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Economic Evaluation for Livestock Insurance in Egypt For The Period 1996-2012

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ABSTRACT

The livestock sector in Egypt is currently facing different threats including diseases. Investments of many small farmers were lost either due to diseases or emergency slaughtering. Livestock insurance can save farmers' investments in such obscure conditions. The objective of this research was to study the livestock insurance trends among the governorates through the period 1996-2012 to set guidelines for its future development. This research was based on data published by the Central Agency for Public Mobilization and Statistics (CAPMAS). Data were statistically analyzed for examining the relationship between quantitative variables, using correlation analysis and regression modeling. To test the effects of year and governorate on the studied variables, One-way ANOVA procedure was fitted. All statistical analyses were carried out by SPSS for windows. Results showed strong positive correlation between number of deaths/emergency slaughtered and the monetary compensation value paid to farmers. About 80.6 % of variations in compensation value were explained by the number of deaths/emergency slaughtered; and that if the number of deaths increased by 10 %, then the compensation value will increase by about 13642 EGP. The number of deaths/emergency slaughtered and the monetary compensation value varies significantly among different years and governorates ($P < 0.05$). It is concluded that insurance system is underdeveloped in Egypt and that its development can save investments especially with the recent increasing risk of diseases and price volatility.

1. INTRODUCTION

The agricultural sector is the main source of living for many rural inhabitants all over the world and in Egypt. Livestock are raised mainly for production and work purposes. In Egypt, the animal sector contributed by 37.33 % from the total value of agricultural production (MALR, 2017), being led by non-commercial producers. According to (Thornton, 2010), smallholders play a significant role in regards to food security especially for the poor. The numbers of livestock in Egypt had been subjected to reductions by 400000 head in the year 2015 compared to 2014 (CAPMAS, 2017a). Farmers in Egypt and all over the world seek risk mitigating strategies to save their investments. One of the financial tools that could be used is agricultural insurance (Kay *et al.*, 2012). Despite the importance of agricultural insurance, it is considered expensive to be implemented and the private sector should be involved with the governmental sector (Reyes *et al.*, 2017). Livestock

insurance is one type of agricultural insurance (Teweldemedhim and Kafidii, 2009). Generally, farmers will select a lower risky alternative with lower returns than a high risky one; for this reason they are motivated to buy an insurance policy to minimize their risks (Shaik *et al*., 2006). The insurance system could be more developed if livestock owners were educated about insurance benefits (Bishu *et al.*, 2018).

Globally, livestock insurance represented a small portion of the total agricultural insurance in 2008 (Čolović *et al.*, 2016). The insurance covers the risks of animal death or emergency slaughtering (Njavro *et al*., 2007). The same condition applied in Egypt as well. In 2015, a total of 1.2 million head were insured showing a 2.8 % increase compared to 2014 (CAPMAS, 2017a). Livestock insurance was developed aiming to save farmers' against financial losses that might result from animal deaths or emergency slaughtering.

According to (Iturrioz, 2009) animal species, location, age and the purpose of raising the animal affected on the insurance premium rates. Though livestock insurance is offered by many countries, insurance against outbreaks is mostly offered in developed countries (Mahul and Stutley, 2010). According to (Meuwissen *et al.*, 2001), epidemic animal diseases constitute high risks to producers, whereas (OECD, 2012) added that risks may extend to human health.

The Livestock Insurance Fund in Egypt was started in 1959 (MALR, 2014) and compensate up to 93.75 % or 100 % of the total value of the insured animal (Egyptian Government Services Portal, 2018).

This research aims to highlight the trends of livestock insurance in Egyptian governorates. The development of livestock insurance would result in larger number of policies being signed in this field resulting in saving farmers' investments and securing food. Finally, recommended measures are stated to develop this sector.

