The Analysis of the Economic Damages of Dust Storms in Iran (The Continue of December Paper 2011)

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Abstract: Dust or dust storm is the accumulation of fine solid particles which are distributed and cause the reduction of horizontal sight to less than two kilometers. The atmospheric conditions, natural structure of the earth, and a resulted structure of mankind retouching are the effective factors in the occurrence of dust phenomenon. Iran and its western neighbors are placed in the dry and half-dry regions of the world and this causes their unavoidable exposure to the dust and storm. As an example, the hot deserts of Arabian and summer affect the west, southwest, and south parts of Iran in summer. (Alijani, 2006) but in recent years, the storm phenomenon have been much more then dust storms considering concentration, permanency, extent, and time. Finally these factors cause the undesirable effects on the environment, economy, and the health of the residents of these areas. In the past, three countries of Iran, Arabia, and Iraq tried to smear with tar the misty deserts of Iraq jointly. Bituminization is one of the oil products which are used to stabilize the flowing sand of deserts. The occurrence of war and the change of government policy in 2000 decade (Christian era) lead to the forgetfulness of this fact and consequently the increase of dust storms in the west, southwest, and south and finally throughout of Iran. The obtained results from the regression analysis and economical model illustrated that approximate measure of 10/89 percent of economic damages are the results of the concentration changes of storms in the investigated areas. Also the Logit analysis confirms that the dripping alternating watering in the agriculture parts decreases the damages in the period of storm entrance.

Key words: dust storm, economical damages, regression model analysis

INTRODUCTION

Dust or dust storm is the accumulation of dust or smoke fine solid particles which are distributed and limited the horizontal sight up to average of one and two kilometers and is very harmful for respiratory patients. Dust storm sometimes leads to the happening of Blue Moon phenomenon.

Dust storm is the nearly permanent occurrence in Mars which sometimes goes up at height of 30 kilometers (more fivefold of Damavand Mountain height than sea surface) and is aggravated in summer and also forms intense storms. One of the reasons of the great downfalls in history is the dust storm phenomenon which dinosaur downfall is among them, mainly because in critical cases this happening leads to the global winter by preventing sunlight radiation to the earth. One of the instances of this phenomenon in human history occurred in the 1816 (the Christian era) in continue of Tamburaeruption which was named the year without summer.

Middle East storms can be divided to three different kinds of North, Front, and convection the principle storm in the Middle East is the North one. North storm and dust happened in the Iraq, Kuwait, and Peninsula which greatly decreased the sight at the earth surface. North storm is divided to summer north and winter north. The storm resulted by each of them causes the creation of dust in Middle East which is called one hundred and twenty winds blow every day from June to September. North storms in Kuwait and Arabia are known with 'Simon" name that means poisoning wind and move gradually to the west of Iran and finally enters the country.(Boochani, 2012)

In Iran, the source of dust storm is the North wind. This wind which is active from May to September is formed in the North of Middle East and with the passage through Turkey Mountains and the North of Iraq is sloped like the funnel to the deserts of Iraq and Syria and also advances to the Persian Gulf and free waters. The dry flows of Arabia weather, without attending to environment, and desert cleaning in Iraq cause the drying of the many batteries of Iraq and also the formation of dusty regions. In the past, Iran, Iraq, and Arabia supported the bituminizing expenses of these lads and all the lands were bituminized in particular seasons. Malthite is one of oil sticky product utilized for stabilizing flowing sands in deserts. Iraq war and the change of policy of these governments in 2000 decade (the Christian era) leads to the forgetfulness of this fact and consequently result in the increase dust storms in Khoozestan, the west of Iran and finally all through the Iran. The recent storm which was the worst one according to the statement of some of the Baghdad residents cause the greatest amount of dust

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storm in Iran during the three past decades and the combination of dust with city pollutant produced the dangerous dust which caused that hundreds of citizens go to the hospitals.

