Drought conditions and management strategies in Palestine

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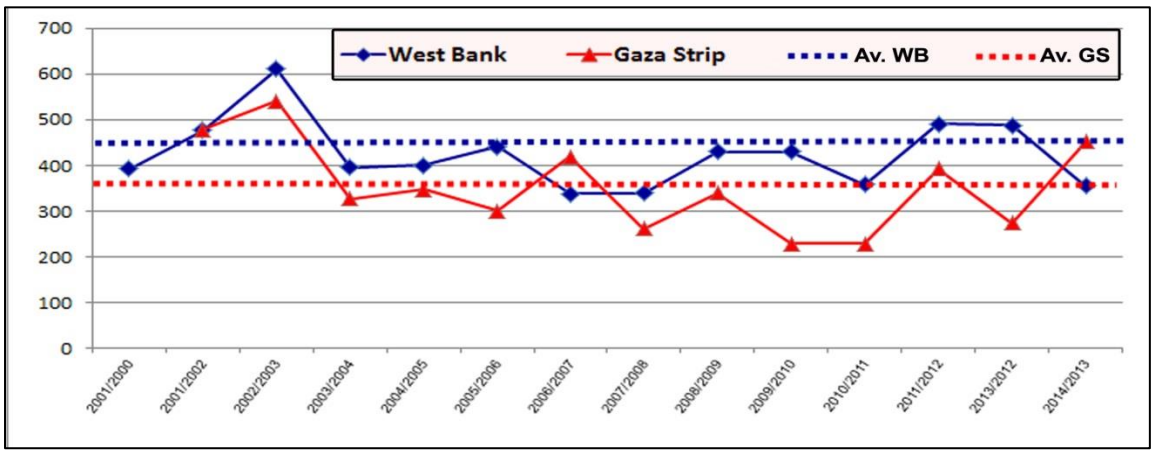
Background:

The seasons of rainfall in Palestine, especially years between 2003 t0 2010 are characterized with many years of below average rainfall and many agricultural drought episodes. The worst two seasons were season of 2007-2008 and 2010-2011 (Fig. 1). In the season of 2007-2008, the annual average rainfall for the northern and southern areas in West Bank, were 64% and 55% of historical means, respectively (MoA 2009). The rainy season 2010-2011 has registered just 73% of the average annual rainfall in the West Bank and only 66% of the average rainfall in Gaza Strip (MoA, 2011b). A decreased amount of rainfall means a decreased amount of groundwater recharge, and hence, an increased water shortage. The increase in water shortage will result in an increase in the water demand's competition between various economic sectors; domestic, agricultural, and industrial. Not only water availability will be affected, the affordability and quality of water will also be affected. (ARIJ 2011).

Fig 1. Annual average rainfall of West Bank and Gaza strip for the rainy seasons 2000 – 2014



MoA 2014

The rainfall season of 2013 – 2014 was unusual and showing variation in the amount and distribution of rainfall with agricultural drought affecting the production of rainfed horticulture. Even with amount of rainfall estimated with 85% and 127% of annual historical average rainfall for West Bank and Gaza Strip respectively (Fig 1), Palestine and other regional countries have been exposed to clear mid-season agricultural drought. In West Bank, around 50% of total amount of rainfall was fallen in 5 days period at the mid of December 2014 followed with 85 days of drought and dry spills period (MOA 2014). In Gaza Strip, the average annual rainfall was above the annual historical average rainfall (127%) but 80% of the rainfall was fallen in December 2014 followed with more than 80 days without rainfall (MoA 2014).

Extreme weather events, such as droughts have been noticeably increased in the southern and eastern slopes of the West Bank. Eighty seven percent of the cultivated land is dedicated to rain-fed agriculture and 33% of the entire landmass is used as pastureland for grazing (ARIJ, 2011). The total area of hyper arid, arid and climates comprises about 35% of the land area of the West Bank. Consequently, drought increases the vulnerability of rural communities (rain-fed farmers and livestock herders) whose coping strategies are already exhausted due to the deterioration of economic situation, high food prices and the closure regime since the second Intifada. Drought is expected to become more frequent, more intense and less predictable as a consequence of climate change (ARIJ, 2011).

