Journal of Risk and Financial Studies
Vol. 1, No. 1, 2020, pp. 75-88

ARF INDIA
Academic Open Access Publishing
www.arfjournals.com

Hedging Sea level Rise and Climate Variability Risk through Coordinating Crop Production Chains in Southeast Mediterranean Sea

Youssef M. Hamada

Agricultural Economics Research Institute, Egypt

Received: 18 January 2020; Revised: 27 February 2020; Accepted: 8 April 2020; Publication: 16 May 2020

Abstract: *Climate change can affect the progress of the Southeast Mediterranean nations by increasing the load on those states, hence, stopping them from achieving out their economic progression. Overheating and less precipitation will cause a significant water shortage. This could un-positively impact food production and deteriorate the existing circumstance of food protection and other associated issues. The Southeast Mediterranean vicinity is anticipated to have greater bad consequences from Sea Level Upsurge than any other zone. The contemporary worldwide warming has the ability to put millions of people and essential economic activities to coastal flooding. Climate change is one of the most important challenges that humanity is facing, as it is no longer the best danger on biodiversity and food protection, however, is also impeding economic overall performance and development. It is really worth announcing that climate threats are all interlinked. For examples of the results of climate change are: global temperature upward thrust, warming oceans ice sheets, glacial retreat, decreased snow cover, rise in sea level, declining arctic sea, ice-ocean acidification, and desertification. This research focuses on giving attention to resolution makers at the seriousness of those risks and to factor out how risk management and insurance techniques can help within the survival of their economies. The value chain was formulated to focus on the scientific linkages between adaptation to climate changes as a Sea level rise and laser land leveling as a prerequisite to reduce saline groundwater on Mediterranean Sea Coast in North Egypt and adaptation to warming in Upper Egypt to study achieving efficiency and equity in cropping patterns in Egypt by focusing on the Strategic current global climate changes Preparedness Plan, introduction methodologies, and specific action to fight drought. As a result of optimal cropping patterns, farm income would increase by 30.391, 190.818 %, water use decrease by 28.159, 28.180 %, CO2 emission reduce by 20.582, 22.840 %, and energy reduce by 23.654, 28.546 % in the old and new lands in Egypt.*

Keywords: *Efficiency, Crisis, Regulation, Risk Management, Solvency*

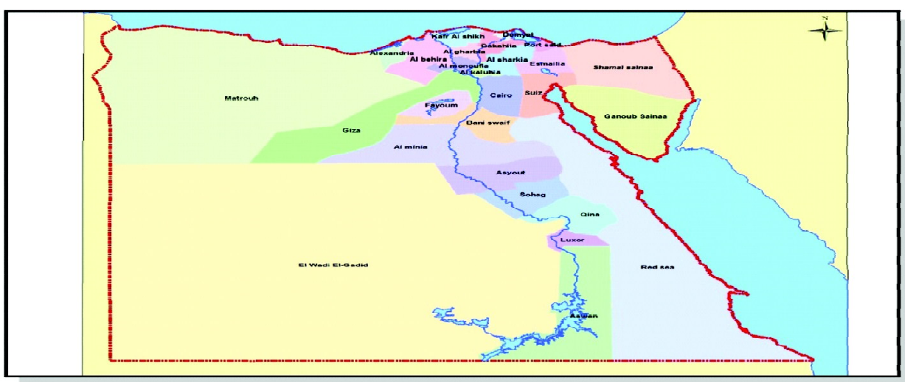
INTRODUCTION

Every year, climate events cause dozens of death, affect tens of thousands of human beings and/or cause millions of bucks in damage, specifically within the agriculture sector. A 2001 drought associated with El Niño brought about agricultural losses of US$30 million. In 1998, Hurricane Mitch precipitated economy-huge damages of over US$3.7 billion, of which over US$2 billion happening in agriculture. Climate hazards have had immediate effects on rural communities: for example, subsistence crops consisting of maize and beans are exceedingly sensitive to current and projected temperature and rainfall trends. Rural farming communities lack enough ability to adapt to climatic changes, due to their low earnings and education levels coupled with environmental degradation. Despite the coping mechanisms in place, climate variability and change are increasingly overwhelming coping capacities and compromising the use of sustainable acclimation strategies **(UNDP 2013).** The mixture of increasing dangers and vulnerability now not simplest puts smallholders at direct hazard, but can also jeopardize the achievements of national and sectorial development goals, inclusive of reduction of poverty and inequality; development of schooling, fitness and security; and get right to water. The Egyptian Government goals to attain an annual growth inside the agriculture sector, improve exports, increase production levels of staples, however, climate variability and change threaten those plans.