2. MATERIAL AND METHODS

2.1. Data collection:

Data of the study were based on the publications of the Central Agency for Public Mobilization and Statistics (CAPMAS), for the period 1996 to 2012. Data included the total number of animals insured (representing the number of animals that were exposed to risk from the owners perspective and their owners decided to pay insurance premium to minimize losses), the total numbers of animal died and/or emergency slaughtered (number of deaths, thereafter), and the total value of compensation in EGP paid to livestock owners (represent the total amount of money that "Livestock Insurance Fund" paid for livestock owners as a compensation representing a portion of the total value of the insured animal, this is equal to 93.75 % or 100 % of the total value of the insured animal depending on the prevailing market prices and insurance policy signed by the owner. In order to determine the total compensation value (in EGP) for different localities, Egypt was divided into five major localities: Locality A (Cairo and Giza), Locality B (Alexandria and Matrouh), Locality C (Portsaid, Suez, Ismailia, Sinai), Locality D representing the Delta and including Damietta, Dakahlia, Sharkia, Qalyoubia, Kafr Elsheikh, Gharbeya, Monofeya, Behera, and Locality E representing Upper Egypt and including Beni-suef, Fayoum, Elmenya, Assyout, Suhag, Kena, Aswan, Luxor, Redsea, New valley.

2.2. Statistical analysis:

A set of statistical analyses have been carried out in this study. To determine the relationship between the number of deaths and the value paid as a compensation cost, Pearson's correlation analysis was performed to estimate the coefficient of correlation between the two variables. Because the number of deaths was a discrete variable and it may deviates the assumption of normality of the current data, hence, spearman's rank correlation was conducted as a confirmatory correlation analysis. However, the results and conclusion of both correlation techniques (as presented in the correlation matrix) were the same. In addition, to quantify the association between the number of deaths and the compensation value, a simple linear regression equation was used where the number of deaths was the independent variable (X) and the compensation cost was the predicted or dependent variable (Y). To test the hypothesis that the years and localities (governorate) associated with the data source have significant effects on the number of deaths and the value of compensation, one-way analysis of variance (ANOVA) procedure was incorporated and considered according to (Snedecor and Cochran, 1989). Means separation and pairwise comparisons were done by Duncan's Multiple Range test according to (Duncan, 1955). All statistical analyses were undertaken using Statistical Package for Social Sciences (SPSS version 20). Results are

considered significant at probability level of 0.05 for each ($P \leq 0.05$).

3. RESULTS AND DISCUSSION

The total monetary value of compensation paid to owners among different localities was presented in table (1). The total value had exceeded 32 million EGP through the study period where Upper Egypt and Delta areas were the major areas representing 49.49 % and 42.30 %; respectively, of the total value. Also, table (2 and 3) showed a strong positive correlation between the number of deaths and compensation value paid to farmers, which is accepted because the compensation value is paid based on the number of animals died. This is because the Livestock Insurance Fund paid monetary value on a per head basis, which means that if large number of livestock died or emergency slaughtered, then more money would be paid as compensation to owners. Results agreed with (CAPMAS, 2017b) which reported that there is variations in disease incidence among different governorates and that Upper Egypt and Delta areas had higher diseases incidence. Lower propensity for insurance might be attributed to small livestock population or lack of knowledge about insurance benefits. This agreed with (Bryła, 2018) who reported that small number of farmers joined the insurance system because many farmers are unaware about insurance benefits, Also, might be attributed to the fact that livestock population in Upper Egypt and Delta area is more than other localities, which agreed with (CAPMAS, 2017a). The compensation system correspond with the observations of (Iturrioz, 2009) who reported that the beneficiary receive the claim amount on a per head basis after verification from authorities.

