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Real or imagined water competition? The case of rice irrigation in the Usangu basin and Mtera/Kidatu hydropower, Tanzania

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Outline of presentation

- Introduction
- Location
- Methodology
- Results
- Conclusions
- Acknowledgements

Introduction

- Water management and competition between users in water scarce river basins is a major challenge facing human race
- The interdependence of water users in river basins necessitates a clear understanding of use in relation to:
  - location, scale of water demand, and the duration of water need
- Failure to which competition and conflicts arises among users.
- This study was conducted in the Usangu basin, Tanzania, since the year 1999 to investigate:

  partitioning of water needs for irrigation and it implications for downstream users particularly hydropower (HEP).

The Problem

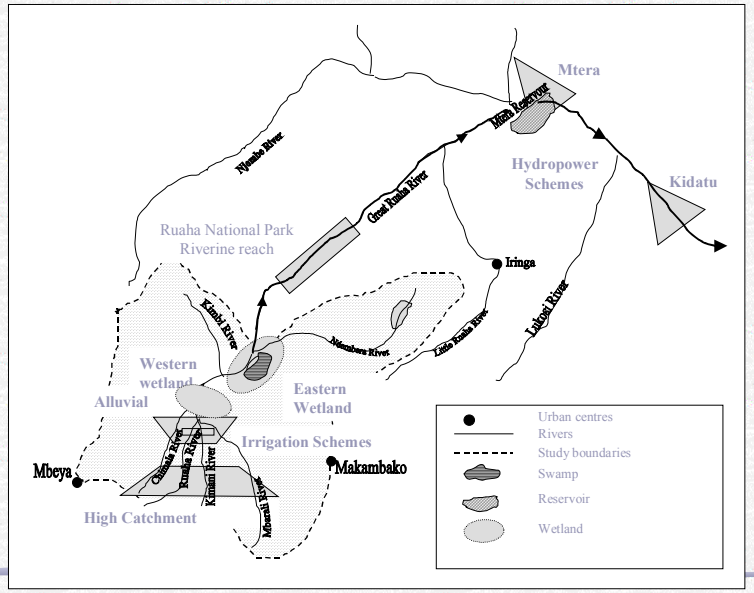
- Competition among water users in the GRR
- Local/National concerns over drying of the GRR in dry season

"For the past 10yrs now the GRR has stopped flowing during dry season between Sept/Oct to December each year" – RUAHA + 10.

- This has impact to Rice Irrigators, Livestock keepers, Ruaha National Park, Mtera/Kidatu Complex (MKC) HEP and has resulted into conflict.
- Of particular reference, the drying up + power rationing in mid 90s was related to dry season rice paddy irrigation and low irrigation efficiency in the basin

This perception/relation is explored in this paper

Interdependence of water users and water resources in the GRR



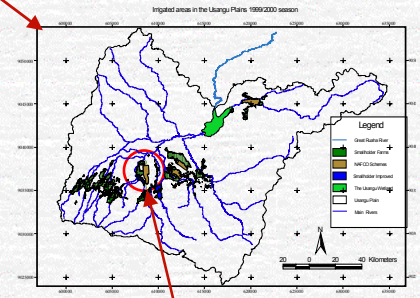
Methods

Case1: Whole of Usangu (Basin scale)

- River flow data of 11 sub-catchment of the Usangu plains from RBWO
- Monitoring systems for the amount of water abstracted from the rivers for irrigation.
- Furrow surveys and Aerial photo interp./GIS approaches used to estimate area under irrigation in each sub-catchment
- River flows and canal abstractions measurement at key points to update the long-term data on river and canal discharges obtained from secondary sources
- Irrigation impact (%) determined as:

$$\frac{\text{Source flow-outflow}}{\text{River source flows}} \times 100$$

Water resources + Irrigated areas



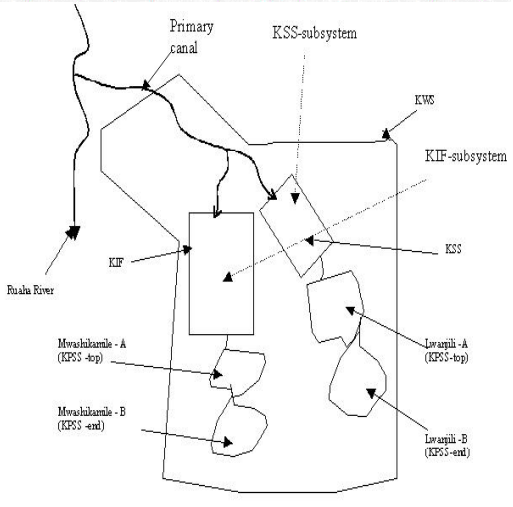
Source: SMUWC, 2001

Case study 2

Case 2: Kapunga water system (Small scale)

- Concept of water reuse in determination of efficiency
- Done through analysis of system hydromodule
  - Ratio of H_2O supply in l/s/ha to final cropped area at end of season
  - Shows how generally the system annually abstract, utilize and manage water
  - Compared to scheme design hydromodule

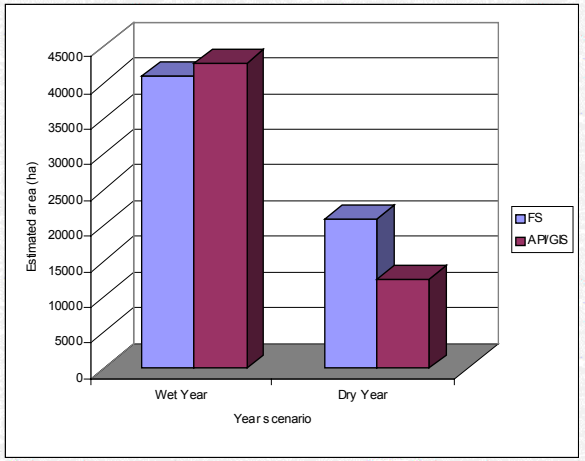
Schematic presentation of KWS



Source: Machibya 2003

RESULTS

- Irrigated area (ha) of rice = dynamic



Irrigated area estimates

Wet Year:

FS-40,933ha

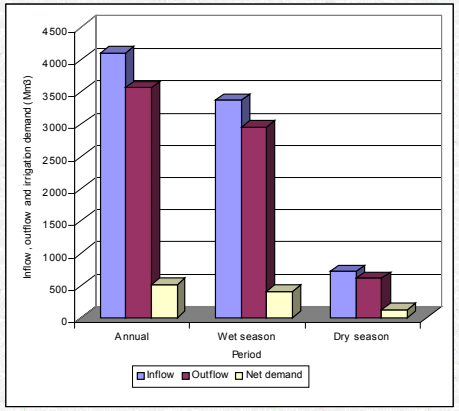
API/GIS=42,812ha

Dry Year:

FS=20,896ha

API/GIS=12,445ha

Annual, wet and dry season irrigation demand in Usangu



High impact (about 90%) during dry season but its contribution to MT/Kidatu is small because the volumes are small

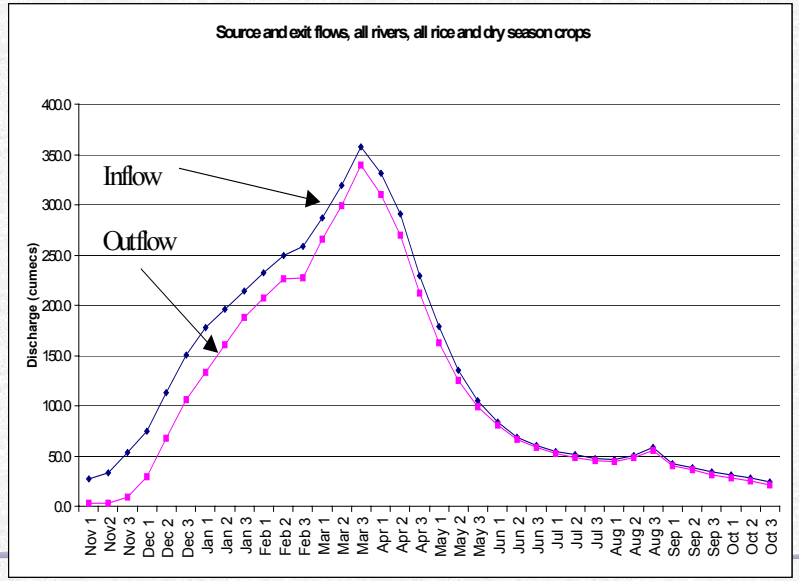
IE reduces dramatically during the dry season but its significance is much less

