

Causal Analysis of Environmental Behavior of Egyptian Farmers

Mokhtar Abd-Ella *, Rateb Soma ** and Mohammed Ebad-Allah *

(*) Agricultural Economics Department, Faculty of Agriculture-Tanta University, Tanta, 31527, Egypt.

(**) Agricultural Economics Department, Faculty of Agriculture- Kafr El-Sheikh University, Kafr El-Sheikh, 33516, Egypt

Mokhtar.abdella@agr.tanta.edu.eg rateb.sawmaa@agr.kfs.edu.eg Mohammed.ebadallah@agr.tanta.edu.eg

Abstract: Human environmental behavior is a result of human-environment interaction. This interaction faces a wide variety of environmental problems. Solving these problems require understanding the environmental behavior. Our study aimed to develop and test a causal model of environmental behavior of Egyptian farmers. Data were collected from a cluster sample of 310 male land holders in Kafr El-Shiekh Governorate through personal interviews. Results showed that the three variables of level of living, mass media exposure, and environmental attitude had significant direct causal effects on environmental behavior. The suggested model may provide usefulness in explaining the environmental behavior of Egyptian farmers in Kafr EL-Shiekh Governorate.

[Mokhtar Abd-Ella, Rateb Souma and Mohammed Ebad-Allah. **Causal Analysis of Environmental Behavior of Egyptian Farmers.** *World Rural Observ* 2012;4(3):18-26]. ISSN: 1944-6543 (Print); ISSN: 1944-6551 (Online). <http://www.sciencepub.net/rural>. 3

Key Words: Human Environmental Behavior, Causal Model, Egyptian Farmers, Egypt.

1. Introduction

The environment has attracted increasing attention from both scholars and officials. This is mainly because of the steady decline of environmental quality during the last decades. Accordingly, most individuals acknowledge that something must be done to preserve the natural environment (**Womack, 2000**). The first attempts to deal with environmental problems focused on the technical aspect as the origin of those problems and the economic aspect as the impact of them. Later attempts outlined and stress the social aspect of environmental problems. Such concepts as public attention, ecological behavior, environmental awareness, environmental attitudes and environmental behavior have been introduced in environmental studied. Consequently, environmental attitudes have become an area of research in environment sociology and environmental psychology (**Kalantari et al., 2007 and Dunlap and Jones, 2002**).

Previous research made it clear that environmental problems are people's problems. Humans cause environmental problems and are affected by them. Therefore, solving environmental problems requires human action. Such human action would be directed to changing human conduct as well as alleviating environmental problems (**Dunlap and Jones, 2002**).

Rural people in Egypt and in many developing countries depend directly on environmental resources for sustenance. **White and Hunter (2005)** reported that environmental resources in many developing countries are actually threatened and the desire for

economic growth is manifest. This situation makes it clear that environmental rehabilitation is urgently needed. Broad concern with environmental issues is a pre-requisite of environmental rehabilitation. But the extent to which this pre-requisite is met is not clear. Little is known about the relative concern with environmental issues among residents of developing countries.

In rural areas of Egypt, air pollution, water pollution and soil degradation are common. **Haas (1990)** stated that most environmental problems in Egypt stem from stretching the limited resource base in order to accommodate the economic of the rapidly growing population. Farming activities are characterized by intensified production using large amounts of chemical fertilizers and pesticides. Such practices lead to soil degradation and decreased productivity. The annual cost of the deterioration of natural resources and the depletion of ecosystems is estimated to be \$5.5 billions (**World Bank, 2002**). Evidence also indicates that environmental risks and hazards to which citizens are exposed in their daily life are progressing at a rate that threatens to outpace restorative action (**Planning National Institute, 2005**). Strict legislations and regulations alone cannot solve the issue posed by environmental issues. Similarly, overseas development assistance cannot do the job. What is needed is an innovative mix of policies that induced changes in human behavior in the areas of production and consumption (**Planning National Institute, 2005**). Such innovative mix has to rely on the participation of local residents. It is expected that farmers acceptance of the environmental policies will be the main motivator or

repressor of participation. It is, therefore, essential to carry out empirical research to identify the environmental behavior of farmers.

The main objectives of this study are:

- 1- To develop a causal model of environmental behavior.
- 2- To test the developed model through the analysis of data collected from a sample of Egyptian farmers.
- 3- To identify the relative importance of the model component variables in explaining environmental behavior.

