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Social Network Analysis of the Adoption of an Agricultural Innovation in a Village in Assiut Governorate

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Keywords: Geodesic Distances, Ego Networks, Brokerage, Centrality.

Abstract:

This research endeavors to know about the network characteristics of the respondents' farmers inside an innovation adoption network, and to identify the relationship between their network characteristics and the time of adoption of this innovation. Data were collected from all farmers of one of the villages of Assiut governorate by questionnaire. The study used UCINET software to analyze and visualize the data. The results identified the farmers with the best network characteristics among farmers in the whole network. Social network analysis states that we can rely on them to convince the largest number of farmers to adopt the innovation very rapidly with the shortest links. Also it cleared up that there's a positive significance correlation between the time of adoption of the innovation and these variables: degree of reach, out-geodesic distances and efficiency of ego network. On the other hand, it came to clear that there's a negative significance correlation between the time of adoption of the innovation and these variables: number of directed ties, density of ego network, two-step reach and closeness centrality.

Introduction:

Research Problem:

The common approach to study the adoption of innovations is to consider that adoption occurs as a result of the request for information, which reduces the uncertainty associated with the decision of adoption. It also states that individuals have access to information through the contact people around them, especially those who were exposed to the same decision before. This process of social diffusion is called the impact of social neighborhood. Even so, the traditional research of the diffusion of innovations lack – until recent years – of any investigation of the effects of interpersonal relationships inside social networks on the diffusion of innovations. This study is trying to trace the problem of the diffusion of innovations in social networks in order to understand the complex behavior of innovation adoption

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dynamics. It also provides clear answers to many questions concerning how these new technologies spread between farmers, and the network characteristics of farmers inside these networks and their impact on the spread of innovations among them. All these and other questions will be answered by social network analysis, so this study is an attempt to analyze the adoption of an agricultural innovation in a village in Assiut governorate through social network analysis.

Research Objectives:

This research endeavors particularly to reach the following aims:

1- Knowing about the network characteristics of the respondents' farmers inside the innovation adoption network.

2- Identifying the nature of the relationship between the network characteristics of the respondents' farmers inside the innovation adoption network and the time of their adoption of this innovation.

Theoretical framework:

There are many definitions of social network analysis; some of these definitions believe that SNA is a collection of methods used in the study of social networks and how the units interact with each others, whether these units are individuals, groups, organizations, animals or computers. Others say that it is synonymous to the graph theory, from the view of adopting the mathematical methods derived from the graph theory in terms of explaining the relations through graphs. Others state that it's an interdisciplinary field of research with a long history of input from sociology, anthropology, statistics, mathematics, education, psychology and aims to understand the network building through graphs and analytic description with focus on the relations between social units rather than the characteristics of these units, it also standardized the language between these areas to the language of Mathematics. A fourth view informs us that it is the science of measuring and visualizing social relations. Anyway and whatever it's definition , all these perspectives agreed that social network analysis is the mapping and measuring of relationships and flows between people, groups, organizations, animals, computers or other information/knowledge processing entities(Abdelghany , 2008 ; Haythornthwaite, 2002 ; Cross etal , 2002 ; McDermot,2005 ; Dekker ,2006 ;Marijtje etal ,2006; Katzmair,2004).In the view of the current study, social network analysis is a set of tools that help to analyze social networks of the adoption of agricultural innovations by measuring and

mapping social relations between farmers inside these networks .

Two approaches are used to analyze social networks , Sociocentric approach and Egocentric approach , Sociocentric approach or whole network approach had derived from sociology influenced by the work of the German sociologist " Simmel ", and provides a view of the construction of the whole network and includes the measurement of relationships within the group and expresses it in numbers , so that we can apply a lot of mathematical analysis, and it focuses on measuring the structural forms of interactions and interpret the output of the network such as the concentration of power within the Community, and it deals with the level of sub-groups within the network and the level of the network as a whole to characterize the sub-groups within the network and network properties as a whole, such as the number of sub-groups, types of sub-groups within the network and individual components of each type, cluster analysis of groups of individuals very similar in their social relations , density of the network as a whole, rates of diodes and triads within the network, network centralization with its various dimensions . The Egocentric network approach has stemmed from Anthropology, unlike Sociocentric approach , the Egocentric network approach focuses on the individual networks (individuals and individuals associated with them) on the basis that everyone has his own network that affect his behavior and trends , and then circulate the characteristics of individual network to explain the behavior of individuals within it , this approach present an image about individual characteristics inside the network and its impact on his attitudes and behaviors, Ego in this approach may represent individual , organization or society for the rest of individuals, organizations or communities (Marijtje,2006; Haythornthwaite,1996).The current study will use the Egocentric network approach to analyze the innovation adoption network because the Sociocentric approach depends on the characteristics of sub-groups and the network as a whole, which is not helpful in identifying the opportunities and constraints of individuals and differences among them in their inclusion in the social structure, and thus the Egocentric network approach is the most appropriate with regard to identifying the characteristics of farmers inside the innovation adoption network, and then link those characteristics with their innovativeness in adopting the innovation .

