

# Argali Raj Kulo (Jethi Kulo) Irrigation System, Argali Village Panchayat, Southern Nepal

Last Updated: November 26, 2025

## 1 Part I: Static Analysis - Collective action

Martin and Yoder's (1986) field research, along with Pradhan's (1989) comparative study of FMIS across Nepal, provides a clear picture of the institutional and physical foundations of the Argali Raj Kulo in southern Nepal. This 300-year-old, farmer-managed canal, located in the Argali Village Panchayat of Palpa District, diverts water from the Khurung Khola to irrigate 48 hectares for approximately 155 households and remains one of the most enduring irrigation systems in the hill region. Collective action is sustained through well-defined membership based on landownership, proportional labor or cash contributions, and strong social norms. Each household's irrigation entitlement is directly linked to its obligation to contribute labor or financial resources for maintenance, reinforcing compliance and minimizing free-riding. These locally crafted rules enable farmers to jointly construct, maintain, and govern the canal, ensuring equitable water distribution and reliable performance. The system thus represents a robust institutional arrangement characteristic of Nepal's farmer-managed mid-hill irrigation systems.

### 1.1 The Commons Dilemma

**The potential appropriation problem/poor coordination of appropriation:** The Argali Raj Kulo maintains equitable water sharing through longstanding norms and locally crafted rules. Water is allocated via continuous flow and rotational schedules (paila), with saachos dividing flows proportionately during scarcity. The irrigation committee manages distribution and labor—requiring one worker per 40 maato muri or a cash payment—while the secretary keeps transparent records. Disputes are resolved internally by the mukhia and committee members. Clear recordkeeping, direct communication, and strong social cohesion prevent coordination failures and free-riding. Continuity in leadership, administrative accountability, and informal norms ensure sustained equitable water use, reflecting effective collective self-governance.

**The potential under provision of public infrastructure:** The sustainability of the Argali Raj Kulo relies on collective maintenance of its infrastructure. Each pre-monsoon season, farmers contribute 1,500–2,500 person-days over 10–12 days to rebuild the earthen diversion weir and repair canal sections, with labor proportional to landholding and cash required from absentees. Non-compliance results in fines or temporary suspension of water rights, recorded by the mukhia. Despite its simple 4-km canal and annually rebuilt intake, partially reinforced by DIHM, the system remains well maintained through locally mobilized labor, resources, and skills, demonstrating strong community capacity to prevent under-provision of public infrastructure.

### 1.2 Biophysical Context (IAD)

**Natural infrastructure:** the perennial Khurung Khola stream, terraced hill slopes of Palpa District, subtropical monsoon climate, and the 48-hectare command area

supporting double cropping.

**Hard human-made infrastructure:** a 4 km canal with earthen and stone-lined sections, an annually rebuilt diversion weir, wooden sluices, branch canals, silt traps, and footpaths for inspection.

### 1.3 Attributes of the Community (IAD)

**Social Infrastructure:** Argali village consists of smallholder farming households characterized by kinship ties, social cohesion, and long-term residence. It is nearly impossible for poor and low caste people to acquire access to irrigation for the important monsoon rice season.

- **Resource users:** About 155 landowning households within the 48-hectare command area hold proportional rights and duties in water use and maintenance. Farmers rely on the canal for rice, wheat, and maize, contributing labor or cash based on land size. Annual pre-monsoon meetings set maintenance plans and water schedules through consensus, while minor disputes are resolved locally by the mukhia and senior members, reinforcing accountability and social cohesion.
- **Public infrastructure provider:** A ten-member committee—led by a hereditary mukhia and supported by a secretary, treasurer, and section heads, manages maintenance, mobilizes labor, enforces rules, and keeps records. Decisions are made collectively and transparently, ensuring accountability. Women also participate in canal cleaning and field irrigation, reflecting inclusive household involvement.
- The irrigation committee maintains a community fund from fines and cash contributions, reinvesting it in canal strengthening, intake repairs, silt traps, spillways, materials, and skilled labor for specialized maintenance.

**Human Infrastructure:** Farmers possess deep indigenous knowledge of canal repair, water distribution, and crop rotation, passed down across generations. Hereditary leadership preserves institutional memory, while the secretary maintains transparent written records. Together, traditional knowledge, technical skill, and reliable administration sustain the Argali Raj Kulo system.

### 1.4 Rules in Use (IAD)

#### Position Rules

- The irrigation committee consists of 10 members, including a hereditary chairperson (mukhia) and other office bearers such as treasurer, timekeeper, and section heads.

#### Boundary Rules

- Membership is based on land ownership within the command area (48 ha).
- Farmers receiving water from the drainage are not members of Raj Kulo, thereby have no voice in decision-making.
- Low-caste households having no land ownership are historically excluded from membership, restricting their access to irrigation for the important monsoon rice season.

### Choice Rules

- Households must contribute labor for canal maintenance in proportion to their land shares (one share = one unit of irrigated land), including participation in the 10–12 days of collective pre-monsoon work or payment of a cash equivalent.
- Farmers are responsible for cleaning the intake and repairing the canal.
- Absenteeism or negligence results in monetary fines and temporary suspension of irrigation rights until compliance.
- On average, households contribute labor or cash equivalent to NPR 45–50 per hectare annually.

### Aggregation Rules

- The chairperson presides over meetings where rules are discussed and adjustments made. Decisions are reached by consensus or majority vote.
- Disputes are handled by the mukhia with two senior members; if unresolved, the case may be referred to the Panchayat.
- Committee meetings are held each May to plan repairs and water distribution, with emergency meetings convened as needed for damage.

