



# Investigation of the Potential of Fogwater Harvesting in the Western Mountainous Parts of Yemen

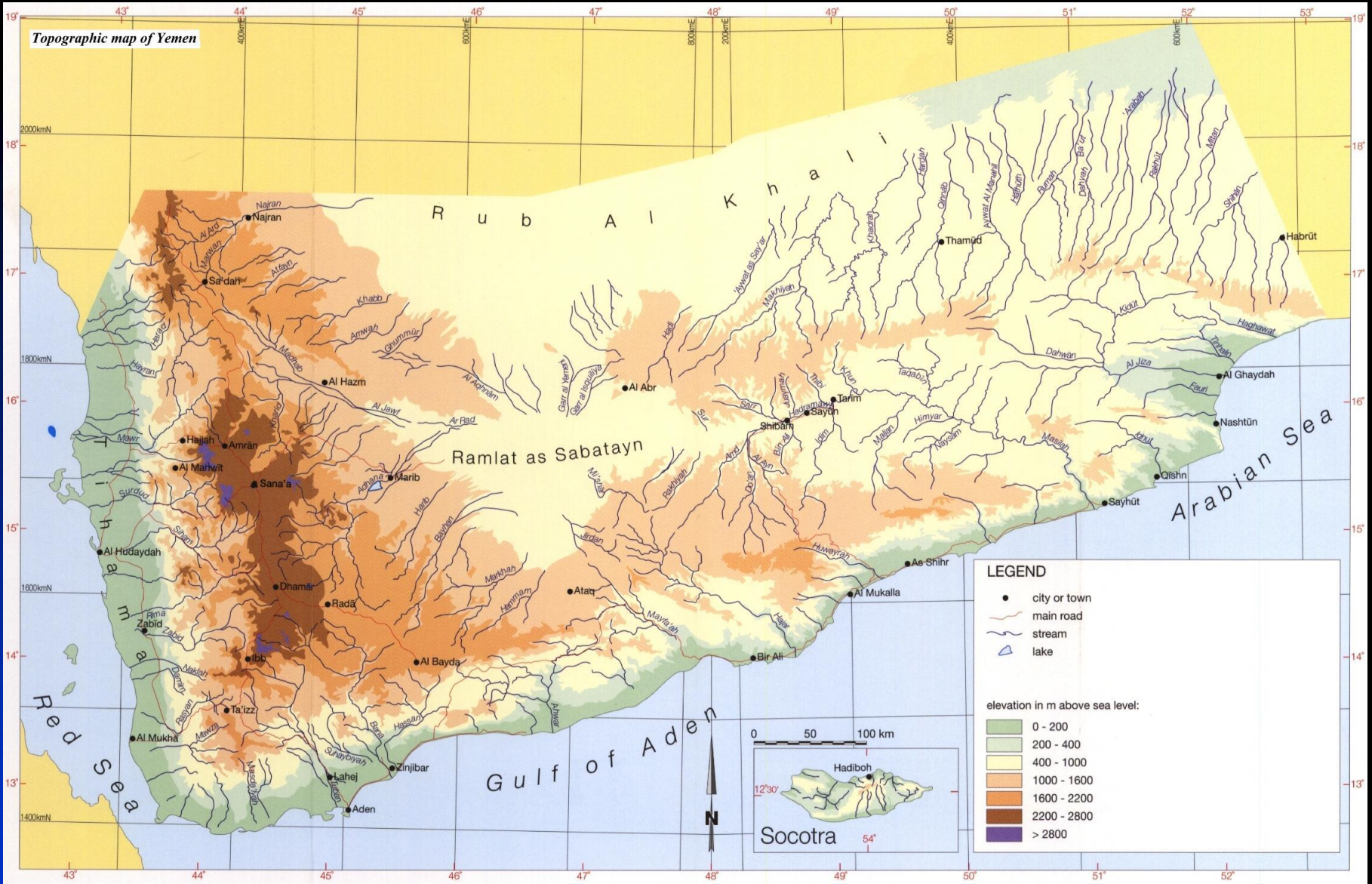
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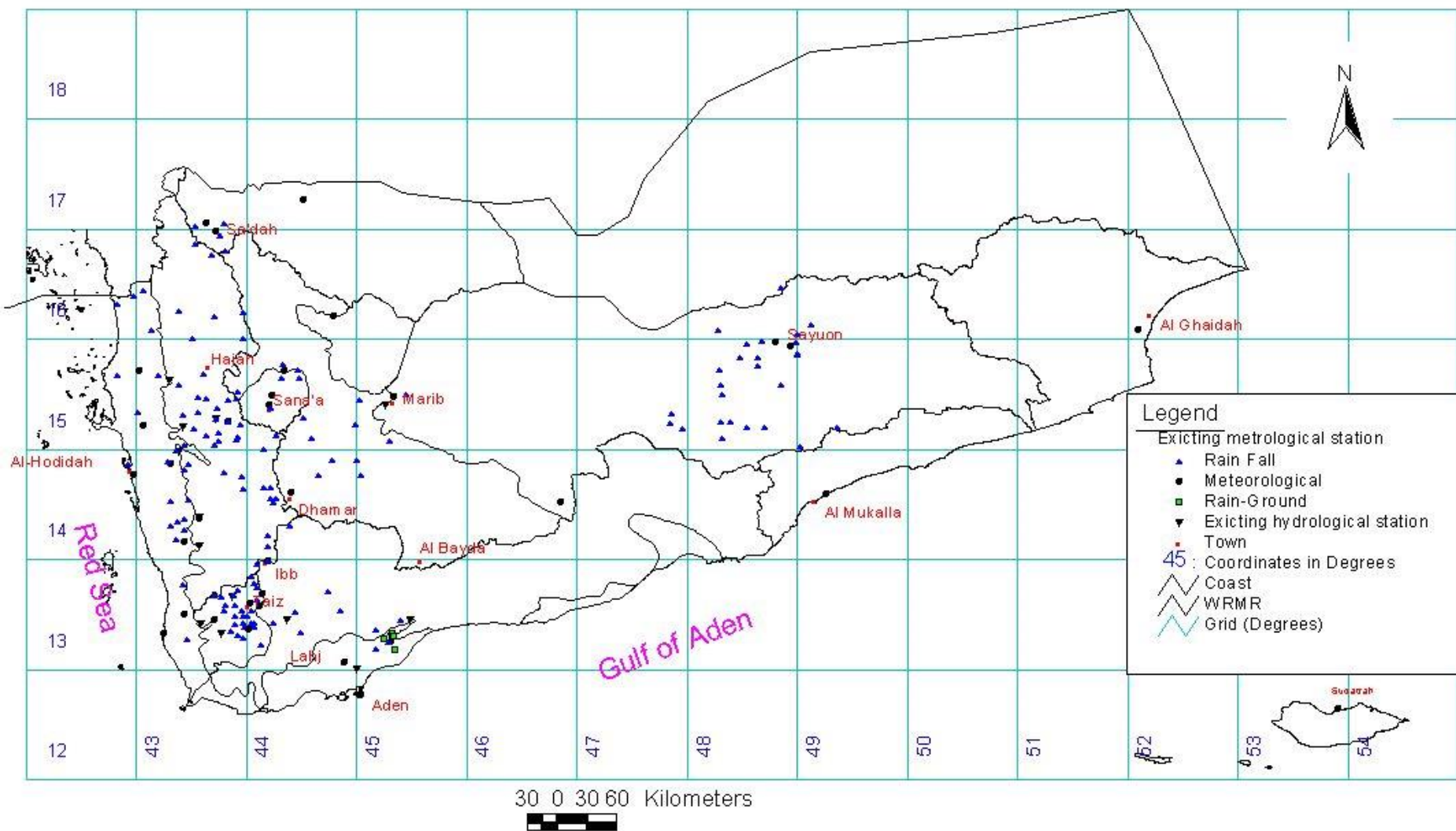
# BACKGROUND

