

Climate-Induced Water Scarcity and the Effectiveness of Community Based Water Resource Management



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Climate-Induced Water Scarcity and the Effectiveness of Community Based Water Resource Management

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**COMSATS University
Islamabad**



WHO WE ARE

A Public sector Degree Awarding
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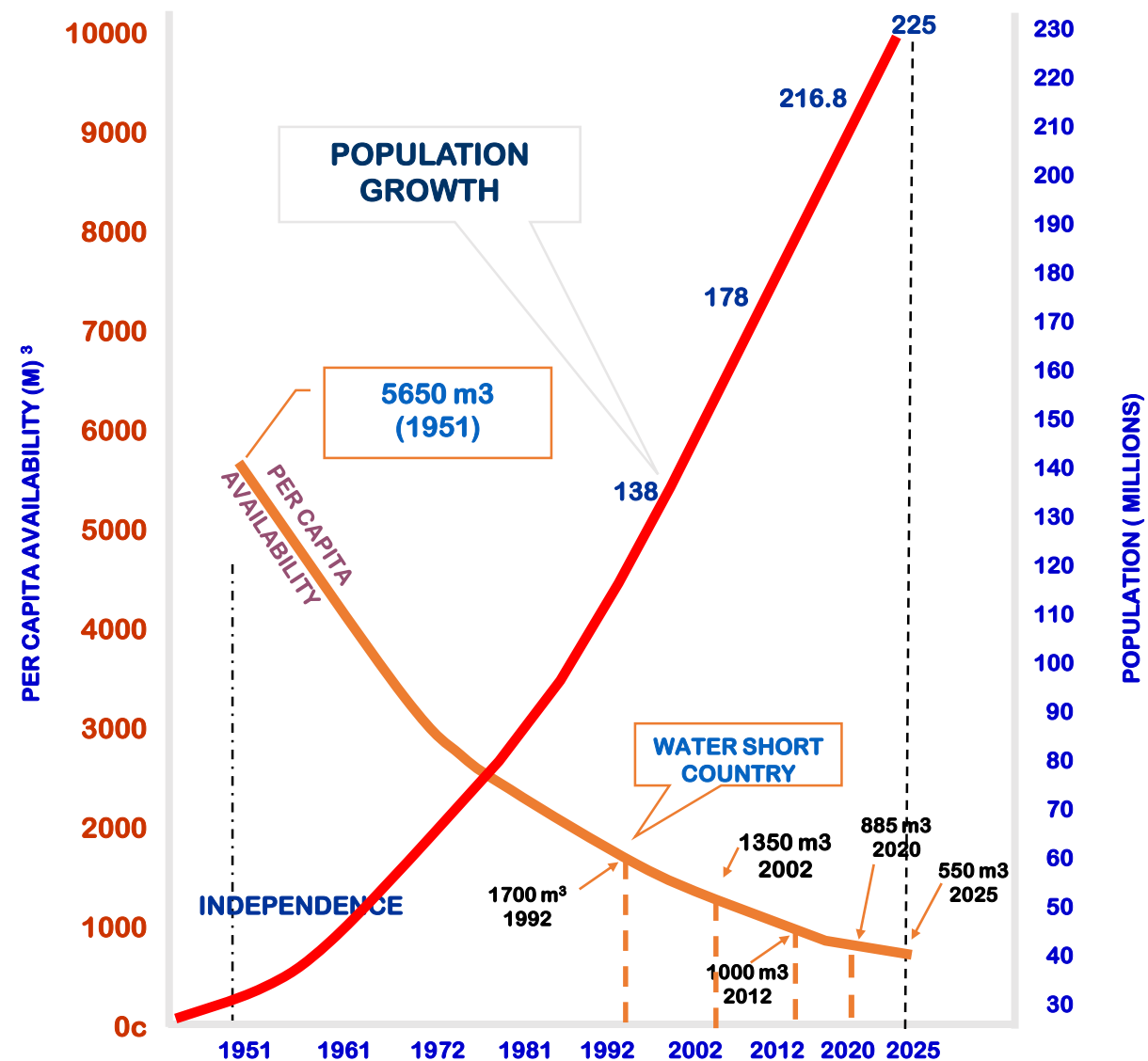
OUR RANKINGS & REPUTATION





Background

Pakistan's Water Security Status



Climate Induced Water Scarcity



THE VULNERABILITY OF PAKISTAN'S WATER SECTOR TO THE IMPACTS OF CLIMATE CHANGE



Health

Population Census

- 2015 — 189 million
- 2030 — 245 million
- 2050 — 309 million



Renewable Water

- Availability stagnant at 246.8 cubic kilometer

Water Availability per Capita

- <1000 cubic meter/person



Water Consumption

- Urban : 120 L/capita/day
- Rural : 45 L/capita/day



Water Unfit for Global Consumption due to

Malaria :

