

WATER INSECURITY IN THE GAZA STRIP

Adaptation strategies of farmers
and households



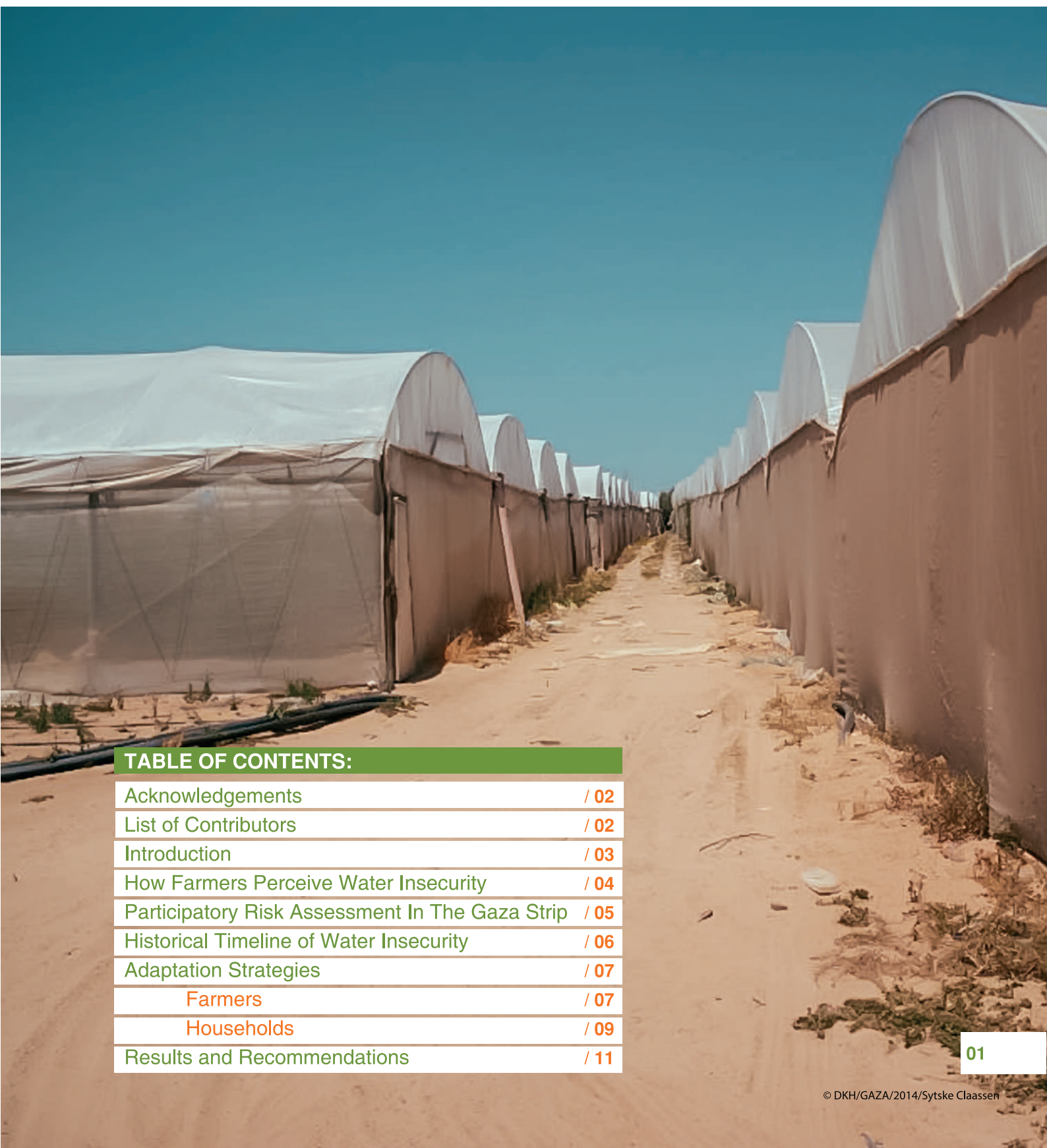


TABLE OF CONTENTS:

Acknowledgements	/ 02
List of Contributors	/ 02
Introduction	/ 03
How Farmers Perceive Water Insecurity	/ 04
Participatory Risk Assessment In The Gaza Strip	/ 05
Historical Timeline of Water Insecurity	/ 06
Adaptation Strategies	/ 07
Farmers	/ 07
Households	/ 09
Results and Recommendations	/ 11

ACKNOWLEDGEMENTS

We are pleased to present the summary of the research study entitled «Water in the Gaza Strip». The research analyses farmers' and households' adaptation strategies to water insecurity in the Gaza Strip (hereinforth "Gaza"). The research and its findings could not have been achieved without the generous support of the German Federal Ministry for Economic Cooperation and Development (BMZ). We express our gratitude to the leadership of the Agricultural Development Association (PARC), strategic partner of Diakonie Katastrophenhilfe. All combined efforts ensured the highest quality of the research and the project entitled "Enhancing Drought Resilience through Innovative

Water Management in the Gaza Strip".

We are also grateful to the dedicated and hard work of the field researchers of the Experts Modernity Consulting and Community Development (EMCCD) who collected most of the data and information that represent the core of this research. Also, we are hugely indebted to the 12 experts and four highly experienced farmers who generously contributed to the research with their time and knowledge. Special thanks goes out to the farmers who participated in the focus group discussion sessions and the ca. 500 people who participated in the survey.

LIST OF CONTRIBUTORS

Lead author and research

- Dr. Ahmad Safi (Diakonie Katastrophenhilfe Representative for Gaza and Disaster Risk Reduction Advisor)

Agricultural Development Association (PARC)

- Taiseer Muhaisen (Deputy Director)
- Hani Al-Farra (Project Manager)

Diakonie Katastrophenhilfe:

- Marius Schneider (Disaster Risk Reduction Program Assistant)
- Sytske Claassen & Sam van den Berg (Disaster Risk Reduction Program Officers)

Consultants

- Dr. Adnan Ayesh (EMCCD)
- Dr. Mazen Abu Aqmar (EMCCD)



© Act Alliance/GAZA/2015/Paul Jeffrey

INTRODUCTION

For decades, the people in Gaza have been facing socio-economic challenges as well as man-made and natural hazards. The population is at a critical turning point in their supply of water. Deteriorating availability (quantity) as well as quality of water has resulted in severe water insecurity.

Gaza's population has been suffering severe and exponentially deteriorating water insecurity. Gaza is highly dependent on the coastal aquifer as its sole source of fresh water. The water level of the aquifer has rapidly declined. One of the causes is a lack of adequate water management policies. In addition, high demands for water by farmers and households led to a rapid decline of groundwater levels.

Consequently, the water quality has been affected by saline seawater. Seawater continues to intrude the coastal aquifer. Inadequate human waste management policies and an excessive use of fertilisers results in high nitrate contamination of ground water.

It is critical to understand the adaptation strategies adopted by farmers and households in order to mitigate the effects of water insecurity. Many of the actions taken by families, business owners and farmers are no longer sufficient. As part of this research, a public survey (random selection), five focus group discussions with farmers from all five governorates of Gaza, as well as twelve key informant interviews with specialists were conducted. Results of the research show that

there is a growing need for local government and international support to ensure sufficient quality and quantity of water, to safeguard life in dignity.

The research is vital as it portrays an in-depth understanding of water insecurity in Gaza. Its outcomes will inform academia,

development workers and policy makers to more effectively support farmers and households in adapting to challenges in their water supply and management.

"How can we continue to cultivate our lands? The warning bell is ringing! Please underline this statement!"
(A farmer from Northern Gaza)





© DKH/GAZA/2013/Dr. Ahmad Safi

HOW FARMERS PERCEIVE WATER INSECURITY

Farmers are deeply concerned with their future—they want and need to be engaged for effective policy making that improves the overall water situation in Gaza.

Farmers increasingly suffer from:

- Water shortages, problems of water quantity
- Severe water pollution, problems of water quality

Farmers identified five root causes of current water insecurity:

- External governmental restrictions on water policy and practice
- Rapid population growth
- Wasteful behavior
- Lack of adequate water management policies and regulatory bodies in Gaza
- Climate change (e.g. unpredictable rainfall)

PARTICIPATORY RISK ASSESSMENT IN THE GAZA STRIP

During a Participatory Risk Assessment in Gaza the Ground Water Salinity and Groundwater Pollution levels as well as Groundwater Level Scarcity have been mapped in 2014.

