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Effectiveness of Different Agricultural Extension Methods in Providing Knowledge and Skills in Disease Prevention: A Case of Smallholder Poultry Production Systems in Dakhalia Governorate of Egypt

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This whole work was carried out by the author HSK.

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ABSTRACT

The study identified the effectiveness of the Demonstration alone, the Meeting alone and the Pamphlet alone and All methods together on the poultry farmers' knowledge and skills levels. The Experimental research design was used in the current study. The study was carried out in Dakhalia Governorate of Egypt during the period from November 2012 to April 2013. One hundred and twenty poultry farmers were selected randomly in 10 districts of the governorate. The sample was categorized into (4) equal groups for providing extension recommendations by different extension methods in cooperation with extension poultry specialists in the districts studied. The first group was exposed to a Demonstration, the second group was exposed to a Meeting, the third group was exposed to a Pamphlet and finally last group was exposed to All methods together. The main findings of the study indicate that: the total average of poultry farmers' exposure level to information sources studied was moderate at 59.8%. In addition, The All Methods group had acquired the maximum knowledge and skills with the percentages of 55.8%, 48.3% respectively followed by the Demonstration method, the Meeting method and the Pamphlet method. It can be concluded that Demonstration, Meeting and Pamphlet could

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be rich communication tools on their own, but when combined with others, can create a more effective training/learning experience.

Key words: Disease prevention; effectiveness; extension; methods; poultry; smallholder.

1. INTRODUCTION

Assisting farmers to become more productive has been common practice in developmental assistance for a long time, as well as the objective of Ministries of Agriculture and sub-national governments around the world [1]. Agriculture is still the main economic activity for the majority of the world's population and it is generally correlated with low socioeconomic indicators, such as education, health and poverty. In fact, as noted by the World Development Report 2008, three out of four poor people in developing countries live in rural areas and most of them depend on agriculture for their livelihoods. In addition, agricultural products, whether in bulk or processed form are common exports in developing countries, and many people depend on their production as their main economic activity [1].

The poultry industry is one of the main agricultural industries in Egypt, where investment in this industry is about LE18 billion. The size of the labor force is about 1.5 million permanent workers and about 1 million temporary workers. The industry contributes a large part of the country's supply of animal protein [2]. The structure of the poultry sector in Egypt consists of two main divisions: poultry enterprises and the household poultry sector. Poultry enterprises include: broiler enterprises; table egg enterprises; rabbit enterprises; duck and turkey enterprises; broiler breeder stations; poultry grandparent enterprises; ostrich and quail enterprises; auto-slaughter enterprises; local hatching laboratories; industry hatching laboratories; and feed enterprises. In household systems both in the countryside and in the cities all types of poultry are kept – chickens, turkey, geese, ducks, rabbits and pigeons [2].

The Egyptian poultry industry fears it will greatly suffer from government efforts to prevent the spread of the avian flu which has been a problem since 2009. Many worry new strict regulations and rules will force them out of the already challenging market. They are claiming a huge financial loss due to something they are calling "infectious bronchitis" which is a catch all name for respiratory problems [3].

Avian flu causes high mortality among the poultry population, the household poultry sector is one of the main income sources for numerous families living in rural areas. Its outbreak and spread into the continent would therefore imply a serious threat to food security and the livelihoods of the rural communities in the continent [4]. The appropriate messages should be developed to inform the rural population about the need to restrain or stop the movement of animals, as well as the measures to be taken if a family identifies a sick or dead bird within its small flock. The importance of hygiene in reducing the mechanical spread of the disease on vehicles, equipment, footwear and clothing should be re-emphasized [5].

Prevention of disease in commercial poultry requires the producer to actively enforce an effective/comprehensive bio security program and to maintain an intact and functional immune system in the chicken. An adequate disease prevention program is essential to a profitable commercial poultry operation. Chronic diseases can reduce efficiency and increase costs. Although a disease prevention program may not show immediate returns on the investment, it will be profitable in the long term [3].