- 3.2 billion people at risk
- 438,000 deaths annually
- 75% reduction in disease by 2020 in Pakistan



Cholera :

- 1.4-4.3 million cases
- 28,000 - 142,000 deaths annually



Agriculture

HinduKush, Karakorum & Himalaya :

- Provides 50-70% water to Indus Basin



Overall Water Flow Stable till 2050:

- Slight upsurge in basin's flow in summers



Agri. Reduction in 2-3 Decades:

- 20% in cereal
- 30% in livestock
- 8% - 10% in Wheat
- 20% in Rice



Cash crops: If 11°C ↑

- 24.14% vegetative
- 8% flowering



4°C ↑ 3% precipitation ↓ :

- 13 % of agricultural productivity (2080)



Energy

Current Losses in Power Transmission

- 23% — 25%



Electricity Consumption ↑

- by 8%/year



Thermal generation

- 65% of current electricity (13,670 MW)



Hydro-Power Potential

- 65% of current electricity (60,000 MW)



24 coal plants

- To be installed by 2025



Electricity expected

- To grow 42,765 MW by 2030



Pakistan

**7th in long term
climate risk**

(Kreft et al., 2016)

**Water stressed
country**

(CCRD, 2018)

**Grossly inefficient
water use**

(Watto and Mugeru, 2014)

Supply based

(Bandaragoda, 2006;
Nagrah et al., 2016)

Compulsion to use

(Rinaudo, 2002)

**Top-down
Inefficient
Inflexible**

Decentralized community based water management system (1997)

Co-management

(Nagrah et al., 2016)

**Requires min.
50% participation**

(Mekonnen et al., 2015)

Conflict resolution, watercourse maintenance, internal meetings, monitoring, collection of “Abiana” (water charges), and vote in distributary level elections

(Nagrah et al., 2016)

Research Objectives

To assess the potential effectiveness of co-management of water resources when confronted with water scarcity caused by climate change

