main reason for many of the agricultural problems and the poor efficiencies associated with agricultural production and productivity today.

The choice to adopt or reject any particular innovation actually begins from the level of perception that a farmer has of a problem that requires the adoption of a mitigating measure, as well as of the proposed technology. According to the literature, perception, need and knowledge are the mediating or intervening variables directly determining an individual's behavior, through which the effects of all other independent variables are reflected (Duvel 1991; Tolman 1967). However, Ighodaro (2016) argues that perception is not only important as one of the mediating variables responsible for human decisions, but is also the main mediating variable. As such, it is regarded as the most important variable determining human behavior. Meijer et al. (2015) seems to be in support of this view. They suggest that the process of individual adoption is that, individuals get knowledge of a new innovation, form a view or perception about it, and the combined effect of their knowledge and perception is what gives rise to the attitude of the individual, which to some extent is not different from the view held in this paper. According to this paper, attitude, as presented by Meijer et al. (2015), is a perception variable.

As hypothesized by Ervin and Ervin (1982), and adapted by Asafu-Adjaye (2008), the process involved in a farmer's decision to adopt soil conservation practices begins with a perception of soil erosion (degradation). In their view, once the problem has been perceived, the farmer then adopts a soil conservation practice(s). This decision is affected by a number of factors, including personal, institutional, physical and economic factors. In addition, the level of perception is determined by farmers' personal characteristics (such as age, education, marital status, gender) and the physical characteristics of the farmland (for example, size of farm). Furthermore, institutional factors such as farmers' participation in extension services also play a part in the relationship in that they assist in increasing farmers' awareness of the problem. Economic factors such as farm income and off-farm income are also important in that they provide suitable conditions for farmers' decisions.

Several studies abound in the literature on factors, which influence individual behaviors regarding the adoption of new innovations. But there seems to be very little information on factors that affect perception of individuals, especially smallholder farmers, regarding their adoption of new technologies, with specific reference to soil conservation technologies. Supporting this, Meseret (2014), citing Stahl (1990), Million (1996) and Azene (2001), comments that insufficient attention has been given to examining factors (like socioeconomic, institutional, and biophysical), which affect perception of farmers regarding their adoption of soil and water conservation (SWC) technologies. A few examples of

close-related studies are studies by Ervin and Ervin (1982), Asafu-Adjaye (2008), Apata (2011), Gebremedhin and Scott (2001), Meseret (2014), and Mudombi (2011). Apart from Meseret (2014), Gebremedhin and Scott (2001), Ervin and Ervin (1982) and Asafu-Adjaye (2008), whose studies are more related to the subject of this paper, others are based on issues relating to climate change and variability, which further emphasize the dearth of information on the subject of the current paper.

Based on the foregoing, Ighodaro (2016) argues that perception plays a significant role prior to any improved adoption decision-making by farmers, especially smallholders. The study proposes that a careful analysis and understanding of the factors that influence farmers' perceptions regarding an introduced technology, the farming problem, which requires a technology, and the extension officer promoting the technology is required if adoption expectations are to be realized. In the current paper, the emphasis is on analyzing the first aspect, that is, farmers' perception of an introduced technology.

Objectives

1. To assess farmers' socioeconomic and demographic characteristics in the study area.
2. To evaluate the factors influencing smallholder farmers' perception regarding (their use of) the soil conservation practices introduced by extension officers in South Africa, using the farming situation at the Qamata Irrigation Scheme in the Eastern Cape as a case study.

MATERIAL AND METHODS

The study was conducted at the Qamata Irrigation Scheme in Intsika-Yethu Local Municipality, Eastern Cape, South Africa. The Qamata Irrigation Scheme was established in 1960 but became operational in 1972. It focuses mainly on the cultivation of crops to address the hunger and food insecurity wreaking havoc in the surrounding communities, resulting especially from the low level of rainfall in the area.

The study adopted a case study research design, for which 70 smallholder farmers at the Qamata Irrigation Scheme, Eastern Cape, and an extension officer were selected using purposive sampling as well as focus group interviews. The extension officer was chosen purposively, while smallholder farmers at the scheme were selected using the latter method.