Agricultural extension and advisory services play an important role in agricultural development and can contribute to improving the welfare of farmers and other people living in rural areas [6,7]. Defines the terms agricultural extension and advisory services as “the entire set of organizations that support and facilitate people engaged in agricultural production to solve problems and to obtain information, skills and technologies to improve their livelihoods”. Extension services can be organized and delivered in a variety of forms, but their ultimate aim is to increase farmers’ productivity and income. According to [8] productivity improvements are only possible when there is a gap between actual and potential productivity. They suggest two types of ‘gaps’ contribute to the productivity differential: the technology gap and the management gap. Extension can contribute to the reduction of the productivity differential by increasing the speed of technology transfer and by increasing farmers’ knowledge and assisting them in improving farm management practices [9]. Additionally, extension services also play an important role in improving the information flow from farmers to scientists [7].

Agricultural extension in recent years has however played a significant role in improving poultry production in Egypt through advisory services and adequate access to information on improved techniques of production. Agricultural extension plays a pivotal role in ensuring the awareness and subsequent adoption of the contemporary methods of poultry management. Various extension methods have been employed to make sure that the technologies get to the end users.

According to [10] a message is effective if it persuades a particular audience. An effective poultry technology message is the one that prompts poultry farmers to act in a way that supports the goals of extension agencies and other stakeholders. On the receipt of such a message, if the target farmers change their behavior in a desired manner the message is effective and the content will be adopted by them.

As noted by [11] Improved agricultural outcomes depend mainly on the effectiveness of the extension messages used to stakeholders as well as capacity and management structures of the extension system, policy environment, market access, characteristics of beneficiary communities and weather conditions. Effectiveness may be also influenced by the degree of feedback and the mechanisms of delivery of information from farmers to the research and extension system, and thus the role of farmers in formulating demand and their ability to exercise voice.

Review of literature in the field of using the extension methods for learning reflects a debate in using one method or several methods together for transferring extension messages. So, the study focused on comparing the effectiveness of using one extension method with several methods together on the poultry farmers’ knowledge and skills levels.

1.1 Conceptual Framework of the Study

A conceptual framework for the effectiveness of extension methods by small-scale poultry farmers in disease prevention practices is illustrated in Fig. 1 indicating that effectiveness of extension methods as a result of the interaction of several variables. These are grouped into variables that relate to characteristics specific to small-scale farmers and farms, communication factors and exposure factors. These are briefly discussed below.

1.1.1 Profile of poultry farmers

The general characteristics, and in particular, age, educational status, major occupation, experience years in poultry, holding type, type of labor have an influence on the poultry farmers' knowledge gain and adoption of new practices [12]. The frequency with which the farmers have contact with different information sources and the degree to which the farmer relies upon these people for disease prevention are important in the acquisition of informal education [13]. Farmers' exposure to different information sources such as T.V, radio, extension agent, extension publications, books and magazines, farmers' associations, friends/neighbors and poultry companies have an impact on enhancing knowledge and skills [14,15]. Also, identifying the current situation of farmers' exposure to information sources will help in determining the appropriate method for learning. Measuring one or more of behavioral components (knowledge, attitudes and skills) before the exposure to any learning method is an important step to judge on the effectiveness of it [16].

1.1.2 Poultry farmers exposure to extension methods studied

There is no shortage of proven methods to choose from for conveying any particular message to any specified target audience. The problem is that extension workers have either not been taught the methods or they are not given the resources to use them. Too few extension organizations have made provision for developing, testing and producing extension and teaching materials and for guidance in the use of modern educational, instructional and communication technology. In practical terms, what the individual fieldworker knows and has the resources to apply are the determinants of the methods employed. There may be methods that are not effective either in producing learning and motivating farmers or in terms of cost. Another unfavorable result may be that too few of those who most need help are being reached [17].

The current study tries to identify the effect of using one extension method (Demonstration alone, Meeting alone and Pamphlet alone) and all methods together on the poultry farmers' knowledge and skills levels.

1.1.3 Effectiveness of extension methods

The difference between knowledge/skills level in the pre-test and the post-test was used to explore the effectiveness level of extension methods. Also, determining the differences among the extension methods studied is a good way to determine the best method in transferring extension messages to poultry farmers.

Agricultural extension still remains one of the most crucial and critical means to reach farming households in the rural areas and globally. The approach is often associated with high levels of rural development. So, achieving efficiency and effectiveness in extension and training activities can be promoted by giving higher priority to strengthening institutions' organizational capacities. Areas which could benefit from such interventions might include policy development, programme planning, organizational and personnel management, monitoring and supervision, research-extension linkages, management of information systems, and inter ministerial/departmental coordination.