World Health Organization started to classify cities of the world for the first time based on polluted particles existed in their atmosphere. According to this classification, Ahvaz is known as the much polluted city in the world.

in this classification, the polluted particles existed in those cities which their amounts were less than ten micrometers were measured that the dusts existed in the Ahvaz atmosphere were more than other regions of the world. Based on this report, the average amount of polluted dust in the Ahvaz atmosphere is three hundred and seventy two microgram in each cubic meter which the utilization of low quality fuel and the existence of heavy industries in this city are among the main factors of their appearance.

World Health Organization while declaring that these dust storms lead to the untimely death for one million and three hundred forty thousands of people asked world countries to increase their performances for decreasing the city pollution.

In this classification, the weather of more than one thousand and hundred city were evaluated in recent years and also the distributed information of their own countries are considered in that classification. Global standard for reaching the dust in the atmosphere is 150 microgram on each cubic meter but new standards are defined in the group work of Khoozestan which according to them, if the dust in the atmosphere reach two thousands microgram on cubic meter, the elementary course, if it reaches three thousands microgram on cubic meter all the educational coursers and if it reaches higher than three thousands microgram on cubic meter all educational centers and governmental organizations will be closed.

By considering this fact that in Ahvaz sometimes the dust concentration is four thousands microgram on cubic meter; therefore, the residents of Ahvaz experienced the air pollution which was twenty six fold as compared with global limitation in the first six months of 2012. The amount of dust concentration suspended in the air was between 1200 to 1800 micrograms

On cubic meter in Booshehr for forty days. Also the amount of 2500 microgram on cubic meter has been reported for other twenty seven days.

In the first six months of 2012 the amount of dust storms was sometimes eighteen fold of standards which were nearly influenced by polluted dust storms in the Lourestan city. In Iran, the main source of dust storms is the hurt of Iraq south which are surrounded by 9000 square kilometers of the south of Iraq, and by increasing the temperature of atmosphere and no raining to the drying of air and it is anticipated if it continues in this summer, the number of days with dusty air will increase to three hundred days in the next decade.

By considering that Iran and its west neighbors are placed in the dry and half-dry belt of the world and more than two third of the menstruation of Iran exists in the dry and half-dry realm and on the other hand the average amount of annual rain is half as compared with annual rain in the world; so Iran is exposed to the dust storm phenomenon in the both local, regional, and world scale.

The west regions of the country are much more exposed to the dust storms system because of their geographical and continental conditions and also their nearness to the deserts of the neighborhood countries like Iraq, Syria, and Arabian particularly because most atmospheric system enter Iran from northwest, west, and southwest. Therefore, the analysis and evaluation of economic damages of dust storms are the necessity.

-Theorized Bases and Accomplished Studies:

- Pargal and Weiler examined the role of formal regulations in the pervading of industrial water pollution in the Indonesia institution in their study. The results of this study illustrate that water pollution is the increasing dependent of production amount and governmental possession and is the decreasing dependent of the efficiency and the regulations of local life environment.

- Antweiler et al, 2001 inspected the relationship between pollution and physical capital in the producing industries in their study. The obtained results show that crafts with higher amount of pollution utilize more physical capital.

- Cole, Elliot.Shimamoto studied the relationship between industrial activities, life environment, and air pollution in the producing industries of England in their investigation. The results of this survey which has done by assisting the data data for the period of 1990-98 illustrate that pollution intensity is the positive dependent of energy consumption, physical capital intensity, and human capital intensity. Also there exists the negative relationship among the amount of pollution and the average value of institution in one industry, the efficiency of industry, capital expenses, research expenses, and development.

- In 2010, Zahra Nasrollahi and MarziehGhafariGoolak in the study under the title of air pollution and its affective factors (case study of the distribution of SOM, SO2 in the Iran producing industries) presented that air pollution is the positive dependent of energy consumption, the volume of industrial activity, and volume of physical capital, and also is the negative dependent of the efficiency of work power, fossil fuel price, and the intensity of human power proficiency.

