Government of Nepal

Ministry of Energy, Water Resources & Irrigation

Department of Irrigation

Irrigation and Water Resources Management Project (IWRMP)

Irrigation & Water Resources Management Project (IWRMP)

PROJECT COMPLETION REPORT (2008-2018)

Office of Project Director

Irrigation & Water Resources Management Project

Department of Irrigation

Jawalakhel, Lalitpur Nepal

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Executive Summary

The Irrigation and Water Resources Management Project (IWRMP) was initiated with the aim of supporting the national goal of poverty reduction through improving irrigated agriculture productivity and management of selected irrigation schemes, and enhancing institutional capacity for integrated water resources management. The target beneficiary groups of the Project were the water users of the selected irrigation schemes.

The Government of Nepal and International Development Association (IDA) had signed a financial agreement on 31st January, 2008 for the implementation of the Project with total amount of US$ 65 million for a period of five years (WB Grant: US$ 50 million, GoN: US$: 10 million, WUA: US$ 5 million). There was an additional agreement dated 2nd November, 2008 for National Food Crisis Response Program with total cost of US$ 14.3 million. Further, there was an additional agreement dated 24th March, 2014 for activities related to the Original Project. The additional support was US$ 50 million (US$ 20 million: Grant and US$ 30 million: Loan) from IDA, US$ 5 million by GoN and US$ 3.1 million by WUA (US $ 58.1 million in total). The completion date for the additional financing of the Project was fixed as 30th June, 2018.

To achieve the Project Development Objective (PDO), the Project was divided into four components:

a) Component A: Irrigation Infrastructures Development & Improvement

b) Component B: Irrigation Management Transfer

c) Component C: Institutional and Policy Support for Improved Water Management

d) Component D: Integrated Crop and Water Management

The Project was designed to be implemented in the three western regions of Nepal i.e. Western, Mid-Western and Far-Western covering 40 districts under Component A for the improvement of surface irrigation schemes under FMIS and GW tube well clusters. Whereas under Component B, four major AMIS (Fully or partly) were taken from Eastern to Far-Western Terai region. Component C was designed to support the stakeholders within the Government of Nepal (WECS) related to water resources planning and policy formulation. Whereas, Component D integrated the irrigation system rehabilitation and improved irrigation service provided through component A and B with agriculture activities.

Component A rehabilitated Farmer Managed Irrigation Systems (FMIS) and implemented new ground water tube-well irrigation clusters. A total of 239 sub-projects (134 in OS and 105 in AF) covering a combined agricultural command area of 38,861 hectares were approved by the Project Appraisal Committee on various dates throughout the Project implementation period. These selected sub-projects were supported with various infrastructure improvement works to achieve year-round irrigation in the command area along with institutional support and agricultural activities. Out of a total of 239 sub-projects, 230 sub-projects (OS: 128, AF: 102) were implemented successfully achieving 97% completion rate on the basis of number of sub-projects. The total command area which was brought under year round irrigation facility with the successful completion of these 230 sub-projects was 34,095 ha (OS: 18,733 ha, AF: 15,362 ha). Out of the original target of 38,827 ha, this achievement was 88% considering the combined non

completion of nine sub-projects. The total population directly benefitted by the implementation of the sub-projects under component A was 384,361 with total households (HH) 59,228. The share of Janajatis and Dalits were 18% and 10% respectively. Since most subprojects under component A comprised of rehabilitation works, there were no significant social and environmental issues reported during implementation. Most of the minor issues reported were mitigated with the preparation and implementation of Social & Environmental Management Plan (SEMP). There was an inbuilt feature of Component A to prepare and implement Gender & Vulnerable Community Development Plan (GVCDP) at the sub-project level.

A total of 7 sub-systems were taken up for IMT under IWRMP **Component B**. Kankai Irrigation System (7000 ha), Sitagunj Branch (8000 ha) & Ramgunj Branch (7800 ha) of Sunsari Morang irrigation system, Block 2 (3000 ha) & Block 8 (3000 ha) of Narayani Irrigation system and Stage I (4800 ha) and Stage II (5700 ha) of Mahakali Irrigation system were taken up for Irrigation Management Transfer with the aim of transferring these systems beyond a certain part to a fully responsible and capable Water User's Association, represented by the farmers of the system. The major works under IMT were Essential Structure Improvements (ESI), water management activities and institutional development works. ESI works were carried out at each of the ISPs to upgrade the quality of the canal networks to provide more water to farmers, especially in the tail end regions of the canal systems. The implemented volume of ESI works in all systems were more than the original targets as the savings gained from currency exchange rate, low bidding and savings from contingencies were further channelled into these system for increasing the scope of ESI activities. Water management was the key issue for an irrigation system and concerned WUA to be sustainable since it ensured availability of sufficient irrigation water from head to tail efficiently and equitably and thereby, justified strictness in the collection of irrigation fees. Major activities under water management were calibration of irrigation structures, development and implementation of canal operation plan, canal maintenance plan and assets management plan. Institutional development activities were carried out in all systems selected for IMT which included the formation of WUAs, infrastructure support and capacity building of WUAs, and Irrigation Service Fee (ISF) collections. At the end of IMT, exit plan was prepared for each system and disseminated to the concerned farmers. The basic objective of the exit plan was to sustain project benefits and best practices of the completed schemes by institutionalizing them in both WUA and DoI.

The aim of the **Component C** was to help provide more effective and streamlined water resources management services at the national level and within selected basins through institutional strengthening of relevant institutions and policy support to the Government of Nepal. The major activities carried out under this Component were the establishment of Water Resources Information System (WRIS), preparing the draft of Integrated Water Resources Policy, Initiating to prepare selected river basin plans, installation and operation of telemetric system in major rivers and canal systems, establishment of river basin offices, and establishment of GIS-based management information systems.

The **Component D** had provided a package of appropriate agronomic and water management practices and investment support as deemed appropriate in the sub-projects under Components A and B. The Component focused on on-farm crop water management, cropping pattern improvement, crop

diversification and intensification, quality seed production in the command area, farm mechanization and organized market. The key activities carried out were social mobilization, field-based training, farmer field school on integrated crop water management and integrated pest management, livestock shed improvement, seed production, income generation program to attract youth in agriculture and demonstration of off-season vegetables in plastic tunnel, distribution of small farm machinery and capacity building of the technical staff, water users, agro- input suppliers and farmers.

All key targets as defined in the Project Development Objective (PDO) and project indicators were achieved by the Project. The Project provided year round irrigation facilities for 73,876 ha of agriculture land with the rehabilitation of schemes under FMIS and AMIS. It was noted that 87% water users were satisfied with the WUA and most of the schemes (87%) collected sufficient fund (cash+labour) for their O&M expenditures. The total number of beneficiaries directly benefitted by the project was 764,611 which was about 85% more than its target. The productivity of major crops e.g. rice, wheat, maize and potato were increased by 51%, 55%, 122%, and 79% respectively in comparison to the baseline values. The average cropping intensity was increased up to 243% from its base value of 168%. Further, the seed replacement rate in the sub-projects were 13%, 13% and 16% for rice, wheat and maize respectively.

Apart from those specified project outcome indicators, employment generation at local level were increased significantly and also the technical knowledge of water users in relation to water resource management, construction management, and financial resources management were increased. Women participation as farmers and as WUA members was also promising. WUA contribution to the physical construction works were also very high (around 8.5%). Crop diversification and commercialization increased in all AMIS after the intervention of IWRMP. It was noted that farmers have started to produce their own seeds for all agricultural products as much as possible. IWRMP was a pioneer project for the promotion of small farm machinery in Nepal. Promotion of small farm-machinery has contributed to reduce the cost of production, drudgery, and workload.

In spite of having many challenges during the course of project preparation and implementation, IWRMP-AF nevertheless, did not reschedule its completion timeline beyond June, 2018, the original date of completion as agreed during its inception. Both parts of the Project, original scope and additional finance, were in its combination, able to achieve most of the target outcomes with the successful completion of more than 97% of sub-projects in the field level by the final deadline of the Project.

Currently, a probable shock to the Project outcome could be the national restructuring into three tier federal government system. Local and Provincial governments should be aware of IMT activities and should recognize the importance and overall contribution to national benefit by FMIS system in Nepal.

The achievements of IWRMP underscore the importance of irrigated agriculture for income generation, employment opportunities and food security at the rural level. It highlights the goals that are both attainable and sustainable by integrating irrigation, agriculture and marketing. It is important that the lessons learned by IWRMP should be redirected by future interventions for improving the economy in the rural areas of Nepal.

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Abbreviations

ADP	Agriculture Development Plan
ADS	Agriculture Development Strategy
AF	Additional Financing (for IWRMP from March 2014 to June 2018)
AMIS	Agency- Managed Irrigation System
AMP	Asset Management Plan
AO	Association Organizer (Social Worker)
BC	Branch Canal
BSC	Branch Secondary Canal
CA	Command Area
CBO	Community Based Organization
CCA	Culturable Command Area
CDMA	Code Division Multiple Access
CMP	Canal Maintenance Plan
COI	Conflict of Interest
COP	Canal Operation Plan
DAC	District Appraisal Committee
DADO	District Agriculture Development Office
DDC	District Development Committee
DDRC	District Disaster Relief Committee
DFSR	Detailed Feasibility Study Report
DG	Director General
DHM	Department of Hydrology & Meteorology
DoA	Department of Agriculture
DoI	Department of Irrigation
DTT	District Technical Team
DTW	Deep Tube Well
EC	(WUA) Executive Committee
EDMS	Enterprise Database Management System
EIA	Environmental Impact Assessment
ESI	Essential Structures Improvement
FAO	Food & Agriculture Organization
FCRP	Food Crisis Response Program
FFS	Farmer's Field School
FMIS	Farmers Managed Irrigation System
FY	Fiscal Year
GoN	Government of Nepal
GMC	Grievance Management Committee
GPRS	General Packet Radio Service
GRM	Grievance Redress Mechanism
GVCDP	Gender & Vulnerable Community Development Plan
GW	Groundwater
GWIDD	Groundwater Irrigation Development Division
ha	hectare
HH	Households
HW	Head Work
ICM	Integrated Crop Management

ICWMP	Integrated Crop and Water Management Program
IDA	International Development Association
IDD	Irrigation Development Division
IDF	Institutional Development Framework
IDSD	Irrigation Development Subdivision
IDV	Irrigation Development Vision
IEE	Initial Environmental Examination
IMT	Irrigation Management Transfer
IMTA	Irrigation Management Transfer Agreement
IMTP	Irrigation Management Transfer Project
IPM	Integrated Pest Management
ISE	Initial Social Examination
ISEA	Integrated Social and Environment Assessment
ISF	Irrigation Service Fee
ISP	Irrigation Subproject
IRR	Internal Rate of Return
IWRM	Integrated Water Resources Management
IWRMP	Irrigation and Water Resources Management Project
KIS	Kankai Irrigation System
Km	Kilometre
m	meter
MC	Main Canal
M&E	Monitoring and Evaluation
MIS	Mahakali Irrigation System
MoAD	Ministry of Agriculture Development
MoF	Ministry of Finance
MoI	Ministry of Irrigation
MSC	Main Secondary Canal
NCB	National Competitive bidding
NEC	Nepal Eastern Canal (Narayani Irrigation System)
NGO	Non-Governmental Organization
NIFWAN	National Federation of Irrigation WUA, Nepal
NIS	Narayani Irrigation System
NISP	Nepal Irrigation Sector Project
NPC	National Planning Commission
NWP	National Water Plan
NWRS	Nepal Water Resources Strategy
NRs	Nepali Rupees
O&M	Operation and Maintenance
OP	(World Bank's) Operational Manual
OPD	Office of the Project Director
OS	Original Scope (of IWRMP from March 2008 to June 2016)
PAD	Project Appraisal Document
PCO	Project Coordination Office
PCR	Project Completion Report
PD	Project Director
PDNA	Post Disaster Need Assessment
PDO	Project Development Objective

PICC	Project Implementation and Coordination Committee
PIM	Project Implementation Manual
PRS	Poverty Reduction Strategy
PSC	Project Steering Committee
Q&A	Question and Answer
RAC	Regional Appraisal Committee
RBO	River Basin Office
RC	Regional Committee
RCC	Reinforced Cement Concrete
RID	Regional Irrigation Directorate
RIS	Ramgunj Irrigation System
RPSU	Regional Project Support Unit
SAWI	South Asia Water Initiative
SEA	Social and Environment Assessment
SEMP	Social and Environmental Management Plan
SIS	Sitagunj Irrigation System
SMIP	Sunsari-Morang Irrigation Project
SMU	Sub-Project Management Unit
SP	Sub-Project
SSC	Sub Secondary Canal
STW	Shallow Tube Well
TA	Technical Assistance
TC	Tertiary Canal
ToR	Terms of Reference
ToT	Training of Trainers
US	United States
WB	World Bank
WECS	Water and Energy Commission Secretariat
WM	Water Management
WRIC	Water Resources Information Centre
WRIS	Water Resources Information System
WUA	Water Users Association

1 PROJECT CONTEXT AND DEVELOPMENT OBJECTIVE

1.1 Context at Appraisal

While initiating the Irrigation and Water Resources Management Project (IWRMP) in 2006/07, Nepal was characterized as one of the lowest per capita income countries in South Asia that had recently emerged from years of violent conflict followed by the peace process accompanied by a long period of political instability and slowly moving towards normality. The Project Appraisal Document (PAD) for the IWRMP was issued in 2007, which states some achievements in economic and human development parameters with improvements in health, education, significant reduction of poverty due to the income from remittances, agricultural entrepreneurial activities, wage levels, and property values. It singles out the agricultural sector needing improvement in productivity through diversification towards higher valued crops with improvements of irrigation infrastructures and their sustainable management. As discussed in the PAD, Irrigation systems in Nepal can be categorised as follows:

a) traditional farmer irrigation systems developed, owned and managed by the communities
b) systems developed with full or partial support of the government
c) large-outlay surface irrigation schemes
d) government developed tube well irrigation schemes both deep and shallow tube-wells
e) Individually owned and operated tube-wells and pumps (mostly using shallow aquifers, streams, ponds, and dug wells).

The first and second categories account for nearly three-quarters of total irrigated area in Nepal and the farmers are fully responsible for all management activities, ranging from diversion of flows at the water source to operation of the canals and delivery to the agriculture field. Over the years and generations that many of these systems have been in operation, the communities responsible for them have also developed their own rules, norms and procedures for managing such irrigation schemes.

The third category includes medium and large systems jointly managed by the government and farmers. The fourth category covers government-developed deep and shallow tube wells (DTWs and STWs) and the fifth is fully privately owned and operated.

The defining characteristics of irrigation systems vary significantly between the hills and the Terai. Hill schemes are predominantly traditional farmer-managed irrigation systems (FMIS) and often suffer from infrastructural weaknesses owing to informal design (earthen canals with rocks, mud and grass used for flow control/diversions) as well as natural damage from landslides and floods. Moreover, abstractions are predominantly made from medium and small watercourses driven by the Monsoon hydrological pattern, with limited capacity for providing year-round water supply and thereby limiting the scope for diversification. Optimising these resources is therefore a priority.

In the Terai, on the other hand, irrigation is characterised by relatively large public irrigation systems (agency-managed irrigation systems or AMIS) which suffer from below capacity performance, poor operation and maintenance (O&M), negligible cost recovery and inadequate maintenance funds. Both the hill and Terai irrigation systems suffer from low water use efficiency leading to low agricultural productivity.

The PAD cites past efforts by the Government of Nepal (GoN) to reform the irrigated agriculture sector. The National Water Plan (NWP), 2005 calls for Integrated Water Resources Management (IWRM). It points out the potential for expanding the nation's irrigated area, and highlights the poor coordination between the Irrigation and Agriculture development sectors as a major shortcoming. The NWP sets forth an ambitious agenda of needed irrigation improvements including management, planning, and capacity development for all stakeholders including water user's groups within the country. These needs are further emphasized in Department of Irrigation's (DoI) Irrigation Development Vision (IDV), 2005. To promote efficiency and effectiveness of water delivery the IDV emphasizes that the DoI must focus on institutional building. Further, Nepal's Poverty Reduction Strategy (PRS) envisages that improved irrigation facilities, uninterrupted supply of chemical fertilizer and expansion of rural credit along with rural roads and higher resource allocations would help achieve annual agriculture growth of about 4.1%. Realizing the importance of Integrated Water Resource management, the GoN stressed the river basin planning approach for water resource development activities. However, there was a lack of a comprehensive, legislative and regulatory framework to enable integrated water resource management.

Recognising the above mentioned facts, the Government of Nepal and International Development Association (IDA) (IDA & WB refers same and use interchangeably in this report) had signed a financial agreement on 31st January, 2008 for the implementation of "Irrigation and Water Resources Management Project (IWRMP)" with total amount of US$ 65 million. According to the signed agreement, the GoN received the Grant Support from IDA of US$ 50 million. The remaining amount was from GoN (US$ 10 million) with obligatory contribution from WUA (US$ 5 million). The project was launched for the period of five years (2008-2013), however, the project period was extended up to 30 June, 2016. There was an additional agreement dated 2nd November, 2008 for National Food Crisis Response Program (NFCRP) with total cost of US$ 14.3 million. Further, the GoN and IDA entered into an additional agreement dated 24th March, 2014 for the purpose of providing additional financing for activities related to the original project (signed dated 31st January, 2008). The additional support was US$ 50 million (US$ 20 million: Grant and US$ 30 million: Loan) from IDA, US$ 5 million by GoN and US$ 3.1 million by WUA (US $ 58.1 million in total). The deadline of the additional financing of the project was fixed up to 30th June, 2018. The Table 1 summarizes the total cost of the project.

Table 1 Project Cost of IWRMP

Project	Agreement Date	Financial Arrangement (Million USD)				
		IDA		GoN	WUA	Total
		Grant	Loan			
IWRMP-OS	31st January, 2008	50	0	10	5	65
IWRMP-AF (NFCP)	2nd November, 2008	0	14.3	0	0	14.3
IWRMP-AF	24th March, 2014	20	30	5	3.1	58.1
Grand Total		**70**	**44.3**	**15**	**8.1**	**137.4**

1.2 Goals and Objectives

The overall project objective was to support the national goal of poverty reduction through improving irrigated agriculture productivity and management of selected irrigation schemes, and enhancing institutional capacity for integrated water resources management. The primary target beneficiary groups of the project were the water users of the selected irrigation schemes.

Key indicators for measuring the achievement of the Project Development Objective (PDO) were:

a) Increase in productivity of selected crops namely: Rice, Wheat, Maize & Potato

b) Percent increase in Cropping intensity

c) Percent of transfer irrigation schemes whose O&M expenditures is undertaken by the concerned WUAs as per agreed Asset Management Plan

d) Percent of Water users in the rehabilitated schemes satisfied with WUAs

e) Area Provided with irrigation and drainage services (ha)

f) Operational water user's associations created and/or strengthen (number)

g) Water users (Number of beneficiaries) provided with new/improved irrigation and drainage services

h) Water users (Number of Female beneficiaries) provided with irrigation and drainage services

To achieve the Project Development Objective (PDO), measuring accomplishments by the use of the key indicators above, the project was divided into four components:

e) Component A: Irrigation Infrastructures Development & Improvement

f) Component B: Irrigation Management Transfer

g) Component C: Institutional and Policy Support for Improved Water Management

h) Component D: Integrated crop and water Management

While Component A and B were implemented by the Department of Irrigation (DoI), Component C and D were implemented by Water and Energy Commissions Secretariat (WECS) and Department of Agriculture respectively. The project was managed by the Office of Project Director (OPD), based at DoI in Kathmandu. Field level implementations were carried out by respective district and regional offices.

In addition to the PDO and its key indicators, each component had its own indicator to monitor its performance. Key indicators for measuring the achievement of the PDO in relation to Component A were:

a) Percent of tail enders reporting improved water availability

b) Percent of WUA formally constituted and holding regular meetings

c) Percent of WUAs collecting water charges (in cash, kind & labour) required for adequate O&M

d) Percent of WUAs maintaining appropriate accounts and cash registers

e) Area irrigated by Ground Water (GW) from deep and shallow tube wells

A summary of the result framework for Component A is given in Table 2.

Table 2 Results Framework for Component A

PROJECT DEVELOPMENT OBJECTIVE	**PROJECT OUTCOME INDICATORS**
Improve irrigated agriculture productivity and management of selected irrigation schemes and enhance institutional capacity for integrated water resources management.	1 Improved irrigated agricultural productivity • percentage increase in productivity of selected crops • percentage increase in cropping intensity 2 Improved irrigation scheme management • percentage of water users in rehabilitated irrigation schemes satisfied with WUA [management of] O&M
INTERMEDIATE OUTCOMES	**INTERMEDIATE OUTCOME INDICATORS**
1 Improved physical performance of select surface water schemes	Percentage of tail-enders reporting improved water availability (relative to baseline)
2 Financially and institutionally sustainable WUAs	Percentage of WUAs formally constituted and holding regular meetings. Percentage of WUAs collecting water charges (in cash, kind and labour) required for adequate O&M Percentage of WUAs maintaining appropriate accounts and cash registers.
3 Enhanced use of groundwater irrigation	Additional area irrigated by groundwater from DTW

The overall objective of Component B was to improve irrigation service performance and service delivery in selected irrigation systems in the Terai through the principles of Irrigation Management Transfer (IMT) to the relevant Water Users Association (WUAs). The component was designed to address problems exhibited in large public irrigation schemes i.e. AMIS characterized by below capacity performance, poor O&M, low cost recovery, and inadequate maintenance funds. Key indicators for measuring the achievement of the PDO in relation to Component B were:

a) Percent of tail-enders reporting improved water availability

b) Number of WUAs holding regular meetings

c) Number of WUAs collecting water charges (ISF) required for adequate O&M

d) Number of WUAs maintaining appropriate accounts and cash registers (schemes)

e) Percent of delivery points receiving proportionate share of water

f) Adequate O&M expenditures by DoI and WUA according to agreed Asset Management Plan

The major goal of Component C, Institutional and Policy Support for Improved Water Management, was to provide more effective and streamlined water resources management services at the national level and within selected river basins through institutional strengthening of relevant institutions, namely WECS, and the DoI. The component was designed to address sector issues relating to the lack of appropriate regulatory framework and sufficient institutional capacity for undertaking effective planning and inter-

sectorial allocation of water resources. Key indicators for measuring the achievement of the PDO in relation to Component C were:

a) Integrated river basin plans developed for four rivers

b) Number of Telemetric system established in targeted basins

The objective of Component D was to increase production, productivity and profitability of agriculture and related production activities in the schemes selected under the project. The component integrated the irrigation system rehabilitation and improved irrigation service provided through Components A and B with agricultural production activities. It focused on the issues of insufficient integration between agriculture and water management interventions in order to derive full benefits from investments in irrigation. The expected outputs are higher productivity in agriculture and related production activities; increase in cropping intensity; and diversification into vegetables and other high-value crops. Overall, the component would seek to provide a package of appropriate agronomic and water management practices and investment support in the concerned irrigation schemes.

