



# Impacts from Fog Water Access in Southwest Morocco: A Household Cost-Benefit Analysis



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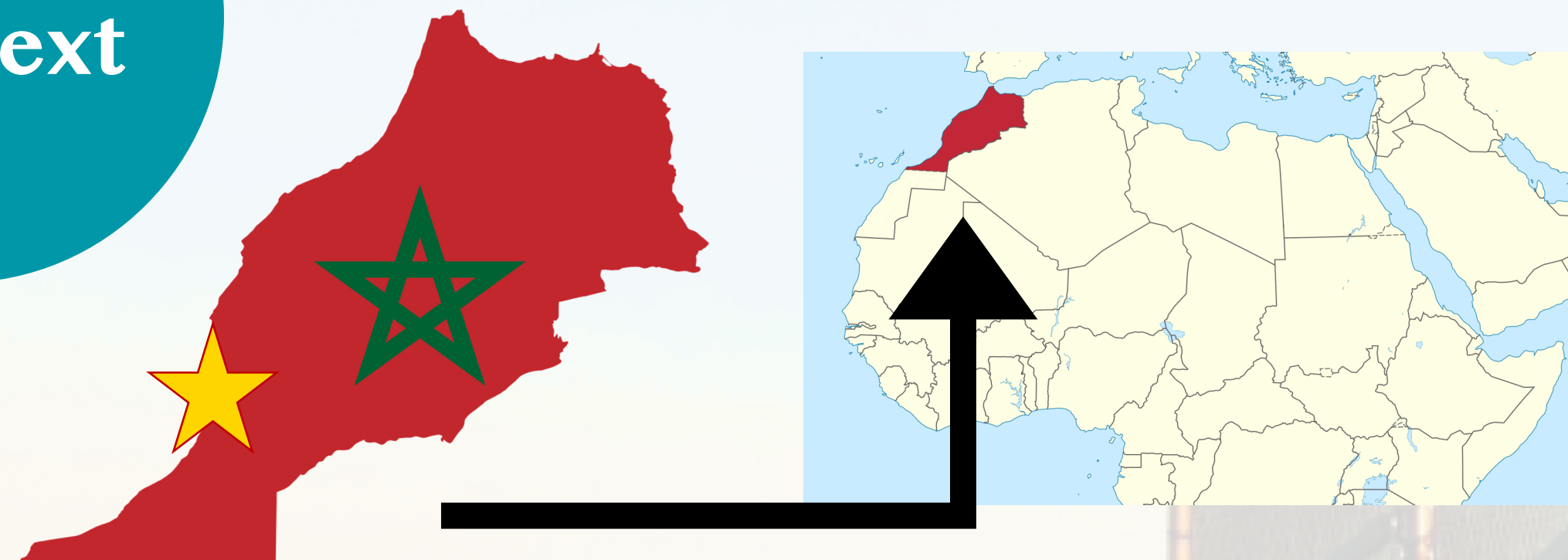
Supervisory Committee: Dr. Renata Serra and Dr. Esther Mullens