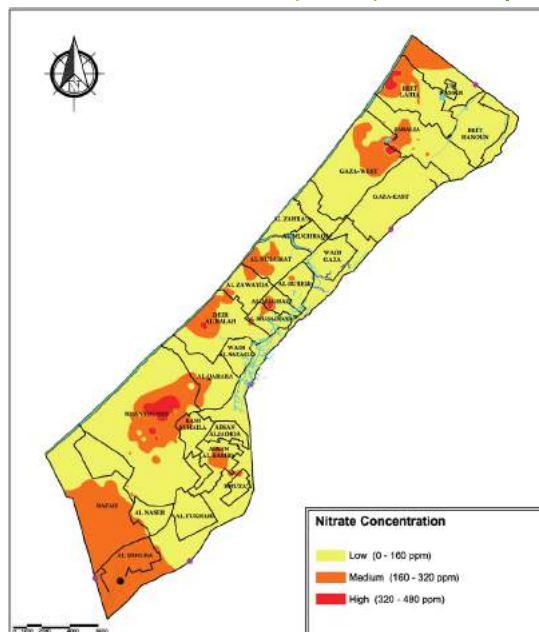
It is important to understand the linkages between water insecurity and other natural and man-made hazards to which farmers and families have to adapt and prepare themselves.

To this end, PARC conducted a comprehensive risk assessment to plan for the project “Enhancing Drought Resilience through Innovative Water Management in the Gaza Strip”.

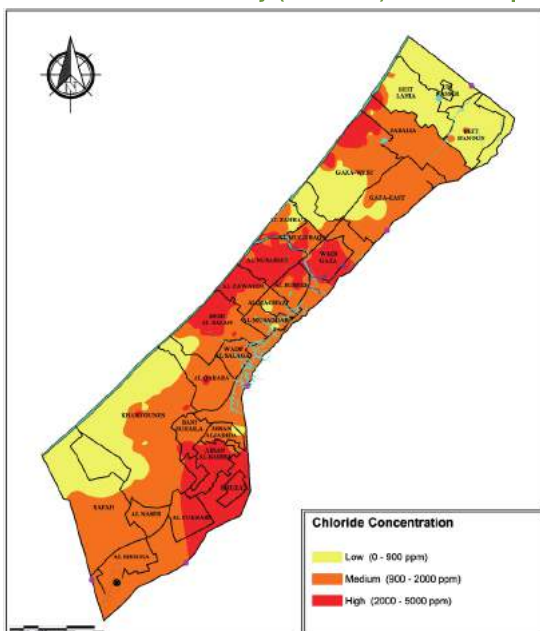
With Geographic Information System (GIS) technology, detailed hazard maps of all hazards in the Gaza Strip were developed.

Read more on PreventionWeb: “Participatory Risk Assessment in the Gaza Strip”

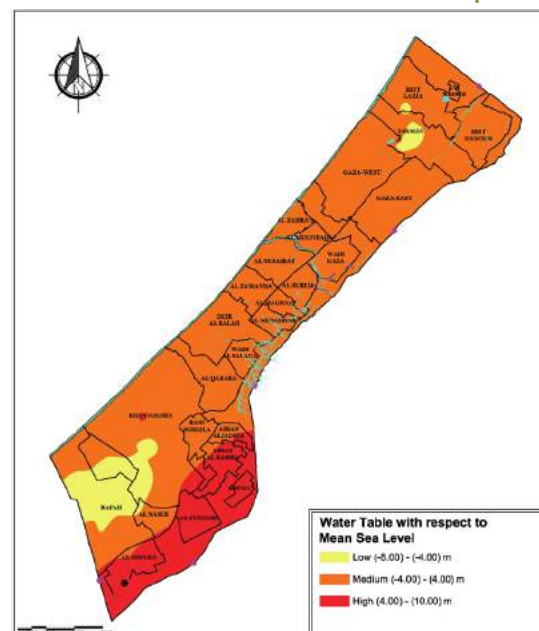
Ground Water Pollution (Nitrate) Hazard Map



