



# Implementation of Small-Scale Farmer-Managed Irrigation Systems

## Nepal – कृषक व्यवस्थित साना सिंचाई योजना

### Implementation of small-scale farmer-managed canal and pond irrigation systems in rural Nepal.

The approach documented here aims to increase agricultural productivity by providing better access to water for irrigation to poor farmers with predominantly marginal landholding (~0.5 ha on average). It focuses on the construction and rehabilitation of farmer-managed irrigation schemes (FMIS) to improve the income and food sufficiency of rural communities and in particular of disadvantaged groups.

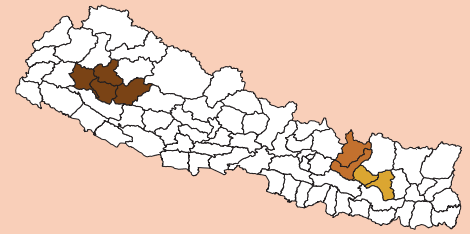
The programme provides technical assistance and funds for two types of irrigation technologies. Support of traditional canal-fed irrigation systems (QT NEP 40, 41) focuses on the rehabilitation of damaged or malfunctioning existing schemes. Irrigation canals are prevalent in lower elevated areas subject to subtropical climatic conditions. Newly constructed pond irrigation systems (QT NEP 43, 42), on the other hand, are situated in the higher, colder, and more water-scarce hill areas.

Implementation modalities are guided by a systematic eight-step approach led by the District Technical Offices (DTO) of the District Development Committees (DDC), supported by community-based organizations and specialized Nepali service providers. The following key elements are central to the implementation approach:

- **Demand Driven:** The initiative and willingness of the local communities concerned are key prerequisites for the programme's support.
- **Participatory Planning and Implementation:** Through a participatory approach, gender and ethnically balanced UCs are formed, which are responsible for leading the scheme's implementation process. The community contributes time, labour, and local construction materials. Public hearings, reviews, and audits before, during, and after implementation are mandatory.
- **Capacitated User Committees (UC):** All members of the UCs are provided with trainings on management and water rights issues during pre-construction, construction, and post-construction phases, enabling them to effectively manage implementation, operation, and maintenance of irrigation schemes on their own.
- **Capacitated Local Service Providers:** Training events enhance the capacities of local NGOs, which supervise the construction process and provide social mobilization services related to the scheme implementation. For each scheme, two appropriate local people are provided with technical training to become skilled caretakers in charge of operation and maintenance.
- **Funding through governmental channels:** Some of the programme funds are channelled through the District Development Funds (DDF) of the District Development Committees.
- **Operation and Maintenance Funds:** For every scheme, an O&M fund is established and managed by the respective UC. The UC prepares collection and spending regulations in consultation with the community. Most communities adopt equitable contribution systems.
- **Equitable water-sharing mechanisms:** Tailor-made policies developed by the users provide equitable distribution and utilization of irrigation water.
- **Community procurement:** To increase ownership, accountability, and commitment, the community procures locally available materials itself.
- **Agricultural extension:** Farmers are linked to agricultural service providers (seed, fertilizer, and input suppliers) and receive information on available agricultural inputs, as well as support in developing their post-implementation cropping patterns.
- **Post-Construction Monitoring and Support:** Follow-up support in the form of coaching and mentoring is provided to the user community at least twice a year in the first three years after construction. Annual functionality inspections are conducted in the same period.

**Left:** Public review in Budhekholi pond irrigation, Birpath VDC, Achham. (LILI)

**Right:** Canal construction in rocky area. (LILI)



**Location:** Eight districts in the Central, Eastern, and Mid-Western Development Regions of Nepal

**Approach area:** >3,000 km<sup>2</sup>

**Type of Approach:** Project/programme-based

**Focus:** Usage of water sources for irrigation

**WOCAT database reference:** QA NEP 41

**Related technology (ies):** QT NEP 40

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**Comments:** The documented implementation approach is part of the Water Use Master Plan (WUMP) approach (QA NEP 36). Key features of the WUMP are its particular focus on "planned and agreed use" of water resources and its holistic approach to managing drinking water schemes. The preparation of a WUMP serves as an entry point for interventions in the water sector and sets priorities in terms of using available water sources and the implementation of related water supply schemes in Village Development Committee areas (VDC), the lowest administrative units in the country. The approach documented here describes the implementation of irrigation projects identified during WUMP preparation.