Farmers have dealt with climate dangers for the duration of the entire history of agriculture. Climate change is now growing the intensity, frequency and variety of those risks – and posing pressing new questions for production's strategy and programming. Well over 50 percentages of farmers have a value chain improvement aspect **(UNDP 2013).** Climate-related risks can cause principal losses of revenue for the farm. The livelihoods of smallholders tend to be most at hazard. However, climate change also has the capability to provide new chances for a few agricultural value chains. In general, those gains require to be balanced against concerns regarding biodiversity conservation and soil erosion on farms. Successful value chain interventions that attain poverty reduction desires can in them be useful to climate change adaption, as they build farmers' property and institutional linkages. But climate change can have foremost results at the consequences of value chain interventions for smallholder beneficiaries; these effects can be poor or positive, and in many instances are uncertain. Therefore, it will pay to do a simple upfront hazard evaluation to perceive and manage risks and possibilities. The purpose of this research is to provide guidance on the basics of climate risk analysis for value chain interventions.

METHODOLOGY

Changes in climate may worsen already present challenges of water scarcity, food security, and, above all, the population increasing in Southeast Mediterranean countries. Loss of biodiversity, desertification, and rise in sea level are some of the alternative pitfalls that may accompany environmental change. Scorching temperatures, extreme humidity, and damaged arid lands are the characteristic countenances of the place. Salt intrusion within the aquifers is an essential effect of those conditions having wide-ranging impacts on agriculture, mainly small scale agriculture, which in turn is aggravating the danger to food security within the area. However, these threats to surroundings, livelihood, and economy have impelled Southeast Mediterranean states to participate actively in worldwide consultations for environmental trepidations **(Al-Maamari et al., 2017).** Climate change has already started to reveal its effects as even few-day-rain floods bring life in numerous of the location to a halt in the region. Thus, those threats to Southeast Mediterranean weather warrant instant and necessary actions. The study area was the old and new lands of Egypt with an area of 2149252.56 and 677504.94 hectares **(MALR, 2020),** which contains 13 governorates (Alexandria, Gharbia, Menoufia, Ismailia, Kafr El Sheikh, Qaliubiya, Dakahlia, Port Said, Sharqia, Damietta, Suez , El-Behaira, and Cairo) in the Nile River Delta and 9 governorates (Giza, Fayum, Beni Suef, Mania, Assuit, Sohag, Qena, Luxor and Aswan) in the Nile River valley **(Figure l)**. The old and new lands in the Nile Valley is the main area that grows in Egypt and is characterized by a pattern of growing crops for a complex year, where crops are cultivated over three consecutive cropping



Lower Egypt		Middle Egypt	Upper Egypt	Outside the Valley
Alexandria	Port Said	Giza	Assuit	New Valley
Gharbia	Sharkia	Beni Suef	Sohag	Matruh
Menoufia	Damietta	Fayum	Qena	South Sinai
Ismailia	Suez	Mania	Luxor	North Sinai
Kafr-El Sheikh	Behera		Aswan	Noubaria
Qalyoubia	Cairo			
Dakahlia				

Figure 1: Nile River valley

Source: (Hamada 2020)

seasons; winter, summer, and nili. The Nile River is the main source of renewable and fresh surface water in Egypt.

MATHEMATICAL MODEL

Risk itself entails the general notion of a juvenile or set of juveniles, regularly characterized as a hazard, an detail of likelihood, an outcome that relates to a set of values, and a time-frame inside which a majority of these activities may additionally occur. Risk assessment and management may then take the region with the aim of reducing vulnerability or maximizing beneflt. The vulnerability here can be thought of because of the redisposition to be harmed. Vulnerability to climate change as defined by means of the **IPCC (2007)** is the handiest a small part of wider social vulnerability defined with the aid of social, cultural, political and institutional factors **(Adger & Kelly 2004).** This broader range is the only in which adaptability if implemented, will take place, so vulnerability is used in this context unless otherwise stated.

