
REVERSING GLOBAL WARMING AND INSECURITY IN SYRIA: THE ROLE OF MACHINE LEARNING TECHNOLOGY.

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Abstract

The pressing challenges of global warming are felt almost in every parts of the world. However, it seems that its environmental and security impact in the Middle East especially Syria has caused more damage in the region than anywhere else in the world. This is a region where wars and conflicts continue to escalate in the face of dwindling natural resources that are important for basic life's amenities. Syria have continue to lament as a result of serious humanitarian crisis and hostilities leading to worsened economic crisis and violation of human rights access to food security. The country remains impoverished under harsh weather and freezing temperatures, food scarcity and extremely damaged land worsened by drought and heavy rainfall contributes to this tension. This insecurity, especially in the area of food has been traced to the problem faced by the agricultural sector in Syria as a result of its inability to access machine learning technology-a sub-set Artificial intelligence for sustenance in the face of harsh climate conditions. However, These tensions have compromised the attainment of one of the sustainable development goals (SDGs) –Food Security. This paper explores the importance of machine learning (ML) as a tool for reversing the climate conditions and insecurity in Syria.

Keyword: Food Security, Global Warming, Machine Learning, Syria.

Introduction

There is no doubt that the effect of global warming, which is a world-wide phenomenon command problems in several parts of the world. In spite of the harsh realities and conditions linked with drought and sturdy efforts toward reversing it all over the world, it seems the Middle East is most affected. This is the finding of the study of Sagatom Saha (2019) who put it thus: “Global warming will do the Middle East no favour. Evidence abounds that it will be the region that climate change will hit hardest.” The effect of climate change driven by extreme weather conditions and related disasters contribute to the damages on economies, lower agricultural production and intensify inequality among social groups. These factors put together contribute to other factors directly or indirectly increase the risk of violence in this region. As a result of this, there have been series of conflict and tussles in this region which cannot be divorced from the effect of droughts and climate change. Climate change has caused series of adverse effects on numerous areas of human sustainability especially on Agricultural farms thereby leading to shortage of food and declining food security, new pests, heat waves which damage the earth surface, heavy downpours and increased flooding.

Upon a critical look at the Middle East, this study finds that one of the principal consequences of drought sweeping through the region is conflict. And with the presence of conflict in the region, one of the Sustainable Development Goals (SDGs) is necessarily going to be

compromised. The transformation of the landscape of the Middle East makes it a safe haven for conflicts and food insecurity as the study of Hameed *et al*(2019) has indicated. So, rather than merely stating the problem and its effect on the conflicts that have erupted in the region, this research will propose how this ugly trend can be reversed in order to be able to guarantee political stability, peaceful cohesion and food security through the use of Machine Learning (ML), as aspect of Artificial Intelligence (AI).

So, in the first section, this study will detail the countries in the region that constitute the Middles East and provide some details and statistics over how drought has been hitting the region. I n this section, the consequences of the drought initiated by climate change will also be exposed. In the second section, this study looks at some of the viable ways that droughts and its negative transformation can be dealt with via AI. The third part of this study is the conclusion.

The Middle East and the Woes of Drought and Climate Change: Syria as Case Study

Perhaps it is helpful to commence with the outlook that the Middle East comprises of the following places: Turkey, Cyprus, Syria, Lebanon, Iraq, Iran, Israel, the West Bank, the Gaza Strip, Jordan, Egypt, Sudan, Libya, Saudi Arabia, Yemen, Oman, UAE, Bahrain, and Qatar. In some instances, one may find countries such as: Tunisia, Algeria, Morocco, Afghanistan and Pakistan. Since the present study cannot capture how drought affects the security

landscape of each of these states in the Middle East region, it uses Syria as a paradigm case. However, before going too far, it is crucial to ask the question: what is climate change and its connection to drought? As a way of responding to this question, Yasmine El-Geressi,(2020) reports that:

Climate change is the long-term alteration of temperature and typical weather patterns in a place. The climate of an area includes seasonal temperature and rainfall averages, and wind patterns. Different places have different climates. A desert, for example, is referred to as an arid climate because little water falls, as rain or snow, during the year. Other types of climate include tropical climates, which are hot and humid, and temperate climates, which have warm summers and cooler winters.