Table (1): Total monetary value of money paid (EGP) to compensate animals' owners according to locality:

	Locality A	Locality B	Locality C	Locality D	Locality E	Total
1996	41050	19283	198464	488084	524354	1271235
1997	23780	23836	122627	507104	624530	1301877
1998	36496	7477	112615	464316	551763	1172667
1999	27418	10161	164636	221034	388857	812106
2000	32541	8044	63857	284903	397586	786931
2001	37953	34269	100843	790578	441431	1405074
2002	27608	11162	78187	581282	488519	1186758
2003	53470	5004	30960	392757	597887	1080078
2004	39648	1738	39028	468630	616293	1165337
2005	66958	9000	68994	580158	751950	1477060
2006	59363	29774	226522	1340429	1149953	2806041
2007	33268	25400	161173	1639168	1803924	3662933
2008	31833	44228	111701	1353733	1654556	3196051
2009	34667	24179	26914	1081163	1669943	2836866
2010	13850	14290	31050	512393	878011	1449594
2011	73440	40350	54610	1104000	1207368	2479768
2012	37155	10535	44235	1726570	2091187	3909682
	670498	**318730**	**1636416**	**13536302**	**15838112**	**32000058**

*Locality A: Cairo and Giza, Locality B: Alexandria and Matrouh, Locality C: Canal area and Sinai, Locality D: Delta area, Locality E: Upper Egypt area

Table (2): Parametric correlation analysis between number of deaths and compensation value.

		No. deaths	Compensation value
No. deaths	Pearson Correlation	1	0.898**
	Sig. (2-tailed) = p-value		0.000
	N	459	459
Compensation value	Pearson Correlation	0.898**	1
	Sig. (2-tailed)	0.000	
	N	459	459

** Correlation is significant at the 0.01 level (2-tailed).

Table (3): Non parametric correlation analysis between number of deaths and compensation value.

			No. deaths	Compensation value
Spearman's rho	No. deaths	Correlation Coefficient	1.000	0.929**
		Sig. (2-tailed) = p value		0.000
		N	459	459
	Compensation value	Correlation Coefficient	0.929**	1.000
		Sig. (2-tailed)	0.000	
		N	459	459

** Correlation is significant at the 0.01 level (2-tailed).

According to table (4), it is concluded that 80.6 % of variation in compensation value is explained by the number of deaths. Therefore, the current regression model is appropriate. The increase in the number of deaths by 10 % would increase the compensation value by about 13642 EGP. This represented economic losses to the Egyptian government as well as producers. This agreed with (Kardjadj, 2018) who reported that animal diseases constitute economic losses to Northern African countries including Egypt.

According to table (5) the number of livestock deaths and the compensation value differ significantly ($p<0.01$) among different governorates and years. This might be attributed to disease occurrence which varies according to locality and environmental conditions, this agreed with (Alleweldt *et al.*, 2009; FAO, 2015) who reported that different factors including environmental conditions affected diseases distribution.

Results in table (6) showed the correlation coefficients and the regression weights for discovering the relationship between the compensation value and the number of deaths within each year. Moreover, the trend of the association between the two variables was graphically displayed (Fig.1) using the regression coefficients, which are called beta. Taken together, Table 7 and Fig. 1, revealed an overall increasing trend of the number of deaths, which significantly ($p < 0.01$) affect, the compensation value for every observed year. More specific, the correlation coefficients were all high (> 0.7), suggesting the prominent / strong relationship between the compensation value paid and the corresponding number of deaths, for all years. This agreed with (Perry and Sones, 2009) who reported that disease distribution and prevalence in developing countries had changed within the last two decades. It was clear that, the highest compensation value was recorded for the year 2008, combining all governorates. The values of beta which were all positive represent the value of compensation for each one unit of death.

In addition, the coefficients of determinations (R^2) were all high and close to one, indicating the ability of these regression equations to explain the highest percentages of variation in compensation value based on the explanatory variable, the number of deaths, which agreed with (Iturrioz, 2009) who reported that as the number of animals died increase, more compensation value would be paid to owners.

Table (4): Effect of number of deaths on the compensation value.