1. The impact of climate change on water availability,

2. Farmers' response to climate-induced water scarcity,

3. The potential solutions to future water scarcity, and

4. The effectiveness of community managed water management

Research Methodology



Exploratory research



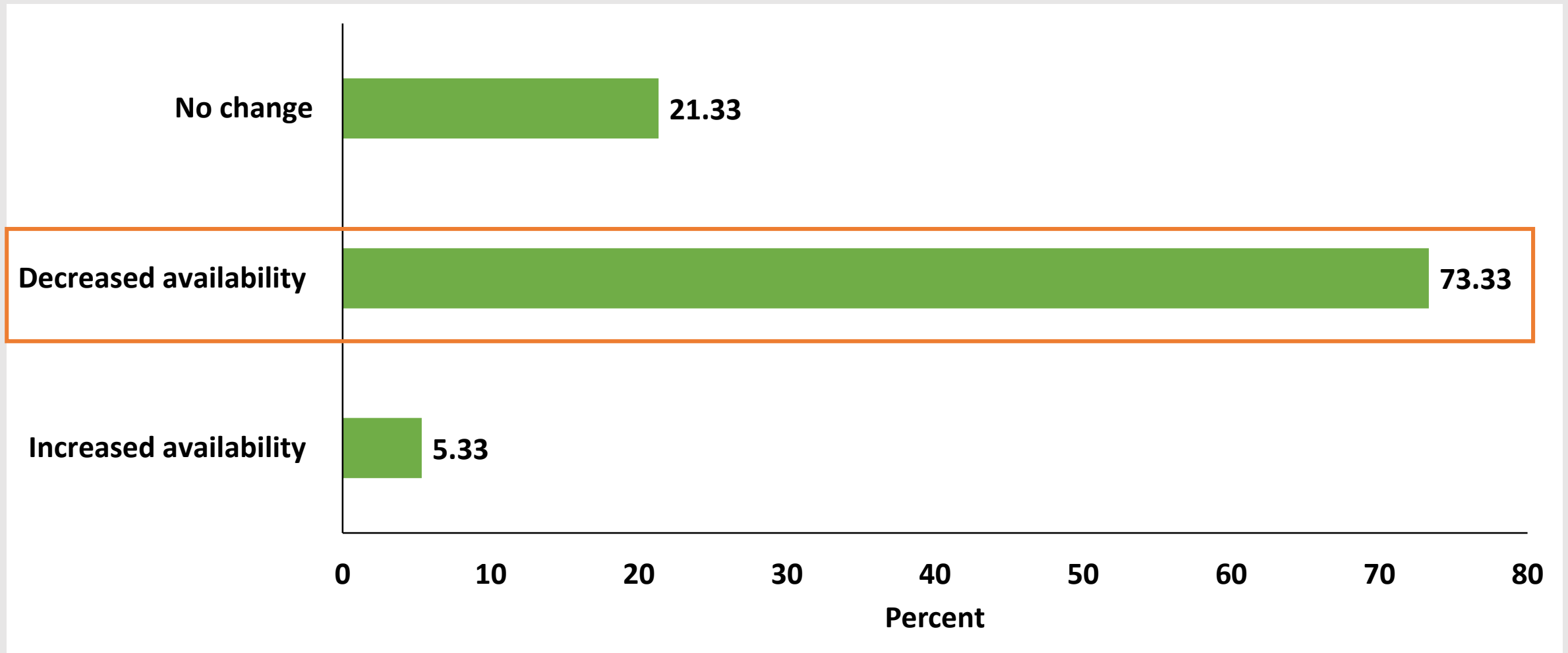
Results and Discussion

Socioeconomic characteristics of households

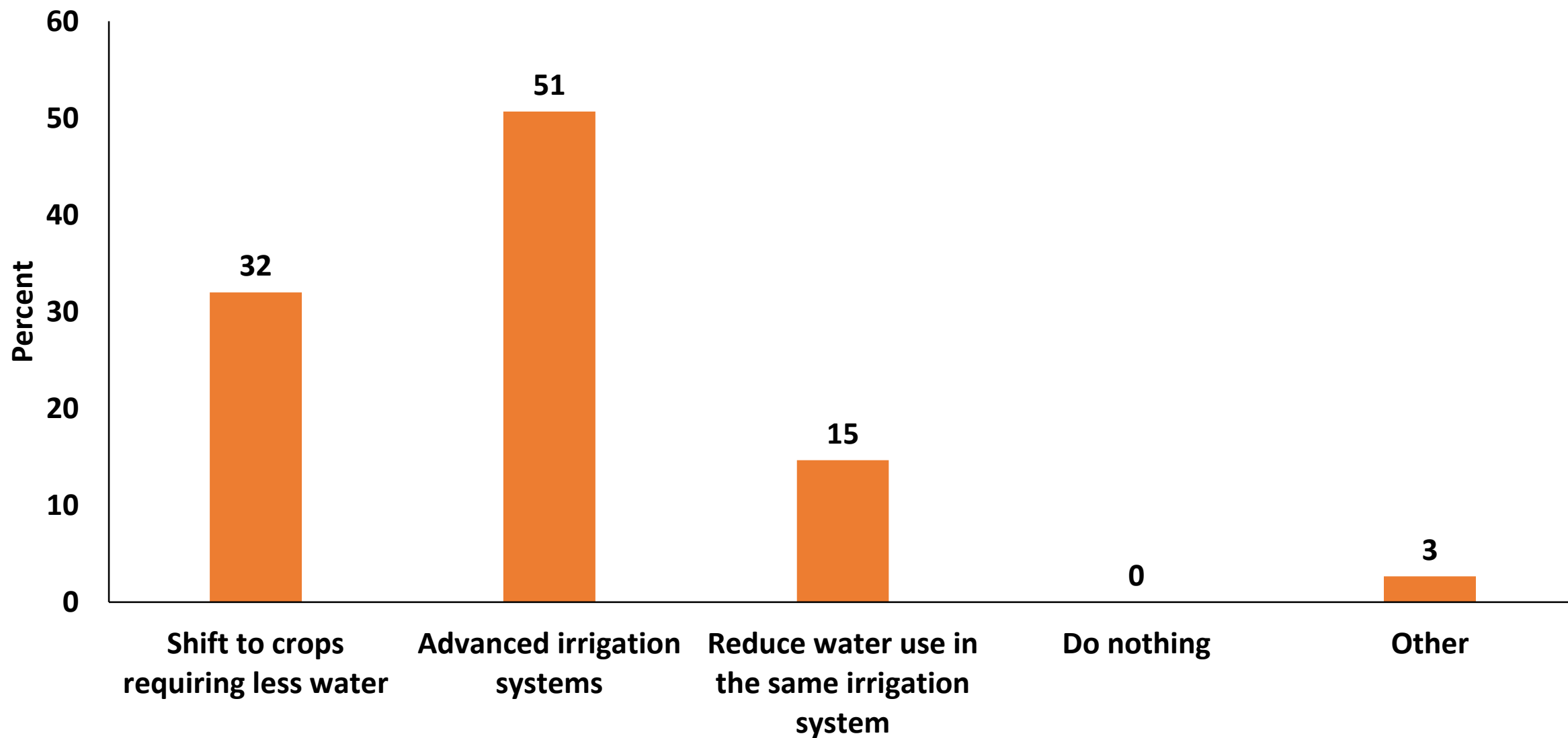
	Average	Std. Dev	Minimum	Maximum
Age (household head)	45.47	10.52	25	70
Education (household head)	9.37	3.48	0	16
Experience (household head)	19.40	11.12	5	55
Household size (family members)	5.97	1.83	3	12
Male family members	3.16	1.17	1	6
Female family members	2.79	1.22	1	6
Family expenditures (PKR)	31,333	18,298	10,000	95,000