Hedging adaptability and mitigation can assist negotiate adaptation guidelines at the countrywide level? For example, Australia's adaptability policy describes variation as being the principal way to deal with the unavoidable influences of climate change **(CoAG 2007).** Which impacts are unavoidable, and which are likely, given exclusive stages of mitigation? How does one set up which stage of global warming and associated impacts should be tailored to? These questions may be addressed by means of understanding the commitment to climate change from beyond and near-term future emissions and the impact of mitigation policy. Past commitment dominates atmospheric warming over the following few decades, with subsequent policy choices having an increasing influence over time. Commitment additionally has a degree of irreversibility inside the limits of model planning, mainly for sea-level rise, which can continue for many years to centuries because of the big heat potential of the oceans **(Solomon et al. 2009).**

Hedging Sea level rise and climate variability risk (HSLRaCVR) through coordinating crop production chains in Southeast Mediterranean sea is a model formulated as an analytical tool for hedging from changes in climate in the old and new lands of Egypt in the agriculture location in Nile valley in light of water scarcity in Egypt **(Figure 2).** To evaluate the sustainability of agriculture, it is crucial to consider the water use performance of the farming system; water use performance can regularly be elevated through decreasing water use from inputs or through the way of developing outputs which includes crop production. In addition, the

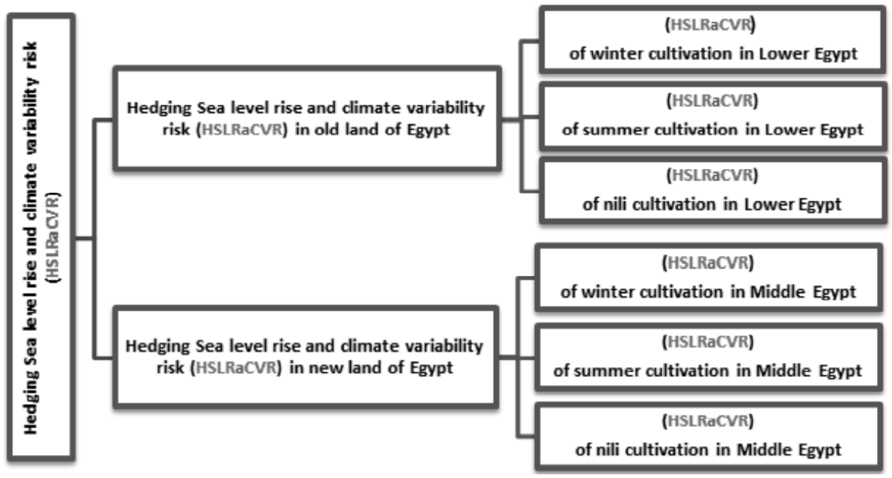


Figure 2: Structure model of hedging Sea level rise and climate variability risk (HSLRaCVR) in the crop production chain in Egypt

Source: (HSLRaCVR model 2020)

model had the potential to introduce many forms of water use as a prerequisite for efficiency and fairness in the agricultural sector in light of water supply change and global climate change, which reduces the cost in order to compete in the global market and reduce the social cost of pollution on agricultural crops. The financial and economic analysis and risks have been moreover studied, as well as the inner annual rate of return for crop production. To fill within the model, field data reported by farmers was used. The vital data have been collected via a comprehensive survey and different inputs for crop fields on a winter season agriculture basis only, and comprehensive data attached into attached to the agricultural status quo and its related socio-economic conditions. Crop area, yield, and cost data have been obtained from the Egyptian Ministry of Agriculture and Land Reclamation **(MALR, 2020),** while water consumption data had been gathered from the Egyptian Ministry of Water Resources and Irrigation **(MWRI, 2020).** The important data related to the input of the cropping pattern of the different production systems have been amassed from primary resources and transformed into appropriate cropping pattern values. Greenhouse gasoline's emissions had been calculated for energy input. The data provided during this research represented typical and/or average data recorded over the three consecutive years (2014/2015-2016/2017).