### Scope rules

- Water allocation follows the principle of proportional landholding.
- Continuous flow is maintained during normal supply; rotational distribution (paila) is used during scarcity.
- Cropping pattern includes rice during monsoon, followed by wheat or maize in the winter and pre-monsoon, respectively.
- All water-right holders, including tail-end users, shall receive water according to the rotational schedule established by the committee.
- Fields that have no monsoon-season water allocation have no claim to water from seedbed preparation until rice harvest, even if they could physically receive water.

### Information Rules

- The secretary keeps accessible records of water allocation for each member, preventing disputes over allocation.
- The secretary records all fines, payments, and contributions in a written ledger. These records are presented during the annual committee meeting for transparency & collected fines are added to community irrigation fund.
- Canal maintenance schedules, share lists, and water rotation plans are publicly announced during meetings.
- Verbal communication is the main mode of coordination, though fines and attendance are recorded by the committee.

### Payoff Rules

- Households must contribute labor or cash for annual weir reconstruction and canal maintenance, with obligations proportional to landholding (about one day of labor or NPR 500 per hectare).

- Fines are imposed for absence during maintenance, disobeying water turns, or other rule violations.
- Noncompliant households lose irrigation rights until fines or required labor contributions are fulfilled; severe cases require additional labor or monetary compensation before rights are restored.
- Exemplary participation may be informally rewarded with public recognition during community meetings.

### 1.5. Summary

The 300-year-old Argali Raj Kulo irrigates 48 hectares for 155 households through strong collective action, proportional labor or cash contributions, and annual rule-setting meetings. Its natural and community-built infrastructure, including a 4 km canal, reconstructed intake, silt traps, and wooden sluices, is maintained with 1,500–2,500 labor-days annually. Transparent recordkeeping, fines, suspension of water rights, and reinvested funds uphold accountability and financial stability. Despite sedimentation, monsoon damage, and other pressures, the system remains resilient through community-driven maintenance, rotational water sharing, stable hereditary leadership, illustrating the enduring strength of community-based governance.

## 2 Part II. Dynamic Analysis – Robustness

### 2.1 Update on the Commons Dilemma

The Argali Raj Kulo has remained stable despite demographic and environmental pressures. Population growth and land subdivision have increased the number of water-right holders, heightening competition during dry months, while youth outmigration has reduced labor availability. Nevertheless, collective rules and hereditary leadership have maintained institutional continuity. Although DIHM reinforced part of the intake with cement, management remains entirely community-driven. Upstream deforestation has increased sediment loads, requiring frequent silt removal and intake reconstruction. Despite these challenges, annual meetings and proportional labor mobilization continue to ensure reliable water delivery and equitable distribution, demonstrating the system’s long-term resilience.

### 2.2 Shocks, Capacities, Vulnerabilities

#### ...to and of the Resource (link 7 to R):

- *Link 5 between PI and resource dynamics (vulnerability):* Seasonal rainfall variability creates pre-monsoon shortages, while monsoon floods and sedimentation damage canal sections. Upstream deforestation adds erosion and sediment loads. The community addresses these vulnerabilities through collective silt-trap dredging and annual intake reconstruction.

#### ...to and of the Public Infrastructure (link 7 to PI):

- Aging canal sections and increased sedimentation have raised maintenance needs, but farmers still contribute 1,500–2,500 labor-days annually to sustain the system. DIHM’s partial cement reinforcement strengthened the intake without changing local control. Coordination with the Chherlung Kulo prevents conflicts, and incremental improvements, like partial lining and canal bank repairs, have improved efficiency and reduced leakage.

#### ...to and of the Public Infrastructure Providers (link 8 to PIP):

- *Link 3 between PIP and PI:* The hereditary mukhia, supported by the secretary and section heads, oversees repairs, labor scheduling, and recordkeeping. Annual meetings plan maintenance and allocate funds from fines and cash contributions.
- *Link 5 between PI and Resource Dynamics:* Regular maintenance reduces water loss and sediment blockage, sustaining adequate flow to the command area. Silt traps and spillways are constructed and maintained to manage sediment flow, directly affecting water availability and yields.
- *Link 8 to PIP:* Administrative capacity has weakened due to youth outmigration, but hereditary leadership maintains institutional stability. Government agencies provide occasional technical assistance during emergencies, with minimal involvement in day-to-day management.
- *Link 3 between PIP and PI:* Written records of fines, labor contributions, and payments are maintained by the secretary, ensuring transparency and accountability. Collective decision-making and social consensus sustain system credibility and compliance.
- *Link 5 between PI and resource dynamics:* Infrastructure improvements, such as canal lining and intake repairs, stabilize water flow and support consistent double cropping, making maintenance quality central to system resilience.

**...to and of the Resource Users (link 8 to RU):**

- *Link 2 between RU and PIP:* Farmers share water needs and maintenance concerns with the committee and engage in planning, while the mukhia and elders resolve distribution disputes internally.
- *Link 6 between RU and PI:* Users contribute labor or materials proportional to land size, wealthier farmers pay cash, and smaller farmers provide labor. Social cohesion ensures compliance, and non-participation results in fines or suspension of water rights.

### **2.3 Robustness Summary**

The Argali Raj Kulo remains institutionally and ecologically robust through community-based governance, hereditary leadership, and proportional contributions. It consistently delivers reliable irrigation and double cropping despite demographic pressures, watershed degradation, and minimal state support. Sustained community investment, 1,500–2,500 labor-days and NPR 45–50 per hectare, along with cement-reinforced intake structures and coordination with Chherlung Kulo, strengthens system performance. Social cohesion, low caste division, and transparent administration preserve trust and accountability. Although outmigration and environmental change create new vulnerabilities, the system continues to function as a resilient, self-sustaining farmer-managed irrigation model.

## **3 Case Contributors**

- Tang SY.
- Brady U, Arizona State University.
- Md Arif Chowdhury, School of Human Evolution and Social Change, Arizona State University.