The increase in temperature during the 20th Century was obvious according to the Palestinian Central Bureau of Statistics (ARIJ, 2011). That increase was by no means uniform during the last decade, with the year 2010 being the warmest in the 125 years (MoT - PMD, 2011). It is noted that there is no metrological information about Gaza, because of the damages caused by the Israeli occupation in 2007 to the metrological stations (ARIJ, 2011).

Drought monitoring and early warning systems:

It is agreed that planning and management of drought in Palestine as in other countries, needs collaborative efforts from all stakeholders concerned with issues related to various types of drought, not on the political level only, but on the technical and socioeconomic levels too. The policy of closing, confiscation, and creation of ghettoes have decreased the accessibility of Palestinians to manage natural resources and to build infrastructure needed to establish early drought warning system needed for monitoring and predicting the occurrence of drought in future. The current situation are characterized by, a): limited number of meteorological stations, b) inefficient distribution of low technology stations and rain gauges in the semi-coastal and highland agro-ecological zones, c) absence of meteorological stations in the eastern slop and Jordan valley zones, and d) lack of data and information for historical records. The need for installing a net of meteorological stations is a priority for the Palestinian Authority especially for the eastern slop and Jordan valley where condensed irrigated agriculture is practiced (Abdou 2007).

The existing database related to the climate conditions and water resources is fragmented and limited and does not support comprehensive data sharing and analysis necessary for an effective monitoring and early warning system. Developing a data collection tool to facilitate data gathering and archiving, such as a national climate databank, is a first step toward creating an effective Early Warning System (EWS), (MoA 2011a). Base line survey have been conducted by MoA to explore type (model), locations, used technology, operators of meteorological stations in West Bank and what is needed to include these station in the EWS (MoA 2011a).

A methodology to quantify drought impacts across all relevant sectors needs to be developed. The methodology should cover all levels and types of drought impacts. This step would provide much needed support to decision makers in developing the mitigation and adaptation plans. It is worth to mention that Ministry of Agriculture has been started the installation of EWS for Agricultural drought but some technical and financial limitation constrained the full operation of this system (MoA 2011a).

Vulnerability assessment:

The vulnerability of natural resources and agricultural sector to the occurrence of drought is very high if it is compared to other economic sectors or to the situation in other neighboring countries. Rain-fed agriculture is the dominant pattern in Palestinian territories and it is known that the impact of agronomic drought in rainfed pattern is more than that in irrigated pattern especially in arid and semi-arid area. In addition to rainfed crop pattern, the diminished water supply during drought period requires the farmers to be capable of adopting reduced demand and efficient water use practices. Agricultural drought in Palestine is very important factor in aggravating the scocio-economic drought in the rural area. Thus, the current and possible drastic reduction in farmers' incomes should be highlighted and the complement mitigation and reaction measures should include support measure and modified insurance policy.

The most vulnerable communities are the Bedouins that rely on springs water during the winter time and completely on water trucking during the summer time. Networks and filling points are often far away and transport cost heavily weigh on their weak economic condition. Most of the very vulnerable people rely on herding and they are exposed to many Israeli-imposed restrictions regarding movement and access to water sources. The lack of cisterns due to Israeli impediment and the consequent low storage capacity do not allow them to have a safe quantity of water to afford the summer season, and they compel to depend on frequent travel of small size (3.7 mc) tankers. Israeli authorities apply restrictive planning and zoning regimes to Palestinian communities living in Area C, making it extremely difficult to carry out legal constructions, including for very basic infrastructure projects. These communities should be the main target of future interventions for domestic water or for animal watering (GVC and Unicef 2010).

Agriculture is diffused in the area categorized as area C, and it depends on old irrigation system poorly managed and maintained because of limited funds and impediment to improve the infrastructure due to the Israeli policies in Palestinian Jordan valley. Farmers own few dunums and the quantity of irrigated water is not enough to optimize productivity.