The technology was documented using the WOCAT ([www.wocat.org](http://www.wocat.org)) tool.

## Problem, Objectives and Constraints

### Problems

- Issues of access to water are often contentious; communities often quarrel over water rights.
- A lack of irrigation water and agricultural inputs results in poor agricultural productivity and food insecurity.
- A weak economy, along with the decreasing appeal of subsistence agriculture, leads to high migration (especially young men).
- Growing water demands for domestic and agricultural use and diminishing water sources (climate change) may aggravate water conflicts.
- Dubious sustainability of irrigation systems: a significant part of the existing schemes in Nepal are not fully functional, indicating a lack of proper management and maintenance.






### Aims/objectives

- Establish inclusive implementation of irrigation schemes at the community level; ensure an equitable and efficient use of water resources.
- Improve access to water for irrigation to increase agricultural productivity, improve livelihoods, and reduce dependencies on external support and migration.
- Improve functionality and operational lifespan of implemented irrigation schemes by enhancing local ownership and capacitating local service providers and User Committees to operate, repair, and maintain the schemes.

## Constraints Addressed

Major	Constraint	Treatment
Institutional/Social	Lacking sense of ownership and entitlement by communities to equitably use irrigation facilities and to share the responsibility for effective operation and maintenance	Apply a participatory planning and implementation approach; gender and ethnically balanced UCs are responsible for implementation process as well as operation and maintenance; regular public audits; in-kind contribution by community; advocate equitable water sharing policies
Technical	Lack of skills to manage and maintain irrigation schemes	Capacity development of UC and local service providers
Financial	Challenge to secure long-term funding for sustainable O&M	Introduce community O&M fund managed by the UC
Minor	Constraint	Treatment
Environmental	Depletion of water sources may aggravate water scarcity	Source conservation schemes to improve natural recharge rates; consider rainwater harvesting

## Participation and Decision Making

Stakeholders/target groups					Contribution to costs:	Construction	Approach
					Local Government (Village/District Development Committee)	2 - 5%	0%
Users, individual/group	Local service providers, NGOs, consultants	Village/district development committees (VDCs/DDCs)			Local Community	10 - 15%	0%
					International non-governmental organisation	80 - 90%	100%
					<b>Total</b>	<b>100%</b>	<b>100%</b>
					For canal and pond irrigation schemes (QT NEP 40, 41 and QT NEP 43, 42), approach costs (i.e., training, social mobilisation, and technical support for implementation) make up about 10-15% of the total scheme costs. Total average scheme costs amount to USD 15,000 (canals) and USD 11,000 (ponds), which includes approach-related expenses of roughly USD 1,500.		

**Decisions on choice of the Technologies:** Initial proposal made by local community to VDCs. Local service providers then compile detailed technical and social surveys, design and cost estimates, which form the basis for project evaluation.

**Decisions on method of implementing the Technologies:** Made by local community based on proposal of technical and social experts.

**Approach designed by:** The Local Infrastructure for Livelihood Improvement (LILI) project of HELVETAS Swiss Intercooperation

**Implementing bodies:** The User Committee (UC) in partnership with local service providers and backstopping by VDC/DDCs and LILI/HELVETAS Swiss Intercooperation.