Key indicators for measuring the achievement of the PDO in relation to Component D were:

a) Percent of farmers in the selected schemes adopting demonstrated techniques

b) Increase in seed replacement rate

1.3 Scope of Project

The Project was designed to be implemented in the three western regions of Nepal i.e. Western, Mid-Western and Far-Western covering 40 districts under Component A for the improvement of surface irrigation schemes under FMIS and GW (deep and shallow) tube well constructions. Whereas under Component B, four major AMIS (Fully or partly) were taken from Eastern Terai to Far-Western Terai. The project coverage area is shown in figure 1 below.

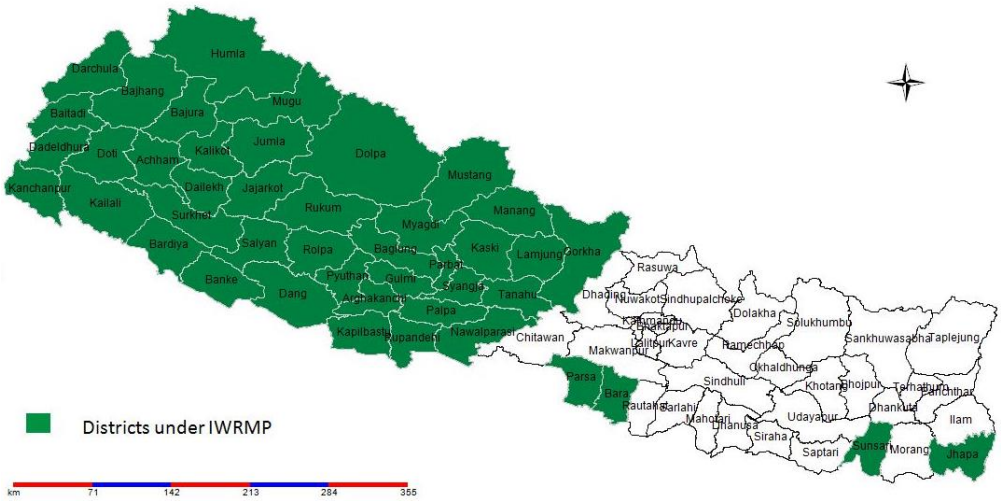

Figure 1 Sub Project Districts (Green color)

The component wise scope of the project are described in the following sub-sections:

1.3.1 Component A: Irrigation Infrastructure Development & Improvement

Component A was designed to address the following issues in selected surface and ground water schemes in the Mountain, Hills and Terai:

a) Structural and Operational weakness in the traditional FMIS, with consequent low water use efficiency and low agricultural productivity.

b) Low utilisation of the excellent GW potential of the Terai.

With regard to the irrigation schemes the component was designed to support rehabilitation and/or construction of a total of 217 irrigation schemes both surface and GW (OS: 134, AF: 83) covering around 33,360 ha of command area. However during the implementation of the sub-projects, savings were realized due to the gain from dollar exchange rate, low bidding from contractors and also saving from contingencies, hence the OPD proposed to increase the scope of the project. Finally, the component targeted to support rehabilitation and/or construction of a revised total of 239 irrigation schemes (OS: 134, AF: 105) covering around 38,827 ha of command area.

In addition to infrastructure renovation/rehabilitation, Component A was concerned with:

- Capacity building of WUAs in the target ISPs in order to improve the levels of service they provide to their members
- Agricultural extension and training to help farmers in the target ISPs exploit the full potential of their rehabilitated irrigation systems
- Capacity building of the Department of Irrigation (DoI) through in-house training, overseas courses and study tours, and regional workshops.
- Preparation of a groundwater irrigation development plan

The total cost of Component A was US$ 70.85 million (OS: US$ 39.85 million, AF: US$ 31.0 million)

1.3.2 Component B: Irrigation Management Transfer

The activities of Component B consisted of:

a) Carrying out surveys, investigations and studies of the irrigation systems

b) Preparation and implementation of an assets management plan that defines the O&M needs of the irrigation systems

c) Provision of training and other capacity building activities for WUAs to enable them to take overall responsibilities for the governance, management and maintenance of the irrigation systems, including the collection and administration of water charges for undertaking O&M activities of the irrigation systems and related equipment to be transferred to WUAs pursuant to IMT agreement between DoI and WUAs.

d) Essential structural improvement works of the irrigation systems and sub-systems to bring them to an operational stage

e) Preparation and implementation of a water management plan to run the system efficiently and optimally to distribute available water resources in the system

f) Repair, upgrading, or procurement of buildings, information systems, transportation and maintenance and information technology equipment

g) Capacity building of WUAs and the DoI

Initially, Component B envisaged within its scope, the Irrigation Management Transfer with the legally empowered WUAs of 9 schemes from 4 different AMIS covering a total of 61,000 ha of command area as shown in Table 3 below:

Table 3 Sub-Projects under Component B as per the Appraisal

Irrigation System	ISPs	ISP Command Area (ha)	No. of WUAs
Kankai IP, Jhapa	1. Entire System	7,000	1
Sunsari Morang IP, Sunsari	2. Sitagunj SC 3. Ramgunj SC 4. Biratnagar SC	8,000 7,800 5,000	1 1 1
Narayani IP, Parsa & Bara	5. Blocks 2 & 8, 6. Blocks 1,3 & 9 7. Blocks 4, 5 & 6	6,000 8,400 8,000	2 3 3
Mahakali IP, Kanchanpur	8. Stage I 9. Stage II	4,800 6,000	1 1
Total	**9 Schemes**	**61,000**	**14**

After the mid-term review mission of the World Bank (WB) in October, 2011, the scope of work of Component B was confined to working with 4 WUAs within 4 AMIS covering only 23,100 ha of command area. However, during the formal agreement of AF in November, 2013, it was agreed to add three other systems namely Ramgunj (7800 ha), Narayani Block 2 (3000 ha) and Mahakali Stage II (5700 ha) as shown in Table 4 with a total target of 39,300 ha of irrigated agriculture land.

Table 4 Sub-Projects under Component B (Actual)

Irrigation System	ISPs	ISP Command Area (ha)	No. of WUAs
Kankai IP, Jhapa	1. Entire System	7,000	1
Sunsari Morang IP, Sunsari	2. Sitagunj SC 3. Ramgunj SC	8,000 7,800	1 1
Narayani IP, Parsa & Bara	4. Blocks 2 5. Blocks 8	3,000 3,000	1 1
Mahakali IP, Kanchanpur	6. Stage I 7. Stage II	4,800 5,700	1 1
Total	**9 Schemes**	**39,300**	**7**

Total cost of this component was US$23.43 million (OS: US$ 10.59 Million, AF: US$12.84 million).

1.3.3 Component C: Institutional and Policy Support for Improved Water Management

The major scope of Component C of IWRMP was to establish a central Water Resources Information Centre (WRIC) at the WECS to develop and maintain national water resource database and disseminate water related data to the concerned stakeholders. Further, the component had aimed to prepare a new integrated water resources policy and with all necessary legal instruments relating to the extraction and use of GW, coordination of water licensing powers, mechanism for legalization of customary water rights, and regulation and promotion of private sector participation. Establishment of telemetric system for real time measurement of water availability in selected rivers was one of the primary tasks of this component. The major activity of this component in the AF period was the preparation of basin plan for Karnali, Gandaki, Babai and West Rapti basin.

Furthermore, this component had to ensure the capacity building activities for DoI aimed at enhancing its capacity for implementing irrigation sector reform, including development of management information system (MIS) and an integrated monitoring and evaluation system (M&E) with associated equipment and facilities.

The total cost of this component was US$ 7.60 million (OS: US$ 4.12 million, AF: US$ 3.48 million)

1.3.4 Component D: Integrated Crop and Water Management

This component integrated the irrigation system rehabilitation and improved irrigation service provided through Component A and B with downstream agricultural activities. It provided a package of modernized agriculture practices and institutional support for farmers and landless vulnerable communities in the command area toward achieving optimal level of agriculture production. ICWM had to be implemented by the farmers themselves using participatory planning, implementation, and monitoring approach. This component ensured intensive training and support to the farmers which included:

a) Promotion of better water use and management practices

b) Adoption and Expansion of non-conventional irrigation technology.

c) Introduction of site specific agronomic practices relevant to local needs and market opportunities

d) Provision of pre and post production support to small farmers in the form of small rural access infrastructure, improved availability of quality inputs, cooperative processing and marketing, strengthening of supply chains, improved storage structures/handling practices, and efficient marketing information.

This component had three sub components as:

a) D1: Integrated crop and water management

b) D2: Improvement of water distribution structures at field level

c) D3: Investment Support for community and productive assets

The sub component D1 focused on improvement of production practices, better water use and management practices which had to be implemented through:

- Field level demonstration for crop and on farm water management (IPM, ICM, FFS etc.)
- Training, capacity building and exposure visit for farmers

The sub component D2 focused on improvement of water distribution structure at field level which would be done through:

- Construction of field channels
- Construction of small water distribution boxes
- Lining of field channels at critical parts
- Construction of drainage system and other related field level structures

The sub component D3 had to enable farmers and other producers to enhance their production system through demand driven augmentation of productive capacity and infrastructure. This support was provided on a matching grant basis, where the farmers group contributed a portion of the total cost of the infrastructure, in kind and cash. The scope of infrastructure would be:

- Shallow tube-wells
- Pilot new water management methods
- Community managed resources centre for farm mechanization and information dissemination
- Community based nursery
- Seed bank for agriculture, horticulture, and fisheries
- Market centres, small roads and culverts

Total cost of this component was US$ 30.3 million (OS: US$7.72 million, AF: US$ 22.58 million)

The overall component wise cost is summarized in the Table 5 below:

Table 5 Component wise project cost

Component		Cost (Million US$)			Remarks
	IWRMP-OS	IWRMP-AF (NFCP)	IWRMP-AF	Total	
Component A	39.85	0	31.0	70.85	
Component B	10.59	0	12.84	23.43	
Component C	4.12	0	3.48	7.60	
Component D	7.72	14.3	8.28	30.3	
Unallocated	2.72	0	2.50	5.22	
Total:	**65.00**	**14.3**	**58.1**	**137.4**	

1.4 Significant Changes during Implementation

The original scope of the project had a timeline till June 30, 2013 for its completion. This timeline was extended to June 30, 2016 due to a number of reasons including the devastating earthquake of 2015 followed by broader blockade. However, the scope of the four different components, A, B, C and D remained unchanged.

2 PROJECT OUTCOME

2.1 Relevance of PDOs

The PDO of Irrigation and Water Resources Management Project (IWRMP) was well aligned with the Government Policy Priority and overall need of the country. At a national policy level, the Project's scope was founded on the Nepal Water Resources Strategy (NWRS) (2002), the National Water Plan (NWP) (2005), Nepal Irrigation Development Vision, 2005 and the Agricultural Development Strategy (ADS). Together, these recognised the importance of year-round irrigation and emphasised the proper management of the surface and groundwater resources. These improvements were to lead to significant increase in crop production resulting in food self-sufficiency, employment generation and poverty reduction. The PDOs of IWRMP is still a relevant objective as the 14th plan (2016/17 – 2018/19) of Nepal envisages an expansion of year round irrigation service in cultivable land and a goal of supporting agricultural yield and production with reliable and sustainable irrigation services.

2.2 Achievement of the PDOs

The prime objective of IWRMP was to *"improve irrigated agriculture productivity and management of selected irrigation schemes and enhance institutional capacity for integrated water resources management"*. This was achieved through the four components as discussed above. The various activities performed under each component with its methodology, process and results to achieve the PDOs and component indicators are described in the following sub-section on component wise.

2.2.1 Component A: Irrigation Infrastructure Development & Improvement

This component rehabilitated Farmer Managed Irrigation System (FMIS) and new ground water tubewell irrigation clusters. A total of 239 sub-projects (134 in OS and 105 in AF) covering a combined agricultural command area of 38,861 hectares were approved by the Project Appraisal Committee on various dates throughout the project implementation period. These selected sub-projects were supported with various infrastructures improvement works to achieve year-round irrigation in the command area along with institutional support and agricultural activities.

The process of identification and approval of subprojects was as follows:

i Information Dissemination and Selection Criteria

In the implementation initiation stage, the concerned DoI and DoA at the district level were responsible for the disseminating of information to farmers' groups about the project and how to avail of its benefits in their respective areas including the preparation and submission of application forms. From this, a sub-project list was prepared and the officials at the DoI/DoA went through this list to refine it on the basis of determining which sub-project were aligned with IWRMP selection criteria. Thereafter, the concerned farmer's groups/WUAs were approached to explain to them how IWRMP worked and ask them whether they would be interested in having the schemes rehabilitated under IWRMP. The criteria were as follows:

a) there were no potential water rights disputes within the river sub-basin;

b) the command area was not less than 25 ha in the hills and 200 ha in the Terai, unless they were in a known food deficit or very remote area;

c) the beneficiaries were committed to taking responsibility for all future O&M;

d) the beneficiaries were willing to contribute to construction costs (10% for surface and 15% for groundwater irrigation schemes) either in cash or kind (including labour work).

ii Application

At this stage, the farmer group would have to had completed the required application form, signed by all beneficiary households, and had submitted it to their respective DoI field office along with an upfront cash deposit of NRs 50 per hectare. If the farmers' group or WUA was not already legally registered at the time, the beneficiaries were permitted to form an adhoc WUA committee to represent them.

iii Feasibility Study

Feasibility studies were generally initiated by the local DoI field offices, using their own expertise or local consultants. Designers were encouraged to work closely with the respective WUAs/farmers groups in the field and discuss the scope of works and preliminary cost estimates with them. Given the small size of most schemes, the resulting detailed feasibility study reports (DFSR) often included detailed designs as well.

iv Social and Environmental Assessment

It was during the feasibility study phase that a separate social and environmental management plan (SEMP) would be prepared for each subproject by the concerned DoI district level office. The SEMP identifies key social and environmental issues as a result of project intervention and plans counter measures for its mitigation during the sub-project implementation itself. These typically included: training in the safe use of pesticides (with intensification of agriculture), guideline preparation of safe use of agro-chemicals, training to agro-vets for safe distribution of agro-chemicals, forestry protection, sanitation of the labourers' camp, control of dust where construction activities are in proximity to inhabited areas and access crossings over the canals for vehicles, pedestrians, livestock and wildlife.

v Appraisal

After review by the District Appraisal Committee (DAC) and the technical assistance (TA) team, the DFSR of a candidate subproject would be submitted to the Regional Irrigation Directorate (RID), which instigated its own field-level verification of the proposed works. It would then be forwarded to the Regional Appraisal Committee (RAC) for ratification and forwarding to the Project Implementation and Coordination Committee (PICC) at the centre for approval for inclusion in the project.

In parallel, the DoI field office would also submit the subproject's SEMP to the IWRMP's Office of the Project Director (OPD) for approval.

vi Resource Mobilisation and Implementation Plan

Once approved, a subproject would be included in the relevant district and region-level work plans, which in turn were submitted for approval to the National Planning Commission. After this stage, the concerned WUA, DoI and DoA at the district level participate to develop and agree to an implementation plan for the

sub-project. The plan specified the responsibilities of the WUA, DoI and Department of Agriculture (DoA). At this stage the WUA was also required to deposit the balance (ie less the NRs 50 per hectare already paid) of the upfront cash up to 0.5% of the investment cost.

vii Formalising Farmer Organisation and Participation

If not already officially registered, the WUA of a subproject approved under IWRMP would then be constituted at a general assembly and registered with the DoI and WUA members would receive initial training in the roles and responsibilities of a WUA. A memorandum of agreement would also be signed between the DoI and WUA, detailing the cost-sharing arrangements and work breakdown arrangements of the proposed works. This became the first formal step of the Institutional Development Framework (IDF) which the project used to structure its WUA capacity building activities.

The overall planning and implementation of IWRMP was done through Office of the Project director (OPD) based in Kathmandu with the guidance from PICC and Project Steering Committee (PSC) chaired by the secretary of Ministry of Irrigation. The sub-project level implementation was carried out by the district level DoI's and DoA's. The overall arrangement of sub-project implementation is shown in Figure 2 below:

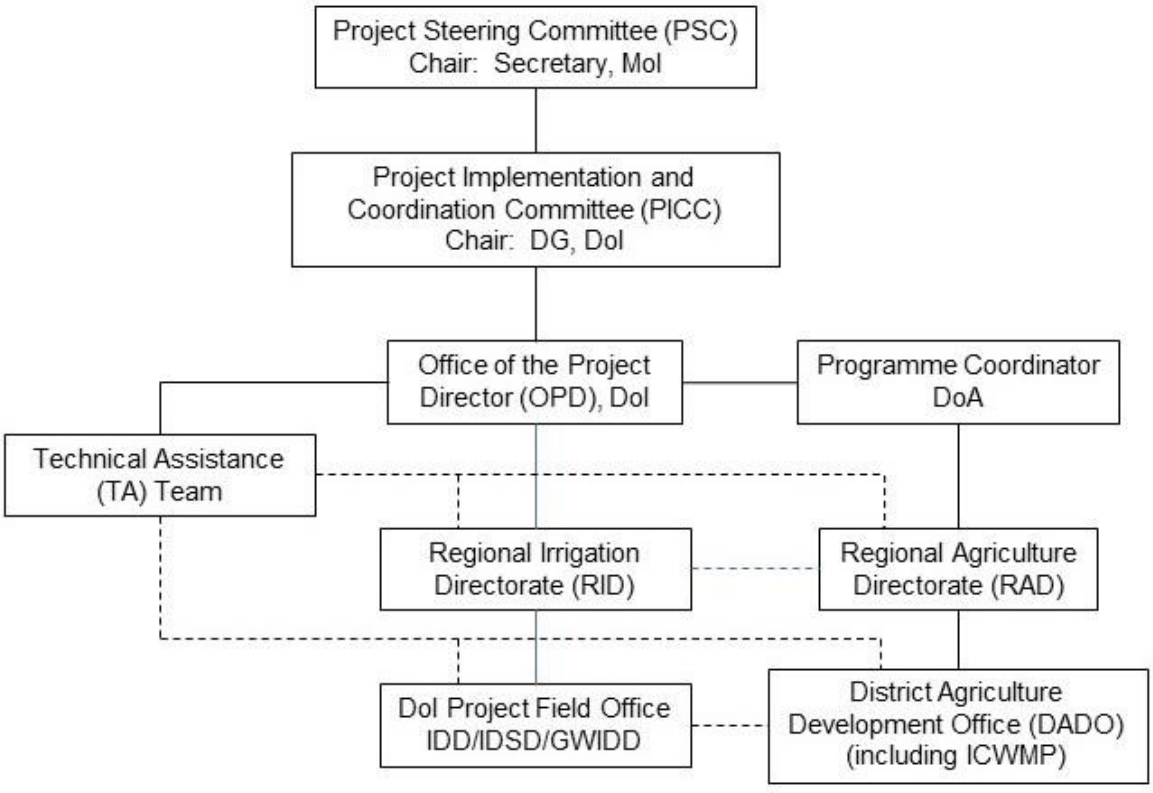

Figure 2 IWRMP Organogram

2.2.1.1 Sub-Project Implementation

Upon approval of a subproject by the PICC, the concerned IDD/IDSD/GWIDD would have prepared a complete set of detailed designs, estimates and drawings, clearly spelling out responsibilities of the DoI and WUA, respectively. This document would then be approved either at a regional or department level, as per the financial authority delegated to them. The concerned DoI field office would then initiate the

procurement process for the construction works. In parallel, it would also initiate training of the WUA's supervision and quality control subcommittee under the IDF so that the WUA could take an active role in construction supervision as well as quality control of its own works carried out under "payable" and/or "contribution" contracts (see below).

a) DoI Contribution

Using funds from the GoN and WB, this component comprised the biggest single component of the project's intervention to rehabilitate/renovate an irrigation subproject. The bulk of the construction works were carried out by local contractors appointed under national competitive bidding (NCB). However, some works (particularly on surface water irrigation schemes) were carried out by the concerned WUA under "WUA Payable" contracts, where the WUA received the engineer's estimated rate for works less 15% (less contract profit). The size of these WUA Payable contracts were limited by GoN procurement rules to NRs 6 million (~ US$ 60 Thousand) up to the end of the 2073/74 fiscal year and to NRs 10 million (~ US$ 1 Million) from the beginning of the 2074/75 fiscal year. WUA Payable contracts were generally not used on groundwater ISPs because much of the work involved was electromechanical and therefore required more highly skilled labour.

b) WUA Contribution

Target WUA contributions towards the cost of construction under IWRMP were 10% and 15% for surface water and groundwater ISPs, respectively. Farmers could contribute either by agreeing to carry out part of the works at their own cost (under a "WUA Contribution" contract) or in cash. In practice, WUAs of surface water ISPs opted for contribution contracts and mobilised village labour to carry out earthworks, canal lining, gabion works and some minor structures. WUAs of groundwater ISPs, on the other hand, mostly opted for cash contributions.

2.2.1.2 Overall Achievements on infrastructure development

The completion of the sub-project physical infrastructure development activities were very encouraging in both OS and AF phase of IWRMP. Out of total 239 sub-projects (OS: 134, AF: 105), 230 sub-projects (OS: 128, AF: 102) were implemented successfully achieving 97% completion rate on the basis of number of sub-projects. The total command area which has come under year round irrigation facility with the successful completion of these 230 sub-projects was 34,095 ha (OS: 18,733 ha, AF: 15,362 ha). Out of the original target of 38,827 ha, this achievement was 88% considering the combined non completion of nine sub-projects.

