

---

# Potential of spate irrigation in improving rural livelihoods: case of Makanya spate irrigation system, Tanzania

Hans C. Komakech

*Co-authors*

M., Mul, P., Van der Zaag & F., Rwehumbiza



UNESCO-IHE  
Institute for Water Education



# Outline

---

- Spate overview
- Case of Makanya spate irrigation system
- Constraints and Potentials
- Conclusions



# Spate system and livelihood security

---



Occurs in harsh environments (risk-prone environment) that make livelihoods vulnerable



But it is more dependable than it appears on the surface, and may provide security to livelihoods.

# Spate system and livelihood security

---

- Spate water does not compete with uses of water in the upstream parts of the catchment.
- Its downstream impact is not known but assumed to be negligible as well.



Spate systems uses high value water at low opportunity cost



# Spate irrigation a 'hidden' livelihood

---

In a way spate irrigation remains a "hidden" livelihood from most governments. The term 'hidden' is used to highlight how such a natural resource dependent system is overlooked in river basin management. It is locally called "**Kitivo**" in **Makanya, Tanzania**



# What does spate system encompass?

---

Defined as a pre-planting irrigation system in which flood precede crop production (Mehari, 2007). But it may also include conjunctive groundwater use, rainfall or used spot on.

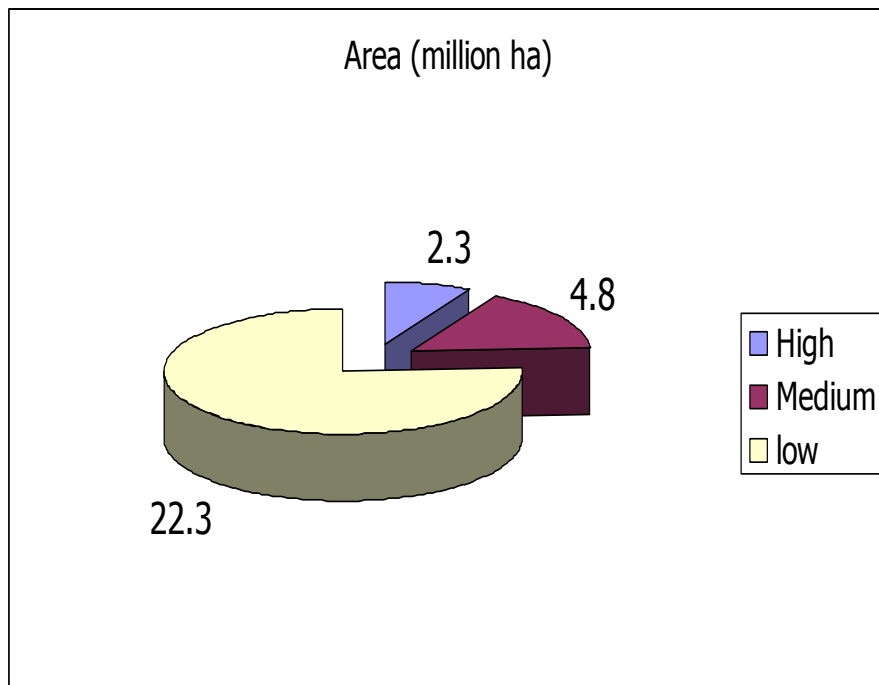


*An integrated irrigation system that combines flash flood, rainfall, & conjunctive use of groundwater to sustain livelihoods in semi-arid or arid areas*

# Some key figures - Tanzania

---

- Agriculture contributes about 45% of the GDP and about 30% of exports
- Potential 29.4 million ha distributed as shown