Data collected from farmers in the study area was analyzed using the Statistical Package for the Social Sciences (SPSS) version 23. Techniques of analyses include basic descriptive statistics (like frequencies, percentages, and means) and a multiple regression analysis model (Table 1). Although other regression models were generally considered for analyzing the factors of adoption, the multiple regression analysis model was adopted because the dependent variable was a continuous variable. As a predictor model, the multiple regression analysis was used to predict the factors that influence smallholder farmers' perception of soil conservation practices introduced by extension officers. Annor-Frempong and Duvel (2009), in their study, posit that descriptive statistics are the first step required to determine the distribution of variables and to summarize large amounts of data. However, to test for relationships that exist between and among variables, other higher statistical techniques are required such as the multiple regression model (Annor-Frempong and Duvel 2009).

Model Specification

According to Laerd Statistics (2013), multiple regression analysis is used when there is a need to predict the value of a variable (called the dependent variable or criterion variable) based on the value of two or more other variables (called the independent or explanatory or regressor variables). Multiple regression analysis models take the form indicated below:

$y=\alpha+\beta x+\varepsilon$ ..... (1)

Where, y = Smallholder farmers' perception of soil conservation practices introduced by extension

X = Exogenous input data of farmers' perception (independent variables)

α = Intercept of y

B = Partial regression coefficient = Parameters to be estimated

ε= Stochastic error term

Therefore, the equation is specified as follows:

$Y = \beta 1AGE + \beta 2EDUCATE + \beta 3MARRIAGE + \beta 4GENDER + \beta 5EXP + \beta 6FARMSIZE + \beta 7LANDOWN + \beta 8SOURLAND + \beta 9FARMINC$

$+\beta 10OFFFINC+\ \beta 11TOTALINC+\beta 12HHSIZE+\beta 13FARMAWAR+\beta 14PARTEXT+\ \beta 15FARMTYPE+\beta 16LENTFARM+\beta 17CROPPROD$ ....(2)

Description and Units of Variables Used in the Model

In this paper, a multiple regression analysis model was used to predict the factors that influence smallholder farmers' perception of the use of soil conservation practices introduced by extension officers in the study area (Table 2).

RESULTS

Socio-economic and Demographic Profiles of Farmers in the Study Area

In any research study, individuals' personal and demographic characteristics cannot be overlooked because they are independent and indirect factors of behavioral change and decision-making. Examples of such variables, according to Bradmore (2004), are age, gender, income level, marital status, and educational level. In the opinion of Shaw and Constanzo (1970), they are very important because they assist in showing patterns of individual behaviors. In support of this, Lategan and Van Niekerk (2007) state that analyzing such patterns may provide a vehicle for understanding the decision-making processes of any population being studied and their resultant production methods.

In this research, the farming population consists of older people (60%) over the age of 55, with just one percent of the participants representing the youth at 18 to 35 years old. The education level of farmers is low, with only three percent exceeding Grade 12, while twenty percent have no formal education. The indication

Table 1: Description, units and expected signs of variables used in the study

Variables		*Description*	*Unit of measurement*
	Dependent Variables		
Y_i	VIEWREC	Farmers' perception on recommended practices by extension	1= Good; 2= Effective; 3= Very effective; 4= I can recommend and train others to use it; 5= It preserves our land; 6= Others
	Independent Variables		
X_1	AGE	Age of farmer	Years
X_2	EDUCATE	Education levels of farmer	Years
X_3	MARRIAGE	Marital status of farmer	1=Married; 2= Single; 3= Divorced; 4= Widow/widower
X_4	GENDER	Gender of farmer	0= Male; or 1= female
X_5	EXP	Farm experience of farmer	Years
X_6	FARMSIZE	Size of farm	Hectares
X_7	LANDOWN	Land ownership	0= Yes or 1= No
X_8	SOURLAND	Sources of land	1= Government; 2= Rented; 3= Inheritance; 4= Purchase; 5= Community; 6= Others
X_9	FARMINC	Income from crops	Rand
X_{10}	OFFFINC	Off farm income	Rand
X_{11}	TOTALINC	Total income of farmer	Rand
X_{12}	HHSIZE	Household size	Numbers
X_{13}	FARMAWAR	Farmer's awareness of soil conservation practice	0= Yes; or 1= No
X_{14}	PARTEXT	Is the farmer attending extension programmes?	0= Yes; or 1= No
X_{15}	FARMTYPE	Farming type of farmer	1= Smallholder; 2= Commercial; 3= Others
X_{16}	LENTFARM	Time of continuous farming on same piece of land	Years
X_{17}	CROPPROD	Level of crop yield	1= Insufficient for own consumption; 2= Just enough for own consumption; 3= Just enough for own consumption and ceremony; 4= Sufficient excess for limited sale; 5= Sufficient excess for expanded sale

thus is that farming decisions are left in the hands of older and less educated people, which suggests a precarious situation for farming in South Africa. The farming population had a gender bias, consisting of more males (60%) than females (40%), and this does not reflect the global advocacy for gender equality of which South Africa is one of the main proponents. Also, it does not reflect the character of the overall population of the Eastern Cape, in which females are said to outnumber males slightly.

