

**Document of
The World Bank**

Report No.: 44438

PROJECT PERFORMANCE ASSESSMENT REPORT

NEPAL

**IRRIGATION SECTOR PROJECT
(CREDIT 3009-NEP)**

June 30, 2008

*Sector Evaluation Division
Independent Evaluation Group (World Bank)*

Currency Equivalents

Currency Unit = Nepalese Rupee

1996 (July)	US\$1 = NRs. 55.7
2004 (January)	US\$1 = NRs. 73.0
2007 (September)	US\$1 = NRs. 65.8

Abbreviations and Acronyms

ADB	Asian Development Bank
CAS	Country Assistance Strategy
CDA	Community Development Activities
DFID	Department for International Development
DHM	Department of Hydrology and Meteorology
DOA	Department of Agriculture
DOI	Department of Irrigation
ERR	Economic Rate of Return
EU	European Union
FINNIDA	Finnish International Development Agency
FMIS	Farmer-managed irrigation systems
HMGN	His Majesty's Government of Nepal
ICR	Implementation Completion Report (of the World Bank)
IDA	International Development Association
IFAD	International Fund for Agricultural Development
ILC	Irrigation Line of Credit
ILO	International Labor Organization
ISF	Irrigation Service Fee
ISP	Irrigation Sector Project
MIS	Management Information System
M&E	Monitoring and Evaluation
MoAC	Ministry of Agriculture and Cooperatives
NGO	Non-governmental Organization
NPC	National Planning Commission
NPV	Net Present Value
O&M	Operation and Maintenance
OMIS	Operational Management Information System
PAP	Project-affected person
PPAR	Project Performance Assessment Report
QAG	Quality Assurance Group
SAR	Staff Appraisal Report
SMIP	Sunsari Morang Irrigation Project
UNDP	United Nations Development Program
VDC	Village Development Committee
WUC	Water User's Committee
WUCC	Water User's Central Committee
WUG	Water User Group

Fiscal Year

Government July 16 – June 15

Director-General, Evaluation	:	Mr. Vinod Thomas
Director, Independent Evaluation Group (World Bank)	:	Ms. Cheryl Gray
Manager, Sector Evaluation Division	:	Ms. Monika Huppi
Task Manager	:	Mr. John Heath

IEGWB Mission: Enhancing development effectiveness through excellence and independence in evaluation.

About this Report

The Independent Evaluation Group assesses the programs and activities of the World Bank for two purposes: first, to ensure the integrity of the Bank's self-evaluation process and to verify that the Bank's work is producing the expected results, and second, to help develop improved directions, policies, and procedures through the dissemination of lessons drawn from experience. As part of this work, IEGWB annually assesses about 25 percent of the Bank's lending operations through field work. In selecting operations for assessment, preference is given to those that are innovative, large, or complex; those that are relevant to upcoming studies or country evaluations; those for which Executive Directors or Bank management have requested assessments; and those that are likely to generate important lessons.

To prepare a Project Performance Assessment Report (PPAR), IEGWB staff examine project files and other documents, interview operational staff, visit the borrowing country to discuss the operation with the government, and other in-country stakeholders, and interview Bank staff and other donor agency staff both at headquarters and in local offices as appropriate.

Each PPAR is subject to internal IEGWB peer review, Panel review, and management approval. Once cleared internally, the PPAR is commented on by the responsible Bank department. IEGWB incorporates the comments as relevant. The completed PPAR is then sent to the borrower for review; the borrowers' comments are attached to the document that is sent to the Bank's Board of Executive Directors. After an assessment report has been sent to the Board, it is disclosed to the public.

About the IEGWB Rating System

IEGWB's use of multiple evaluation methods offers both rigor and a necessary level of flexibility to adapt to lending instrument, project design, or sectoral approach. IEGWB evaluators all apply the same basic method to arrive at their project ratings. Following is the definition and rating scale used for each evaluation criterion (additional information is available on the IEGWB website: <http://worldbank.org/ieg>).

Outcome: The extent to which the operation's major relevant objectives were achieved, or are expected to be achieved, efficiently. The rating has three dimensions: relevance, efficacy, and efficiency. *Relevance* includes relevance of objectives and relevance of design. Relevance of objectives is the extent to which the project's objectives are consistent with the country's current development priorities and with current Bank country and sectoral assistance strategies and corporate goals (expressed in Poverty Reduction Strategy Papers, Country Assistance Strategies, Sector Strategy Papers, Operational Policies). Relevance of design is the extent to which the project's design is consistent with the stated objectives. *Efficacy* is the extent to which the project's objectives were achieved, or are expected to be achieved, taking into account their relative importance. *Efficiency* is the extent to which the project achieved, or is expected to achieve, a return higher than the opportunity cost of capital and benefits at least cost compared to alternatives. The efficiency dimension generally is not applied to adjustment operations. *Possible ratings for Outcome:* Highly Satisfactory, Satisfactory, Moderately Satisfactory, Moderately Unsatisfactory, Unsatisfactory, Highly Unsatisfactory.

Risk to Development Outcome: The risk, at the time of evaluation, that development outcomes (or expected outcomes) will not be maintained (or realized). *Possible ratings for Risk to Development Outcome:* High, Significant, Moderate, Negligible to Low, Not Evaluable.

Bank Performance: The extent to which services provided by the Bank ensured quality at entry of the operation and supported effective implementation through appropriate supervision (including ensuring adequate transition arrangements for regular operation of supported activities after loan/credit closing, toward the achievement of development outcomes. The rating has two dimensions: quality at entry and quality of supervision. *Possible ratings for Bank Performance:* Highly Satisfactory, Satisfactory, Moderately Satisfactory, Moderately Unsatisfactory, Unsatisfactory, Highly Unsatisfactory.

Borrower Performance: The extent to which the borrower (including the government and implementing agency or agencies) ensured quality of preparation and implementation, and complied with covenants and agreements, toward the achievement of development outcomes. The rating has two dimensions: government performance and implementing agency(ies) performance. *Possible ratings for Borrower Performance:* Highly Satisfactory, Satisfactory, Moderately Satisfactory, Moderately Unsatisfactory, Unsatisfactory, Highly Unsatisfactory.

Contents

Principal Ratings	v
Key Staff Responsible.....	v
Preface	vii
Summary	ix
1. Sector Background	1
Agriculture.....	2
Water Resources and Irrigation in Nepal	3
Support for water Resources and Irrigation Development	4
2. Project Design	6
Objectives, components and costs	6
3. Implementation	10
Implementing Arrangements	10
Implementation Experience	10
Monitoring and Evaluation	10
4. Project Ratings.....	11
Relevance of Objectives and Design	11
Efficacy	15
Efficiency	25
Outcomes	26
Risks to Development Outcomes	27
Safeguards	27
Bank Performance	28
Borrower Performance	29
5. Lessons.....	30

<p>This report was prepared by George T. K. Pitman (Consultant) who visited Nepal in November-December 2007. Soon-Won Pak provided administrative support.</p>
--

Annex A. Basic Data Sheet.....	33
Annex B. Nepal - All Externally-funded Irrigation and Agriculture Projects	37
Annex C. Economic Analysis.....	39
Annex D. Borrower Comments	41

Principal Ratings

	<i>ICR*</i>	<i>ICR Review*</i>	<i>PPAR</i>
Outcome	Satisfactory	Moderately Satisfactory	Moderately Unsatisfactory
Institutional Development Impact**	Substantial	Modest	nr
Risks to Development Outcome	nr	nr	Substantial
Sustainability***	Unlikely	Unlikely	nr
Bank Performance	Satisfactory	Satisfactory	Moderately Unsatisfactory
Borrower Performance	Satisfactory	Satisfactory	Moderately Unsatisfactory

* The Implementation Completion Report (ICR) is a self-evaluation by the responsible operational division of the Bank. The ICR Review is an intermediate IEGWB product that seeks to independently verify the findings of the ICR.

** As of July 1, 2006, Institutional Development Impact is assessed as part of the Outcome rating.

*** As of July 1, 2006, Sustainability has been replaced by Risk to Development Outcome. As the scales are different, the ratings are not directly comparable.

nr = not rated

Key Staff Responsible

<i>Project</i>	<i>Task Manager/Leader</i>	<i>Division Chief/ Sector Director</i>	<i>Country Director</i>
Appraisal	Ohn Myint	Shawki Barghouti	Hans M. Rothenbuhler
Completion	Shyam S. Ranjitkar	Adolfo Brizzi	Kenichi Ohashi

Preface

This is the Project Performance Assessment Report (PPAR) on the Nepal Irrigation Sector Project (Credit 3009-NEP). The Project, estimated at appraisal to cost US\$103.01 million, was approved in November 1997 for an IDA Credit of US\$79.77 million equivalent. At mid-term review in August 2000 the loan was reduced through cancellation of US\$8.01 equivalent because of slow implementation, reduction of unit costs and project scope, and depreciation of the Nepalese Rupee against the SDR. The project closing date had two extensions totaling 24 months in order to complete physical works delayed by the effects of the Maoist insurgency in the Western, Mid-Western and Far-Western Regions. CIDA allocated US\$0.77 million through a parallel grant to assist technical assistance for the water strategy component. Total project costs at project closure in June 2004 (excluding the CIDA grant) were US\$90.86 million of which IDA provided US\$69.10 million equivalent. The government (including the contribution from communities) contributed US\$21.16 million.

This report is based on the review of the respective Memorandum and Recommendations of the President and Project Appraisal Report, credit and legal documents, project files at the World Bank's Headquarters and in Kathmandu, the Implementation Completion Report (ICR) and discussions with Bank staff in Washington and Kathmandu.

An Independent Evaluation Group (IEG) mission visited Nepal in November-December 2007 to discuss the effectiveness of the Bank's assistance with the Government, development partners, implementing agencies, and beneficiaries. The cooperation and assistance of central government officials, management and staff of implementing agencies and other parties concerned are gratefully acknowledged.

The project was selected for assessment to inform the IEG global evaluation of agricultural lending. Irrigation has long been used as a vehicle to expand the agricultural production base in Nepal and facilitate intensification of land use. The Bank has assisted Nepal in developing its irrigation for the last 20 years and this sector project provides an opportunity for an assessment of the effectiveness of the last phase of that lending.

Following standard IEG procedures, copies of the draft PPAR were sent to government officials for comments. These comments are included in Annex D.

Summary

Nepal's principal international partners for irrigation development have been the World Bank and the Asian Development Bank. Since the 1970s the World Bank has approved 13 credits totaling \$355 million for irrigation-specific projects and the Asian Development Bank has approved nine credits totaling \$160 million. In the late 1980s a long-term strategy for the sector and a shorter-term public investment program promoted key reforms through a Master Plan for the irrigation subsector. While it accepted that government-management of large irrigation projects should continue, it was proposed that water user groups should be created to take full responsibility for the operation of smaller schemes by year 2000, and this became the centerpiece of government's irrigation policy. To provide incentives for turnover to beneficiaries the government agreed that small schemes would be rehabilitated, priority being given to a demand-driven approach preconditioned on formation of water user groups, financial viability of operations and maintenance, and cost-sharing arrangements.

In 1988 government requested assistance from its external funding partners to scale-up the approach through an irrigation sector project (ISP). Both the World Bank and the Asian Development Bank took this as an opportunity to support reform of the small and medium-sized irrigation subsector that accounts for the bulk of Nepal's irrigation infrastructure and serves the poorest communities. Within the Bank the ISP concept was piloted with technical assistance from the UNDP through the Irrigation Line of Credit that disbursed US\$16 million through two ongoing Bank-assisted projects. Successful outcomes led to the full-fledged Irrigation Sector Project (1997-2004). The ISP focused on assisting development of Nepal's water resources strategy and Water Plan, and improving the productivity of farmer-managed systems in the three western regions of Nepal and the Sunsari Morang Irrigation Project (SMIP) in eastern Nepal.

The *outcome* of the ISP is rated moderately unsatisfactory. The objective to enable sustainable development and management of Nepal's water resources by means of a comprehensive and integrated national water management policy was and remains substantially relevant to Nepal's needs. The objective to increase the productivity and sustainability of irrigation systems was and remains highly relevant. Irrigation is a mainstay of the agricultural economy and is second only to fertilizer as a source of agricultural growth. Bank sector work in 1991 found that "in the short to medium term agriculture presents the highest potential for growth and poverty alleviation, as the vast majority of the people, and especially of the poor, live in rural areas and draw their livelihood from agriculture. Agriculture remains crucial; other sectors are far less relevant." However, the decision to include the unfinished SMIP within the ISP reduced the focus on developing non-governmental and private sector institutions to assist demand-led development and measures to ensure irrigation scheme sustainability in remote areas. This inclusion also overlooked the fundamentally different design and institutional issues of the public and private irrigation subsectors. Institutionally the SMIP component supported a replication of the irrigation agency's top-down approach that retrofitted beneficiary participation after completion of design and construction of the secondary distributory canals.

The ISP led to adoption of a new National Water Strategy in 2002 and a National Water Plan in 2005. Despite these significant achievements, and the passing of legislation to enable their implementation, Nepal still lacks the capacity to engage in integrated and comprehensive water resources management. Intersectoral coordination remains almost non-existent and each sector agency continues to plan water resources management and development independently.

Agricultural production from irrigation systems improved. While links with agricultural extension were planned these were generally ineffective due to poor cooperation and coordination. ISP's physical targets for irrigated area improvement or extension were exceeded for farmer-managed irrigation schemes but not met for either groundwater development (because of reduction of subsidies) or public irrigation schemes. Within the large-scale public SMIP overall cropping intensity increased but there was no discernible impact on crop yields. In contrast crop yields of ISP's small-scale farmer-managed schemes increased substantially. How far these outcomes are attributable to the project, however, is unclear. There is no "without project" counterfactual and monitoring and evaluation was modest at best. Exogenous factors benefiting the project outcomes included trade policy reforms that increased agricultural exports, commodity market deregulation that encouraged private sector participation and investments, particularly for fertilizer, and upgraded and extended road networks that improved access for inputs and marketing.

The objective of increasing the sustainability of irrigation systems was partially achieved. In small-scale schemes farmers proved willing to contribute as needed in cash or kind for both capital expenditure and for group-managed operations and management. This was not the case for the large-scale public SMIP. Although irrigation service fee recovery increased greatly during project implementation it plummeted to less than two percent of billings when project-financed technical assistance ceased. This was a repeat of the pattern in earlier Bank-financed support for public sector irrigation. Current levels of public budget for operation and maintenance meet less than half of requirements and deferred maintenance in SMIP is accumulating.

Overall efficiency is rated as modest. Despite the investment in the water resources management and policy component an additional US\$4 million is now needed to complete the capacity-building exercise under the approved follow-on project. In contrast the cost of the small-scale farmer-managed scheme was less than two-thirds of expectations and the area covered was substantially in excess of appraisal targets. Economic rates of return (ERR) based on a small non-random sample range between 18 and 22 percent. The findings on efficiency for SMIP are less sanguine and efficiency is rated negligible for agriculture productivity improvements. The ERR for the public sector component is less than one percent. The overall ERR of the project, weighted by component costs, is 10 percent.