Hedging Sea level rise and climate variability risk (HSLRaCVR) in crop production chain can be written as:

$$\text{Minimize HSLRaCVR} = \text{STDEV}\sum_{y1=1}^{Z1}(\text{Evy2} - \text{Evy1})/\text{Evy1} + \text{STDEV}\sum_{y2=1}^{Z2}(\text{Evy4} - \text{Evy3})/\text{Evy3} \quad (1)$$

Z1 : Total amount of productions cultivated in the scheme of old land

Evy_1 : Economic value of production old land before adaptation to climate change

Evy_2 : Economic value of production old land after adaptation to climate change

Z2 : Total amount of productions cultivated in the scheme of new land

Evy_3 : Economic value of production new land before adaptation to climate change Evy_4: Economic value of production new land after adaptation to climate change

V : Total annual volume of water used in the scheme

Subject to

$$EVy = Qy \;.\; Py - Cy \quad (2)$$

$$Qy = Ry \;.\; Ay \quad (3)$$

Q_y : Quantity of production y

R_y : Yield of production y

A_y : Area allocated to production y

P_y : Marketing price of production y

C_y : Production costs dedicated to production y

RESULTS AND DISCUSSION

Several steps have been followed to carry out **hedging from Sea level rise and climate variability risk (HSLRaCVR)**: The first step was the optimal cropping pattern for growing crops in winter in the old and new lands of Egypt. The second step was to simulate the optimal cropping pattern for Egypt. The third step was to simulate the optimal cropping pattern in the region with the current cropping pattern (2014/2015-2016/2017) to reallocate crop acreage according to production and technical risk management. To fill within the model, field data reported by farmers was used. The vital data have been collected via comprehensive survey and different inputs for crop fields on a winter season agriculture basis only, and a comprehensive data attached into attached to the agricultural status quo and its related socio-economic conditions. Crop area, yield, and cost data have been obtained from the Egyptian Ministry of Agriculture and

Land Reclamation **(MALR, 2020),** while water consumption data had been gathered from the Egyptian Ministry of Water Resources and Irrigation **(MWRI, 2020).** The necessary data related to the cropping pattern input of the different production systems were collected from primary sources and converted into appropriate cropping pattern values. Greenhouse gas emissions were calculated and expressed per the energy input. The data presented in this research represented typical and/or average data recorded over the successive years of 2014/2015-2016/2017. Current cultivation and its economic assessment in Egypt offered inside the place and the season in old and new lands are offered in **Tables 1 and 2.** The remaining base year data is available from the sources in **Tables 1 and 2** places of crops in a bigger view, which clarifies the area crops and their area as well as cultivation from their source **(ECAPMS, 2020).**

Hedging from Sea level rise and climate variability risk (HSLRaCVR) through coordinating crop production chains in Southeast Mediterranean sea is a model formulated as an analytical tool for hedging changes in climate inside the old and new lands of Egypt within the agriculture region in Nile valley in light of water scarcity in Egypt **(Figure 2).** To evaluate the sustainability of agriculture, it is might important to consider the water use efficiency in the farming system; water use efficiency can often be elevated through reducing water use from inputs or by the method of growing outputs such as crop production. To use technical risk management it can be reallocated the land use to growth farm earnings; in which the model was adjusted regardless of attention to the change in the land to accompany changes in soil and water type after laser leveling of the land inside the old and new lands of Egypt. The model structure for optimum cultivation based on the suitable soil type and water in Egypt is shown in **Figure 2.** Moreover, **Table 3** shows the economic evaluations of optimal cultivation based on Hedging from Sea level upward thrust and climate variability risk (**HSLRaCVR**) and through the usage of laser land leveling of land within the old and new lands of Egypt and was compared with the current situation in Egypt. **Figures 3 and 4** illustrate changes in water efficiency in cultivation within the area in wintry weather season from common 2014/2015-2016/2017 to **HSLRaCVR** inside the old and new lands of Egypt. The consequences showed that the whole water consumption for optimum cultivation reduced by 28.159 and 28.181% within the old and new lands of Egypt and that the overall area of crops would be 931749.034 and 319914.983 hectares planted in the old and new lands of Egypt, in addition to the anticipated model provides a higher net benefit than the current model. The general net profit of the heterogeneous case become 186530.800 and 69395.275 million EP higher than the total of the

Table 1
Changes area in winter cultivation of old and new land of Egypt flow values from the mean 2014/2015-2016/2017 to HSLRaCVR (Green is values that have increased, red are values that have decreased)

