

# UNCSD Rio+20 Focal Point on Managing Climate Change & Adaptation in the Agriculture Sector of Libya

Satya Pal Bindra, Salem Abulifa, and Amer Mohamed Belasher

**Abstract**—Oil producing & exporting arid and semi arid Libya is spread over an area of 1.76 million sqkm. It accounts for barely 6 million population. Over 95% of country is desert. Like elsewhere in Libya too, the agriculture sector has potential to growth for creating employment and food security in the country. However agriculture account for at least 30 per cent of global greenhouse gas (GHG) emissions and is rising rapidly. Country imports 85% of its food & agriculture related products. Oflate, the agriculture sector in New Libya is receiving wide spread attention to contribute not only to country's gross domestic product and engaging more of its unemployed population & specially the youth. It is highly exposed and vulnerable to extreme climate events and the impacts of climate change. Agricultural production is constrained by frequent natural disasters like flash floods, droughts, erosion, desertification and heat waves. Such climate-related events have put fragile agricultural ecosystems in both coastal and desert areas at risk. Projected future scenarios of climate suggest that climatic conditions in Libya will worsen, which may imply even more frequent occurrences of climate-related extremes and negative impacts on food production. However, by adopting the right measures, it is possible to adapt effectively to the challenges posed by climate change. Such measures require a comprehensive approach that includes strengthening the capacities of system, institutions and individuals for delivering need-based services to vulnerable and especially the farming communities in large country with far apart destinations.

In response to the Libya 's need for self sufficiency UNCSD Rio+20 Focal Point is assisting the country in strengthening capacities for climate risk management and climate change adaptation in the agriculture through a numerous initiatives and Programs This paper is designed to present some of the experiences and lessons learned from these initiatives like desert prosperity initiative & 2015. International Year of Soil for enhanced productivity Finally it includes additional details to provide a comprehensive understanding of climate variability and change in Libya and their impact on agriculture. It also highlights how the Libyan UNCSD Focal Poin country is raising awareness and assisting in adapting and adopting some of the best practice technical and policy options for coping with the impacts of climate variability and change.

**Index Terms**--Managing climate change, Adaptation, Agriculture Sector, Libya

## I. INTRODUCTION

World over a billion people are hungry today. Agriculture yield is set to drop by 20% in some areas as a result of climate change. Like elsewhere in Africa, in Libya too climate change is threatening both food supply and agriculture. It is indeed an expanding global population that demand for food is due to nearly double by 2050. Farmers are finding it hard to adapt to

Satya Pal Bindra is with the UNCSD Rio+20 Focal Point Libya  
Salem Abulifa is with Free Excellency for Oil & Environmental Solutions Libya  
Amer Mohamed Belasher is with the Agriculture Research Center Tripoli

changing growing seasons and rainfall levels, and need significant support to feed. Add to this are poor farming practices that damage soil fertility, kill off plant and animal species and pollute water supplies resulting into a complicated picture. As per World Food Program agriculture is in part responsible for climate change and the industry is responsible for up to 30% of global greenhouse gas emissions. To meet the challenges of climate change and food security industry must not only adapt to reduce GHGs emissions but also grow to feed an expanding population. Food production which is the largest user of water globally is responsible for 80–90% of consumptive water use from surface- and ground-water. Energy is lifeline for transport and fertilizes crops. Food production and supply chains are responsible for around 30% of total global energy demand. Crops are now being used to produce biofuels.

The paper is based on an investigation that shows how the impact of widespread tree cuttings in case study areas of Libya are resulting in to climate change that increases in sea level rise. It focuses on the possible impact of climate change on agriculture sector. It also investigates that how agricultural production is directly related to biophysical conditions, the economic and social characteristics and technology. Interesting results of a benchmarking survey by gathering information across several of farms have helped demonstrate priorities for action and improvement targets to develop both technical and functional capacity for enhanced agricultural production in the region. Finally the study highlights that how best practices from community based sustainable land management using water efficiency management techniques are capable of providing a) innovative design and lessons learnt, b) legal and policy framework and c) partnerships like: 1. Government/NGO/CBO, 2. Public-private partnerships (3Ps) and leveraging additional financing to combat the impact of global warming for enhanced agricultural production. This research demonstrates that how data bases compiled from a detailed comprehensive survey using observations from satellite imageries and interviews for case study areas of Libya to identify and further investigate the factors and factor interactions to combat climate change can contribute to the success of agricultural production in Libya, region and world at large.