- Mohammad HosseinBoochani and DariushFazeli in 2011 illustrated in their investigation that the number of dust focuses has been 3/5 fold in the Iraq, Arabia, and Syria in the past three decades. In continue, these conditions were identified in the period of 1352 days in Ilam. (As an example in the west of the country)

- In 2007, ElahehVaseghi and AbdolkarimEsmaeeli measured the economic efficiency of change in the continent on the corn production in Iran using Rykardin Method and investigated the effects of future continent changes on the net income of agriculturists and used the data of the period of 5 years in 11 provinces. The obtained results confirmed that continent variables have significant and no linear effects on the net income in exchange for each hectare of corn production. Also the results illustrated that increasing of temperature and rainfall reduction up to coming hindered year because of air pollution and increasing the distribution of greenhouse gases cause twenty nine percent reductions in the yield of corn reduction in Iran. (Fifty four dollars in exchange for each hectare)

Research Method:

In order to analyze the regarded data, analytical-descriptive method was used. In this method, simple regression methods and economical profit and loss analytical methods were utilized regarding the survey of statistical data. The required statistics and data were collected from statistical collection of Agricultural

Jehad Organization, the internet station of metrological organization, and air navigation organization of Iran, and then were examined using analytical model of Logit related to the method of loss reduction.

Research Purpose:

The anticipation of the economic loss of dust storms in the agricultural domain, sanitation, and transportation.

Main Hypothesis:

There is a relationship between the measure of dust storms and their abundance in the environment and economical loss in the domain of agriculture, sanitation, and transportation.

Analysis of Data:

**Table 1:** The loss of agriculture domain.

Injured Regions	Product reduction of wheat on the basis of percent in each hectare of cultivation	Average of concentration on the basis of microgram in the atmosphere
Kermanshah	0/1	1100
Ghasreshirin	0/3	1800
Sarpolezahab	0/27	1760
Eslam Abad	0/22	1580
Ilam	0/26	1820
Dehloran	0/29	1832
Ahvaz	0/24	1840
Andimeshk	0/27	1870
KhoramAbad	0/25	1670
Pole Dokhtar	0/2	1790

$$R = \frac{N\xi xy - \xi x\xi y}{\sqrt{N\xi x^2 - [\xi x]^2 N\xi y^2 - [\xi y]^2}}$$

$$R = -0/33$$

$$y = 12/1 - 0/2x$$

If $B < 0$ then the diagram will be as follows
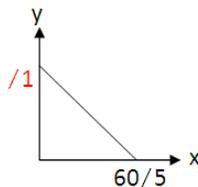
As it is observed, because the negative value of r is the indication of negative correlation; therefore the mark of b will be negative. The negative correlation coefficient of 0/33 means that there is a reversed relationship between the amount of dust storms concentration and wheat production in the injured decuple regions. By increasing the dust storms concentration and their permanency the wheat production will be reduced.

$$V = (rxy)^2(100) = (-0/33)^2(100) = 10/89$$

As it is illustrate, 10/89 percent of dispersion is in common between two variables and nearly 10/89 percent of the variance entire related to the reduction of wheat production in the injured regions is as a result of the variance of dust storms concentration in the decuple regions.

In the normal condition, on the average; 3000 kilogram of wheat have a cost of 980 dollars of each hectare of wheat cultivation in the lands in which averagely we face 24 percent of production reduction in the decuple regions while there exists the loss of 235 dollars to the wheat production system.

Table 2: Anticipation of the amount of loss related to the wheat product in the three west provinces on the basis of dollar.

Injured provinces	The evaluation of loss on the basis of dollar	The amount of loss on the basis of ton	Anticipation of the average of wheat production in 2012 on the basis of ton
Kermanshah	16/920/000	216000	900/000
Ilam	13/160000	168/000	700/000
Lorestan	15/040000	192/000	800/000
Sum	45120000	576000	2400000

In addition to the mentioned cases, on the whole; there is a reduction of 20600 ton of garden product, 750 ton reduction of honey, and nearly 45120000 dollars of economic loss in these three provinces.