## Land User Involvement

Phase	Involvement	Activities
Initiation/motivation	Interactive	During community meetings, a joint decision to go forward with the implementation of a specific scheme is taken. After recommendation by the VDC, the community selects/elects a UC, which is responsible for the whole implementation process.
Planning	Interactive	The UC is in charge of the detailed planning and implementation process of a particular scheme. Public hearings during the preparation phase disseminate information on the implementation plan and respective roles and responsibilities; they also act as forums to gain approval of the entire community.
Implementation	Interactive/external support	The community contributes to construction with labour and local construction materials. Public reviews during the construction phase assess progress and ongoing works.
Monitoring/evaluation	Interactive/passive	Public audits are conducted after completion: all members of the community assess the quality of the completed work, review expenditures/contributions by the programme and the community, and evaluate whether the scheme meets the set standards. Follow-up visits with functionality inspections are conducted by project staff during the first three years after construction.

**Involvement of women and disadvantaged groups:** Quotas are used as one means of ensuring the participation of women (minimum 40%) and disadvantaged groups (proportional to their local population), backed by pro-active measures such as the engaging of local women as social mobilizers, small group discussions to bring out sensitive issues, and training women in non-stereotypical roles such as tap and tank maintenance, and water distribution.

**Involvement of disadvantaged groups:** Disadvantaged groups (Dalit and Janajati among others) participate in all activities and committees in numbers proportional to their share of the overall population.

Phase	Steps	Responsibility	The eight steps of the implementation process
Preparation	1	Demand submission by communities to VDCs directly or by service providers, line agencies or others through DDC, first screening.	
	2	First socio-economic and technical survey of screened demands and prioritization of projects	
Survey, Design & Formalisation of the Project	3	Social and technical Detail Survey, Design, Cost Estimate including agricultural cropping areas. <ul style="list-style-type: none"> <li>Evaluation of prioritized projects.</li> <li>Linkage to Agricultural Service Providers</li> </ul>	
	4	<ul style="list-style-type: none"> <li>Public Hearing for Communicating Results of Detail Survey to the Community and VDC concerned</li> <li>- Publication of Design of Irrigation Scheme, Agricultural Plan, Contributions &amp; Cost Sharing</li> <li>- Formation of User Committee (UC)</li> <li>- Preparation of Operation &amp; Maintenance Fund System (OMF/S)</li> <li>- Signing of Community Agreement</li> <li>Construction Management Training</li> </ul>	
Construction & Finalization	5	Collection of local materials and start of excavation of trenches, ponds or foundations (depends upon the nature of the project). Monitoring and Verification of required community contribution.	
	6	Supply of non-local materials to agreed road-head and subsequent transportation of the site Simultaneous completion of excavation	
	7	Project construction, site supervision and public review	
	8	Project completion commissioning and reporting including public audit	

It is assumed that each project can be completed within 1 ½ years including preparation. Detailed surveys of irrigation projects need to be done in the driest periods – i.e. in the pre-monsoon months of mid-February to mid-May

## Technical Support

**Training/awareness raising:** Social mobilization and awareness-raising orientations are key components of the approach: public hearings and audits are held to gain the community people approval, but also to build shared commitment and ownership to use and maintain schemes responsibly.

On-site training sessions are organized for the members of the User Committee (training on management issues during preconstruction/construction/post-construction phases of the scheme) and caretakers (training operation, monitoring, and maintenance of the schemes). The two selected caretakers also become of part of the construction crew, preparing them to identify and execute repair and maintenance works later on. Local service providers (NGOs and private organizations) are capacitated with training events on social mobilization, facilitation of participatory processes, basic conflict mediation techniques, and technical expertise.

**Advisory service:** Local service providers and resource persons provide FMIS users agricultural, technical, and social advisory services and regularly backstop the UCs in all matters related to scheme implementation. The local service providers are jointly selected and hired through an open bidding process run by the DDC and the programme.

**Research:** Research is not a major focus of the approach. However, functionality and quality inspections are conducted annually in the first three years after construction, focussing on the functional status of physical structures and institutional mechanisms (activity of UC and scheme caretakers, collection and utilization of O&M Fund, established water sharing practices). In specific schemes, cost-benefit analyses are carried out. Findings of these inspections inform general updates of the approach, as well as specific adjustments to different local contexts and needs.