Winter cultivation in old land of Egypt

	Mean	*HSLRaCVR*	*Change*	*%*
Wheat	418898.0	485085.0	66187.0	15.800
Broad Beans	13597.4	8308.6	-5288.8	-38.896
Barley	1782.3	1949.9	167.6	9.402
Lentil	442.8	250.7	-192.1	-43.386
Fenugreek	457.9	598.7	140.8	30.740
Chick Peas	748.3	223.3	-525.0	-748.289
Lupine	32.8	82.6	49.7	151.613
Flax	2487.2	1308.9	-1178.4	-47.376
Onion	24849.5	22091.8	-2757.7	-11.097
clover	240983.0	205229.2	-35753.8	-14.837
Clover Tahreesh	35303.5	38393.8	3090.4	8.754
Garlic	4142.0	3973.1	-169.0	-4.080
Sugar Beet	67039.8	74728.9	7689.1	11.469
Tomato	11979.0	12176.2	197.2	1.646
Vegetables	70550.1	71669.4	1119.3	1.586

Winter cultivation in new land of Egypt

	Mean	*HSLRaCVR*	*Change*	*%*
Wheat	128023.0	99341.4	-28681.6	-22.40
Broad Beans	7140.7	8655.8	1515.1	21.22
Barley	14608.0	35324.8	20716.8	141.82
Lentil	6.4	0.0	-6.4	-100.00
Fenugreek	223.0	118.7	-104.3	-46.76
Chick Peas	0.2	49.4	49.2	27900.00
Lupine	57.5	0.0	-57.5	-100.00
Flax	4.4	54.2	49.7	1128.00
Onion	11317.6	8064.7	-3253.0	-28.74
clover	23720.0	77615.8	53895.8	227.22
Clover Tahreesh	1836.1	1477.5	-358.6	-19.53
Garlic	1312.1	1325.1	13.1	0.99
Sugar Beet	23162.7	25284.8	2122.1	9.16
Tomato	20834.4	17811.1	-3023.3	-14.51
Vegetables	49096.0	42812.1	-6283.9	-12.80

Data source: (1) MALR (2020) (2) HSLRaCVR model (2020) (3) ECAPMS, (2020)

Table 2
Changes area and energy consumption in winter cultivation of old and new land in Egypt flow values from the mean 2014/2015-2016/2017 to HSLRaCVR (Green is values that have increased, red are values that have decreased)

Winter cultivation in old land of Egypt

	Mean	*HSLRaCVR*	*Change*	*%*
Irrigated area of crop in old land	5117.3	5282.0	164.8	3.2
Crop revenue	190051.6	247809.7	57758.1	30.4
Crop profit	166260.0	186530.8	20270.8	12.2
Crop production cost	26235.4	40629.1	14393.7	54.9
Labor Wages	5488.8	6723.4	1234.6	0.0
Other Expenses (Labor Wages)	1257.5	1696.3	438.9	34.9
Crop water consumption	12350.5	8872.7	-3477.8	-28.2
Kerosene fuel million tons	3189.3	2532.9	-656.5	-20.6
Energy consumption in cultivation TJ	100.8	76.9	-23.8	-23.7
Main crop yield	101.6	125.4	23.8	23.4
Secondary crop yield	33.0	43.1	10.2	30.8
Main crop price	7947.8	10282.3	2334.4	29.4
Secondary crop price	494.7	509.4	14.7	3.0
Manure	514.1	927.6	413.5	80.4
Fertilizers	2195.0	3002.0	807.0	36.8

Winter cultivation in new land of Egypt

	Mean	*HSLRaCVR*	*Change*	*%*
Irrigated area of crop in old land	1613.1	1813.6	200.5	12.4
Crop revenue	32119.9	93410.7	61290.7	190.8
Crop profit	20074.2	69395.3	49321.0	245.7
Crop production cost	8436.1	13102.6	4666.5	55.3
Labor Wages	1967.5	2224.7	257.2	13.1
Other Expenses (Labor Wages)	447.6	539.8	92.2	0.0
Crop water consumption	4170.5	2995.2	-1175.3	-28.2
Kerosene fuel million tons	1400.7	1080.7	-319.9	-22.8
Energy consumption in cultivation TJ	37.7	27.0	-10.8	-28.5
Main crop yield	23.9	40.6	16.7	70.0
Secondary crop yield	10.5	12.0	1.6	14.9
Main crop price	1890.3	3741.4	1851.1	97.9
Secondary crop price	144.9	139.9	-5.0	-3.4
Manure	200.3	279.7	79.4	39.6
Fertilizers	802.2	940.2	138.0	17.2