Also, the harsh effect of climate change contributes immensely to drought which is characterized by warmer temperature, enhanced evaporation which reduces surface water and dries out soil and vegetation thereby increasing soil damage and food production shortage. On this note, it is easier to understand what drought does.

Drought, in the words of Bernard Cayne (1992) refers to:

“a period of below average rainfall, longer and more severe than a dry spell.” It has been perceived as “a gradual natural disaster characterised by the lack of precipitation, resulting in a water shortage.”

Drought, from this understanding is clearly a consequence of climate change which seems to make rivers dry, thereby making life difficult or tedious for Middle Easterners whose source of livelihood is dependent on agriculture, especially occupation such as land cultivating and fishing. In a related development, Hameed *et al* (2020) indicate that “Natural disasters may act as harmful causes of food insecurity in the Middle East. Frequent drought events, water scarcity, and unsustainable intensive agricultural practices may impact food security in the region.”By taking a look at the case of Syria, the impact of drought on the security landscape is not encouraging. Research shows that climate change in Syria can not be ignored. The effect of this can be seen on pre-existing issues such as political instability, poverty, and scarce resources. Sagir further emphasized that climate change is the worlds biggest threat to security. (Sagir 2015;42). Climate change disruption in Syria was an amplifier and multiplier of the political crisis that was building up in syria. Also, the adverse condition of decreased precipitation and devastation of agricultural land, particularly in Eastern Syria led to massive loss of income, livestock and crop yeilds. (Steffan 2017;12).

The multiplier effect of climate change brought about the importation of grains to the country and inflation in food supply. It also resulted to migration, leaving only the poor farmers to go back to their farms for little or no harvest. This made these poor farmers easy targets for terrorist recruiters from groups like so-called islamic state.

This is why the impact of drought and climate change has been linked with wars and unrest in Syria.

Yasmine El-Geressi (2020) expatiates that; “We have seen an example in Syria, where the rural population could not cope with the extended drought period since the end of the 1990s. By suppressing the conflicts and the demands for help in 2011, combined with the so-called “Arab spring”, the violence escalated.” In a related development, Sagatom Saha (2019) makes political and conflict impact of the drought in Syria more obvious in the following statement:

For an early example of warming's damaging power, look no further than Syria. Climate change caused the generational drought that preceded the ongoing civil war there. That drought drove rural farmers into urban centers like Damascus and Aleppo, priming the populace for concentrated, large-scale political unrest. From 2002 to 2010, the country's total urban population increased by 50 percent. While climate change certainly did not compel Bashar Al-Assad to brutally crack down on his own people, it did prompt a confrontation that might not have occurred. Climate-induced economic despair and migration worked to reinforce other salient conflict drivers including Assad's “privatization” efforts and concentration of power that exaggerated inequality and severed the dictator's connection to rural, recently migrated communities.

It has also been found that “As climate change causes rapid temperature increase, food shortages, and economic pain elsewhere, more Middle Eastern Countries might tip over into bloodshed. Because tyranny, exclusion, marginalisation and discrimination between the dominant (forces in the region) population and the use of armed violence undermine the right to food and lead to deterioration of food sovereignty, institution-building on authorization and violence leads to consolidation of food deprivation which in turn is a factor in sustaining violence. Water related violence can be attributed to the role water plays to development dispute and economic activities. Hence, water and climate change plays a direct role in the deterioration of Syria's economic conditions, scarcity of natural water, increase incidences of water related violence contributed immensely to the civil war that began in Syria since March 2011 (Cooper 1983). Climate-induced water shortages will be another source of conflict. When the Islamic State controlled large swathes .of territory across Iraq and Syria, it wrested control of dams that provided drinking water, electricity, and irrigation to millions along the Tigris and Euphrates rivers (Burstein 1978). In the absence of water to ensure electricity and meaningful livelihood, it does not require too much thought to understand the connection between wars, conflict and environmental challenges. This has been found to be the underlying reasons for the “Ensuing clashes with Kurdish and Iraqi forces left Shiite holy cities like Karbala and Najaf without water. More than 23 million live in the river basin, and experts predict that, because of

global warming, the Tigris and Euphrates will “disappear this century,” making conflict over what remains even more tempting if contested political control returns to the Fertile Crescent”(Worth 2010).