Conceptual Framework

Concern with environmental behavior is common among scholars belonging to different academic disciplines including psychology and sociology. Psychologists have been emphasizing the relationships between psychological variables and environmental behavior (e.g., **Ajzen and Driver, 1992 and 1991 and Ajzen and Fishbein, 1980**). Sociologists, on the other hand, have been emphasizing the relationships between demographic and socio-economic variables and environmental behavior (**Gould et al., 1989**). Neither discipline claims to encompass the whole phenomenon studies. What is needed is a wider perspective that incorporates the viewpoints of the two disciplines in a unified and more comprehensive model (**Gaugnano et al., 1995; Stern and Oskamp, 1987; Hines et al., 1986/1987 and Van Liere and Dunlap, 1980a**).

It seems that causal modeling is a plausible means of combining the psychological and sociological as possible determinants of environmental behavior. Causal modeling as specified by sociological methodologists (i.e., **Duncan, 1966**) is based on several assumptions, namely, relationships between variables in the model are linear, the model explains the total variance in every internal variable in the model and an additional path is added to take care of this point for each internal variable, and that variables in the model can be temporally or causally ordered.

With the above assumption in mind, the researchers specified two categories of variables. The variables that are thought to be causing the other variables are called the external variables in the model. The external variables may be used only as independent variables as the research has no intention to explain them. The second category of variables is those variables that the researchers intend to explain them. Those variables are called the internal variables in the model. The internal variables are then ordered according to variable scientific evidence with the

target variables being the last. The outcomes may be presented in a diagram on which causal relationships are presented with arrows indicating the direction of causality. The model is then translated into a series of simultaneous equations. Those equations are then imposed on the data and the results are located on the model.

In this study, it is thought that the sociological variables are the external variables in the model. An individual with specific sociological variables gets in contact with the environment; this contact may stimulate his psychological entity to interact with the environment. Ultimately, his environmental behavior will be outcome.

Six sociological variables are specified as external variables in this study. Those are age, farm size, income, level of living, mass media exposure and membership in environmental organizations. Previous studies reported that each of the said external variables is impacting environmental behavior.

The relationship between age and environmental behavior in the literature seems to be inconclusive. Several researchers reported positive relationships between age and environmental concern (**Furman, 1998 and Devkesen and Derksen and Gartrell, 1993**). On the other hand, some studies reported negative relationships (**Arcury and Chirstenson, 1990; Mohai and Twigt, 1987 and Van Liere and Dunlap, 1980b**). The literature seems to emphasize that age has always affected environmental behavior. The direction of the relationship may be decided by the issues included, the social structure in the society studies, and the range of age of study samples. **Womack (2000)** mentions that young people tend to disassociate themselves from environmental concern. It is stressed here that that argument is particularly in traditional rural communities with patriarchal authority where young people are neither expected nor required to get involved when older are there. Other scholars argue that old people have no hope to benefit from environmental rehabilitation efforts and lead them to shy away from such efforts (**Van Liere and Dunlap, 1980b**). It is thought that age of Egyptian farmers will have a positive impact on environmental behavior.

Farm size has core significance in rural Egypt. Farm size reflects two major aspects of rural life. On one hand, dependence on farming to meet life expenses tends to increase as farm size increases. On the other hand, farm size represents the main resource base to be cared for. Both aspects represent probable motives for proper environmental behavior. **Hardi and Whittaker (1999)** stated that production practices on small farms are less environmentally damaging than those on large farmers. Their results

indicated that the correlation between farm size and environmental contaminants was found to be weak. **Tucker and Napier (2001)** indicated that farm size would be positively correlated with perceived agricultural pollution risk. **Buttel et al. (1981)** found that farm size to be negatively related to concern about pollution from agricultural chemicals. In view of the plausible theoretical argument, it is expected that farm size will have a positive impact on environmental behavior in this study.

Level of living, may also be positively related to environmental behavior. It has been argued that concern with the environment comes next to meeting basic human needs (**Inglehart, 1990**). This means that people enjoying higher levels of living tend to have better environmental behavior. It is expected that level of living will have a positive impact on environmental behavior in this study.