The region and ecological wise distribution of the completed sub-projects are shown in the Table 6 below. The table clearly shows that a large number of sub-projects were in Western region (107 number), probably in view of the area being more accessible to the sub-project sites in this region followed by Mid-Western (79 number) and Far-Western (44 number). With the similar reason, the Mountain geographic region had less number of sub-projects (35 numbers), followed by Terai (59 numbers) and hills (136 numbers). The main reason for lesser number of sub-project in Terai than in hill was due to the larger size of sub-projects in Terai.

Table 6 Distribution of completed sub-project under Component A

Ecological Belt	Western		Mid-Western		Far Western		Total	
	No of SPs	**CCA (ha)**	**No of SPs**	**CCA (ha)**	**No of SPs**	**CCA (ha)**	**No of SPs**	**CCA (ha)**
Mountain	8	335	13	925	14	657	35	1,917
Hill	78	4,330	40	2,165	18	1,249	136	7,744
Terai (Surface)	14	6,721	19	5,684	7	3,878	40	16,283
Terai (G/W)	7	5,242	7	1,909	5	1000	19	8,151
Total	**107**	**16,628**	**79**	**10,683**	**44**	**6,784**	**230**	**34,095**

The total population directly benefitted by the implementation of the sub-projects under Component A were 384,361 with total households (HH) 59,228. The share of Janajatis and Dalits were 18% and 10% respectively. The overall distribution of population and HH in all three ecological regions are shown in the Table 7 below:

Table 7 Distribution of population and HH under Component A sub-projects

	ISP (Nos)	HH (No)	Population				
			Total	**Male**	**Female**	**Janajati**	**Dalit**
Mountain	35	5,758	35,397	17,606	17,791	6,305	6,030
Hills	136	20,591	141,652	68,829	72,823	27,292	14,230
Terai (Surface)	40	19,308	125,424	61,611	63,813	18,411	6,061
Terai (GW)	19	13,571	81,888	40,826	41,062	17,126	8,900
Total (No)	**230**	**59,228**	**384,361**	**188,872**	**195,489**	**69,134**	**35,221**
Total (%)			**100%**	**49%**	**51%**	**18%**	**10%**

2.2.1.3 Uncompleted Subprojects

Altogether 9 sub-projects (OS: 6, AF: 3) remain incomplete by the end of 30th June, 2018 which accounts 4% of total target. Total command area covered by these 9 sub-projects was 4,075 ha. The main reason behind their incompletion was usually because of poor performance of the NCB contractors & WUAs as well as some site-specific technical and social problems. A brief description of each of such sub-projects is given below:

a) Gudrung Khola ISP, Kapilvastu (400 ha)

This sub-project was taken up during OS phase of the project. Issues of working inside forest zone were triggered during sub-project implementation. The EIA report was submitted to Ministry of Forest however, still remains undecided for its approval which eventually led the sub-project to be incomplete.

b) Sukatia ISP, Kalikot (71 ha)

Due to the passiveness of contractor and WUA during sub-project implementation, the sub-project remains incomplete.

c) Ghunkhaya ISP, Kalikot (104 ha)

Due to non-performance of WUA and Contractor, the sub-project remains incomplete.

d) Khatikulo ISP, Kalikot (150 ha)

Due to non-performance of WUA and Contractor, the sub-project remains incomplete.

e) Ghatgaon ISP, Surkhet (400 ha)

Conflict between IDD, WUA and contractor led to contract arbitration and remains under judiciary consideration to date, hence the sub-project remains incomplete.

f) Jugeni Khola ISP, Dailekh (50 ha)

River bed degradation up to 1.5 meters near the HW site and landslide to the extent of 200 meters along the main canal led to the contractor and WUA becoming passive towards the work. Afterwards, the sub-project was deemed to be technically and contractually unfeasible for further implementation and hence remains incomplete.

g) Jhimjhime ISP, Rupendehi (240 ha)

The sub-project was completed 80% physically and already capable of supplying improved irrigation services to 70% of the 240-ha command area, however very slow mobilization of the contractor and WUA led the sub-project to be incomplete. Outstanding works comprise a 300-m guide bund, 30% of the headworks, two aqueducts, dismantling of the old head regulator and 2,767m^3 of backfilling.

h) Itiya Kulo ISP, Rupendehi (2500 ha)

Despite the best efforts of the IDD, the sub-project remains incomplete although the sub-project achieved 90% of physical progress and was capable of supplying improved irrigation services to 80% of the 2,500-ha command area. Outstanding works comprise RCC block work, 120m of canal lining and one escape structure.

i) Petbaniya DTW, Nawalparasi (160 ha)

The outstanding works for this ISP comprise 1km of pipe laying which means that although the subproject was completed about 80% physically, it was not able to deliver water to any part of the command area.

2.2.1.4 Institutional Development Activities

a) Water Users Associations

One of the objectives of Component A, IWRMP was to provide institutional support to the WUAs of target FMIS. A pre-condition to this end was the formalization of such beneficiary WUAs such that they registered themselves at the concerned DoI district office so they may avail of such support. In fact, all 233 WUAs of FMIS were newly registered legally in concerned IDD/IDSD as all of them were managed by some form of (un)official WUA for many years and one of the target outcomes of the project was to ensure that these WUAs were financially and institutionally sustainable. DoI district field offices (IDD/IDSD/GWIDDs) had primary responsibility for institutional development of WUAs through a structured programme of training

and activities known as the Institutional Development Framework (IDF), which was developed by the project to be implemented in three phases:

i ***Phase I – Preparation*** Activities under this phase were primarily concerned with formation and registration of the WUA, training of WUA executive committee (EC) members in their roles and responsibilities, formation of WUA subcommittees and basic governance. Activities also included training of the WUA's supervision and quality control committee in anticipation of construction works starting on site in order that the WUA could be confident in the quality of work being carried out by the contractor as well as controlling their own works carried out under WUA payable and contribution contracts.

ii ***Phase II – Implementation*** Much of the activity under this phase of the IDF was concerned with setting up financial management systems for operation and maintenance of the irrigation system. For example, work was started on preparing budgets for irrigation service fee (ISF) collection, training WUAs in financial regulations and organising financial audits. In parallel, the WUA was supported in developing an O&M plan for the completed works and strengthening working ties with other line agencies.

iii ***Phase III – Operation & Maintenance*** The final phase of the IDF was an ongoing process of support for the WUA as it took over long-term O&M of the completed scheme. This was also the stage when WUAs were encouraged to set up grievance redress mechanisms (GRM) and establish a complaint register.

The number of training events during IWRMP (2008-2018) are given in the table 8 below. The total numbers of participants in 1006 of the organized events were 28,241 of which 48 % were female participants. These data only count for the training packages basically organized by Component A under DoI. Other agriculture extension related training events were also organized by the Component D of IWRMP for FMIS sub-projects separately.

Region	Events (No)	Participants			Ethnicity	
		Male	Female	Total	Janajati	Dalit
West	422	6,674	4,297	10,971	2,752	579
Mid-West	382	4,778	4,594	9,372	2,602	2,365
Far West	202	3,063	4,835	7,898	528	795
Total (No)	**1,006**	**14,515**	**13,726**	**28,241**	**5,882**	**3,739**
(%)		**52**	**48**		**21**	**14**

Table 8 Training in FMIS during IWRMP

FMISs like those rehabilitated/renovated under Component A of IWRMP do not receive support from GoN for routine O&M of their systems. This is the responsibility of the farmers organised collectively through informal farmers' groups (as they have done historically since the schemes were first built) or through formally registered WUAs. For traditional systems with an open intake from the water source and earthen canals, O&M activities are dominated by the need to clean debris, sediment and weeds from the canals and farmers contributed to these activities with their own labour.

Upgraded schemes are able to deliver more water to farmers' lands by reducing seepage losses and improving the performance and robustness of diversion and cross drainage structures. However, they do also change the O&M needs of the scheme. As well as labour to clean out canals and sediment traps, materials also need to be bought to repair damaged sections of concrete lining or road bridges and paint control gates. On schemes with long main canals remote from the command area, there may also be a need to formally appoint someone to operate and monitor the condition of a remote headworks as well as the main canal. Finally, while the GoN does support farmers to rebuild their schemes after major damage caused by floods or landslips, it cannot always respond as quickly as necessary to limit crop damage and the farmers therefore need to build up a fund for emergency repairs.

With this in mind, as a part of the institutional development framework, the project worked with WUAs to develop annual budgets for operating and maintaining their schemes. Budget headings included:

- O&M of headworks, main canals, branch canals, flow control structures, bridges, etc.
- remuneration of chowkidar (Hired person who worked for canal operation)
- administrative costs of running the WUA itself and organising general assemblies
- administrative costs of annual audits and WUA registration

After preparation of these budgets (usually by TA team), each irrigation service fee (ISF) collection plan was prepared which first was forwarded to the concerned IDD/IDSD for fine tuning before ratification by the WUA's general assembly. Since preparation of ISF collection plan was initiated by OPD around the end of the project, it was not completed for all 233 FMIS. The ISF collection plan was prepared for only 71 FMIS and of which 48 FMIS had already rectified the plan by their general assembly. The remaining 23 FMIS are under the process of its rectification by concerned WUAs. All IDD/IDSD were given the proper instruction to continue the preparation of ISF collection plan for remaining FMIS. Further, the preparation and updating of these plans are a continuous process for a liveable FMIS. A summary of the ISF target rates, collection in the year 2017/18 in both kind and cash for 48 FMIS in tabulated in Annex: F.

Since the O&M of all FMIS that were rehabilitated under IWRMP will be the responsibility of concerned WUAs, there will be no further support from the government side for its O&M until there will be a need of major rehabilitation or any emergency rehabilitation. Hence, a general understanding is that the WUA will collect adequate water charges in terms of cash and kind for its annual maintenance work. However, Annex F gives the picture of 48 sub-projects regarding collection of water charges in comparison to their actual need. The average ISF targets for these 48 sub-projects of 2074/75 was NRs. 357,000 per sub-project whereas the average collection was NRs. 260,753 which gives the figure of **73%.**

In all practicality IDF activities were not completed up to its upper limit due to several limiting factors. Some of those limiting factors were:

- Many WUAs still do not see the value of IWRMP administrative requirements such as maintaining minutes of meetings, lists of water users or audit documents or holding meetings on a regular

basis. Many young people from the villages go overseas for employment, leaving women and old people to conduct WUA activities.

- With the exception of their local DADOs, most of WUAs have not maintained active links with line agencies due to lack of knowledge, financial issues and hesitation. However, links with DADOs have also been disrupted recently as agricultural services are restructured in line with the new federal constitution.
- A major limitation for its implementation was the lack of appropriate and sufficient man-power in division (local) offices. Only 60% offices had an Association Organizer (AO) and then a single AO had to cover all sub-projects in that district and not just IWRMP sub-projects. The numbers of sub-projects were usually more than 25 in each district including Government Funded sub-projects. Further, long distances between office centre and sub-projects, particularly in hills and mountains was another challenging factor to implement IDF activities. With such low level of interaction, many WUAs didn't appreciate the importance of the IDF activities in helping them manage their irrigation system in sustainable way.

b) Department of Irrigation

The principal components of institutional development in the DoI under Component A of IWRMP were foreign training courses and observation tours and regionally based residential workshops. Foreign training courses for GoN experts were not specific to any one component of IWRMP but are discussed here for completeness. Subjects covered included:

- participatory irrigation management
- irrigation water management
- WB project preparation and management
- groundwater development
- integrated water resources management

During the course of IWRMP, a number of residential workshops were organised by the OPD, with the support of its technical assistance (TA) team, in the three regions. Participants were technical and accounting officials from the irrigation field offices as well as staff from the OPD, RID, Regional Agriculture Directorate (RAD), DoI and Ministry of Irrigation (MoI). During each workshop, field officers were encouraged to share their experiences on IWRMP subprojects in their districts and take part in general discussions on how best to address any problems that may have arisen. The OPD and TA team also conducted refresher training courses and Q&A sessions in areas such as:

- gender and vulnerable community participation and development
- agriculture extension
- data collection and geographic information systems

- implementation of social and environmental management plans
- groundwater pump testing and well development
- WB procurement processes

2.2.1.5 Agriculture development activities under Component A sub-projects

Most of the agriculture development activities were conducted by component D of IWRMP through its district agriculture development offices, agriculture service centres and local implementation agencies. This is discussed in detail in sub-section 2.2.4 of this report.

2.2.1.6 Implementation of Social and Environmental Management Plan (SEMP)

Since most subprojects under Component A comprised rehabilitation works, there were no significant social and environmental issues and SEMP mitigation measures principally covered topics such as:

- rules on employment of construction labourers and their health and safety on site
- site management relating to sanitation and refuse management facilities for construction labour camps
- preserving access across canals and other structures for people, livestock and wildlife
- training farmers in the safe use of pesticides as agricultural activities intensify after project implementation
- stabilisation of landslip-prone areas

Examples of other project-specific measures aimed at social and environmental enhancement rather than simple mitigation of the impacts of the project's interventions included:

- Though not actually included in the SEMP itself, construction of ponds along the main canal of Thure ISP where it passed through Bardiya National Park for wildlife, including tigers and elephants, to use for drinking water.
- Diverting irrigation flows in Maspatal and Gangru Pinathang ISPs for domestic and sanitary use by Dalit women. This water is reused in canal going to command area.

A graph illustrating SEMP implementation in the three regions according to the type of mitigations measures involved is presented according to category of mitigation measure in **Figure 5**, based on the following categories:

- **Access**: footbridges, livestock bridges, wildlife bridges, road bridges
- **Animal Facilities**: drinking water ponds for livestock and wildlife
- **Land Stabilisation**: gabions, retaining walls and plantation to stabilise river banks and slopes liable to landslides

- **Site Management**: location, sources of fuel, sanitation facilities and refuse management for workers camp / fire safety / enforcement of poaching bans / working methods and their possible impact on forests
- **Employment**: preference for employment of locals and/or Dalits / enforcement of minimum wage and equal pay rules for men and women / ban on child labour / health and safety for workers
- **O&M Training**: training in operation and maintenance of the installed works
- **Heritage**: protection of culturally important sites
- **Organic Farming**: promotion of and training in organic farming
- **Chemical Use**: training in the safe and environmentally sustainable use of chemical fertilisers and pesticides / integrated pest management (in response to an intensification of agricultural production)
- **Groundwater (GW) Monitoring**: monitoring of groundwater quality (especially arsenic), groundwater levels and possible interference with nearby shallow and deep tube wells

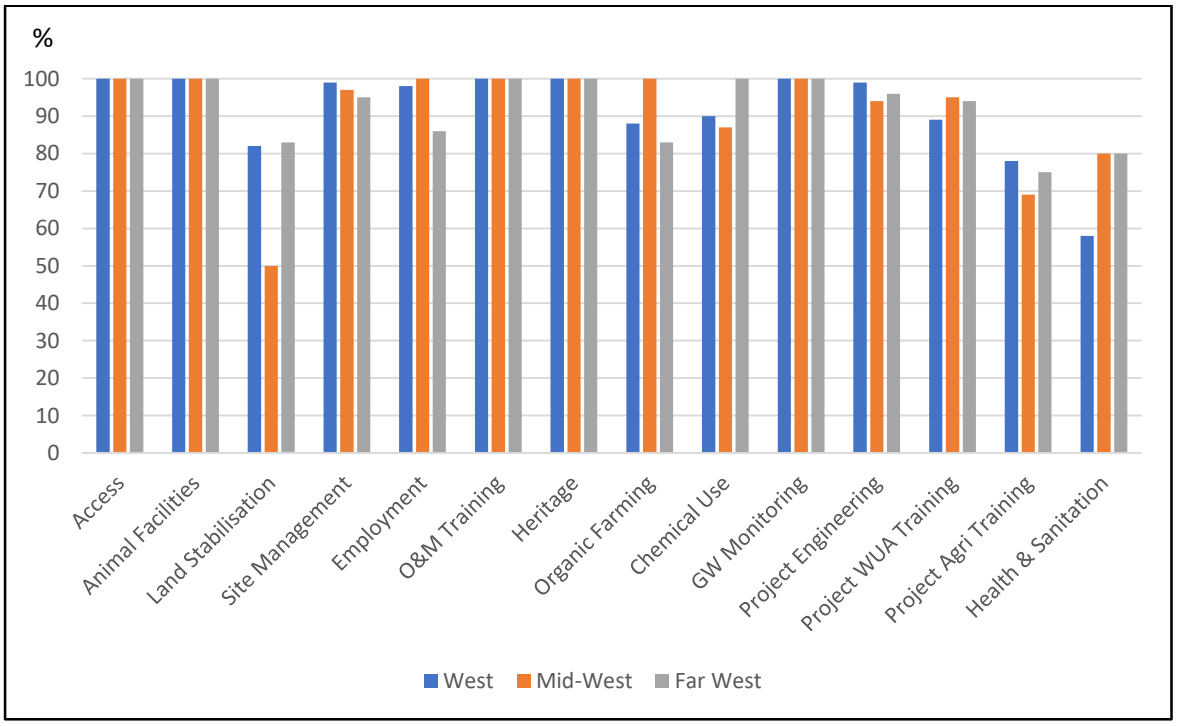

Figure 3 SEMP Compliance by category for all ISPs under Component A

With reference to Figure 3, noncompliance with regard to land stabilisation generally involves planting programmes in landslip-prone areas by the respective WUAs which the WUAs have not carried out. The few noncompliant site management issues relate to the WUA failing exercising control over the contractors in sourcing firewood for their labour camps. Most non-compliance with respect to employment came from enforcement of health and safety rules, such as supply of personal protective equipment.

The following additional categories, comprising 51% of the total number of mitigation measures, were also included in SEMPs and therefore also reported on in Figure 3, above. However, their relevance to an SEMP is questionable either because they included activities that the project was intending to do anyway as part of its work to improve the performance of irrigated agriculture or because they are not relevant to the implementation or impact of the project.

2.2.1.7 Implementation of Gender & Vulnerable Community Development Plan (GVCDP)

At the last stage of the project, it was realized to prepare and implement plan for the gender and vulnerable communities in the sub-project area so that these communities could be positively benefitted from the sub-project implemented around them. The project's active intervention with gender and vulnerable communities comprised income generation activities in three pilot ISPs namely: Bhorlebas ISP in Nawalparasi, Gamkhola Kholtepani ISP in Surkhet and Ratipur ISP in Kailali as a part of the Gender and Vulnerable Community Development Action Plan (GVCDAP). The aim of these pilot programmes was primarily to raise awareness among DoI staff of the process of developing GVCDAPs and their importance in order that they could be replicated across all ISPs in any follow-on project and/or project implemented by GoN. For this, the process and early results of the pilot programmes were discussed at the regional workshops. A GVC group was formed in each of the three pilot ISPs, where the participants were invited to identify their priorities for improving incomes. These included:

- cultivation of seasonal vegetables
- mushroom farming
- cultivation of off-season vegetables in plastic tunnels
- use of bio-fertilizers and bio-pesticides

The project provided training and basic equipment to the participant farmers/non-farmers. Participants in Bhorlebas have reported success in cultivating seasonal vegetables and its sales in the local markets. Participants in Gamkhola Kholtepani have had a similar experience with regard to mushroom farming.

2.2.1.8 Irrigation Water facilities and other monitoring of PDOs indicator

Due to very isolated nature of sub-projects, small in size and unavailability of skilled man-power in WUA, there were no provision of measuring flumes or meters that could record reliable water flow along the canal system in most of the FMIS sub-projects. To monitor some of the PDOs indicators, the farmers' questionnaires were therefore designed to determine their individual experiences through simple yes/no questions such as, "Do you receive more water in the summer/winter/spring season since the completion of the rehabilitation works than you did before?" These questions were asked of all farmers and then disaggregated according to the location of their lands in the head, middle or tail-end of the irrigation system.

In relation to performance of the WUA, the farmers were asked the following yes/no questions:

- Does the WUA deliver all the water you are entitled to?
- Does the WUA deliver the water to your field in time for your crops' needs?

- Do you always know when it is your turn to receive irrigation water?

Again, all farmers were asked these questions and their answers were disaggregated according to the location of the lands in the irrigation system. They were structured in a yes/no format to avoid ambiguity and misinterpretation while at the same time giving the project as means of assessing the overall level of satisfaction amongst farmers and identifying any inequities in the WUA's performance. Finally, the farmers were asked a more subjective question on how they rated the performance of the WUA. The sample of "Yes/No" question can also be accessed in http://dwri.gov.np/iwrmp/index.php/2018-03-12-10-35-47 .

Table 9 summarises the farmers' perceptions of water availability through all three cropping seasons based on the questionnaires. Altogether, 764 farmers in 32 completed ISPs (Mountain: 5, Hill: 20, Terai (Surface): 5, Terai (GW): 2) have completed questionnaires in the due course of the project and, in general, the biggest benefits noticed by hill and Terai farmers are in the summer and winter growing seasons when often well over 80% of farmers have experienced an increase in irrigation water supplies. Fewer of these farmers have experienced increased supplies in the spring season (particularly in the Far West and in the Terai) but this is to be expected since overall water availability is at its most limited at this time of year. Mountain farmers also report increases in summer water supplies but less so in winter when those at higher altitudes abandon cultivation because of low temperatures.

Table 9 Season wise farmer's perception of water availability in component A sub-projects

	No of ISPs			Percentage Receiving More Water in		
	Total	**Completed**	**Completed & Surveyed**	**Summer**	**Winter**	**Spring**
West						
Mountain	3	3	3	100	09	100
Hill	28	21	11	88	85	86
Terai (S)	7	3	2	100	40	0
Terai (GW)	4	2	2	80	80	80
Mid-West						
Mountain	7	1	0			
Hill	18	12	7	100	92	83
Terai (S)	8	6	2	100	96	84
Terai (GW)	5	3	0			
Far West						
Mountain	9	2	2	86	86	57
Hill	11	8	2	83	77	63
Terai (S)	3	2	1	60	40	50
Terai (GW)	2	0	0			
All						
Mountain	19	6	5	94	40	83
Hill	57	41	20	92	87	83
Terai (S)	18	11	5	92	62	44
Terai (GW)	11	5	2	80	80	80

Similarly, Table 10 summarises how many tail-end farmers have been able to increase their cropped areas in each season as a result of the rehabilitation works in their areas. When reading these figures, it should be remembered that they document simple yes/no responses to questions and not, for example, what percentage increase there has been in cropped areas. In some cases, the sample sizes are also still relatively small and consequently, results can vary widely. In surface systems in the Terai, for example, reports of increase water supplies vary from 60% to 100% between the regions in the summer season and 0% to 84% in the spring. Overall, however, the results confirm those in Table 10, with the biggest benefit is in the summer.