Data source: (1) MALR (2020) (2) HSLRaCVR model (2020) (3) ECAPMS, (2020)

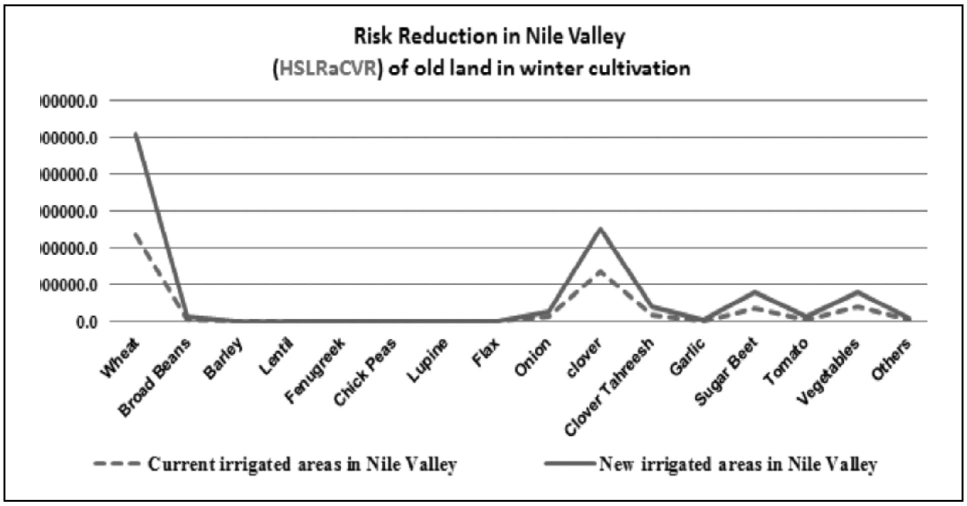


Figure 3: Changes area in winter cultivation of old land in Egypt flow values from mean the 2014/2015-2016/2017 to HSLRaCVR

Data source: (1) MALR (2020) (2) HSLRaCVR model (2020) (3) ECAPMS, (2020)

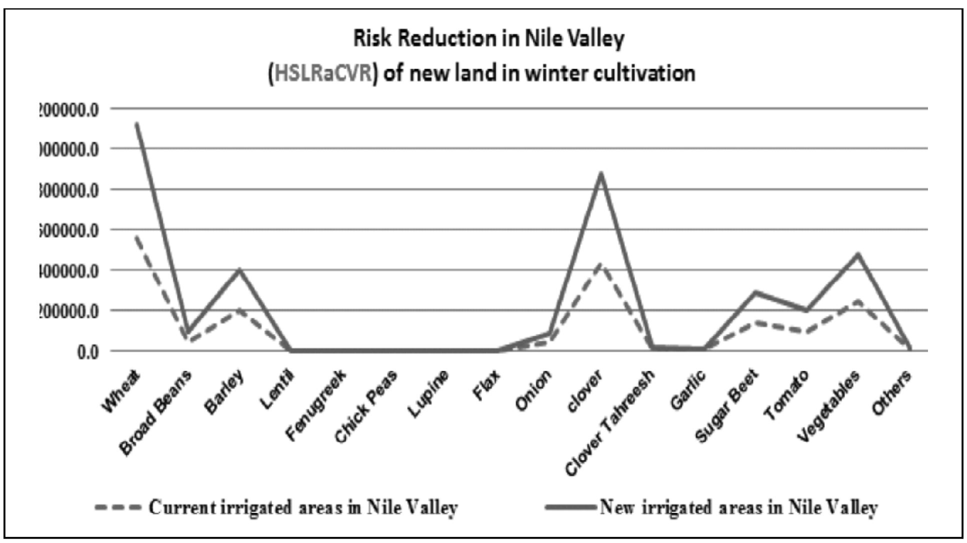


Figure 4: Changes area in winter cultivation of new land in Egypt flow values from the mean 2014/2015-2016/2017 to HSLRaCVR

Data source: (1) MALR (2020) (2) HSLRaCVR model (2020) (3) ECAPMS, (2020)

homogeneous case (166259.954 and 20074.227 million EP) after applying the model, in addition to the total cost of crops in heterogeneous case 40629.067 and 13102.565 million EP that did no longer reach the total homogeneous case (34968.102 and 8436.099 million EP). This end result may also imply that the difference between the heterogeneous cases had a massive effect on the optimal solution. For this reason, the **HSLRaCVR** model of the heterogeneous character of the land area is applicable to cultivation primarily based on production and managing technical risks after laser land leveling in the old and new lands of Egypt.