Social network analysis has many applications in many fields like: uncovering the networks of the diffusion of innovations , interpretation of public opinion

and political participation through the analysis of the political power of social network , portraying the spread of rumors among individuals , study the stability of social networks and it's potential breakdown or the migration of its members , studying the virtual communities via the Internet and it's sustainability , redistribution of students , colleagues, prison fellows according to the study of their networks , analyzing the purchasing desires before producing a new product in markets , tracing the spread of infectious diseases among humans and animals , following the spread of goods and services , tracing the spread of crime and aggressive behavior and visible or invisible terrorist networks , press surveys , identifying opinion leaders , drawing and measuring the flow of knowledge between individuals and organizations , clarifying the common points between research area to another , periodic monitoring of individuals and organizations networks to identify it's strengths and weaknesses , diagnosing the problems of information flow , analyzing of passenger data, phone calls, Internet communications and transactions of banks , building a foundation for political campaigns after analyzing the public opinion , helping to build teams and restructuring of organizations (Ehrlich & Carboni,2005 ; Kadushin,2005 ; Friemel,2007).

There are many benefits from using social network analysis in the study of the diffusion of agricultural innovations like: increasing the response of farmers by closing the gaps between farmers and each others and reduce the time required to find information about agricultural innovations, knowing about how the information about agricultural innovations enter and exit the group , identifying the most central farmers who can transfer information about agricultural innovations to other farmers quickly and efficiently and those peripherals far from processes inside the network , identifying farmer's opportunities and constraints through their positions within the network , evaluating the social capital of farmers (network positions of farmers) in terms of influence and power they have , uncovering the farmers network of relations and it's strengths and weaknesses , gaining insight about the mechanisms of power within social networks of the diffusion of agricultural innovations , knowing about the weaknesses within the networks of the diffusion of agricultural innovations to make it easy to handle it , identifying the redundant relations so we can search for ways to reduce the time spent in the access to and transfer of information about agricultural innovations (Cross,2004; McDermot,2005 ; Smith,2004)

In terms of the impact of social networks on the diffusion of innovations, the study of the diffusion of innovations in social networks is useful in understanding the complex behavior of how widespread the motivations of change through interactions within social networks. It also useful in understanding the influence of other members of social network, which means, once an individual decides to adopt an innovation; those who are in contact with him will evaluate the new revenue the individual has got from the innovation and compare it with their current benefits. So the links between individuals is responsible for the flow of information about the innovation between them (Guardiola,2002).

Research Methodology:

ELKORDY village was selected to be a place of this study, because it has the smallest number of farmers in Assiut governorate (72 farmers). Data were collected from all farmers (the population of the study because this kind of studies doesn't deal with samples) of this village by questionnaire asking them about: did the farmer adopt the innovation (one of the new Corn varieties) and when?, who convinced the farmer to adopt this innovation from the village farmers?. After collecting the data, it cleared up that there are 43 farms adopted the innovation. The study followed the next steps to implement social network analysis of the adoption of the innovation to the 43 farmers:

1- Data were collected from each respondent separately on the farmer who convinced him to adopt the innovation in addition to the time of adoption of the innovation for each respondent.

2– Every adoption relationship between respondents was transformed to a matrix (using social network analysis software), so the required analysis and graphs can be accomplished.

3– Social network analysis software (UCINET) was used for data analysis to analyze and visualize the data of the study (Borgatti etal, 2002).