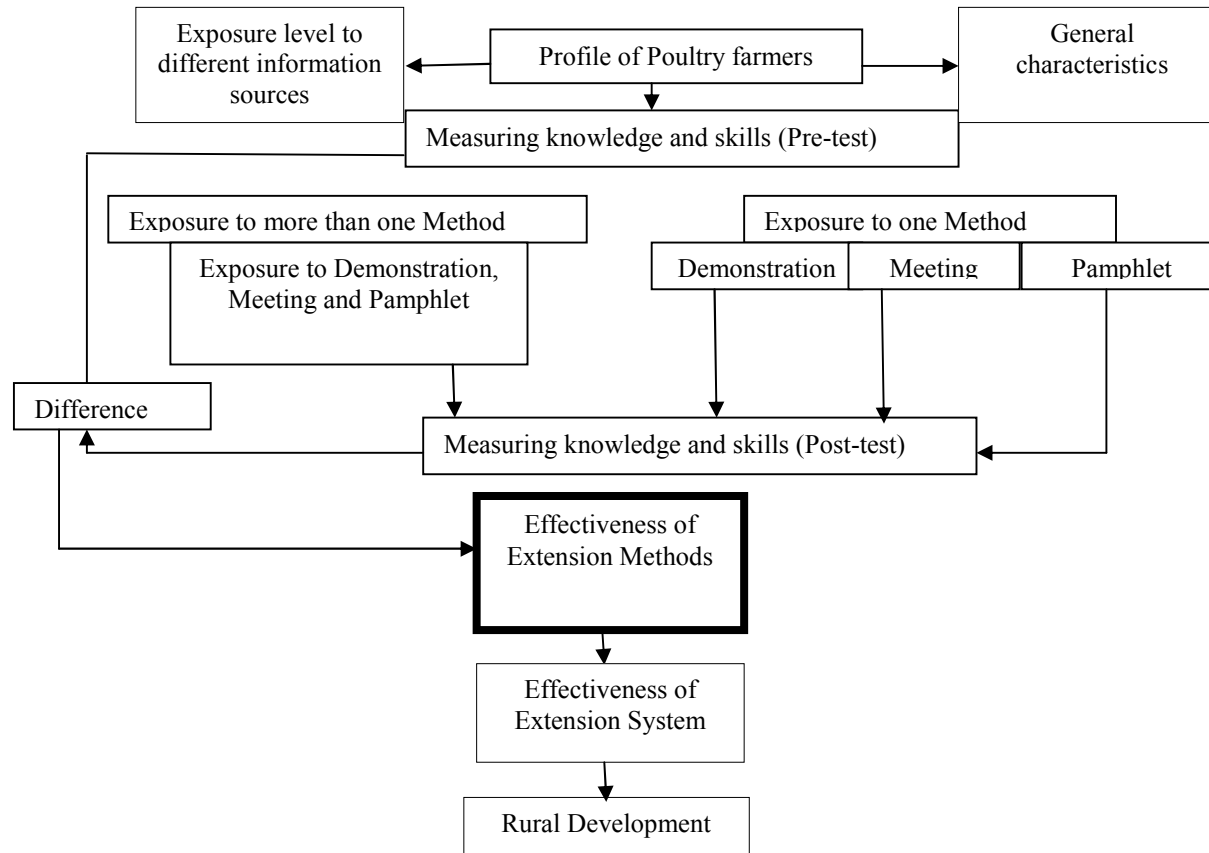


Fig. 1. Conceptual Framework of the study

1.2 Objectives and Hypothesis of the Study

The main purpose of the current study was to measure the effectiveness of some extension methods (demonstrations, meetings, pamphlets and all three methods together) on poultry farmers' knowledge and skills levels. This aim can be achieved through the following objectives:

1. To identify exposure level of poultry farmers in information sources studied.
2. To identify knowledge/skills level of poultry farmers in the areas of disease prevention before and after their exposure to the extension methods studied.
3. Determine the differences among extension methods studied according to its impact on the knowledge gain/skills acquisition levels of respondents.

This study hypothesized that there is a significant difference between the farmers in the pre-test and the post-test regarding to their knowledge and skills levels in the disease prevention practices. Also, there is a significant difference among the extension methods studied according to their impact on knowledge gained/skills acquisition of respondents in the disease prevention practices.

