Assessment of Modernization Needs for the Philippine National Irrigation Systems to Support High Value Crop Production

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Outline of the Presentation

1. National irrigation system
2. Rationale of the study
3. Methodology
4. Results
   - System overall and operational objectives and flow control method
   - System management and irrigation practices
   - System performance and physical capacities
   - Irrigation issues: NIA and IA perspectives
   - Potentials for HVC production/crop diversification
5. Conclusion

Rationale

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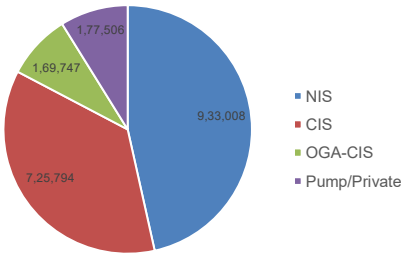
National Irrigation Systems

- Gravity-type systems, designed and operated for rice monoculture
- Government-owned and co-managed with IA
- Service area > 1,000 ha
- Serve about 933,000 ha (47%) of the total irrigated areas



Rationale

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Rationale

❖ HVC production as a strategy
- improve farmers income
- nutrition and self-sufficiency in major food crops
- produce for export market
- generate agriculture-based enterprise in rural areas
- adapt to decreasing water supply to agriculture

➢ NIA adopted crop diversification as an adaptation strategy to climate change
➢ NIS are designed and operated for lowland rice cultivation
➢ Upgrading in the design, irrigation technology and operation of existing NIS

➡ To identify key modernization needs for NIS to support diversified HVC production

Methodology

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Methodology

- 3 case study systems
- Collection of system data
- Interviews/consultation with IA
- Interview with NIA
- System walkthrough
- Logic design analysis and MASSCOTE diagnostic tools
- Analysis of system performance and issues

Case study systems

1. Lower Chico RIS
   - Design SA: 2,000 ha
   - Firmed-up SA: 1,255 ha
   - Water source: Chico River
   - Official operation: 1979
   - Diversion: Intake barrel
   - Diversion capacity: 4.75 m^3/s
   - Main canal: 6.82 km
   - 2nd canal: 30.81 km
   - No. of IA: 5
   - No. of farmers: 2,456
   - Main crop: Rice
   - Wet season: May - Sep
   - Dry season: Dec - Apr

Methodology

Case study systems

2. Mainit RIS

- Design SA: 3,500 ha
- Firmed-up SA: 2,265 ha
- Water source: Mainit River
- Official operation: 1976
- Diversion: Ogee
- Diversion capacity: 4.37 m^3/s
- Main canal: 9.458 km
- 2nd canal: 61.77 km
- No. of IA: 8
- No. of farmers: 1,894
- Main crop: rice Rice
- Wet season: Nov - May
- Dry season: Jun - Oct

Case study system

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Methodology

Case study systems

3. Tago RIS

- Design SA: 14,000 ha
- Firmed-up SA: 4,356 ha
- Water source: Tago River, Mimie Sumo-sumo
- Official operation: 1986
- Diversion: 1 Ogee, 2 barrages, 2 impoundments
- Diversion capacity: 24.13 m^3/s (Tago)
- Main canal: 75 km
- 2nd canal: 73.7 km
- No. of IA: 22
- No. of farmers: 2,675
- Main crop: rice
- Wet season: Nov - Apr
- Dry season: May - Oct

Survey & interview

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Methodology

Data collection and interviews

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Results

Logic design analysis

System objectives

- Productive irrigation
- Rice monocropping
- Dry season irrigation
- Equitable supply per ha

➢ There is logical coherence in the design of the system
➢ Lower low flows and intake barrel ROR are **not** coherent with the productive irrigation objective

Operational objectives:

- ***Lower Chico RIS / Tago RIS***
  - Imposed allocation to TU
  - Adjustable flow to TU
  - Rotational flow through main system
  - Upstream control
  - Direct offtaking
- ***Mainit RIS***
  - Imposed allocation to TU
  - Splitted flow to TU / intermittent flow
  - Splitted flow through main system / rotational flow through main system
  - Proportional control /Upstream control

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Results

Irrigation practices

- Service area is divided into management units; each is managed by its IA
  - Lower Chico RIS: 5
  - Mainit RIS: 8
  - Tago RIS: 22
- Under IMT contract
  - NIA: O&M and management of main facilities
  - IA: O&M and management of secondary facilities and structures from medium-sized lateral canals down to terminal irrigation structures
- Start of irrigation season: agreed upon by the NIA and IA
- Cropping schedules:
  - Simultaneous irrigation in Lower Chico RIS
  - Staggered, upstream to downstream in Tago RIS
  - Rotation by main canal in Mainit RIS

Performance: Mainit RIS

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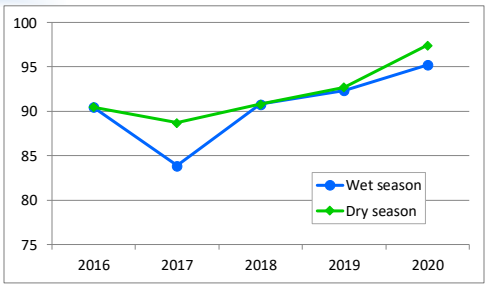
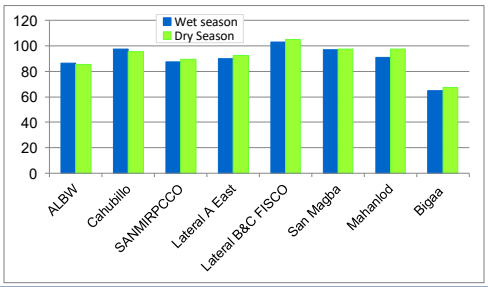
Results

System performance: actual irrigated

Mainit RIS

- 5-yr range: 84-97% of FUSA
  - national average: 74-86%
- 5-yr average:
  - dry season: 92%
  - wet season: 91%
- Variations among management units





Performance: Tago RIS

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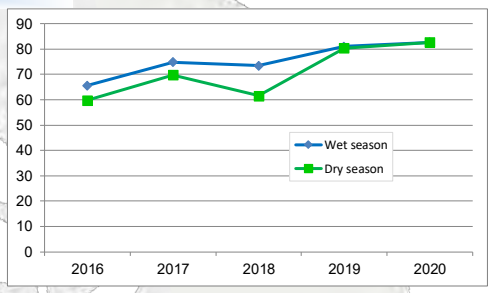
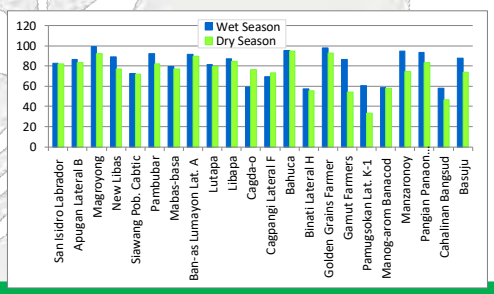
Results

System performance: actual irrigated

Tago RIS

- 5-yr range: 60-83% of FUSA
  - national average: 74-86%
- 5-yr average:
  - dry season: 71%
  - wet season: 76%
- Variations among management units





Functional capacity

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Results

Functional capacities: Present VS. Required

- Decreased functional capacity in most aspects

Functions	Lower Chico RIS	Mainit RIS	Tago RIS
Diversion (canal)	<	≈	<
Division (canal)	n/a	≤	n/a
Storage (canal)	<	<	<
Conveyance	<	≈	<
Sediment control	<	≈	<
Discharge transfer	<	≈	≈
Water level control	<	≈	<
Flow measurement	<	≈	<
Safety	<	<	<
Communication	≈	≈	≈
Water reuse	≈	≈	≈
Transport/access	≅	<	<
Diversion (headwork)	<	<	<
Storage (headwork)	<	<	<