4– After drawing the innovation adoption network, the study concentrated on measuring the network properties of individuals using social network methods related to the following aspects (Hanneman& Riddle, 2005):

1) Connection and Distance
   - Reachability
   - Connectivity
   - Geodesic Distances
2) Ego networks
   - Ego Network Density
   - Structural Holes
   - Brokerage
3) Centrality and power
   - Degree Centrality
   - Closeness Centrality
   - Betweenness Centrality

5 - Spearman rank correlation coefficient had been used to know about the relationship between the network

characteristics of the respondents' farmers inside the innovation adoption network and the time of adoption of this innovation.

Research Results:

Analyzing the Network properties of Farmers inside the innovation adoption network:

1-In-Degree:

In-Degree is a way of thinking about each farmer as a source of information about the innovation. Looking at Fig.(1) , which shows the innovation adoption network, and Table (1), which shows the network Characteristics of the respondents farmers, it came out that there is a difference in the reception of relations (sending information) within the network, as farmers numbers 46 ، 27 39 ، 36 ، 58 have the highest In-Degree within the network and therefore, everyone of them act as a facilitator or Communicator or Transmitter of the information about the innovation within the network, while farmers numbers 48 ، 3called farmers "Out of the Loop" that they do not receive many direct relations, and farmers numbers ، 28 21 ، 19 ، 11 53 ، 50 ، 49 ، 47 ، 38 34 ، 33 ، 32 59 ، 55 ، have only one In-Degree, so they are the least recipients of relations within the network (semi-isolated), while the rest of the network members are completely isolated since the In-Degree of everyone of them equal to zero and they are farmers members ، 8 ، 7 ، 6 ، 2 ، 1 13 ، 10 ، 9, 37 ، 35 ، 25 ، 24 ، 20 ، 57 ، 56 ، 54 ، 52 ، 45 ، 42 ، 40 ، 61، 60 .

2-Reachability

A farmer is "reachable" by another if there exists any set of connections by which we can trace from the source to the target farmer, regardless of how many others fall between them, it is possible that farmer A can reach farmer B, but that farmer B cannot reach farmer A . Looking at Fig.(1) and Table (1), it became clear that not all farmers can reach all farmers and not all farmers can be reached by other farmers , it can be noticed that farmers numbers ، 2 ، 55 ، 42 21 45 ، 38 ، 37 ، 20 ، 11 can reach the largest possible number of others within the network, although they represent the edge of the network and those with less In-Degree because of their reliance on indirect relations to reach the largest possible number from the rest of their peers within the network, on the other side about the access of the farmer by others, the study found that farmers numbers 27, 39 , 58 were the farmers that all members of the network can reach despite the fact that each of them can reach only a limited number of farmers (2), and then came behind them in terms of ability to be reachable by others farmers numbers ، 36 46 ، 32 ، 47 and the rest of the farmers, despite their ability to reach a large number of others through indirect links, their ability to be reachable by others was low and amounted to zero

for the farmers who occupy the edge of the network

3- Point Connectivity

Point Connectivity is the number of nodes that would have to be removed in order for one farmer to no longer be able to reach another. Looking at Fig. (1) and Table (1), it came to light that farmers numbers 27, 39, 58 are the highest in connectivity with the others , that in order to make any of them isolated within this network, we must remove all the network points(42 farmers), after them farmers numbers 21 ، 7 55 ، 47 ، 38 ، 36 ، 32 ، and the points that must be removed to make each of the rest of farmers isolated ranged between 3 - 7 points within the network.

4- Geodesic Distances

The geodesic distance is the number of relations in the shortest possible walk from one farmer to another. Looking at Fig. (1) , and Table (1), it cleared up that these distances are small, with lengths ranging between 1-8 which means that the spread of information about the innovation within this network is quite easy, it also can be noted the lack of path between each xy, yx, this means that all farmers can't reach all other farmers and therefore despite the small distances between farmers, the message that will start anywhere in the network will not reach all farmers. The results in terms of geodesic distances from the farmers to other farmers (out-Geodesic Distances) showed that farmers numbers 27, 39, 58 have had access to farmers whom they contacted through the shortest geodesic distance with an average of 1.5 distance, then the average lengths of links for the rest of farmers ranged between 2 for farmers close to the ex-farmers, such as numbers 19 6 ، 1 ، 53 ، 50 ، 48 ، 47 ، 46 ، 36 ، 28 ، 56 , 57 , 59 to a higher average length of farmers on the edge of the network and depend on the long indirect links such as farmers numbers 21 ، 7 . In terms of geodesic distances to the farmer from other farmers(in-Geodesic Distances), on the contrary, the study found that farmers numbers 27, 39, 58 were the farmers that all other members of the network can reach but through the longest average geodesic distances of 3.4 , 2.9, 2.8 as most of other farmers depend on indirect links to reach these farmers, then the average lengths of links for the rest of the farmers ranged between 1-2.5 and of course an average of zero for the farmers who do not have any choices (In-Degree is zero).