At this juncture, it is critical to ask: What will be the fate of Middle Easterners, a region already embroiled in wars and conflicts if these two popular rivers dry up. There is no doubt that continuous conflict and insecurity will graduate to the norm in Syria and other states of the Middle East. This is the case when one looks at Chad, in the Sudan area of Africa.

As a way of contextualizing this discourse, one may recall that “in the 1960s, Lake Chad used to cover an area that is about 26, 000 square kilometres. At the moment, it has shrunk to just about 1,300 square kilometres.” (Hameed et al, 2019). This is a very disturbing trend as the lake continues to shrink unabatedly due to increasing demand of the water by the surrounding population. So, as global temperature rises, the Sahara Desert expands southward causing desertification along its route. The socio-economic implications of this trend, among many others, is that, it has necessitated the movement of herdsmen to the Southern and middle belt regions of Nigeria.

Speaking in this connection, Adeolu Oyekan (2020) reveals that owing to “the extinction of the one-time colossal Lake Chad,

agricultural activities such as crop and pastoral farming have been grounded, leaving locals jobless and very poor.” In assessing this drought region in Africa during their research, Raymond Fisman and Edward Miguel (2020) add that:

When all of the fishes are dead and drought has killed off the crops, a young Chadian has little to lose by joining a rebel band, no matter how brutal. He may actually make out a better living from stolen loot than by going it alone, especially since farmers who are not linked to any armed group are easy prey for the rebels or the national army. In the name of survival, we would probably do the same thing if we walked in their shoes. The calculus of survival can turn anyone into an economic gangster.

What this translates into in these regions in Africa is the farmer-herder conflict which in the opinions of Oyekan “cannot obviously be settled by failed governments, one that has let her people down several times. The government seems to have failed to wield her political influence in a just and fair manner, failing to live up to the expectations of her citizens.” Like Africa, the Middle East also boasts of the failure of governments on several fronts leading to the incapacity to meet the obligations it has to its citizens, it loses legitimacy to insurgents whose main ambition is to overthrow an existing government using a variety of violent and non-violent tactics to gain the support of the aggrieved citizens. In addition, conflict theories have shown that when a group's shared grievances about marginalization is combined with a strong sense of group

identity, there is a tendency for the outburst of violent responses against the source of their marginalization, either real or imagined.

So, in the case of Syria and regions of the Middles East, the drought continues to compromise the security landscape of the region. By looking at the unique case of Syria, El-Geressi highlights that: “The prolonged dry spell in the country led to the death of 85 percent of livestock in the east and widespread crop failure, pushing 800,000 people into food insecurity and triggering mass migration from rural to urban areas with farmers moving into urban centres like Damascus and Aleppo. From 2002 to 2010, the country's total urban population increased by 50 percent, priming the populace for concentrated, large-scale political unrest.” When one looks at the history of this region, from Biblical times, it is sad that the situation of the region has not improved and with the onset of the drought initiated by climate change, the condition continues to get worse. The security landscape continues to make one wonder whether peace can ever return to this region as “It is observed that displaced inhabitants of rural areas who went to seek employment in Syria's larger cities, a large portion of which were already overpopulated, formed disenfranchised belts of disparate communities surrounding Hamah, Homs, and Daraa. This contributed ultimately to extreme political unrest and outbreak of conflict in Syria, and followed by President Bashir al Assad use of his armed forces against them.” This has led to the growth of world renowned insurgent groups especially ISIS. In the research carried out by Yasmine El-Geressi, (2020) it

was recorded that:

Climate-induced economic despair and migration also worked to grow the influence of ISIS in Syria. When ISIS controlled large swathes of territory across Iraq and Syria, it wrested control of dams that provided drinking water, electricity, and irrigation to millions along the Tigris and Euphrates rivers. ISIS capitalised on the devastation brought by climate change to attract new members as it happened in several agricultural villages in Iraq, many of which were successfully taken by ISIS via their recruitment tactics that were created to entice impoverished farmers who had their lives and incomes devastated by a series of natural disasters, such as drought and harsh winds.