- Location : South west of Arabian Peninsula
- Geographic Area : 555,000 km<sup>2</sup>
- Population(2001) : 18,200,000
  - Urban : 23%
  - Rural : 77%
- Renewed W.R. : 2500Mm<sup>3</sup>/Year
- Water Uses(2000) : 3400Mm<sup>3</sup>/year
- The Shortage : 900 Mm<sup>3</sup>/year

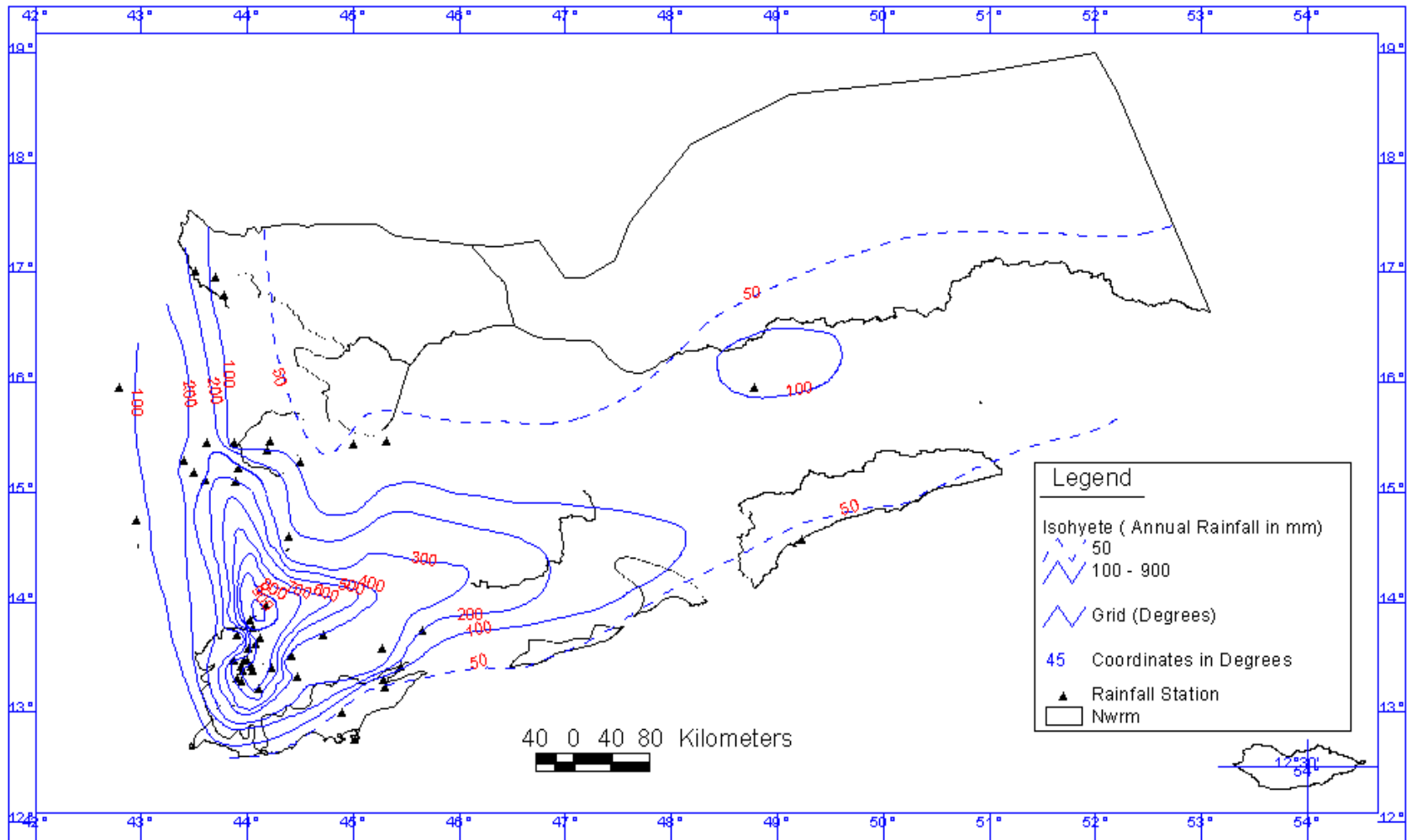


Topographical map of Yemen showing different Wadis

# Existing Metrological & Hydrological Network in Yemen



# Average precipitation in Yemen



# WHY THE FOG HARVESTING IS IMPORTANT IN YEMEN?

# Foggy Country









# Villages and hamlets are scattered



# Difficult topographical conditions





# Objectives

## The objectives of this study are:

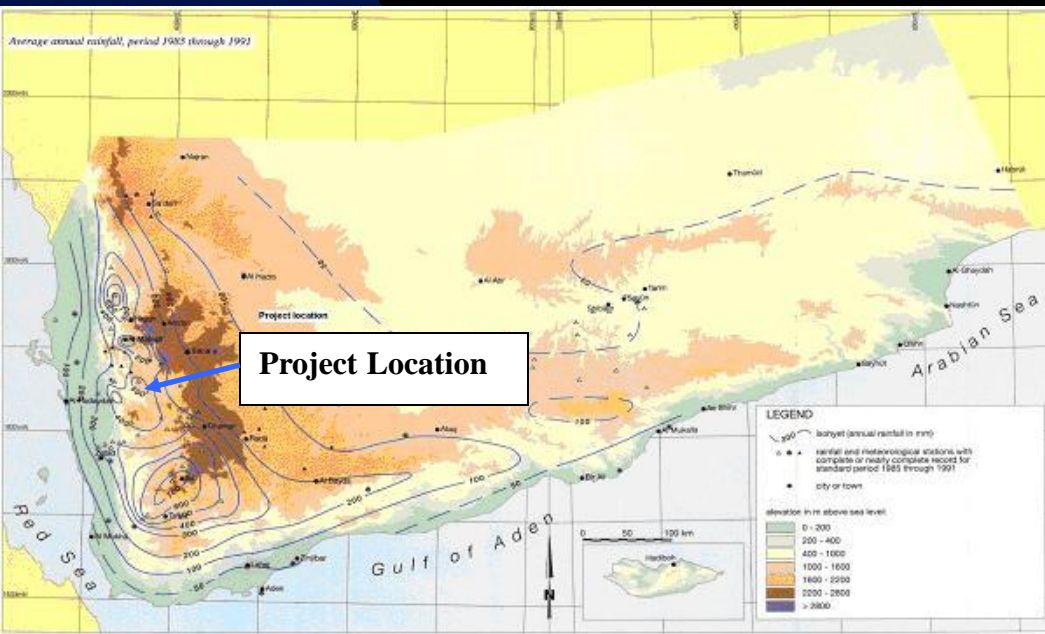
- Describe the fog harvesting techniques applicability in Yemen,
- Get sufficient data for making a reliable estimate of the daily yield through out the year,
- Identify parameters influence fog collections,
- Identify information and data needs to evaluate management effect on water harvesting techniques.