Ground Water Salinity (Chloride) Hazard Map



Ground Water Table Level Hazard Map



Before 1948

Governance: British mandate

Population: 70 - 80,000 by 1948

Major agricultural practice:

- Citrus farms of large landowners
- Use of hand pumped wells (no electricity)

Water sources:

- Reliance on rainwater and the Wadi;
- Few private wells mainly for domestic usage

Indicators:

- Low groundwater extraction rate: 16 MCM/year
- High groundwater level: 2 - 10m

1948

Governance: Egyptian administration

Population: 356,000 by 1967

Cultivation: 260,000 dunams

Major agricultural practice:

- Irrigated citrus crops with high water demand
- Use of hand pumped wells (no electricity)

Water sources:

- Increasing reliance on groundwater

Indicators:

- Groundwater extraction rate: 78 MCM/year
- Groundwater level drops by 8m – remains above sea level
- Low chloride levels

Adaptation strategies:

- shift to irrigated crops
- Increasing reliance on groundwater

1967

Governance: Israeli occupation

(18% of land dedicated to settlements)

Population: 600,000

Cultivation: 195,000 dunams (1989)

Major agricultural practice:

- Trend towards vegetable cultivation and high value crops for export (strawberries and roses)

Connection to power grid in 1970s:

- Change of lifestyle leads to increased water

Water sources:

Sole dependence on groundwater aquifer – Wadi water is depleted

Indicators:

- Groundwater extraction rate: 116 MCM/year
- Groundwater level drops rapidly
- Chloride pollution levels increase significantly

Adaptation strategies:

- Increased land productivity
- Drip/sprinkler irrigation technologies

1994

Governance: Palestinian National Authority

Population: 1.7 Million in 2014

Rapid increase of population during 1994-1998 and after 2nd Intifada

Three offensives on Gaza 2008/9, 2012 and 2014 and strict control of Gaza since 2007

Cultivation: 150,000 dunams

Major agricultural practice:

- Increased use of greenhouses for cultivation of vegetables
- Increase of cultivation of olive trees
- Decrease use of 'cash crops'

Water sources:

10,000 legal and illegal wells constructed

Indicators:

- Groundwater extraction rate: 190-160 MCM/year
- Groundwater level dropped significantly and most of aquifer is below sea level
- Chloride pollution in some areas exceeds 2000mg/l. 95 % of water unsuitable for drinking purposes

Adaptation strategies:

- Efficient irrigation technologies (e.g. tensiometres)
- Illegal wells/purchase of water
- Treated wastewater for irrigation and household use
- Rainwater harvesting; increasing storage capacities
- Households conserve water; water treatment units

2015

ADAPTATION STRATEGIES - FARMERS

The rapid decline of the groundwater level and the deteriorated water quality confront farmers with many challenges. These hazards threaten livelihoods as well as the overall food security in Gaza. Farmers have adopted different adaptation strategies in order to cope with these challenges. While some adaptation strategies are positive (sustainable), others are negative and further worsen the water availability and healthy growth of agri-businesses in the long run.

Farmers need to be supported to adopt positive strategies which safeguard livelihoods for generations to come. At the same time, there is a need to raise awareness of negative effects of some adaptation strategies among farmers to prevent further deterioration of water insecurities in Gaza.

Positive strategies

- Effective and well-maintained irrigation technologies (e.g. drip irrigation)
 - » Increases water efficiency and reduces costs
- Rainwater Harvesting
 - » Increase in availability and quality of water and long term cost efficiency
- Use of treated wastewater
 - » Needs awareness raising
- Change to less water demanding and saline tolerant crops
 - » Need for establishment of coordination body

Negative strategies

- Illegal wells for the extraction of large amounts of water
 - » Depletion of groundwater levels and increase in water salinity
- Purchase of water
 - » Undermines economic development
- Abandonment of agricultural lands
 - » loss of livelihood of farmers
- Purchase water from distant water sources
 - » Leads to further depletion of water sources and burdens farmers' economic development

"Now I cultivate two dunams instead of 10. This decreases the risk of losing, but also decreases my profit. So my livelihood and standard of living are affected. I had to decrease the allowances of my children, my expenses on my family's recreational activities, and my expenditures in general. "

(A farmer from Northern Gaza)



© Act Alliance/GAZA/2015/Paul Jeffrey



© DKH/GAZA/2015/Marius Schneider

Rainwater Harvesting for Greenhouses

Diakonie Katastrophenhilfe and The Agricultural Development Association (PARC) have constructed more than 45 communal rainwater harvesting ponds with groups of 3-5 greenhouse farmers. Moreover, sustainable Geo-Membrane rainwater harvesting ponds were introduced for the first time in the Gaza Strip.