Now, it is clear that climate change and drought are reasons for the exacerbation of conflicts and insecurity in the Middle East. Whereas this study has been able to use Syria as a case study, it is important to note as well that there are implications for these conflicts that make it almost impossible to actualise some of the Sustainable Development Goals (SDGs). This is now what this study turns to.

Specifically, there are eight Millennium Development Goals. These are: Goal One: Eradication of Extreme Poverty and Hunger; Goal Two: Achieving Universal Primary Education; Goal Three: Promote Gender Equality; Goal Four: Reduce Child Mortality; Goal Five: Improve Maternal Health; Goal Six: Combat AIDS, Malaria and other Diseases; Goal Seven: Ensure Environmental Sustainability;

and Goal Eight: Develop a Global Partnership for Development (Babalola, O 2013).

When the conflict in Syria and other countries in the Middle East are examined, it is clear that they will manifest that the possibility of surpassing the target established for Goal One may not be feasible. In other words, owing to the impact of drought in the Middle East, food insecurity may be the norm. It is however the fervent conviction of this study that with the use of AI, a significant aspect of drought in the Middle East can be reversed, in order to pave way for the attainment of the SDG on food security, which in turn will mitigate the prevalence of conflict in the region. How this is possible or can be attained is the focus of the next section.

Machine Learning and the Reversal of Drought in the Middle East

First, it is pertinent to commence with the question of Machine Learning (ML): What is ML? Whilst talking about ML, Elisa (2018) explains that: “Machine Learning field evolved from the broad field of Artificial Intelligence, which aims to mimic intelligent abilities of humans by machines.” It has been found that ML “allows computer to find hidden insights without being explicitly programmed where to look” ML, being a form of Artificial Intelligence (AI) has been found useful for “Web search, spam filters, recommender systems, ad placements, credit scoring, fraud detection, stock trading, drug design, and many other applications.” In AI, ML has been discovered

to assist “in taking an optimized decision for the machine which eventually increases the efficiency of the machine and more organized way of performing a particular task.” While discussing some of the ways through which ML can be useful, Adeolu Oyekan argues that “ML has proved successful in its use for analysing weather and crop data months before farmers begin to cultivate. This, no doubt, has the capacity to assist in guaranteeing better crop yield.” This is similar to the findings of Noe Elisa who holds the view that:

This will reveal drought on the horizon, and farmers will be advised to skip a planting season, saving them a lot of million US dollars in input costs. The weather report system with the help of machine learning would enable governments, donors, farmers, relief agencies, NGOs and others to implement more rapid, tailored interventions to prevent food crises. More specifically, the technology has the capability of forecasting underperforming crops in African countries and situations that will call for an international convention.

As a way of corroborating the above excerpt, it needs to be said that through ML boost in agricultural produces have been witnessed in the area of food security and this is one of the major points of the SDGs. This is made possible via ML capacity to be able to “detect plant diseases using images captured by low-cost mobile phones” Badmus et al (2010). Through ML, it is possible to save farmers from investing so much in seeds and plants that will frustrate crop yield

and then frustrate the effort toward the attainment of this SDG. Furthermore, via ML, it is possible to potentially tell precisely soil fertility, percolation and the best times to plant. It is actually feasible to realise this via the exploration of its arrays of algorithms, such as decision trees and support vector machine. This is why Oyekan is of the view that ML also has the capacity to assist with food security since it can assist crop farmers with what to plant and when to plant for a better yield. It is in this way that ML, through smart technology can dispel conflict and initiate food security, promoting some of the fundamentals of the SDGs.