2. METHODS

The Experimental research design was used in the current study. This study was carried out in Dakhalia governorate, Egypt. The governorate has a high concentration of small poultry enterprises (5000-15,000 birds) that are served by the governmental extension service. A population of the study consists of 10 districts in the governorate were purposively selected. Twelve small scale poultry farmers in each district were randomly selected on the basis of 20% of the total population. This resulted in 120 poultry farmers which is the sample of the study. The sample was categorized into (3) equal groups according to farm size: farmers had 5,000 birds, farmers had 10,000 birds and farmers had 15,000 birds. Each group was classified into (4) equal sub-groups for providing extension recommendations by different extension methods in cooperation with extension poultry specialists in the districts studied. The first sub-group was exposed to a Demonstration; the second sub-group was exposed to a Meeting; the third sub-group was exposed to a Pamphlet and finally the last sub-group was exposed to all three methods together.

The Demonstration method was used by an extension poultry specialist to explain knowledge and skills related to the three areas of disease prevention skills: sanitation, vaccination and disinfection. The Meeting method was conducted by the extension poultry specialist at the extension center to poultry farmers. Concerning the Pamphlet, the study depended on a pamphlet published by the Agricultural Research Center (ARC)-Ministry of Agriculture in 2012 entitled "common diseases in meat chicken and how to prevent it" to provide extension recommendations to the group of the pamphlet. Finally, all of the previous Three Methods together were provided to the last group.

The similarity of farmers as much as possible was given into consideration before data collection depending on their socio-economic characteristics mainly to: age, educational status, experience years in poultry and holding type.

The field study was facilitated by the researcher, but implemented by the ten extension poultry specialists in the study area. Each of the extension poultry specialists was

responsible for 12 farmers classified into 3 groups as was mentioned above. In the first production cycle, the specialist visited each farm to measure knowledge of poultry farmers in the disease prevention areas before they were exposed to the extension methods studied (pre-test) by using a questionnaire prepared by the researcher. Concerning skills, the specialist used observation to record the executed practices in the areas studied. In case of difficulty obtaining of executed practices by observation, the specialist depended on direct questions to get responses. During the second production cycle (after two months), the specialist used the extension methods to provide knowledge and skills of sanitation, vaccination and disinfection to poultry farmers. In the third production cycle, the researcher used farm visits to measure farmers' knowledge of information provided during the second production cycle. Responses were recorded in a questionnaire (post-test). Concerning skills, the specialist during the third production cycle depended on observation to record the executed practices in the areas studied.

In the pretest, a questionnaire was used to collect primary information from the poultry farmers. The structured interview guide was divided into three sections. The first section was on the socio-economic characteristics of farmers while the second was on the knowledge of disease prevention practices. The knowledge was measured on a 2 rating scale of 'know' and 'don't know'. The third section attempted to determine the skills of farmers by measuring executed practices. The skills were measured on a 3 point rating scale of 'fully executed', 'partially executed' and 'not executed'. Nineteen practices which addressed poultry disease prevention were used for the study. The drafted interview guide was subjected to review by two experts in poultry research and two agricultural extension experts. Their inputs and suggestions were incorporated into the final draft.

2.1 Measurement of Variables

The numeric values for the knowledge were assigned as 1 for know, 0 for don't know. Thus, the maximum score of knowledge per respondent was (19) while the minimum was (0). On the other hand, the numeric values for the skills were assigned as 2 for fully executed, 1 for partially executed and 0 for not executed. Thus, the maximum score of skills per respondent was (38) while the minimum was (0). The knowledge and skills scores were later grouped into three levels (low, medium and high) using the mean score and standard deviation.

2.2 Operational Definitions

2.2.1 Knowledge level

This means the quantity and quality of information which famers have concerning the practices studied in the areas of vaccination, sanitation and disinfection of disease prevention.

2.2.2 Skills level

This means the capability of farmers to execute practices studied in their farms related to the practices studied in the areas of vaccination, sanitation and disinfection of disease prevention.

2.2.3 Knowledge gain /skills acquisition

This means the differences between farmers' total score in post-test and pre-test and it is calculated by following formula (Total score of post-test - Total score of pre-test).