Table 10 Perception of increment of crop area in Tail Enders farmers in component A sub-projects

	No of ISPs			Percentage Cropping More Land		
	Total	**Completed**	**Completed & Surveyed**	**Summer**	**Winter**	**Spring**
West						
Mountain	3	3	3	100	09	100
Hill	28	21	11	82	69	83
Terai (S)	7	3	2	100	0	0
Terai (GW)	4	2	2	60	60	60
Mid-West						
Mountain	7	1	0			
Hill	18	12	7	99	89	78
Terai (S)	8	6	2	100	100	100
Terai (GW)	5	3	0			
Far West						
Mountain	9	2	2	86	71	43
Hill	11	8	2	77	69	69
Terai (S)	3	2	1	60	40	50
Terai (GW)	2	0	0			
All						
Mountain	19	6	5	94	34	77
Hill	57	41	20	87	76	80
Terai (S)	18	11	5	92	48	50
Terai (GW)	11	5	2	60	60	60

a. WUA Performance

The results given in Table 11 relate to the farmers' rating of their respective WUAs' performance in terms of (i) water entitlements, (ii) water availability to meet crop needs, (iii) irrigation scheduling and communication, and (iv) overall WUA performance. Overall, results from 32 surface ISPs (764 responded) surveyed show that although there is some variation between ecological belts (farmers from the hills areas appear to receive a better overall service from their WUAs), results from head, middle and tail are generally of the same order of magnitude. This suggests that regardless of any weaknesses that may persist in the WUAs, the benefits of their work are being distributed equitably.

Table 11 Percentage of farmers on WUA's performance in Component A sub-projects

Percentage of Farmers Reporting	Location of Respondents' Land		
	Head	**Middle**	**Tail**
Mountain			
They receive all the irrigation water they feel they are entitled to	77	72	61
They receive their irrigation water when their crops need it	77	78	61
They always know when they will receive their irrigation water	23	47	28
The performance of the WUA is Good/Acceptable	92	92	94
Hill			
They receive all the irrigation water they feel they are entitled to	95	90	87
They receive their irrigation water when their crops need it	92	90	87
They always know when they will receive their irrigation water	92	87	82
The performance of the WUA is Good/Acceptable	98	98	97
Terai (Surface)			
They receive all the irrigation water they feel they are entitled to	85	71	83
They receive their irrigation water when their crops need it	85	51	73
They always know when they will receive their irrigation water	77	49	80
The performance of the WUA is Good/Acceptable	98	90	95
Terai (Groundwater)			
They receive all the irrigation water they feel they are entitled to	100	91	80
They receive their irrigation water when their crops need it	83	100	80
They always know when they will receive their irrigation water	83	55	80
The performance of the WUA is Good/Acceptable	100	100	100
All			
They receive all the irrigation water they feel they are entitled to	91	84	82
They receive their irrigation water when their crops need it	88	83	80
They always know when they will receive their irrigation water	78	73	73
The performance of the WUA is Good/Acceptable	97	96	96

2.2.2 Component B: Irrigation Management Transfer (IMT)

A total of 7 sub-systems were taken up for IMT under IWRMP. Kankai Irrigation System (7000 ha), Sitagunj Branch (8000 ha) & Ramgunj Branch (7800 ha) of Sunsari Morang irrigation system, Block 2 (3000 ha) & Block 8 (3000 ha) of Narayani Irrigation system and Stage I (4800 ha) and Stage II (5700 ha) of Mahakali Irrigation system were taken for the Irrigation Management Transfer with the aim of transferring the of the system beyond a certain part to a fully responsible and capable water user's association, represented by the farmers of the system. A brief descriptions of IMT methodology and its key activities are presented in the following sub-sections.

2.2.2.1 IMT Methodology

The approach taken for developing irrigation management capacity in WUAs was formulated upon the experience of lessons learned from predecessor projects, i.e. Irrigation Management Project (IMP) and Irrigation Management Transfer Project (IMTP). The overall management of the project was the responsibility of the Office of the Project Director (OPD) located in DOI central office in Kathmandu. At the field level, the management and implementation was the task of a Sub-Project Management Unit (SMU) which is part of DOI's District Divisional Office responsible for an ISP. The OPD and SMUs were assisted by the TA team in carrying out the various steps of WUA development and management transfer. For the IMT sub-projects a 14-step approach was used for the IMT process as spelled out in Table 12 below.

Table 12 IMT steps for component B sub-projects

Step No.	Irrigation Management Transfer Steps	Responsible Agency
Step 1:	Initial assessment of command area (ha) and its ESI needs	DOI Division Office
Step 2:	Determine no. of WUAs	DOI Division Office/WUA
Step 3:	WUA consultation (First and Second)	WUA/SMU/TA
Step 4:	Basic Information collection through RA method	OPD /SMU
Step 5:	ESI prioritization and estimate	SMU/WUA
Step 6:	Preparation of the draft IMT Agreement Document	WUA/SMU/TA
Step-7:	Third consultation with central WUA and General Assembly	WUA/SMU/TA
Step-8:	IMT Agreement Document signing by WUA and DOI	OPD/SMU/WUA
Step-9:	Institution development	OPD/SMU/IMD/TA
Step-10:	ESI implementation	OPD/SMU/ DOI Division Office
Step-11:	Water management program implementation	OPD/SMU/TA
Step-12:	Management responsibility transfer to WUA	DOI/OPD
Step-13:	Performance evaluation of irrigation system and WUA	OPD/SMU/ DOI Division Office
Step-14:	Exit Plan for WUA sustainability (wrap up program, WUA support linkages etc	OPD/IMD/SMU/WUA/TA

2.2.2.2 Essential Structures Improvement (ESI) works

ESI works were carried out at each of the ISPs to upgrade the quality of the canal networks to provide more water to farmers, especially in the tail end regions of the canal systems. These ESI improvements generally included a mix of achieving the following elements:

- Improvement of the canal system:
    - main and branch canals reshaped and strengthened
    - canal lining
    - canal service roads improved
    - gabion bank protection
- Improvement of the water control structures:
    - head regulators
    - cross regulators
    - gates
    - outlets
    - cross drainage works like culverts

The implementation rate of ESI works in all systems were more than the original targets as the savings gained from currency exchange rate, low bidding and savings from contingencies were further channelled into these system for increasing the scope of ESI activities.

The ESI works in Kankai irrigation system included the rehabilitation of all branch canals (Branch 0 to Branch 21) and all tertiary canals. Before the IWRMP implementation, command areas under braches 0 to 16 were in partial irrigated condition whereas command areas under branches 17 to 21 were totally un-irrigated. After IWRMP intervention for ESI implementation, and additional 1000 ha previously un-irrigated and out of service of the system has now been brought under year round irrigation. Further, drained water was re-used in the system to irrigate about 235 ha of land at the tail end of two braches (S15 and S17). By the end of IWRMP implementation, more than 7000 ha of command area was being irrigated by Kankai irrigation system.

Likewise, the ESI works in Sitagunj irrigation sub-system of SMIP was the rehabilitation of Sitagunj branch (S9) (14 km in length), 10 Sub-Secondary canal (28 km length in total), and 40 tertiary canals. Out of 273 water courses, 24 water courses were rebuilt. The major ESI activities included canal lining, additional culverts and field outlets etc. The total command area under this rehabilitation works was 8000 ha.

The ESI works in another branch canal of SMIP were in the Ramgunj branch (S10) (11.5 km in length), 6 Sub-Secondary canals (21.8 Km length in total), and 21 tertiary canals. Out of 229 water courses, 180 water courses were rebuilt. A total of 7000 ha command area was fully irrigated with the improvement of the irrigation systems.

In Block 8 of Narayani Irrigation System, the major rehabilitation works under ESI were in the Main Secondary Canal (MSC-8) (4.7 km), Six Branch Secondary Canal (BSC) (16.3 km), 14 Sub Secondary Canal (SSC) having total length of 10 km and 102 tertiary canals. Other ESI works in this system included construction of outlets in Nepal Eastern Canal (NEC), turnout structures, canal linings, embankments, and installation of new gates etc. From this rehabilitation works, a total of 3000 ha command area is now under irrigation service.

Similarly, in block 2 of Narayani Irrigation System, rehabilitation works under ESI were carried out in Main Secondary Canal (MSC-2) (10.7 km), Six Branch Secondary Canal (BSC) (22.4 km), and 8 Sub-Secondary Canal (SSC) having total length of 6 Km and 118 tertiary canals. The total command area under this sub-system was 3000 ha.

Mahakali Irrigation System (MIS) which lies in the far-western part of Nepal was also brought under IMT of IWRMP. The command area of MIS is separated into two parts by the Suklaphanta wildlife reserve. The upper part of the command area is known as MIS Stage I and the lower part as MIS stage II. Both Stage I and Stage II were handed over to the fully functional WUAs. In stage I, the ESI works were carried out in all five blocks (A, B, C, D & E) which included 11 Branch and Minor canals having total length of 40 km. The rehabilitation works in 201 tertiary canal were also concluded during implementation of IWRMP. Major rehabilitation works were canal lining, construction of outlets and gated structures. With the implementation of these rehabilitation works, a total of 5100 ha land is now under year round irrigation facilities.

In stage II, the ESI works were carried out in all four blocks (5,6,7 & 8) which included 20 branch and minor canals having total length of about 50 Km. 167 tertiary canals (out of 274) were also rehabilitated during the IWRMP implementation. The fully defunct minors namely Bhuda minor, Bhudagauri minor, Jhilmila minor, Kamari minor, Imiliya minor, Khairighat minor were successfully rehabilitated which contributed about 1700 ha of command area. The partially functional minors viz. Pachoi minor & Singhpur minor were also completely rehabilitated to deliver water up to their tail ends. One of the big achievement of ESI work in stage II was to reclaim agriculture land of about 500 hectare out of total 890 ha of water logged area. Only one minor named ZZR of Pachoi branch could not be rehabilitated. This was mainly due to the fact that this minor has never been fully constructed, hence the difficulty to start a full scale rehabilitation. The costs involved were too high and beyond the scope of an ESI intervention. Total command area under year round irrigation system achieved in Mahakali stage II was 6200 ha.

Table 13 below summarizes the total command area under component B of IWRMP:

Table 13 Command area of Sub-Projects under Component B (Target Vs. Achieved)

Irrigation System	ISPs	Target CA in Appraisal	Achieved CA during project implementation
Kankai IP, Jhapa	1. Entire System	7,000	7,000
Sunsari Morang IP, Sunsari	2. Sitagunj SC 3. Ramgunj SC	8,000 7,800	8,000 7,000
Narayani IP, Parsa & Bara	4. Blocks 2 5. Blocks 8	3,000 3,000	3,000 3,000
Mahakali IP, Kanchanpur	6. Stage I 7. Stage II	4,800 5,700	5,100 6,200
Total	**9 Schemes**	**39,300**	**39,300**

2.2.2.3 Water Management activities for IMT

Water management is the key for an irrigation system and concerned WUA to be sustainable since it ensures sufficient irrigation water from head to tail efficiently and equitably. The major activities in water management that were conducted by IWRMP in all sub-systems were:

a) Calibrate the irrigation structures at necessary locations particularly in the off taking points for branch canal.

b) Develop a holistic strategic water management plan which includes canal operation plan (COP) and canal maintenance plan (CMP)/Asset Management Plan (AMP) to deliver irrigation service efficiently and equitably right from the main canal to farmers' field with defined standards and indicators as specification of the service such that these services are sustained in future.

c) Conduct a rigorous training program for the WUAs and gate operators about the use of COP and CMP/AMP.

Calibration is needed to develop a relationship between the depth of flow and discharge through the canal. The objective of calibration is to evaluate the hydraulic performance of the flow control structures and to measure the water flow (discharge) through the canal system. The calibration of the various structures along the canal system ensures equitable water distribution to the system from head to tail.

The Main Canal COP establishes a schedule and quantity of reliable irrigation water delivery for the intake of each Branch Canal. Each Branch Canal WUA is then guided through developing its COP based on the amount of water the MC COP provides their sub-system. The COP is created with an objective of providing an equitable amount of water throughout the system.

The AMP is developed with an inventory of all the infrastructure assets identified, along with the maintenance of each asset for the system to remain functional. The maintenance needs are labor, materials, and financial resources. This helps the WUA members to understand how much ISF is

needed, and how it will be used.

There were three basic steps involved in the development and implementation of COPs and AMPs.

- **Step One - Preparation**: All the information needed were gathered in terms of canal layout, structure location, command areas, cropping pattern and crop area, and so on. A participatory approach was used to gather all the required information. After the calibration of the hydraulic structures, COP was developed for all sub-systems with the technical assistance of the consultants. Table 14 lists the preparatory steps of COP. With the inventory of all the infrastructure assets, their maintenance and other related O & M expenditures, the AMP were prepared for all sub-systems following the step as in Table 15.
- **Step Two - Dissemination**: After the COPs and AMPs had been prepared, the next step was “dissemination”, that is, presentation of the completed product to the WUA members. The TA consultant, SMU leader, and WUA Chairman participated in community discussion of these plans.
- **Step three – Implementation:** The final step was the actual implementation of the COP and AMP. The MC COPs have been implemented during the cropping seasons (Monsoon, Winter & Spring) of the final year of the project under the supervision of concerned SMUs/TA consultants. As regard to the branch canals, the COPs and AMPs were prepared and provided to the concerned WUAs with the trainings on its proper use.

Table 14 Steps in COP Preparation

Step	COP Preparation Method
1	Prepare parcellary maps of canal systems / subsystems
2	Crop data collection (crop calendar, cropping pattern and cropped area) for all the crops grown in the command area. This data is then used in FAO’s CROPWAT software program to estimate the optimal water demand schedule.
3	Calibration of flow control structures at strategic locations
4	Gauge painting for water allocation and distribution as planned
5	Use rating tables for both MC and BCs
6	Preparation of COP for all season crops

Table 15 Steps in AMP Preparation

Step	AMP Preparation Method
1	Prepare updated inventory of canal systems / subsystems and other WUA assets
2	Estimate annual maintenance costs
3	Prepare annual maintenance plan and budget
4	Preparation of the AMP
5	Dissemination workshop with WUA members
6	Implement maintenance plan
7	Ongoing M&E
8	On-going knowledge and skill development trainings during IMT-B for WUAs and DOI/SMU for effective implementation of AMP

The progress of the water management activities in all irrigation sub-systems are tabulated below (Table 16):

Table 16 Target vs. Progress for various activities under Component B sub-projects

Activity	KIS		SIS		NIS-8		MIS-I		RIS		NIS-2		MIS-II		Total
	Target	Progress	Target	Progress	Target	Progress	Target	Progress	Target	Progress	Target	Progress	Target	Progress	
Calibration	19	19	15	15	6	6	9	9	7	7	9	9	22	22	**87**
MC COP	1	1	1	1	1	1	1	1	1	1	1	1	1	1	**7**
BC COP	22	22	13	13	6	6	9	9	7	7	6	6	20	20	**83**
MC AMP	1	1	1	1	1	6	1	1	1	1	1	6	1	1	**7**
BC AMP	22	22	13	13	6	6	11	11	7	7	6	6	20	20	**85**
Exit Plans	1	1	1	1	1	1	1	1	1	1	1	1	1	1	**7**

2.2.2.4 Institutional Development activities for IMT

For IMT of any scheme, Institutional Development activities are essential to build up the capacity of farmers and water users' group so that the transferred schemes will run sustainably and with high efficiency. The major institutional development activities carried out during the IWRMP intervention for IMT were:

a) Formation of WUAs
b) Infrastructure development for WUA
c) Capacity building activities (Training etc.) for WUA and farmers
d) Irrigation Service Fee (ISF) collections

In most of the sub-systems that were taken for IMT under IWRMP, there are two levels of WUAs, a main canal (MC) WUA at the MC level, and a branch canal (BC) WUA for each of the branch canals. In some of the schemes, there was also a third level of WUAs created for the tertiary level canals, called "water courses" the SMIS system being a case in point. During the implementation of IWRMP, WUA committees were formed in all the irrigation schemes under IMT: 7 at the MC level, 68 at the BC level, and 1251 at the TC level. Each level of WUA has an elected working committee usually led by the president. In general, WUA executive committee usually forms other sub-committees to carry out the following responsibilities.

- Canal Operation and Management
- ISF Collection
- Conflict Management
- Monitoring and Evaluation
- Construction Management

The project has supported all WUAs with logistic support for their infrastructure development activities as well. The details of the infrastructure support by IWRMP to the sub-systems are given in the Table 17 below:

Table 17 Infrastructure support to WUA under component B sub-projects

Infrastructure Support to WUA	***KIS***	***SIS***	***RIS***	***NIS-8***	***NIS-2***	***MIS-I***	***MIS-II***	***Total***
Grant to WUA (NRs)	8,26,000	9,44,000	8,00,000	3,54,000	8,00,000	6,01,800	8,00,000	**5,125,800**
Buildings (New & Rehab)	12 (1, 11 BC)	1 (MC)	2 (1 MC, 1 BC)	1 (MC)	2 (MC)	6 (1 RC, 5 BC)	5 (1 RC, 4 BC)	**29**
Excavators/backhoe	3	2	2	3	3	2	2	**17**
Tractors	1	1	1	1	1	1	1	**7**
Motorcycles	2	1	1	1	1	2	2	**10**
Bicycles	114	65	50	150	100	50	84	**613**

** MC: Main Committee, RC: Regional Committee, BC: Block Committee

Similarly, the managerial and technical development trainings were designed and given to the concerned WUAs and farmers during the course of project implementation. The prime topic of the training are listed in Table 18 below:

Table 18 Training topics for WUAs

No.	Management Development	Technical Development
1	Orientation to IMTP and Irrigation Management	
2	Office and record keeping	
3	Observation Tour	
4	Training of Trainers (TOT)	
5	WUA ISF Collection and Mobilization	
6	Computer Training	
7	Leadership Development/Good Governance	
8	Quality Control and Supervision	
9	Financial Management	
10		Canal Operation Plans (COP)
11	Participatory Irrigation Management	
12	Internal System Visit	
13		Equitable Water Distribution
14	Women's Participation in Irrigation	
15	Management of WUA Office	
16		Agriculture Production and Management
17	WUA internal resource mobilization	
18	Participatory Monitoring and Evaluation	
19		Asset Management Plans (AMP)
20	Conflict management	
22		Irrigation water management
23	Action plan preparation	
24	WUA formation methods and process	
25	Institutional and WM capacity development of WUA	
26	Consultation on IMT/social mobilization process	

The number of targeted training events and its achievements for each sub-system are given in the Table 19 below. The total number of participants in the training were 19,013 of which 25% were female participants.

Table 19 Total number of participants in various trainings

Items	OS ISPs				AF ISPs			Total
	KIS	SIS	NIS-8	MIS-I	RIS	NIS-2	MIS-II	
Target Events	68	68	68	68	**76**	68	104	**520**
Completed Events	125	69	63	68	23	53	28	**428**
Progress %	**183**	**101**	**100**	**91**	**30**	**78**	**27**	**82%**
Participants	5764	5050	3072	2418	467	1396	846	**19,013**
Male	4374	4090	2137	1669	408	1082	589	**14,349**
Female	1390	960	935	749	59	314	257	**4664**
Female%	25%	19%	31%	31%	13%	23%	31%	**25%**

A key concept in IMT concerns the amount of ISF (irrigation Service Fee) that irrigating farmers pay to the WUA for the water service they receive. The intent of this ISF is to provide funds that cover the cost of O&M for the part of an irrigation system for which the WUA is responsible. Since the contribution of the irrigating farmers for O&M is not just cash, but also labor they contribute for canal cleaning, it is more appropriate to think of "ISF" as more accurately "Irrigation Service Resources", or ISR. However, this report will continue to use the familiar concept of "ISF", but with the understanding based on the experience of IMT-B ISPs that the "fee" is a combination of cash plus labor.

At the start of the IWRMP the OPD engaged the services of a local consultant firm to visit each of the 7 sub-system for IMT, assess their layout and condition, and make an estimate of the annual cost per hectare required to keep the scheme in good working condition, the ISF Target Rate. The consultant's original estimates included the cost of maintaining the entire system, including the headwork, the main canal, secondary/branch canals, and down to the tertiary level canals. However, the WUAs decided that this estimate would be too high for the farmers, so it was decided to remove the cost of maintaining tertiaries from the ISF Target Rate with the understanding that the farmers themselves would do this tertiary maintenance work (primarily cleaning silt from the small tertiary canals) with their own "in-kind" volunteer labor. Accordingly, the OPD decided that costs of head-works and main canal O&M would not be included as these were not a part of IMT as such.

As the IMT under IWRMP progressed over the years, in the beginning WUA's initial estimates for the ISF target rate that their farmers considered reasonable were lower than the ISF Target Rates as calculated in Table 20. Each year the WUAs would reassess what their farmers could afford and increase the estimate, an increase that reflected the WUAs growing understanding of what maintenance was required, and satisfaction at seeing the improved water availability resulting from the ESI work. Despite these increases, actual ISF collections remained lower that the targets. Table 21 shows the evolution of ISF targets between the beginning and the end of the project.

Table 20 ISF rates in sub-projects under IMT

ISF Target Rate Estimate	KIS	SMIS/RIS	NIS-8	MIS-I	SMIS/RIS	NIS-2	MIS-II
Original Consultant ISF Estimate	615	700	650	616	800	635	564
WUA Starting ISF Rate	210	300	210	200	315	400	250
WUA Ending ISF Rate	300	450	210	450	600	635	564

Table 21 Trend of total ISF collection in IMT sub-projects

Sub-System	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17
	2066/67	2067/68	2068/69	2069/70	2070/71	2071/72	2072/73	2073/74
KIS	176,440	943,466	385,562	695,629	820,749	1,196,700	1,489,177	2,411,891
SIS				562,017	682,880	110,511	114,000	1,203,000
RIS						286,500	345,000	545,000
NIS-8			35000		202,185	196,106	127,200	124,761
NIS-2						448,071	225,796	493,259
MIS-I			971,000	534,424	569,962	612,413	1,170,421	1,040,329
MIS-II					961,583	994,698	1,149,133	2,592,467

The WUAs' ISF Target Rates, when multiplied by the WUAs' command areas, gives their respective ISF Target amounts. These amounts represent a target for collecting the ISF, and a target for spending on O&M. Following the administrative training by the Project, the WUAs maintain accounting records that itemize their cash income sources and expenses. They also maintain records of in-kind labor contributions for canal cleaning and other labour tasks. Typically, the WUA members agree that each family should contribute 2-3 person-days per year as labour contribution in the canal system. In the presentations below for these three indicators the in-kind labour is converted into a cash equivalent using the established GON labour rates for each WUA area. This in-kind labour cash equivalent is recorded as both an income source, and as an expense. Table 22 below shows annual O&M resources collections from different sources by each sub-system in the year 2017.