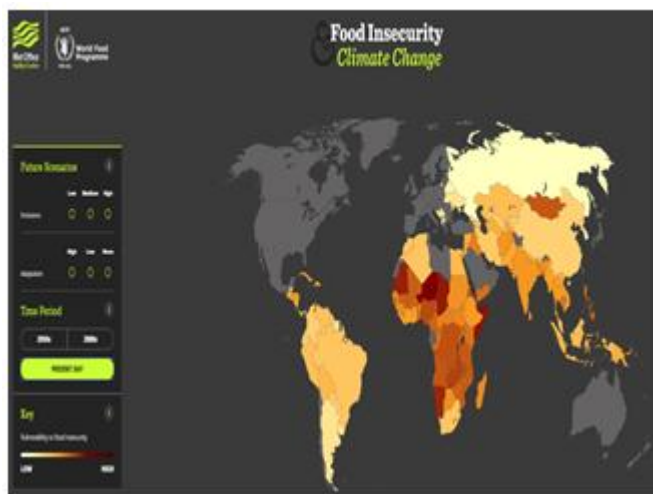
## II. AN APPRAISAL OF EXISTING SITUATION

An appraisal of the present situation as shown the chart below shows what nations are most susceptible to the threat of climate change. As apparent most falling on the continents of Africa and Asia. When looking at some of the poorest populations around the world, it becomes abundantly clear how the least wealthy populations are some of the most harshly impacted by global warming. A recent World Bank study found

that in the 52 countries analyzed, most people live in countries where poor people are more exposed to droughts, floods and heat waves than the average of the population as a whole. Meanwhile, the United States appears to be one of the least vulnerable countries susceptible to damage caused by global warming, though its total carbon footprint is the largest on Earth.



By World Food Programme and the Met Office in the UK as given in an interactive map, shown below that outlines the problem over time and across different scenarios.



The map above shows the situation in 2050 if emissions are slightly reduced, and with a low level of adaptation – with the darker shades indicating a higher level of vulnerability. The map makes clear that a modest reduction in emissions will not be enough to reduce the threat faced by farmers and countries around the world would remain highly vulnerable in 2050.

By considering this map from the present point of view, the situation is already serious in many countries around the world. This clearly indicates that immediate action is needed to ensure world food supplies are not severely impacted by climate change. Overview of Paris 2015 Summit shows that all countries stand to lose even with deal in Paris that restricts global warming to 2°C. African countries are found to lose the most – because they are the most vulnerable. Global warming induced climate risk in Africa has long faced because of its high levels of background poverty, its farmers’ dependence on rainfall, its weak infrastructure and its lack of social welfare “safety nets”.

Present scenario shows that since Africa has done little to cause global warming – its greenhouse gas emissions are only

4% of the world’s total. Since Africa is already facing the worst effects of climate change therefore, African governments with an added incentive need to put in place policies that are long which is already happening: in countries such as Ethiopia, Kenya and Rwanda that have already developed climate-resilient strategies to reduce poverty, raise productivity and cut emissions. For Africa, priorities at the Paris climate summit delivers on the commitment to keep global warming below 2°C and the climate agreement that meet Africa’s needs for global finance and support to respond to the climate challenge. The Africa Progress Report, 2015, Power, People, Planet: Seizing Africa’s Energy and Climate Opportunities, identifies a range of practical measures for supporting five key steps that are essential for achieving climate justice for Africa: This includes 1) **Phase out fossil fuel subsidies** by G20 countries with a set timetable by a ban on exploration and production subsidies by 2018. 2) **Clean up climate finance** by funding for adaptation, financing mitigation and supporting low-carbon development – notably the Clean Technology Fund and the Scaling Up Renewable Energy in Low Income Countries by restructured & more responsive to Africa’s needs and opportunities. 3) **Drive Africa’s low-carbon energy transition** by scaling up investment in energy – especially renewable energy – to unlock Africa’s potential as a global low-carbon superpower. A ten-fold increase in power generation is required to provide all Africans with access to electricity by 2030. 4) **Leave no-one behind** by providing subsidized electricity to achieve universal access to energy by 2030, which means providing access for an additional 645 million people through connections to the grid or decentralized mini-grid or off-grid provision & better and more accessible energy to power up Africa’s agriculture. 5) **Adopt new models of planned urbanization** to develop more compact, less polluted cities, alongside safer and more efficient public transport. . Linking African cities to the growing range of global city networks, including the “C40” group of cities, to unlock new opportunities for exchanging knowledge, building capacity and providing finance. Thus the COP21 summit in Paris provides a platform for raising the global ambition, setting a course that avoids climate disaster and showcasing Africa’s pathway for a future powered by inclusive low-carbon energy