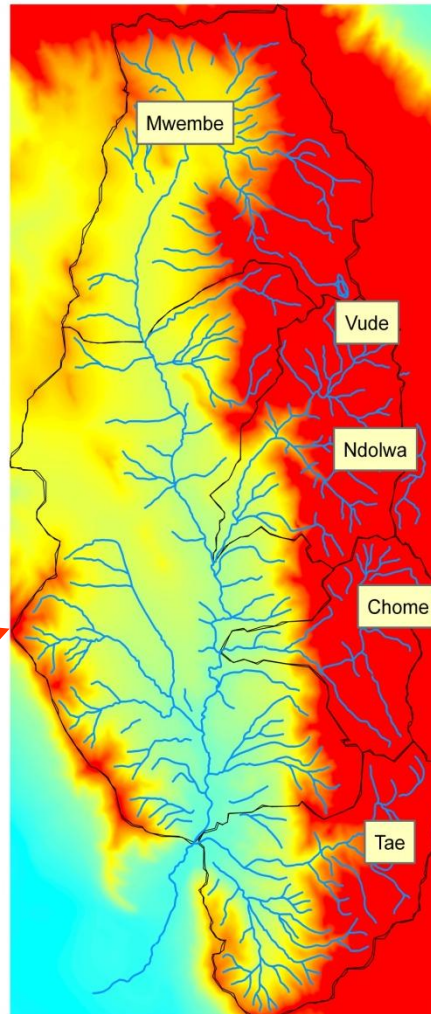
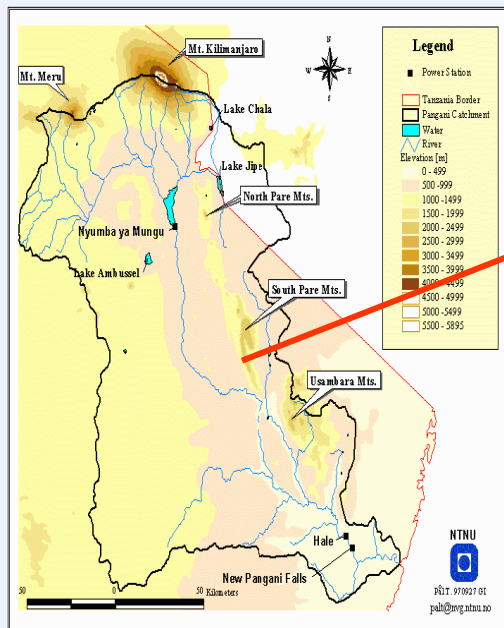
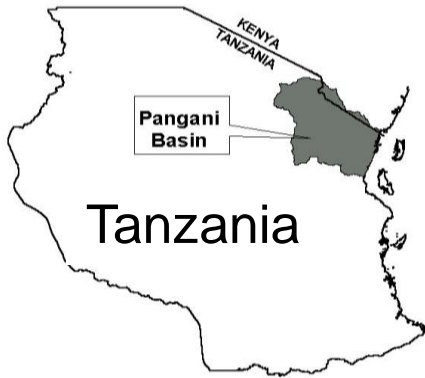


## Irrigation system category:

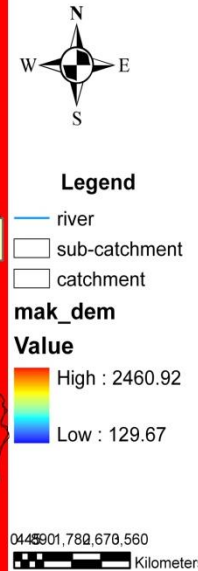
- Traditional systems
- Rainwater harvesting systems
- Improved systems
- Large scale commercial systems



# Makanya Catchment

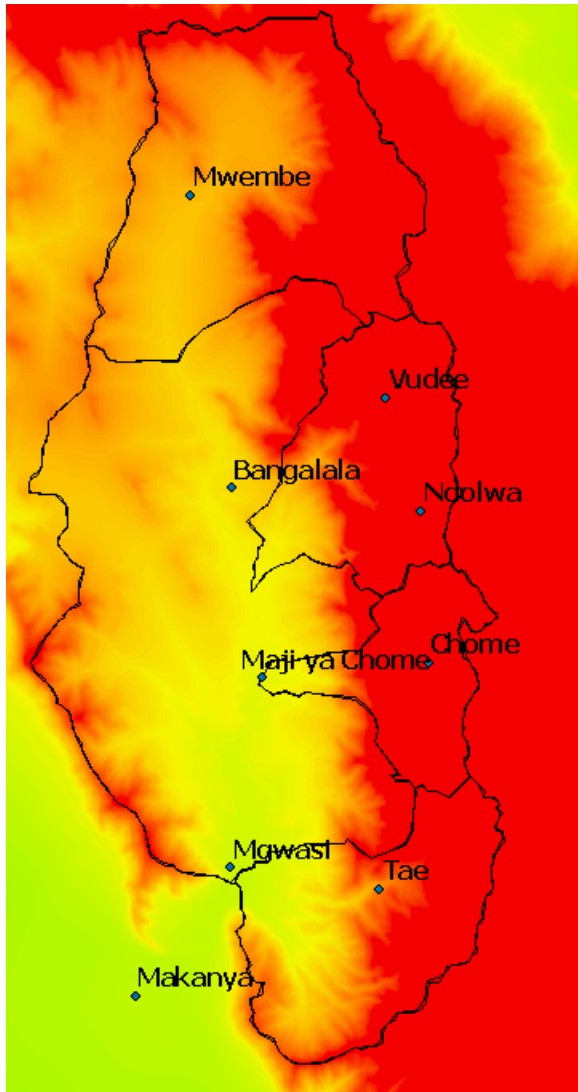


- Area – 300km<sup>2</sup>
- Water stressed catchment
- Disconnected from Pangani river since 1970s – surface hydrology