## The Context

### World's Largest Fog Harvesting Project:

Ait Baamrane, Morocco



### A Rural, Amazigh, Muslim Community of Small Villages



Annual Precipitation of 112 mm, but 143 days of Fog Events

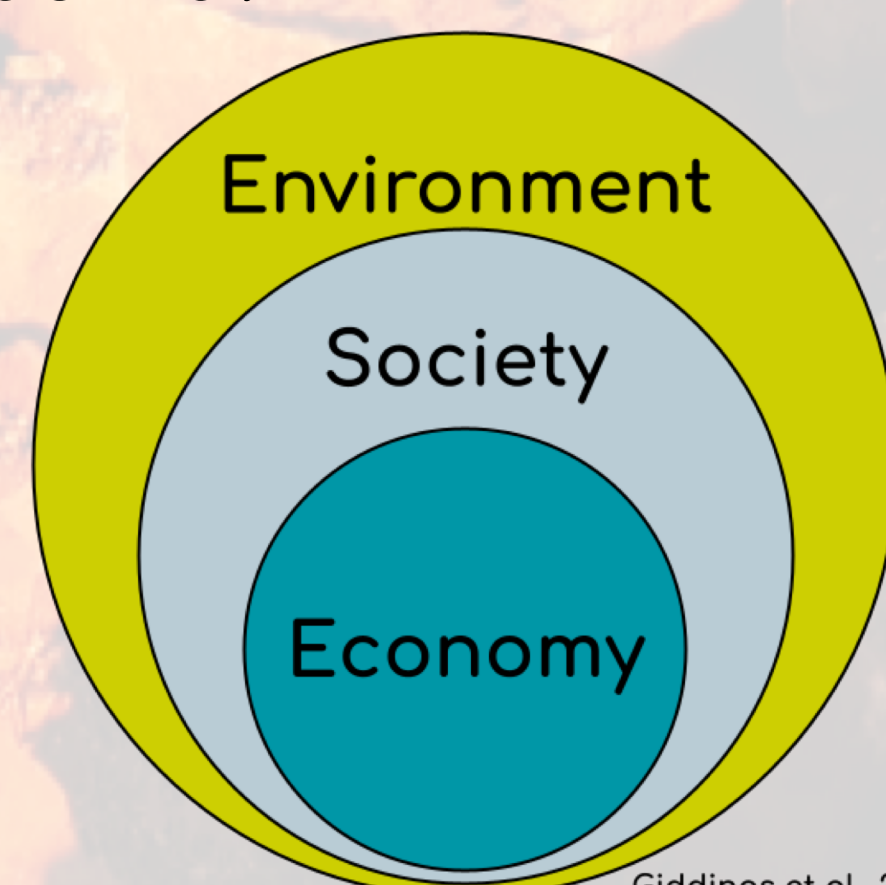
### Extra Hours in a Day

- Women used to spend ~3 hours a day fetching water
- NGO Dar Si Hmad began fog infrastructure in 2011
- 16 Villages now have indoor plumbing
- ~212 Households, 5 Mosques, 3 Schools

## Research Questions

1. How has the fog infrastructure project impacted the life of the beneficiaries? *i.e. what do people do with their free time now that they do not have to gather water?*
2. How does this relate to economic development? *i.e. has access to water led to changes in income?*

HOW HAS WATER ACCESS CHANGED SOCIETY?  
DO THOSE CHANGES RELATE TO THE ECONOMY?



Giddings et al., 2002

## Study Design

### Semi-Structure Household Interviews

- 36 out of 635 Fog Recipients
- 34 households
- 10 out of 16 villages
- 27 female, 9 male respondents
- Conducted in Tashilhit (*Amazigh dialect*)
- Thematic Analysis of Interview Notes

## Total Wage =

value(Market Work + Domestic Work + Leisure)

### Market Wage

Real income from employment



### Domestic Work

Cooking, cleaning, livestock, etc.



### Leisure

Rest, recreation, quality time, celebrations

Wage = the value of time

## Research Themes

### Domestic Efficiency

- More Water for Cooking, Cleaning, Livestock, etc.
- Water for New Cleaning Activities

### Enhanced Leisure

- More Family Time – Daily Life and Extended Visits
- Increased Social Time
- Improved Weddings and Celebrations

### Transportation Methods

- "I sold my Donkey"
- Donkey-Sharing
- Road Infrastructure

### Education

- Water Access at School
- Children More Likely to Attend School than Parents
- Evolution of Educational Priorities

### Immigration

- Reduced Outward Migration
- Families Returning to Villages
- Extended Family Visits

### Physical and Mental Health

- Increased Sleep
- Increased Water Consumption
- Increased Appetite
- Improved Hygiene
- Reduced Physical Strain
- Reduced Stress and Anxiety
- "Better Quality of Life"

## What About The Air?

1. Are there noticeable changes in the local environment as a result of fog harvesting? *i.e. Is there a measurable difference in the relative humidity of the atmosphere as it passes through the CloudFisher?*

WHAT DOES REMOVING WATER VAPOR DO TO THE AIR?  
IS THE AIR *DRIER*? CAN WE *MEASURE* A CHANGE?