Table 22 Annual resources collection by IMT sub-projects as of 2073/74

Annual O&M Resource Collection (NRs 1000) in 2073/74							
	KIS	**SIS**	**NIS-8**	**MIS-I**	**RIS**	**NIS-2**	**MIS-II**
AMP O&M Target	**4,336**	**5,600**	**1,800**	**3,141**	**5,600**	**1,800**	**3,666**
ISF, fees, rent income	**2,412**	**1,203**	**125**	**1,041**	**545**	**493**	**2,593**
ISF collections	1,652	1,003	117	1,041	545	420	1,996
membership fees	56	200	8	0	0	70	11
nomination fee	66	0	0	0	0	0	0
entry fee	6	0	0	0	0	0	0
other miscellaneous fees	409	0	0	0	0	3	586
O&M Charge collection	223	0	0	0	0	0	0
Equipment services income	**1,230**	**285**	**256**	**567**	**740**	**182**	**0**
excavator	891	200	128	333	500	116	0
tractor	204	50	128	234	240	66	0
thresher	82	25	0	0	0	0	0
meeting room & shop rental	53	10	0	0	0	0	0
Total cash income	**3,642**	**1,488**	**381**	**1,608**	**1,285**	**675**	**2,593**
% of O&M target (cash only)	84%	27%	22%	52%	23%	38%	71%
In-kind O&M labor	**3,350**	**3,328**	**910**	**2,835**	**4,937**	**1,303**	**2,884**
% of O&M target (labor only)	78%	60%	51%	91%	89%	73%	79%
Total cash plus labor	**6,992**	**4,816**	**1,291**	**4,443**	**6,272**	**1,978**	**5,477**
% of O&M target (cash & labor)	162%	86%	72%	142%	112%	110%	150%

2.2.2.5 Exit Plan of IMT sub-system

The concluding activity of the IMT process was the preparation and dissemination of an Exit Plan for each canal systems/subsystem. The general objective of an Exit Plan is to sustain project benefits and best practices of the completed and ongoing project schemes by institutionalizing them in the related mother institutions. Following the inputs from WUAs and concerned farmers, the Exit Plan was finalized. A few specific objectives of the “Exit Plan” are enumerated below:

- Review the Irrigation Management Transfer Agreement (IMTA) against the program requirement and justify the relevance of these activities for the future reference and evaluation of the implementation process;
- Document project achieved input status against planned inputs for each component;
- Document project component tasks against outputs, status and their level of utilization;
- Segregate completed tasks by outputs, inputs and performance to be achieved;
- Prepare post-turnover support plan including necessary tasks to be completed during the IWRMP project implementation period;
- Document applied processes and best practices to be followed by the departmental mother institutions, and;
- Provide and introduce to the mother institutions all manuals, processes, and guidelines developed during project operation through an orientation workshop.

2.2.3 Component C: Institutional and Policy Support for Improved Water Management

The aim of the component was to help provide more effective and streamlined water resources management services at the national level and within selected basins through institutional strengthening of relevant institutions, namely the Water and Energy Commission Secretariat (WECS) and the Department of Irrigation (DoI). The component addresses sector issues relating to the lack of appropriate regulatory framework and sufficient institutional capacity for undertaking effective planning and inter-sectoral allocation of water resources.

Achievements

Water Resources Information System: The main outputs of the component under IWRMP were establishment of a central Water Resources Information Center (WRIC) and computerized Water Resources Information System (WRIS) at the WECS. WRIC was the National Center to develop and maintain a national water resources database (availability, allocation, and use) and disseminate water-related data to interested users engaged in, for example, basin planning and management. WRIC is an organizational, physical entity with defined structure, systems and processes, while WRIS is a combination of hardware and GIS-based computerized system which would provide data to support activities of basin planning and management. WRIS also share hydrologic and meteorological data collected by the Department of Hydrology and Meteorology (DHM), strengthened with the telemetric system established in West Rapti and Babai Sub-basins.

Integrated Water Resources Policy: The WECS formed a task force on July 1, 2009 coordinated by the Joint Secretary, Legal Division, WECS and comprising Joint Secretaries of Water Resources, Energy, and Environment Divisions along with the Project Coordinator as the members. A draft 'Integrated Water Resources Policy' was prepared. As the country has gone through political restructuring and has become a Federal State with seven provincial governments and several empowered local governments, WECS reinitiated in drafting National Water Resources Policy in the changed context. The draft Policy document is now under discussion among several stakeholders.

River Basin Management Plans: Under the OS, RBMP was to be prepared for two pilot basins. Two more basins were added in the additional financing. The basins were: Babai, West Rapti, Gandaki and Karnali rivers. Later, with the availability of funding support from SAWI RE TF which is part of the Power Sector Reform and Sustainable Hydropower Development Project (PSRHDP, P150066), three additional river basins were added with the objective of preparation of Master Plan of the Power Sector. The IWRMP is to fund this activity by IDA grant of around $3.5m. However, the total estimated cost of this sub-component is US$6m, which is now being co-funded by $3.5m from IWRMP-IDA grant and $2.5m from SAWI RE TF. When this activity was funded solely by IWRMP until 2015, procurement of the consulting firm was stalled by April 2015 as a conflict of interest (COI) issue came up during the procurement process. However, the World Bank responded that there was no COI. Later on, it was agreed to cancel the procurement and increase the scope of works to prepare river basin plans and hydropower development master plans for all river basins of the country. After mobilizing SAWI TF, procurement was re-launched in early 2016, and then encountered some delays. Financial bids were opened on April 23, 2018. With the IWRMP-IDA grant closing in June 2018, the SAWI RE TF is the only financing source. SAWI's $2.5m is available until December 2019. The GoN has requested the Bank to explore other grant resources. The contract was signed in June 2018.

Telemetry Systems: This is an automatic system for determining the depth of water level and discharge at the particular point of river or canal where the system has been installed. This system has a sensor placed over the water surface which detects the water level and transmits it to a central server through GPRS or CDMA. So, data can be assessed from anywhere through internet.

The establishment of real time data acquisition system with code division multiple access (CDMA) based telemetry in Narayani basin has been highly successful and the same technology were followed in Babai and West Rapti basins also. Telemetry systems were installed in 32 stations (9 hydrological and 23 meteorological stations) in Babai, West Rapti and Karnali River basins. 11 hydro-met stations were upgraded and information from telemetry systems uploaded into water resources information system (WRIS).

DOI has also taken initiative to establish telemetric system in its canal network to monitor the real time canal discharge in four stations (two at Kankai Irrigation system and remaining two at Mahakali Irrigation system). At Kankai, the system was installed at 'Sardare' (intake of Kankai Irrigation Canal) and 'Janata Chowk' and the data can be assessed through **www.wscada.net/display/kankai** . Similarly, at Mahakali, the system was installed at border weir near Gaddha Chawki and on the bridge of Daiji Minor and the data can be assessed through **www.wscada.net/display/mahakali**. Also, the display system has been set up at office from where regular monitoring is being done by the office staff.

Preparation of Water Use Evaluation Model: Preparation of a preliminary Water Use Evaluation Model for West Rapti Basin was completed in November 2009 with the support from the international expert provided through the Bank's South Asia Water Initiative (SAWI) fund.

Establishment of River Basin Offices: RBOs have been established at Nepalgunj for Karnali basin and at Narayanghat for Gandaki (Narayani) basin jointly by WECS and the Department of Hydrology and

Meteorology (DHM). Hydrology units of DHM were shifted to Nepalgunj from Surkhet and to Narayanghat from Pokhara. The requirement of logistics were jointly assessed by the WECS, DHM and OPD. The RBOs are responsible for developing procedural guidelines and decision making tools (for formal water access) for the sub-basins and providing training to the stakeholders.

Establishment of a Regional Cooperation Cell for Trans-boundary Water Management: The concept and the mandate for establishing the Regional Cooperation Cell to look after trans-boundary water management were approved by the 54th meeting of Water and Energy Commission held on November 23, 2009. The cell was established with the operational responsibility entrusted to a Joint Secretary of WECS.

Establishment of GIS-based Management Information System: GMIS application was designed and developed for capturing and storing specifically for irrigation subproject profile information at the preparation stage as well as status information of implementation stages during construction of surface and ground water irrigation subprojects. The GMIS was built in two versions: Desktop and Web. Currently, Desktop GMIS is under operation in all division, sub-division, and regional offices. OPD has been receiving required data offline from each cost-centre which have been processed for summary and reporting. However, Web based GMIS was replaced by DoI central database system EDMS and hence ceased to be relevant and in now not in operation.

2.2.4 Component D: Integrated Crop and Water Management

The Component D: Integrated Crop and Water Management has provided a package of appropriate agronomic and water management practices and investment support as appropriate in the sub-projects under Components A and B of IWRMP. The component focuses on on-farm crop water management, cropping pattern improvement, crop diversification and intensification, quality seed production in the command area of selected ISPs under Components A and B, farm mechanization and organized market. The key activities carried out were social mobilization, field-based training, farmer field school, livestock shed improvement, seed production, income generation program to attract youth in agriculture and demonstration of off-season vegetables in plastic tunnel, distribution of small farm machinery and capacity building of the technical staff, water users, agro-vets and farmers.

In addition to IWRMP (IDAH3380, IDAH53340), IWRMP Component D also supported the Food Crisis Response Program (FCRP) (IDA45150) under Social Safety Nets Project (SSNP). The specific activities under this part included support to: a) Rehabilitation and Improvements of FMIS (small scale) and Non-Conventional irrigation technologies (shallow tube-wells, rainwater harvesting, lift irrigation, drip & sprinkler systems etc.) and b) increase local production of improved seeds and soil management.

Most of the task under Component D was implemented by Department of Agriculture (DoA) where at central level, the Project Coordination Office (PCO) had been established in order to implement, monitor and coordinate the agricultural programs. Sub-project level activities were implemented through the respective District Agriculture Development Offices (DADO) of the DOA while Regional Agriculture Directorates (RADs) were involved basically in monitoring and reporting of the Component D activities of their respective development regions.

The major activities carried out by Component D were:

a) **Seasonal Planning workshop:** This activity involved the preparation of seasonal calendar of operation.

b) **Farmer's field school (FFS):** FFS dealt about better crop production techniques, safe use of pesticides and integrated crop and water management techniques.

c) **Demonstration:** The purpose of a demonstration is to show farmers that a particular innovation is practicable under the local conditions. Its ultimate aim is to increase cropping intensity in irrigated area; improve soil fertility by incorporating legume crop and improve crop productivity. Seasonal planning decides about the types of technology to be demonstrated based on local need and potentiality.

d) **Livestock shed improvement:** It aims to improve sanitation and proper use of cow dung and urine and thereby contribute to soil nutrient management. It is reported that urine collection has multiple benefits such as increased efficiency of bio-gas and uses as liquid fertilizer in kitchen gardening.

e) **Seed Production:** Seed multiplication of suitable variety and subsequent use by local farmers was visualized as one of the key interventions of the project to increase seed replacement rate that in turn contributes to enhance crop productivity. So far, seed production was carried out in 3,569 ha (paddy: 919 ha, wheat: 888 ha, maize: 976 ha, potato: 670 ha and others: 116 ha) that has produced about 19,616 metric ton of quality seeds (paddy: 3,226 mt, wheat: 2,822 mt, maize: 2,952 mt, potato: 10,494 mt and others: 122 mt) which were sufficient to cover about 194,300 ha of command area (Paddy: 51,600 ha, Wheat: 18800 ha, Maize: 118100 ha , Potato: 3350 ha , and other: 2450 ha). Additionally, in case of NFCRP, 2090 mt of quality seeds (Paddy: 350 mt, Wheat: 450 mt, Maize: 600 mt, and Potato: 690 mt) were produced which cover nearly 33600 ha of command area.

f) **Farm Mechanization Support:** Farm mechanization was one of the important interventions since the beginning of the project. Particularly, this project was one of the pioneer projects promoting small farm machineries in Nepal. It is reported that the farm machinery introduced through the project has contributed to reduce drudgery, work load and cost of production and make farming more attractive for young generation. The major farm machineries distributed during the project were power tiller, mini tiller, winnowing fan, rotavator, threshing machine, ripper, harrow, corn sheller and cultivator.

g) **Poly House Farming:** Vegetable farming under plastic roof/tunnel is becoming quite popular in Mid and high hills, hence the project has supported poly house farming in some of these areas. In addition, the project had also sent 13 staffs to train on high tech plastic tunnel/poly house farming, drip irrigation and integrated crop and water management in Israel. The learned technologies have been introduced in three ISPs namely, Darimjula ISP of Salyan, Khurkot ISP of Parbat and Subeda Tallojyula, of Bajhang district.

h) Youth Promotion Program: In order to attract youth in agriculture, the project also supported youth to carry out different types of agro-based enterprises based on their business plan. The project has supported up to NRs. 40,000 per entrepreneur on instalment basis under this scheme. They were mainly engaged in off season vegetable farming, mushroom farming and so on.

i) Income Generation Activities for Poor and Marginal communities: In order to provide the benefits of the project to the landless, marginal and poor households of the irrigation command area, the project provided small grant of a maximum of NRs. 50,000 to carry out need-based income generation activities such as mushroom cultivation, bee keeping, spice cultivation and off-season vegetable production.

j) Model ICWM Program in partnership with WUA: The project has implemented its agriculture program through Water Users' Association (WUA) in five locations, namely: Mahakali irrigation system (Second phase, block seven) of Kanchanpur; Manpur ISP of Dang: Adhikhola ISP of Shyanja, Gajedi ISP of Rupandehi and Kankai irrigation system of Jhapa district. The objective of this activity is to make WUA responsible and accountable for agriculture development within the sub project area. The modality adopted to implement this model program includes: (i) formation of agricultural sub-committee under WUAs comprising of progressive farmers to implement this program; (ii) preparation of seasonal plan with detail activities and its target by the agricultural sub-committee in consultation with the farmers; (iii) refinement and finalization of the seasonal plan through a workshop in the presence of WUAs, farmers, DADO and PCU; (iv) tripartite agreement between WUA, DADO and PCU signed to implement the seasonal plan; (v) technical support and continuous monitoring by DADO, PCU and local resource person; (vi) upon the completion of the seasonal plan, WUA forwards necessary documents like original bills, receipt and reports to the respective DADO for payment; (vii) After the field verification, the DADO finally transfers an eligible payment to the account of WUA directly.

k) Capacity Enhancement: Under the capacity building, the project has supported to conduct different types of trainings, seminars and exposure visits to the farmers/water users of the sub-project areas, inputs suppliers (agrovet and seed entrepreneurs), social mobilizers and the staff related to the project. The subject of the training included seed production, soil fertility management, on-farm water management, social mobilization, safe use of pesticides, agri-insurance and so on.

l) Social Mobilization Support: Considering the high work load of the field level technicians and necessity of social mobilization support at the sub project level, the project has mobilized part-time social mobilizers. They have worked in close coordination with DADO and WUA as a bridge between DADO and farmers/water users. The project has trained them on wide range of topics including social mobilization, crop insurance, data collection, reporting and legal aspects of agriculture input trade.

m) Construction and Rehabilitation of Small Irrigation Schemes: One of the key activities supported under the FCRP was the construction and rehabilitation of small irrigation schemes (less

than 25 ha in hills and mountain and less than 200 ha in Terai). The principal objective of the construction and rehabilitation of small irrigation schemes was to improve food security of small-farmers by increasing the agricultural productivity and production. The major activities includes rehabilitation of community managed small irrigation schemes, rain water harvesting, and water pumping. The analysis of the progress reports of the project districts reveals that 3491 small irrigation schemes have been constructed and/or rehabilitated in the project area under the FCRP that added total irrigated area of about 373 ha serving total 28,394 HHs. Table 23 presents the number of small irrigation schemes completed, additional irrigated area and beneficiary households by district. Also various intervention under rehabilitation of small irrigation schemes are presented in the Table 24:

Table 23 Small Irrigation Schemes completed under Component D

District	**# of small irrigation shemes completed**	**Incremental irrigated area, Ha**	**Beneficiary household**
Achham	172	16.24	1543
Bajhang	221	23.82	1661
Bajura	190	14.35	1392
Bhojpur	255	16.62	1331
Dailekh	156	17.11	1496
Darchula	220	19.85	1483
Gorkha	141	20.84	1388
Humla	88	9.3	581
Jajarkot	123	15.09	1183
Khotang	180	17.66	1234
Myagdi	122	21.4	755
Manang	57	7.44	427
Mugu	426	10.02	774
Mustang	100	12.91	755
Okhaldhunga	155	17.85	1242
Ramechhap	117	12.1	1217
Rolpa	129	18.05	1352
Rukum	135	17.04	1466
Salyan	98	9.8	982
Sankhuwasabha	114	27.95	1318
Solukhumbu	120	14.58	1356
Taplejung	230	14.78	1388
Terathum	155	18.05	1352
Total	**3491**	**372.85**	**28394**

Table 24 various interventions under completed small irrigation schemes

Interventions	# of small irrigation schemes completed					
	FY 08/09	FY 09/10	FY 10/11	FY 11/12	FY 12/13	Total
Construction of irrigation canal	0	19	2	42	10	**73**
Construction of water diversion structure	4	2	10	10	0	**26**
Establishment of sprinkler irrigation	38	73	4	13	5	**133**
Construction of water collection pond/tank/plastic pond	72	119	175	153	47	**566**
Supply of irrigation pipe/ water pump	183	331	453	281	67	**1315**
Rehabilitation of irrigation pond/tank	5	90	143	1	1	**240**
Rehabilitation of irrigation canal/water diversion structure	143	383	344	219	49	**1138**
Total	**445**	**1017**	**1131**	**719**	**179**	**3491**

n) Community Seed Storage Center: The project supported the farmer communities at the grassroots level in building and improving seed processing and storage facilities. The project constructed small as well as large scale facilities. In small scale category, 38 community based seed storage centres have been constructed in 21 districts as shown in Box 1. Each seed storage centre consisted of an office-cum seed processing house and seed storage house. The capacity of the seed storage house was 20 metric tons. The project bore 80% of the total cost of the storage house while the remaining 20% was contributed by the community. Each centre was equipped with sets of equipment/machineries for seed processing, cleaning, treatment and bag sealing except seed center developed at Humla and Mugu districts.

Box 1: No. of community seed storage center developed in district

Accham-1, Bajhang-1, Bajura-1, Bhojpur-2, Dailekha-1, Darchula-2, Gorkha-1, Humla-2, Jajarkot-2, khotang-3, Myagdi-3, Mugu-1, Okhaldhunga-3, Ramechhap-2, Rolpa-4, Rukum-1, Salyan-2, Sankhuwasabha-1, Solukhumbu-1, Taplejung-1 and Terathum-3

Moreover, the project also supported to establish large scale community seed processing and storage centre under community and public partnership in four locations i.e.

- Dibyapuri, Nawalparasi
- Maharanijhoda, Jhapa
- Rajapur, Bardiya
- Motipur, Rupandehi

The centres consisted of drying cum transitional shade, seed processing house, seed storage (100 metric ton capacity) and separate office building. Seed processing plant were equipped with all the machines needed for efficient cleaning and grading operations. The seed processing setups were fully computerized system (in-line processing) with the capacity of 2 metric ton per hour. While the project contributed 80% of the cost for construction of the centre, the cost of the seed processing plant and the associated equipment were fully subsidized.

o) Post Disaster Agriculture Rebuilding Activities: IWRMP-AF (FCRP: IDA Credit 4515) also supported rebuilding agriculture following the devastating earthquake in April 2015 as an immediate response.

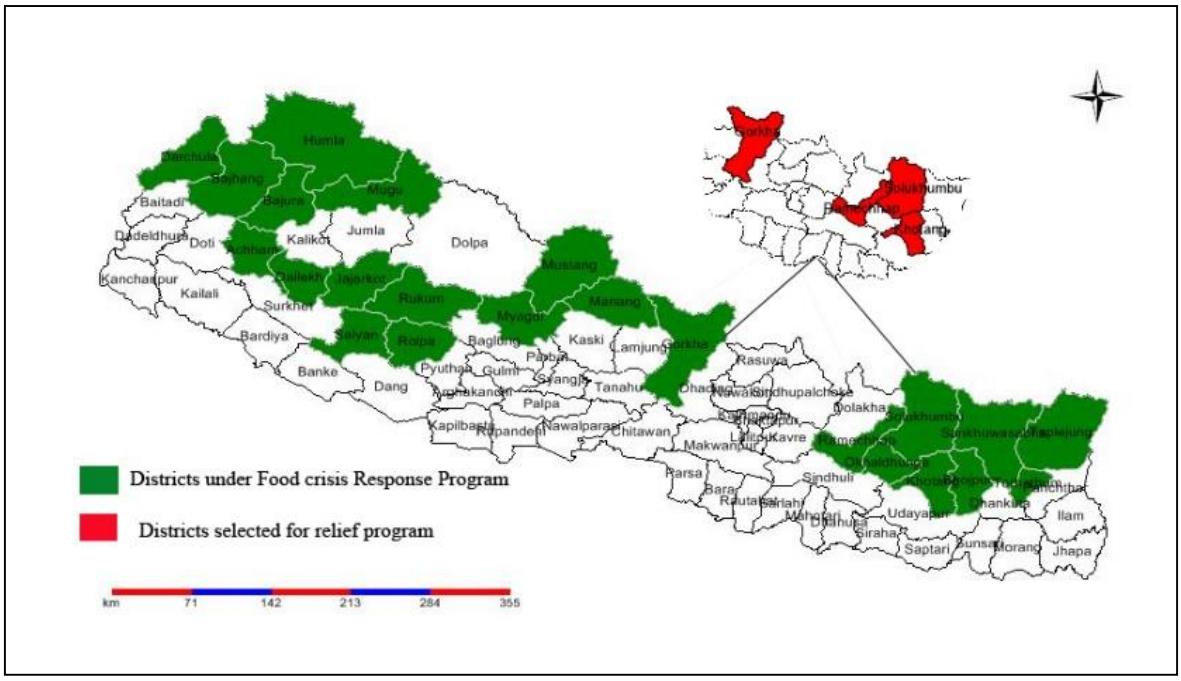

Figure 4 Districts for food crisis response program & relief program

Rebuilding activities were implemented only in four districts: Gorkha, Ramechhap, Khotang and Solukhumbu (Figure 4) which fall within the 23 districts supported by the FRCP and within 31 districts affected by the earthquake. Within the framework of recommendations made by the Post-Disaster Needs Assessment (PDNA) report, the rebuilding activities included (i) construction of livestock sheds, (ii) establishment of community grain and seed storage, and (iii) supply of small farm machineries.