# Makanya Catchment

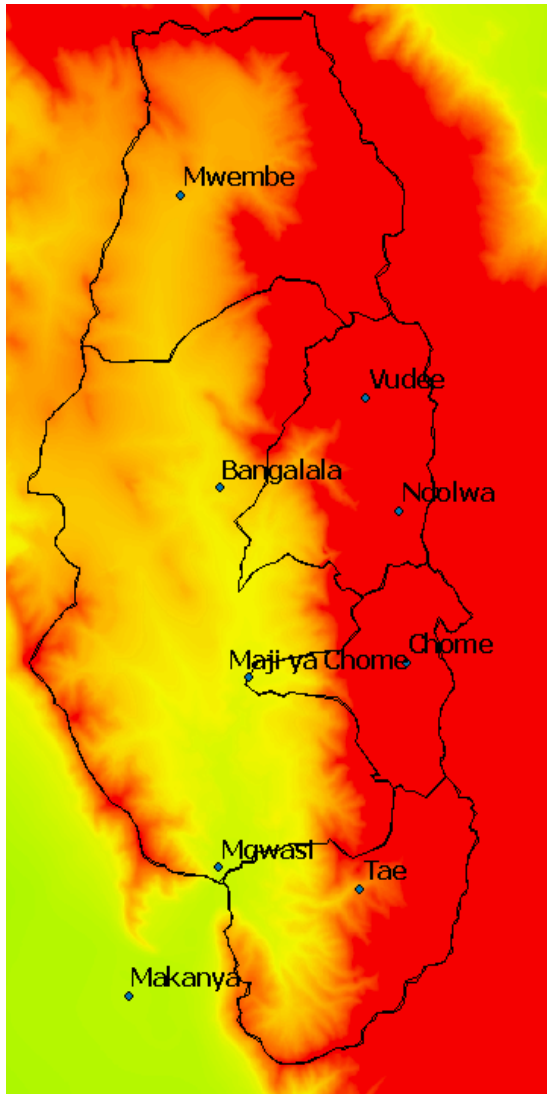


Rainfall is bi-modal (March – May & Oct – Dec)

| Zone      | Rainfall (mm/a) |
|-----------|-----------------|
| Highlands | 800 - 900       |
| Midlands  | 500 - 600       |
| Lowlands  | <400            |

