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Water Productivity Indicators in Great Ruaha River Basin: Analysis and Implications for Decision-Making and Allocating Water

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Outline of presentation

- Introduction
- Values of WPIs
- Indicators and implications for water allocation
- Conclusions

Introduction

- Increase in population coupled with increase in per capital water demand
  - Result into increase in water demand
  - Pressure on bulk water users (agriculture)-free or allow water to flow to economic productive uses (industries, high value crops)
- Perceptions of undervalued water uses (or un assessed) to be more productive
- This paper explores some of these issues by examining practical WPIs for water use sectors in the GRR Basin.

Importance of WPIs

- Generally:
  - Useful in gauging the state of national economies
  - Classical means of measuring and assessing impacts
- For BWR
  - Useful in deriving the benefits accrued from water use
  - creating a linkage with water allocation options
  - Important for assessing the potentials for increasing the water productivity (output or benefit per drop) in different water use sectors
- Fostering informed debate about sustainable management and allocation of WR with particular attention to poor families

Values of WPIs

- Physical-apply to all water uses
- Economical-limited to uses with market
- Social values-AC, CVT-WTP
  - Difficulty because of scantiness of data-perceived as less productive
- Departure on application of some of the Dublin principles (Principle No. 4)-water has an economic value in all its competing uses –recognized as an economic good

- The RIPARWIN argument is that:
  - water allocation based on economic efficiency should not necessarily be taken at a face value, but be backed up with comprehensive analysis of benefits accrued from, and opportunity cost of each water user
  - WPIs can be classified as primary, secondary and tertiary indicators

- Primary-simple counts and measurements of inputs (e.g. water in m^3, land in ha) and outputs (tones rice, jobs etc)
- Secondary (biophysical and socio-economic)-output/input variables giving ratio indicators
- Tertiary-involve more variables in the ratio computation generating so called 'specific' variables-($/person/$m^3$)
  - are relatively new in water productivity research

Water productivity indicators from water use –GRRB

Water use	Primary	Secondary (biophysical)	Secondary (socio-economic)	Tertiary
Irrigated Crops	Number of farmers Area (ha) Yield (ton) Income ($) Water used, net & gross, (m^3)	Total biomass (ton/m^3) Crop yield (ton/m^3)	Total revenue ($/$m^3$) Net revenue ($/m^3) No. of employment (Jobs/m^3) Inputs ($/$m^3$)	Specific net hydrovalue ($/pp/$m^3$ – net) Specific gross hydrovalue ($/pp/$m^3$ – gross)
Fishery	Number of fishers (n) Quantity of fish (n) Total income ($) Water used, net & gross, (m^3)	fishers (fishers/m^3) Yield of fish (ton/m^3) CPUE (kg/unit effort)	Income ($/$m^3$) Livelihood supported (Lhood/m^3) Artisan jobs (jobs/m^3)	Specific net hydrovalue ($/pp/$m^3$ – net) Specific gross hydrovalue ($/pp/$m^3$ – gross)
Domestic use	Households (N) (n) Reduction of water related diseases (diseases/m^3) Total income ($) Water used, net & gross, (m^3)	Households (hh/m^3) Reduction of water related diseases (diseases/m^3)	Value added to water ($/$m^3$)	incr. enterprises per area (Enterp/area/m^3) Increased sanitation (no of birth/ day/m^3)
Environmental	Livelihood supported (n) Number of species available (n) Total income collected ($) Water evaporated ($m^3$)	Livelihood supported (N/ha) Number of species available (N/ha)	Income ($/$m^3$)	Specific net hydrovalue ($/pp/$m^3$ – net) Specific gross hydrovalue ($/pp/$m^3$ – gross)
Hydropower	No of people engaged (n) Electricity produced (KW hrs) Water evaporated (m^3) or used Total income ($)		Income from sales ($/kWhrs) Economic output ($/m3)	Specific net hydrovalue ($/pp/$m^3$ – net) Specific gross hydrovalue ($/pp/$m^3$ – gross)

Implications for allocating water in river basins

- Irrigated agriculture
- Domestic functions/benefits
- Livestock functions/benefits
- Environmental functions/benefits
- Hydropower functions/benefits
- Decision aids

Conclusions

- Productivity indicators are drawn based on input –output conceptualization of water use
- WPIs can be used as a resourceful tool for analysing the tradeoffs and prioritising of water use and allocation in competing and non-competing water uses
- WPIs will enrich the debate over whether water should flow to the sector representing the highest economic utility