2.2.4 Effectiveness of extension methods

This means the extent of results which have been achieved in relation to knowledge/skills increasing for respondents in the areas of vaccination, sanitation and disinfection and it is calculated by the following formula [18]:

$$\frac{\text{Total score of post-test (\%)} - \text{Total score of pre-test (\%)}}{100 - \text{Total score of pre-test (\%)}} \times 100$$

2.2.5 Vaccination

This means the level of knowledge and skill in the practices regarding to the use of sufficient amount of water to drinking the birds for two hours, adding of a detergent to a remaining amount of the water after two hours of drinking , adding amount of the milk into vaccination water, opening ampoules of immunization into vaccination water, avoid adding the water in the farm before vaccination (2 hours in summer and 4 hours in Winter) , avoid adding drugs before vaccination by 24 hours , avoid using vaccination in the automatic farm poultry water drinking, avoid adding vaccination in the heat hours and washing the automatic farm poultry water by the water only without adding the detergents in it.

2.2.6 Sanitation

This means the level of knowledge and skill in the practices regarding to clean the farm by water and detergents, washing the farm equipments and supplies, control of insects, pests and other animals and giving a suitable period between production cycles (at least two weeks). Also, sanitation process put into consideration that when all dirt is removed, there is little organic material left in which disease agent may be protected and carried. Cleaning means that the surfaces of the object must be visibly clean with no dirt left that is visible to the eye Cleaning needs effort – scrubbing, brushing and high pressure washing with the detergent and the water.

2.2.7 Disinfection

This means the level of knowledge and skill in the practices concerning to using the screened walls and windows, all workers or visitors should wash their hands and feet with soap before entering the chicken house, all workers or visitors must change or cover their clothes and footwear before entering the chicken house (wear farm's clothes) and all workers or visitors should clean and disinfect their footwear between sheds by using a footbath or change footwear.

2.3 Data Analysis

The data was analyzed using SPSS computer software. Descriptive statistics such as frequency distribution and percentages were used to describe the data. (t) test was used to determine the differences between pre and post-tests according to the level of poultry

farmers' knowledge and skills, while the (F) test for analysis of variance was used to determine the differences among the extension methods studied according to its impact on farmers' knowledge gain/ and skills acquisition of disease prevention practices.

3. RESULTS AND DISCUSSION

3.1 General Characteristics of Poultry Farmers

Table 1 showed that 43.3% of the poultry farmers were adult (34-50 years). More than half 53.3% of the respondents had secondary education while 31.7% had university education. However, only 5% could barely read and write. The result shows that the educational level of poultry farmers was fairly high in the study area. This is expected as modern poultry rearing requires people who understand and can apply technical information in the production and management of poultry farming. The data on years of experience of poultry farmers showed that 40.8% had spent between 11 and 15 years in the business while those who have spent between 6 and 10 years constitute 31.7% of the respondents. Poultry farming was the unique occupation of most (55.8%) of the respondents while 44.2% had other professions such as trading, teaching and nursing. Thirty-four percent of the respondents claimed to own the land they were using for poultry farm. However, 17.5% and 54.2% rented and leased the land they were using for poultry farm respectively. More than half (56.7%) of the respondents rely on hired labor. In-depth interview with respondents revealed that 44.5% of the respondents hired between 1-4 workers while 21.7% employed more than four workers. A larger percentage of the respondents had at least one person working for them for salaries or wages.

Table 1. Distribution of poultry farmers according to general characteristics

Variables (n=120)		N	%
Age	Youth(≥ 33 years)	39	32.5
	Adult(34-50)	52	43.3
	Old(>50 years)	29	24.2
Educational status	Read and Write	6	5
	Primary education	12	10
	Secondary education	64	53.3
	University	38	31.7
Major occupation	Poultry farming	67	55.8
	Others	53	44.2
Experience in poultry (in years)	<5	11	9.16
	6-10	38	31.7
	11-15	49	40.8
	>15	22	18.3
Holding type	Rented	21	17.5
	Leased	65	54.2
	Owned	34	28.3
Type of labour	Self only	14	11.7
	Family labour	38	31.7
	Hired labour	68	56.7

Source: field survey 2013

3.2 Poultry Farmers' Exposure Level to Different Information Sources

Table 2 showed that Veterinarian, farmers associations and neighbors/friends were the main sources of information for respondents in disease prevention by 89.7%, 85%, 62.5% respectively. Dependence on extension agent or extension publications to access information on disease prevention came at the fourth and fifth ranking respectively with low levels. This indicates that most of the farmers didn't depend mainly on information through extension agents and the extension publications. The total average of poultry farmers' exposure level to information sources studied was moderate at 59.8%. Therefore, more still needs to be done to enhance farmers' access to information sources especially extension one.

