

# **Coping with Climatic Variability by Rain-fed Framers in Dry Zone Sri Lanka : Towards understanding adaptation to climate change**

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# Introduction

- **Climate & farmers**

- **Climate** : A matter of uncertainty in all circumstances
- **Farmers** : Regularly witness climate uncertainty; Inherently adaptive

- **Forms of climate uncertainty**

- **Climatic variability** : Natural; Familiar to farmers
- **Climate change** : Human induced; Currently experienced?

- **Relationship: Climatic variability Vs. Climate Change**

- Change of familiar patterns of 'variability'? (Adger et.al. 2003; Weitzman, 2008)

- **Adaptation behavior**

- **Farmers perspective**: Both forms create risk and uncertainty
- Many common features in decision-making

# Research Problem

- **Climate uncertainty & developing countries**
  - Developing countries (DC) are more vulnerable ( Stern, 2007; UNDP, 2007)
  - Poorer communities in DCs are even vulnerable
  - Majority of poor occupied in agricultural livelihoods
    - Rain-fed and irrigated farmers
- **Rain-fed & Irrigated**
  - Rain-fed : Naturally more vulnerable to climate uncertainty
  - More affected by poverty

# Research Problem (contd..)

- **Village tank farmers in dry zone Sri Lanka**
  - **Village tanks:** Community-owned rain water harvesting devices (5-80 ha water spread area)
  - **Over 12,000 tanks**
  - **High dependence on local RF**
  - **Long history of adaptation to climatic variability**
- **Highly vulnerable to climate change**
  - **Adaptation policy : priority attention**
  - **First step towards : current adaptation behavior**

# A Village Tank



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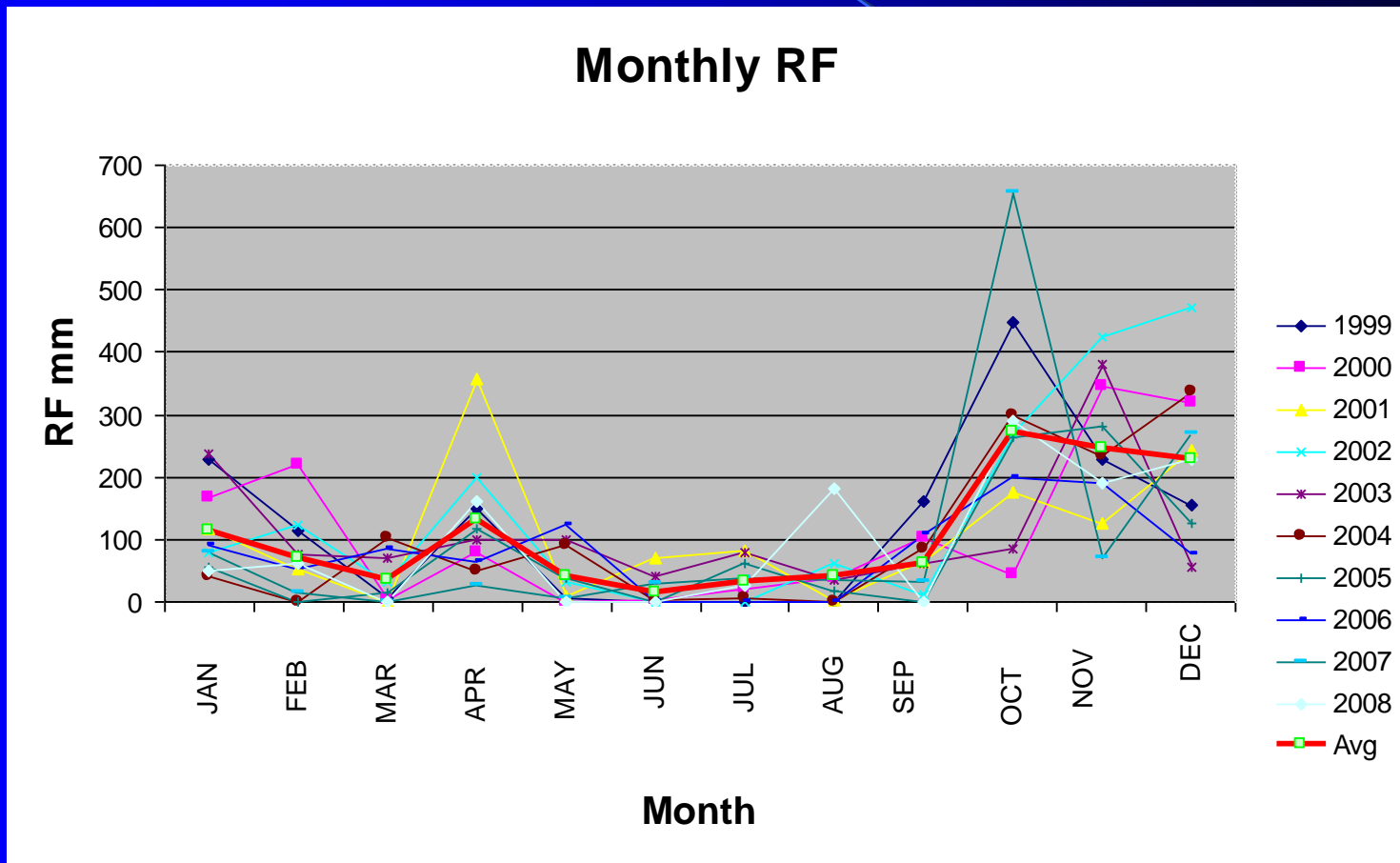
# Objectives