On the one hand, ML can assist farmers in Syria and the Middle East for instance, to predict when to plant; what type of seeds to plant for better yield; and what time to engage in these activities where weather will not be a gross challenge. This is possible via the extensive researches expended over the nature of soil and how it can be tweaked to aid improved yield. It needs no elaboration that the soil is a crucial aspect of any successful crop agricultural venture. An important fact which needs to be given serious consideration in a bid to curb the level of food and social insecurity caused by drought in the Middle East, which ML can assist with is the capacity to point out original source for the nutrients used to grow crops. Soil is the basis of all production systems in agriculture, forestry and fishery. Soil stores water, nutrients and proteins in order to make them available for proper crop growth and development. The result is: “Minimize nitrate leaching and boost production; Classify soil and the risks

involved in artificial vegetation; Predict soil enzyme activity; Predict monthly mean soil temperature and texture; Estimate soil nutrient after erosion and in areas affected by desertification; and It is 92 percent (%) accurate” Shelby et al (2017). In a related development concerning how ML can assist with drought, Clara Ngozi Eli-Chukwu. (2019) explains that: “robotics and autonomous systems (RAS) are set to transform global industries. These technologies will have great impact on large sectors of the economy with relatively low productivity such as agro-food (food production from the farm to the retail shelf).”

All of the foregoing, specifically, the place of ML in reversing drought in the Middle East can be tackled via “sensor networks for climate and range condition, decision support for where and when to move animals, autonomous systems for sample forage quality and provide supplements, and data analytics to connect in-situ measurements to the landscape scale are promising areas for innovation” Geli et al (2019). On this note, one may easily deduce that through a proper appreciation and application of artificial intelligence to farming in the Middle East, food security can be guaranteed in the face of the harsh weather and climate condition of climate change in the Middle East.

In an area where desertification is norm, it is important to find a way to reverse this in order to guarantee food security and reduce conflicts and tensions in the Middle East. Since desertification, as

stated hitherto, “is one of the most serious problems facing the the Middle-East with dire economic consequences for the region. Deserts are extremely dry areas with sparse vegetation.” (McQueen et al 1995; Klompenburg 2020; Martini et al 2022) However, the exploration of the promises of ML is crucial. With ML as a sub-set of AI, pastoral farmers can know where and when to move their flock. In a related development, it has been pointed out that “they can also know beforehand where quality fodder can be acquired without necessarily clashing with crop farmers.” What this means is that some of the tensions caused by drought in the Middle East can be overcome if the technology of ML is used for making peaceful co-existence between farmers and herders, for example, possible.

Conclusion

In this study, the influence of drought over the security landscape of the Middle East has been examined in the light of how it has been able to instigate conflict and insecurity in the Middle East. Using Syria as a case study, this study has been able to show that the connection between drought and social instability can be tackled through the use of ML. With ML, the adverse effects of drought can be mitigated in a way that makes it possible to guarantee food security. This can serve as a way of curbing and mitigating all forms violence, extremism and conflict caused by the adverse effects of drought, climate change and global warming.

Works Cited

Adam, A. (2021). “Middle East.” *Encyclopaedia britannica* Available at

<https://www.britannica.com/place/Middle-East> (Accessed 11 November 2021)

- Amanda Macmillan and Jeff Turrentine (2021) Global warming 101.
- Babalola, O. (2013). Combating violent-extremism and insurgency in Nigeria: A case study of the boko haram scourge. MA Thesis. University of Kansas: Kansas City
- Badmus I. A. and Ogunmola, D (2010). "Meeting the challenges of the millennium development goals in Nigeria: Problems, possibilities, and prospects." Centre for Peace Studies. University of New England.
- Buhaug H, Benjaminsen, T.A, Sjaastad, E and magnus Theisen, O. Climate variability, food production shocks and violent conflict in sub-saharan Africa. Environmental Research letter 10, 1250 15 (2015)
- Cayne, B.S. (ed.). (1992). *The new webster's dictionary of the English language*. New York: Lexicon
- Dykem, J.A and cobel, D.B. (2019). Warming and the risk of civil war in Africa. Dahyl Academy
- El-Geressi, Y. (2020). "Climate change, water woes, and conflict concerns in the middle east: A toxic mix." *EarthDay* Available at <https://www.earthday.org/climate-change-water-woes-and-conflict-concerns-in-the-middle-east-a-toxic-mix/> (Accessed 19 November 2021)
- Eli-Chukwu, N. C. (2019). Applications of artificial intelligence in agriculture: A review." *Engineering, technology & applied science research*. Vol. 9(4): 4377-4383
- Elisa, N. (2018). "Could machine learning be used to address Africa's challenges?" *International Journal of Computer Applications* Vol. 180(18): 9-12.
- Fisman, R. and Miguel, E. (2008). *Economic gangsters: Corruption, violence and the poverty of nations*. Princeton: Princeton University Press.
- Geli, H, Prihodko, L, Randall, J, Tran, S. C, Misra, S. Boucheron, L, Razzaghi, T, Sandoval, S, Daniel, D, Mora, C. and Arslan, F. (2019). "Climate adaptive systems for future agricultural and rangeland