# Scientific test of this approach in the Hajja Governorate



- Dr. Schemenauer from the Canadian NGO fogquest [www.fogquest.org](http://www.fogquest.org) has developed this approach.
- As a first scientific project we want to install 30 small fog collectors to test out possible sites in the Hajja governorate and to collect data.
- The approach is currently used successfully in 20 countries.
- A SFCs Fog Collector (1 sqm) can produce every fog day up to 20 litres of pure drinking water, collected in plastic storage tanks.
- In the Hajja Governorate we have up to 80 fog days per year.

# Characteristics of the Study area



- Located in the west of the country
- Mountainous area with altitude range from 1650m to 2480m
- Rain annually falls between March – May and July – September
- During the dry season Hajja is known as a foggy region (80 days/year)

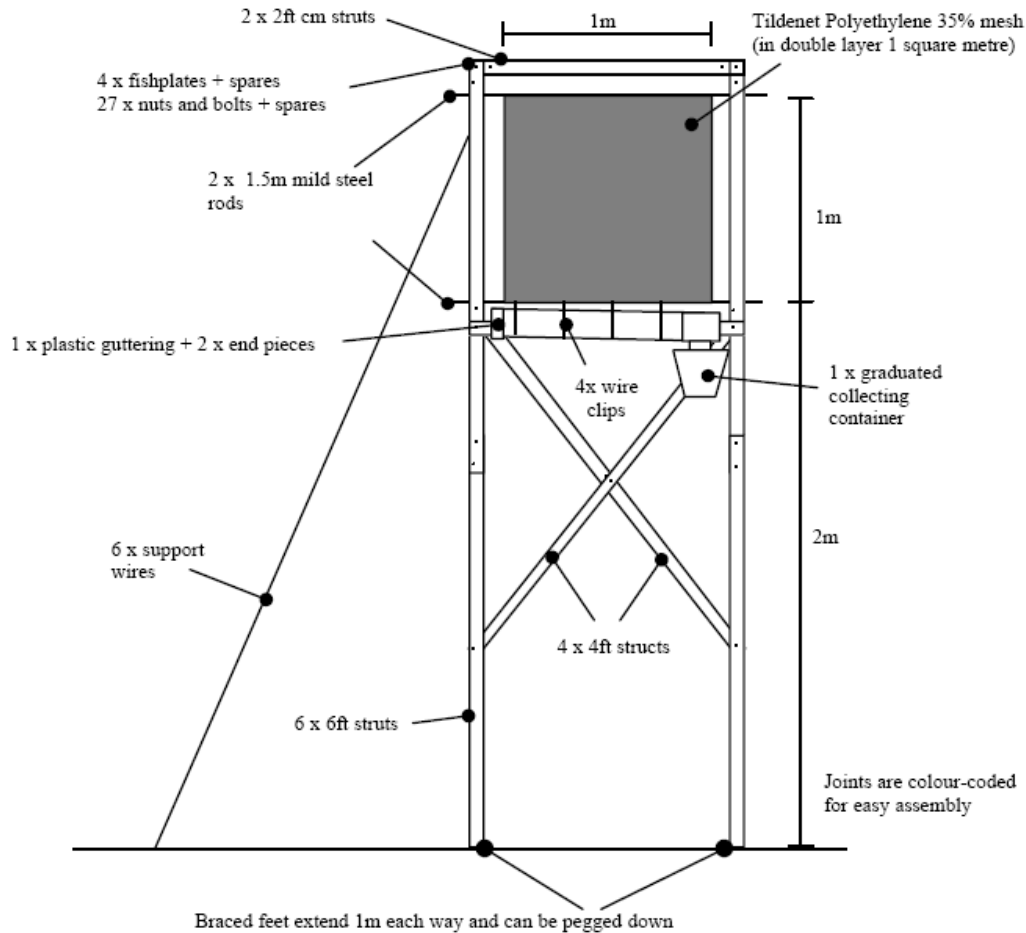
# Technical Description of the Standard Fog Collectors (SFs)