Mass media exposure is the most influential means of acquiring awareness about the environmental. Therefore, environmental awareness increases as mass media exposure increases. If awareness is of any utility, it will lead to proper environmental behavior. **Lichtenberg and Zimmarman (1999)** found that farmers who placed greater importance on information from new media tend to express greater environmental concern. Available research reports support a positive relationship between mass media exposure and environmental behavior. It is expected that mass media exposure will have a positive impact on environmental behavior in this study.

Membership in voluntary organizations provides opportunities for individual to take initiative action in many subjects, including the environment. It also provides a channel to collaborate individual effort (**Patchen, 2006**). It is expected that membership in voluntary organization will have a positive impact on environmental behavior in this study.

Income is crucial variable in rural areas, particularly with regard to the environment. Low-income people, derived by life necessities are expected to pay no attention to environmental affairs. Therefore, only the relatively high-income persons can develop some environmental concern to be reflected in environmental behavior. The relationship between income and environmental behavior in the literature seems to be inconclusive. On one hand some studied reported positive relationships between income and willing to pay for environmental quality

(**Israel and Levinson, 2004**). Other studies concerned Positive association between income and environmental (**Buttle and Flinn, 1974; McEvoy, 1972**). On the other hand some studies reported negative relationship (**Malkis and Qrasmick, 1977; Van Liere and Dunlap, 1978; Constantini and Hanf, 1972**). It is expected that income will have a positive impact on environmental behavior in this study.

Although not explicitly stated, it is expected that the impact of the above socio-economic variables is not limited to environmental behavior. They are expected to affect the psychological entity of the individual including their other internal variables in this study.

Environmental awareness, in the sense of acquiring information that the environmental suffers serious problems, is conceptualized here as the first step toward proper environmental behavior. **Inglehart (1997)** argues that awareness is essential to any realistic strategy of social change. Several studies reported positive relationships between environmental awareness and environmental behavior (**Schultz, 2001; Stern et al., 1995; Napier and Brown, 1993 and Gloud et al., 1989**). It is expected that environmental awareness will have a positive impact on environmental behavior in this study.

Governmental trust is the second internal variable of concern in this study. In rural Egypt, government is the main actor in environmental issues. Governmental trust is the gate through which concern with the environmental has to pass. Many scholars argue that governmental trust is an important antecedent to cooperation regarding the environmental (**Martinez-Moyano, 2006**). It is expected that governmental trust will have a positive impact on environmental behavior in this study.

Environmental attitudes, in the sense of having a pre-environmental judgment, are expected to grow according to acquired environmental awareness and lead to environmental behavior. The empirical relationship between environmental attitudes and environmental behavior is only moderate or weak (**Kilbert, 2000; Kaiser et al., 1999; Kuhlmeier et al., 1999 and Scott and Willits, 1994**). It is expected that environmental attitudes will have a positive impact on environmental behavior in this study. The proposed causal model may be expressed in Figure (1).