## External Material Support/Subsidies

**Labour:** The majority of unskilled labour works is carried out by the community (trench digging, pond excavation, collection and portering of local materials), while all skilled labour and selected unskilled labour works (intake construction, idle length of main canal/pipe) are organized and managed by the community and paid for by the programme. To this end, the programme funds are channelled through the District Development Funds (DDF) of the District Development Committees.

**Inputs:** Local materials (stone, sand, aggregate, wood, bamboo) are contributed by the community. The programme bears the road transportation costs for sand and provides other required construction materials (cement, reinforcement bars, pipe fittings, and tools) up to the nearest motorable road-head. This, if applicable, is done through community procurement.

**Credit:** No credit is provided.

**Support to local institutions:** The programme extends technical assistance to DDCs and VDCs for the evaluation of community project proposals and the procurement of local service providers and backstops the whole implementation process. As mentioned above, training workshops are organized for UCs and local service providers.

Monitored aspects	Methods and indicators
Biophysical	None
Technical	Final commissioning after completion of construction and annual function and quality inspections during the first three years after construction monitor the status of physical structures and the hydraulic flow in the scheme.
Institutional	Function and quality inspections include institutional mechanisms: activity of UC, collection and utilization of O&M Fund, activity of trained service providers, as well as established and complied water sharing policies.
Sociocultural	Detailed socioeconomic assessment during preparation phase. No dedicated follow-up monitoring. Public hearings/audits before, during, and after implementation ensure transparency and community participation. Ad hoc observations of attitude during follow-up visits of project staff.
Economic/production	Detailed socioeconomic assessment during preparation phase. Post-implementation production-income and cost-benefit analyses are conducted once within the first three years after construction.
No. of land users involved	During public review and final commissioning, community contribution and participation is assessed.
Management of Approach	Final reports of every implemented scheme and annual reports of the programme conclude on allocation of resources.



## Monitoring and Evaluation

**Changes as result of monitoring and evaluation:** Functionality surveys revealed that a common problem with pond schemes was rupturing of the silpaulin sheets and reluctance of the user committee to replace them. As a simple cost-effective protection measure, jute bags were filled with a mixture of soil and cement to cover the plastic membrane sheets. Moreover, larger ponds (>150 m<sup>3</sup>) were found to have a higher failure rate. Hence, in later project stages, the programme stepped away from large ponds and turned toward implementing batteries of smaller ponds (30 m<sup>3</sup> – 60 m<sup>3</sup>) instead.

## Impacts of the Approach

**Improved water resources management:** The approach instils feelings of shared responsibility to use water resources in an equitable and sustainable manner.

**Adoption by other users/projects:** DDCs and Central Government agencies consider the approach as relevant since it provides a viable model for addressing the priorities of marginalized farmers. It is in line with the District Development Plans and with policy options being discussed for the new Agriculture Development Strategy. ADB-funded Community Irrigation Project adopted the pond technology.

**Improved livelihoods/human well-being:** The irrigation schemes helped to increase food security, health, and household income through increased and diversified production. This makes farmers less dependent on migration. Most farmers mention that the increase in income also allows for better schooling of the children. The availability of water (for irrigation) is of outstanding importance for improving livelihoods of farmers. For other inputs to agricultural production, they are less dependent on external support.

**Improved situation of disadvantaged groups:** Socially and economically disadvantaged groups are the primary target group of the programme. They participate in all parts of the process on equal terms.

**Poverty alleviation:** The additional irrigation water supply is often used to grow vegetables and cash crops. If market access is established, the latter may contribute to considerable increments in income. Net annual incremental benefits for an average household range between USD 60 and 80 against a baseline of USD 25. Scheme caretakers also gain an additional source of income.

**Training, advisory service, and research:** The offered training and advisory services effectively capacitate UCs and local service providers to implement, monitor, and maintain the irrigation schemes. However, this increased capacity does not always result in well-managed and -maintained schemes, as retention of caretakers, continuing activity and renewal of the UC, and mobilisation and apposite use of the O&M funds are challenging aspects in the post-construction phase.