- The collectors are simple, flat; rectangular nets (mesh) of nylon (area  $1\text{m}^2$  )
- Constructed with locally available materials and local workmanship

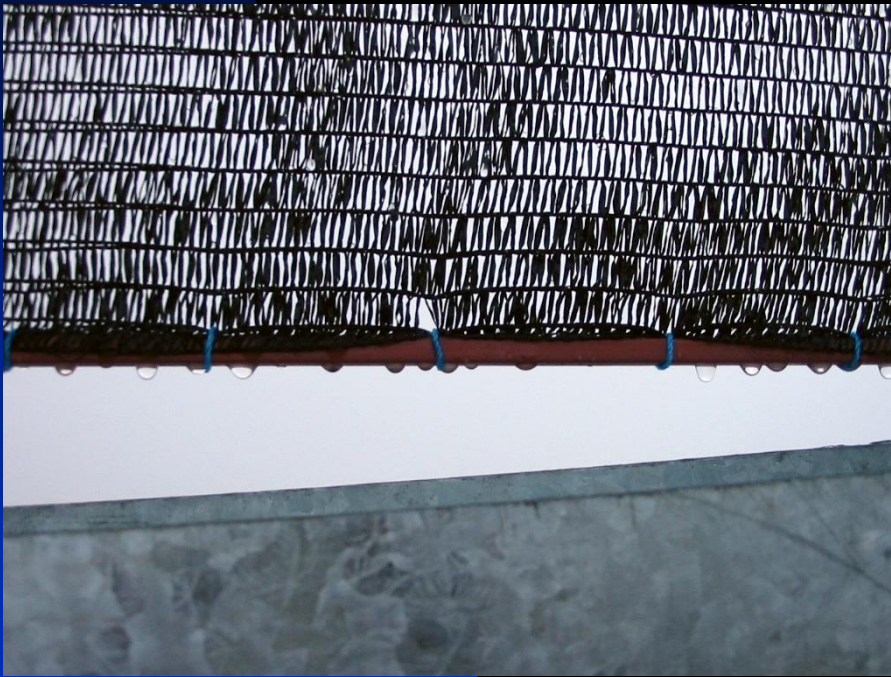




**Fig. 3. Diagram of Standard Fog Collector (SFC) used in the study area (Schemenauer and Cereceda, 1994a)**



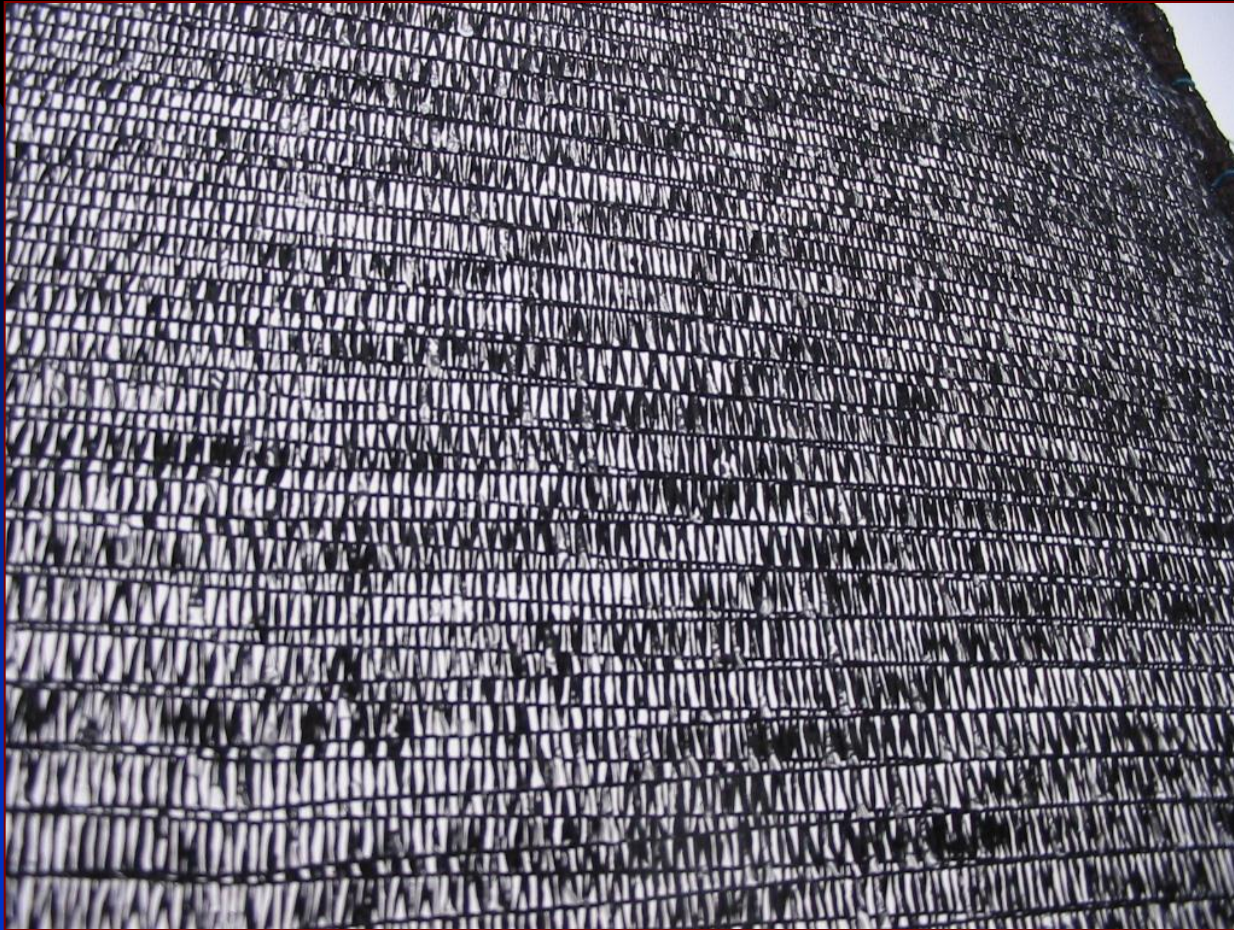
# Technical Description of the Standard Fog Collectors (SFs)