In addition, trainings on water resource management for farmers to increase the efficient use of water were conducted. Furthermore, a comprehensive media campaign was set up to raise awareness of water insecurity and possible adaptive measures.

ADAPTATION STRATEGIES - HOUSEHOLD LEVEL

Households in Gaza have adjusted their practices and behavior in response to the deteriorating water insecurity. Today, the water consumption rate in Gaza falls below the optimal 100 liter per capita per day, recommended by the World Health Organization.

WATER SHORTAGE

Interviews showed that the water situation for the population significantly worsened when Gaza became connected to the electrical grid and water network. The use of household appliances (e.g. washing machine, dishwasher, etc.) significantly increased the population's demands of water.

Families and individuals adopted positive measures such as:

- Conservation of water: decreasing number of showers; decreasing waste of water while cooking
- Increasing of water storage capacity: installation of water tanks

Households have also adopted negative adaptation strategies:

- Drilling of illegal water wells: Further contributing to the exploitation of the groundwater levels;
- Purchase of untreated water from local sellers: a financial burden and poses significant health risks.

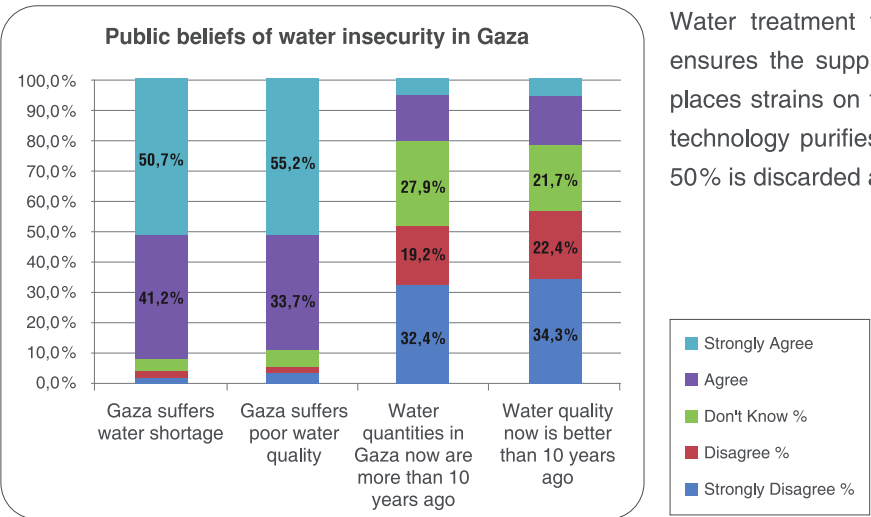
WATER QUALITY

After groundwater levels dropped below the sea level, intrusion of saline water led to a deterioration of the water quality of the only source of fresh water in Gaza.

In response, the population adopted a number of adaptation measures, such as:

- Purchase of bottled drinking water
- Purchase of drinking water from treatment plants at a high cost
- Installation of household level Reverse Osmosis Units
- Installation of household seawater treatment plants (treatment of highly saline groundwater)

Water treatment through Reverse Osmosis Technology ensures the supply of higher quality water, but it further places strains on the water availability in Gaza. While the technology purifies 50 % of the inflowing water; the other 50% is discarded as brackish water.





© DKH/GAZA/2015/Marius Schneider

Household rainwater harvesting units

Great impact has been achieved to improve hygiene practices for families. More than 300 household level rainwater harvesting units have been constructed to improve water quality and availability at the household level. Rainwater is collected from flat roofs and is stored in newly established water tanks which increase households' water storage capacities.