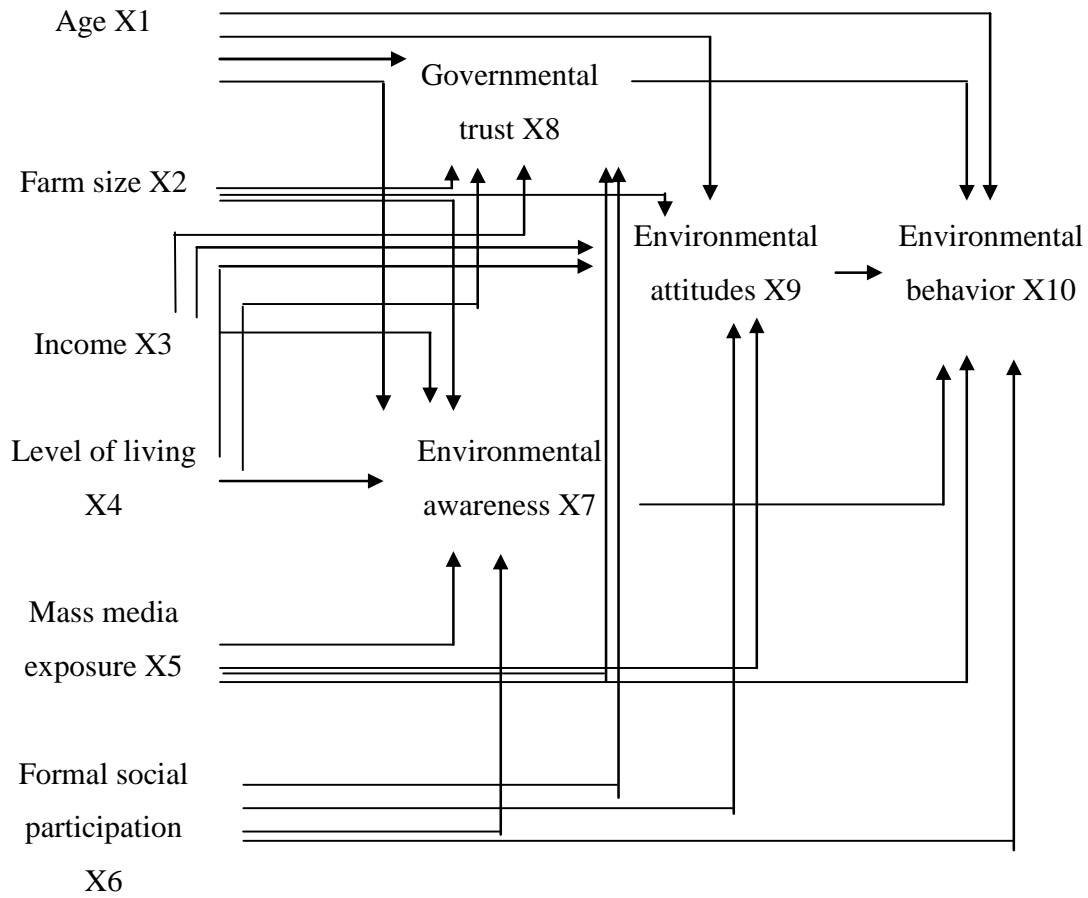


Figure 1. The proposed caused model

The model may be expressed in the following simultaneous equations:

$$X_7 = P_{71} X_1 + P_{72} X_2 + P_{73} X_3 + P_{74} X_4 + P_{75} X_5 + P_{76} X_6 + e_7$$

$$X_8 = P_{81} X_1 + P_{82} X_2 + P_{83} X_3 + P_{84} X_4 + P_{85} X_5 + P_{86} X_6 + e_8$$

$$X_9 = P_{91} X_1 + P_{92} X_2 + P_{93} X_3 + P_{94} X_4 + P_{95} X_5 + P_{96} X_6 + e_9$$

$$X_{10} = P_{101} X_1 + P_{102} X_2 + P_{103} X_3 + P_{104} X_4 + P_{105} X_5 + P_{106} X_6 + e_{10}$$

Where:

X1= age, X2 = farm size, X3 = income, X4 = level of living, X5 = mass media exposure,

X6= Formal social participation, X7= environmental awareness, X8 = environmental trust, X9 = environmental attitudes and X10= environmental behavior.

2. Materials and Methods

The field work of this study was conducted in the Egyptian Governorate of Kafr El-Sheikh. Four villages were randomly selected from the

Governorate land tenure records kept in the village farm cooperatives were used as sampling farmers. A 10% sample was drawn from the male land holders listed in the records. Data were collected from sample

persons through personal interviews during April through July, 2008. A total of 310 usable interview schedules were completed. Collected data were then coded and analyzed.

The study variables were measured as follows:

- 1- Age: number of complete years from birth to the time of interviewing.
- 2- Farm size: number of Kirats (1 kirat = 175 m²) of farm land operated.
- 3- Income: reported number of Egyptian pounds earned in the last year.
- 4- Level of living: number of home appliances owned.
- 5- Mass media exposure: a weighted sum of press reading radio listening and television watching.
- 6- Formal social participation: number of voluntary organization joined.
- 7- Environmental awareness: an index of items with an internal consistency (Alpha) coefficient of 0.89.
- 8- Governmental trust: an index of items with an internal consistency (Alpha) coefficient of 0.87.
- 9- Environmental attitudes: an index of items with an internal consistency (Alpha) coefficient of 0.72.
- 10- Environmental behavior: an index of items with an internal consistency (Alpha) coefficient of 0.71.

3. Results and Discussions

Table (1) presents the outcome of the simultaneous equations specified in this study. Figures in the table show that the external variables of the study, combines, explain about 15.7% of the variance in environmental awareness. The explained

variance in environmental awareness is due to the effect of the two external variables of mass media exposure and formal social participation. This means that farmer requires environmental awareness only through contact with the social environmental. The

other four external variables of age, farm size, income and level of living are of no utility in explaining environmental awareness.