- water collects on the net, the droplets join to form larger drops that fall under the influence of gravity into a channel, from which it is conveyed to a storage tank



# Mesh 40 %



# Field works and measurements

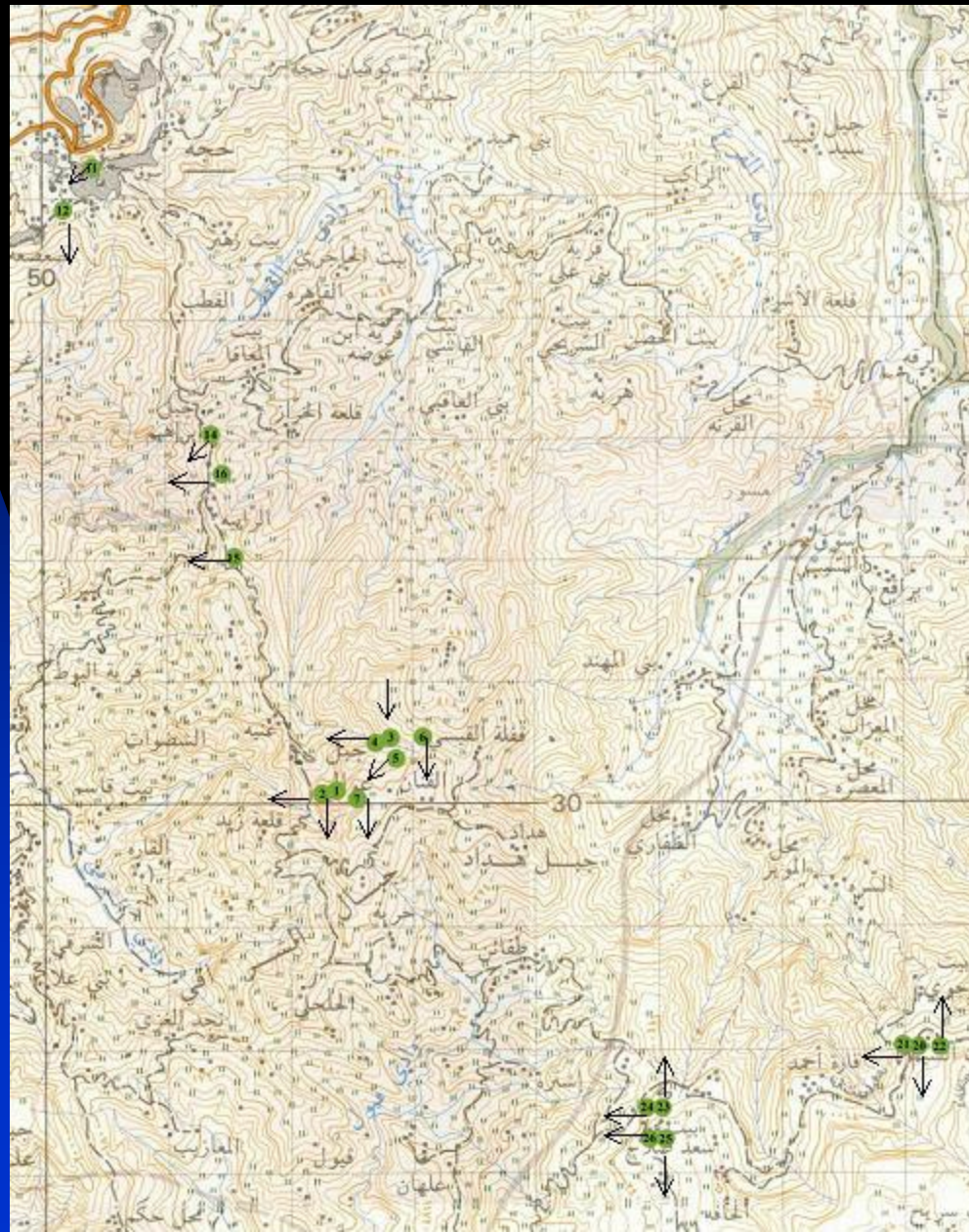
- Nineteen different sites were chosen and the 26 small Standard Fog Collectors (SFCs) were installed,
- The harvested fog water was measured on daily basis during three months.