Risks to development outcomes are rated as substantial. The National Water and Energy Commission has insufficient staff with a broader planning perspective, remains focused on hydro-power and electricity generation, and neglects inter-sector coordination. Institutional risks to the development effectiveness of small-scale farmer-managed schemes are modest. However, physical risks are high—mainly from landslides, earthquakes and floods. The risks to the SMIP are substantial. Sedimentation within the

irrigation system sap farmers' willingness to cooperate on maintenance and interfere with timely and adequate supply of water. The Department of Irrigation's focus on the civil engineering to the detriment of institutional development poses a substantial risk.

Bank performance is rated as moderately unsatisfactory. Project design was flawed because the importance of public sector institutional reform was overlooked and the mix of components lowered effectiveness. More attention should have been given to monitoring and evaluation. Borrower performance is also rated moderately unsatisfactory. Once the project had been agreed government performed poorly in setting up the higher-level coordinating committees—which proved to be ineffective. The national irrigation agency remains a top-down organization that tends to set performance targets for public sector irrigation schemes without building sustainable local capacity, particularly farmer organizations, to undertake operation and management of irrigation projects. Poor financial management was a systemic problem.

Experience with this project confirms five IEG lessons:

- A more comprehensive approach is required to maximize benefits from improved agricultural water management. Water is only one input; institutional development and capacity building are equally important, as are agricultural inputs and marketing.
- Donors need to work together more effectively, with each working to their comparative advantage, the aim being to achieve a harmonized sector-wide approach that avoids duplication and contradictions. In Nepal this assessment found while it made sense for donors' projects to be geographically differentiated this was at the expense of sector-wide coordination and mutual learning.
- Do not lose sight of project beneficiaries. Too much attention to water resource policy and management deflected attention from the need to reform public sector management of large-scale irrigation projects and improve service-delivery. As a result the longer-term sustainability of the public irrigation subsector and farmers' livelihoods dependent on it are at high risk in Nepal.
- Non-governmental organizations are generally better at working with farmers than government to increase the productivity of small-scale farmer-managed irrigation systems. The project clearly demonstrated that partnership with NGOs enabled agricultural productivity improvements in remote locations where the poorest rural communities are located.
- Greater attention should be given to monitoring and evaluation to ensure informed policy-making and decision-making. In Nepal the scope of data collection and storage of data on agricultural input and output performance information significantly contracted during the transition from public to private service provision.

Vinod Thomas
Director-General
Evaluation

1. Sector Background

1. A landlocked mountainous country, Nepal is the poorest country in South Asia and the 12th poorest in the world. The population is almost evenly split between the mountains/hills and the low-lying flat Terai plains bordering India that comprise about a quarter of the total land area. Four-fifths of the population is rural. Nepal's population grew from 19 million to over 27 million in the period 1991-2005 at a mean decadal rate of 2.3 percent; the urban population doubled. Over the same period per capita annual income increased from US\$200 to US\$270 and the incidence of absolute poverty declined from 42 percent to 31 percent.¹ Recent analysis indicates that as much as one-third to one-half of the reduction in the poverty rate is due to the increase in remittances, rather than increased local productivity.² Even so, 35 percent of the rural population remained below the absolute poverty line in 2003-04.³ Rural poverty has caused a steady exodus of people from the mountains and hills to the Kathmandu valley and the Terai, as well as fueling emigration. Despite substantial investment in universal education since 1971 literacy remains low – only 49 percent of those aged 15 or older were literate in 2004. Dependence on foreign aid and grants has systematically increased. In 1975-80 foreign aid provided 48 percent of development expenditures; by 1990 this had increased to 71 percent.

2. Natural resource limitations, mountainous terrain, floods and landslides, and the paucity of all-weather roads—all combined to constrain the development of markets for agriculture and industry.⁴ Poverty and caste discrimination increased social exclusion. Agricultural sector productivity almost stagnated and rural growth was slow. Together these factors contributed toward technological backwardness, rural illiteracy, and an unstable political situation that dampened economic growth.

3. Political instability has hindered development since the early 1990s. Nepal became a constitutional monarchy and multiparty democracy in 1990. After internal dissent caused a hung parliament the Nepali Congress government called a general election in 1994, after which the Communist Party of Nepal (Unified Marxist-Leninist) emerged as the biggest party. Resistance to radical reform in parliament caused the more extreme Maoists to start a 'people's war' in 1996 to end the constitutional monarchy, a movement fuelled by public spending that privileged ruling elites and urban centers, gender, ethnic and caste-based exclusion.⁵ Over the period 1996-2004 the insurgency affected most rural areas, particularly in the mid- and far-western regions, and killed

1. 2008. World Development Indicators database. Millennium Development Goals. The data for 1994/95 is an estimate while the latter data are drawn from the Nepal Living Standards Surveys of 1999/2000 and 2003/04. The reduction in headcount poverty rate

2. Central Bureau of Statistics/World Bank/DFID/ADB. 2006. *Resilience Amid Conflict*.

3. 2006. Nepal in Figures. Central Bureau of Statistics, National Planning Commission Secretariat.

4. There were about 10,109 km of roads in 1996 of which 5,871 km were surfaced. The pace of roadbuilding increased during the late 1990s but stagnated after 2002 because of the Maoist insurgency and conflict in rural areas. By 2006 the national road network was 17,279 km of which just 4,911 km were black-topped. Even so, 14 of Nepal's 75 districts do not have roads suitable for motor vehicles. There is only 27.3 km of railway connecting Nepal to India's rail network and ports.

5. DFID/World Bank. 2006. *Unequal Citizens: Gender, Caste and Ethnic Exclusion in Nepal*.

about 10,000 people. And in the period until 2001 there were 11 short-lived coalition governments. The assassination of the monarch in 2001 and the breakdown of the cease-fire agreement with Maoists in 2003 led to further instability and government by royal decree in 2005. The civil unrest created by this action finally unified political parties into a coalition that resolved to end the monarchy and rewrite the constitution—actions approved by parliament in December 2007. For Nepal’s development partners the continuous political uncertainty since 1996 raised questions about the most effective assistance modalities given the weakness of His Majesty’s Government of Nepal (HMGN), a problem made more difficult by the constitutional crisis after 2003.

4. Recent economic performance has been poor. Liberalization of the economy, following several IMF-Bank stabilization and structural adjustment operations in the late 1980s and early 1990s, helped boost annual GDP growth to 5 percent between 1996 and 2001.⁶ But from 2001 to 2006 growth slowed, averaging only 2.1 percent per year. Agriculture, the mainstay of the economy, is mostly subsistence-oriented (except in the Terai). While accounting for about 80 percent of employment in the mid-1990s and one-half of GDP, agriculture accounted for three-quarters of employment and about 38 percent of GDP in 2005/06. Industrial development is severely constrained by the small domestic market and Indian competition and produces mostly low-technology consumer goods, such as carpets, garments and handicrafts. Over the period 1994-2006 industrial output shrank from 9.3 percent to 7.5 percent of GDP, dampened by the increasingly risky investment climate. Similarly, after growing steadily in the early 1990s, tourism fell sharply after 2001 because of the insurgency. In response to the civil conflict and the prospect of better opportunities abroad, as many as one million Nepalese took overseas work. Remittances accounted for 12 percent of GDP in 2004.⁷

Agriculture

5. Agricultural growth over the period 1970-1990 averaged only 3 percent or about half a percentage point faster than population.⁸ Half of the cultivated area is in paddy (the main irrigated crop), which grew at a scant 1.3 percent a year. In contrast, the growth of wheat, potato and sugarcane accelerated. Agriculture remains primarily subsistence-oriented. Only a small proportion of farms use modern technology, and most major crops and other agricultural products have low yields. Of the four major crops except for sugarcane, Nepal had higher yields than all other South Asian countries in the early 1960s, but has had comparatively lower yields since the early 1990s. Moreover, the 81 percent of the active labor force employed in agriculture was responsible for only 45 percent of GDP in 1990/91—the value added per capita by other sectors was five times that of agriculture.

6. Non-agricultural sectors grew at 6.3 percent in 1996-2000, agriculture grew more slowly at 3.2 percent.

7. The Economist Intelligence Unit, 2007. The share of households receiving remittance rose from 23 percent in 1995-96 to 32 percent in 2003-04.

8. HMNG. 1995. Nepal Agricultural Perspective Plan. This plan was extremely important as it showed that key agricultural statistics generated by the Department of Food and Agricultural Marketing Services and the agricultural GDP generated by the Central Bureau of Statistics were inaccurate for the period 1975-1992. In particular revisions by the National Planning Commission reduced the rate of agricultural growth over the period 1980/81 to 1990/91 from 5.03 to 2.30 percent for food grain crops and for cash crops from 5.37 to 2.15 percent. Thus the share of agriculture in GDP fell from 52 percent to 45 percent in 1991/92.

6. By 1990/91 the crop sector contributed about 60 percent of agricultural GDP. With all land potential fully developed growth was driven mainly by increased use of fertilizer and irrigation. Fertilizer accounted for about 44 percent of the growth in agricultural GDP, irrigation 15 percent and varietal improvement less than one percent.⁹ Officially reported fertilizer use grew at the rate of 12 percent per year from 1980/81 to 1992/93.¹⁰ Even so, in per hectare terms the level of application is low compared with other countries in the region: one-third to one-quarter that of Bangladesh, Pakistan, and Sri Lanka and 10 percent that of China.¹¹ At present yields, rice, wheat and maize alone are estimated to be removing 700,000 tons of nutrients annually.¹² Commercial fertilizer was replacing little more than 10 percent of that annual loss.

Water Resources and Irrigation in Nepal

7. Nepal has abundant water resources capable of irrigating 8 to 10 million hectares and providing 43,000 MW of hydropower. About 40 percent of the nation's 2.6 million ha of potentially irrigable lands are developed. Less than one percent of the hydropower potential is utilized and this supplies 85 percent of national demand.¹³ Water for domestic consumption is drawn from springs and streams in the hilly areas and from river diversions and groundwater in the Kathmandu valley and elsewhere. Water quality is poor in and around Kathmandu because of extensive pollution of rivers; and in parts of the Terai because of the high arsenic content of groundwater. Development of Nepal's rivers for irrigation is costly because of the large diversion structures needed to manage the annual floods, exacerbated by the large quantity of sediment these waters carry. India needs to agree to any diversion of these trans-boundary rivers—a further complication. Consequently, groundwater-based irrigation has proved to be an attractive option in the Terai for both the private and public sectors.

8. Irrigation in Nepal is broadly categorized according to ownership and management (public versus private schemes), to location (Hills versus Terai), and to source of irrigation water supply (surface versus groundwater). Private irrigation schemes have long been developed and managed by private farmers, and are classified as Farmer-Managed Irrigation Systems (FMIS). The rest of the irrigation schemes are publicly developed and managed by the Department of Irrigation (DOI).

9. Nepal implemented its first public sector irrigation projects in the 1920s with assistance from the Government of India. To this day India makes expertise and finance available to Nepal in exchange for water rights to the main rivers—which serve the large irrigation schemes in India. Even after construction of the Chandra Canal in 1928 and several later projects, the total irrigated area was still only about 25,000 ha in 1950. Cooperation with India through the 1954 Kosi Project Agreement enabled construction of

9. HMNG. 1995. Nepal Agricultural Perspective Plan.

10. Data from the Agricultural Inputs Corporation. This only captures public sector sales, not those of the private sector importers.

11. Total chemical fertilizer use in Nepal was 26 kg/ha in 1990, mostly nitrates and phosphorus. In comparison India used 91 and Bangladesh 101 kg/ha.

12. HMGN. 1995. *op cit.*, page 92.

13. In 2004 the installed hydropower capacity was 370 MW and an additional 240 MW is under development. Together these will only utilize 1.6 percent of the potential.

the Chattra Canal that supplied water to the Sunsari Morang Irrigation Project in eastern Nepal, while the Gandak Barrage-Eastern Canal System Agreement of 1959 underpinned the Narayani Irrigation Project in central Nepal.

10. Over the next 30 years government significantly expanded its investment in irrigation to cover small and medium surface and groundwater systems. More than two-thirds of total irrigation lies in the Terai, about a quarter in the Hills and less than five percent in the mountains. In the hills the mode is primarily gravity-fed traditional irrigation systems owned and managed by communities or farmers, while in the larger valleys many systems were developed with full or partial support of the government. Of the 1.06 million ha of irrigated land, government investment developed about quarter from scratch and a further quarter through upgrading community-owned schemes. The balance comprised 0.32 million ha developed by farmers alone; and 0.14 million ha developed with help from credits extended by the Nepal Agricultural Development Bank. One-quarter of all surfacewater-based irrigation is publicly-managed by DOI, the rest privately by farmers and farmer's groups. Similarly, government manages one-quarter of Nepal's 170,000 ha served by mechanized groundwater abstraction.

11. The design of large-scale irrigation projects was based on the Indian policy of spreading water relatively thinly over large areas to provide insurance against drought for wet-season (*kharif*) crops. Distribution systems of all government-financed projects were developed only partially¹⁴ in the expectation that farmers would build water distribution systems—in practice much of the potential command went undeveloped because farmers were unwilling or unable (for socioeconomic or technical reasons) to invest. As a result only 71 percent of public investment in command area development is utilized, and only 38 percent of that has year-round irrigation.¹⁵ More recently, government has helped finance the extension of distribution systems to the 50 ha level, as well as organizing water users' associations and providing agricultural support services.¹⁶

12. The dearth of agricultural inputs, and fertilizer in particular, explains in large part the slow growth of agricultural production and farmers' low productivity (paragraph 6). This is part of the vicious circle by which low margins and insecure water supplies preclude collection of water user fees, jeopardizing adequate operation and maintenance and thus reducing water management efficiency. Uncertain or unreliable water supplies allied with low margins heighten risk aversion and lower the perceived benefits of fertilizer and investments in improved agricultural management.

Support for water Resources and Irrigation Development

13. Nepal's principal international partners for irrigation development have been the World Bank and the Asian Development Bank. Since the 1970s the World Bank has approved 13 credits totaling \$355 million for irrigation-specific projects and the Asian

14. Thus farmers were responsible for blocks of 700-1,000 ha for the Narayani project and 200 ha for the Sunsari Morang project.

15. HMGN. 1995. Nepal Agricultural Prospective Plan. ADB assistance (TA No.1854-Nep).

16. More recently the policy has been to extend irrigation infrastructure to serve areas of 28 ha (*chaks*) subdivided into 4 ha *subchaks* and to upgrade the quality of support services.