Total population 35,000 & about 6,000 in the spate area

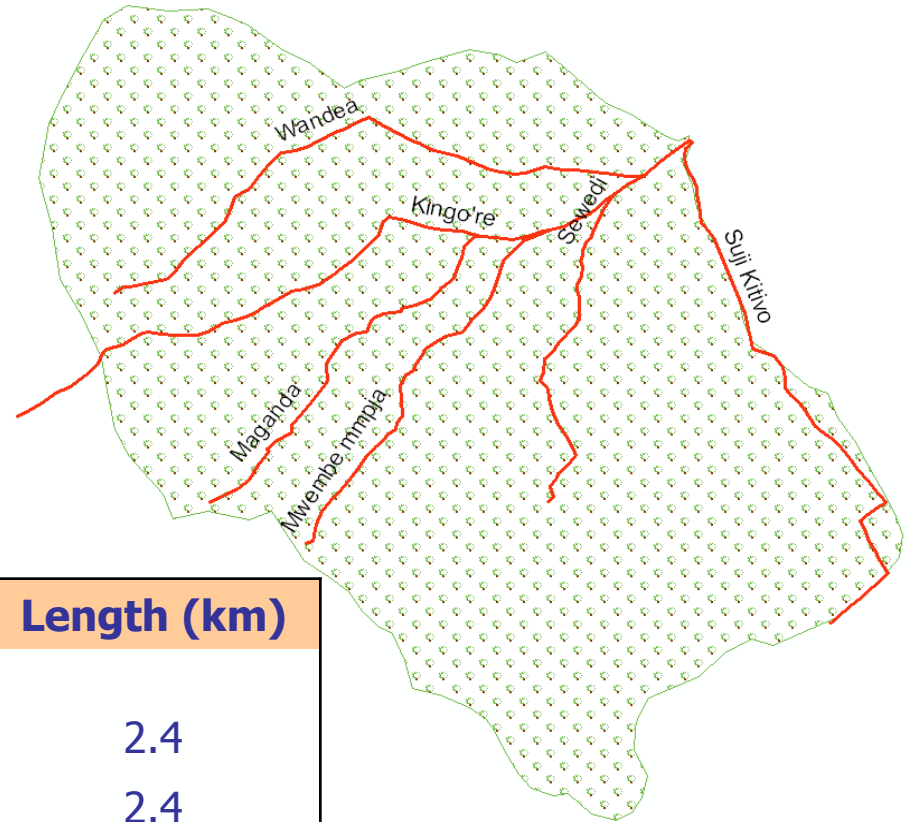
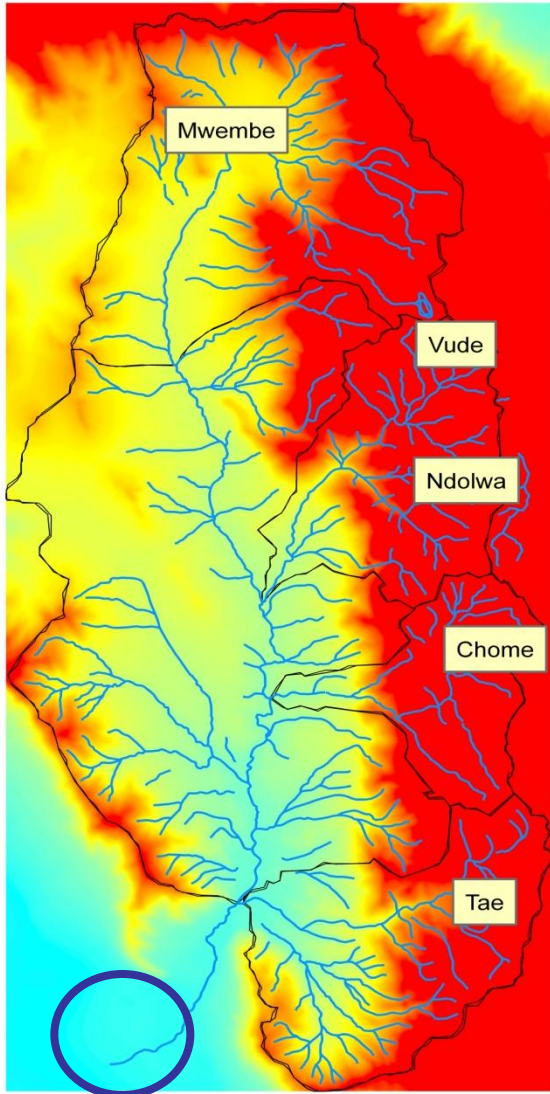
# Dependent water sources



| Zone     | Dependent water source                    | Infrastructure               |
|----------|---|------------------------------|
| Highland | Rainfall, river water during dry seasons  | Smaller micro-dams           |
| Midland  | Rainfall, river water throughout the year | Bigger micro-dams            |
| Lowland  | Seasonal flash floods, rainfall           | Direct diversion, Chaco dams |