Range of water use efficiency for rice paddy measured in KWS

Wet season 45- 65%

Dry season 8.1-14.0%

Overall Irrigation Impact – Basin scale



Water use efficiency-Basin scale

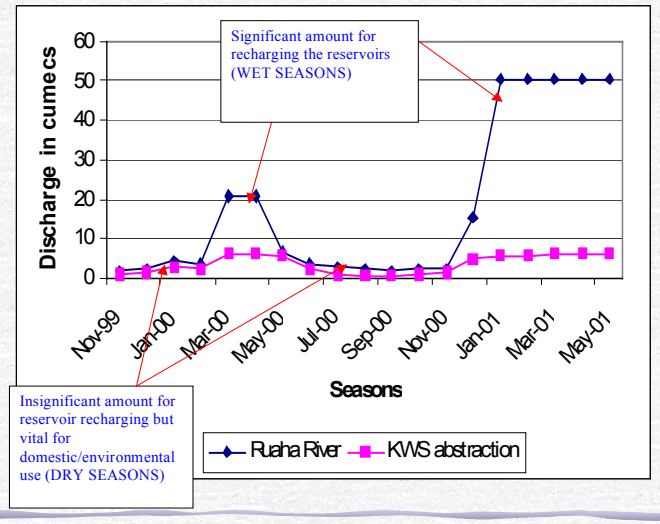
- Hydromodule from maximum supply & irrigated area is 1.07l/s/ha.
- Slightly lower than the design hydromodule in most of Usangu irrigation schemes of 1.2-1.5l/s/ha or the commonly perceived value of 2l/s/ha as the hydromodule for Usangu irrigated paddy.
- Comparison of the above values indicates that efficiencies in Usangu are underestimated
- Alternatively, if efficiencies are around 20% (RBMSIIP 2001) in Usangu, it is difficult to justify where, when and how does the 80% of the water is lost in irrigation systems.

Water use efficiency- small scale

Irrigated areas and hydromodules for the KWS

Subsystems	Seasons	Total area (ha)	Average inflow (l/s)	Hydromodule (l/s/ha)
KIF water reuse sub system	1999/2000	2214	2430	1.10
	2000/2001	3662	3680	1.00
KSS	1999/2000	1403	1100	0.78
	2000/2001	1468	1400	0.95
Whole KWS	1999/2000	3618	3530	0.98
	2000/2001	5131	5080	0.99

Irrigation impact between seasons - KWS abstraction



Conclusions

- The results show that wet season river flows are more important in recharging the reservoirs than visible low flows in the dry season which may look serious but are not quantitatively important to meet the HEP need.
- In reality most of the water is neither used for rice irrigation as only 17% of the available water in the dry season is used for ***net*** irrigation needs.

- Inefficient use of water by rice irrigation system during the wet season is not supported by both case studies.
- Savings from irrigation are not likely to benefit the HEP sector because of four reasons.
  - First irrigation uses a relatively small proportion (12%) in the wet season.
  - Secondly, irrigation efficiency is not too low since the hydromodules in Usangu are low (1.0 l/s/ha) compared to previously thought (2.0 l/s/ha).
  - Thirdly, although impact is high in dry season (90%) much of this arises from domestic reticulation rather than dry season irrigation.
  - Fourthly, the supply and demand quantities in the dry season are proportionally insignificant with respect to re-filling the reservoirs. Savings not be perceived at MKC.