Table 2. Distribution of poultry farmers according to their exposure level to information sources studied

No.	Information Sources	Exposure level						Average (%)
		Frequently		Occasionally		Rarely		
		N	%	N	%	N	%	
1	Farmers' Association	69	57.5	48	40	3	2.5	85
2	Neighbors/friends	22	18.3	61	50.8	37	30.8	62.5
3	Extension Agent	10	12	20	16.7	90	71.3	48.8
4	Veterinarian	83	69.2	37	30.8	-	-	89.7
5	Television	-	-	22	18.3	98	81.7	39.4
6	Extension publications	1	0.8	30	25	89	74.2	46. 1
7	Books	7	5.8	32	26.7	81	67.5	46.1
8	Poultry companies	5	4.2	32	26.7	83	69.2	45
Average %								59.8

Source: Field survey 2013

3.3 Poultry Farmers' Knowledge Level of Disease Prevention Practices

At least 30% of the respondents had a high knowledge level of managing poultry diseases in pre-test as presented in Table 3. However, for less than half of the respondents (44.2%) in post-test were in the high category of knowledge level followed by moderate (40.8%) and low (15%) categories.

Table 3. Distribution of respondents according to their knowledge level in pre and post-tests

No.	Knowledge level	N	%	Mean	SD
Pre-test				2.06	0.73
1	Low	29	24.2		
2	Moderate	55	45.8		
3	High	36	30.0		
Post-test				2.35	0.7
1	Low	18	15.0		
2	Moderate	49	40.8		
3	High	53	44.2		

Source: Field survey 2013

Table 4 showed that Group I, which was exposed to the Demonstration method alone, followed suit with 13.7% having an increase in knowledge level. This impact indicates the utility of demonstration as an extension method to the farmers. Group II, which was exposed to meetings alone achieved an increase in knowledge (9.18%). The farmers of Group III who received the message through pamphlet alone gained the least increase in knowledge (3%). The all methods group gained the highest increase in knowledge (16.75%).

The mean difference is significant at (0.05) level between post and pre-test values in all the four modes of methods which were 4.9, 4.5, 2.6 and 6.07 respectively in Groups of demonstration, meeting, pamphlet and all methods. The 't' test favored the alternate hypothesis, i.e. $H_A: M2_M1$ against $H_0: M1_M2$.

The effectiveness was worked out based on the individual scores obtained. The all methods group had acquired the maximum knowledge (55.83%) through the instructions given by the meeting method followed by the demonstration method and the pamphlet method.

3.4 Poultry Farmers' Skills Level of Disease Prevention Practices

The results of the Table 5 indicated that a large proportion of the respondents on skills level in pre-test were in moderate (43.3%) category followed by low (39.2%) and high (17.5%) categories. However, for more than half of the respondents on the skills level in the post-test were in moderate (56.7%) category followed by high (28.3%) and low (15%) categories.

Table 6 showed that Group I, which was exposed to the Demonstration method alone, followed suit with 11.77% having an increase in skills level. This impact indicates the utility of demonstration as an extension method to the farmers. Group II, which was exposed to meetings alone achieved an increase in skills (7.11%). The farmers of Group III who received the message through pamphlet alone acquired the least increase in skills (0.9%). The all methods group gained the highest increase in skills (23.32%).

The mean difference is significant at (0.01) level between post and pre-test values in all the methods except for pamphlet group which were 4.66, 4.34 and 9.37 respectively in Groups of demonstration, meeting and all methods. The 't' test favored the alternate hypothesis, i.e. $H_A: M2_M1$ against $H_0: M1_M2$ except for the farmers exposed to pamphlet method.

The effectiveness was worked out based on the individual scores obtained. The All methods group had acquired the maximum skills (48.33%) through the instructions given by the meeting method followed by the demonstration method and the pamphlet method.

