Small-scale hill irrigation systems and adaptation to climatic variability

Ram Bastakoti
International Water Management Institute

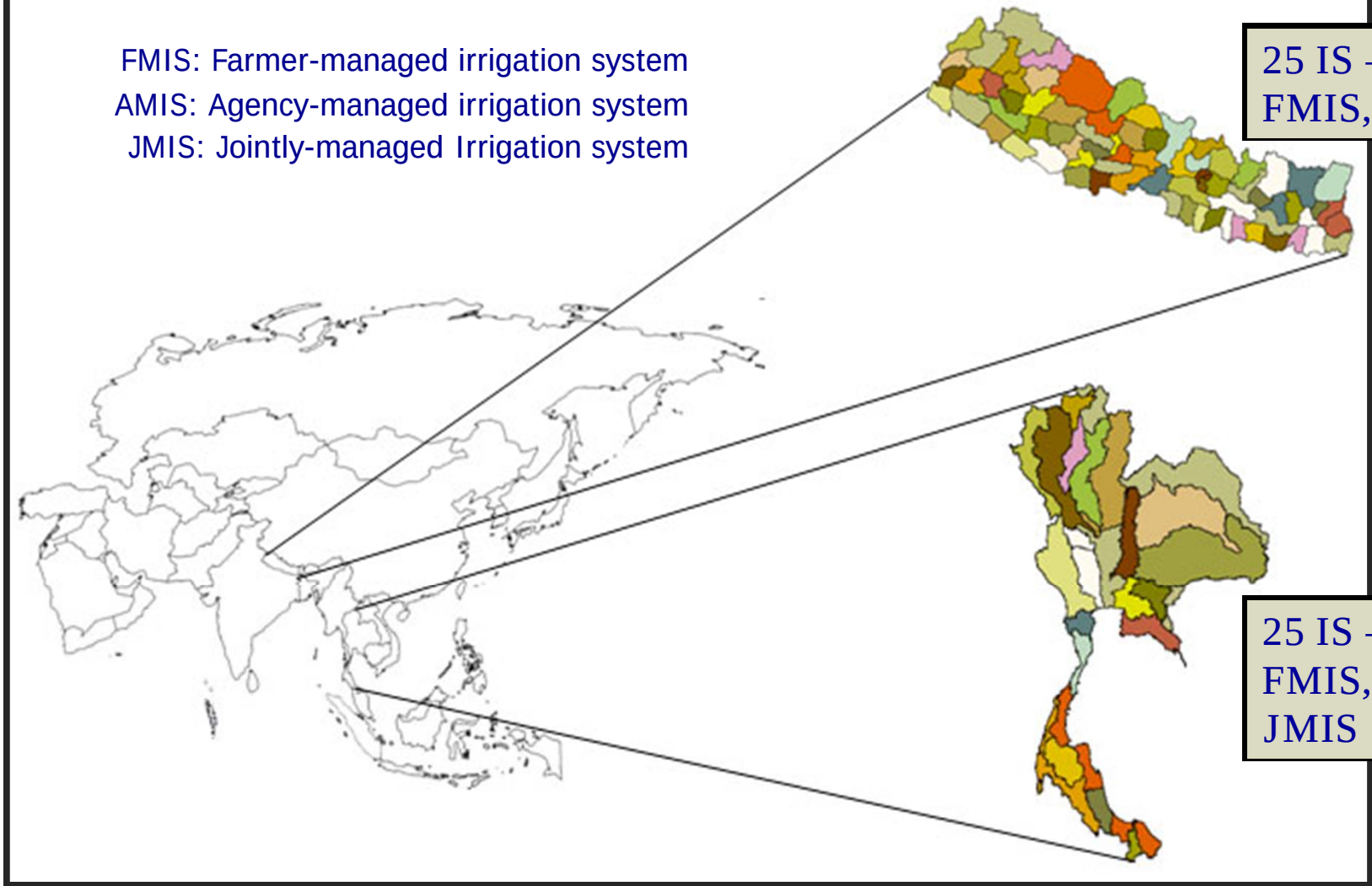
Regional Workshop on “Training Needs and Gaps Assessment on Adaptation and Resilience to a Changing Climate in South Asia”, 4-5 September 2013, Kathmandu, Nepal

Adaptation is a dynamic social process: the ability of societies to adapt is determined, in part, by the ability to act collectively.

IWMI
International Water Management Institute

Irrigation systems examined.....

FMIS: Farmer-managed irrigation system
AMIS: Agency-managed irrigation system
JMIS: Jointly-managed Irrigation system



25 IS – mostly FMIS, few AMIS

25 IS – majority FMIS, some JMIS

IWMI International Water Management Institute

Biophysical context: Irrigation infrastructure

Run-off-the-river type

Simple water distribution and conveyance structure

IWMI International Water Management Institute

Biophysical context.....

And exist in difficult terrain and diverse topography

Majority of sampled IS were small (<200 ha)

IWMI International Water Management Institute

Climate change and variability

- **Temperature**: Increase in mean annual temperature both in Nepal [1976-2005] and Thailand [1951-2003]

- **Precipitation**
  - Nepal [1976-2005]- overall increase in average annual precipitation but spatial [decrease in mid-west] and temporal variability [decline in pre monsoon]
  - Thailand [1951-2003] - decrease in average annual precipitation with temporal variability across the season

- Increasing variability in temperature and precipitation – results in extreme climate events

Climatic variability – rainfall anomalies

- Changing rainfall pattern – delayed onset of monsoon – affect rice transplanting and productivity in both Nepal and Thailand (>50%)

Source: DFID

- Delayed winter rain affect wheat productivity– farmers forced cultivate inferior crops or no cultivation at all (all sampled systems in Nepal)

Climatic variability – floods

- Increasing frequency of flood events
- Flash floods with uncertain strength – damage infrastructure
- High failure rates of structures; affect the capacity of IS to maintain predictable and regular water availability
- Difficulty in maintenance

Adaptation to climatic variability

Existing practices

- Water shortages – FMIS rework water allocation based on water availability (in Nepal) – and contribute more for O&M
- WUA suggest farmers for growing in reduced area, or growing in a cluster or group; ‘area sharing’ [observed in some systems in Chiang Mai valley of Thailand].
- Other measures - Drought resistant local varieties and technologies, cereals exchange, provision of loans and help among communities

Adaptation to climatic variability....