IA consultation

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Results

IA consultation

- Management unit situation

	Lower Chico RIS	Mainit RIS	Tago RIS
Wet season, too much water	6/6	1/6	11/14
Dry season, scarce water	6/6	6/6	12/14
Rice monocropping	2/6	3/6	6/14
Whole area planted, 2 cropping	4/6	--	13/14
Whole area irrigated ≥ 1 cropping	--	2/6	--
>1 coping strategy for water scarcity	9/13	6/6	12/14
Do-nothing on flood	4/6	--	13/14
Willing to diversify crops	5/6	3/6	12/14

IA irrigation issues

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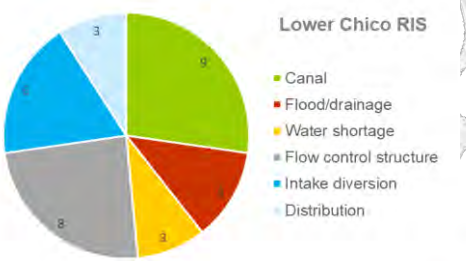
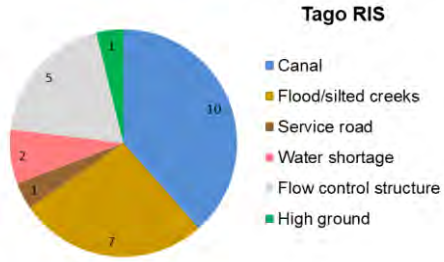
Results

Irrigation issues: IA perspective





NIA irrigation issues

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Results

Irrigation issues: NIA perspective

- Lower Chico RIS
  - tampering and cumbersome manual operation of the main intake gates
  - heavily scoured base of the main intake structure
  - silt-laden water supply
  - non-functional offtake gates at the Trifurcation
  - cumbersome manual operation of the big check
  - silt-laden flood water from the mountain flowing into canals
  - heavily silted drainage channels and blocked drainage outlet
  - municipal drainage discharges eroding canal walls
  - lack of backhoe and dump truck for canal dredging/desilting

Sufficiency: other food crops

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Results

Irrigation issues: NIA perspective

- Tago RIS
  - worn out, cumbersome manual operation and non-operational mechanisms of sluice and main intake gates
  - lack of critical flood water level warning device
  - damaged concrete blocks and curtain wall
  - excessive seepage at sluice gate rubber seal
  - lack of silt ejector
  - insufficient water supply during dry season
  - quarrying
  - oversized canal for the present irrigation requirement
  - excessive seepage along the main canals
  - informal settlers on main canal embankments
  - Deteriorated/non-functional flow control structures
  - inappropriate flow control structures
  - flooding exacerbated by silted and constricted natural drainage
  - lack of sufficient drainage network
  - dilapidated service roads

Desired modernization

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Results

Desired modernization by NIA and IA

- rehabilitation of damaged/non-functional physical structures
- installation/construction of additional/improved flow control structures (gated, automatic, with lock)
- dam (in Lower Chico)
- additional canals
- silt ejector
- modern flow monitoring system
- service roads
- improved drainage system
- O&M equipment (backhoe, dump truck)
- solar-powered water pumping units

Modernization need

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Conclusion

Modernization need:

- Increased water storage (dam, main canal)
- Need for heterogenous approach to irrigation system modernization
- irrigation modernization to proceed in phases starting from water-scarce areas
- Control of water along the main conveyance system
- Water tanks/temporary storage upstream of HVC production
- Check gates for capture drainage water for reuse
- Solar-powered shallow tubewell irrigation
- Dredging and increased drainage density
- Filtration system for micro-irrigation (drip)
- Capacity enhancement programs for NIA and IA on O&M of modern irrigation technology

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