5- Size of Ego Network

Size of ego network is the number of farmers that one-step out neighbors of the farmer, plus the farmer himself. Looking at Fig. (1) and Table (1), it came out that farmers numbers ، 36 ، 58 39 27, 46 are farmers with the largest size of ego network within this network, while farmers numbers ، 8 ، 7 ، 6 ، 2 ، 1 37 ، 35 ، 25 ، 24 ، 20 ، 13 ، 10 ، 9 ، 57 56 ، 54 ، 52 ، 45 ، 42 ، 40 ، 61 ، 60 are farmers with the

smallest size of neighborhood within this network .

6- Number of directed ties

Number of directed ties is the number of connections among all the farmers in the farmer network. Looking at Fig. (1) and Table (1), it became clear that farmers numbers 27, 39, 58 are the only farmers whom each individual network contained a single direct link between its members, while the individual networks of the rest of the farmers empty from any of these links.

7- Density of Ego Network

Density is the number of ties divided by the number of pairs. That is, what percentage of all possible ties in each farmer network is actually present?. Looking at Fig. (1) and Table (1), it came to light that farmers numbers 27, 39, 58 live in a low-density neighborhood, the density was zero for the rest of the network farmers due to the lack of direct links within their individual networks.

8- Number of weak components

If the farmer was connected to A and B (who are connected to one another), and the farmer is connected to C and D (who are connected to one another), but A and B are not connected in any way to C and D (except by way of everyone being connected to the farmer) then there would be two "weak components" in the farmer's neighborhood. Looking at Fig. (1) and Table (1), it cleared up that farmers numbers 36, 58, 46, 39 are the most farmers whom have been able to link weak components within the network, while farmers numbers 24 ، 20 ، 13 ، 10 ، 9 ، 8 ، 7 ، 6 ، 2 52 ، 45 ، 42 40 ، 37 ، 35 ، 25 ،, 61 ، 60 ، 57 ، 56 54 live in a single neighborhood and therefore they could not link any of weak components inside this network .

9- Two-step reach

Two-step reach goes beyond farmer's one-step neighborhood to report the percentage of all farmers in the whole network that are within two directed steps of the farmer. Looking at Fig. (1) and Table (1), it came out that farmers numbers 39, 27, 58 have the most ability to reach members of this network by two-steps(a 2 step indirect contact either to or from the farmer), while farmers numbers ، 10 ، 7 37 ، 34 ، 33 ، 21 ، 9 ، 45 ، 42 ، 20 49 ،,61 are less able to access to members of this network through two steps.

10- Effective size of Ego Network

Effective size of the network is the number of alters that ego has, minus the average number of ties that each alter has to other alters. Looking at Fig. (1) and Table (1), it became clear that the size of Ego network equals the effective size of Ego network for all farmers except farmers numbers 58, 27, 39 whom have linked to each others, and so everyone of them has a farmer linked to another within his network, and so this reduced the overall impact of every one of them, unlike the rest of the

members of the network, those whom did not show any links between members of their networks making the effective size of the network is equal to the total size of the network for all of them , and so everyone of them retained his full effect within his network .

11- Efficiency of Ego Network

Efficiency norms the effective size of farmer's network by its actual size. Looking at Fig. (1) and Table (1), it came to light that farmers numbers 58, 27, 39 did not reach the maximum efficiency of investing their relations, that the efficiency resulting from the calibration of the effective size of the network by the total size of the network are 0.97, 0.94, 0.94 while the rest of farmers have the full efficiency of their networks, where the effective size of the network equals the overall size of the network for all of them .