- **Construction of Livestock sheds:** The Project supported the construction of 5944 livestock sheds for the earthquake affected rural farmers. The livestock shed construction activity was implemented through the respective DADO in close coordination with the District Disaster Relief Committee (DDRC). The main roles of the DDRC in livestock shed construction were to develop household selection criteria and identify target households. Each selected household after the completion of the work as per the guidelines of the project was provided NPR 25,000.00 financial support irrespective of the total cost involved for it. The details of the livestock shed constructed by district is presented in Table 25.

Table 25 Livestock shed constructed under Component D

District	No of livestock shed constructed	Cost, NPR,000		
		IWRMP	Beneficiaries	Total
Gorkha	1793	44825	41731	86556
Khotang	1206	30150	20254	50404
Ramechhap	1766	44150	44150	88300
Solukhumbu	1179	29475	15741	45216
Total	**5944**	**148600**	**121876**	**270476**

- **Establishment of Community grain and seed Storage:** The project supported the affected communities in building and improving grain and seed storage facilities.Upon the recommendation of the DDRC of the respective districts, the project constructed seven new community grain and seed storage centres: three in Gorkha district, two in Ramechhap district and one each in Khotang and Solukhumbu districts with the involvement of local community. In addition, the project renovated three community seed storage centres (Palungtar, Gorkha; Khimti, Ramechhap and Tingala, Solukhumbu) that was constructed previously under the FCRP.

- **Supply of Small Farm Machineries:** The project distributed 90 small farm machineries (60 mini tillers and 30 power-tillers) based on the demands of the earthquake affected communities through concerned DADOs (Table 26).

Table 26 Number of Farm Machinery distributed

District	Type of farm machinery distribute		
	Power tiller	**Mini tiller**	**Total**
Gorkha	15	18	**33**
Khotang	0	12	**12**
Ramechhap	15	9	**24**
Solukhumbu	0	21	**21**
Total	**30**	**60**	**90**

p) Non-Conventional Irrigation technology program through NGOs: The Office of Project Director (OPD) at DoI also undertook an initiative to implement micro scale non-conventional irrigation technology program with the support of Non-Governmental Organizations (NGOs). The main objective of this program was to improve the livelihood of the socially disadvantaged small and marginal farmers through income generation activities using various non-conventional irrigation technologies. These technologies included community/individual/joint pond, drip,

sprinkler system, treadle and solar pumps. To implement this program, OPD had selected three different NGOs respectively for western, mid-western and far-western development regions. The major task of the NGOs were to support micro-irrigation activities which consisted both of hardware (construction, installation) and software (training/skill development) part. With the implementation of this program, a total of 2,318 HH were directly benefitted. Table 27 below is the summary of the hardware part carried out under this program.

Table 27 Micro-Irrigation activities under Component D (DoI part)

Region	Working Districts	Achievements (Nos.)					Irrigated Command Area (Ha)
		Treadle Pump (Nos)	**Drip System (Nos)**	**Sprinkler (Nos)**	**Solar Pump (Nos)**	**Pond (ha)**	
Western	Kaski, Tanahun , Nawalparasi	140	345	180	3	17	44
Mid-Western	Banke, Dailekh, Kalikot	140	345	180	3	17	39
Far-Western	Kailali, Kanchanpur, Dadeldhura	90	345	150	2	7	25
Total:		**370**	**1035**	**510**	**8**	**41**	**108**

With the intervention of all these four components, the agriculture productivity for the selected crops, cropping intensity and seed replacement rate in the sub-projects under IWRMP has been significantly increased. The overall achievement at the end of the project as per the PDO and result framework are as shown in the Table 28 below:

Table 28 Achievements in Project Indicators (Result Framework)

Design Summary Development Objective	Indicators	Baseline	Progress (June 2018)	End Target (June 2018)
To improve irrigated agriculture productivity and management of selected irrigation schemes and enhance institutional capacity for integrated water resources management	Increase in productivity of selected (main) crops	Rice-2.9 Mt/ha Wheat-2.0 Mt/ha Maize-2.1 Mt/ha Potato-10 Mt/ha	Rice- 4.38 Mt/ha Wheat- 3.09 Mt/ha Maize- 4.66 Mt/ha Potato- 17.83 Mt/ha	*Rice-3.8 Mt/ha* *Wheat-3.2 Mt/ha* *Maize-3.6 Mt/ha* *Potato-16 Mt/ha*
	Percent increase in Cropping Intensity	168%	243%	220%
	Percent of WUAs in transfer irrigation schemes whose O&M expenditures is as per agreed Asset Management Plan	NA	94%	85%
	Percent of water users in the rehabilitated schemes satisfied with WUAs	N/A	87%	70%
	Area provided with irrigation and drainage services (ha)	33,106	Component A = 34095 ha Component B = 39300 ha Component D = 481 ha **Total = 73,876 ha**	72,867
	Operational water users' associations created and/or strengthened (number)	0	Component A=233 Component B= 7	221
	Water Users (Number of beneficiaries) provided with new/improved irrigation and drainage services	0	Component A = 384361 Component B = 380251 **Total = 764611**	415200

	Water users (number of female beneficiaries) provided with irrigation and drainage services	0	Component A = 195489 Component B = 193115 **Total = 388604**	215904
Component A: Irrigation Infrastructure Development and Improvement	Percent of tail enders reporting improved water availability	N/A	81%	60%
	Percent of WUA formally constituted and holding regular meetings	0	100%	100%
	Percent of WUAs collecting water charges (in cash, kind and labor) required for adequate	0	73%	100%
	percent of WUAs maintaining appropriate accounts and cash registers	0	100%	100%
	Area irrigated by Groundwater from deep and shallow tube well(DTWs and STW)	464 ha	8151 ha	8725 ha
Component B: Irrigation Management Transfer	Percent of tail-enders reporting improved water availability	0	60%	60%
	Number of WUAs holding regular meetings	0	7 (holding regular meeting once in a month)	7
	Number of WUAs collecting water charges (ISF) required for adequate O&M	0	7	7
	Number of WUAs maintaining appropriate accounts and cash registers (schemes)	0	7	7

	Percent of delivery points receiving proportionate share of water	0	100%	100%
	Adequate O&M expenditures by DOI and WUA according to agreed Asset Management Plan in 5 out of 7 schemes	0	83%	100%
Component C: Institutional and policy support for Improved Water Management	Integrated river basin plans developed for four rivers	0	0	Contract signed to initiate the work
	Telemetric systems established in targeted basins	0	36 (4 in KIS and MIS)	
Component D: Integrated Crop and Water Management	Percent of farmers in the selected schemes adopting demonstrated techniques	0	59%	60%
	Increase in seed replacement rate	Rice = 10.2% Wheat = 10.3% Maize = 11.3%	Rice =13% Wheat = 13% Maize = 16%	Rice = 13.01% Wheat = 10.9% Maize = 16.01%

2.3 Other Outcomes and Impacts

With the implementation of both the project activities in the sub-project level: i.e. hardware and software part, the project has achieved most of its targets as per the Project Development Objectives and other project outcome indicators. Apart from those specified project outcome indicators, some additional and related positive outcomes/impacts are as stated below:

- Employment generation in local level was increased and technical knowhow of WUAs and farmers both in water resource management, construction management, and financial management were also enhanced. An example: The impact study of the western region's sub-projects reveals that all selected ISPs have well maintained and operated bank accounts indicating proper financial management. The project has generated additional full time, seasonal and part time employment opportunities among the farming population. These employment opportunities were generated as a result of construction and maintenance of canal, shifting from two to three crop production, traditional to cash crop production, seed production, processing and marketing, input supply, production and processing Agri-products. Similarly, mushroom farming and bee keeping promotion has increased employment among economically disadvantaged, landless and vulnerable community people.
- Women participation as farmers and as WUA members was promising. They had actively participated in all training packages and in most of the cases; their participation was around 50%. In addition, the impact study of GW sub-projects reveals that women participation in marketing has increased by 16% after project intervention.
- In some of the sub-project areas, particularly, in Terai (e.g. Bhairahawa Lumbini Ground water irrigation sub-project), due to its promising returns and seen as breaking away from long time tradition, fisheries became one of the main attractions among the farmers after rehabilitation of the sub-projects under IWRMP. It was noted that after the completion of IWRMP rehabilitated works in BLGWIP, dedicated areas for fish farming have been increased by around 10%. These fish ponds range in size from 0.068 to 6 ha and together account for 10% of command area. It has been reported that the farmers harvest approximately 3,600 tonnes fish per year from 400 ha area and generate a combined net income of around NRs. 456 million.
- WUA contribution in FMIS was also promising with an average of about 8% of total sub-project infrastructure development cost in surface irrigation schemes whereas in GW irrigation sub-project, it was about 9%.
- The Grievances redress mechanism were well established in each of the sub-project level from WUA to the central project office because of which the implementation process of sub-projects became more smooth and transparent.
- Institutional development activities for WUA and DoI, were inbuilt into IWRMP so as to support the capacity improvement of both WUA and DoI Officials. Capacity enhancement from these activities were instrumental in helping to overcome several issues in gender and vulnerable community,

agriculture development, data management system, social and environment mitigation, participatory irrigation development, procurements, and project preparation.

- The beneficiary income was substantially increased in most of the ISPs after the rehabilitation work under IWRMP. Table 29 shows beneficiaries' financial returns of cereal crops in 41 completed subprojects. In the mountain ISPs, the cereal crop offering the best return was paddy. On the other hand, maize appeared to be the profitable crop in hills and wheat in the Terai. Overall, maize was seen to be most profitable.

Table 29 Financial Returns of Cereal Crops in Completed Sub-Projects under component A

Ecological Belt	No of ISPs	Income and Costs (NRs/ha)								
		Paddy			**Wheat**			**Maize**		
		Gross Income	**Cost of Production**	**Net Income**	**Gross Income**	**Cost of Production**	**Net Income**	**Gross Income**	**Cost of Production**	**Net Income**
Mountain	3	148,500	85,000	63,500	81,133	53,000	28,133	82,266	55,300	26,966
Hill	25	118,753	79,813	38,940	85,110	55,324	29,786	81,638	51,572	30,066
Terai (S)	9	101,555	70,989	30,566	78,744	51,922	26,822	73,405	48,656	24,749
Terai (GW)	4	94,949	73,675	21,274	73,975	54,420	24,505	88,924	59,273	24,701
Average	41	114,832	77,657	37,175	82,335	54,319	28,499	80,587	51,956	28,149

- In all areas, financial returns per hectare from cash crops like potatoes and vegetables were significantly higher than for cereal crops (Table 30). Mountain farmers achieved highest returns from potato, whereas hill and Terai farmers could expect better returns from vegetables. Overall, vegetable farming offered the best returns. An example for such an observation comes from the impact evaluation of the western region sub-project i.e. in Motipur Kadwa ISP, where this increase was more than 110%.The difference in returns between cereal and cash crops was less marked for groundwater-irrigated subprojects where the farmers had to balance the higher cost of irrigation water with better year-round availability of supply.

Table 30 Financial returns in Cash Crops in completed Sub-Projects under component A

Ecological Belt	No of ISPs	Income and Costs (NRs/ha)					
		Potato			**Vegetable**		
		Gross Income	**Cost of Production**	**Net Income**	**Gross Income**	**Cost of Production**	**Net Income**
Mountain	3	302,663	115,000	187,663	262,667	111,000	151,667
Hill	25	284,044	139,251	144,794	298,738	143,325	155,412
Terai (S)	9	285,676	170,122	115,554	287,876	134,556	153,320
Terai (GW)	4	198,459	140,185	58,274	280,098	154,040	126,058
Average	41	277,415	144,344	133,071	291,895	140,080	151,815

- The economic analysis of 18 completed sub-projects shows their economic performance compares with what was anticipated in their respective feasibility study reports. The internal rate of returns (IRR) as calculated based on the performance after their construction, are given in Table 31 below. Overall, the figures confirm that the economic performance of the ISPs had improved as a result of the project's interventions and in general to a greater extent than anticipated in their respective feasibility study reports.

Table 31 Internal Rates of Return in completed Sub-Projects under Component A

ISP	District	Ecological Belt	IRR (%)	
			Current (2018)	**DFSR**
West				
Bangrebesi	Lamjung	Hill	26.5	23.1
Kamtitar	Syangja	Hill	15.5	13.4
Andhikhola	Syangja	Hill	60.2	23.3
Damkaphant	Gulmi	Hill	46.6	16.8
Tokare	Nawalparasi	Terai S	36.3	23.0
Mid-West				
M Bahunichaur	Surkhet	Hill	16.2	17.4
Jharkhet	Surkhet	Hill	22.4	18.0
Gamkhola	Surkhet	Hill	23.5	20.8
Gartung Khola	Pyuthan	Hill	39.2	22.0
Gharikulo	Pyuthan	Hill	42.0	20.1
Ambasa Balanti	Bardiya	Terai S	11.0	21.9
Batule Kurle	Bardiya	Terai S	15.5	14.8
Paruwa	Banke	Terai S	32.2	38.9
Sanoshree	Bardia	Terai GW	18.1	18.4
Far West				
Manekuda	Baitadi	Hill	45.7	14.2
Jogijala	Dadeldhura	Hill	35.9	15.0
Badhuwa	Dadeldhura	Hill	41.6	13.9
Dhanraskhet	Doti	Hill	23.4	14.8

- After the implementation IMT in AMIS, ISF collection rate was increased significantly to cope with the regular O&M. For example in Kankai Irrigation system, the amount of annual ISF collection was increased by 8 times in 2016/17 in comparison to 2009/10.
- ISF collection was started based on per hectare per crop basis in Kankai Irrigation System which was socially/economically justified and also total collection was increased significantly.
- By the end of the project, a number of water courses were developed and/or rehabilitated in both Ramgunj and Sitagunj sub-system of SMIP which was initially out of the scope of IWRMP, however with this development, water distribution system in field level has become more effective.
- As a result of IWRMP intervention, about 500 ha of water logged area was reclaimed in Mahakali Irrigation system (Stage II) which was reused as agricultural land yielding three crops per year.
- Crop diversification and commercialization have increased in all AMIS after the intervention of IWRMP. For example; wheat cultivation area was considerably increased in Kankai irrigation system; Banana farming was introduced and getting more popular in MIS, farmers have shifted to vegetable farming from traditional Maize farming in NIS.
- Farmers have started to produce their own seeds for all agricultural products as much as possible. For example, during the impact evaluation it was revealed that 60% of respondent of MIS produce their own seeds. The increase in seed replacement rate was attributed to a system of seed production and distribution established by the project. In this, Nepal Agriculture Research Council, Research Centers and DoA owned farm centers have provided source seeds of improved varieties for multiplication to the command area farmers through respective DADOs. The source seeds were then multiplied by the farmers and then distributed to other farmers in the command area.
- The productivity of other crops has been increased in all the systems e.g. in Sitagunj sub-system the productivity of vegetables has increased by 34%, oilseeds by 40% and lentil by 67%.
- Promotion of small farm-machinery has contributed to reduce the cost of production, drudgery, and work load. It has been noted that the use of ‘power tiller’ can save 1/3 of the cost of ploughing and 90% of the time of ploughing. Similarly, the use of ‘reaper’ reduces the cost of harvesting by 40-60%. It has also been observed that the promotion and use of farm mechanization has helped to attract youths into agriculture activities.
- The independent impact evaluation report of Kankai Irrigation System reveals that the number of conflicting events in relation to irrigation management among farmers had decreased significantly and WUA was capable of operating the system efficiently and sustainably even after the handover of system. Similar results have been observed from impact evaluation in Far-Western Region’s sub-projects.

3 KEY FACTORS THAT AFFECTED IMPLEMENTAITON AND OUTCOME

3.1 Key factors during preparation

During the preparation of the project in 2006/07, Nepal was at a politically critical crossroad. Economically, Nepal was facing the dual challenges of accelerating domestic growth and sharing this growth more broadly across the population. Even though irrigated agriculture was a mainstay of the country's economy, this sector was facing a number of challenges including low productivity, less use of farm technology and low water use efficiency etc. That is why, the project, IWRMP, was intended to formulate strategies to address these major issues of irrigated agriculture. However, due to the political uncertainties, defining its goal, outcome and its working modalities were key issues during the preparation. The project was designed with the lessons learned from WB's previous project named Nepal Irrigation Sector Project (NISP). More transparency and accountability in performance management and service delivery in public irrigation system was ensured through a clear agreement between WUAs and DoI. It was realized during the preparation of IWRMP that meaningful community participation requires substantial capacity building, integrated agriculture and water management interventions increases benefit, and sustainability of O&M of irrigation schemes depends crucially upon associated financial arrangement.

Given the political and security situation at the time of project preparation, IWRMP was designed with modest institutional and policy reform component having simple implementation strategy. The project therefore had proposed a substantial upfront investment in performance improvement of small and medium irrigation system, on-farm water and agricultural productivity along with an embedded agenda for gradual institutional reform.

There was difficulty acquiring accurate baseline data for some of the project outcome indicators e.g. water user's satisfaction level to WUA, tail-ender's satisfaction level etc.

Other than the facts mentioned above, there were no any major issues that came up during preparation of the project.

3.2 Key factors during Implementation

The project had started its implementation in 2008 at a crucial juncture in time when the country had just survived a violent civil upheaval and finally entered into what was expected to be a peaceful period to be pushed again into a major political transition. The first constitutional assembly election was held in May, 2008 followed by the second in November, 2013. The local, provincial and central government elections were conducted during the project implementation period which directly or indirectly hampered the project's implementation progress. Other major factors which had high impacts on the project were Koshi embankment breach in August, 2008, Gorkha earthquake in April, 2015 followed by the boarder blockade for more than six months. Due to all these reasons, the project period of IWRMP original scope was extended up to June, 2016. Furthermore, countless natural hazards, e.g. massive floods in western terai in 2014 and 2016 and landslides in every monsoon season in hills hindered the smooth implementation of the project.

Nevertheless, IWRMP-AF did not reschedule its completion timeline beyond June, 2018, the original date of completion as agreed during its inception. Both parts of the project, original scope and additional finance, were in its combination, able to achieve most of the target outcomes with the successful completion of more than 97% of sub-projects in the field level by the final deadline of the project.

4 M&E QUALITY, PERFORMANCE, COMPLIANCE ISSUES, AND RISK TO DEVELOPMENT OUTCOME

4.1 Quality of Monitoring and Evaluation (M&E)

At the centre level, the Project Steering Committee (PSC) chaired by the Secretary of Ministry of Irrigation had provided the overall policy guidance and necessary coordination among the central level stakeholders for the successful implementation of the project. The Project Implementation and Coordination Committee (PICC), chaired by the Director General (DG) of the Department of Irrigation (DoI) had the function of examining and approving individual irrigation sub-projects based on their technical and financial feasibility. Overall responsibility of the project was placed with the Office of Project Director (OPD), which worked under the guidance of PSC and PICC. The Office of the Project Director (OPD) had overall responsibility for planning and coordinating, monitoring and evaluation (M&E) activities while the day-to-day project implementation in the field was the responsibility of the district level DoI and DoA offices. There was a parallel Project Coordination Office (PCO) in the Department of Agriculture (DoA) which had the role to coordinate and monitor the corresponding regional and district offices.

Overall, the implementation of project activities was based on a three-tier structure:

a) The OPD had the responsibility to consolidate all project activities at the centre and coordinate with various implementing agencies

b) A Regional Project Support Unit (RPSU) in each Regional Irrigation Directorate (RID) along with Regional Agriculture Directorate (RAD) had the responsibility for supervision and implementation of sub-project activities

c) A Sub-Project Management Unit (SMU) in each separate district implemented the sub-project at the district level. In addition, a District Technical Team (DTT) was established under each SMU to implement component D activities at the sub-project level.

The project management unit in WECS for Component C was headed by the division chief of the Water Resource Division at WECS. The implementation of telemetric activities were carried out with the assistance of Department of Hydrology and Meteorology (DHM).

The project was implemented according to the norms, rules and procedures outlined in the Project Implementation Plan (PIP) and the Project Implementation Manual (PIM) which clearly defined the roles and responsibility of different stakeholders and provided details of project processes and project cycle.

The OPD had overall responsibilities for M&E activities. Collection of appropriate data from sub-project level, its analysis and producing final report were made with the help of appointed Technical Assistance (TA) team for both Components A and B, regional directorate and district level offices. M&E data collection activities mainly focussed on:

- construction progress
- financial disbursement

- implementation of IDF agricultural training
- participation of women and other vulnerable communities in project training courses
- SEMP implementation
- crop productivity and cropping intensity
- overall levels of production and farmer incomes
- adaptation of improved seed and farming techniques

The project had also surveyed the farmers' experiences of the impacts in the rehabilitated systems through structured questionnaires covering:

- changes in water deliveries
- changes in cropped areas
- performance of the WUA in relation to management of water deliveries

The data collections were done both through online and offline mode. The Desktop based GMIS was installed in all cost centres from which the sub-project level progress data were collected via. Regional Directorates. Separate database sheets were also developed in user-friendly excel sheets which included all technical, financial, agricultural and institutional data. Such data collected from the field offices helped the OPD to continuously monitor activities carried out at the sub-project level.

Furthermore, independent consultants were hired to carry out the evaluation of SEMP implementation in all three regions. Additionally, impact study of the sub-projects under original scope were carried out for both FMIS (GW & SW) and AMIS systems.

IWRMP has been hosting a well-structured website (www.dwri.gov.np/iwrmp) with all the information regarding IWRMP activities which include reports, documents and related photographs and videos ensuring transparent and easy access to information for all relevant people and stakeholders.

The regular implementation support mission from the World Bank has also ensured close monitoring of the project activities the details of which can be found in their respective implementation support reviews.