Development Bank has approved nine credits totaling \$160 million.¹⁷ Additionally, they also provided credit for small-scale irrigation as components of integrated rural development projects. Other international agencies, including IFAD, EU, ILO and UNDP, supplemented these efforts. The main bilateral agencies include the Kuwait Fund, Saudi Fund for Development, CIDA, Japan, USAID and several European countries. Internally, the Agricultural Development Bank of Nepal assists development of small farmer-owned irrigation schemes. Irrigation development supported by the donor community remained focused on new construction and expansion of irrigation infrastructures until the late 1980s when reform was introduced to the agenda.

14. In the late 1980s a Master Plan for the irrigation sector was formulated, comprising a long-term strategy and a shorter-term public investment program.¹⁸ The Plan proposed several key reforms to management of irrigation in Nepal. While it accepted that management of irrigation projects exceeding 2,000 ha should stay with DOI, it recommended that water user associations (WUAs) should be created to take full responsibility for the operation of smaller schemes by year 2000. Devolution of management became the centerpiece of the government's 1989 *Working Policy on Irrigation Development*. In a major departure from past practice construction or rehabilitation would not start until sufficient budget had been allocated to ensure completion. And in an attempt to reduce the burden on the exchequer, subsidies on all forms of irrigation were reduced.¹⁹

15. To provide incentives for turnover the government agreed that small schemes would be rehabilitated, priority being given to a demand-driven approach tied to formation of WUAs, financial viability of operations and maintenance and cost-sharing arrangements.²⁰ Beneficiary contribution was dependent on the size and the geographical location. Conjunctive use of surface and groundwater was recommended to supplement water supplies for large public irrigation projects with water shortages. Shallow tubewells were to be developed on a demand-driven basis under the planning guidance of DOI. A more integrated approach to agricultural development was promoted. This included better coordination among the government's irrigation, agricultural development and input agencies to develop an integrated package of inputs, credit and extension services, plus training of farmers in participatory management of irrigation. This was complemented by improving road access to market centers. In 1986, steps to test the practicality of these reforms were initiated through the Irrigation Management Project with USAID-funded technical assistance.

16. In 1988, finding farmers receptive, the government requested assistance from its external funding partners to scale-up the approach through an Irrigation Sector Project

17. Annex C lists multi- and bilateral investment in Nepal's agriculture and irrigation.

18. UNDP Planning and Design Strengthening Project (PDSP). Executed by the World Bank.

19. Farmer's contribution to the capital cost of small and medium projects would be in the range 5 to 25 percent. Farmers would bear all the O&M costs of small and medium schemes and tubewells. Subsidies for capital costs of would not be more than 40 percent for STW and 75 percent for DTW. DOI would no longer collect water charges on small and medium schemes after their turnover to users. Total O&M costs of large projects would be collected from beneficiaries.

20. Priority was assigned to projects with the highest rate of economic return that had to be at least 10 percent.

(ISP). Both the World Bank and the Asian Development Bank took this as an opportunity to support reform of the small and medium-sized irrigation subsector that accounts for the bulk of Nepal's irrigation infrastructure and serves the poorest communities. Within the Bank the ISP concept was piloted with technical assistance from UNDP. An Irrigation Line of Credit (ILC) was created, disbursing US\$16 million through two (ongoing) Bank-assisted projects.²¹ The ILC tested procedures for introducing Farmer-Managed Irrigation Systems (FMIS) and turnover procedures for DOI's smaller projects and paved the way for the fully-fledged Irrigation Sector Project scheduled for 1991. The Asian Development Bank (ADB) launched its own Irrigation Sector Program in 1989 to cover the introduction of FMIS over 25,000 ha using slightly different selection criteria. As far as IEG could determine these two approaches are implemented independently with no coordination or mutual lesson learning.

17. Successful completion of these projects was followed by ADB's Second Irrigation Sector Project or SISP (1996-2002) and the World Bank's Irrigation Sector Project (1997-2004.) The SISP focused on constructing new farmer-managed irrigation schemes, rehabilitation and groundwater development in the central and eastern regions. This built on ADB's Community Groundwater Shallow Tubewell Irrigation Program and IFAD's Community Irrigation Sector Project. In contrast the World Bank's project focused on assisting development of Nepal's water resources policy and strategy, and improving the productivity of farmer-managed systems in western regions of Nepal and the Sunsari Morang Project in eastern Nepal. This report provides a performance assessment of the World Bank's Irrigation Sector Project.

2. Project Design

Objectives, components and costs

18. The overriding goal was to assist the government's water policy reforms, including completion of the national water resources development plan and measures to increase the productivity of irrigated agriculture. Table 1 summarizes project objectives, components and costs.

19. The project's two original objectives were to :

- assist the government in planning and utilizing its water resources in a harmonized, effective and sustainable manner, and
- increase the productivity and sustainability of irrigation systems on about 59,600 ha of land in selected districts of three Western and Eastern regions.

20. At mid-term review the water resources strategy objective was scaled back to improving sector policy and strategy—'assisting the government to utilize water resources in a harmonized, effective and sustainable manner' was seen to be too ambitious an objective. This assessment is based on the revised objective:

21. Credit 1924-NEP. 1988. The Mahakali Irrigation II Project in Western Nepal (US\$41.9 million); and Credit 2144, 1990. The Bhairawa Lumbini Groundwater Irrigation II Project US\$(52.6million.)

- *To enable sustainable development and management of Nepal's water resources by means of a comprehensive and integrated national water management and policy.*

21. **Water Policy and Strategy.** The water resources planning and harmonization objective was to lay a foundation for sustainable water resources management through integrated river basin planning. Specifically, the aim was to consolidate and standardize the differing policies and approaches practiced by the five Nepalese water agencies. Through its support for a National Water Planning Unit the project would increase the effectiveness of the National Water Development Council chaired by the Prime Minister. It was expected also that the basin-wide approach would assist development of comprehensive planning for water and the environment and lead to better coordination of external development assistance for water development.

22. Following agreement on a Consolidated Water Policy the resultant Water Resources Strategy was expected to be completed during the third year of the project. All existing policies, acts and regulations bearing on water would be reviewed, including hydropower, irrigation, urban and rural water supply and industrial waste water. The aim would be to assess the compatibility of policies toward these sub-sectors and recommend changes.

23. Harmonization of the development needs of each water sector with government's medium- to long-term national planning would provide the framework for development of the national water strategy. Subsequently this was to be followed by preparation of a National Water Resources Development Plan and a Water-Related Environmental Management Plan for the short, medium, and long term. Important supporting activities were: a review of public irrigation investment subsidies (with a view to gradually reducing them); a survey of the fiscal implications of the budgetary requirements for operation and maintenance (O&M) of public irrigation systems, in light of joint beneficiary management; and cost-recovery policies. Given that grant funding could potentially become available from bilateral donors the Bank agreed that the technical assistance support could be provided under parallel funding.²² As a result of CIDA support the project expenditure on this component was only 41 percent of the appraisal estimate.

24. **Irrigation Productivity.** Support for increased productivity and sustainability of irrigation systems was aimed at both the public and private sectors covering 59,600 ha spread over 40 of Nepal's 75 Districts. In area terms, two-thirds was to be based on a demand-driven model in which the beneficiary farmers contributed substantially to the capital costs of new projects or rehabilitation either in cash or kind: a "no-payment, no-project" principle was proposed. The target area for small and medium schemes put up for rehabilitation and improvement was to be 39,500 ha. However, these schemes were mostly partly-completed subprojects (covering 21,995 ha) carried-over from the previous Irrigation Line of Credit (ILC) program, selected as pilots for the demand-led approach. The subprojects included 31,500 ha of FMIS in the Hills and Terai and 7,500 ha of new

22. CIDA later provided US\$0.745 million to finance international consultants to assist completion of the water strategy and policy work.

and 500 ha of rehabilitated groundwater irrigation. The subprojects were contingent on the formation of a WUA (and members' willingness to contribute to capital costs); plus evidence of technical, economic, social and environmental viability. Most of the FMIS

subprojects had rudimentary water diversion and control facilities that were to be upgraded with permanent engineered structures.

25. The remaining one-third of the project area was scheduled for system improvement and turnover of O&M, with a view to lowering the fiscal burden and increasing local ownership. The selection of land in the public perimeters targeted by the project (15,100 ha or 75 percent of the area, absorbing 96 percent of the budget)—located in the Eastern Region—was geared to rehabilitating the third stage of the Sunsari Morang Project (as an extension of the Bank's earlier support for the second stage completed in 1995).²³ This involved substantial engineering as well as support for institutional development and capacity-building. Engineering included the rehabilitation and modernization of main and secondary canals, drainage, associated inspection roads, and development of distribution networks at the tertiary level. In contrast to Sunsari Morang III, this small component financed 5,000 ha of small and medium public schemes in the hills and Terai in the three Western regions for turnover to farmer O&M.

26. **Institutional Strengthening.** The goal was to enable the Department of Irrigation (DOI) to become an agency responsible for planning, budgeting and facilitating development by others, removing it from day-to-day involvement in construction work and scheme O&M. Project support was aimed at building the capacity of the DOI to better plan infrastructure development and outsource operation and maintenance through greater involvement of farmers, the private sector and NGOs. This included substantial technical assistance and training to aid short-listing and design of subprojects, supervision and monitoring of quality control. The Department of Agriculture received US\$2 million to facilitate its assistance to irrigation subproject design and implementation in areas not receiving support from the parallel Bank-supported Agricultural Research and Extension Project.²⁴ A small sum (US\$0.86 million) was allocated to building the capacity of the private sector and NGOs in irrigation water planning and its management.

27. Water resources management was also targeted for strengthening. A groundwater monitoring system was to be installed by DOI. Also, the Department of Hydrology and Meteorology (DHM) was to be upgraded using US\$ 5.5 million to ensure that its data management capability matched the needs of national water planning; and to enable Nepal to meet its regulatory responsibilities as the most important upper riparian of the Ganges and Teesta River Basins.

23. IEG. 1998. Performance Audit Report. Narayani III Irrigation Project (Credit 1715-NEP), Sunsari Morang Irrigation II Project (Credit 1914-NEP) and Sunsari Morang Headworks Project (Credit 2430-NEP.) Report. No. 18377. August 21, 1998.

24. AREP covered 14 of the 40 districts of NISP.

Table 1: Nepal Irrigation Sector Project: Objectives, components and costs

Objectives	Components	Project Costs US\$ millions		
		Planned	Actual	
	1. Comprehensive Water Resources Strategy and Consolidated Water Policy	1.25		
1. To enable sustainable development and management of Nepal's water resources by means of a comprehensive and integrated national water management and policy	<ul style="list-style-type: none"> • Formulate a comprehensive water strategy and consolidation policy to address the issues, prioritize practical options and recommend a comprehensive strategy for implementing the optimal development of Nepal's water resources. The formulation of the strategy is expected to be completed during the third year of the project. 	}	}	
	<ul style="list-style-type: none"> • Finance the review of government's subsidy policy in irrigation development investment. 			1.32
	<ul style="list-style-type: none"> • Review operation and maintenance (O&M) requirements in different public irrigation systems and associated water user charges to cover full O&M costs in light of the joint management of the systems with beneficiary farmers. 			
	<ul style="list-style-type: none"> • Provide institutional support to the Ministry of Water Resources and National Planning Commission to establish a National Water Planning Unit at central level, procure equipment, technology, transport and other facilities including development of computerized management information systems and geographic information systems. 			0.11
and	2. Irrigation Sector Improvement and Development	72.43	73.86	
2. To increase (a) productivity and (b) sustainability of irrigation systems in three Western and Eastern Regions	<ul style="list-style-type: none"> • Rehabilitate, improve and develop small- and medium-scale farmer-managed irrigation schemes including: <ul style="list-style-type: none"> ○ rehabilitation and improvement of existing surface water systems covering 31,500 ha in the Hills and Terai. ○ rehabilitation and development of new tubewells schemes on 8,000 ha in the Terai, each covering about 10 ha. 	34.13	34.25	
	<ul style="list-style-type: none"> • Improve public irrigation systems and turn over all or part of the O&M to farmers on 20,100 ha. This includes: <ul style="list-style-type: none"> ○ improvement and rehabilitation of the Sunsai Morang Phase III irrigation system, construction of a 5.5 km Kosi flood embankment, and institutional development to strengthen the central DOI, and its project offices, WUAs and NGOs in the management transfer process. ○ Finance turnover and/or joint management of 5,000 ha of medium-scale irrigation on the demand-driven principle. 	34.73	39.61	
	<ul style="list-style-type: none"> • Support Infrastructure Development (farm roads, flood protection, environmental management, and demand-led participatory micro-hydropower and water supply schemes) 	3.56	0.0	
	3. Institutional Strengthening	16.02	16.49	
	<ul style="list-style-type: none"> • Finance consulting services, training, office buildings and equipment, and limited incremental staff and O&M on a declining basis for the DOI, DHM and DOA. 			
	<i>Physical and Price Contingencies</i>	13.32	-	
	Total Cost	103.02	90.86	

3. Implementation

Implementing Arrangements

28. The Ministry of Water Resources (MoWR) had overall responsibility for the management of the project. An inter-ministerial Project Central Coordination Committee (PCCC) chaired by the Secretary of MoWR coordinated inter-ministerial and inter-departmental project activities relating to policy, budget and major procurement. The Director-General Irrigation was the Secretary of the PCCC. Within the MoWR the Department of Irrigation (DOI) was the main implementing agency either through the offices of its Regional Directors or the Sunsari Morang Irrigation Project Board headed by its Project Manager. A central Project Implementing Committee was established within DOI reporting to its Director-General. However, those components supporting agricultural inputs were managed independently by the Ministry of Agriculture.

29. Activities related to the water resources strategy were subject to the direct guidance of a National Steering Committee. Day-to-day management was through a new National Water Planning Unit that reported to the Water and Energy Commission Secretariat to maintain its independence from line ministries responsible for water. National and international consultants played an important role in this strategic planning exercise.

Implementation Experience

30. Credit effectiveness was delayed by nine months and most project activities were slow to mobilize because of DOI inefficiencies. Project management performance was rated as unsatisfactory for almost one-third of project duration. There was little supervision by DOI's regional staff.²⁵ While many of these problems were substantially rectified after mid-term review the malaise was not fully resolved before the end of the project. Implementation was also held up by government's delay in appointing consultants for supervision of key activities.²⁶

31. Because of the slow progress the project was partially restructured following mid-term review. The water resources development objectives were modified (paragraph 19), dated covenants on studies and policy implementation were extended and about 10 percent of the Credit (US\$8.01 million) was cancelled because of cost savings. The project was extended twice for a total of two years to enable completion of works affected by slow social mobilization and the Maoist insurgency, and closed in June 2004.