12-Constraint of Ego Network

Constraint is a summary measure that taps the extent to which farmer's connections are to others who are connected to one another. Looking at Fig. (1) and Table (1),it cleared up that farmers numbers 58, 36, 39, 27, 46 are farmers with less strictly based on the degree of efficiency and the effective size of the network , while farmers numbers 19 ، 11, 38 ، 34 ، 33 ، 32 ، 28 21 59 ، 55 ، 53 ، 50 ، 49 ، 47 ، are middle-constraint within their networks, while the rest of the network farmers are more exposed to their behavior restriction in their Ego networks .

13- Brokerage

The farmer has many opportunities to act as a "broker when he lies on the directed path between two others. Looking at Fig. (1) and Table (1), it came out that the current network has only one kind of brokerage, and it's the role of Coordinator, because the network consists of one group and free of sub-groups, making it impossible for the presence of other types of brokerage that require more than one sub-group within the network, looking at the role of Coordinator, it can be noticed that farmers numbers 36, 58, 39, 27, 46 played the largest number of Brokerage between other members of the network, while the farmers numbers ، 11 ، 48 ، 3 ، 38 ، 34 ، 33 ، 32 ، 28 ، 21 ، 19 49 ، 47, 59 ، 55 ، 53 ، 50 played the least brokerage role between the rest of members of the network, while there are lack of this role for the rest of the network farmers .

14- Degree Centrality

Linton Freeman developed basic measures of the centrality of actors based on their degree, as the more ties the farmers has then, the more power they may have. Looking at Fig. (1) and Table (1), it became clear that farmers numbers 27 ، 39 ، 36 ، 58 46 ، have the highest degree centrality within the network and therefore the most central and

influential compared to other farmers, then the rest of the farmers ranging around the edge of the network to represent the least central and influential farmers within the network.

15- Closeness Centrality

Closeness centrality emphasizes the distance of a farmer to all others in the network by focusing on the distance from each farmer to all others. Looking at Fig. (1) and Table (1), it came to light that farmers numbers 47 ، 27 ، 39 ، 58 46 ، are more central and therefore more able to reach the rest of network members with the shortest links, while farmers numbers 37 21 ، 42 ، 7, ، 45 ، 2 55are the least central and those who occupy the edge of the network and thus less able to reach the rest of the farmers with short links .

16- Betweenness Centrality

Betweenness centrality views a farmer as being in a favored position to the extent that the he falls on the geodesic paths between other pairs of farmers in the network. Looking at Fig. (1) and Table (1), it cleared up that farmers 38 ، 32 ، 36 ، 27 ، 39 ، 58 , 55 ، 50 ، 3 ، 47 are more central through the central role each of them played which can be translated to strength through the broker role that makes others depend on him as an intermediary in the exchange of information, while farmers numbers ، 10 9 ، 8 7 ، 6 ، 2 ، 1 ، 40 ، 37 ، 35 ، 25 ، 24 ، 20 ، 13 61 ، 60 57 ، 56 ، 54 ، 52 ، 45 ، 42 are the least central that they occupy the edge of the network where there is lack of betweenness centrality because they didn't act as a broker in any relationship within the network

The relationship between the Network characteristics of the respondents' farmers inside the innovation adoption network and the time of their first adoption of this innovation:

The results in Table (2) representing the spearman correlation coefficients between the network characteristics of farmers inside the innovation adoption network and the time of adoption of this innovation , it cleared up that there's no correlation between the time of their first adoption of the innovation and these variables: in-degree , degree of reachable , point connectivity , in-geodesic distances, size of ego network, number of weak components , effective size of ego network , constraint of ego network , brokerage , degree centrality , betweenness centrality.

Also it cleared up that there's a positive significance correlation between the time of first adoption of the innovation and these variables: degree of reach, out-geodesic distances and efficiency of ego network. And there's a negative significance correlation between the time of first adoption of the innovation and these variables: number of directed ties, density of ego network, two-step reach, closeness centrality.