# Makanya spate irrigation system

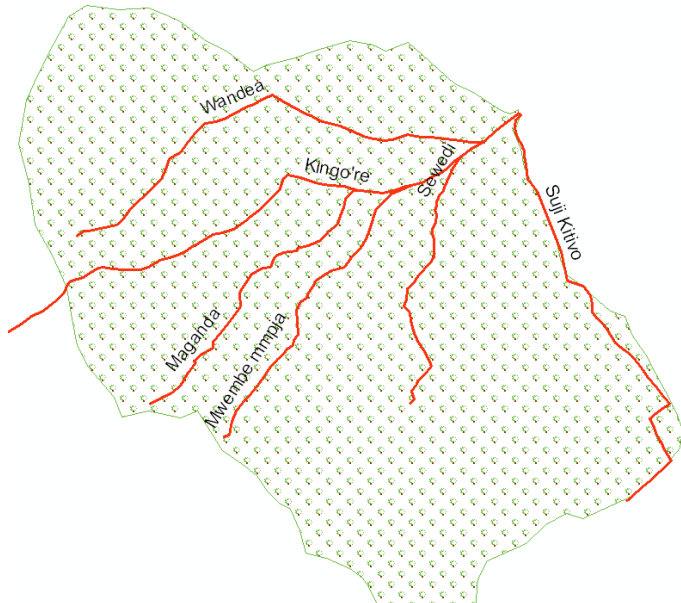


| Canal        | Length (km) |
|--------------|-------------|
| Mwembe mmoja | 2.4         |
| Kingo're     | 2.4         |
| Wandea       | 2.5         |
| Maganda      | 1.7         |
| Sewedi       | 1.5         |
| Suji Kitivo  | 2.5         |

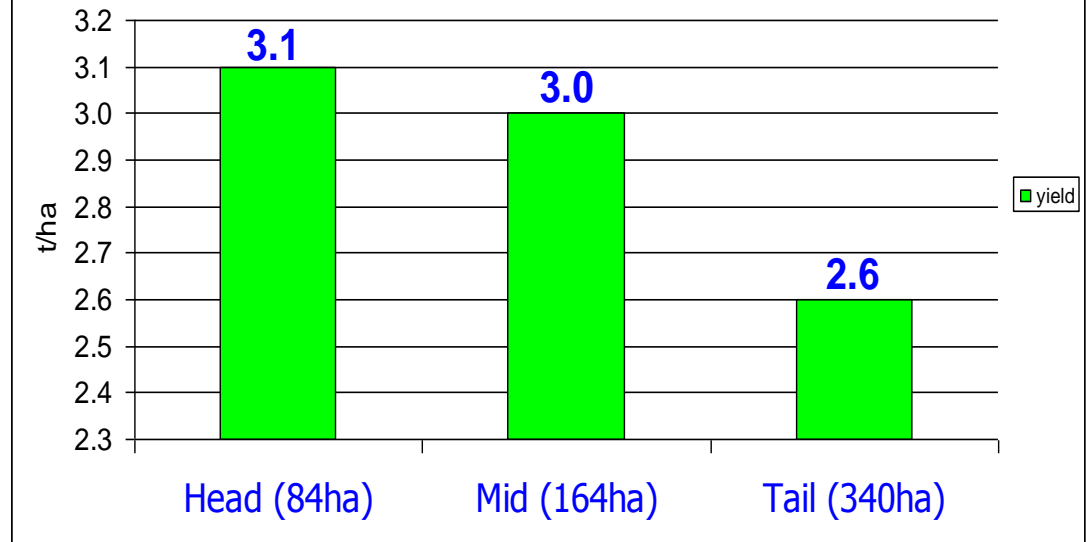
| Area (ha) | Perimeter (km) |
|-----------|----------------|
| 662.7     | 11.0           |