Table 3: Anticipation of the loss amount of the maize product in the three provinces on the basis of dollar.

Injured provinces	Product reduction of maize on the basis of percent	Average amount of dust storms concentration in the atmosphere on the basis of microgram
Kermanshah	0/19	1553
Lourestan	0/22	1725
Ilam	0/24	1895

$$R = \frac{N\xi xy - \xi x \xi y}{\sqrt{N\xi x^2 - [\xi x]^2 N\xi y^2 - [\xi y]^2}}$$
$$r = -0/30$$
$$y = -51/5 + 0/03x$$
$$V = (rxy)^2(100) = (-0/3)^2(100) = 9$$

As it is presented, 9 percent of dispersion is common between two variables and nearly 9 percent of the variance entire related to the reduction of maize production is as a result of the variance of dust storms concentration in these three injured provinces.

In the normal condition, on the average; 14000 kilogram of maize have a cost of 4263 dollars of each hectare of maize cultivation in which if we face 9 percent of production reduction in three provinces of each hectare in the production therefore there is a loss of 426 dollars to the maize production system.

Table 4: The anticipation of the amount of dust storms loss of maize products in the west three provinces on the basis of dollar.

Injured provinces	Evaluation of loss on the basis of dollar	Average of reduction amount on the basis of ton	Anticipation of the average of the maize production in 2012 on the basis of ton
Kermanshah	903420	37/800	420/000
Ilam	797724	33660	374000
Lorestan	674028	28440	316000
sum	2375171	999000	111000

Table 5: Loss amount anticipation of dust storms to the passenger service of air transportation in decuple injured regions in 2011 0n the basis of dollar.

direction	Loss amount of air transportation income in the passenger service on the basis of dollar	Numbers of flight cancellation on the basis of each person in the sight less than 600 meters	Degree of passenger transportation on the basis of each person
1-Tehran-Abadan	213550	4271	15821
2-Tehran-Ahvaz	1020900	20418	756245
3-Tehran-Bandar Abbas	335600	3356	124300
4-Tehran-Zahedan	384552	3924	145345
5-Abadan-Tehran	87600	1752	64886
6-Ahvaz-Tehran	637600	12752	472305
7-BandarAbbas-Tehran	384300	3843	142321
8-Zahedan-Tehran	577710	5895	218321
9-Tehran-Kermanshah	192750	3855	142780
10-Kermanshah-Tehran	314950	6299	233287
sum	4149512	66365	

Because of the high amount of dust storms concentration, the 2/73 percent of year the sight decreased less than 60000 meters which leads to the cancellation of flights of decouples directions. Generally, 4149512vdollars cause a loss to just passenger service of air transportation in the ten flight directions of Iran during a year. However the cost of company and the missed opportunities of passengers and personnel have not been regarded.