## Study Design

### Relative Humidity Measurements

- 2 HTP:wx Sensor Push Smart Sensor attached to front and back of 3 nets
- Reading Every Minute for 21 Days
- Removal of Spurious Temperatures
- Removal of Days with RH < 70%
- Difference in Relative Humidity Calculated between Front and Back



## Initial Results

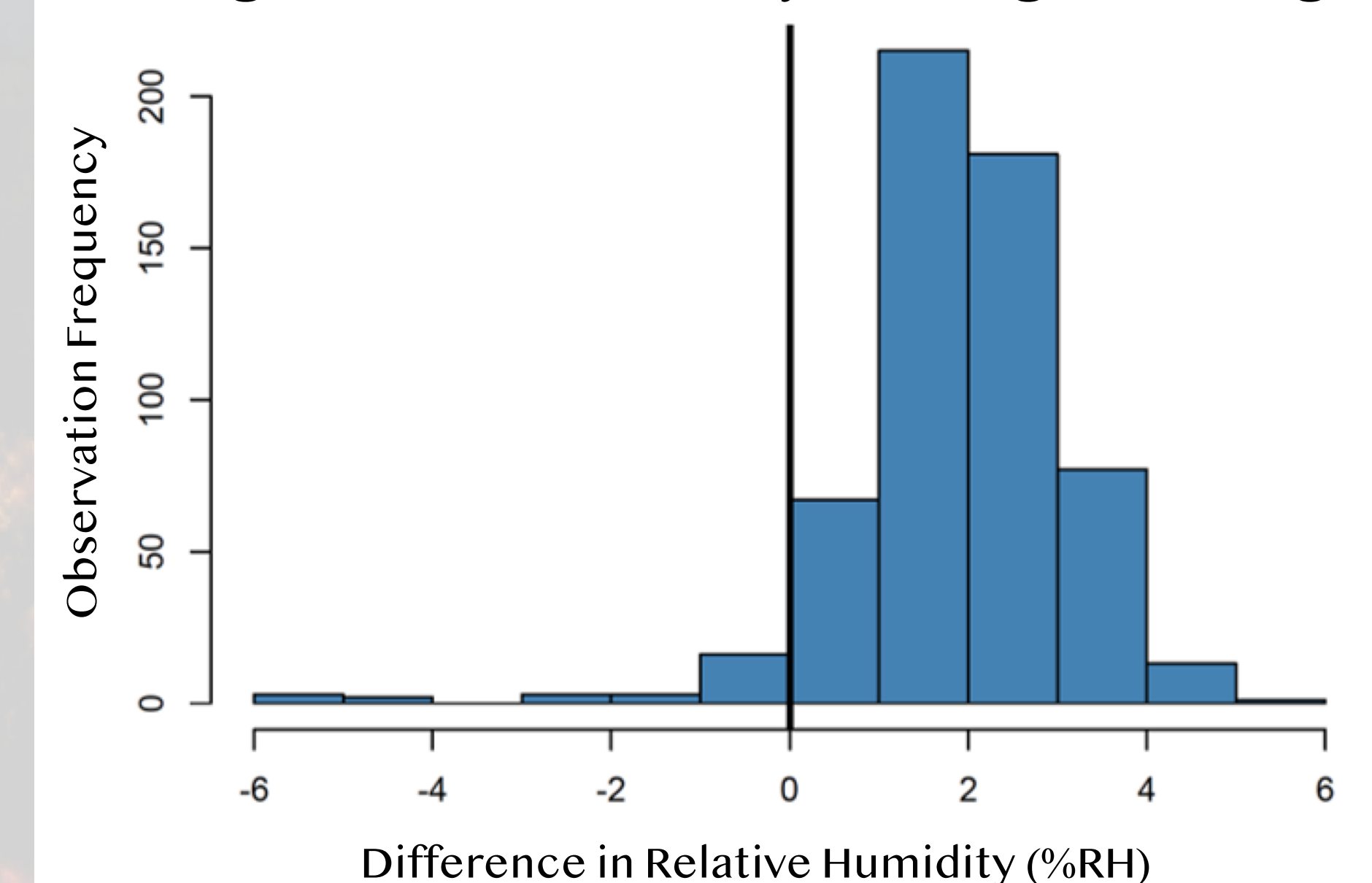
### Site A:

~2% Decline in Relative Humidity

### Suggestion:

Larger Scale, Longer Duration

Change in Relative Humidity After Fog Harvesting



Compliments of Dr. Esther Mullens, UF