# Makanya spate



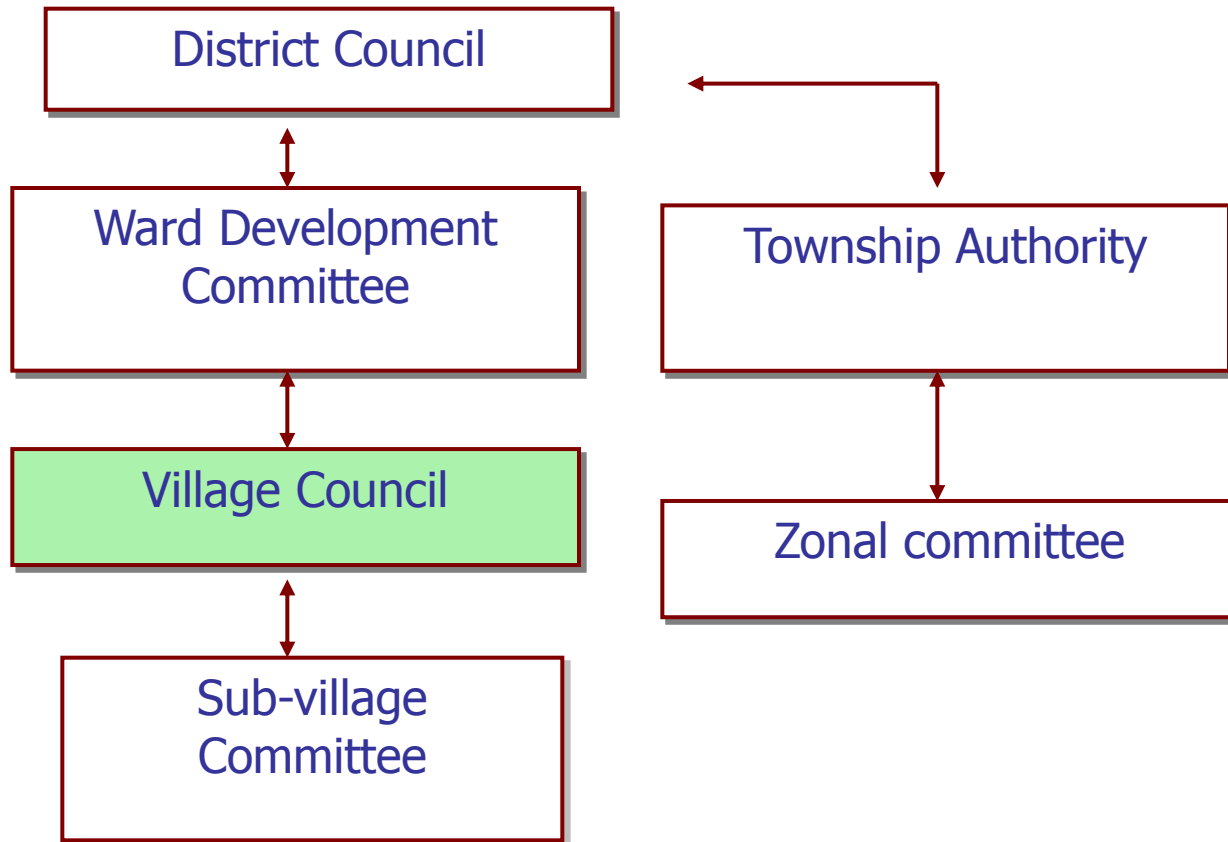
**Maize yields (t/ha) variation from head - tail end of Makanya spate system**