Diagram 2- the wheat product

Diagrame3-maize product
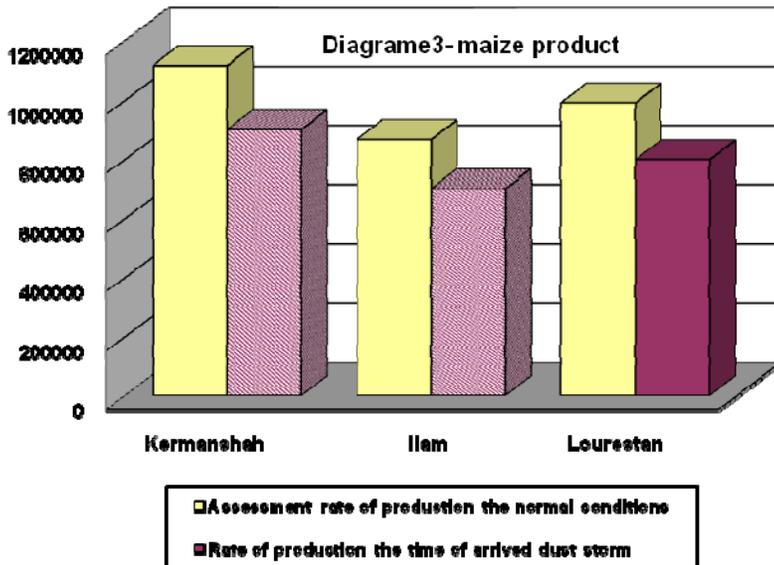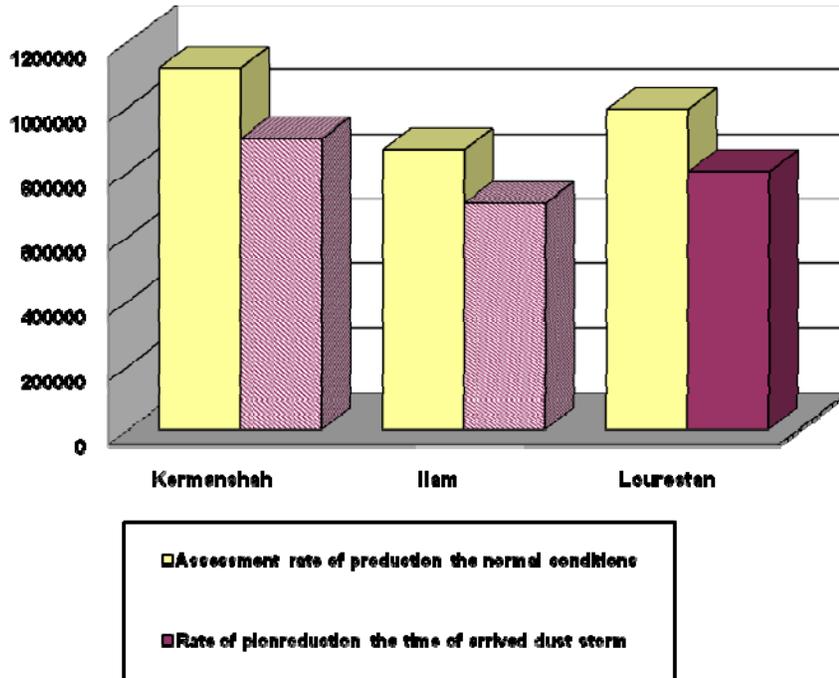
$19\% \times 198947.36 = 37800$

$22\% \times 153000 = 33660$

$24\% \times 118500 = 2844$

There was a balance at the e_1 point before but after the entrance of dust storms and the imposition of variables costs to the cost system we reach system 2 in which the balance exists at the e_2 point and is the indicator of 2000 kilogram reduction of wheat product.

diagram4-the costs wheat
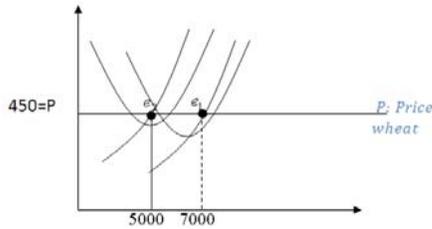
The data related to the sketch of simple Logistic regression diagram

Because of the alternative watering in two forms of dripping and traditional of the conditions of dust storms entrance for agricultural products

The numbers of alternative watering	PS	Exp(Logit PS)	Logit PS	Not improved 1 & Improved 0
2	0/1	0/12	-2/202	0
4	0/2	0/24	-1/392	0
5	0/21	0/38	-0/9496	1
6	0/31	0/45	-0/767	1
8	0/58	1/41	-0/4774	1
9	0/67	2/10	-0/7491	1
10	0/79	3/67	1/278	1