Table2: Spearman correlation coefficients between farmers network characteristics inside the innovation adoption network and the time of their first adoption of this innovation

Network Characteristics	Time of Innovation Adoption
in-degree	- 0.210
degree of reach	0.638**
degree of reachable	- 0.151
point connectivity	0.140
in-geodesic distances	- 0.038
out-geodesic distances	0.594**
size of ego network	- 0.210
number of directed ties	- 0.451**
density of ego network	- 0.451**
number of weak components	- 0.209
two-step reach	- 0.528**
effective size of ego network	0.209
efficiency of ego network	0.451**
constraint of ego network	0.209
brokerage	- 0.209
degree centrality	- 0.210
closeness centrality	- 0.574**
betweenness centrality	- 0.105

** Correlation coefficient is significant at 0.01 level.

Conclusion:

It can be noticed from the previous view of the Network characteristics of the respondents' farmers that farmers numbers 58, 39, 27, 36 , 46 have the best network characteristics among farmers in the whole network , therefore we can rely on them to convince the largest number of farmers to adopt the innovation very rapidly with the shortest links .

It came out that there's a positive correlation between the time of adoption of the innovation and the number of network members that farmer can reach, which may be due to that , the position of the farmers who can reach a smaller number of their peers within the network is in the middle of the network and they depend more on direct links to reach the rest of their peers within the network, making them the most central and closer to the events within the network and therefore most vulnerable to information about the innovation and therefore more innovativeness in the adoption of the innovation compared to the other farmers .

It became clear that there's a positive correlation between the time of adoption of the innovation and the out-geodesic

distances from the farmer to other farmers, this may be due to that, the shorter the distance from the farmer to other farmers, the faster he received information about innovation, thus of course increase the possibility of early adoption of the innovation.

It came to light that there's a positive correlation between the time of adoption of the innovation and the efficiency of ego network, this may be due to that the decrease of the degree of efficiency of the farmer means increasing of ties between farmer network members, creating a kind of pressure on the farmer to adopt the innovation earlier than other farmers.

It cleared up that there's a negative correlation between the time of adoption of the innovation and number of directed ties inside the farmer network, this may be due to that the increasing number of directed ties inside the farmer network means more pressure on the farmer to adopt the innovation earlier than other farmers.

It came out that there's a negative correlation between the time of adoption of the innovation and the density of ego network, this may be due to that increasing density of the farmer network means that the farmer lives in dense neighborhood, where other farmers linked with each others, creating a kind of pressure on the farmer to adopt the innovation earlier than other farmers.

It became clear that there's a negative correlation between the time of adoption of the innovation and the two-step reach degree of the farmer, this may be due to that the high proportion of farmers within the network two-steps away from the farmer can maximize the farmer's ability to reach members of the network, and therefore he gets information about the innovation faster and becomes more innovativeness in the adoption of the innovation compared to other farmers.

It came to light that there's a negative correlation between the time of adoption of the innovation and the closeness centrality of the farmer, this may be due to that increasing closeness centrality of the farmer means increasing farmer's ability to reach the rest of the farmers directly which enables the farmer to get information faster on the innovation and becomes more innovativeness in the adoption of the innovation compared to other farmers.

References:

Abdelghany, M, 2008. *Social Network Analysis of the Diffusion of Innovations*, Journal of Economics and Management: Current Issues and Perspectives, 11, (2), 270-272.

Borgatti, S.P., Everett, M.G. and Freeman, L.C. 2002. *Ucinet for Windows: Software for Social Network Analysis*. Harvard, MA: Analytic Technologies, available at:

http://www. analytictech.com/ucinet/ versions.htm

Cross, R. etal, 2002. *Social Network Analysis*, IBM Institute for Knowledge Based Organizations, USA, available at http://www935.ibm.com/services/au/igs/pdf/g510-1669-00-cpov-a-birds-eyeview.pdf

Cross, R., 2004. *Introduction to Organizational Network Ana lysis*, the Network Roundtable at the University of Virginia, School of Commerce, available at: www.byed ay.net/ ona.htm

Dekker, A., 2006. *Conceptual Distance in Social Network Analysis*, Journal of Social Structure, Volume 6, available at:http://www.cmu.edu/joss/ cotent/articles/volume6/dekker/ index.html

Ehrlich, K., Carboni, I., 2005. *Inside Social Network Analysis*, Boston Knowledge Management Forum, 16 June, USA, available at: www.kmforum.org/content/think20%research20%june20%16.pdf