4.2 Environmental, Social, and Fiduciary Compliance

The Environment Protection Act (EPA) 1996 makes it mandatory to carry out an IEE or EIA of all projects/sub-projects. However, since the project's civil works only comprised rehabilitation of existing structures, construction of DTW pump houses and laying pipelines, it was categorised as a type "B" project. Under this category, the project was only required to prepare social and environmental management plans (SEMP) for each sub-project to identify and mitigate the impacts of the project's interventions. The main areas of concern were:

- *Equal access to project benefits for women and vulnerable communities such as indigenous peoples and Dalits*. Work affecting women and vulnerable communities was guided by the World Bank's (WB) Operational Manuals (OP) 4.10 (*Indigenous Peoples*) and 4.20 (*Gender and*

Development). The GoN has established minimum criteria of 33% for the participation of women in WUAs and the project routinely maintained and evaluated disaggregated data on the participation of other vulnerable groups.

- *Land acquisition and resettlement*. In addition to the WB's OP 4.12 (*Involuntary Resettlement*), the 1977 Land Acquisition Act, Rule 1969 of the 1962 Land Acquisition Act and the 1993 Guidelines are the core legal documents on private land acquisition, property valuation, and compensation grievance redress. However, this did not prove to be an issue in the project's rehabilitation schemes, where works were generally confined to historically established alignments for both FMIS and AMIS. For new small community systems such as deep tubewells (DTWs) which each serve an area of around 40 ha in general, beneficiaries themselves willing to provide required land for pump house and overhead tank in which OPD has received documentary evidence of their land contribution .
- *Participation of benefitting communities in key decision making*. Consultations with irrigation communities were structured through WUAs, registered with the DoI, and the WUAs' Gender and Vulnerable Community subcommittees. These included the establishment of grievance redress mechanisms at project, district, regional and national levels.
- *Preservation of access for wildlife and local livestock across the canals*. This was addressed through the inclusion of footbridges and culverts in the rehabilitation/construction designs.
- *National parks and conservation areas*. The National Park and Wildlife Preservation Act 1973 and its regulations: the National Park and Wildlife Preservation Rule 1973 (2030) and the Buffer Zone Management Rule 1994 set out provisions for the protection of wild flora and fauna. Where irrigation infrastructure was located within areas covered by this legislation, the concerned authorities were included in consultations concerning the design of the works as well as mobilisation of contractors' and WUAs' work teams and working methodologies.

Other issues such as health and safety during construction, sanitation of the construction workers' camp and protection of adjacent ecosystems were addressed through the construction contractors' contracts under the supervision of the DoI.

The office of Project Director along with financial consultant regularly carried out monitoring of the financial issues in all the cost centres to access the fiduciary compliances at different intervals of the project period. It was found that all district cost centres had fulfilled the requirements in line with financial regulations. The internal and external audits were carried out in timely manner in each district by the concerned district account control office and office of auditor's general office respectively. The unaudited financial statements/Financial Monitoring Reports (FMR) were prepared and submitted to the World Bank on a timely basis.

4.3 Performance of Government Institutions and Departments, Non-Government Entities, the principle TA provider, the Supervisory Entity involved in the project

The government organizations mainly engaged for the successful completion of the project were Ministry of Finance (MoF), National Planning Commission (NPC), Ministry of Irrigation (MoI), Ministry of Agriculture Development (MoAD), Water & Energy Commission Secretariat (WECS), Department of Irrigation (DoI), Department of Agriculture Development (DoAD), and Department of Hydrology and Meteorology. Other major stakeholders were National Federation of Irrigation WUA, Nepal (NIFWAN), Concerned WUAs, Non-Governmental Organizations (NGOs), District Development Committees (DDCs), and project hired Technical Assistance (TA) team.

As discussed earlier, both Components A and B were implemented by DoI, whereas Component C was implemented by WECS and some parts by DoI and Component D was jointly implemented by DoA and DoI. Implementation of telemetric system was carried out under Component C with the assistance from DHM. NIFWAN were engaged during the preparation of implementation guidelines, norms and directives. Some pilot micro irrigation technology transfer schemes were carried out through NGOs.

Two separate TA teams were mobilized for Component A and Component B to support the work of the OPD and to advise and assist DoI/DoA field offices as and when necessary in areas such as:

- Irrigation infrastructure design
- SEMP preparation
- Institutional strengthening of WUAs
- Participation of women and other vulnerable communities in the work area of the project
- Construction quality control
- Agriculture extension and training
- Support in Financial management and reporting
- Preparation of CoPs, AMPs etc. for AMIS systems
- Monitoring and Evaluation

For Component A, the TA team comprised of 13 full-time and 7 part-time experts including one expatriate team leader. Final input from this TA team were 421.2 person-months including 14.6 P-M international inputs. Likewise, for Component B, the TA team comprised of 12 nationals and 1 international team leader with total inputs of 310 P-M and 12 P-M respectively.

Overall, the government agencies as well as concerned stakeholders had performed efficiently and above satisfactory level to achieve the overall goal of the project.

4.4 Risk to Development Outcome

One of the major issue persists for all FMIS and AMIS sub-project was its sustainability, particularly in AMIS that were handed over to the WUA recently. The complexity of the technical features of canal operation and management requires different types of high skilled workers in the system for continuous technical backstopping. The retention of trained farmers within the sub-project is always a key issue for institutional development of the system. The progress made during the IWRMP intervention in ISF

collections should be continued by WUA and should also be increased annually as per agreed AMP. Any failure of irrigation system management and institutional management will lead to the loss of agriculture productivity and production so far achieved during the IWRMP interventions.

At this moment, probable a major shock is the national restructuring into three tier federal government system. Local and Provincial governments should be aware of IMT activities and should recognize the importance and overall contribution to national benefit by FMIS system in Nepal.

5 LESSONS AND RECOMMENDATIONS

After the completion of the project, a number of factors that were overlooked/experience gained during the inception, planning and implementation have lent lessons learned, that at this stage, come as recommendations. These are as follows:

i Sub-projects under Component A were distributed very thinly across the western regions, often with only one or two ISPs in any one district. This had hindered effective management, monitoring and evaluation and it has been recommended that in future, subprojects be clustered together whenever possible.

ii Opportunities to optimise designs were missed because agriculture development plans (ADP) were prepared after detailed engineering designs had been completed. It is recommended that ADPs be incorporated into the detailed designs so that the engineering proposals can more closely reflect the needs and ambitions of the farmers.

iii The DoI had encountered some difficulties in persuading farmers to contribute to the levels specified in IWRMP. This was because farmers in groundwater sub-projects resented having to pay more (15%) than farmers in surface water projects (10%) and contributions were higher than those required on rehabilitation sub-projects entirely funded by the GoN. It is recommended to follow the Irrigation policy for farmer's contribution part.

iv The implementation of IDF were hindered by un-availability of skilled man-power or inadequate number of man-power in district level. Because of which many WUAs failed to appreciate the importance of the IDF activities in helping them manage their irrigation systems in a sustainable way. An NGO could be appointed in future to provide social support services for a cluster of subprojects. Services could include: GVCDPs, GRMs, ISF collection, WUA training and IDF implementation.

v AMIS sub-systems, e.g. in Narayani and SMIP, under Component B have been facing the problem of sufficient discharge as only a branch/part of the system were taken for IMT. The possibility of achievements being undone is high. It is hence recommended to take an entire system for IMT implementation rather than just parts of a system.

vi Due to complicated technical features of canal operation for water management and assets management, a regular technical support to the WUAs will be required for their sustainability.

vii A major challenge facing implementation of the environmental and social framework was the tendency to treat it as a distinct component of project implementation, with its own budget line and administration, separate from those of the main construction works. As a result, implementation of SEMP mitigation measures often lagged behind the main part of the rehabilitation/construction works on site. Many mitigation measures identified in SEMPs (such as village road bridges and covered canals) form an integral part of the irrigation infrastructure and could be more efficiently implemented as part of the main works contracts.

viii Dedicated social mobilization and technical support in each ISP is important to reap the benefits of irrigation facilities through agriculture diversification. Agriculture development was constrained by an inadequate range of activity support. In order to provide a full range of needed agriculture support inputs from on-farm production up through the value chain to marketing, farm level investment in agriculture development should be increased.

ix It was realized from the project implementation that agriculture extension program is much more effective if delivers through WUA and this can reduce workload of public extension system and increase transparency and accountability. If utilized properly, WUA can substantially transform agriculture in the command area. Thus, WUA should be developed as a multi-functional community organization looking after development of irrigation and agriculture sector rather than just for construction and maintenance of irrigation canals and related infrastructure.

ANNEXES

ANNEX: A (List of PICC Approved Sub-Projects under Component A of IWRMP-OS)

Amount in '000 NPR

SN	District	Name of Sub project	CCA (ha)	PICC Approved Date	PICC Amt.
	Western				
	Mountain				
1	Mustang	Namgel ISP	32	Sept. 24, 2010	9,872
2	Mustang	Dhakmaar ISP	90	Dec. 29, 2010	27,544
3	Manang	Tenki ISP	45	Feb. 28 ,2012	21,862
4	Manang	Shyarkhu Ghatte ISP	25	Dec. 4, 2009	6,200
5	Manang	Gowa khola ISP	26	Dec. 29, 2010	12,131
	Hill				
6	Lamjung	Tarawali ISP	25	March 17, 2009	3,772
7	Lamjung	Sheraphant ISP	65	Dec. 4, 2009	18,416
8	Lamjung	Eklephant ISP	25	May 20, 2010	5,780
9	Lamjung	Majuwa khola ISP	80	Dec. 29, 2010	22,392
10	Lamjung	Kirinchekandabote ISP	52	May 13, 2014	14,523
11	Lamjung	Sitikhola Bhatbesi ISP	50	Feb. 28, 2012	14,858
12	Syangja	Suraudi ISP	80	Dec. 29, 2010	23,345
13	Syangja	Tamakhubari ISP	30	May 20, 2010	9,744
14	Syangja	Jyagdi thulokulo ISP	40	Dec. 29, 2010	9,647
15	Kaski	Puranbesi ISP	48	29-Dec.-2010	10,853
16	Kaski	Bagadi Birauta ISP	75	29-Dec.-2010	18,732
17	Kaski	Polyangtar ISP	110	Feb. 28, 2012	25,307
18	Palpa	Aath Bishe ISP	25	March 17, 2009	5,408
19	Palpa	Churi Chaurasi ISP	30	Dec. 4, 2009	5,495
20	Palpa	Gethi Chaur ISP	34	Dec. 4, 2009	6,858
21	Palpa	Dailatung ISP	40	March 17, 2009	7,718
22	Palpa	Legduwa Jhumsa ISP	34	March 17, 2009	6,177
23	Palpa	Jhyangla Phant ISP	35	Dec. 29, 2010	7,994
24	Palpa	Maidani Phant ISP	45	Sept. 24, 2010	6,050
25	Palpa	Amerai ISP	53	March 27, 2014	15,071
26	Palpa	Talmul ISP	78	March 27, 2014	25,582
27	Palpa	Argali ISP	215	Feb. 28, 2012	58,347
28	Palpa	Materi kulo ISP	28	Dec. 29, 2010	8,013
29	Baglung	Lekhani ISP	62	May 13, 2009	9,393
30	Baglung	Kusmishera ISP	57	Dec. 29, 2010	12,374
31	Myagdi	Babiyachaur ISP	34	June 3, 2009	6,606
32	Myagdi	Ghara ISP	80	Dec. 29, 2010	20,278
33	Gorkha	Hajariphant ISP	38	March 17, 2009	7,515
34	Gorkha	Dhumwakot ISP	54	Dec. 29, 2010	10,674
35	Gorkha	Nimel phant ISP	25	Feb. 28, 2012	5,540
36	Gorkha	Kaldheri khet ISP	25	Dec. 29, 2010	7,971
37	Gorkha	Bhandarthok ISP	50	March 17, 2009	7,852

38	Parbat	Khurkot ISP	95	Dec. 29, 2010	25,698
39	Parbat	Thulakhet ISP	30	Dec. 29, 2010	7,062
40	Tanahun	Nayatar ISP	100	Dec. 4, 2009	29,603
41	Tanahun	Golme Shankhe ISP	45	Dec. 4, 2009	11,108
42	Tanahun	Pokhrel phant ISP	30	Feb. 28, 2012	8,069
43	Tanahun	Chundi khola ISP	29	Feb. 28, 2012	7,317
44	Tanahun	Chundi Barah ISP	45	Feb. 28, 2012	10,672
45	Tanahun	Gadi Jhauritar ISP	51	Dec. 4, 2009	13,141
46	Tanahun	Shera phant ISP	50	Dec. 4, 2009	9,798
47	Tanahun	Bhulke kulo ISP	44	Sept. 24, 2010	15,793
48	Gulmi	Jethi Kulo ISP	50	March 17, 2009	14,593
49	Gulmi	Dalli khola ISP	29	March 17, 2009	7,938
50	Gulmi	Lampate ISP	45	Dec. 29, 2010	13,142
51	Gulmi	Tardi khola ISP	50	Dec. 29, 2010	10,945
52	Gulmi	Pahadi phant ISP	29	Dec. 29, 2010	8,422
53	Arghakhanchi	Thuladhunga ISP	40	Dec. 4, 2009	8,317
54	Arghakhanchi	Durga phant ISP	35	Feb. 28, 2012	7,703
55	Arghakhanchi	Bangi khola ISP	31	Feb. 28, 2012	6,688
	Terai				
56	Kapilvastu	Gangauliya Gautaria ISP	220	June 3, 2009	15,552
57	Kapilvastu	Sayar Bandh ISP	400	Dec. 29, 2010	27,940
58	Kapilvastu	Galaha Bangawa ISP	800	Feb. 28 2012	62,445
59	Kapilvastu	Gudrung khola ISP	400	Feb. 28 2012	75,186
60	Kapilvastu	Bethi ISP	470	May 13, 2009	61,738
61	Rupandehi	Gajedi ISP	419	Jan. 16, 2014	96,970
62	Rupandehi	Gonaiya ISP	800	June 3, 2009	59,872
63	Rupandehi	Motipur Khadwa ISP	1500	June 3, 2009	55,254
64	Nawalparasi	Tamsariya Baruwa ISP	217	Dec. 29, 2010	27,651
65	Nawalparasi	Nayabelhani ISP	320	Dec. 29, 2010	49,032
	GW				
66	Rupandehi	Parroha-Semlar DTW ISP	400	May 20, 2010	69,210
67	Nawalparasi	Tamsariya DTW ISP	240	March 17, 2009	34,887
68	Nawalparasi	Sunol Swathi DTW ISP	240	March 17, 2009	5,882
69	Rupandehi	Suryapura STW-Electrification	200	May 20, 2010	10,687
	Total of Western Region		9394		1,364,209
	Mountain				
70	Kalikot	Sukatiya ISP	71	Dec. 4, 2009	9,827
71	Kalikot	Ghunkhaya ISP	104	Feb. 28, 2012	31,167
72	Kalikot	Khatikulo ISP	150	Feb. 28, 2012	31,125
73	Dolpa	Khatijyula ISP	100	Aug. 6, 2010	39,963
74	Dolpa	Jugeni to Rangaon ISP	52	28-Feb. 2012	17,198
75	Mugu	Gulm ISP	90	Aug. 6, 2010	43,063
76	Mugu	Barkhu ISP	90	Feb. 28, 2012	20,167
77	Humla	Yanchujyula ISP	50	Feb. 28, 2012	19,415
78	Jumla	Bandi Raaj ISP	120	May 13, 2009	42,226
	Hill				
79	Surkhet	Ratataar Goremare ISP	85	Jan 11, 2009	7,725
80	Surkhet	Itaura ISP	60	Jan 11, 2009	4,684
81	Surkhet	Kharkhola ISP	225	Jan 11, 2009	21,580
82	Surkhet	Chanaute ISP	87	Jan 11, 2009	9,577

83	Surkhet	Baghkhor ISP	40	Dec. 31, 2010	14,763
84	Surkhet	Ghat Gaun ISP	400	May 13, 2009	93,562
85	Surkhet	Chaur khola ISP	50	Dec. 31, 2010	18,536
86	Surkhet	Tatekulo ISP	90	Dec. 31, 2010	26,687
87	Dailekh	Jugeni khola ISP	50	May 13, 2009	14,424
88	Dailekh	Khadapalchaur ISP	80	Dec. 31, 2010	28,014
89	Pyuthan	Kasi kulo ISP	35	Dec. 4, 2009	12,532
90	Pyuthan	Badahara Saribang ISP	30	Dec. 31, 2010	8,792
91	Pyuthan	Aarang Khola ISP	25	Dec. 31, 2010	7,230
92	Rolpa	Madichaur ISP	30	Dec. 31, 2010	12,311
93	Rolpa	Puran Gaun ISP	40	Dec. 4, 2009	16,335
94	Rukum	Chandribang ISP	30	Dec. 4, 2009	9,932
95	Rukum	Bhalachaur ISP	31	Feb. 28, 2012	14,177
96	Jajarkot	Oriwaul ISP	40	Dec. 4, 2009	9,789
97	Jajarkot	Kolgad ISP	25	Feb. 28, 2012	9,378
98	Salyan	Reshamjyula ISP	100	Jan 11, 2009	17,479
99	Salyan	Bhumeshworjyula ISP	40	Jan 11, 2009	5,778
100	Salyan	Pandheri Palesi ISP	45	Dec. 31, 2010	12,401
101	Salyan	Mantura ISP	50	Feb. 28, 2012	10,367
102	Salyan	Syalpani ISP	27	Dec. 31, 2010	11,022
	Terai				
103	Dang	Baruwa Guale ISP	228	May 13, 2009	46,400
104	Dang	Malware ISP	1200	May 13, 2009	167,300
105	Dang	Dohate ISP	38	Dec. 31, 2010	6,074
106	Dang	Koraban ISP	210	Dec. 31, 2010	9,962
107	Dang	Patukhola ISP	250	Dec. 31, 2010	39,832
108	Dang	Oineriya ISP	60	Feb. 28 2012	15,549
109	Dang	Chhotekulo ISP	180	Dec. 31, 2010	26,288
110	Dang	Manpure ISP	400	Feb. 28, 2012	27,970
111	Banke	Malaiya Pathraiya ISP	285	Feb. 28, 2012	48,490
112	Bardiya	Kaaligaudi ISP	230	May 13, 2009	51,829
113	Bardiya	Pratappur ISP	235	May 13, 2009	52,228
	GW				
114	Banke	Shamshergunj DTW ISP	360	June 3, 2009	65,818
115	Banke	Jaispur Saigaon STW ISP	315	Dec. 4, 2009	4,399
	Total of Mid- Western Region		6533		1,213,364
	Mountain				
116	Bajura	Pilchaur Majhkulo ISP	35	Feb. 28, 2012	13,118
117	Bajura	Dungreekhola ISP	64	Feb. 28, 2012	23,978
118	Bajhang	Purchauri ISP	30	Dec. 4, 2009	7,040
119	Darchula	Chaud ISP	60	Feb. 28, 2012	16,691
120	Darchula	Chholaigad ISP	58	Dec. 29, 2010	14,728
	Hill				
121	Doti	Salenigad ISP	60	Dec. 29, 2010	22,180
122	Achham	Ranisera ISP	58	Feb. 28, 2012	19,955
123	Achham	Badabinayak ISP	51	Feb. 28, 2012	18,375
124	Dadeldhura	Ghatteplot ISP	45	May 13, 2009	7,366
125	Dadeldhura	Goalghar Bhitrisen ISP	30	Dec. 31, 2010	10,738
126	Dadeldhura	Choud Rupal ISP	48	Dec. 31, 2010	16,789
127	Baitadi	Paudi Surinayagad ISP	277	Dec. 29, 2010	36,702
	Terai				

128	Kailali	Amarawati ISP	200	June 3, 2009	27,901
129	Kailali	Banikulo ISP	1800	Dec. 31, 2010	202,763
130	Kailali	Gaidakheda ISP	450	Feb. 28, 2012	29,855
131	Kailali	Bandegada ISP	205	Feb. 28, 2012	35,401
	GW				
132	Kanchanpur	Daiji DTW ISP	360	June 3, 2009	59,466
133	Kanchanpur	Parashan DTW ISP	80	June 3, 2009	1,643
134	Kailali	Udasipur STW Electrification	200	Dec. 31, 2010	6,529
	Total of Far- Western Region		4111		571,218
	Total of 3 Regions		**20038**	**-**	**3,148,791**

ANNEX: B (List of PICC Approved Sub-Projects under Component A of IWRMP-AF)

Amount '000 NRs

SN	District	Name of Sub-project	CA (ha)	PICC Approved date	PICC Amount
	Western Region				
	Mountain				
1	Mustang	Syang ISP	42	29 Dec, 2016	14,238
2	Mustang	Jhong Putak ISP	50	11 Mar, 2015	21,895
3	Manang	Tilche ISP	25	11 Mar, 2015	9,992
	Total of Mountain-West- 3 (Nos.)		**117**		**46,125**
	Hill				
4	Lamjung	Bangrebeshi ISP	75	16 Jan, 2014	20,376
5	Lamjung	Kesidi Lamabagar ISP	25	11 Mar, 2015	8,708
6	Gorkha	Pokharatar ISP	70	13 May, 2014	19,990
7	Gorkha	Bakrang Besi ISP	75	20 Jan, 2015	25,926
8	Tanahun	Bilmade Mulpani ISP	45	27 Mar, 2014	15,697
9	Tanahun	Bhanu Barah ISP	40	20 Jan, 2015	13,985
10	Kaski	Kharikhola Bhalabhat ISP**	34	27 Mar, 2014	12,574
11	Kaski	Dhiprangbesi ISP	28	29 Dec, 2016	14,616
12	Kaski	Kotre Kafaltar ISP	38	11 Mar, 2015	15,291
13	Kaski	Tallo Dabake ISP	27	29 Dec, 2016	11,190
14	Parbat	Aguwa khola ISP	35	16 Jan, 2014	11,917
15	Parbat	Sibdi Chiluwa ISP	37	11 Mar, 2015	15,352
16	Parbat	Gyandi ISP	170	29 Dec, 2016	25,126
17	Parbat	Rati khola ISP	95	29 Dec, 2016	20,628
18	Myagdi	2023 Sale kulo ISP	33	20 Jan, 2015	13,148
19	Baglung	Chhisti ISP	52	16 Jan, 2014	14,532
20	Baglung	Tallo Lamahi Phant ISP	38	20 Jan, 2015	14,380
21	Syangja, Palpa	Aandhi khola ISP	330	16 Jan, 2014	59,697
22	Syangja	Kamtitar ISP	32	11 Mar, 2015	16,743
23	Palpa	Itiya khola ISP	29	27 Mar, 2014	9,018
24	Palpa	Sardewa ISP	50	27 Mar, 2014	17,006
25	Palpa	Serakhet ISP	26	11 Mar, 2015	9,755
26	Palpa	Gairapanari Binapate ISP	56	27 Mar, 2014	27,759
27	Gulmi	Waorgati Sanichaur ISP	55	16 Jan, 2014	24,035
28	Gulmi	Jherdi khola ISP	25	16 Jan, 2014	10,671
29	Gulmi	Damkaphant/Sota ISP	100	20 Jan, 2015	44,742
30	Gulmi	Rumta Aambot ISP	80	29 Dec, 2016	31,970
31	Arghakhanchi	Damaidhunga ISP	50	16 Jan, 2014	13,886
32	Arghakhanchi	Kopche Damare ISP	64	20 Jan, 2015	24,087
	Total of Hill-West -29 (Nos.)		**1,814**		**562,806**
	Terai-Surface				
33	Nawalparasi	Tokare ISP	520	16 Jan, 2014	86,609
34	Nawalparasi	Bhedabari ISP	200	29 Dec, 2016	17,599
35	Nawalparasi	Bhorlebas ISP	120	16 Dec, 2016	21,640