The majority (90%) of farmers in the study area had farms of no more than five hectares in extent, indicating that in the main the level of farming at the scheme comprised smallholdings. Moreover, ninety percent of farmers own their land, which seems to indicate a favorable environment for adoption practices in the study area. In terms of sources of land for farming, the majority of the farmers (21%) obtained their land by inheritance, while only a very few (4%) obtained their land through rent or lease, and such ownership would seem to be favorable for adoption decisions. Moreover, over sixty percent of farmers have cultivated the same piece of land continuously for more than 10 years, and this is long enough for signs of soil deterioration to have set in which eventually motivates farmers to adopt soil conservation practices. In addition, half (50%) of the farmers have been in farming for over 18 years, which indicates that farmers in the study area have reasonable experience.

Determinants of Farmers' Perception of the Use of Soil Conservation Practices Introduced by Extension Officers

As indicated, although perceptual measurement is somewhat subjective, it plays a vital role in individuals' decision-making processes. Hence, this paper, as suggested by authors like Duvel (1991), proposed that an additional stage, the perception stage, should be added to the five stages of the adoption process proposed by Rogers (1983). This is because, after the knowledge or awareness stage of the adoption process, depending on the information, the source of the information and how the information was presented to the individual in question, a perception is created in the mind of the individual, which eventually leads to the persuasion stage of Rogers' (1983) adoption process. This is why the first step for a clear understanding of the adoption process of farmers in the study area was to measure how their perception of the various soil conservation practices introduced to them by the extension officers interacted with their decision to adopt such practices. As such, seventeen (17) independent variables (x) were entered into the multiple regression analysis model, where y stands for the dependent variable, as presented in equation (2). Following a backward elimination process and a multi-collinearity check on the variables of the regression model, the results of the analyses are as presented in Tables 2 and 3.

Table 2: Correlation matrix of various adoption variables of study

	AGE	*MAR*	*EDU*	*SIZ*	*TYP*	*HHS*	*LIV*	*CRO*	*INCR*	*OFF*	*TOT*	*EXP*	*AWA*	*EXT*
AGE	1													
MAR	.024	1												
EDU	-.530	.062	1											
SIZ	.028	.216	.069	1										
TYP	.017	.159	.004	-.016	1									
HHS	-.185	.041	.173	.045	.017	1								
LIV	-.023	-.186	-.123	-.140	-.012	.171	1							
CRO	-.018	-.099	-.018	.050	.233	.153	.304*	1						
INCR	-.047	.030	.118	.038	.045	.046	.120	.217	1					
OFF	.321	-.109	-.330	.307	.073	.205	.097	.099	.096	1				
TOT	.217	-.054	-.130	.198	.083	.177	.152	.240*	.738	.701**	1			
EXP	.092	-.059	.158	.107	.052	-.116	.029	-.105	.035	-.031	-.015	1		
AWA	.126	-.093	-.227	-.072	-.055	-.230	.015	-.112	-.213	.045	-.117	.220	1	
EXT	.100	-.038	-.208	-.104	.121	-.180	-.057	-.189	.158	.022	.127	.211	.367	1

Note: EDU= Education; SIZ= Size of farm; TYP= Type of farming; HHS= Household size; LIV= Level of livestock production; CRO= Level of crop production; INCR= Income from crops; OFF= Off-farm income; TOT= Total income; EXP= Years in farming; AWA= Awareness of soil conservation; EXT= Participation in extension

Checking for multi-collinearity among independent variables is the main assumption needed in order to run a regression analysis. As such, a correlation matrix of independent variables was conducted, as presented in Table 2. As expected, age (AGE) has a fairly high negative correlation (r = -0.530) with education (EDU), indicating that older farmers tend also to be less educated. This is supported by Asafu-Adjaye (2008), whose correlation coefficient (r = -0.50) for the relationship between age and education was similar to that of this paper. Off-farm income (OFF) has a high positive correlation (r = 0.701) with total income (TOT), indicating that farmers with high off-farm income have high total income, and vice versa. Apart from the aforementioned, the correlation coefficients in the remaining cases are low, with the absolute values of the majority (almost 75%) falling below 0.2, thus suggesting that the problem of multi-collinearity is not serious among the variables in this model.