- production: A whitepaper on artificial intelligence applications in agriculture.” Available at [artificial-intelligence-in-agriculture---white-paper-with-summary---v6.pdf](#) (Accessed 17 November 2021).
- Gurr, T.R. (1994). “People against states: Ethno-political conflicts and the changing world system.” *International Studies Quarterly*. Vol. 38(1): 347-77
- Hameed, M., Ahmadalipour, A and Moradkhani, H. (2019). “Drought and food security in the middle east: An analytic framework.” *Agricultural and Forest Meteorology* 281
- Kotsiantis, S.B. (2007). “Supervised machine learning: A review of classification techniques.” *Informatica*. Vol. 31: 249-268
- Koubi, v. Climate change and conflict. Annual Revised Political science journal 20, 343-360. 2019
- Mohammed, N. T. (2015). “Desertification in northern Nigeria: Causes and implications for national food security.” *Peak Journal of Social Sciences and Humanities*. Vol. 3(2): 22-31
- Oyekan, A.O. (2020). “Technology and social cohesion: Deploying artificial intelligence in mediating herder-farmer conflicts in nigeria.” *Filosofia Theoretica: Journal of Philosophy, Culture and Religions* 9(3): 15-32
- Qui, J., Wu, Q., Ding, G., Xu, Y & Feng, S. (2016). “A survey of machine learning for big data processing.” *EURASIP: Journal of advanced signalprocessing*. Vol. 1.
- Quinne, J. & Leyton-Brown, K. (2011). “Modelling and monitoring crop disease in developing countries. *Twenty-fifth AAAI Conference* Vol. 1: 1390-1395.
- Martini, G., Bracci, A., Riches, L. et al. machine Learning can guide food security efforts when primary data are not available. *Nat Food* 3, 716-728.
- McQueen R.J, Garner S.R (1995), Applying machine learning to agricultural data comput. *Electron. Agric*, 12 (4), pp.275-293
- Saha, S. (2019). “How climate change could exacerbate conflict in the middle east.” *Atlantic council*. Available at

<https://www.atlanticcouncil.org/blogs/menasource/how-climate-change-could-exacerbate-conflict-in-the-middle-east/> (Accessed 11 November 2021)

Sajhir S. (2015) Climate Change in Syria, Trends, Projections and Implications, Ulrika. Akesson and knud Falk, SLU publisher.

Staffan M (2017) Political Geography, Climate change and the Syrian war revisited, Jan Shelby, Omar Dahi, Christiane Frohlich, Mike Hulme, Elsevier Ltd

Thomas van Klompenburg, Ayalew kassahum, Cagatay catal: Crop yeild prediction using machine learning: A systemativ literature review, Computers and Electronics in Agriculture, Volume 177, 2020

UNICEF: Syrian crisis, Available at <https://www.unicef.org/emergencies> (Accessed December 8, 2022)

Wen, J., Li, S., Lin, Z., Hu, Y & Huang, C. (2012). “Systematic literature review of machine learning based software development effort estimation models.” *Information software technology*, Vol. 54(1): 41-59. (Accessed 11 November 2021)