Source: Household Survey, 2018. 1 USD=0.01 PKR

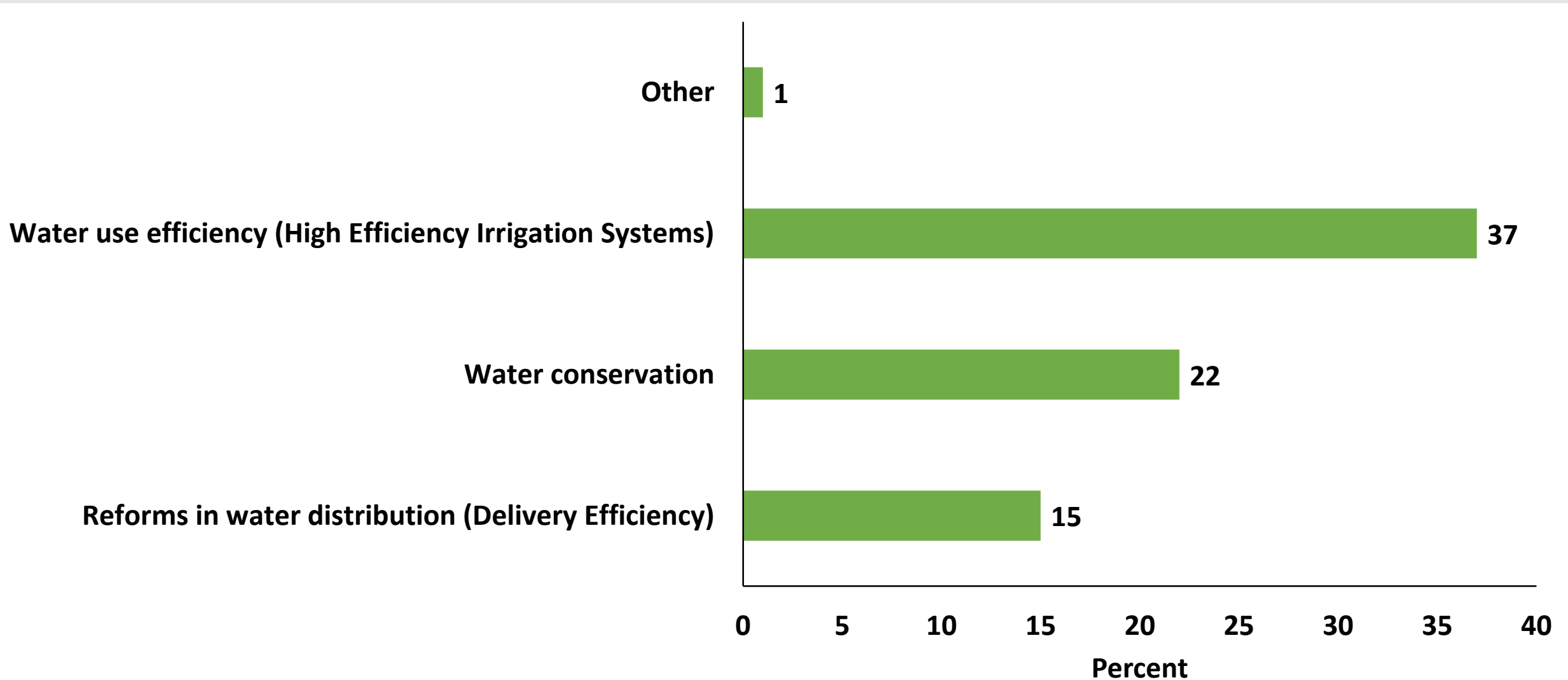
Farmers' perception about impact of climate change on water availability for crops over the last decade