According to the results (see Table 3), the adjusted R^2 is about 0.5, which does not indicate a serious level of multi-collinearity among the variables. Also, the overall significance of the model indicates a level of 0.017 ($P < 5\%$), implying the goodness of fit of the model in terms of the study variables. Based on findings, the age (AGE), marital status (MARRIAGE) and education (EDUCATE) of farmers were found to be significantly positive in impacting on farmers' perception of soil conservation practices in the study area. Also, having a significant impact are the level of livestock production (LIVEPROD), income from agricultural crops (INCOMAGC), off-farm income (OFFINCOM) and farmers' overall income (TOTALINC). Similarly, significant were farmers' years of experience (FARMYRS), awareness of soil conservation practices (AWARESCP), as well as use of soil conservation practices (participation in extension recommendations for soil conservation) (PARTEXT).

DISCUSSION

According to the results (see Table 3), farmers' age, marital status and education were positively significant in the analysis, indicating that these variables have a greater likelihood of increasing farmers' perception positively with respect to the soil conservation practices introduced by extension officers. These are also well supported in the literature. Asafu-Adjaye (2008) discovered in his study on factors affecting the adoption of soil conservation measures, a case study of Fijian cane farmers, that age and education were positively related to perception of soil erosion in the area. According to this finding, older farmers are more likely to perceive the soil erosion problem in the area. In support of this, Ervin and Ervin (1982) found that educa-

Table 3: Regression estimates for role of farmers' perception on adoption

Variables	*Unstandardized coefficients*		*T*	*Sig.*	*Collinearity statistics*	
	B	*Std. error*			*Tolerance*	*VIF*
Constant	-3.967	3.293	-1.205	.246		
AGE	.944	.445	2.124	.050**	.412	2.427
MARRIAGE	1.114	.486	2.293	.036**	.437	2.287
EDUCATE	1.013	.295	3.430	.003***	.440	2.275
SIZEFARM	.422	.369	1.146	.269	.550	1.817
FARMTYP	-1.397	1.375	-1.016	.325	.431	2.321
HHSIZE	.410	.249	1.644	.120	.499	2.002
LIVEPROD	-.628	.274	-2.297	.035**	.709	1.410
CROPPROD	-.360	.280	-1.287	.216	.726	1.377
INCOMAGC	.000	.000	2.666	.017**	.094	10.628
OFFINCOM	.000	.000	2.266	.038**	.089	11.293
TOTALINC	.000	.000	-2.875	.011**	.042	23.654
FARMYRS	-.590	.315	-1.872	.080*	.488	2.050
AWARESCP	2.127	.783	2.717	.015**	.593	1.687
PARTEXT	1.833	.826	2.220	.041**	.533	1.876
R	.854					
R^2	.730					
Adjusted R^2	.493					
Overall sig.	.017					

tion was significantly and positively influential at p<1 percent on the perception of the degree of soil erosion problem, as well as subsequent adoption of soil conservation practices in Monroe County, Missouri.

In addition, farmers' marital status was found to be positively related to farmers' perception of soil conservation practices introduced by extension officers. This is as expected. Wood et al. (2007) suggest that a rapidly growing body of literature indicates that marriage as a factor may have a broad range of benefits, including improvements in an individual's economic wellbeing, their mental and physical health, and the wellbeing of their children, which in turn has an impact on appropriate decision-making. Similarly, farmers' education level was significantly positive in association with farmers' perception of soil conservation practices. This also was as expected, because the kind of knowledge a person has can have a significant impact on appropriate decision-making. Hence, Bonabana-Wabbi (2002), citing Waller et al. (1998) and Caswell et al. (2001), maintains that education creates a favorable mental attitude for the adoption of new technologies especially of information-intensive and management-intensive practices. Moreover, more educated farmers are said to have greater access to information on soil conservation measures (Asafu-Adjaye 2008).