The PS diagram on the basis of the numbers of drawn watering
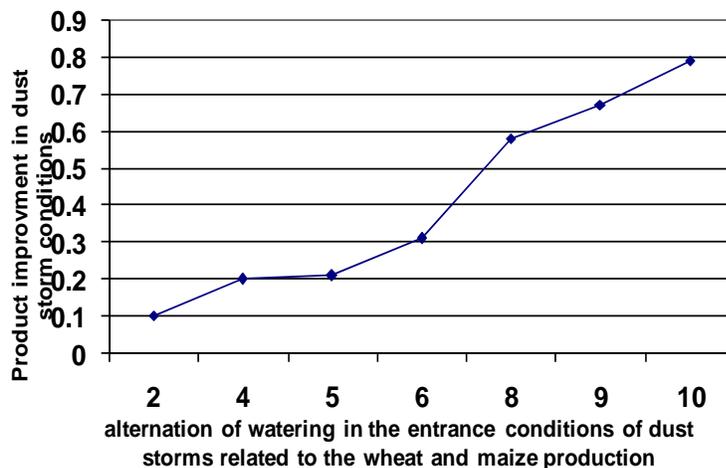
The upper diagram confirms that if in the dust storm conditions, alternative and dripping watering occur , the improvement will be obtained in the agricultural products (maize and wheat) so that there will be nearly 40 percent increase in the wheat production and 41 percent increase in the maize production in each hectare which is about 600 dollars of economic loss compensation of wheat production and 1000 dollars of economic loss compensation of maize production, however the average cost of dripping and alternative watering in one agricultural period (in the entrance conditions of dust storm) is nearly 150 dollars which is about 450 dollars of profit for each of wheat and about 850 dollars of profit for each of maize.

Conclusion:

One logarithm exchange is done with Logit exchange in evaluations which is as follows:

$$\log it(ps) = \log\left(\frac{ps}{1-ps}\right) = Log\ odds$$

When the PS changes amplitude is between 0 and 1, the logit changes amplitude is between $-\infty$; $+\infty$. When PS approaches zero, PS approaches $1-1$. Therefore logit is nearly equal to log (ps) and when PS approaches 1; Logit (PS) is nearly equal o $\log(1/1-ps)$. As a result, the logit measure comes near to logarithm in two extents but it finds out linear relationship with PS for PS middle amounts. Consequently the PS diagram on the basis of x will be one curved in the form of s with sigmoid. Therefore;

$$\log it(ps) = bo + \xi b_j x_i$$

Which the follow function is used in the analysis of the research question

$$PS = \frac{\exp(\log itps)}{1 + \exp(\log itps)}$$

Table 5: The production improvement and the reduction of economic loss in the entrance conditions of dust storms with watering alternation.

Variables existed in the equation	P	d_F	x^2	$-\log L$
Fixed number	0/00	1	67/242	67/242
Production improvement in the entrance conditions of the dust storms	0/00	1	40/021	27/221

The mentioned data indicate that the evaluation of model is not suitable without any variables and x^2 is very great. By entering the variable, the improvement of x^2 production was decreased (021/40=323/27-242/67). This will be accompany with 1 degree of freedom of change in x^2 and will anticipate the significant change. The obtained regression equation for the research and mentioned data is as follows:

$$\log it(ps) = -\frac{2}{699} + \frac{0}{0711}\text{improvementof production}$$

the justification of 0/0711 coefficient in the regression equation for the improvement of production in the entrance conditions of dust storms confirms that one unit of improvement increase in the production will increase the Logit (PS) or Log odds up to 0/0711.

If a Log odd is entered in the equation for the improvement in the wheat production up to 40 and in the maize production up to 41.

$$\log it(ps) = 0/0711(40) - 2/699 = 0/145$$
$$\log it(ps) = 0/0711(41) - 2/699 = 0/216$$

With the alternation of e, we will have:

$$\frac{1/93}{1/53} = 1/26$$

Therefore it can be observed that by increasing one unit of production improvement of the entrance conditions of dust storms, the ratio of Log odds will be increased that this is equal to 8/4 percent of improvement increase. So that it can be concluded that there will be exist the decrease of economic damages in this domain the same as this ratio.

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