Monitoring and Evaluation

32. **Design.** At appraisal the aim was to establish a "scientific system of M&E...incorporating all key processes, input and output indicators, and impact

25. World Bank. Mid-term Review. Annex 9, page 2.

26. For example the SMIP was implemented by a Design Consultant appointed in 1999 who had the lead role in planning, supervision and mobilization of WUGs.

parameters for monitoring progress in achieving development objectives.” This would be achieved by enhancing existing DoI’s M&E systems. The exceptions were a special project benefit monitoring and evaluation exercise (PBME) that would be undertaken by the Department of Agriculture for the FMIS schemes, and an impact evaluation of on-farm water management practices under the FAO technical assistance effort. Generally, the detail of outcome and impact monitoring was left to consultants. While the weakness of M&E of DOI’s inputs and outputs was recognized, particularly for financial monitoring, attention was given to training and capacity-building to rectify only when problems emerged. The modest list of outcome indicators agreed at appraisal was extended and improved after mid-term review.

33. **Implementation.** This varied considerably by component. DOI’s management information systems remained poor for much of the project hindered by lack of modernization, computerization, poor coordination and inadequate staffing (paragraph 63.) Mid-term review of the DoA’s PBME system revealed an absence of standard indicators and little uniformity in data collection methods, jeopardizing the creation of a baseline.

34. **Utilization.** By highlighting the causes of slow implementation, the mid-term review prompted a more thorough use of M&E. But DOI continued to focus on counting outputs: number of schemes, areas irrigated; WUAs formed. Conversely, the M&E systems developed by project consultants—while not mainstreamed by DOI—were used to assess project outcomes and impacts: for example, effectiveness of WUAs and improvements in on-farm water management, and increases in productivity. **The overall rating for M&E is negligible.**

4. Project Ratings

Relevance of Objectives and Design

35. **Objective 1: Water Resources Policy and Strategy is substantially relevant.** This objective (described in Table 1) is substantially relevant to Nepal’s water institutions even though Nepal’s abundant water resources are lightly exploited (paragraph 7). There is little competition for water—except in the Kathmandu valley where usable supplies are reduced by pollution and in some areas in the hills and mountains where there are conflicts in water uses among drinking water, hydropower, and upstream and downstream irrigation users. Essentially, these are local river basin problems, requiring local solutions. Rather than concentrating its efforts here there is a stronger case for the Bank to help raise the efficiency of public sector institutions responsible for local water management and service-provision; and to promote beneficiary participation in decision-making, operation and maintenance.

36. In response to the recommendations of the 1993 Water Resources Management Policy, Bank staff were keen to adopt comprehensive and integrated approaches to water resource development. But, in the case of Nepal at least, such an integrated approach was premature. Water management policies were fragmented and there was no comprehensive legislative and regulatory framework to enable integrated water resource

management. In the long term, while development of an integrated strategy would be desirable, the short to medium-term priority was harmonization of existing policies aimed at making line agencies more accountable and efficient.

37. The biggest challenge was to reform sector institutions, particularly those dealing with sustainable and cost-effective delivery of water supply and sanitation and irrigation services. In the absence of systemic reform of key implementing agencies and an increasing role for the private sector and NGOs, the application of comprehensive and integrated water policies and strategies stood little chance of success. The Bank's approach diverted attention from the reform of DOI's way of doing business. Nevertheless, some parts of the project were appropriate and highly relevant to irrigation sector reform. These included review of government's subsidy policies in irrigation investment and recommendations for reform; the review of O&M requirements in public irrigation projects; and the review of cost-sharing arrangements through water charges.

38. **Objective 2: Irrigation Sector Improvement and Development was highly relevant.** Irrigation is a mainstay of the agricultural economy and is second only to fertilizer as a source of growth (paragraph 6). Farmer and government alike recognize that irrigation is vital to rural prosperity and national agricultural production.²⁷ Less understood is the need for a year-round water supply. Although irrigation has been the centerpiece of investment programs in Nepal for more than fifty years, the emphasis has been on supplementary monsoon irrigation. At appraisal only 18 percent of the arable area had a reliable year-round water supply. Thus a key component of Nepal's Agricultural Perspective Plan (APP) 1995-2015 was to increase the area with an assured year-round supply, in order to accelerate growth and reduce risks.²⁸ Under the APP it was expected that success in applying the seven components of the APP would increase annual agricultural growth from 2 to 5 percent.

39. The ISP project objective was highly relevant to Nepal's national planning process. During the initial phases of appraisal, the seventh plan (1985-1990) introduced the basic needs program. This aimed to provide adequate clothing, shelter, food, health, education and security for the Nepalese people. Enhancing agricultural productivity, food availability and income was to be a major part of the program. The eighth plan (1992-1997), the first to be issued after multi-party democracy was restored, built on the recommendations contained in the *Irrigation Sector Master Plan* (para 18) and the *1992 Irrigation Policy*. The plan gave priority to low-cost projects involving joint participation of government, semi-government organizations and the private non-governmental organizations. The emphasis was placed on low-cost, speedy implementation and beneficiary-management. The ninth plan (1998-2002) and tenth plan (2002-2007) both

27. HMG. 1995. Nepal Agricultural Prospective Plan.

28. The APP had seven components. (1) accelerating agricultural growth; (2) doing so through concentrated investment in a small number of input priorities; (3) those priorities were shallow tubewells in the Terai, agricultural roads, fertilizer and technology system of research and extension; (4) a small number of high-value commodity priorities to facilitate intensification of agriculture, especially in the hills; (5) those priorities were citrus, vegetables and vegetable seeds, apples, apiculture and sericulture; (6) strong multipliers from increased farm income to growth of output and employment in the rural non-farm economy; and (7) an implementation mechanism that operated at district and national levels complemented with an analytical body to facilitate reinforcement and adjustment of the plan over time.

gave more attention to irrigation development, aiming to increase the national irrigated area by 250,000 hectares. This included 107,000 hectares of farmer-managed irrigation systems. The government's *Irrigation Development Vision* of 2005 more clearly aligned subsector objectives with national ones and emphasized increased productivity of agriculture through provision of year-round demand-led irrigation with substantial farmer involvement in design, operation and management.

40. Improving agricultural productivity was also expected to contribute substantially to poverty alleviation. The Bank's *Nepal: Poverty and Incomes* (1991) analyzed the extent and depth of poverty. Follow up work pointed to weak agricultural growth as the prime cause of poverty.²⁹ A later Bank report argued that increasing agricultural productivity was essential to ensure broad-based equitable growth: "*In the short to medium term, agriculture presents the highest potential for growth and poverty alleviation, as the vast majority of the people, and especially of the poor, live in rural areas and draw their livelihood from agriculture....Agriculture remains crucial; other sectors are far less relevant.*"³⁰ The report recommended better targeted public expenditure in the agriculture sector and identification of delivery mechanisms which reached the poor. Current relevance of efforts to spur agricultural productivity and the geographic targeting of the project is affirmed by the findings of the Bank's *Nepal Development Policy Review* (2005) that again focused on the need to increase agricultural productivity for poverty reduction, and the multi-donor country review *Nepal Resilience Amidst Conflict* (2006) that highlighted the plight of farmers in the western regions.^{31, 32}

41. Finally, the objectives were highly relevant to the Bank's Country Assistance Strategies (CASs). The 1997 CAS and its 2005 update identified agriculture as the key sector presenting the highest potential for growth, as it accounts for almost 40 percent of gross domestic product and 80 percent of employment.³³ In particular, the project was relevant in three key areas emphasized by the CAS: (a) poverty alleviation through increased production in irrigated agriculture; (b) effective utilization of public resources by gradually transferring O&M responsibility from the public to the private sector; and (c) enhanced participation of the private sector, NGOs and farmer-beneficiaries in the investment decision process and systems' ownership. Success of such interventions was expected to encourage private investment because users would have local control over natural resources management.

42. Nepal's *Poverty Reduction Strategy Paper* (PRSP) aimed at poverty reduction through productivity gains and increased private sector activities in the key sectors, particularly accelerating agricultural productivity growth through improved rural infrastructure and diversification into cash crops and livestock. Accordingly a key

29. The results of the 1995/96 Nepal Living Standards Survey enabled unambiguous determination of the role of agriculture in Nepal's poverty.

30. World Bank. 1999. *Nepal: Poverty at the turn of the twenty-first century*. Report No. IDP 174. Internal Discussion paper, South Asia Region.

31. World Bank. 2005. *Nepal Development Policy Review – Restarting growth and Poverty Reduction*. Report No. 29382-NP. Match 24, 2005.

32. World Bank. 2006. *Nepal – Resilience Amidst Conflict: An Assessment of Poverty in Nepal, 1995-96 and 2003-04*. Report No. 34834-NP. June 26, 2006. A product of the collaboration among Nepal's NPC, the World Bank, ADB and DFID.

33. World Bank. 1996. *Nepal Country Assistance Strategy*. Report No. 15508-NEP. April 30, 1996.

“development result” of the 2003 CAS was “increased agricultural growth and broad-based rural development.” The 2007 Interim Strategy Note focused primarily on means to secure the peace accord, including protection of past reform gains, and strengthening the foundations of growth.

Relevance of Design

43. **Overall relevance of design is rated substantial.** Targeting rehabilitation of surface water schemes (51,000 ha), new groundwater development (8,000 ha) and support for small-scale infrastructure development, (particularly roads) directly contributed to meeting the goals of the APP. The APP highlighted groundwater and shallow tubewells (STWs) as the primary mode of irrigation growth for three-quarters of the incremental irrigation targeted (0.6 million ha) because of their relatively low cost. The analysis underlying the APP indicated that the design of large-scale public irrigation projects could not easily be converted to provide a year-round supply. In addition the APP aimed to improve the efficiency and productivity of existing systems (covering 155,000 ha). The Bank originally planned to support groundwater and FMIS only, which made sense because the latter supplies water to about 21 percent of Nepal’s cultivated land; the public sector covers only 11 percent. However, late in the appraisal process a decision was made to merge the third-phase of the Sunsari Morang Project (which was being prepared in parallel as a stand-alone project) with the irrigation sector project.

44. This merger, however, overlooked fundamental differences in the design and institutions of each irrigation subsector. It failed to probe the feasibility of retrofitting the Project to provide a year-round water supply. The Sunsari Morang component largely continued DOI’s top-down approach, addressing beneficiary participation only after completion of design and construction of the secondary and distributary canals. Subsequently irrigation officials conducted a walk-through of tertiary canal alignments with water user associations that contributed labor for construction.³⁴ The FMIS adopted a diametrically opposite approach—with rehabilitation and improvements identified and partly paid for by beneficiary farmers. In practice this put huge demands on the organizational capacity of DOI, more so as the FMIS required extensive capacity-building and agronomic skills that DOI did not have.

45. Even so, increasing beneficiary participation was and remains relevant to Nepal’s Irrigation Policy of 1992 and its amendment in 1997. This policy mandates “*construction, renovation, rehabilitation, repair and maintenance and operation of all projects by a definite collective understanding and mutual participation between water user farmers and His Majesty’s Government.*” The 2005 Vision affirms the relevance of this approach (paragraph 39) and goes a step further by calling for a progressive shifting of O&M costs to beneficiaries. IEG’s own findings show that projects are more successful when they provide support for long-term capacity-building and indigenously-matured initiatives.³⁵

34. IEG. 1998. Project Audit Report. Performance Audit Report. Narayani III Irrigation Project (Credit 1715-NEP), Sunsari Morang Irrigation II Project (Credit 1914-NEP) and Sunsari Morang Headworks Project (Credit 2430-NEP.) Report. No. 18377. August 21, 1998. See paras 2.9, 2.10, 3.19., 4.12 to 4.17 and 6.6.

35. IEG. 2005. The Effectiveness of World Bank Support for Community-Based and Driven Development.

46. Poor on-farm water management in the Sunsari Morang Irrigation Project was not addressed by the project—a major failing. The ICR (section 4.2) recognizes this as a problem: “...there has been little increase in winter and spring cropping intensities, but only a modest increase in crop yields. Again this is attributed to poor in-field water control. However, ...this was never a design consideration under the project.”

47. The attention to subsidy issues was highly relevant. Subsidies to agriculture and irrigation placed a large burden on Nepal’s development budget since the mid-1980s and the review initiated by the project was timely and relevant. The subsidy policy was neither rational nor uniform across the subsector. Government objectives were either fuzzy or unknown. During the 1990s subsidies for capital investment in irrigation rose to about 10 percent of the total national development budget and, of this, 90 percent went to public surface irrigation projects.³⁶ Including agency costs increased the overall subsidy to 95 percent. More efficient and cheaper groundwater schemes received far lower capital subsidies: for STWs it was 65 percent for group owned and 30 percent for individually-owned wells. In contrast, DTWs attracted a 90 percent capital subsidy. There were also many unresolved issues around the actual and implicit subsidies for O&M to the various types of irrigation either by failure to collect irrigation charges or setting them too low. An additional complexity—brought about by inadequate coordination and harmonization—was the confusion created by the sometimes contradictory donor advice to government on subsidy policies.³⁷

Efficacy

Objective 1: Enabling sustainable development and management of Nepal’s water resources by means of a comprehensive and integrated national water management and policy was partially achieved with major shortcomings. Efficacy is rated modest.

48. **Water Policy and Strategy.** The policy dialogue and production of policy and strategy documents was fully achieved. However, systemic institutional weaknesses were not addressed by the project and enabling actions were only partly achieved.

49. The project led to adoption of a new National Water Strategy in 2002 and a National Water Plan in 2005.³⁸ These built upon the Water Resources Act of 1992 and the Water Resources Regulation Act of 1992, both of which pre-dated the project. Despite these significant achievements, and the passing of legislation to enable their implementation, Nepal still lacks the capacity to engage in integrated and comprehensive water resources management. This is not so much a matter of the lack of the required

36. HMGN/DOI. 2000. Nepal Irrigation Sector Project Irrigation Subsidy Study. Phase II Report.

37. The ADB-financed Second Agricultural Program Loan included a dated covenant to reduced irrigation subsidies on STWs to zero by July 1999. IFAD’s Community Shallow Tubewell Irrigation Project proposed in 1998 a subsidy of 85 percent because it argued this was reasonable given that they were targeting the very poorest farmers. The World Bank argued during preparation of its Terai Groundwater Irrigation Project that there should be no differential subsidy among tubewell types and the cost per ha to farmers should be the same. It was ambivalent about the removal of subsidies.

38. The Water Resources Strategy was approved on January 9, 2002. The National Water Plan was completed *ex post* by consultants employed by WEC using CIDA grants.

supply-side hydrological information—water resources data collection was successfully carried out—it was more the lack of capacity and experience within the Water and Energy Commission Secretariat.

50. Sector agencies continue to plan water resource management and development independently. The two agencies responsible for water supply and sanitation at the national level remain in disarray and are struggling at their main task of providing and sustaining potable water supplies to municipal and rural areas. The successful semi-autonomous Fund Board (that only facilitates rural water supplies and sanitation implemented by NGOs) only works at the village-level.³⁹ Although hydropower capacity doubled between 2000 and 2005 this represents a very modest use of the potential and there is almost no competition with other water users. As with water supply and sanitation, primary hydropower concerns are increasing service provision to households and industry, and facilitating private sector investment in line with the revision to Nepal's Hydropower Policy in 2001-02.⁴⁰

51. A consistent, reliable and up-to-date database on water utilization by all users is still lacking. Information on water quality is incomplete. There are no river basin water development plans although two are planned under the recently approved Bank-financed Irrigation and Water Resources Management Project.⁴¹ Indeed, this project includes US\$4.1m to further develop the institutions responsible for improved water management in Nepal that were assisted under this ISP project. Overall the achievement is modest at best.