In this paper, the level of livestock production was negatively related to farmers' perception of soil conservation practices introduced by extension officers. The indication of this is that the more the level of production of livestock owned by farmers increases, the lower their perception of practices recommended by extension officers, and the more their perception favors their own practices for soil conservation. This is unexpected because, as expected, the better the level of livestock production, the better the level of income and ultimately the more socioeconomically disposed a farmer is toward any new innovation introduced by change agents. Another reason is that for the farmers in the Eastern Cape, livestock is crucial with respect to their agricultural and food security strategies. According to the National Department of Agriculture (NDA 2007), the Eastern Cape is the premier province for and home to more livestock than any other province in South Africa. One reason for the negative coefficient of this variable in the paper could be because the variable was actually calculated as off-farm income in the paper. This was because, although the farmers engage in livestock production on their own, it does not form part of the activities undertaken by the irrigation scheme where the data for this paper was collected.

Also, positively significant in influencing farmers' perception of soil conservation practices introduced by extension services are incomes derived from agricultural crops and off-farm sales, as well as the overall income of the farmer at five percent level of significance. This is as expected because income, from whatever source, means farmers are empowered to overcome poverty, and their purchasing power is enhanced even with regard to the technologies needed on-farm. However, the magnitude of the coefficients of the three income sources was very small, indicating that they all exert relatively little influence on farmers' perception of soil conservation practices by extension officers. This agrees with the literature. Asafu-Adjaye (2008) posits in his paper that because the coefficient for net farm income was very small, it suggests that the variable exerted a relatively small influence on perception of soil erosion among the Fujian cane farmers.

Moreover, the number of years farmers have been involved in farming, which was used as a measure of farmers' experience in the paper, was negatively significant (a low significance level of 10%) in its influence on farmers' perception of soil conservation practices by extension practitioners. This is unexpected because the expectation was that the more experience a farmer has, the more likely he will be to perceive and adopt soil conservation practices introduced by extension services. However, one factor that may have influenced this result is that farmers were required at some stage to compare their own practices with those introduced by extension services. Perhaps, through experience, they have proven their own practices, unlike those of extension services. This may suggest that they have risk-averse tendencies, which is congruent with the literature. Also, other factors like insufficient information regarding practices introduced by extension services may also have had an impact on the relationship. However, the results of this paper, regarding the impact of experience on perception, are similar to those of Asafu-Adjaye (2008). The differences lie in the fact that, although the coefficient was positive

for the impact of experience on perception for Asafu-Adjaye, as it is in this study, the impact was not statistically significant for the former unlike in this study.

Finally, the results of this study also reveal that awareness of soil conservation practices by extension officers and participation in extension programs on soil conservation were both statistically significant in their influence on farmers' perceptions of the soil conservation practices of extension agents. This was as expected. In this model, farmers' awareness was coded as a binary response variable, where awareness was coded '1', and non-awareness was coded '0'. Interestingly, the sign of regression coefficient is positive, indicating that the farmers who claimed awareness of the soil conservation practices introduced by extension services also have more and as such participated in their use better perceptions of the soil conservation practices, which also is congruent with the literature. Rezvanfar et al. (2009), in their study on factors affecting the adoption of sustainable soil conservation practices among wheat growers, discovered that the level of farmers' awareness of the effects of conservation practices correlated positively and significantly with their eventual adoption.

CONCLUSION

This study sought to determine the factors, which influence farmers' perception regarding the use of soil conservation technologies in South Africa, using the case of smallholder farmers at the Qamata Irrigation Scheme, Eastern Cape. According to the empirical results, perception was seen as very relevant in adoption decision-making, interacting significantly positively with eight of the study adoption variables. These variables are age, marital status, farmers' education levels, income (from crops, off-farm and overall), awareness of soil technologies and extension participation. The indication therefore is that older farmers (reflecting measures of experience), more educated and married farmers, and those with increased income from whatever source, have more potential for improved perception. A further indication is that farmers who are aware of the soil technologies introduced by extension services are also those who participate in the use of such practices, thus establishing the significance of perception in the adoption decision-making process regarding their use of soil technologies.

RECOMMENDATIIONS

Based on this, it is therefore recommended that improving farmers' education and incomes, their awareness and participation in extension programs, as well as encouraging more youth to take up farming, will lead to improved perception, consequently leading to improved adoption by farmers. Furthermore, it is recommended that efforts to improve the adoption of agricultural technologies by farmers should first be directed at improving farmers' perception, because improved perception will indirectly involve an improved adoption decision-making process on their part. In addition, it is proposed that, unless the factors prevailing on farmers' perception have been carefully analyzed and understood, no conclusions should be drawn regarding the failure of any particular technological intervention process. Accordingly, an analysis of the factors influencing farmers' perceptions could assist to a great extent in redirecting the course of the adoption process for any particular farmer at any particular time.

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