Libya spread over an area of 1.78 million sq km with 95% desert has 2000 km coast line. Interesting case studies presented [2] at Al Garabouli, Kasrekhiar and near Tripoli region at Tajoura are designed to promote the adaptation of Mediterranean agricultural systems to climate change through a combination of modern and traditional water management and conservation techniques. New and indigenous varieties of cereals and legumes resistant to difficult climatic conditions are used. The activities are underway to present the performance of introduced varieties and management practices to farmers, extension agents, researches and decision makers.

An overview shows that in Libya like many other countries regulatory decisions such as water allocation and pollution licensing are implemented at the scale of the river basin or catchment. Most of these institutions are grouped as River Basin Organisations (RBOs). Some are specifically mandated with managing groundwater water aquifers and lakes basins. Libya, Egypt, Chad and Sudan have signed a UN-backed

agreement on the shared use of a massive underground aquifer system straddling the four countries known as the Nubian Sandstone Aquifer System. Containing an estimated 150,000 cubic kilometres of fossil water, it covers an area of two million square kilometers.

### III. UNCSO RIO+20 FOCAL POINT LED CASE STUDIES & INITIATIVES IN LIBYA

UNCSO Rio+20 Focal Point Libya has a significant role to play in achieving the targets envisaged under Libya's Nationally Determined Contributions (INDCs). Case studies prepared have shown that all the major crops of Libya will be adversely impacted due to climate change, "leading to concerns about sustained food production and food security. The desert & its biodiversity have been shown to be highly vulnerable to climate change impacts, leading to loss of critical ecosystem services.

Climate change projections show that the vulnerability of the both sea water intruded coastal areas & deserts are further likely to increase. There are also uncertainties about water availability in the especially in the context of a warmer desert and increased evapo-transpiration of man made river reservoirs. There is a need to initiate agricultural research "to develop drought and heat tolerant crop varieties, provide agro-meteorological advisories to farmers, improve water and irrigation management and promote soil conservation measures. In green mountain desert farms corridors linking the protected areas to facilitate migration of flora and fauna, reduced desert orchards fragmentation and degradation, conserve existing biodiversity rich farms, and promote mixed species are required.

Libya can undertake large-scale afforestation with policy and financial support as envisaged under the INDCs and the Paris Agreement," the statement said, adding: "Adoption of new and emerging technologies in Libya will involve high financial costs, capacity building and upgradation of physical infrastructure. There is hence a need to develop institutions and capabilities in Libya to leverage the Global Climate Fund finance that may become available.

Based on an appraisal of past and present situation that led to plan case studies in Libya it is apparent that there are structural vulnerabilities, in the absence of a strong adaptive capacity. It, has produced nurtured vulnerabilities that render its economy susceptible to the impacts of crises. On analyzing how the recent crises are intertwined, it is found that like most North African governments' Libyan responses to the 2007 food crisis were slow, not well targeted towards those most affected by soaring food prices, and included measures that could not be easily terminated once food prices began to ease. Nurtured vulnerabilities - greater sensitivity to fluctuations in international prices, financial transfers and investments - were all reinforced during this period. Despite this,

Libyan economy like most other North African economies demonstrated good macroeconomic resilience during the subsequent 2009 global financial crisis. However, the effects of the crisis were detrimental at microeconomic level, particularly for SMEs, informal sector workers and poorer households. Using the fiscal space created prior to the crisis, Libya like most other North African countries were able to

implement countercyclical fiscal policies. Yet, these crisis responses deepened the nurtured vulnerabilities, as they were a mere expansion of the measures introduced in response to the world food crisis. Moreover, a sizeable portion of the countries' fiscal stimulus packages was directed towards supporting international trade and export firms, rather than domestic companies or national development.