**Land/water use rights:** UCs are introduced to handling water rights issues and conflicts during construction management, operation, and maintenance trainings. As a result, most of the UCs have registered their schemes and water sources with either the District Water Resource Committee (DWRC) and/or the Irrigation Division office. The schemes' tailor-made water distribution and maintenance policies are governed by equitable principles, i.e., water is allocated to households either equally or proportionately (proportionate to cultivated land).

**Long-term impact of subsidies:** No subsidies are part of the approach. UCs are expected to finance maintenance works with the O&M fund established during implementation. Households contribute to the O&M fund either equally or proportionally (to allocated water). While most of the schemes have adequate funds for minor repairs and maintenance, regular collection of O&M funds is not practiced in all communities, which poses a concern for long-term functionality.

## Concluding Statements

**Main motivation of land users to implement SLM:** The irrigation schemes help to increase food sufficiency. Increased and diversified production improves the diet, and through marketing of surplus, farmers can increase income.

**Sustainability of activities:** Proper functioning of irrigation schemes is determined by both the quality of physical structures and the effectiveness of the institutional mechanisms to properly operate, monitor, and maintain the schemes. While the schemes have a robust physical foundation, a key issue toward true sustainability is the establishment of institutional mechanisms related to operation and maintenance (UC, O&M fund, caretakers), which remain active throughout the designated lifespan of each scheme.

Strengths and → how to sustain/improve	Weaknesses and → how to overcome
The approach improves food sufficiency, household income, and health. The improvements are tangible enough for villagers to reduce migration, in particular among the more marginalized groups who, for financial reasons, usually depend on the more "precarious" migration options. The improvements of livelihoods are so substantial that farmers have a genuine interest in maintaining them → institutionalize the approach by developing a FMIS-subsector, which requires focused action by the government to coordinate the FMIS subsector, combined with coordinated donor support to build capacity at the central and district level. Broaden the funding of FMIS by integrating related governmental funds and attracting new donors to subscribe to the approach.	Institutional mechanisms related to operation and maintenance (UC, O&M fund, caretakers) at the local level are less active during post-construction phases. This could adversely affect the long-term functionality of schemes. → UCs control or mobilize other institutional components; therefore, measures to further activate the UCs are crucial to keep the entire mechanism active in the long run. Measures to make UCs more effective include: (i) reform UC every two years and provide training to new members; (ii) build UC capacity by strengthening linkages with local bodies and other resource organizations; (iii) become member of the National Federation of Irrigation Water Users' Association Nepal (NFIWUAN) and other networks in the sector; and (iv) increase UC income by better mobilizing the O&M fund.
Community owns process by participating in planning and contributing to implementation. Approach enhances feelings of ownership and instils a sense of shared responsibility to utilize the resources in an equitable and sustainable manner. → investigate how the process can be simplified and made more cost-effective to facilitate replication. Further capacitybuilding of disadvantaged groups may enable them to participate more actively.	Migration of key UC members, ineffective retention and remuneration of caretakers, as well as major repair works, which are beyond the resource mobilization capacity of the community, may result in quiescent O&M mechanisms and functionality failures → retain caretakers in scheme area by offering refresher courses and creating opportunities to offer their skills in other programmes. Secure long-term post-construction support so that UC and service providers remain active for the scheme's whole service life. As these issues are of a long-term nature, the related support should be institutionalized at the governmental level.
Approach is economically viable; the implemented schemes exhibit a positive return on investment → to maximize the benefits, review the needs of farmers in terms of backward and forward linkages within the agriculture value chain.	Conflicts may emerge when tail-end users receive less water than originally allotted due to diminishing water sources → capacitate local service providers to help review and adapt water sharing policies during follow-up visits.

**Key references:** SWISS Water & Sanitation NGO Consortium (2013) Beneficiary Assessment of WARM-P, Nepal. Lalitpur, Nepal: WARM-P/HELVETAS; HELVETAS (2013) The Effectiveness and Outcomes of Approaches to Functionality of Drinking Water and Sanitation Schemes. Lalitpur, Nepal: WARM-P/HELVETAS

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