

Environmental Valuation and Pricing: Pakistan's Fading Aquifers


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Introduction

- Groundwater: important source of irrigation in Pakistan's Indus Water Basin since 1960s
 - Unmanaged extraction of groundwater has led to the continuous depletion of the resource
 - Groundwater quality has also deteriorated over time
 - Adverse impact on land productivity and farm profits in the future
 - Policy interventions required to control the unsustainable use of groundwater in Pakistan
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Issues

- Lack of property rights
 - Absence of a strong regulatory institution
 - Flawed valuation of services
 - Ecosystems
 - Art and culture
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Nonexistent Price Structures


- Marginal user cost of groundwater
- The discounted value of the loss in future net benefits of a unit of extraction of groundwater in the present
 - Scarcity value
- **Price per unit of groundwater includes not only its marginal cost of extraction but also its marginal user cost**

Groundwater Governance


MANAGEMENT REGIMES



Open Access Resource

- Myopic farmers (not forward looking)
 - No incentives to conserve
 - Resource degradation
 - If small enough users then gains from communal management (Elinor Ostrom)
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Optimal Management

- Forward looking social planner
 - Maximizes discounted (net present value) net benefits of groundwater in a long term horizon
 - Accounts for the marginal user cost of groundwater
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An Example

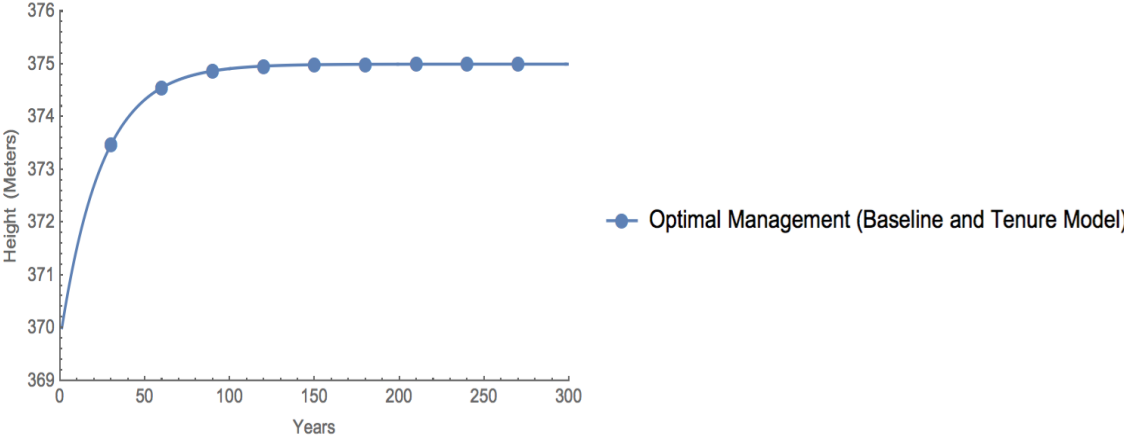
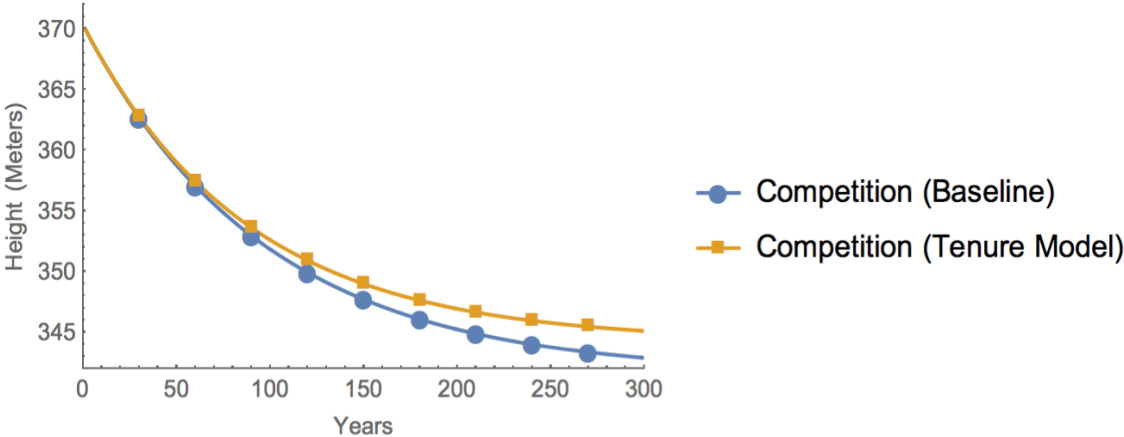
NASIM AND HELFAND (2016)