- **Examine the farmers' perception of the risks posed by variability of Local RF**
- **Identify the key adaptation strategies taken up by farmers against the perceived risks**
- **Identify important policy implications emanating from the current experience on adaptation to face the future impacts of climate change**

# Conceptual Framework: Behavioral economics

- Focused on farmers perceptions and judgments (e.g. Weber, 2006; Marx et.al. 2007; Hansen et.al. 2004)
- Experience from repeated choices: Experience based decisions (Hertwig et.al. 2004)
  - **Experiential processing of observations**
    - Judgments of probabilities based on heuristics
  - **Perception of risk as feelings**
    - ‘Affect’ based perceptions

# Conceptual Framework: Local RF pattern



# Conceptual Framework: Farmers' perceptions

## Average pattern of RF likelihood

- Perceived as a seasonal pattern over an annual cycle
- Usually a shared perception among community members

	RF Likelihood		
	Insufficient RF	Sufficient RF	Excessive RF
Season 1	High		
Season 2		High	
Season 3			High

# Conceptual Framework: Farmers' perceptions

## Random shocks

- **Shocks: Relative to perception of average pattern**
  - E.g. Failure of rains in the season, erratic distribution, unexpected rains at the time of harvest
- **Perception: individual sense of risk alertness and readiness to respond shocks**
  - Alert farmers sense random shocks more readily than less-alert farmers and respond effectively
- **Based on personal characters and information**

# Conceptual Framework: Adaptation responses

- Short run adaptation by adjusting farming system activities – **Based on average seasonal pattern**
  - Timing of activities to carry out farming under direct RF
  - Making use of water from facilities that alter time and space availability
  - Gambling with weather
- Urgent responses to random shocks: **Based on the perception of shocks**
- Long-term structural adaptations

# Method

- **Study area**

- Anuradhapura district (North central province)