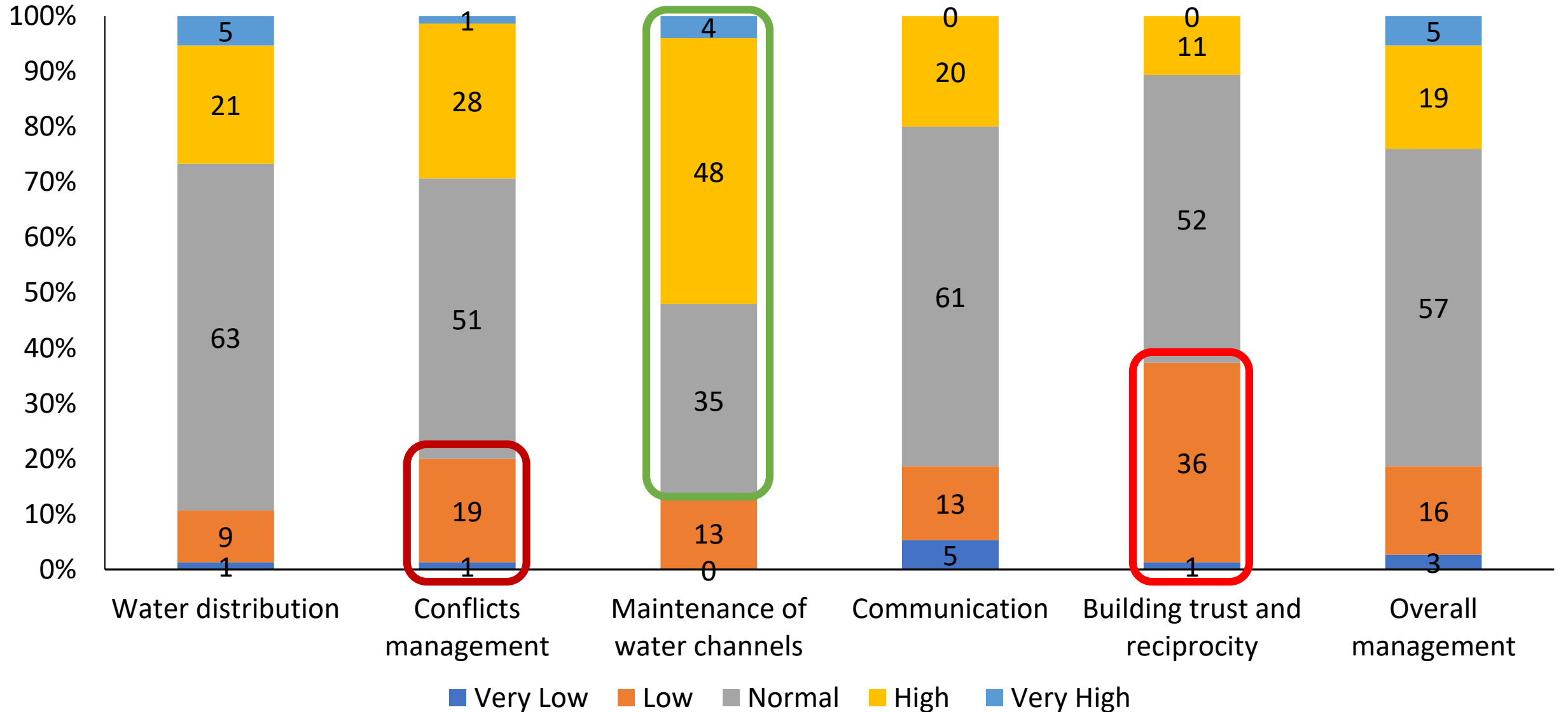
Farmers' responses to climate-induced water scarcity



Potential solutions to future water scarcity



Effectiveness of community based organizations





Conclusions and Recommendations

Climate-induced water scarcity is a foregone conclusion for Pakistan



Flexibility, and ownership of the system - for resilience



Community based irrigation management



Collective action of farmers in co-management

The sampled farmers had an overwhelming consensus that **climate change is expected to reduce the available irrigation water.**

The major adaptation measures towards climate-induced water scarcity included adoption of **high efficiency irrigation** techniques followed by shifting to **crops with lower water requirements.**

The potential long-term solutions to future water scarcity due to climate change were pointed out as wider adoption of **high efficiency irrigation systems, water conservation technologies, and reforms in water distribution.**



Thank You



Questions & Comments

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