Friemel, T., 2006. *Applications of Social Network Analysis*, University Publishing Konstanz, Germany, available at:http://www.friemel.com/asna/documents/asna_friemel_2007_content-and introduction.pdf

Guardiola, X., etal, 2002. *Modeling Diffusion of Innovations in a Social Network*, Physical Review, E 66, available at: http://www.ffn.ub.es/~albert/articles/PREmodelling.pdf

Hanneman, R., Riddle, M. 2005. *Introduction to Social Network Methods*, University Of California, Riverside, available at:http://faculty.ucr.edu/~hanneman/nettext/Haythornthwaite,C., 1996. *Social Network Analysis, an Approach and Technique for the Study of Information Exchange*, Library & Information Science Research, Volume 18, Issue 4, available at: http://www.sciencedirect.co

Kadushin, C., 2004. *Introduction to Network Theory*, Graduate Centre, Brandies University, USA, available at: www.home.earthlink.net/~ckadushin/texts/basic%20network%20concepts.pdf

Katzmair, H., 2004. *Social Network Analysis*, University of Economics and Business Administration, Vienna, available at: www.fas.at/news/_downloads/social_network_analysis_english_katalog_timeshift_2004.pdf

Marijtje, A. etal, 2006. *What is special about Social Network Analysis?* , Methodology, Vol. 2 (1), available at: http://spit www.uvt.nl/~vermunt/methodology2005b.pdf

McDermott, P., 2005.*Conducting Social Network Analysis in Construction Projects*, School Of Construction And Property Management, University of Salford, U.K, available at:

www.research.scpm.salford.ac.uk/trust/documents/social%20network%20analysis%20draft%20. doc

Smith, D., 2004. *What is Social Network*, The University of Melbourne, Department of Political Science, available at: www.psych.unimelb.edu.au/cnss/ assets/process_summary.pdf

التحليل الشبكى الإجتماعى لتبنى إحدى المستحدثات الزراعيه بإحدى قرى محافظة أسيوط

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قسم المجتمع الريفى والإرشاد الزراعى – كلية الزراعة – جامعة أسيوط

الملخص:

تم إجراء هذا البحث بهدف التعرف على الخصائص الشبكيه للزراع المبحوثين كأفراد داخل شبكة تبنيهم لإحدى المستحدثات الزراعيه ، التعرف على طبيعة العلاقه بين الخصائص الشبكيه للزراع المبحوثين داخل شبكة تبنى المستحدث وبين زمن تبنيهم هذا المستحدث لأول مره . تم إختيار قرية الكوردى– مركز صدفا – لتكون مكاناً لإجراء هذا البحث لكونها أصغر قرى محافظة أسيوط من حيث عدد الحائزين (72 حائز) ، وأجري التحليل الشبكى على 43 مزارع هم جملة من تبنوا المستحدث (صنف الذره الشامى هجين فردى4) من إجمالى الزراع الذين يزرعون الذره الشاميه بالقريه والبالغ عددهم 62 مزارع ، وتم إستخدام برنامج UCINET لعمل التحليلات والرسوم التى تضمنها البحث ، وخلصت النتائج إلى أن الزراع أرقام 58 ، 39 ، 36 ، 27 ، 46 هم الزراع أصحاب أفضل الخصائص الشبكيه إجمالاً بين زراع الشبكه وإن إختلف ورودهم وترتيبهم من خاصيه شبكيه لأخرى ، وبالتالي هم الزراع الذين يمكن الاعتماد عليهم لإقناع أكبر عدد ممكن من زراع القريه بتبنى المستحدث بأسرع وقت وبأقصر الطرق ، كما أوضحت النتائج إرتباط زمن تبني الزراع لأول مره للمستحدث إرتباطاً موجباً بكل متغير من متغيرات: عدد الزراع الذين يمكن للمزارع الوصول إليهم ، متوسط الطرق الجيوديسيه من المزارع إلى باقى الزراع ، كفاءة شبكة المزارع كل على حده ؛ وإرتباط زمن تبنيهم لأول مره للمستحدث إرتباطاً سالباً بكل متغير من متغيرات: عدد الروابط المباشرة للمزارع ، كثافة شبكه المزارع ، درجة الوصول على مرحلتين للمزارع ، تمركز المزارع المبنى على القرب كل على حده .