Function	**Y = -5018.89 + 1364.29 (number of deaths)**
T (for coefficients)	(-1.702) + (43.53)**
F (for model goodness)	1894.7**
R^2 (for model goodness)	

	0.806

Y = the compensation value, ** Significant at ($p < 0.01$)

Table (5): Effect of years and governorates on number of deaths and compensation value

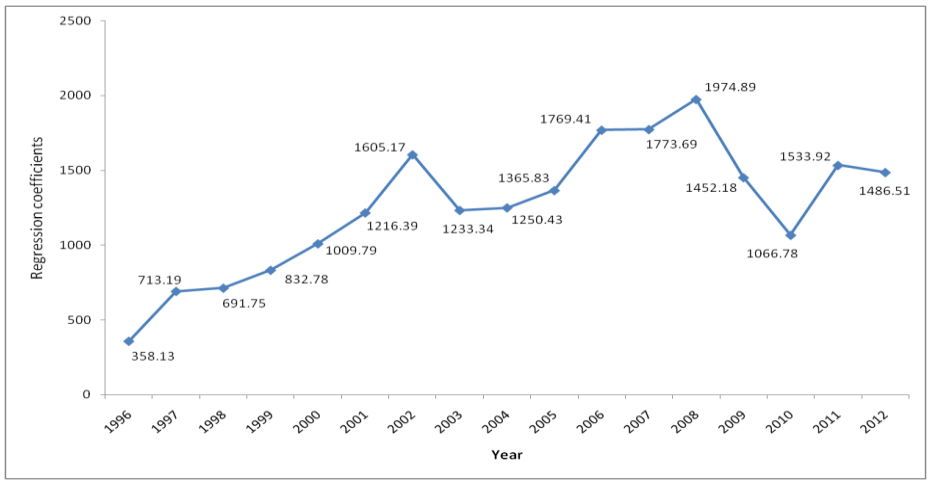
Effect	Outcome	Total df	F	P-value
Year	Number of deaths	458	2.227**	0.004
	Compensation value	458	3.103**	0.0001
Governorate	Number of deaths	458	20.942**	0.0001
	Compensation value	458	16.139**	0.0001

** Significant at ($p < 0.01$)

Table (6): Correlation and Regression analysis between compensation value and number of deaths within the years

Year	B (beta)	T	P-Value	R	R^2
1996	358.13	7.698	0.001	0.839	0.703
1997	691.75	12.639	0.001	0.930	0.865
1998	713.19	7.458	0.001	0.831	0.690
1999	832.78	16.48	0.001	0.957	0.916
2000	1009.79	13.16	0.001	0.935	0.874
2001	1216.39	9.28	0.001	0.880	0.775
2002	1605.17	6.749	0.001	0.804	0.646
2003	1233.34	15.649	0.001	0.953	0.907
2004	1250.43	15.54	0.001	0.952	0.906
2005	1365.83	14.36	0.001	0.944	0.892
2006	1769.41	19.339	0.001	0.968	0.937
2007	1773.69	18.29	0.001	0.965	0.931
2008	1974.89	15.703	0.001	0.953	0.908
2009	1452.18	14.625	0.001	0.946	0.895
2010	1066.78	22.096	0.001	0.975	0.951
2011	1533.92	10.463	0.001	0.902	0.814
2012	1486.51	21.929	0.001	0.975	0.951

Fig. 1: Relationship between the compensation value and the number of death represented by regression coefficients as functions in the year.



It is concluded that the livestock insurance program in Egypt is still in its infantile stages despite its early adoption. Upper Egypt and Delta localities represented the highest percentage of monetary compensation value among other localities in Egypt which indicated awareness of livestock insurance programs in these areas, large livestock population and higher incidence of diseases than other localities. Both farmers and the government are subjected to high economic losses due to animal diseases, and that development of the insurance sector can save investments in livestock industry.

It is recommended to develop veterinary extension campaigns to introduce insurance benefits to farmers. Also, private companies should be encouraged to participate in livestock insurance.

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