- **Data**

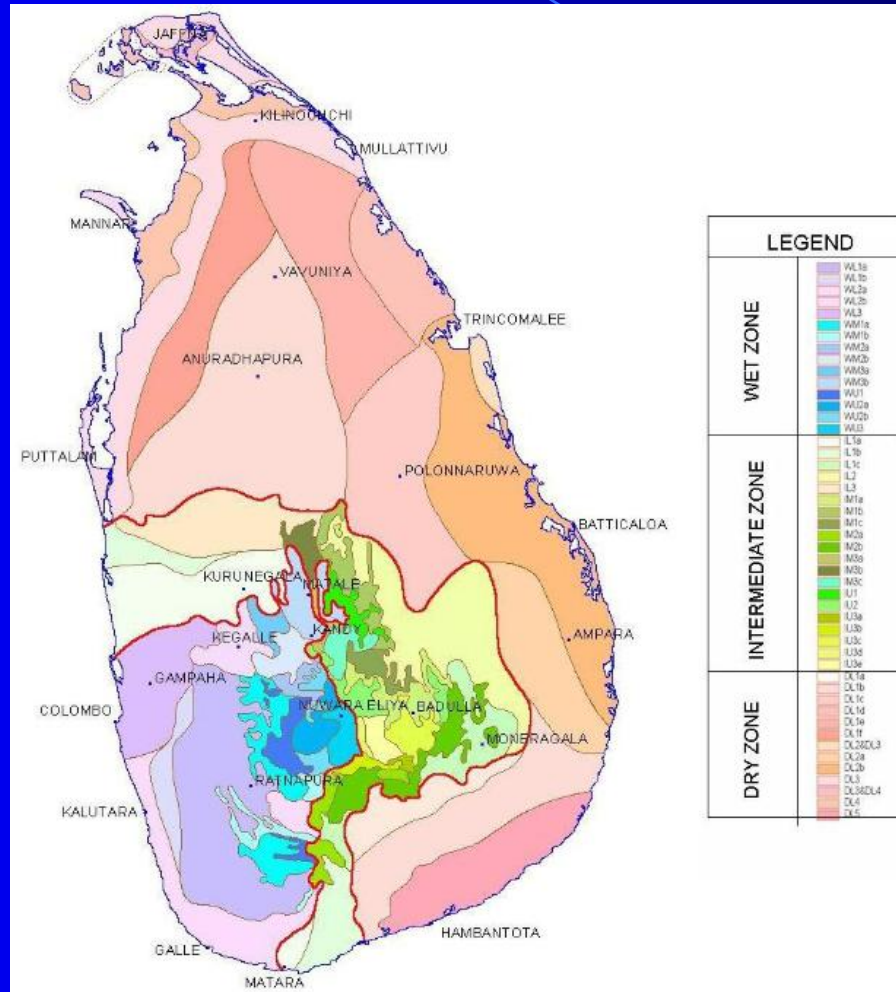
- **Primary data**

- Household survey
- Focus group discussions
- Key informant interviews

- **Secondary data**

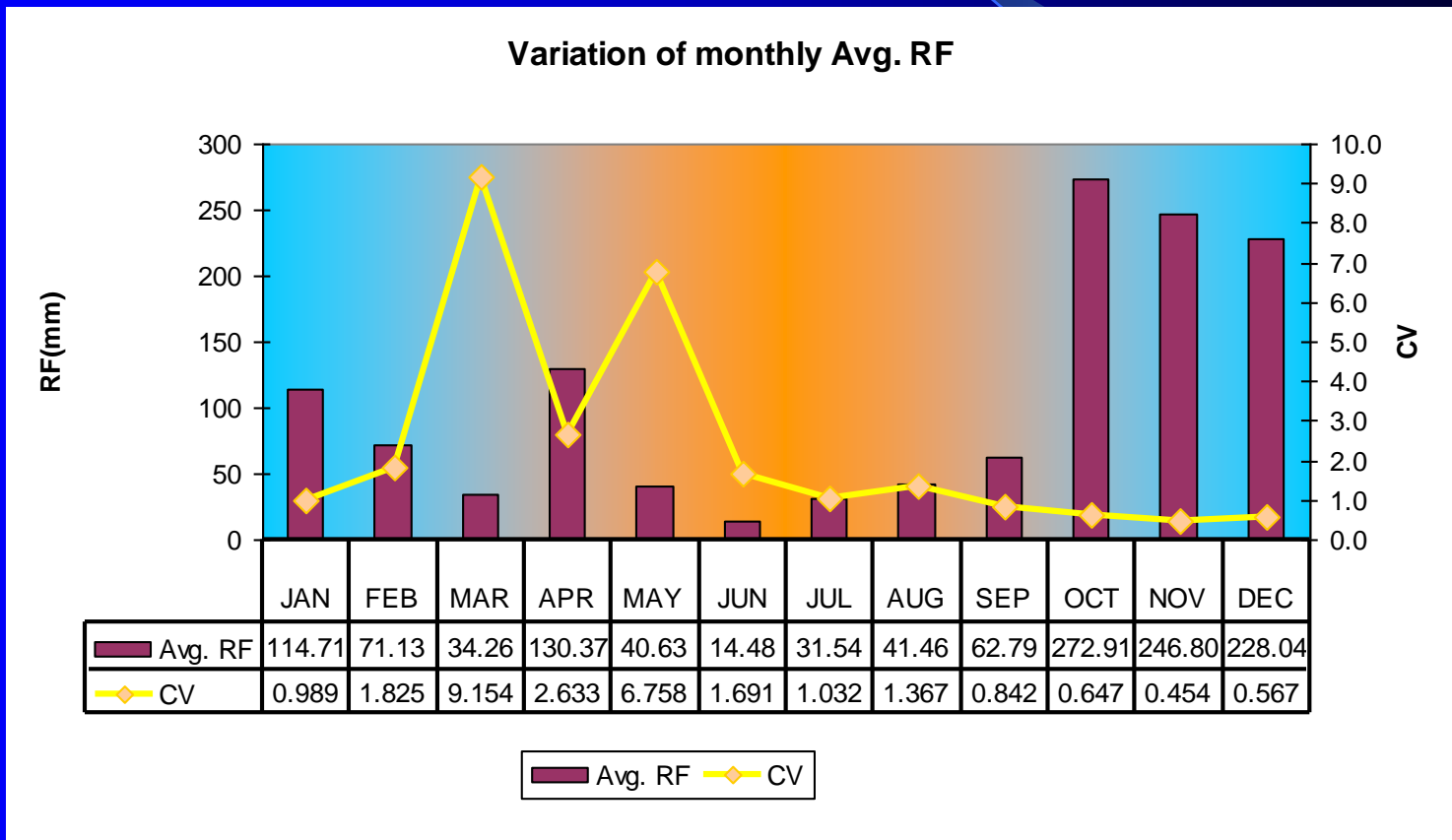
- Climate data – weather stations of Meteorological Department in the area
- Official records
- Previous studies : some relevant data from studies since 2003
- Research by others : substantial literature on village tank systems