52. **Subsidy Reform.** The evolution of government's policy of irrigation subsidies was thoroughly reviewed by consultants but their recommendations were limited and had negligible impact. First, the targeted increases to irrigation area in the APP were treated as non-negotiable. The report's prime concern was the impact of subsidies on the growth of groundwater irrigation through shallow tubewells (STWs) and to a lesser extent, deep tubewells (DTWs.) Groundwater sources, however, only accounted for about 13 percent of the public sector irrigation budget. There was no comprehensive analysis of the market-distorting impact of government subsidies on all irrigation, the role of the private sector, of farmers' willingness to pay, or the supply response that would occur if subsidies were reduced. There was no consideration of productivity improvements from other inputs that could make subsidies redundant. The study made no implementable recommendations on subsidy policies to reach the poorest non-creditworthy rain-fed farmers that would have benefited most from groundwater and very small-scale irrigation.

53. Second, the study's recommendations were impractical as they ignored the political economy of agricultural reform and the role of other donors. In practice, actions outside the influence of the project led to major reform of subsidies affecting irrigation

39. IEG. 2008. PPAR Rural water Supply and Sanitation Project.

40. According to the 2001 census only 40 percent of Nepalese households have access to electricity. Electricity consumption per capita in Nepal is the lowest in South Asia: in 1999-2000 India use 379 Kwh, Pakistan 321, Sri Lanka 255, Bangladesh 89 and Nepal 47 Kwh.

41. World Bank. 2007. Irrigation and Water Resources Management Project. Credit -NEP. This project costing US\$65 million was approved for a Credit of US\$50 million on November 26, 2007.

productivity—in particular those for STWs and fertilizers (Box 1). In 1995-96 the subsidy for STWs was reduced in to 60 percent for group-owned wells and 30 percent for individually-owned wells. Subsequently, the government eliminated subsidies for all types of STWs in 2002 in line with the covenant agreed under the ADB-financed Second Agricultural Program Loan. Subsidies for DTWs remained.

54. The subsidy elimination stopped dead the growth in the number of public STWs. The number of DTWs increased—driven by capital costs subsidies averaging 84 percent.⁴² Growth of the groundwater area slowed as expected, but this did not lead to a proportional fall in the growth of agricultural productivity (discussed below). Even without a subsidy STWs are an attractive investment.⁴³ Some observers thought that lack of uptake was an attempt by farmer's unions to induce government to resume subsidies; but government remained firm. Since the government ceased to subsidize STWs the official figures provide no information about subsequent uptake by farmers. From the foregoing IEG rates the efficacy of the subsidy studies as negligible. Overall, given the very modest achievement on comprehensive planning of water resources and the negligible achievements on subsidies for irrigation, efficacy is rated negligible.

Box 1: Fertilizer subsidies reform—Official data misrepresents reality

Independently of the project government reduced fertilizer subsidies from 1997, completely removing them by 2001. The Agricultural Input Corporation (AIC) monopoly on fertilizer distribution was dismantled and this spurred private sector growth. Officially registered private sales grew from 17,550 tons in 1997/98 to 118,265 tons in 2002/03. In 2005/06 sales were 78,258 tons. AIC's sales fell from 91,178 tons in 1997/98 to 13,295 tons in 2005/06.⁴⁴ Elimination of subsidies seems to have reduced fertilizer use. This impression is incorrect. A random survey of fertilizer use clearly demonstrated that total fertilizer consumption per ha was 35 kg/ha in 1997/98 compared with the official figure of 13 kg/ha. In 2000/01 the comparative data were 58 kg/ha compared to the official figure of 17 kg/ha. Supply was more timely too: 22 percent found it was delivered late in 1997/98, compared to 14 percent in 200/01. Official statistics give only a partial view of what is actually happening.

Source: MOAC and ADB. 2002. *op cit.* paras 690 to 747.

Objective 2(a): Productivity of irrigation systems improved—how much this may be attributed to the project is unclear. Overall efficacy is rated modest. This balances the very modest performance of public sector irrigation against the excellent performance of farmer-managed systems.

55. Physical targets for irrigated area improvement or extension were exceeded for the FMIS schemes but not met for either groundwater or the Sunsari Morang Irrigation Project (Table 2.) Even so, agricultural production from irrigation systems was improved: the Sunsari Morange project produced much less than targeted, the farmer-managed system considerably more. Agricultural productivity also increased in response to exogenous demand and supply stimuli described below. Additionally, the benefits from a number of other donor-financed initiatives spilled-over to project areas (Annex B).

42. MOAC and ADB. 2002. Nepal Agricultural Sector Performance Review. March 2002. para 530 et seq.

43. *Op cit.*, para 760. Their surveys indicate financial rates of return for STWs ranging between 38 and 60 percent for farmers and 21 to 43 percent to the economy. The ICR for the ISP did not give ERRs for STWs.

44. Government of Nepal. 2006. Statistical Information on Nepalese Agriculture 2005/06. Ministry of Agriculture and Cooperatives.

56. **Exogenous factors bolstered productivity.** The agriculture sector grew because of reduced tariffs in inputs—now among the lowest in the South Asia region—and the privatization of the fertilizer market.⁴⁵ Increased productivity and cropping intensity, coupled with diversification in to higher-value products,

contributed to agriculture's improved performance in the second half of the 1990s, a trend that has continued to this day. Rising incomes, increasing domestic demand and improved export opportunities expanded markets for agricultural products.⁴⁶

57. National expansion of infrastructure benefited agriculture and the project. Between 1995 and 2004 the total road network increased by 6.7 percent a year, from 11,000 to 17,000 km. District and rural roads—vital for agricultural marketing—increased by 11 percent a year.⁴⁷ Access to irrigation rose from 54 percent in 1995-96 to 67 percent in 2003-04, most of this due to expansion of canal irrigation. Trade policy reforms increased agricultural exports. Commodity market deregulation encouraged private sector investment, particularly in fertilizer. Households reporting use of fertilizer increased from 55 percent in 1995-96 to 63 percent in 2003-04. The proportion of farm households reporting easy access to fertilizer rose by more than 90 percent.

The Sunsari Morang Project performed poorly

58. The project set out to increase irrigated area and agricultural productivity. Cropping intensity increased because the irrigation channels were improved and extended. As a result, cropping intensity increased from 160 percent in 1998-99 to 223 percent in 2006-07 because of expansion of winter and spring cultivation (Figure 1). In the summer the main trend has been to increase paddy production and substitute sugarcane for jute and maize, a move encouraged by start-up of a local sugarcane factory. In the winter season, there was an increase in the area under irrigated wheat, pulses, vegetables and sugarcane. In the spring the preference has been firstly for paddy, which accounts for about one-half the incremental area, followed by pulses, green manure and maize.

Table 2: Physical achievements were high

Type of Irrigation	Planned Area (ha)	Actual	
		Area (ha)	%
Farmer-managed irrigation systems	31,500	46,250	147
Groundwater STW	3,200	435	15
Groundwater DTW	4,800	5,550	122
Sunsari Morang: extension	15,100	11,500	76
Sunsari Morang: turnover	5,000	5,000	100
Total	59,600	68,735	115

Source: IEG derived from DOI data.

45. Over the period 1996-2006 agricultural GDP grew at 3.3 percent compared with the 2.9 percent average of the previous ten years. In 2005 this declined to 3 percent and the poor monsoon rains of 2006 lowered this to only 1.7 percent.

46. World Bank. 2005. *Nepal Development Policy Review – Restarting Growth and Poverty Reduction*. Report No. 29382-NP. March 24, 2005. Chapter 4 provides a review the agricultural sector.

47. World Bank, DFID and ADB. 2006. *Nepal: Resilience Amidst Conflict – An Assessment of Poverty in Nepal, 1956-96 and 2003-04*. Report 34834-NP. June 26, 2006. The data quoted are drawn from the Nepal Living Standard Surveys of Of 1995-96 and 2003-04.

59. However, crop yields did not improve over the without-project situation (Figure 2). Thus only the physical part of project underlying the productivity objective was substantially achieved (76 percent, Table 2). At appraisal it was expected that the project's support for agricultural extension would lead to crop diversification away from rice towards more profitable crops: potato, sugarcane, jute and oilseeds (Figure 2). Sugarcane (the most profitable crop) only achieved 10 percent, and oilseeds 8 percent, of appraisal targets. Production increments did not match appraisal expectations except for paddy, vegetables and pulses which exceeded them. This was because agricultural extension supported by the project was a failure.

60. The project had little impact on paddy yields. Paddy rice remains the dominant crop in the area and accounts for about 48 percent of the total cropped area. Yield has systematically increased by about 15 percent since the early 1990s – the same as the ‘without-project’ situation in surrounding districts. A comparison of the SMIP growth rate for the yield of summer irrigated paddy with the national growth rate for all paddy shows an almost identical yield increment (Figure 3). Project farmers told the mission that agricultural extension services were not generally available from the project and that they relied on their own networks for advice. This is borne out by independent observations.⁴⁸ IEG concludes that within SMIP the observed growth in yield would have happened without ISP.

Figure 1: Cropping Intensity in SMIP

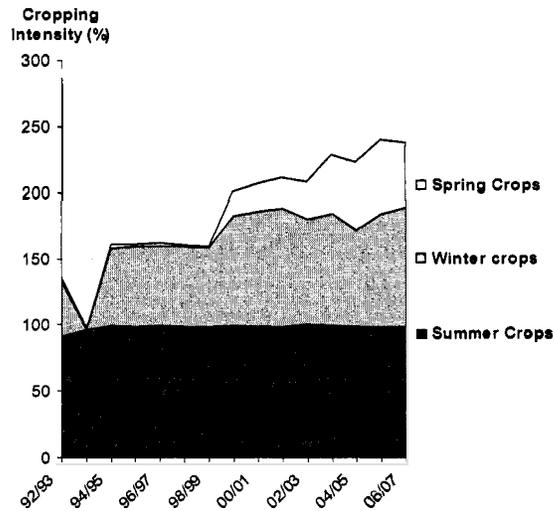
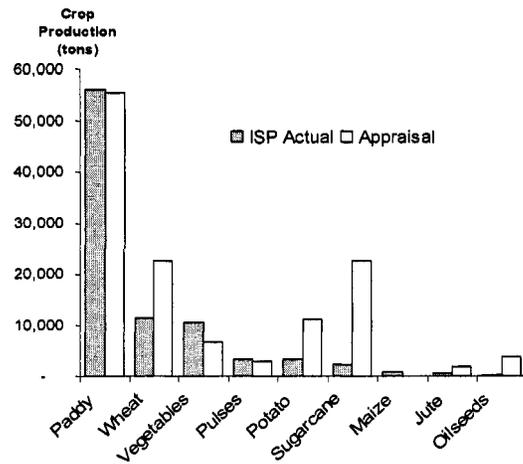


Figure 2: Actual and predicted incremental production under ISP in the SMIP



Source: IEG calculations based on DOI's SMIP Annual Cropping Reports 1992/93-2006/07

48. HMG. 2004. Irrigation Benchmarking – A World Bank Mission to Kathmandu. December 8 to 25, 2004. This exercise covered the whole SMIP project with a special focus on four secondary canals as case studies. Field surveys were undertaken by 18 DOI staff. When reporting agricultural performance all noted that agricultural extension services were notable by their absence. The overall conclusion was the SMIP improved water distribution thus raising cropping intensity but had negligible impact of crop yields.

61. Despite this, overall agricultural output from Sunsari Morang increased because of the increased cropping intensity - but it did not meet appraisal targets. In gross tonnage terms it met 70 percent of the target - but that is not very meaningful as it is the mix of crops that matters and the incremental value-added. In value-added terms the Sunsari Morang project only achieved 55 percent of the expectations at appraisal but at far greater cost – 52 percent more per ha than the appraisal estimate.

62. While it is tempting to conclude that the project could have caused the increase in cropping intensity and crop diversification, in the absence of data on adjacent non-project areas it is impossible to be sure. Critical M&E data are missing. Farmers outside the project may have invested in their own irrigation supplies such as STWs or small-scale surface irrigation; and they may also have diversified. Nepali farmers have ready access to the Indian market for both input and output marketing.

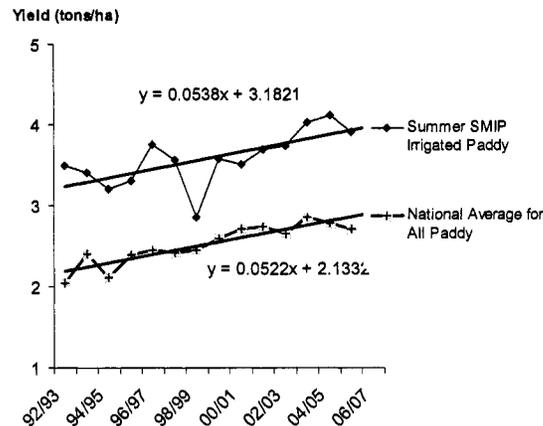
Farmer-managed irrigation systems performed well

63. Determining impact on agricultural production is more difficult because the 338 irrigation schemes are relatively small and are widely dispersed across a non-homogenous landscape. Generally, the ISP facilitated WUA formation. It used NGOs to manage and guide repair or upgrade of existing irrigation facilities. Few project resources were devoted to agricultural extension implemented by the DOA. FAO technical assistance helped to upgrade on-farm water management in 30 schemes (instead of the 40 planned) covering over 2,940 ha or 48 percent of the area targeted at appraisal.

64. A single-difference “before and after” calculation shows that cropping intensities increased in all three western regions (Table 3). The “without project” counterfactual was not monitored and thus the share of the increment cropping intensity attributable to the ISP cannot be determined given exogenous factors (paragraphs 56 and 57).

65. The findings for yield improvements are more sanguine. Except for paddy, crop yields in FMIS are generally significantly more than the district average in each physiographic region (Table 4). Outside the Terai wheat yields are much higher than district averages whilst maize yields show substantial increases. The very large increase in wheat and maize yields is the result of more reliable water supplies and better farming practices during the winter months. There was also crop diversification; but this was confined mainly to potato. Aggregate chemical fertilizer application showed little change, averaging about 80 kg/ha in the west and far western regions, but only 34 kg/ha in the mid-western region. Use of organic manure is high but application rates are not known.

Figure 3: SMIP paddy yield growth follows the national average



Source: DOI/SMIP Annual Cropping Report 2007 and MOAC 2006 (op cit).