Table 3
Changes in the economic and financial values for the winter season in the old and new land in Egypt flow values from the mean 2014/2015-2016/2017 to HSLRaCVR (Green is values that have increased, red are values that have decreased)

Winter cultivation in old land of Egypt				
	Mean	*HSLRaCVR*	*Change*	*%*
Irrigated area of crop in old land	5117.3	5282.0	164.8	3.2
Main crop yield	101.6	125.4	23.8	23.4
Secondary crop yield	33.0	43.1	10.2	30.8
Main crop price	7947.8	10282.3	2334.4	29.4
Secondary crop price	494.7	509.4	14.7	3.0
Crop revenue	190051.6	247809.7	57758.1	30.4
Crop profit	166260.0	186530.8	20270.8	12.2
Crop production cost	26235.4	40629.1	14393.7	54.9
Labor Wages	5488.8	6723.4	1234.6	0.0
Other Expenses (Labor Wages)	1257.5	1696.3	438.9	34.9
Rate of return (IRR)	4.43	5.10	0.66	14.98
Absolute Risk	21.49%	16.48%	-5.01%	-23.31
Winter cultivation in new land of Egypt				
	Mean	*HSLRaCVR*	*Change*	*%*
Irrigated area of crop in old land	1613.1	1813.6	200.5	12.4
Main crop yield	23.9	40.6	16.7	70.0
Secondary crop yield	10.5	12.0	1.6	14.9
Main crop price	1890.3	3741.4	1851.1	97.9
Secondary crop price	144.9	139.9	-5.0	-3.4
Crop revenue	32119.9	93410.7	61290.7	190.8
Crop profit	20074.2	69395.3	49321.0	245.7
Crop production cost	8436.1	13102.6	4666.5	55.3
Labor Wages	1967.5	2224.7	257.2	13.1
Other Expenses (Labor Wages)	447.6	539.8	92.2	0.0
Rate of return (IRR)	2.81	6.13	3.32	118.32
Absolute Risk	134.93%	46.40%	-88.53%	-65.61

Data source: (1) MALR (2020) (2) HSLRaCVR model (2020) (3) ECAPMS, (2020)

Table 4
Changes in crop emissions of the winter season in the old and new land in Egypt flow values from the mean 2014/2015-2016/2017 to HSLRaCVR
(Green is values that have increased, red are values that have decreased)

Winter cultivation in old land of Egypt				
	Mean	*HSLRaCVR*	*Change*	*%*
NO_x	1.59	1.26	-0.33	-20.58
SO_2	7.66	6.09	-1.58	-20.58
CO_2	7704.23	6118.49	-1585.74	-20.58
SO_3	nugatory	nugatory	nugatory	nugatory
CO	2.45	1.94	-0.50	-20.58
CH	nugatory	nugatory	nugatory	nugatory
SPM	nugatory	nugatory	nugatory	nugatory
Winter cultivation in new land of Egypt				
	Mean	*HSLRaCVR*	*Change*	*%*
NO_x	0.70	0.54	-0.16	-22.84
SO_2	3.37	2.60	-0.77	-22.84
CO_2	3383.45	2610.66	-772.78	-22.84
SO_3	nugatory	nugatory	nugatory	nugatory
CO	1.08	0.83	-0.25	-22.84
CH	nugatory	nugatory	nugatory	nugatory
SPM	nugatory	nugatory	nugatory	nugatory

Data source: (1) MALR (2020) (2) HSLRaCVR model (2020) (3) ECAPMS, (2020)