To sum up, the results in Tables 4, 6 indicated the value of All methods to enable farmers' learning process. They felt that when the Demonstration was supplemented with both of the Meeting and the Pamphlet, the retention of the message was increased due to reinforcement. The findings also stressed that the Demonstration method would serve as a valuable tool for effective information and technology transfer. The All methods also facilitated the knowledge gained to be translated into action as revealed by the rate of skills of the disease prevention practices. Demonstration, Meeting and Pamphlet could be rich communication tools on its own, when combined with others, can create a new training/learning archetype.

Table 4. Differences between poultry farmers exposed to different extension methods depending on their knowledge level of disease prevention practices in pre and post-tests

Knowledge level	Demonstration Group(n=30)			Meeting Group(n=30)			Pamphlet Group(n=30)			All methods (n=30)		
	Mean (%)	SD	E. (%)	Mean (%)	SD	E. (%)	Mean (%)	SD	E. (%)	Mean (%)	SD	E. (%)
Pre-test	68.14	0.66	43	71.48	0.71	32.18	81.57	0.55	16.27	70.00	0.79	55.83
Post-test	81.84	0.56		80.66	0.74		84.57	0.61		86.75	0.62	
Gain(Post-test-Pretest)	13.7			9.18			3			16.75		
t value	4.9**			4.50**			2.06*			6.07**		

Note. E. (%) - Effectiveness, (*) significant at 0.05 level, (**) significant at 0.01 level

Table 5. Distribution of respondents according to their skills level in pre and post-tests

No.	Skills level	N	%	Mean	SD
Pre-test					
1	Low	47	39.2	1.78	0.72
2	Moderate	52	43.3		
3	High	21	17.5		
Post-test					
1	Low	18	15.0	2.2	0.62
2	Moderate	68	56.7		
3	High	34	28.3		

Source: Field survey 2013

Table 6. Differences between poultry farmers exposed to different extension methods depending on their skills level of disease prevention practices in pre and post-tests

Skills level	Demonstration Group(n=30)			Meeting Group(n=30)			Pamphlet Group(n=30)			All methods (n=30)		
	Mean (%)	SD	E. (%)	Mean (%)	SD	E. (%)	Mean (%)	SD	E. (%)	Mean (%)	SD	E. (%)
Pre-test	62.01	0.66	30.98	62.80	0.49	19.11	73.15	0.71	3.61	51.75	0.91	48.33
Post-test	73.78	0.58		69.91	0.53		74.12	0.69		75.07	0.64	
Acquisition (Post-test-pretest)	11.77			7.11			0.97			23.32		
t value	4.66**			4.34**			0.9			9.37**		

** Significant at 0.01 level

3.5 Differences in Farmers' Knowledge Gain/Skills Acquisition Depending on Their Exposure to Different Extension Methods Studied

As shown in Table 7, ANOVA test results showed that there is a significant difference among different extension methods studied regarding to poultry farmers' knowledge gain which ($F=3.93$, $P=.01<.01$).

Table 7. ANOVA Results for differences in farmers' knowledge gain depending on their exposure to different extension methods studied

	Sum of Squares	Df	Mean Square	F	Sig.
Between group	812.568	3	270.856	3.93**	.010
Within Groups	7976.106	116	68.760		
Total	8788.674	119			

As seen in Table 8, Least Significant Difference Test results indicate that there is a significant difference at the 0.05 level between the Demonstration method and the Pamphlet method ($MD=10.7$, $P=0.02$), the Meeting method and the All methods method ($MD= -7.57$, $P=.018$), the Pamphlet method and the all Methods ($MD=-13.75$, $P=.005$) and the Meeting method and the Pamphlet method ($MD= 6.18$, $P=0.028$) in knowledge gain. Also, no significant difference was found between the Demonstration method and the Meeting ($MD= -4.52$, $P=.063$) and the Demonstration method and the All methods ($MD= -3.05$, $P=.605$) in knowledge gain.

It can be concluded that farmers exposed to all methods have significantly higher scores than farmers exposed to the Demonstration alone, the Meeting alone and the Pamphlet alone in knowledge gain. Therefore, the all methods group provided more knowledge gain than the farmers obtained from the other three methods of exposure.

The literature also supports the findings of this study. [19,16] found that farmers who are exposed to more than one extension method had higher scores in knowledge gain rather than other farmers.

As shown in Table 9, ANOVA test results showed that there is a significant difference among different extension methods studied regarding to poultry farmers' skills acquisition which ($F=20.02$, $P=.000<.01$).