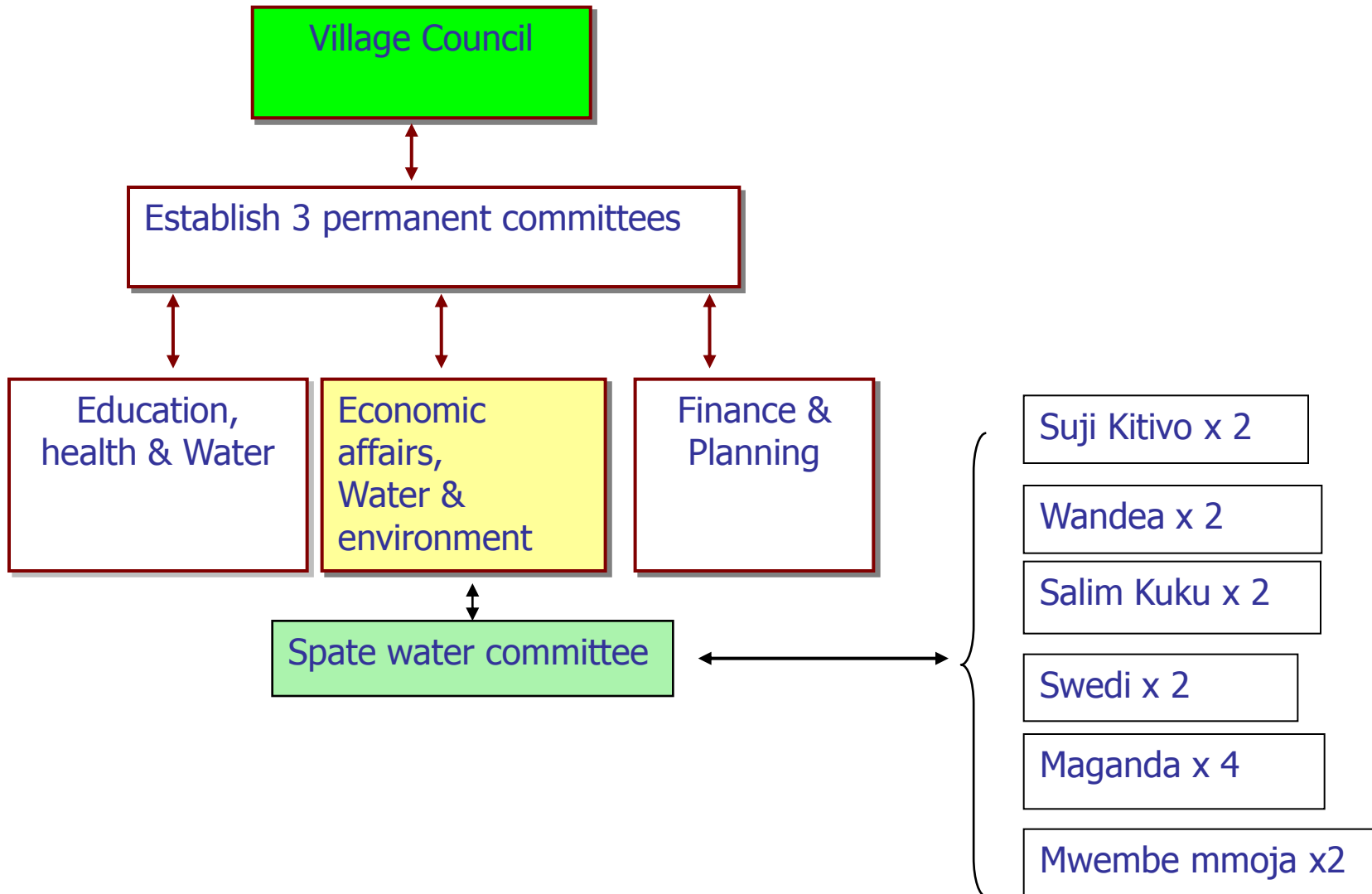
*(Mutabazi et al., 2005)*

# Institutional arrangements

---



# Institutional arrangements





# Roles & responsibilities



## Econ. Works & Environment committee

- Planning & coordination
- Extension services
- Setting users fee
- Conflict resolution

## Spate Water Committee

- Water allocation
- canal maintenance
- conflict resolution

# Rules & regulations of the spate system

---

- Membership and water right is based on ownership of land within the command area;
- First flood reaching the spate area anyone can irrigate. An incentive to ensure that farmers remain vigilant and avoid losses since there is no storage in the system.
- Subsequent water allocation is contingent on participation in canal maintenance;
- Allocation is time based, and depending on availability – six hours during high flows and 12 hours during low flow;
- For high flow, water allocation starts downstream;
- On Sundays, water is allocated to the representatives of the canal receiving water at that time;