# Study Area



# Results

- Timing of actions



# Results

<b>Period</b>	<b>RF</b>	<b>Variability</b>	<b>Shocks</b>	<b>Adaptation options</b>
Sept – Feb (‘Maha’ season)	Moderate-High	Low	Low RF; Erratic distribution	→ Timing is the main option → Main prospects are selected → Quick adjustments to shocks
Mar - May	Low-Moderate	High	No shocks	→ Gambling is the main strategy
June - Aug	Low	Low	High RF	→ Farming under tanks & wells → Coordination with group → Off-farm prospects

# Results

- Traditional farming system in the area

Farming system activity	Crops	Seasonality		Water supply		Location	Economic status
		Maha	Yala	Maha	Yala		
Lowland farming	Paddy	All plots in the field	Limited area	Rain-fed + tank water	Tank water	Command area of village tanks. Bethma in Yala	Mainly subsistence with limited sales if a surplus available
Upland farming	Coarse grains, Grain legumes, Pulses, Vegetables, condiments, Gingelly	1-5 ac avg. by all HH	Gingelly	Fully rain-fed	Fully Rain-fed	Shifting agriculture in commonly owned uplands	Mainly subsistence with few cash crops
Permanent crops	Coconut, fruits, multi purpose trees	No seasonality		Rain-fed + retained moisture in soil		Home gardens	Mainly subsistence with few cash crops

# Results

## Timing of Prospects

- **'Maha' (Main) Cultivation Season: Sept - Mid March**
  - Only period for ensuring high potential returns by timing
  - Paddy & 'Chena', two major farming system activities are timed at this period

Late Aug-Sept	Moderate intermittent RF	<ul style="list-style-type: none"><li>▪ Land preparation</li><li>▪ Establishment</li></ul>
Mid Oct-mid Jan	Moderate-high frequent RF	<ul style="list-style-type: none"><li>▪ Growing period</li></ul>
Mid Jan-mid March	Low RF	<ul style="list-style-type: none"><li>▪ Maturing &amp; harvest</li></ul>

# Results

## Altering space and time availability

- **‘Yala’ (dry) season: Mid May-Sept**
  - High likelihood of low RF (variability (CV) is low)
  - Successful outcomes from timing of prospects are limited
- **Prospects under altered availability of rain water**
  - Cultivation of weather sensitive cash crops under agro-wells
    - Chilli, onion and vegetables
    - Susceptible to disease and drainage in rainy season.  
Shifted from ‘Maha’ to ‘Yala’ with ground water option
  - **In the past** : Cultivation of paddy in a limited area subject to water level in tanks (joint adaptation)

# Results

## Gambling with weather

- **March-Mid May: Mid season; Pre-Yala**
  - Low-moderate RF with inter-annual fluctuations
  - Level of uncertainty is high for any stable farming prospect
- **Risk loving farmers gamble with weather**
  - Broadcast gingelly (sesame) in fallowing chena – risky crop
  - Extensive, low cost farming operations: No land preparation; minimum inputs (seeds, labor)
  - If successful, good extra income; otherwise abandon

# Results

## Quick adjustment to random shocks

- **Random shocks:** Relative to perceptions and established practices
  - Low or erratic RF upsets timing of major prospects in 'Maha'
  - Unexpected RF at harvesting period can damage susceptible crops in 'Yala'
- **Farmers make quick intra-seasonal adjustments to face random shocks**
  - **Delays in RF in Maha:** Short maturing varieties
  - **Untimely RF in Yala:** Harvest as fresh chili without waiting for maturing to produce dry chili.

# Results

## Long-term structural adaptations



- **Historical**
  - **Village tanks : joint adaptation**
- **Recent**
  - **Agro-wells**
  - **Private adaptation**
  - **Technologically induced**
  - **Expensive – high value crops**

# Policy implications

- **Facing the climate change**
  - **If gradual long-term shift**
    - Farmers can update their perceptions and judgments
    - Voluntary adaptation is viable option
    - Limited policy support
  - **If abrupt, catastrophic shift**
    - Difficult to update perceptions and judgments quickly
    - Voluntary adaptation is not a viable option
    - Strong policy assistance
      - Information – Forecasts
      - Enhance the risk alertness

**Thank You!**