66. Incremental agricultural production 1998-02 was 130,000 tons or about 2.5 tons/ha. This was more than double (115 percent) the baseline production. Over the half the overall incremental production was contributed to potato, 31 percent to wheat and barley and less than a tenth to paddy. The largest change in crop diversification was to barley in the Mid-western Region and wheat in the Western Region.

Table 3: Cropping intensity in FMIS improved

Status/Region	Western	Mid-Western	Far Western	Total
Baseline cropped area (1998)	23,541	19,281	10,783	53,605
Final cropped area (2002)	29,458	33,837	15,417	78,712
Incremental cropping intensity	25%	75%	43%	47%

Source: DOI project completion report based on DOAs Project Monitoring and Baseline Evaluation. July 2003.

Table 4: Crop yields in FMIS are better than District averages

Region/Crop	Paddy			Wheat			Maize		
	ISP	District	Increment	ISP	District	Increment	ISP	District	Increment
Mountain	2.01	1.87	+7%	1.81	1.49	+21%	2.35	1.55	+52%
Hills	2.54	2.40	+6%	2.43	1.62	+50%	2.47	1.71	+44%
Terai	2.70	2.77	-3%	2.05	2.03	+1%	2.51	1.84	+36%

Source: MOAC. 2002. Statistical Information on Nepalese Agriculture
DOA. 2002. Seasonal Crop Benefit Monitoring.

Objective 2 (b): The objective to increase sustainability of irrigation systems was partially achieved. Efficacy is rated modest.

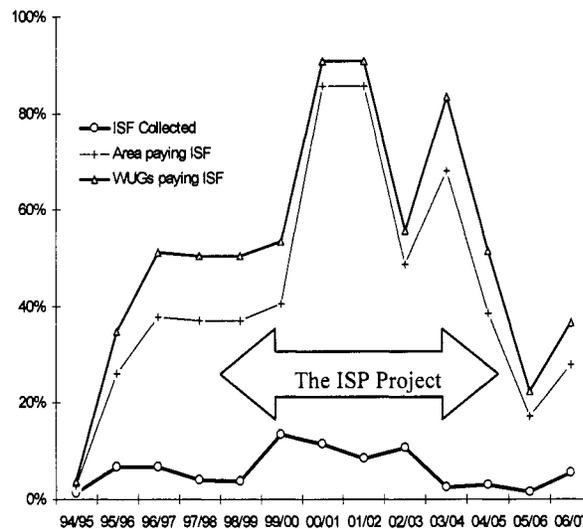
67. **Farmer-managed irrigation systems have a substantial chance of being sustained.** NGOs helped to build water user associations to better manage operation and maintenance—until DOI’s budget constraints led to a cut in the number of facilitators. Farmers were willing to help meet the cost of capital investments. Their contributions averaged 12 percent in terms of cash, and considerably more if in-kind contributions are factored in. Farmers are accustomed to work together, either cooperatively or under the local leaders. Self-interest ensures that farmers are willing to fund essential maintenance works done on as as-needed basis. Formal irrigation service fee arrangements as practiced in public sector projects (and as discussed below) have not been the norm for local farmer-managed schemes. Even so, large-scale damage caused by floods or landslides may be beyond local repair capability. While DOI’s regional staff is willing to help out, the budget pinch means that they cannot meet all requests.⁴⁹ This is a significant shortcoming. During project implementation about one-fifth of schemes (particularly those in hills and mountains) were affected by floods and landslides.

49. For example, the DOI Pokhara Office had all its vehicles off the road for a month during 2007 because of budget shortage- thus staff were unable to move from the office to work with farmers. Insufficient budget also reduced the availability of construction equipment.

68. **The Sunsari Morang Irrigation Project is unlikely to be sustainable.** Unlike the FMIS, most farmers in public irrigation schemes expect the government to pay all the operation and maintenance costs. Lack of payment was a problem in the past and the project set out to redress this failing. Studies conducted by the project examined the cost of operating and maintaining large public-sector irrigation projects. Initial recommendations were fine-tuned after trial implementation to test cost recovery methods. In practice the post-monsoon trial period was too short, covered too few schemes and did not produce a replicable model because of the small sample.⁵⁰ The recommended unit area Irrigation Service Fee (fee) of Rp700/ha was not approved because the government dismissed the proposal as unaffordable. Instead, the fee was set at Rp200 per ha. Since the project ended DOI has increased this to Rp300/ha.

69. Fee payments increased systematically from the first to the second SMIP—mainly because the project engaged social science consultants who understood how to form and motivate water-user associations to contribute cash for O&M.⁵¹ These same consultants also trained DOI staff and pushed hard to increase active participation of farmers in project O&M. When the consultants' contract expired, the DOI's ability to motivate farmers and collect fees dwindled rapidly (Figure 4). Field interviews suggest that the consultants substituted for DOI's oversight of fee collection—working closely with farmers in public schemes was never became part of DOI culture.⁵² This reflects the engineering focus of DOI staff and its lack of social scientists.

Figure 4: Irrigation Fee Collection was good during the project but fell sharply afterwards



Source: DOI data and IEG 2007

70. Despite the reduced rate set by the government the total fee of Rp12.7 million due for the whole SMIP has never been collected. Total fee collection peaked at 13 percent of total dues in 1999/00 but fell to 1.5 percent in 2006/07. The figures are little improved if

50. The trial was limited to only four schemes, two surface water and one groundwater scheme in the Terai, and one surface water in the hills. Post-monsoon fee collection was difficult because many farmers maintain that most of their water derived from rainfall, not the irrigation system. Earlier piloting of irrigation service fee collection in the Sunsari Morang project for 1999/00 showed the highest rate of ISF collection was in the period December-May when irrigation makes the most difference.

51. The total design command area of SMIP is 68,000 ha. Figure 4 is based on the total area of the SMIP in which WUGs were formed (63,866 ha), and all WUGs in that area (1,620). This covered 20 canal systems of which the maximum number paying was 16.

52. Overall, the ISP project used three international and 333 local consultants, the former covering 44.4 person-months service, the latter 406.4 person-months. Within SMIP, 35 short-term Association Organizers were employed to improve WUG performance and motivate them to pay ISF.

the areas paying nothing are removed—O&M cost recovery then peaks at 16 percent and falls to 5.5 percent in 2006/07. Only farmers in 8 of the 20 secondary canal systems have systematically paid fees since the mid-1990s. And at only three sites—all of them continually supported by donors and located next to the main canal where water supply is secure—have fee collection rates exceeded 50 percent.⁵³ But even for these three sites there are large variations in payment rates between water user groups. Attempts to increase fee payments have failed, partly because they have not become a regular part of DOI operations. DOI continues to pay almost the full cost of O&M in Sunsari Morang. At an estimated US\$24 per ha to fully maintain the project, beneficiaries only contributed 0.6 percent in 2006/07. (In practice their share may be more because DOI never has sufficient budget to pay full O&M costs). Low fee recovery rates are the result of farmer's dissatisfaction with the design and operating procedures of DOI-managed schemes, the unwillingness of the leaders of water-user groups to act as fee collection agents for government, and the lack of agricultural extension services. The Maoist insurgency also discouraged farmers from paying fees for government irrigation services and this also contributed to low cost recovery.

71. DOI cannot ensure that irrigation water is sediment-free—a major problem during Bank appraisal of the Second Sunsari Morang Project (1986-87), as well as at the time of the last IEG assessment of SMIP (1998). Water is drawn from the Kosi River through the offtake constructed under the US\$35.7 million Sunsari Morang Headworks Project. This water flows into a large stilling basin constructed under second project. Two floating dredgers each capable of removing about 250,000 cubic meters of silt a year were provided. When they were commissioned in 1995 siltation within the irrigated command area was reduced by 70-80 percent and the irrigated area increased by 30 percent. In the period June 1996-December 2005 almost 3 million cubic meters of silt were removed—0.4 million cubic meters per year.

72. The insufficient O&M budget from DOI—less than half of that required—eventually led to a major breakdown of the dredgers; only one has been working since June 2005.⁵⁴ As a result the stilling basin has silted up. This creates an unforeseen dry season problem because post-monsoon water levels in the main canal intake are below the level of sediment in the stilling basin. Because of this the flow through the stilling basin erodes fine sediment captured during the monsoon, flushing it into the irrigation system. This hampers system operation, places a huge burden on farmers to remove sediment to keep the water flowing in the tertiary canals, and reduces the supply at the tail end of the system—driving many farmers to install their own wells (and making them unwilling to pay fees).

53. These are Ramdhuni (849 ha), Singiya (740 ha), and SSJ Jhumka (891 ha). Together these cover only 4 percent of the total SSMIP area and account for about half of the existing area targeted by ISP. The SSJ Jhumka area was chosen in 1988 under the Bank-financed SMIP II to pilot water management with intensive consultant supervision and capacity-building 1988- 1977.

54. Dredger BARUN was out of order from 17 June 2005 until 20 November 2007. Dredger ARUN has been out of order since 27 August 2007 and is awaiting spare parts. IEG was informed that DOI cannot afford the cost of genuine spare parts from the manufactures (HYDROLAND of France) and are trying to get them manufactured in Calcutta, India. During 2006 only 195,755 cubic meters of sediment was removed – less than half the amount required. *Source:* Personal communication, DOI Biratnagar, December 2, 2007.

73. **DOI's Management Information System does not work well.** In 1994-1996 a comprehensive operational management information system (OMIS) was piloted, improved and mainstreamed. This included an M&E system to monitor fee collection, crop coverage and yield, farmers' response, maintenance of the canals and so on. Two DOI water management department staff members were trained how to use these systems. But the level of management was still inadequate (Box 2). At the end of the Headworks Project in 1997 the international consultants departed. They returned under the ISP in 1999 and reviewed progress—again finding major problems with DOI staffing. IEG discussions with DOI staff and with farmers' groups revealed that the same pattern recurred at completion of ISP. In 2000, this was accentuated by the retrenchment of DOI staff (para 89) and staff reluctance to serve in the field during the Maoist insurgency.

Box 2: Understaffing of Sunsari Morang Project Office was a problem

Consultants Progress Report No. 3 (May 1999.) *"The [international] water management expert undertook immediately a quest of information and data from the previous times....However, only a minor part of documents that should be available somewhere with SMIP could be retrieved. Similarly, the project computers appeared not to contain any useful information relating to water management, and also the water management program of the OMIS.....could not be traced. The frequent transfer of Project staff is the main reason why most documentation and know-how is lost. Generally speaking, the WMD [Water Management Department] is understaffed and there is no systematic implementation of many tasks.....which should be routine."*

Consultants Report of the Water Management Unit (1996.) *"No water management staff is seconded to manage the operation of the Chatra Main Canal which often results in arbitrary operations of intakes unless the [Water Management] Division is properly organized and strengthened, the implementation of water management and joint management process will become questionable."*

Source: ISP Project Files, World Bank Kathmandu Office. December 2007.

74. **Water User Associations in Sunsari Morang formed under the project were not effective in paying ISF.** The WUAs are responsible for water distribution below the secondary canal systems (Box 3). In the Stage III area of SMIP, two secondary canals (Biratnagar and Harinagara Mahadevkol) were targeted by the project, including 486 WUAs covering 15,100 of the 18,678 ha commanded by these canals. Within this area 280 WUAs had been "formed" five years earlier by DOI in response to targets issued from Kathmandu.

Box 3: Organization of water users in the Sansari Morang Irrigation Project

The SMIP design is built around the concept that the DOI regulates the main and secondary canals to ensure a continuous flow of water. DOI controls the supply and tells farmers at the beginning of the irrigation season how much water it will distribute – farmers have to adapt accordingly. Below the secondary canals water user organizations assume responsibility for rotational water distribution to the tertiary canals using gates in the Stage I area of SMIP. The Stage II area was redesigned to have proportional flow dividers that, in comparison, require little management. Distribution of water in the tertiary canals to water courses serving 30 ha and 10 to 30 individual farmers in each subunit is the responsibility of the WUAs. Fee collection is the responsibility of WUAs under the general direction of the 20 water user central coordinating committee for all the WUAs served by each secondary canal. The seven largest secondary canals have intermediate water user committees representing 6 to 20 WUAs on the central committee. Typically, a WUA manages an average 39 ha but the range is quite large: 24 to 138 ha.

Source: DOI and PAD.

75. The international consultants responsible for the 1999 baseline survey found that in these "mature" WUAs only 26 percent of farmers knew they were actually members of

a WUA; 14 percent had participated in WUA activities and only five percent had a clear sense of roles and responsibilities.⁵⁵

76. Under ISP, WUA capacity was built up steadily from 1999 onwards; and 83 percent of the targeted area managed by WUAs was completed by project closure. Even so, fee collection was only effective between 2000 and 2004—when the consultants were active. Fee recovery in the Biratnagar canal command reached 4.5 percent of the assessment in 2002/03 and fell to 0.4 percent in 2003/04. The Harinagara Mamadevkol secondary fared worse than the average: fees peaked in 2001/02 with a collection rate of 2.4 percent; nothing was collected in 2002/03 and the rate was 0.6 percent in 2003/04. Nothing has been collected from any of these associations since 2004. IEG was told by the Zhorahat water users' central committee that manages the Harinagara Mamadevkol secondary that there is no mechanism for fee collection.⁵⁶ Farmers in the meeting also complained about shortages of canal water (particularly for tail-enders), and the build up of silt over the last two years. Asked to summarize what impact the project had had on them they said: *“we only have half the benefit potentially available, our traditional sources of water [small temporary barrages on streams running through the command area] were stopped by the project, and we get no help from the agricultural department—why should we pay?”*

77. Sunsari Morang is unlikely to be sustainable given the under-funding of O&M, the unsatisfactory status of sediment control, farmers' unwillingness to pay fees, and DOI's inability to collect it. A visual inspection of the main canal in the Stage III project area revealed high levels of siltation and aged concrete structures. While secondary canals were in good order, tertiary canals were incomplete (missing in some places) and silted up. DOI is understaffed, incapable of managing either the project or the farmers. The interviews with farmers confirmed the deficiencies of agricultural extension services. Internal management of the WUAs is weak. Membership of WUAs is not compulsory which encourages free-riding. And those farmers that take water illegally or default on paying their dues cannot be disciplined. Neither the local magistrates nor the DOI will proceed against them; a test case was thrown out. IEG found the same problem in 1998; nothing appears to have changed since.

Efficiency

78. Because performance varies between components, the efficiency of each is separately assessed.

79. **The efficiency of the water resources management and policy component is rated modest.** Taking into account both Bank and CIDA contributions, targets for strengthening management and development were only partly achieved. Despite the investment made under ISP, the follow-on project will devote an additional US\$4.12 million to capacity building.

55. DOI. 1999. SMIP Stage III (Phase 1) Project Benefit and Monitoring Evaluation. February 1999.

56. Meeting with 14 farmers December 2, 2007. The WUCC includes 12,000 ha of which 8,000 were developed; 430 WUGs; and 74,000 of the 88,000 farmers in the command. It contains 22 km of secondary canal and 30 tertiary canals totaling 120 km in length.