The 2011 Arab Spring forced Libya like other North African governments to become more responsive to the needs of the poor and unemployed, although poorly-targeted public policies continued to benefit mainly the affluent, further reinforcing the growing nurtured vulnerabilities. The recently launched Libya Humanitarian Response Plan 2015-16 by World Food Program identified 2.44 million people in need of protection and some form of humanitarian assistance – including 435,000 internally displaced persons – those are acute basic needs in the health, food, protection, shelter and water and sanitation sectors. Of the 2.44 million, 1.3 million Libyans are food insecure. The UN World Food Programme as per latest estimates requires \$47.7 million to be able to reach the most affected in 2016, estimated at some 210,000 persons.

### IV. RESEARCH METHODOLOGY

Libya based UNCSO Rio+20 Focal Point, academies, universities, high institutes, Technical Colleges and Research Centers have launched initiative to reduce, reuse & recycle resources product and services (3Rs) for rebuilding the country to combat climate change impacts induced by 2011 Libyan crisis. The country is engaged in preparing actions, accords, ideas and best practices to mitigate the impact of projected extreme events and weather by considering low carbon, resource efficient measures and enhanced use of renewable to tackle impending climate change. 28 hot spots in Libya are identified to convert them to bright spots. To commemorate 2015 as the International Year of Soils declared by the 68th UN General Assembly (A/RES/68/232) UNCSO Rio+20 Focal Point Libya is celebrating the event in a big way by a series of lectures by Prof Dr Satya P. Bindra for raising awareness of the importance of soils for food security and essential eco-system functions.

The objectives of the IYS are: a) to create full awareness of civil society and decision makers about the fundamental roles of soils for human's life; b) to achieve full recognition of the prominent contributions of soils to food security, climate change adaptation and mitigation, essential ecosystem services, poverty alleviation and sustainable development; c) to promote effective policies and actions for the sustainable management and protection of soil resources; d) to sensitize decision-makers about the need for robust investment in sustainable soil management activities aiming at healthy soils for different land users and population groups; e) to catalyze initiatives in connection with the SDG process and Post-2015 agenda; f) to advocate rapid enhancement of capacities and systems for soil information collection and monitoring at all levels (global, regional and national). In addition, an initiative to enhance soil productivity and farm output is taken up. Soil Health Card Scheme is launched and schemes are set up for perishable commodities. To address the irrigation requirements of every farm in an effective and sustainable manner in case study areas



are treated as a project of Civil Aviation Technical College by targeting resource-poor, small and marginal farmers, particularly focusing on organic farming and green house technology.

Another initiative on water-energy-food nexus is established to focus on the interdependence of the three strategic resources by understanding the challenges and finding opportunities. The nexus objectives are 1) To improve energy, water and food security 2) To address externalities across sectors and decision-making at the nexus & 3) To support transitions towards sustainability.

To resolve Libyan problem authors have undertaken activities in Developing a Framework for Water Security and Climate Resilience Development using IWRM as a Tool in line with UNFCCC guidelines on Fresh water resources and climate change adaptation. The objective of these activities are to help in Promotion of WACDEP in global climate change processes and the world water week in Stockholm COP 16, Mexico, COP 17, Durban. Libya did celebrate Water, Climate Development Day to help to support African regional process for the World Water Forum. Libya employed Global Water Partnership: (GWP) suggested methodology to Target Coordinator for Climate Change and WACDEP that is central to the Targets for WWF. Global Linkages of WACDEP Part of the GWP Pledge under the UNFCCC's Nairobi Work Program recognized by UNFCCC is adopted as a mechanism for the user Interface Platform of the Global Framework for Climate Services under WMO. Framework for Water Security & Climate Resilient Development is indeed a useful tool to enable implementation of WACDEP, supported by Climate Development Knowledge Network (CDKN). Libya used Technical Background Document Strategic Framework for Water Security and Climate Resilient that provides a Development Capacity Building Plan for the Framework Policy Briefs.