How the social capital built around irrigation system could help adapt to the climatic variability?

- Institutional responses
- Rules and allocation practices

Institutional responses

- Water Users' Association (WUA) responsible for management and deal with external disturbances
- WUAs [mainly in FMIS] can mobilize users for quick response, eg, repair flood-damaged infrastructure
- Local leaders facilitate water allocation in case of shortage [observed in Thailand]
- Local administration [eg TAO in Thailand] play crucial role in establishing link with external agencies

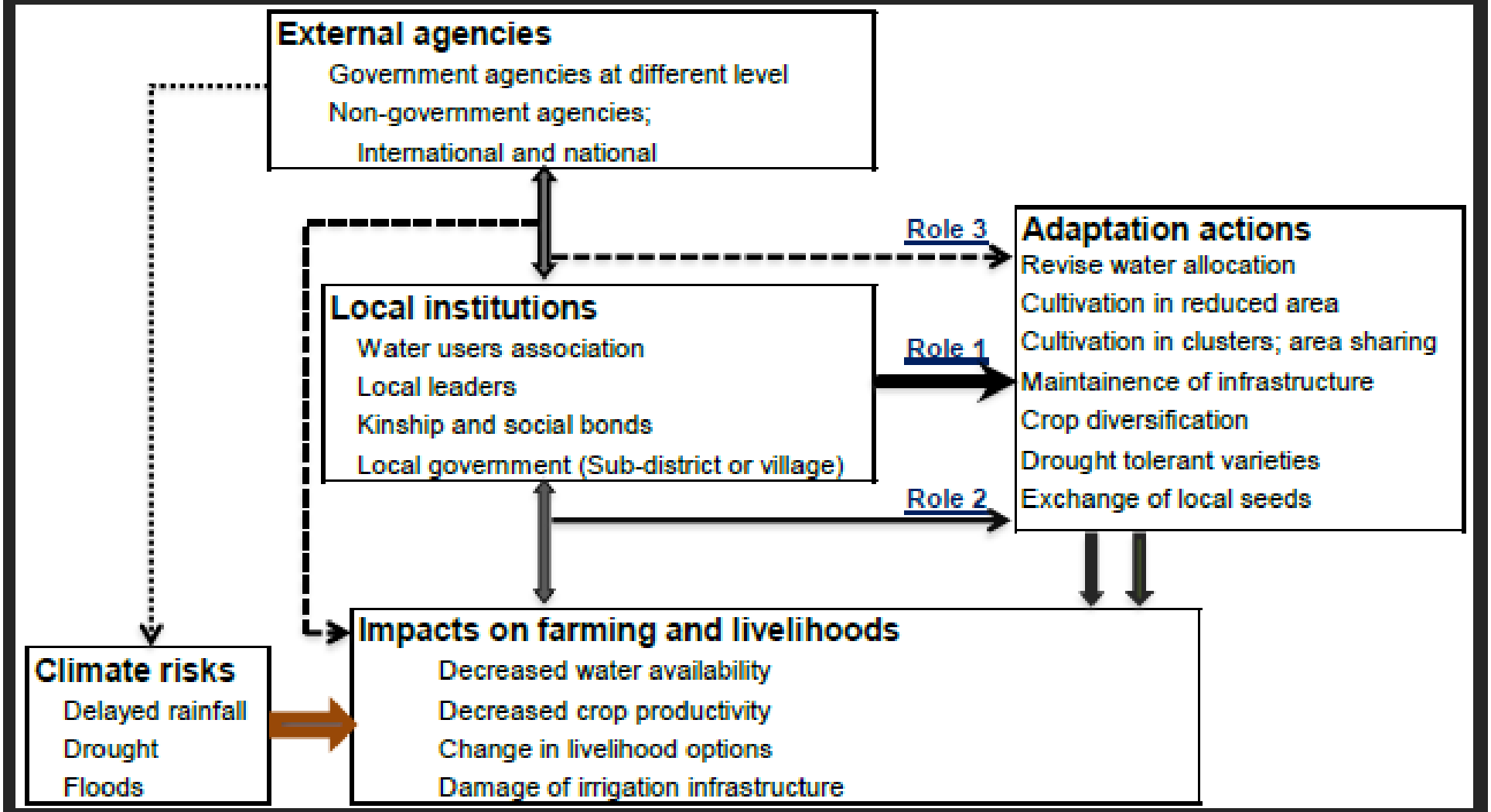
Rules and allocation practices

- Specify operational level rules based on the local context – water allocation mechanism, rights and responsibilities of the users

- FMIS – make and enforce rules by users – better monitoring by local monitor

Local monitor in FMIS

Local institutions facilitate adaptation in different ways



IWMI International Water Management Institute

Further challenges

- **Market pressures** – increasing cropping intensity, multiple cropping and dry season commercial vegetable production - change water requirements, water shortage and conflict

- **Socio-economic dynamics** [outmigration; demographic transition] – labor shortage and affect collective action

- **Increasing frequency of extreme climate events** – irrigation systems become more vulnerable