80. **The efficiency of FMIS is rated substantial.** Unit costs were only 60 percent of the appraised values and area targets were amply exceeded. Economic returns calculated by the ICR at completion (based on a small non-random sample) range between 18 and 22 percent. Financial rates of return are slightly lower and cover a wider range: 10 to 29 percent. IEG's visits to FMIS schemes revealed substantial improvements in agricultural production and there is little to contradict the ICR's findings. Given the very large number of FMIS schemes and the logistical difficulty of taking an adequate random sample, IEG did not recalculate the ERR for the FMIS component.

81. **The efficiency of the SMIP component is rated as negligible.** In the case of SMIP, the project only increased the irrigated area but did not increase yields (paras 58-60) despite investing US\$3,690 per ha—or more than four times more expensive per ha than the average FMIS (where there was incremental production), Table 5. The DOI's annual cropping report provides *ex post* area of crops grown and this was the basis of IEG's revised ERR estimate of 1 percent (Annex C). The primary reasons for the low ERR are the absence of effective agricultural extension and continued uncertain and poor water management that induces risk-averse farming. The ERR considering the whole SMIP would be even lower if the sunk costs (US\$122 million) invested over the period 1978-1997 were included.

82. **Overall efficiency is thus rated modest.** Overall project economic efficiency was determined by applying weights to each component. If the ERR of the project components are weighted by area, the average ERR is 16.7 percent (Table 5). But given that the small area of the SMIP accounted for over half the project investment costs the area weighting is not very realistic. When weighted by costs, the average ERR is 10.3 percent.

Outcomes

83. **The overall outcome rating is moderately unsatisfactory** (Table 6). This is derived from the ratings for each individual objective weighted by its share of project costs. Given the relatively low cost of objective 1 (US\$0.5 million) it is clear that the moderately unsatisfactory outcome is the result of including the SMIP in the project and tolerating a business-as-usual approach to the public irrigation sector.

Table 5: Project Costs and Economic Efficiency

Scheme Type	Total Area ha	Costs US\$ millions			Cost per ha	Scheme ERR	ERR weighted by area	ERR weighted by Costs
		Civil Works	Institutions	Total				
Private FMIS Surfacewater	46,250	27.94	6.25	34.19	739	19.9	-	-
Private FMIS Groundwater	5,985	5.13	0.77	5.90	1,001	6.0	-	-
Public -SMIP	11,500	40.89	1.55	42.44	3,690	0.9	-	-
Total	63,735	73.86	8.57	82.53	-	-	-	-
Average	-	-	-	-	1,295	-	16.7	10.3

Source: IEG based on project files

Risks to Development Outcomes

84. **Risks to development outcomes are rated substantial.** The capacity of the National Water Planning Unit is uncertain because there are insufficient staff with the broader planning perspective required. The water and energy commission secretariat remains focused on hydro-power and electricity generation and is not devoting much effort to the big challenge of coordinating river basin planning, irrigation, water supply and sanitation, flood control, and hydro-power.

Table 6: Project Outcome Rated on Achievement of Project Objectives

Objective	Relevance	Efficacy	Efficiency	OUTCOME
1. To enable sustainable development of Nepal's water resources by means of a comprehensive and integrated national water management and policy	<i>Substantial</i>	<i>Modest</i>		
2 (a) To increase productivity of irrigation systems				
FMIS	<i>High</i>	<i>Substantial</i>		
SMIP	<i>Substantial</i>	<i>Modest</i>		
2(b) To increase sustainability of irrigation systems				
FMIS	<i>High</i>	<i>Substantial</i>		
SMIP	<i>Substantial</i>	<i>Modest</i>		
Overall Ratings	Substantial	Modest	Modest	Moderately Unsatisfactory

85. Institutionally the risks to the development effectiveness of FMIS are modest because of the long tradition of community management in Nepal, particularly in the hills and mountains. But there is high risk from landslides, earthquakes and floods, which affect up to five percent of FMIS subprojects each year. Communities are poorly equipped to repair damage from these natural hazards. Government is willing to help as part of its broader commitment to rural development and poverty alleviation it but does not always have the means to intervene effectively.

86. The risks to SMIP are substantial, mainly based on the poor condition of dredgers and the level of sediment build up and inadequate funding for O&M. DOI's focus on the civil engineering aspects of irrigation to the detriment of institutional development and capacity building of WUAs is a further risk. The follow-on project will address these shortcomings; but the experience of past interventions does not encourage optimism about the outcome.

Safeguards

87. There was substantial land acquisition in order to build canals, drains and road access. While over a thousand farmers had to surrender small areas of land, few of these

were seriously affected. Land acquisition was not fully identified at appraisal because the design of the canal systems was only finalized during project implementation. In addition to the land acquisition generated by the ISP there was also the issue of unresolved land compensation from the initial construction of the project during 1970-72. The Bank established that compensation for this land acquisition had been partial and urged the MoWR to address the issue. The final outcome is unknown.

88. The issue of compensation and loss of assets by project-affected people (PAP) received high attention at mid-term review because the DOI was perceived to be dragging its feet. The grievance redress committee that was established included two PAPs to favor transparency. Generally the PAPs expressed satisfaction with the processing of land compensation payments but complained about the low compensation rates. Because land users wanted to reduce the tax they paid on sales, they understated property prices. This meant that land compensation rates were below market prices.⁵⁷ DOI did not respond to IEG's request for full details of the compensation program.

Bank Performance

89. **Quality at entry is rated unsatisfactory.** Appraisal was a slow process made more difficult by several changes of senior Bank staff and management, and a change in Bank emphasis—from meeting physical targets to building institutional capacity, and from a project-by-project focus to a more comprehensive approach involving river basin planning. The ADB was equally active in the irrigation sub-sector at this time and appears to have been a strong competitor to the Bank. In 1992-93, ADB rebuffed an attempt by the Bank to coordinate irrigation reform efforts. The Bank distanced itself from the ADB's irrigation sector project. To its own project it added the Water Resources Management and Policy Objective in line with the Bank's drive to implement its 1993 Water Resources Management Policy. In retrospect this was probably a mistake. The inclusion of general water resources issues that required inclusion of another agency diverted the Bank from giving adequate attention to the reform of the DOI. There was certainly a need to harmonize and update Nepal's water resources management policies and inter-sectoral standardization with respect to water planning and use—but it was not the highest priority.

90. It was also a mistake to add the SMIP. If the project had only focused on FMIS and greater involvement of the private sector and NGOs, plus more emphasis on the factors affecting agricultural productivity, it may have developed a viable model for the future of Nepal's irrigation sector.

91. **Bank supervision is rated moderately satisfactory.** Supervisions were used to push the DOI to increase the pace of project implementation; but this proved harder to achieve than expected. The focus on physical targets (area opened to irrigation), timely mobilization of consultants and fiduciary responsibility diverted attention from the main goal—to raise agricultural productivity. The new regional vice-president wanted to

57. The average land compensation paid by DOI was Rp 136,646/ha. ADB advised the Bank that land values in the SMIP area were in the range Rp 225,000 to Rp 300,000/ha. Accordingly the Bank pressed DOI to increase the rates of compensation.

accelerate project implementation, encouraging his staff to give priority to disbursement rates and physical targets. This resulted in a neglect of the more challenging goal of building institutional capacity. The Maoist insurgency constrained field visits. Reports on implementation progress were patchy, with insufficient analysis of pitfalls. There should have been more attention to M&E in the early stages of the project, and while this issue was addressed at mid-term review, it was not satisfactorily resolved. **Overall Bank performance is rated moderately unsatisfactory.**

Borrower Performance

92. **Government performance during preparation is rated moderately satisfactory.** The government was keen to mobilize Bank financing for the irrigation sub-sector as it was one of the key components of the agricultural prospective plan. However, once the project had been agreed, government was slow to set up the higher-level coordinating committees, and these proved to be ineffective. Responsibility for the project was devolved to DOI. Government then went on to promote several macro-economic and civil service reforms that reduced the ability of DOI to manage the project effectively. As far as IEG can determine, DOI was not consulted about these reforms. Just over halfway through the project civil service reform cut MoWR staff numbers from 17 to seven. The PCO was downgraded to a lower class organization. DOI's District Offices were closed with staff being transferred to Divisional and Sub-divisional Offices.⁵⁸

93. **Agency performance is rated moderately unsatisfactory.** High turnover of senior staff undermined consistent leadership: the Director General changed five times; the Project Coordination Officer four times. In the regional and district offices of DOI staff complements were difficult to maintain because of the insurgency. The high turnover was aggravated by poor staff incentives. Inadequate field allowances for agricultural extension made it hard to motivate extension agents.

94. Central project management effectiveness was hampered by the weak monitoring and evaluation system, the delayed training of DOI staff, and slow recruitment of NGOs and civil society organizations to assist with farmer mobilization. SMIP financial management was satisfactory—unlike that of the FMIS and the water resources management components. This was partly the result of the large number (97) and dispersal of accounting centers, the difficulties of coordinating the activities of the four implementing agencies⁵⁹ and the failure to develop computer-based management information systems.

95. The Project Coordinating Office, located in DOI, was understaffed and more concerned with meeting scheme and area targets than with keeping good records. District level management and cost centers did not receive timely training to bolster their procurement and accounting skills and capacity and were unclear about reporting requirements and expected standards. Procurement risks remained high throughout

58. The MOWR and DOI were reorganized following the recommendations of the Public Expenditure Review Commission in 2000. The Commission was initiated in response to donor pressure.

59. MOWR (DOI), DOA, WECS and DHM.

project implementation; and staff's unfamiliarity with Bank procedures frequently led to delays and the buildup of a considerable backlog of reimbursable claims.

96. DOI focused on that which it was good at: civil engineering construction. It failed to coordinate closely with the agricultural department. It also proved unable to understand the crucial role that farmer organizations play in ensuring sound operation and management of irrigation projects and the collection of ISF. DOI remained a top-down organization, good at setting targets but less good at building the local capacity needed to meet them. High turnover of staff adversely affected the operation of management information systems and this weakened DOI's ability to disburse effectively. Financial management, particularly in the regions, was a systemic problem. At the field level, most DOI staff members are highly motivated; but frustrated by budgets too small to allow them to realize potential. **Overall Borrower performance is rated moderately unsatisfactory.**

5. Lessons

97. The ISP project demonstrates that water is a necessary but not sufficient input for increasing crop yields and farmers' incomes. A more comprehensive approach is required. Agricultural extension efforts in the project were modest, doing little to boost yields or crop diversification. How far this was a result of the Maoist insurgency is unclear. The recently closed (2002) Agricultural Research and Extension Project failed to improve the link between research, field application and strengthened agricultural extension service.⁶⁰ New technological improvements were not disseminated to farmers; and government research remained Kathmandu-based. (And yet the preceding agricultural extension project [1985-95] had satisfactorily developed a group-centered, participatory approach to replace the ineffective training and visit system.) Currently JICA is supporting the Agricultural Training and Extension Improvement Project and the Swiss Development Corporation is focusing on vegetable seed production among poor and disadvantaged farmers in remote areas of Nepal. There are several reports about the ineffectiveness of the public sector agricultural extension system; but no alternative system has emerged. The lack of a harmonized and sector-wide approach precludes reform efforts that promote solutions which are more closely aligned to the highly variable agroclimates and soils of Nepal.

98. A similar problem exists for the irrigation subsector. In the previous five years ADB, World Bank and USAID have each worked with DOI. However, they operated in isolation. Each agency promoted its own model and the models were sometimes incompatible—for example, there were conflicting proposals about how to get farmers to pay for irrigation. Financing projects without regard to an overall strategy for the irrigation sector is not an effective way to press for changes in government policy, institutions and individual behavior. Program lending has a potentially bigger impact on

60. World Bank. 1998. Nepal Agricultural Research and Extension Project. Credit 2977-NEP. This project cost US\$23.8 million, had an IDA credit of US\$17.6 million and was completed in 2003. IEG rated outcome as unsatisfactory, institutional development as modest and sustainability as unlikely; Borrower performance was rated unsatisfactory.

the ways sectors are managed and on policies and regulations that affect economic incentives. It is particularly important for the agricultural and water sector to seek a consensus among government agencies, donors, and concerned NGOs about what can be done, who will do it, and how. This more comprehensive approach would link irrigation and agricultural reform policies to higher level macro-economic instruments to improve agricultural sector performance. More attention is needed to targeting the poorest.

99. The Nepal Rural Water Supply and Sanitation Project and the Poverty Alleviation Fund demonstrate that the private sector and NGOs can offer an alternative to central government agencies that are unable or unwilling to reform. Project design failed to tackle DOI's ineffective business practices, relying too much on technical assistance to introduce reform to farmers. The same approach was evident in other water sectors. Support to urban water supply and sanitation continued to center on ineffective centralized institutions. The Bank had more success with rural water supply and sanitation. It created an autonomous Fund Board that worked through the private sector and NGOs. This approach has succeeded but needs further strengthening, particularly mobilization of local funding and linking it to district development planning. This model could be extended to the irrigation sector.

100. Self-employment in agriculture and wage-employment jointly account for more than half the income of the poorest households in Nepal. In the absence of alternative livelihoods, effective measures to improve agriculture sector performance are vital for reducing poverty. Within agriculture, growth of staple crops has fallen behind that of livestock, horticulture and fruit. Cereals still dominate and yields improve only slowly.

101. Given the Bank's mandate to alleviate poverty, was it justified to spend so much on the SMIP project for such a modest increase in irrigated area? Higher levels of incremental agricultural production were achieved in the FMIS at a quarter of the cost per ha. Project assistance to the SMIP was preceded by three other Bank credits totaling \$128 million in present prices. To date, the government has also invested US\$74 million in this project. And yet there are still 800,000 hectares of rain-fed cultivable land in Nepal, much of it located in the most poverty-stricken western and far western regions. The productivity of rain-fed agriculture needs boosting and particular attention is needed to improve understanding of terrain and agro-climate and to assist farmers to adopt small-scale irrigation. There are many NGOs in Nepal capable of doing this work as demonstrated by the success of the farmer-managed irrigation systems.

102. Finally, monitoring and evaluation of the agriculture sector needs strengthening. The partial privatization of agricultural input supply has left holes in national databases. Information, for example, on the use of fertilizer and groundwater is lacking. Comprehensive statistical data is a significant public good that is essential to inform sound decision-making and public policy.