As seen in Table 10, Least Significant Difference Test results indicate that there is a significant difference at the 0.05 level between the Demonstration method and the Meeting method ($MD=4.66$, $P=0.032$), Demonstration method and Pamphlet method ($MD= 10.8$, $P=.005$), the Demonstration method and the All methods ($MD=-11.55$, $P=.004$), the Meeting method and the Pamphlet method ($MD= 6.14$, $P=.004$), the Meeting method and the All methods ($MD= -16.21$, $P=.00$) and the Pamphlet method and the All methods ($MD= -22.35$, $P=.00$) in skills acquisition.

To sum up, the farmers exposed to the All Methods have significantly higher scores than farmers exposed to the Demonstration alone, the Meeting alone and the Pamphlet alone in skills acquisition. Therefore, the All Methods group provided more skills acquisition than the farmers learned from other three methods of exposure.

The literature also supports the findings of this study. [16,20] found that farmers who are exposed to more than one extension method had higher scores in skills acquisition rather than other farmers.

Table 8. Least significant difference test results of farmers' knowledge gain regarding to exposure to different extension methods

(I) Extension methods	(J) Extension methods	Mean difference (I-J)	Std. Error	Sig.
Demonstration	Meeting	4.52	2.14	.063
	Pamphlet	10.7 [*]	2.14	.020
	All methods	-3.05	2.14	.605
Meeting	Demonstration	-4.52	2.14	.063
	Pamphlet	6.18 [*]	2.14	.028
	All methods	-7.57 [*]	2.14	.018
Pamphlet	Demonstration	-10.7 [*]	2.14	.020
	Meeting	-6.18	2.14	.628
	All methods	-13.75 [*]	2.14	.005
All methods	Demonstration	3.05	2.14	.605
	Meeting	7.57 [*]	2.14	.018
	Pamphlet	13.75 [*]	2.14	.005

Table 9. ANOVA results for differences in farmers' skills gain depending on their exposure to different extension methods studied

	Sum of squares	Df	Mean square	F	Sig.
Between Groups	3849.696	3	1283.232	20.02	.000
Within Groups	7432.647	116	64.075		
Total	11282.343	119			

Table 10. Least significant difference test results of farmers' skills acquired regarding to exposure to different extension methods

(I)	(J)	Mean Difference (I-J)	Std. Error	Sig.
Demonstration	Meeting	4.66 [*]	2.06	.032
	Pamphlet	10.8 [*]	2.06	.005
	All methods	-11.55 [*]	2.06	.004
Meeting	Demonstration	-4.66 [*]	2.06	.032
	Pamphlet	6.14 [*]	2.06	.004
	All methods	-16.21 [*]	2.06	.000
Pamphlet	Demonstration	-10.8 [*]	2.06	.000
	Meeting	-6.14 [*]	2.06	.004
	All methods	-22.35 [*]	2.06	.000
All methods	Demonstration	11.55 [*]	2.06	.024
	Meeting	16.21 [*]	2.06	.000
	Pamphlet	22.35 [*]	2.06	.000

4. CONCLUSION

This study had examined the exposure of poultry farmers to different extension methods at Dakhalia governorate of Egypt. Findings revealed that the poultry farmers rarely depend on obtaining information through extension agents and the extension publications.

The results of this study revealed the comparative effectiveness of using one extension method for learning to using more than one method. Based on the study results regarding to the exposure to the extension methods studied. The using of All Methods Together approach was found to be the most effective information dissemination extension education method in terms of enhancing both of farmers' knowledge and skills. A Demonstration got 2nd position in order of effectiveness followed by the Meeting and finally the Pamphlet.

This study recommends that extension programs should use several methods simultaneously to enhance knowledge and skills of the stakeholders.

More research is needed to replicate the present findings and explore the cumulative impact of the extension methods. However, these data encourage future studies on the following points: (i) the scope of developing other techniques especially using of the information communication technology (ICT) that can be by mobiles, computers and networks for using in farmers' extension programmers, (ii) measuring the knowledge gain in the delayed span and not only immediate span to reflect consolidation of acquired information, and (iii) evaluation of the treatment approach for the content in the extension methods (supplemental materials for the message, usage of persuasion skills, time, sequence of contents ,etc...) as well as evaluation of education content of the extension methods.

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COMPETING INTERESTS

Author has declared that no competing interests exist.

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