# Location of SFCs

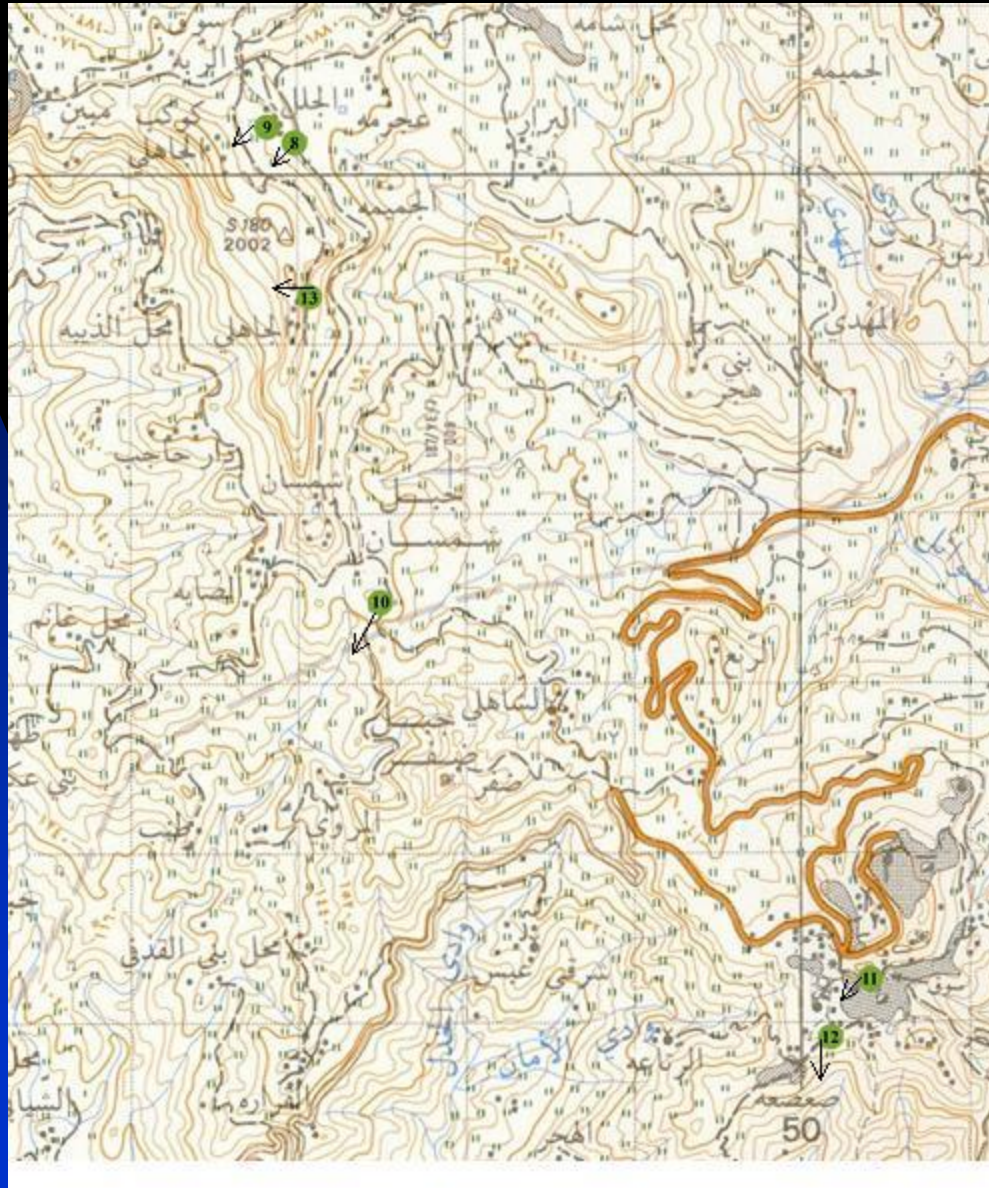
Site Name	No. of collectors
Shiraqi	7 SFCs
Mabijan	4 SFCs
Hajja City	2 SFCs
Humlaan	3 SFCs
Asschmur	3 SFCs
Maswar	7 SFCs
<b>Total</b>	<b>26 SFCs</b>