According to fiscal and economic analyzes, the internal annual rate of return (**IRR**) became higher than the current model of the zone and increased by way of 14.98 and 118.32% inside the antique and new lands of Egypt. The absolute risk of optimal cultivation is decreased by means of 23.31 and 65.61% **(Table 3).** The proposed model furnished much less greenhouse gasoline emissions than the existing model for all agricultural operations. Pollutants cause damage to the ecosystem, structures, and human health. The social value according to ton of greenhouse gas emissions and air pollutants was calculated to obtain data at the ideal use of water in vintage and new lands in Egypt in Table 4. Finally, farmers ought to level the land via laser because it is the best solution to the Egyptian question, as it is low-cost (261.904 EP) for each with hectare in Egypt. As such, improving the technical, economic and organizational performances of agro-food supply chains positioned on irrigated schemes appears a valuable direction to follow. It indicates (1) pinpointing the essential supply chains riding the water intake at the scheme level, (2) analyzing their capability potential for improvement and (3) in particular running with the numerous stakeholders involved in those chains. The strategic balance between productions will depend essentially at the farm kind - on the identical time as both operational and tactical decisions may be made in step with the context farmers are presently facing. All one's decisions will directly affect the water productiveness through several production functions. The manufacturing of manure contributing to soil fertility is another factor taken by account by farmers. In that case, prices need to be attractive, as several supply chains operate within the irrigation scheme and they fiercely compete for scarce water, land, labor and capital sources.

CONCLUSION

Hedging from Sea level rise and climate variability risk (**HSLRaCVR**) through coordinating crop production chains in Southeast Mediterranean sea is a model formulated as an analytical tool for hedging changes in climate inside the old and new lands of Egypt within the agriculture region in Nile valley in light of water scarcity in Egypt. To use technical risk management it can be reallocated the land use to growth farm earnings; in which the model was adjusted regardless of attention to the change in the land to accompany changes in soil and water type after laser leveling of the land inside the old and new lands of Egypt.

This research focuses on giving attention to resolution makers at the seriousness of those risks and to factor out how risk management and insurance techniques can help within the survival of their economies. The value chain was formulated to focus on the scientific linkages between adaptation to climate changes as a Sea level rise and laser land leveling as a prerequisite to reduce saline groundwater on Mediterranean Sea Coast in North Egypt and adaptation to warming in Upper Egypt to study achieving efficiency and equity in cropping patterns in Egypt by focusing on the Strategic current global climate changes Preparedness Plan, introduction methodologies, and specific action to fight drought. As a result of optimal cropping patterns, farm income would increase by 30.391, 190.818 %, water use decrease by 28.159, 28.180 %, CO_2 emission reduce by 20.582, 22.840 %, and energy reduce by 23.654, 28.546 % in the old and new lands in Egypt.

REFERENCES

Adger, W. N., Kelly, P. M. (2004). Social vulnerability to climate change and the architecture of entitlements, *Mitigation and Adaptation Strategies for Global Change* 4: 253-266.

Al-Maamari, Q. A., Abdulrab, M., Al-Jamrh, B. A. & Al-Harasi, A. H. (2017). The Relationship between Total Quality Management Practices and Individual Readiness for Change at Petroleum Exploration and Production Authority in Yemen. *International Journal of Business and Industrial Marketing*, 6, 48-55.

CoAG, Council of Australian Governments (2007). National Climate Change Adaptation Framework, Council of Australian Governments, Canberra.

ECAPMS (2020). Egyptian Central Agency for Public Mobilization and Statistics, Selected Water Related Statistics, *http://www.msrintranet.capmas.gov.eg*

Hamada, Y. M. (2020). Effect of Variation of Water-Use Efficiency (WU) on: Water Management in Agriculture; Crop Production Management; Risk Management in Agriculture; and Labor Management in Agriculture, *Asian Journal of Economics and Finance*. 2020, 2, 1, ARF INDIA, Academic Open Access Publishing, *www.arfjournals.com*

HSLRaCVR (2020). HSLRaCVR model, Hamada, Y. M., 2020.

IPCC (2007). Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Solomon S., Qin, D., Manning, M., Chen, Z., Marquis, M., Avert, K.B., Tignor, M., Miller, H.L. (eds). Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

MALR (2020). Egyptian Ministry of Agricultural and Land Reclamation, Selected data on costs, prices, and land in production, 2020.

MWRI (2020). Egyptian Ministry of Water Resources and Irrigation, Selected water resources data 2020.

Solomon, S., Plattner, G-K., Knutti, R., Friedlingstein, P. (2009). Irreversible climate change due to carbon dioxide emissions, Proceedings of the National Academy of Sciences 106.

UNDP (2013). Climate risk management for smallholder agriculture in Honduras, Prepared by the International Institute for Sustainable Development (IISD), United Nations Development Programme (UNDP), Bureau for Crisis Prevention and Recovery (BCPR). 2012. Climate Risk Management for Smallholder Agriculture in Honduras. New York, NY: UNDP BCPR, January 2013.