The upgrading of storage facilities should be a solution to emergency preparedness to match with frequent drought events, mainly characterizing the summer season. Intervention in improving water access should alleviate the poor condition of these communities already suffering by limited access to grazing lands for herders and to limited access to markets for selling agriculture products (GVC and UNICEF, 2010).

Emergency relief and drought response:

It is observed that weak coordination and cooperation among all stakeholders made the information on types and forms of emergency aid limited and not clear. In drought episode of 2007-2008 where the total rainfall reached 67% of the annual average in WB, and the direct losses in rainfed horticultural production were estimated with 113.5 M US$ (farm gate prices) and more than 200,000 small ruminants were affected (MoA 2008). Examples of these losses were shown in Table 1. In addition to agriculture, water sector, food security, health, and shelter were affected too, and the needed humanitarian support were fodder, shelter for lambs and veterinary kits in agriculture, tankered water and new filling points in water sector, food aid and better nutritional security in food

security, (equipment, mobile clinic and training) in primary health care. According to UN-OCHA report, an amount of fund needed to cover the above mentioned support was estimated with 44 million US$ and what was spent is only 3.6 million US$ (UN- OCHA 2008). Many international organization such as ACF, CISP, CARE, ACTED and Oxfam covered different geographic areas and distributed water, seeds, and fodder, according to agreed criteria. 25/liters/person/day and 9/liters/animal/day have been distributed as well as 1 kilo of fodder/animal/day for a minimum of 60 days .

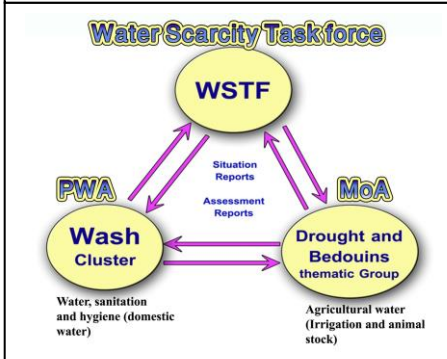
Table 1: Yield reduction and losses in production in 2007-2008 season

Crop	Yield Reduction %	Losses Value M US$
Wheat	40	6.9
Fodder Crops	35	4.5
Fruits	35	10.6
Olive	40	60.7
Grape	35	14.1

Reference : MoA 2008

In 2009, a new body was formed (Water Scarcity Task Force – WSTF) to improve the coordination among governmental institutes, local and Foreign NGO, international and united Nation organization (Fig. 2). After the episode of drought in 2010-2011season, WSTF actively supervised many water scarcity assessment and coordinated and monitored the distribution of many humanitarian and emergency interventions in Palestine (WSTF 2011). The criteria for support was modified and updated as follow.

Fig.2 : Water Scarcity Task Force



Reference: Abdo 2012

The criteria for selection beneficiaries are :

1) Water and Sanatation
   a) Consumption: Humanitarian scarcity baseline: less than 30 LPCPD (Rating: e.g. High: <30, Med. 30-60, low: >60)
   b) Affordability: Indicator: Price of save water (at household, including price of transport)
      Humanitarian scarcity baseline: more than 5.4 US$ (Rating: e.g. High: >5.4 US$, Med. 2.7 to 5.4 US$, low: >2.7 US$) . This criteria implies distance to nearest save water source, taking into account the price of water transport, and Ideally this parameter should be cross checked with household income and the % of expenditure of income spent on water.
   c) Resilience Storage capacity for water (at household level)
   d) Quality (Humanitarian scarcity baseline -not fully secure or safe source).
2) Agriculture
   a) Animal water consumption
   b) Dependency : Indicator: Dependency on herding
      Measurement units: in % of overall household income
      Humanitarian scarcity baseline: more than 50%
      (Rating: e.g. High: >50%, Med. 25-50, low: <25)

c) Viability
Indicator: Number of months that herders rely on purchased fodder
Measurement units: in Number of months
Humanitarian scarcity baseline: more than 6
(Rating: e.g. High: >6, Med. 4-6, low: <4)

Practices to alleviate drought impacts:

I. In Agricultural sector strategy programs and priorities (MoA2013)
   1) Enable the institutional and legal environment:
      - Implement and activate the endorsed Law of Farmers Compensation Fund
      - Plans to develop the Agricultural Insurance service.
   2) Watch to safeguard
      - Improve the quality and accessibility of data.
      - Early warning and forecasting for agricultural drought (many components of an early warning system are in place within MoA structure).
      - Minimize the impact Natural hazards such as drought, floods, frost and wind storms by improving extension services.
      - Environmental conditions such as land degradation, desertification and water scarcity.
      - Increase variability and uncertainty in food production.
      - Control volatility in agricultural commodity markets and soaring food prices.
      - Build the technical and institutional capacities of department within MoA tasked and dedicated to climate change and drought monitoring.
      - Link the EWS to Food Security Information Systems. Tools will be developed to enable the provision of early warning estimates including pictorial evaluation tool to forecast levels harvest. Also, MoA will benefit from its lessons learned from the current project-based monitoring activities and up-scale these to a National level.
   3) Prepare to respond and being more predictable to climatic uncertainty.
   4) Enhance innovative and indigenous practices (Climate smart sustainable agriculture …. etc)
   5) Build resilience and improve adaptive capacity of farmers.

II. Measures to alleviate drought & water scarcity Impacts
   1) Groundwater Supply Development (Drilling of new wells and Rehabilitation of springs and wells (Fig 3).

   2) Water Harvesting: Installing water collection ponds for irrigation and constructing small scale dams in Fara'a and Auja wadis (Fig 4).

Fig. 3 : Well in Jericho - 2011

Fig. 4 Al-Auja Dam - 2012

3) Control groundwater abstraction from upper and lower aquifers to be within the sustainable yield limits (Froukh 2010).
4) Improving groundwater recharge through utilization of generated runoff (Froukh 2010).
5) Demand Management (water losses Reduction, awareness and a communication strategy, including a community education campaign, changing crop patterns, and water use restrictions, balancing demand with water supply sources, and save fresh water by use nonconventional water).
6) Alternative Resources: Purchased water, desalination, reuse of Treated Wastewater and reallocation management.
7) Conduct public awareness to control water demand (Froukh 2010).

The need for knowledge and skills on drought management:

There is no doubt that political (situation, willingness and commitment) and technical contexts are the main reasons for the absence of comprehensive and proactive drought risk reduction strategies. The priorities for Palestinian Authority were directed toward the foundation of institutional, legal, and legislative frameworks and the formulation of policies and strategies to improve the water supply. In addition to constraints imposed by the Israeli occupation forces that distort the performance and hinder the development planning, the lack of scientific and technical knowledge bases is another constraint to achieve the comprehensive disaster risk reduction, starting with hazard and risk assessments, vulnerability analysis and ending with preparedness, response and recovery processes. Institutional reforming, adoption of good governess and participatory approaches, and technical and human building capacities need substantial financial resources which are considered one of the important difficulties in updating and formulating policies and strategies. These approaches of reforming and good governess need a clear commitments and wills from the policy makers and decision makers where political complication interacts and hinders the implementation of such approaches. Furthermore, the public prospective is making such changes difficult to be accomplished especially with the weak participation and incorporation of civil and public sector in this process.

As conclusion, the interaction between political and technical difficulties is maximizing the suffering of Palestinian communities especially that located in area C. The need to develop a comprehensive drought Strategy and national plan is becoming a must and a priority in strategic options; this can't be achieved without building the capacities at organizational, methodological, and operational. Monitoring and early warning; risk and vulnerability assessments for each economic sector; formulating appropriate mitigations, actions, and response, and Implementation are the core constitutes of this plan. Preparedness leads to greater institutional capacity to cope with drought events through the improvement of information flow and coordination between and within different levels of government. It is also about increasing the coping capacity of individuals, communities, and governments to handle drought events. Drought preparedness, coupled with appropriate mitigation actions, and public awareness and training programs, can reduce and, in some cases, eliminate many of the impacts associated with drought.

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