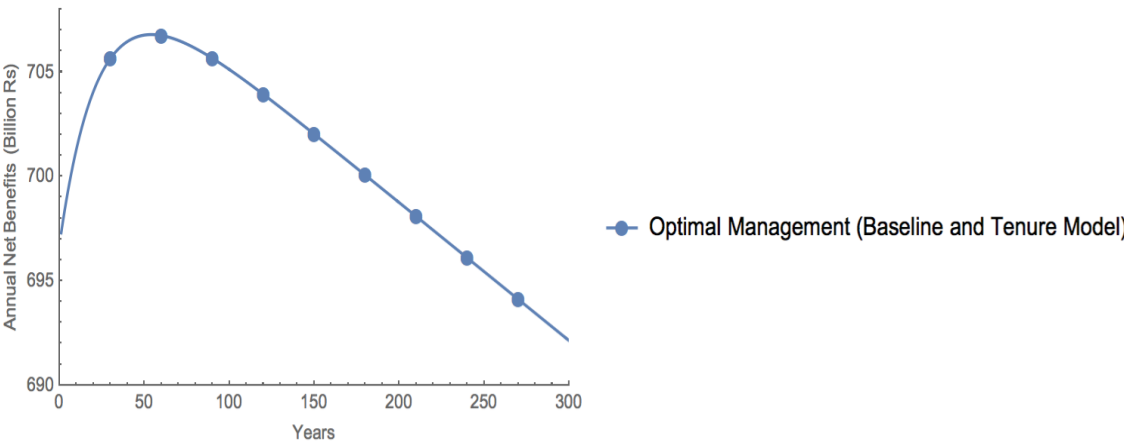
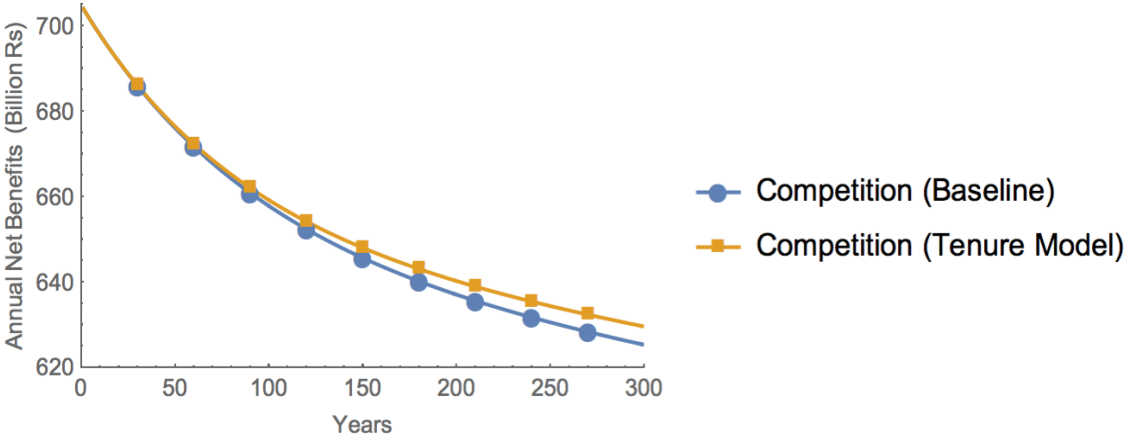
Results

- Clear long-run benefits of optimal management in the Indus Basin
- Water table level rises and groundwater stock is replenished
- Benefits most likely much larger:
 - Focus only on agriculture

Results: Water Table



Results: Net Benefits



Policy Instruments

- Optimal groundwater tax
 - Redistribution of tax
- Tradable permits
 - Rights as a valuable commodity

Thank you!