Technical Background Document is prepared to help guide robust decision-making in developing practical low or no-regret adaptation measures. It captures international best practices in defining water security and climate resilient strategies, assessment methods, etc. critique on pros/cons of various methods in existence develops/adapts methods for understanding water futures, climate futures and development futures that provides guidance on dealing with uncertainty, increased climate variability & climate information gaps. It provides knowledge on relevant investments required to enhance water security & climate resilience. It also clarifies links between water securities, IWRM, Climate Change (CC), development Basis for the Strategic Framework on Water Security & Climate Resilient Development.

## V. DISCUSSION OF RESULTS

Based on feedback from stakeholders after implementation of numerous initiatives in case studies it is evident that Libya needs climate smart agriculture at a time when the Inter-governmental Panel on Climate Change has underlined the possible threat due to rise in mean temperatures and sea levels. Based on international best practices & consultation with global, regional, national & local stakeholders, it is found that there is need to promote alternate year devoted to millets and other under-utilised cereals like whole series of minor

millets. Their importance is going to grow in an era of climate change. These cereals are much more climate smart than wheat or rice. They could also help fight climate change, because they often need less water and tolerate higher temperature and droughts. Since year 2014 is the UN International Year for Family Farming, efforts must be made to restore family farming traditions to empower women and young people. Small farm productivity and profitability will be greatly helped if this year is used to reinvigorate family farming tradition, with a special focus for empowerment of women and young children. Family farming is a means to sustainable livelihood. It will also protect the ecological and economic foundations of sustainable agriculture by conserving bio-diversity and enabling job-led economic growth. Thus family farming can go a long way in combining nutrition security with food security. Family farmers can manage both food security and nutrition security by integrating nutritional criteria in the choice of crops they decide to cultivate,

The two themes that are central to the reinforcement of resilience growth in Libya like others in North Africa, include strengthening food security and promoting regional integration.

To improve food security at both national and household levels, the Libyan economy should:

- Improve access to foods through better integration into global food markets and increased credit and financial resources to small and poor farmers;
- Improve agricultural productivity through higher government expenditure on the agricultural sector and related Research and Development activities; and,
- Reform social safety nets, particularly by moving away from regressive universal subsidies on food and fuel towards more targeted subsidies.

To enhance regional integration the country needs to implement following policies:

- Elimination of nontariff measures;
- Improving cross-border trade facilitation and logistics;
- Reducing the cost of infrastructure (notably transportation and ICT);
- Giving a prominent role to the private sector.

These, together with an alignment of policies and procedures related to investment and labour mobility, are meant to significantly improve regional integration and better protect the countries against global economic and financial crises.

Adoption of a resilient growth strategy is critical for turning political transitions in the country into decisive and tangible socio-economic gains.

Such a growth strategy will help pave the way for a more stable and equitable growth trajectory, which addresses the reclamations at the very heart of the Arab Spring.

## VI. CONCLUDING REMARKS

Creating the necessary agricultural technologies and harnessing them to enable Libya to adapt its agricultural system to changing climate requires research, innovations in policy and institutions. Institutions and policies are important at multiple scales. Libya should use following best practice policy principles to develop its agricultural policy for enhanced production Country can help create a "Green Revolution" for sub-Saharan Africa by assisting countries to boost productivity

throughout the agricultural value chain and help small-holder farmers to break the cycle of poverty. There is need to increase lending for agriculture in Africa, to help farmers manage systemic risks, including through financial innovations to counter weather variability, such as drought. Paper suggests technology and science to boost yields. The International Finance Corporation, or IFC, can scale up investment and advisory support to agribusiness operations in Africa and elsewhere, including through working with the Bank on land titling and productivity, local currency financing, working capital, distribution and logistics, and support for the intermediary services on which farmers must rely. To be most successful, there is need to integrate and mobilize a diverse range of partners – the FAO, WFP, and IFAD; other MDBs; private donors such as the Gates Foundation; agricultural research institutes; countries with great agricultural experience, and most of all, the private sector.

Country's structural vulnerabilities can, in the absence of a strong adaptive capacity, produce nurtured vulnerabilities that would render economy susceptible to the impacts of crises. Based on case studies to recognize some of the most common problems experienced in planning and developing options for overcoming them a set of recommendations on how to enhance institutional and legal reforms for its implementation at the national/local levels are briefly outlined.

Finally it shows that how lessons learnt and best practices especially from UN agencies & initiatives are assisting to promote integrated water resource management and sustainable agricultural production in Libya for its wider application in both developed and developing countries.

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