The external varieties and environmental awareness, combined explain 22.9% of the variance in Governmental trust. This explained variance is mainly due to the effect of the three variables of income, formal social participation and environmental awareness. The external variables of age, farm size, and level of living have no utility in explaining the variance in Governmental trust. Whereas the external variable of mass media exposure has an indirect effect on Governmental trust through affecting environmental awareness.

The external variables of the study, environmental awareness and Governmental trust, combined, explain 70.3% of the variance in environmental attitudes. The explained variance in environmental attitudes is due to the impact of the five variables of age, farm size, mass media exposure, environmental awareness and Governmental trust. Level of living is the only external variable that has no utility in explaining environmental attitudes. Income, affects environmental attitudes indirectly through affecting Governmental trust and formal social participation affects environmental attitudes indirectly through affecting environmental awareness and Governmental trust.

Table 1. The outcome of the simultaneous equations

Dependant variables Independent variable	Environmental awareness	Government trust	Environmental attitudes	Environmental behavior
Age	-0.001	-0.002	-0.102**	-0.044
Farm size	0.041	-0.045	0.089*	0.011
Income	-0.063	0.175**	-0.016	-0.027
Level of living	-0.033	-0.027	0.003	0.094**
Mass media exposure	0.294*	0.052	0.713**	0.244**
Formal social participation	0.207*	0.304**	-0.013	0.000
Environmental awareness	-	0.238**	0.137**	0.017
Governmental trust	-	-	0.079*	0.011
Environmental attitudes	-	-	-	0.664**
R2	0.15	0.229	0.703	0.867
F	9.017**	12.117**	89.702**	218.684**

* Significant at the 5% level.

** Significant at the 1% level.

The external variables of the study, environmental awareness, Governmental trust and environmental attitudes, combined, explain 86.7% of the variance in environmental behavior. The explained variance in environmental behavior is due to the effect of the three variables of level of living, mass media exposure and environmental attitudes. The external variables of age and farm size affect environmental behavior indirectly through affecting environmental attitudes, income affects environmental behavior though affecting

Governmental trust that, in turn, affects environmental attitudes. Similarly, formal social participation affects environmental behavior indirectly through affecting Governmental trust that, in turn, affects environmental attitudes. Environmental awareness affects environmental behavior through affecting Governmental trust and environmental attitudes.

The above findings are presented in figure (2) that showed the model of the study, revised according to the empirical evidence.