Lessons

103. Experience with this project confirms five IEG lessons:
- A more comprehensive approach is required to maximize benefits from improved agricultural water management. Water is only one input among many; institutional development and capacity building are equally important; as are agricultural inputs and marketing.
 - Donors need to work together more effectively, with each working to their comparative advantage, the aim being to achieve a harmonized sector-wide approach that avoids duplication and contradictions. In Nepal this assessment found while it made sense for donors' projects to be geographically differentiated this was at the expense of sector-wide coordination and mutual learning.
 - Do not lose sight of project beneficiaries. Too much attention to water resource policy and management deflected attention from the need to reform public sector management of large-scale irrigation projects and improve service-delivery. As a result the longer-term sustainability of the public irrigation subsector and farmer's livelihoods dependent on it are at high risk in Nepal.
 - Non-governmental organizations are generally better at working with farmers to increase the productivity of small-scale farmer-managed irrigation systems. The project clearly demonstrated that partnership with NGOs in Nepal enabled agricultural productivity improvements in remote locations where the poorest rural communities are located.
 - Greater attention should be given to monitoring and evaluation to ensure informed policy-making and decision-making. In Nepal the scope of data collection and storage of data on agricultural input and output performance information significantly contracted during the transition from public to private service provision.

Annex A. Basic Data Sheet

NEPAL IRRIGATION SECTOR DEVELOPMENT PROJECT (CREDIT 3009-NEP)

Key Project Data (amounts in US\$ million)

	<i>Appraisal estimate</i>	<i>Actual or current estimate</i>	<i>Actual as % of appraisal estimate</i>
Total project costs	103.01	90.86	88
Loan amount	79.78*	68.42	86
Cofinancing	-	-	-
Cancellation	-	9.6	-

* Due to appreciation of the SDR, the original loan amount had increased to US\$88.96 by project completion.

Cumulative Estimated and Actual Disbursements

	<i>FY98</i>	<i>FY99</i>	<i>FY00</i>	<i>FY01</i>	<i>FY02</i>	<i>FY03</i>	<i>FY04</i>	<i>FY05</i>
Appraisal estimate (US\$M)	4.3	17.9	39.5	61.9	75.2	79.2	79.2	79.2
Actual (US\$M)	0	8.8	20.5	37.5	52.8	63.1	67.1	68.4
Actual as % of appraisal	-	49	52	61	70	79	85	86
Date of final disbursement:	10/28/2004							

Project Dates

	<i>Original</i>	<i>Actual</i>
PCD	-	06/18/1997
Appraisal	-	09/29/1997
Board approval	-	11/25/1997
Effectiveness	12/30/1997	09/17/1998
MTR	12/31/1999	05/04/2000
Closing date	06/30/2002	06/30/2004

Staff Inputs (*Actual/Latest Estimate*)

Stage of Project Cycle	Staff weeks	US\$ ('000)
Identification/Preparation	217.00	214.0 *
Appraisal/Negotiation	85.80	71.9 **
Supervision	386.11	553.8
ICR	8.00	44.00
Total		

* Cost of FAO/CP staff inputs in 1987 and 1988 not included.

** There appears to be some confusion in the 'legacy' system records. Thus in FY 98 and FY 99 some staff inputs are recorded as Supervision when in fact they were inputs for appraisal. In the absence of a more detailed breakdown the inputs for FY 98 have been listed here as part of the appraisal whilst the inputs for FY 99 have been listed as supervision.

Mission Data

Date (month/year)	No. of persons	Specializations represented	Implement. status	Develop objectives
Identification/Preparation				
1987	8	Economist(2); Financial Analyst; Irrigation Engineer; Credit Specialist; Unidentified(3)		
1988	13	Economist; Irrigation Engineer(2); Agronomist; Financial Analyst; Others(8)		
1989	6	Agronomist; Irrigation Engineer; Financial Specialist; Unidentified(2); Others(1)		
1990	4	Unidentified(2); Others(2)		
1991	8	Financial Analyst; Irrigation Engineer; Agronomist(2); Unidentified(2); Others(2)		
1992	6	Irrigation Engineer; Economist; Unidentified(2); Others(2)		
1993	4	Economist; Environmentalist; Unidentified(2)		
1994	2	Economist; Agriculturalist		
1995	9	Economist; Irrigation Engineer; Agriculturalist(2); Others(5)		
1996	10	Irrigation Engineer(2); Economist; Agriculturalist(2); Others(5)		
Appraisal/Negotiation				
1997	22	Irrigation Engineer(5); Economist(3); Agriculturalist(3); Financial Analyst; Environmentalist; Others(9)		

<i>Date (month/year)</i>	<i>No. of persons</i>	<i>Specializations represented</i>	<i>Implement. status</i>	<i>Develop objectives</i>
1998	16	Irrigation Engineer(4); Economist(4);Agriculturalist(2); Financial Analyst(2); Environmentalist;Others(4)		
1998	8	Irrigation .Engineer(2); Economist(3); Agriculturalist(2); Others(2)		
Supervision 28/6-7/7/1998	6	Irrigation .Engineer; Economist(2); Agriculturalist(2);Others		
Supervision(1) 27/10-15/11/1998 (PSR 12/09/1998)	7	Irrigation .Engineer; Economist; Agriculturalist(2); Sociologist; Others	S	S
Supervision(2) 28/5-15/6/1999 (PSR 6/12/1999)	5	Irrigation .Engineer(2); Agriculturalist(2); Sociologist	S	S
Supervision(3) 4-16/12/1999	9	Irrigation Engineer; Agriculturalist(2); Sociologist; Others(5)	S	S
Review of WRS 9-15/1/2000	3	Irrigation Engineer; Water Resources(2)	S	S
Mid Term Review 4-25/5/2000 (PSR 06/14/2000)	14	Irrigation Engineer(2); Economists(3); Agriculturalist(3); Sociologist(2); Financial Analyst; Environmentalist; Others(2)	S	S
Supervision(5) 19/11-11/12/2000	9	Irrigation Engineer; Economist;Agriculturalist(2); Financial Analyst; Others(4)	S	S
Supervision(6) 4-18/6/2001	6	Irrigation Engineer; Agriculturalist; Financial Analyst; Sociologist;Others(2)	S	S
Supervision(7)	6	Irrigation Engineer; Agriculturalist; Financial Analyst; Sociologist;Others(2)	S	S
Supervision(8)	6	Irrigation Engineer; Economist; Agriculturalist(2); Others(2)	S	S
Supervision(9) 9-30/9/2002	13	Irrigation Engineer;Economist; Agriculturalist(2); Financial Analyst;Others(7)	S	S
Supervision(11) 16/11-5/12/2003 (PSR 02/16/2004)	7	Irrigation Engineer(2); Agriculturalist; Financial Analyst; Sociologist; Others(4)	S	S
Supervision(12)		Irrigation Engineer(2)	S	S

<i>Date (month/year)</i>	<i>No. of persons</i>	<i>Specializations represented</i>	<i>Implement. status</i>	<i>Develop objectives</i>
June 2004				
ICR 1-5/7/2004	4	Irrigation Engineer(2); Agriculturalist; Economist	S	S

Other Project Data

Borrower/Executing Agency:

FOLLOW-ON OPERATIONS

<i>Operation</i>	<i>Credit no.</i>	<i>Amount (US\$ million)</i>	<i>Board date</i>
Irrigation and Water Resources Management	C3380	50.80	12/06/07

Annex B. Nepal - All Externally-funded Irrigation and Agriculture Projects

Table B1: Irrigation Sector Projects

<i>Agency</i>	<i>Years</i>	<i>Development Project</i>	<i>Loan millions</i>
World Bank	2007-2013	Irrigation & Water Resources Management	US\$50.0
World Bank	1997-2004	Irrigation Sector Project	US\$68.4
World Bank	1992-1997	Sunsari Morang Headworks	US\$23.4
World Bank	1990-1999	Bhairawa Lumbini Irrigation III	US\$51.9
World Bank	1988-1998	Mahakali Irrigation II	US\$42.5
World Bank	1988-1997	Irrigation Line of Credit subproject	US\$16.0
World Bank	1986-1995	Narayani Irrigation III	US\$24.5
World Bank	1983-1990	Bhairawa Lumbini Irrigation II	US\$16.0
World Bank	1980-1988	Mahakali Irrigation I	US\$16.0
World Bank	1987-1995	Sunsari Morang Irrigation II	US\$40.0
World Bank	1978-1987	Sunsari Morang Irrigation I	US\$30.0
World Bank	1978-1986	Narayani Irrigation II	US\$14.0
World Bank	1976-1982	Bhairawa Lumbini Irrigation I	US\$9.0
World Bank	1973-1981	Birganj Irrigation -Narayani I	US\$6.0
ADB	1996-2002	Irrigation Sector II	US\$33.0
ADB	1994-2001	Irrigation Management Transfer	SDR 9.0
ADB	1992-2000	Rajapur Irrigation	SDR 12.2
ADB	1992-1998	East Rapti irrigation	SDR 7.53
ADB	1989-1996	Irrigation Sector I	US\$33.1
European Union	1997-2001	Irrigation Development	ECU 8.35
Saudi Fund	1995-2000	Bhaimati Irrigation II	Riyals 74.0
Saudi Fund	1988-1997	Bagmati Irrigation I	Riyals 30.0
IFAD	1994-2000	Groundwater Irrigation	US\$7.6
OPEC	1995-1999	Chanda Mohana Irrigation	US\$8.5
Netherlands	1992-1997	Mechi Hill Irrigation	NRS. 11.8
UNCDF		Marchawar Irrigation II	US\$5.6

Table B2: Agricultural Sector Projects

Agency	Dates	Development Project	Loan US\$ millions
World Bank	1998-2003	Agricultural Research and Extension	23.8
UK/ODA	1996-2003	Hill Agricultural Research	19.9
SDC Technical Cooperation	1996-2001	Vegetable Seed Production	5.0
SDC Technical Cooperation	1986-1996	Vegetable and Potato Seed	not known
ADB	1996-2001	Third Livestock Development	28.2
European Union	1995-2001	Strengthening of Veterinary Services and Livestock Disease Control	11.0
GTZ	1992-1997	Promotion of Livestock Breeding	10.0
USAID	1991-1996	Improvement of Research Management Agro-enterprise Technology Systems	12.0
USAID	1991-1996	Vegetable Seed Production and Fruit Improvement in Western Region-Market Access for Rural Development	7.2
ADB	1989-1997	Secondary Crops Development	7.0

Annex C. Economic Analysis

Annex C1: Sunsai Morang Irrigation Project Economic Analysis

Baseline Cropping and Net Returns updated at Mid-term Review

Ex Post based on DOI's SMIP Cropping Inventory 2006-2007

Without Project 1995-1996 Proposed Area of 11,500 ha		Total Area	Net Returns Rs Million	Net Returns per ha	Total Area	Project Area	Net Return Million Rp	Incremental Million Rp	
Kharif	Irrigated paddy - HYV	2,659	36	13,539	57,519	10,176	138	102	
	Irrigated Paddy - Local	886	9	3,385	1,856	328	1	-8	
	Rainfed paddy	6,755	49	18,428	0	0	0	-49	
	Jute Irrigated	0	0	0	0	0	0	0	
	Jute Rainfed	1,218	0	0	0	0	0	0	
	Pulses	0	0	0	682	121	0	0	
	Oilseeds	0	0	0	0	0	0	0	
	Vegetables	0	0	0	508	90	0	0	
	Rabi	Wheat	3,876	34	12,787	38,715	6,850	88	54
		Oilseeds	1,107	12	4,513	1,704	301	1	-11
Pulses		1,661	16	6,017	11,317	2,002	12	-4	
Potato - Irrigated		111	2	752	1,240	219	0	-2	
Potato- Rainfed		554	12	4,513	0	0	0	-12	
Vegetables		200	7	2,633	2,210	391	1	-6	
Sugarcane		111	2	752	2,159	382	0	-2	
Spring Cro	Jute	0	0	0	2,020	357	0	0	
	Paddy	0	0	0	15,342	2,714	37	37	
	Pulses	0	0	0	7,674	1,358	0	0	
	Vegetables	0	0	0	1,840	326	1	1	
	Oilseeds	0	0	0	275	49	0	0	
Summary	Total project Area	11,000			68,000	11,500			
	Total Cropped Area	19,138	179		213,061	25,665			
	Summer	11,518			63,925	10,715			
	Rabi	7,620			57,355	10,146			
	Spring	0			31,463	4,804			
Cropping Intensity	174%				223%				

Source: DOI/SMIP annual cropping report 2007.

Economic Rate of Return Calculation

Economic Cash Flows Rp Millions

Year	Investment	Extension/Training O&M	Total Costs	Incremental Benefits	Cash Flow
1996	1	0	2		-2
	2	381	2	383	-383
	3	457	2	484	-464
	4	520	25	545	-495
	5	531	25	556	-481
	6		25	25	75
	7		25	25	77
	8		25	25	80
	9		25	25	83
	10		25	25	85
2006	11		25	25	88
	12		25	25	91
	13		25	25	94
	14		25	25	97
	15		25	25	100
	16		25	25	103
	17		25	25	106
	18		25	25	109
	19		25	25	113
	20		25	25	116
	21		25	25	120
	22		25	25	123
	23		25	25	127
	24		25	25	131
	25		25	25	135

ERR 0.9%

Annex D. Borrower Comments

Dear Mr. John Heath

**Re: NEPAL – Irrigation Sector Project (Credit 3009 NEP) Draft Project
Performance Assessment Report**

Please find below our comments on the above said PPAR.

1. The cropping intensity in Sunsari Morang Irrigation Project (SMIP) has increased from 160% in 1998-99 to 237% in 2006-07 which is more than anticipated during the project appraisal.
2. The yields of summer paddy and wheat, the major crops in the area, have increased to more than 4t/ha and 2.5t/ha respectively after the implementation of the project. These values match well with the appraisal expectations.
3. There are more than 1500 watercourse, serving 28ha block, in SMIP that are cleaned twice a year by the WUAs. This shows that the farmers' contribution towards the O&M of the project is remarkable.
4. The decrease in ISF collection after 2002-03 is mainly due to the insurgency problem that restricted the field level activities of the project staff. It is expected to increase in the future.
5. Department of Irrigation (DoI) is concerned about the O&M fund requirement for SMIP. Accordingly an amount of NRs. 39.4 million has been increased in the originally allocated amount of NRs. 30 million for the current Fiscal Year. The amount is expected to increase considerably in the future as NRs. 200 million has been proposed and already discussed with the Ministry of Finance for the coming Fiscal Year. One excavator which will be helpful in coping with the siltation problem in the canals will be purchased out of this amount
6. The dredgers, though were supposed to be replaced after 9 years, are still functioning well after 12 years. And DoI is planning to purchase a new dredger in the near future from the O&M budget to be allocated.

I would like to mention that SMIP is also providing irrigation in an area of about 15000ha for Spring Paddy, which was not anticipated during the appraisal of the project, contributing to overall increase in production. The dredgers have a critical role in it. With DoI/Government of Nepal being serious about the O&M fund requirement of the project; increased cropping intensity and yield of major crops as well as farmer's involvement in O&M; we are of the opinion that the project will be sustainable.

Yours Sincerely

Anil Kumar Pokhrel
Deputy Director General
Department of Irrigation

cc: Ms. Monika Huppi, Manager Sector Evaluation Division, World Bank