The average cost of an SFC was \$ 30 US

# Locations of the SFCs



# Locations of the SFCs





# COMMUNITY PARTICIPATION

# TRANSPORTED MATERIALS



# Breaking the rock



# Sewing the mesh

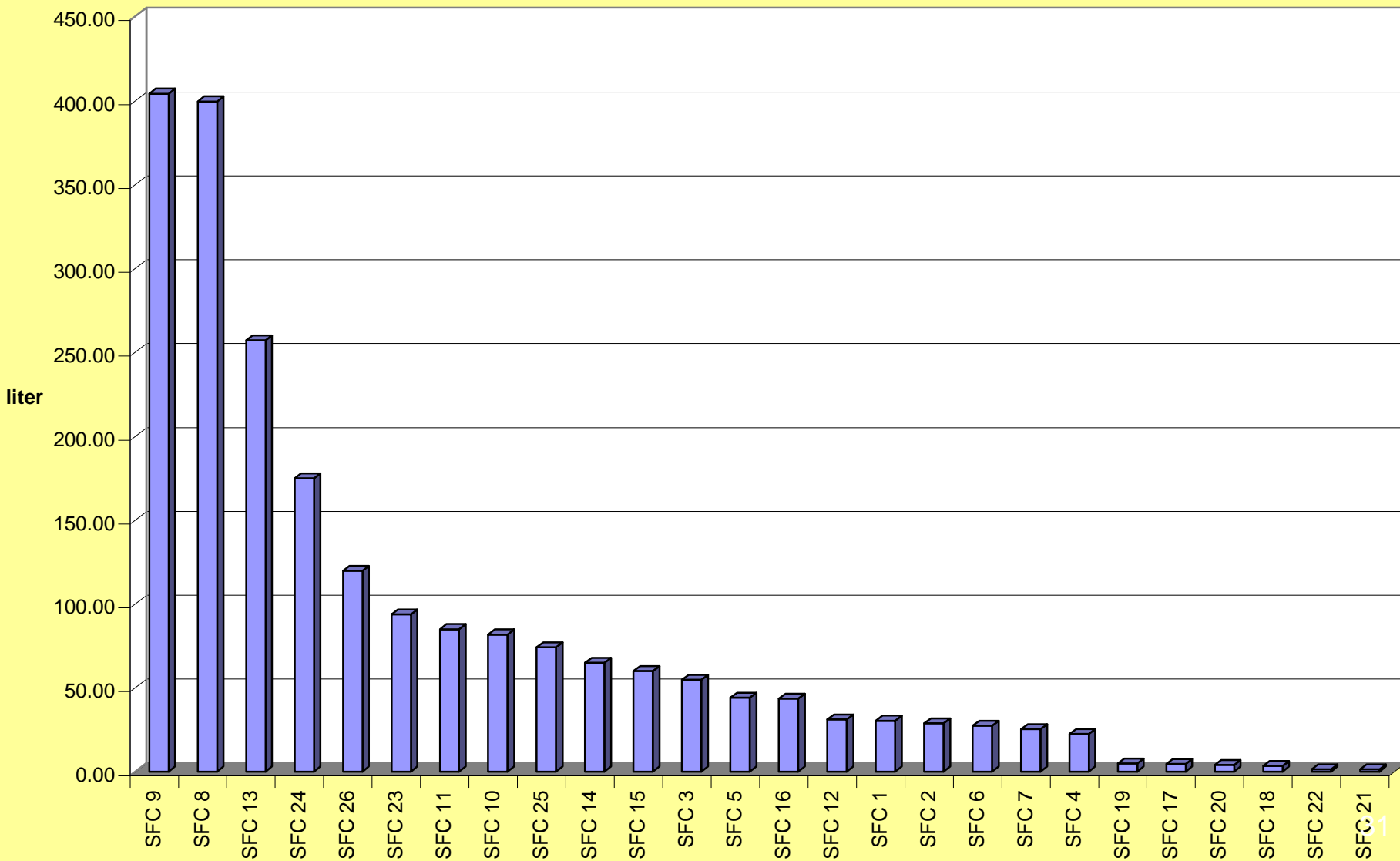


# Instillation the Collectors



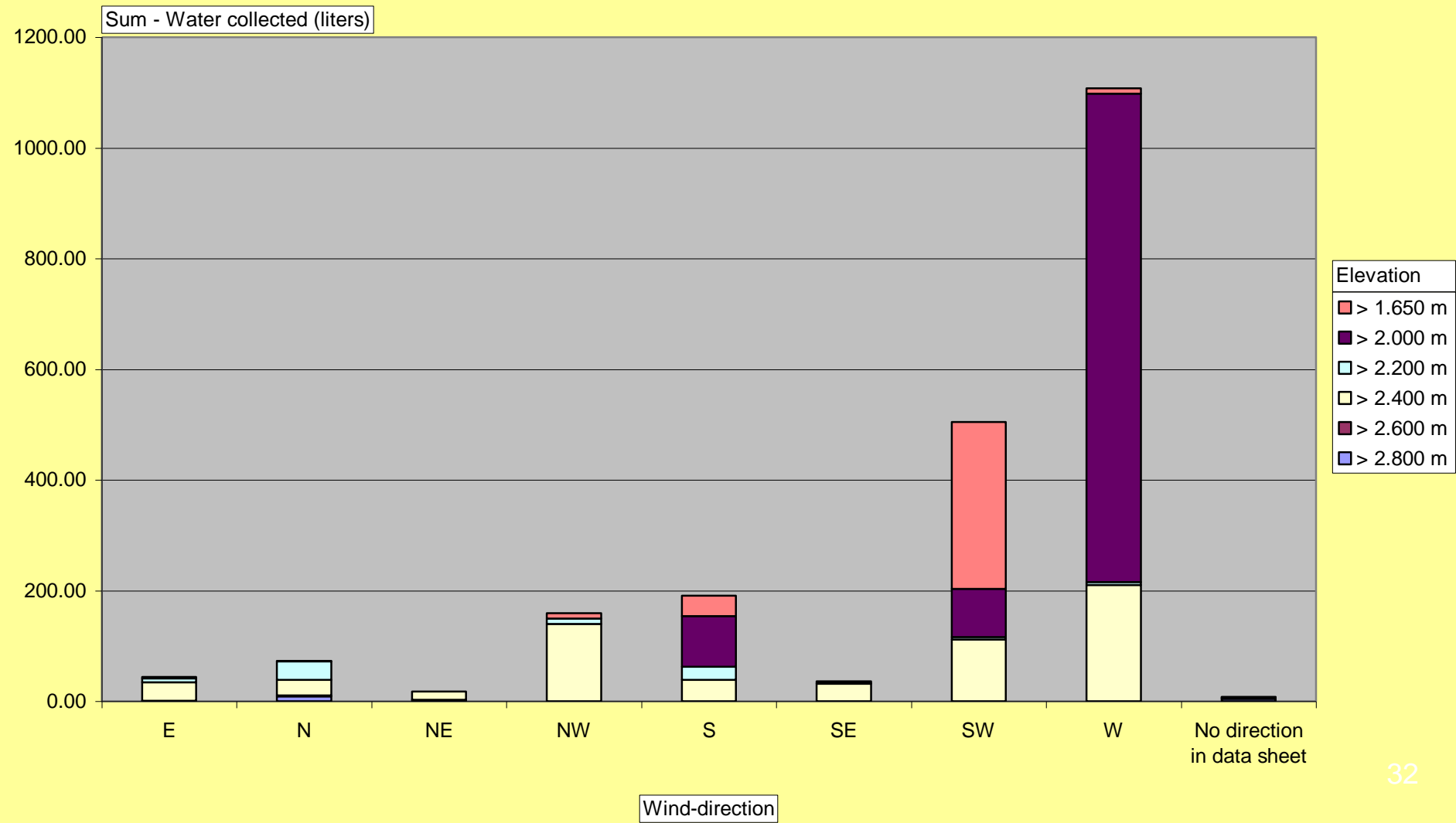
# RESULTS

# Total fog water collection for the all collectors



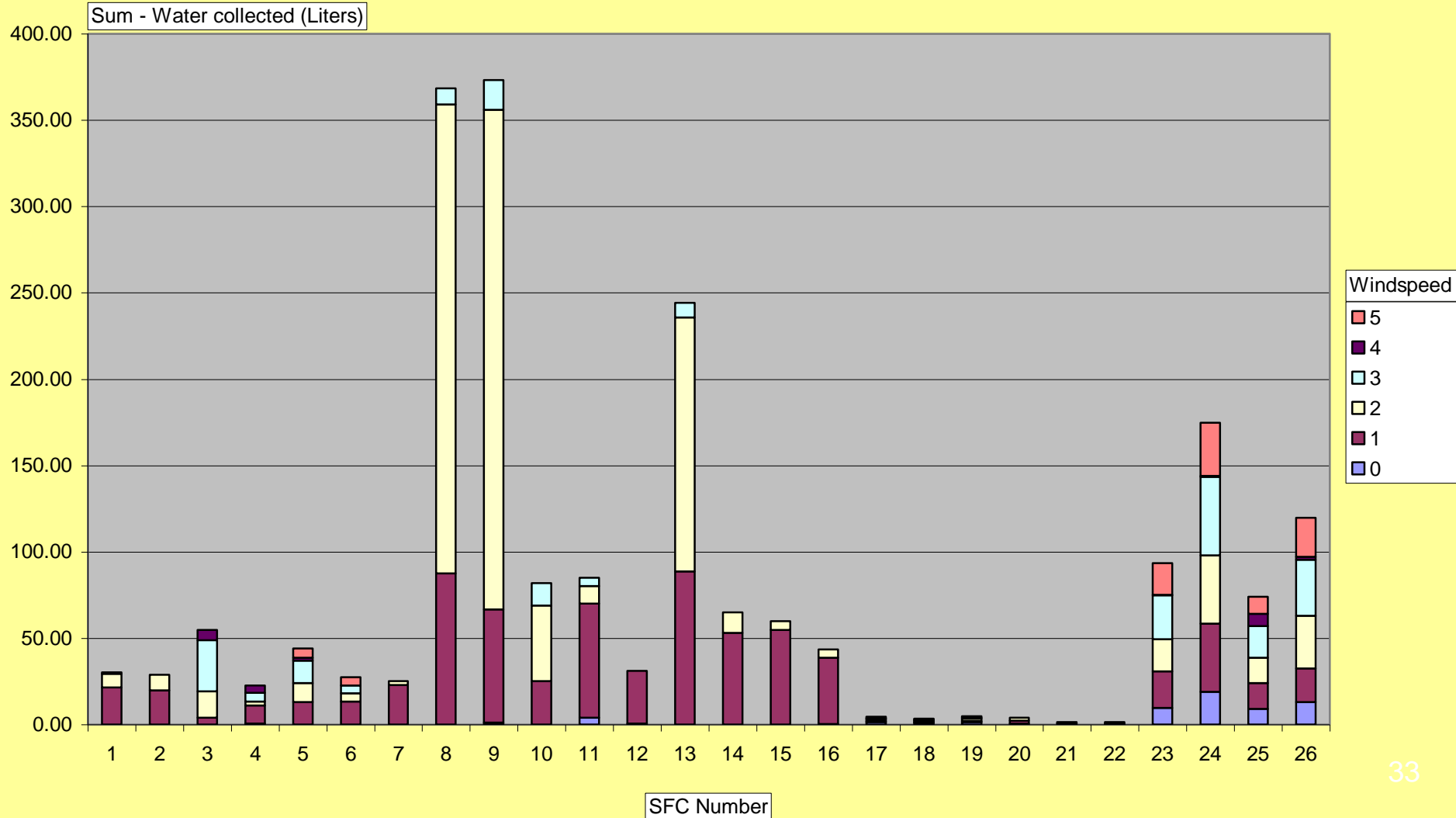
# Variation of the Fog water collection with wind direction and altitude

Date (All)





# Variation of the Fog water collection with wind speed



# RESULTS AND DISCUSSION

- The results from data record during the study period from 1 January 2003 to 1 March 2003, the fog water collection rate is not acceptable in most collectors (1 liter/day)
- Mid-January to the end of February is lower water production while the month of March water production rate is high production

# RESULTS AND DISCUSSION

- South-west winds direction are the most productive
- Almost 50% of the water collection occurred when the wind speed was around 2 m/s
- Elevations from 2000-2500 above sea level are a good sites for water harvesting

# CONCLUSIONS AND RECOMMENDATIONS

- More investigation is needed on the various parameters contributing to the fog collection such as relative humidity, temperature, distance to the coastline and SFCs technologies etc.
- More research is needed on the dynamics and chemistry of fog in order to optimize quality and yield.

# CONCLUSIONS AND RECOMMENDATIONS

- More sites should be studied either in Hajja or elsewhere in Yemen such as in the eastern parts of Yemen.
- Cooperation between scientists involved in Fog - water collection in the Arab countries and globally.
- Enhances community participation and awareness

# ACKNOWLEDGEMENTS

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**THANK YOU  
for Attentions**