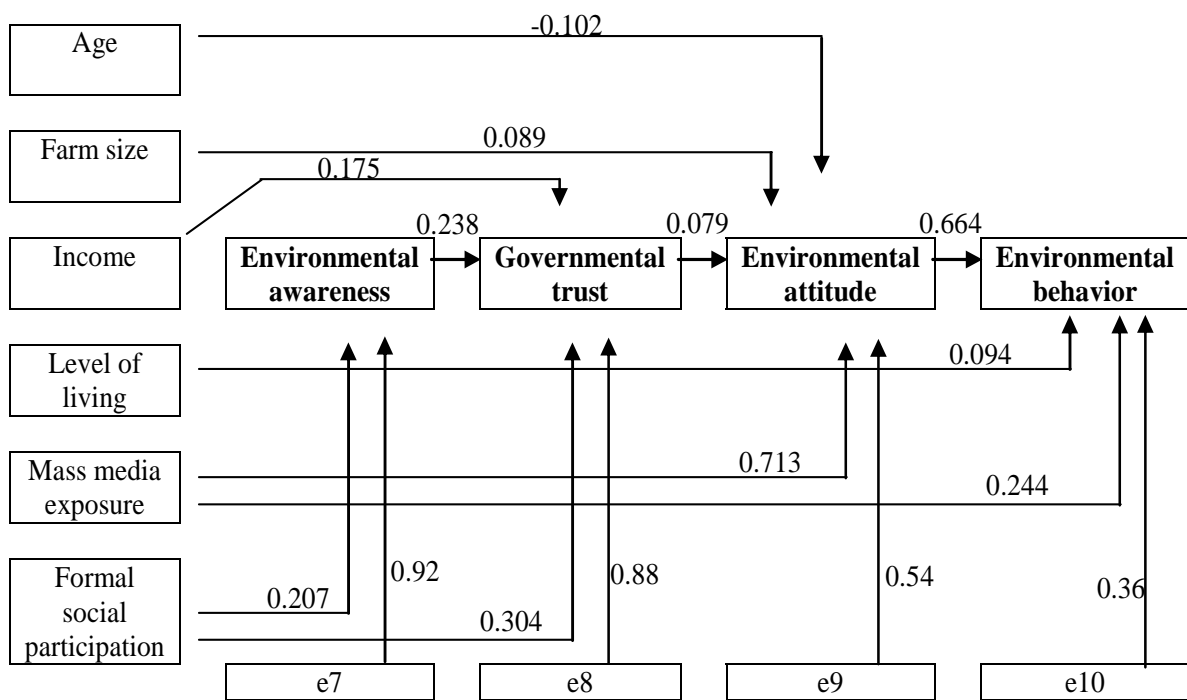


Figure 2. The revised causal model with the significant path coefficient

The decomposition of the causal effects of external and internal variables on environmental behavior is presented in Table (2). Figures in the tables show that both direct and indirect effects of age, farm size and income are rather low. The effects of mass media exposure and formal social participation on environmental behavior are mainly

direct (0.094 and 0.0244, respectively, compared to respective indirect effects of 0.018 and 0.050). Whereas the effects of formal social participation, environmental behavior are mainly indirect (0.207 and 0.221, respectively compared to respective direct effects of zero and 0.011).

Table 2. The results of the decomposition of the causal effect of external and internal variables on environmental behavior

Variables	Direct effect	Indirect effect	Total
Age	0.044	0.043	0.08
Farm size	0.011	0.030	0.041
Income	0.029	0.039	0.066
Level of living	0.094	0.018	0.112
Mass media exposure	0.244	0.050	0.294
Formal social participation	0.000	0.207	0.207
Environmental awareness	0.017	0.221	0.238
Governmental trust	0.011	0.068	0.09
Environmental attitudes	0.664	0.000	0.664

Environmental attitudes has the strongest total effect on environmental behavior, followed by mass media exposure, environmental awareness, formal social participation, level of living and Governmental trust, in that order. This means the environmental behavior is affected by variables expressing social interaction (mass media exposure, and formal social participation) and personal dispositions Governmental trust and environmental attitudes rather than the socio-economic standing of the person. When the direct effects on environmental behavior are compared, environmental attitudes shows the greatest direct affect, followed by mass media exposure and level of living, in that order.

Conclusion

This study aimed to construct causal model of environmental behavior of farmers and testing the model. A causal model containing the external variables of age, farm size, income, level of living, mass media exposure and formal social participation in addition to the internal variables of environmental awareness, Governmental trust, environmental attitudes, and environmental behavior was constructed. Data were collected from a luster sample of 310 male land holders in Kafr El-Shiekh Governorate through personal interviews using a structured interview schedule collected data were coded and analyzed. The main findings of the study may be summarized as follows:

- 1- The specified model explained 15.7%, 22.9%, 70.3% and 86.7% of the observed variance in environmental awareness, Governmental trust, environmental attitudes and environmental behavior, respectively.
- 2- Mass media exposure had the strongest direct causal effect on environmental awareness and environmental attitudes. Whereas, formal social participation had the strongest direct causal effect of Governmental trust.

- 3- Environmental attitudes had the strongest direct causal effect on environmental behavior which validates the attitudes behavior consistency with regard to concern with specific environmental issues.
- 4- The three variables of level of living, mass media exposure, and environmental attitude had significant direct causal effects on environmental behavior. The other variables in the model had only limited indirect causal effects on environmental behavior.
- 5- The suggested model was largely support as having utility in explaining the environmental behavior of Egyptian farmers in Kafr El-Shiekh Governorate.

Acknowledgments

The authors express their gratitude to the Field Crops Research Stations members- Rural Sociology Research Department at Kafr El- Sheikh. We also desire to express our thanks to Prof. Abd El-Gawad Bali for his invaluable assistance in counting scintillations.

Correspondence author

Mohammed Ebad-Allah

Department of agricultural economics, Faculty of Agriculture-Tanta University, Tanta, Egypt.

E-mail: mohammed.ebadallah@agr.tanta.edu.eg

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6/22/2012