# Rules & regulations of the spate system

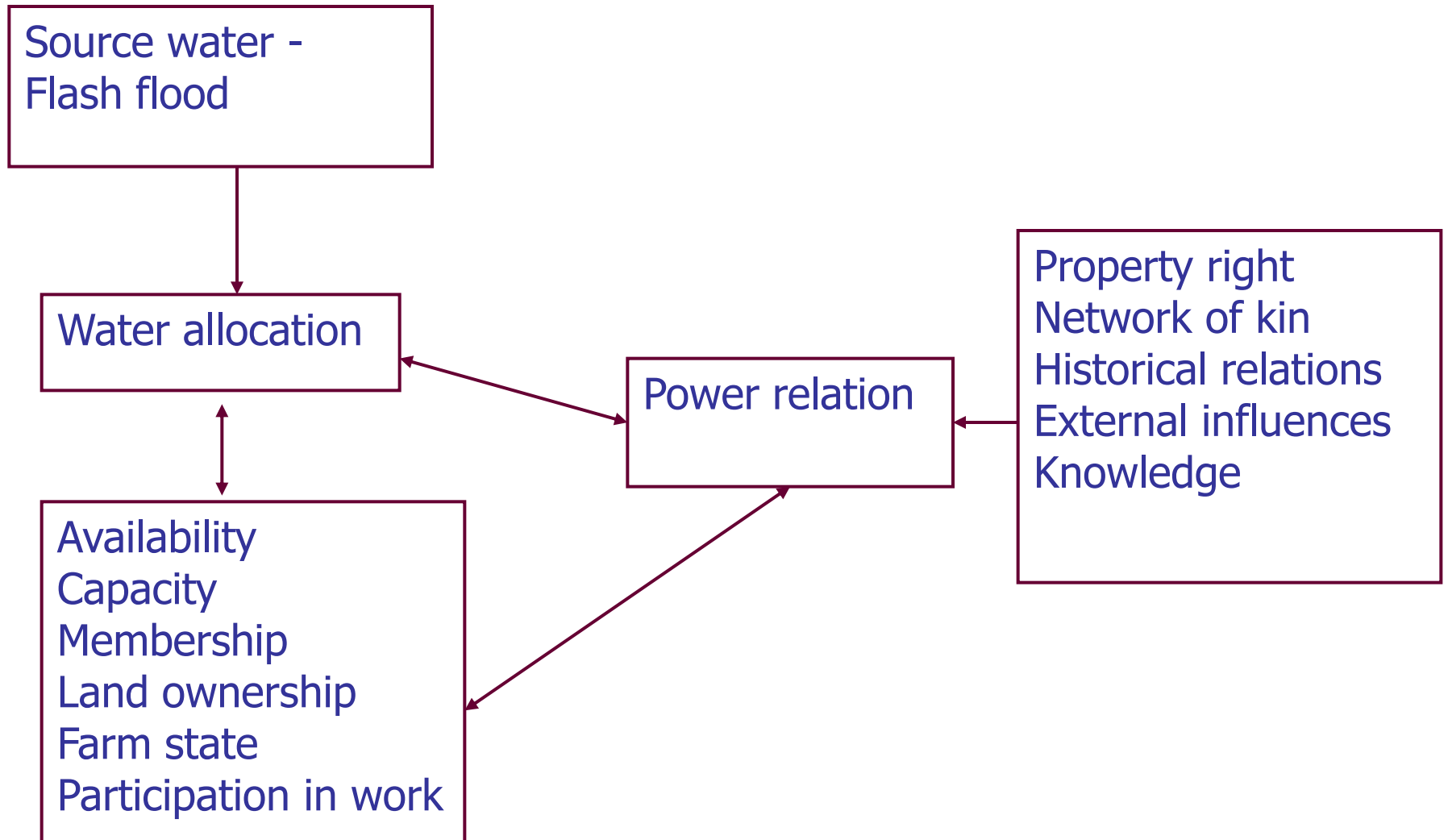
---

- A Farmer who fails to participate in the preparation of the canal is fined. The penalty amount is set by the members and approved by the village government;
- Business(wo)men are fined TSH 6,000 (approx. 4.8US\$), while non-business(wo)men are fined TSH 2,000 (approx. 1.6US\$), equivalent to one day work;
- The penalty amount may be recovered by grabbing of the offender's property;
- During conflict or when a farmer refuses to work he/she must still be allocated water and the matter resolved afterwards.



# Dynamics of water rights

---



# Constraints & potentials

---



Labour intensive due to high sediment load, and constraints from other infrastructures upstream (Railway bridge, sisal estate etc).



Induced inequity, yields also do vary with distances from the main canal.

# Constraints & potentials

---



Land degradation upstream – sediments are now more coarse and predominantly sand.



Seasonal variation – floods occurs

- 3 times (Oct – Dec) lasting approx. 7days
- 3 -4 times (March – May) lasting 1 – 3 days.
- Jan – Feb it is dry with devastating effects on crop yields



# Constraints & potentials

---

| <b>Option</b>                               | <b>Remarks</b>   |
|---|--|
| Re-design/storage<br><b>“Modernization”</b> | <ul style="list-style-type: none"><li>• High investment costs</li><li>• change status quo of land ownership</li><li>• need careful planning. Likely to succeed if its initiated by farmers</li></ul>   |
| Conjunctive groundwater use                 | <ul style="list-style-type: none"><li>• High potential in the area but not yet used</li><li>• Could reduce uncertainty thus increased benefits</li><li>• Maintain the status quo in land ownership</li><li>• Investment in management critical</li><li>• High value crops could be grown – lablab beans used in making biscuit being grown</li><li>• Investment in extension services an asset</li><li>• Investment in marketing helpful</li></ul> |

# Missing link with upstream users

---

Makanya spate irrigation farmers always look upstream for the floods, but never bothers about what upstream farmers are doing. They also do not bother what their use implies for users downstream of the spate irrigation.

- Possibly because they target water stems from parts of the hydrograph not presently used upstream



# Conclusions

---

- Spate system occurs in harsh environments that make livelihoods vulnerable
- But it is dependable and often provides security to livelihoods in semi-arid areas
- It uses high value water at low opportunity cost and we assume it is also creates no major negative externalities downstream
- Technically it is a challenge to upgrade spate system but investment in conjunctive groundwater use and growing high value crops could be an asset
- Significant effort however will be required in developing suitable institutional arrangements that often forms the social mortar cementing water use systems
- For spate system to be fully integrated in river basin management, its development has to be linked with all users/uses in the catchment



**Asante sana! (Thank you!)**

---