© DKH/GAZA/2015/Marius Schneider

RESULTS AND RECOMMENDATIONS

The research shows that farmers and citizens in Gaza are well aware of the challenges of water insecurity. Particularly farmers are highly critical of adaptive measures that have negative effects on their livelihoods and cost efficiency. Support for more governmental action and farmer engagement to enhance adaptive capacities as well as monitoring of water usage patterns are of critical urgency.

Below, some recommendations are provided to inform future steps for effective action at the household, farmer, policy and academic levels.

Recommendations for households

- Practice a more water efficient lifestyle;
- Establish rainwater harvesting units;
- Enhance water storage capacity for dry season;
- Engage proactively in discussions for water policies;
- Increase understanding of opportunities of agricultural products irrigated with treated wastewater;
- Practice caution with regards to the quality of drinking water that families purchase.



© Act Alliance/GAZA/2015/Paul Jeffrey

Households' willingness to adapt to water shortage	Household's willingness to adapt to water quality
<ul style="list-style-type: none"> - Start harvesting rainwater: 35% - Enhance water storage capacity: 37% - Practice water saving (e.g. during showers): 48% 	<ul style="list-style-type: none"> - Purchasing treated drinkingwater (59.5%) - Purchasing treated water for domestic uses (43%) - Purchasing bottled water (40%)
Less preferred adaptation measures: <ul style="list-style-type: none"> - Reusing of gray water in home gardens: 13% 	Less preferred adaptation measures: <ul style="list-style-type: none"> - Boiling tap water (27%) - Chlorination of drinking water (27%)

Recommendations for farmers

- Increase level of self-organisation:
 - To discuss and exchange experiences of adaptation strategies;
 - To coordinate crop production to decrease losses;
 - To advocate for governmental support and engagement
- Increase facilities for rainwater harvesting and use of collected water;
- Maintain and improve irrigation networks to reduce water loss;
- Seek assistance in use of novel technologies in order to improve water efficiency;
- Raise awareness about the opportunities of treated wastewaters for irrigation.

"The cost of withdrawing water from the underground is increasing all the time. Our crops need good quality water. We are worried and don't know how we can continue to farm our lands considering these costs."

A farmer from Gaza City governorate stated.

Recommendations for policy makers

- Raise awareness and engage the public in discussions on water insecurity to increase willingness to adopt positive adaptation strategies;
- Increase governmental and civil society assistance for farmers and households to adopt positive adaptation strategies (rainwater harvesting, irrigation schemes; innovative technologies, etc.);
- Better engage with farmers for more effective monitoring schemes on illegal agricultural wells digging;
- Develop monitoring schemes for the usage of treated wastewater and of produce irrigated through treated wastewater;
- Raise public acceptance on the viability of greywater usage for irrigation purposes at farm and household levels;
- Establish coordination mechanism to mitigate price fluctuations.

Recommendations for academia

- Suggestions for research include a comparative analysis of costs and benefits of the following:
 - Different policy options interventions (national and local levels);
 - Different adaptation measures such as rainwater harvesting; increasing storage capacity; etc.
 - Different individual and household level water conservation options;
 - Different measures of water treatment for agricultural and household usage.

For more information, find the research: Safi et al. (2016) "Water in the Gaza Strip" Gaza: PARC



Diakonie 
Katastrophenhilfe

Member of
actalliance

The Agricultural Development Association,

PARC-Gaza Gaza strip, Salah Eddin St.

Al-Zaitoun

Quarter before Abu Jebba Petroleum station.

Tel : +970 8 2805040/41/42

Fax : +970 8 2805039

Email : adming@palnet.com

Email : parc-gaza@pal-arc.org

Front Page Photos: © Act Alliance/GAZA/2015/Paul Jeffrey

© DKH/GAZA/2014/Sytske Claassen

Readers are encouraged to reproduce material from Diakonie Katastrophenhilfe/PARC Reports for their own publications, as long as they are not being sold commercially. As copyright holders Diakonie Katastrophenhilfe/PARC, request due acknowledgment. For online use, we ask readers to link to the original research. The views presented in this paper are not necessarily presenting the view of Diakonie Katastrophenhilfe/PARC.

© Diakonie Katastrophenhilfe/PARC, 2016; This work is licensed under creative commons Attribution – non commercial licence.