36	Kapilvastu	Madwan Sikari ISP	535	27 Mar, 2014	83,896
37	Kapilvastu	Bharai khola ISP	200	16 Jan, 2014	38,021
38	Rupandehi	Itiyakulo ISP	2,500	13 May, 2014	131,841
39	Rupandehi	Jhimjhime ISP	240	13 May, 2014	58,710
	Total of Terai-West - 7 (Nos.)		**4,315**		**438,316**
	Terai-GW				
40	Kapilvastu	Valwad DTW ISP	460	16 Jan, 2014	14,260
41	Rupandehi	BLGWP (Original)	3,000	11 Mar, 2015	138,000
42	Rupandehi	BLGWP (Additional)	1,080	29 Dec, 2016	50,000
43	Nawalparasi	Petbaniya DTW	160	29 Dec, 2016	37,184
	Total of GW-West - 4 (Nos.)		**4,700**		**239,444**
	Total of Western Region - 43 Nos.		**10,946**		**1,286,690**
	Mid-Western Region				
	Mountain				
44	Humla	Maspatal ISP	100	27 Mar, 2014	67,195
45	Humla	Gangru Pinathang ISP	28	11 Mar, 2015	18,028
46	Humla	Sarkegad ISP	60	29 Dec, 2016	41,850
47	Jumla	Giri Khola ISP	110	11 Mar, 2015	43,755
48	Jumla	Laudisim ISP	60	29 Dec, 2016	30,025
49	Mugu	Librukhola to Bajhkhet Gatjyula ISP	15	16 Dec, 2016	10,864
50	Dolpa	Kharpula ISP	50	16 Dec, 2016	28,911
	Total of Mountain-Mid-West- 7 nos.		423		240,627
	Hill				
51	Jajarkot	Chaukha Rauli Jyula ISP	27	11 Mar, 2015	10,686
52	Jajarkot	Sani chaur ISP	20	29 Dec, 2016	12,379
53	Rukum	Chauke Takuri ISP	45	27 Mar, 2014	20,677
54	Rukum	Sakure ISP	45	29 Dec, 2016	28,922
55	Rukum	Chhipra khola ISP	45	16 Dec, 2016	29,979
56	Pyuthan	Ghari kulo ISP	30	3 Jan, 2014	13,018
57	Pyuthan	Gartung khola ISP	55	3 Jan, 2014	20,239
58	Pyuthan	Lamasera ISP	25	29 Dec, 2016	12,247
59	Pyuthan	Pindali Phant ISP	45	11 Mar, 2015	19,110
60	Rolpa	Manghat ISP	50	20 Jan, 2015	26,033
61	Rolpa	Oat ISP	45	11 Mar, 2015	23,059
62	Surkhet	Malarani Sahare ISP	200	20 Jan, 2015	57,221
63	Surkhet	Jharkhet ISP	28	27 Mar, 2014	11,195
64	Surkhet	Mathillo Bahuni Chaur ISP	44	11 Mar, 2015	18,080
65	Surkhet	Gamkhola Kholte Pani ISP	40	11 Mar, 2015	14,147
66	Salyan	Darimjyuala ISP	56	3 Jan, 2014	18,620
67	Salyan	Tatke kulo ISP	25	16 Dec, 2016	16,531
68	Dailekh	Kharigaira Tarachaur ISP	75	29 Dec, 2016	24,466
	Total of Hill-Mid-West - 18 Nos.		900	-	376,611
	Terai-Surface				
69	Bardiya	Batule- Kurule ISP	70	3 Jan, 2014	27,762
70	Bardiya	Ambasa-Balanti ISP	213	20 Jan, 2015	42,553
71	Banke	Paruwa ISP	200	3 Jan, 2014	32,802
72	Banke	Thure ISP	215	20 Jan, 2015	40,120
73	Dang	Lohadabre ISP	800	3 Jan, 2014	116,967
74	Dang	Ratgaiyan ISP	495	3 Jan, 2014	35,978
75	Dang	Bahundanda ISP	270	20 Jan, 2015	68,836
76	Dang	Babarpur Jaluke ISP	105	29 Dec, 2016	43,039

	Total of Terai-Mid-West - 8 Nos		2,368		408,057
	GW				
77	Bardiya	Sanoshree DTW	240	29 Nov, 2016	54,759
78	Bardiya	Sanoshree-Taratal DTW ISP	160	29 Nov, 2016	42,151
79	Banke	Radhapur Sitapur DTW ISP	760	11 Mar, 2015	14,260
80	Dang	Bela DTW ISP	160	20 Jan, 2015	38,572
81	Dang	Dhanauri DTW ISP	160	29 Nov, 2016	41,350
	Total of GW-Mid-West - 5 Nos		1,480		191,093
	Total of Mid-Western - 38 Nos		**5,171**		**1,216,388**
	Far-Western Region				
	Mountain				
82	Darchula	Goiladi ISP	26	19 Dec, 2013	10,368
83	Darchula	Naktad ISP	72	29 Dec, 2016	21,009
84	Darchula	Pant Pali ISP	40	11 Mar, 2015	10,287
85	Bajhang	Bhairabnath ISP	50	19 Dec, 2013	11,974
86	Bajhang	Subeda Tallo Jyula ISP	35	19 Dec, 2013	13,661
87	Bajhang	Subeda Mallo Jyula ISP	60	20 Jan, 2015	23,970
88	Bajhang	Kuch ISP	40	11 Mar, 2015	15,127
89	Bajhang	Deura Jwalikhet ISP	48	29 Dec, 2016	14,624
90	Bajura	Bhaunera ISP	32	29 Dec, 2016	15,974
	Total of Mountain-Far-West - 8 Nos		403		136,994
	Hill				
91	Baitadi	Nwali ISP	40	19 Dec, 2013	9,297
92	Baitadi	Limuda ISP	50	19 Dec, 2013	18,027
93	Baitadi	Manekuda ISP	27	11 Mar, 2015	10,722
94	Baitadi	Kotedigad ISP	25	29 Dec, 2016	12,220
95	Dadeldhura	Jogijala ISP	29	19 Dec, 2013	16,432
96	Dadeldhura	Badhuwa ISP	26	19 Dec, 2013	10,400
97	Dadeldhura	Dhittadi ISP	29	20 Jan, 2015	14,204
98	Dadeldhura	Bhitte Sal ISP	32	11 Mar, 2015	15,091
99	Doti	Dhanras Khet ISP	72	19 Dec, 2013	28,720
100	Doti	Kadamandu ISP	200	20 Jan, 2015	79,300
101	Doti	Kala Patthareswar ISP	150	20 Jan, 2015	59,919
	Total of Hill-Far-West - 11 Nos.		680		274,332
	Terai-Surface				
102	Kanchapur	Bagun ISP	256	19 Dec, 2013	34,724
103	Kanchanpur	Kalapani ISP	600	20 Jan, 2015	137,176
104	Kailali	Ratipur ISP	367	19 Dec, 2013	63,793
	Total of Terai-Far-West - 3 Nos		1,223		235,693
	Terai-GW				
105	Kanchanpur	Suda DTW ISP	160	29 Nov, 2016	44,589
106	Kailali	Sadhepani DTW ISP	240	11 Mar, 2015	58,757
	total of GW-Far-West - 2 Nos		400		103,346
	Total of Far-Western Region - 25 Nos		**2,706**		**750,366**

** This sub-project had been dropped before its implementation.

ANNEX: C (Sample WUA Income-Expenditure Details: Kankai Irrigation System)

(Fiscal year, mid-July to mid-July)	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17
	2066/67	2067/68	2068/69	2069/70	2070/71	2071/72	2072/73	2073/74
WUA cash income	**630,640**	**1,919,693**	**1,585,501**	**2,178,310**	**2,572,149**	**3,114,430**	**2,474,027**	**3,642,361**
ISF & other fees, rent income	**176,440**	**943,466**	**385,562**	**695,629**	**820,749**	**1,196,700**	**1,489,177**	**2,411,891**
ISF collected, central WUA	170,000	436,668	373,502	645,061	724,407	1,152,295	1,342,687	1,651,804
membership fees	6,440	54,620	6,520	37,520	43,880	23,350	144,490	56,240
O&M charge collected, branch WUAs		452,178			42,542	14,640		223,058
nomination fees								66,000
entry fee					4,000	4,000	2,000	6,000
other fees (miscellaneous)			5,540	13,048	5,920	2,415		408,789
Equipment services income	**454,200**	**976,227**	**1,199,939**	**1,482,681**	**1,751,400**	**1,917,730**	**984,850**	**1,230,470**
excavator	454,200	976,227	1,199,939	1,263,506	1,291,500	1,371,390	817,100	891,150
tractor				219,175	427,900	444,440	35,400	203,820
thresher					15,000	65,000	82,000	82,500
meeting room and shop rental					17,000	36,900	50,350	53,000
WUA cash expenditures	**544,566**	**2,059,171**	**1,491,130**	**1,671,625**	**2,285,311**	**2,530,316**	**2,363,346**	**2,588,406**
Salaries/allowances/hospitality	**159,270**	**643,761**	**413,160**	**482,010**	**748,107**	**908,416**	**1,103,701**	**982,117**
staff salaries	86,842	307,886	373,630	268,000	282,250	400,200	552,500	587,350
ISF collectors' salaries				67,255	103,686	158,801	202,916	228,082
meeting allowance	30,694	273,450		59,400	74,746	86,600	82,150	48,800
driver allowance				23,360	98,000	66,100	48,950	45,750
secretary allowance					96,000	108,000	120,000	0
travel allowance	23,450	38,100	15,100	37,550	37,620	33,500	27,400	16,500
guest hospitality	18,284	24,325	24,430	26,445	55,805	55,215	69,785	55,635

(Fiscal year, mid-July to mid-July)	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17
	2066/67	2067/68	2068/69	2069/70	2070/71	2071/72	2072/73	2073/74
Office operation	**152,503**	**287,169**	**119,388**	**304,095**	**444,537**	**476,011**	**416,138**	**407,019**
office supplies	47,755	31,904	18,973	57,095	98,681	39,235	57,347	25,307
printing	53,983	21,733	33,740			76,360	59,280	86,385
newspapers						5,670	4,760	8,150
cleaning						6,600	6,000	6,800
office equipment maintenance						16,700	27,100	17,550
water, elec, phone, internet	8,490	14,351	13,205	22,800	72,981	40,424	74,490	10,685
prizes and donation					5,111	5,111	5,111	0
auditing		9,000	10,000	14,500	16,000	16,000	16,000	16,000
general assembly expenses				76,100	84,700	79,850	101,840	111,482
communication/transportation		2,600	13,620	23,000		28,030	9,250	50,645
liabilities		75,600	11,000	110,600	79,700	161,051	12,495	8,732
election expenses								58,150
miscellaneous	42,275	131,981	18,850		87,364	980	42,465	7,133
Government taxes	**17,000**	**43,667**	**37,350**	**64,506**	**72,441**	**115,230**	**134,269**	**165,180**
Equipment fuel/maintenance	**215,793**	**1,084,574**	**921,232**	**821,014**	**1,020,226**	**1,030,659**	**709,239**	**1,034,090**
fuel								
excavator	204,445	564,743	548,278	25,960	538,309	509,431	268,451	213,478
motorcycle					29,530	28,333	44,635	22,150
tractor							20,330	9,515
maintenance								
excavator	11,348	519,831	372,954	700,389	327,343	296,977	260,293	491,489
motorcycle				23,290	41,472	35,471	49,430	8,050
tractor				71,375	83,572	160,447	66,100	289,408

(Fiscal year, mid-July to mid-July)	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17
	2066/67	2067/68	2068/69	2069/70	2070/71	2071/72	2072/73	2073/74
Total O&M cash contributions	**630,640**	**1,919,693**	**1,585,501**	**2,178,310**	**2,572,149**	**3,114,430**	**2,474,027**	**3,642,361**
Target O&M	**4,336,000**	**4,336,000**	**4,336,000**	**4,336,000**	**4,336,000**	**4,336,000**	**4,336,000**	**4,336,000**
% of O&M target reached (cash only)	15%	44%	37%	50%	59%	72%	57%	84%
In-kind O&M expenditures	**0**	**0**	**1,444,250**	**2,238,583**	**2,888,500**	**2,888,500**	**2,888,500**	**2,510,400**
days of farmer labor			5,777	8,954	11554	11,554	11,554	8,368
daily labor rate (NRs/day)			250	250	250	250	250	300
% of O&M target reached (in-kind only)	0%	0%	33%	52%	67%	67%	67%	58%
Total O&M cash + in-kind contributions	**630,640**	**1,919,693**	**3,029,751**	**4,416,892**	**5,460,649**	**6,002,930**	**5,362,527**	**6,152,761**
% of O&M target reached (cash + in-kind)	15%	44%	70%	102%	126%	138%	124%	142%

ANNEX: D (Implementation progress of Component D (DoA))

Major activities	Unit	Progress										
		Original Scope						Additional Financing				Total
		08/ 09	09/10	10/ 11	11/12	12/ 13	13/ 14	14/15	15/16	16/17	17/18	
Demonstration	No.		2009	424	2482	1264	529	420	286			7414
Livestock shed improvement	No.				1088	810		637	260	369	137	3301
Fish pond promotion	No.						179	155				334
Plastic tunnel	No.			220	122	26	160	437	325	205	52	1547
High-tech plastic tunnel	No.								1(38)	2(28)		3(66)
Capacity development and extension												
Farmer field school	Number		49	64	218	176	21	99	54	32	36	749
District technical staffs training	Times		3	3	3	1	1					11
Field based farmer training	Times		115	232	133	83	44	44	44	216	142	1053
Seasonal planning workshop	Times		49	128	190	126		54	127	123		797
Training to agro-vet and input dealer	Times								8			8
Social mobilizer mobilization	Number						17	63	60	60	63	263
Investment support grant												0
Small farm machinery distribution	Sets		1305	65	344	112	250	289	47	16		2428
Investment for community assets	Number		24	39	93	59	71					286
Income generation activities												0
Youth employment promotion	Number						20	320	158	150	77	725
Income generation activities for poor and marginal community	Number				81		49	49	72	104	53	408
Seed production (mainly rice, wheat, maize and potato)	Ha			65	421	542	541	419	578	612	391	3569
Strengthening M & E												0
Strengthening grass-root level extension-distribution of computer sets	No.							44	12		77	133
4-wheelers	No.							4			2	6
2-wheelers	No.							50				50

ANNEX: E Comparison of Irrigation Service fee Collection Rates in the 2017/18 Fiscal Year with Plans

ISP Name	District	Ecology	CCA	Population	HH	ISF Targets		ISF Collection						
						Overall	2074/75	Cash	Labour	Total	Rs/Ha	Rs/Ha	% of Overall	% of 2017/18
Damaidhunga	Arghakhanchi	Hill	50	696	65	303,150	125,600	3,500	81,200	81,200	1,694	1,303	28%	67%
Kopehe Damare	Arghakhanchi	Hill	64	352	66	425,632	134,432	-	61,600	61,600	963	933	14%	48%
Damkaphant/Sota	Gulmi	Hill	100	3028	388	1,647,500	354,300	4,800	157,500	157,500	2,055	530	12%	58%
Jherdi Khola	Gulmi	Hill	25	562	109	107,650	55,125	-	42,000	42,000	1,680	385	39%	76%
Waorgati Sanichaur	Gulmi	Hill	55	1000	218	1,109,045	518,620	-	371,000	371,000	6,745	1,702	33%	72%
Bhari Khola	Kapilvastu	Terai S	200	1500	160	929,400	499,400	-	392,000	392,000	1,960	2,450	42%	78%
Madwan Sikari	Kapilvastu	Terai S	535	5678	1103	1,507,570	693,300	-	490,000	490,000	916	444	33%	71%
Kotre Kafaltar	Kaski	Hill	38	380	68	310,390	149,118	-	108,800	108,800	2,863	1,600	35%	73%
Bangrebeshi	Lamjung	Hill	75	665	199	653,050	421,825	-	364,000	364,000	4,853	1,829	56%	86%
Kesidi Lamabagar	Lamjung	Hill	25	345	54	332,200	149,325	-	103,600	103,600	4,144	1,919	31%	69%
Tilche	Mustang	Mountain	25	370	53	296,000	193,600	-	168,000	168,000	6,720	2,170	57%	87%
Syang	Mustang	Mountain	42	650	130	483,994	319,539	-	280,000	280,000	6,667	2,154	58%	88%
2033 Sale Kulo	Myagdi	Hill	33	1100	240	1,012,872	912,948	-	888,000	888,000	26,909	3,700	88%	97%
Tokare	Nawalparasi	Terai S	520	5000	1000	2,428,560	1,605,712	-	1,400,000	1,400,000	2,692	1,400	58%	87%
Gairapanari, Binapate	Palpa	Hill	56	1219	167	858,152	592,152	-	482,000	482,000	8,607	2,886	56%	81%
Sardewa	Palpa	Hill	50	854	112	496,950	378,400	-	280,000	280,000	5,600	2,500	56%	74%

Serakhet	Palpa	Hill	56	331	61	496,758	387,142	9,776	336,000	336,000	13,299	5,668	70%	89%
Aguwa Khola	Parbat	Hill	35	927	145	465,360	248,045	-	175,000	175,000	5,000	1,207	38%	71%
Sibdi Chiluwa	Parbat	Hill	37	980	106	518,057	260,500	-	168,000	168,000	4,541	1,585	32%	64%
Kamtitar	Syangja	Hill	32	528	71	997,144	815,536	-	770,000	770,000	24,063	10,845	77%	94%
Bhanu Barah	Tanahun	Hill	40	1043	171	447,000	358,700	4,000	280,000	280,000	7,100	1,661	64%	79%
Bilmade Mulpani	Tanahun	Hill	45	687	128	414,290	288,538	4,500	200,000	200,000	4,544	1,623	49%	71%
Oat ISP	Rolpa	Hill	45	300	60	274,510	176,500	90,000	64,500	64,500	3,433	2,575	56%	88%
Manghat	Rolpa	Hill	50	1010	147	533,800	315,000	-	215,000	215,000	4,300	1,463	40%	68%
Mathillo Bahuni Chaur	Surkhet	Hill	44	665	122	295,520	211,920	-	97,520	97,520	2,216	799	33%	46%
Gamkhola Khotte Pani	Surkhet	Hill	40	987	125	133,100	121,100	-	85,100	85,100	2,128	661	64%	70%
Ambasa-Balanti	Bardiya	Terai S	213	1086	196	724,100	298,100	-	85,100	85,100	400	288	12%	29%
Batule-Kurule	Bardiya	Terai S	70	800	70	400,100	267,100	-	85,100	85,100	1,216	1,216	21%	32%
Chauke Takuri	Rukum	Hill	45	1500	300	470,390	243,000	-	198,000	198,000	4,400	660	42%	81%
Darimjyuala	Salyan	Hill	56	1100	160	315,408	145,000	20,048	89,000	89,000	1,947	682	35%	75%
Gartung Khola	Pyuthan	Hill	55	700	135	507,155	275,000	-	220,000	220,000	4,000	1,630	43%	80%
Ghari Khola	Pyuthan	Hill	30	2000	300	248,880	136,500	-	82,500	82,500	2,750	275	33%	60%
Jhakhet	Surkhet	Hill	28	880	160	232,500	152,000	48,020	82,500	82,500	4,644	813	56%	86%
Lohadabre	Dang	Terai S	800	4134	689	2,419,700	1,154,100	12,000	754,100	754,100	958	1,112	32%	66%
Paruwa	Banke	Terai S	200	2500	200	767,510	510,000	-	310,000	310,000	1,550	1,550	40%	61%

Ratgaiyan	Dang	Hill	495	3024	458	924,130	739,470	148,500	491,970	491,970	1,294	1,398	69%	87%
Sakure	Rukum	Hill	45	1800	300	536,238	270,000	45,000	180,000	180,000	5,000	750	42%	83%
Thure	Banke	Terai S	215	4500	600	1,005,171	803,400	215,000	425,000	425,000	2,977	1,067	64%	80%
Badhuwa	Dadeldhura	Hill	26	300	60	2,972,990	141,796	-	84,000	84,000	3,231	1,400	3%	59%
Subeda Tallo Jyula	Bajhang	Mountain	35	1099	175	1,303,260	400,645	-	175,000	175,000	5,000	1,000	13%	44%
Jogijala (Re-appraised)	Dadeldhura	Hill	29	822	80	376,987	142,580	-	84,000	84,000	2,897	1,050	22%	59%
Manekuda	Baitadi	Hill	27	696	70	541,501	164,300	-	70,000	70,000	2,593	1,000	13%	43%
Ratipur	Kailali	Terai S	367	1580	225	1,299,790	310,358	-	63,000	63,000	172	280	5%	20%
Bagun	Kanchanpur	Terai S	256	3099	498	564,248	163,250	17,215	63,000	63,000	313	161	14%	49%
Dhittadi	Dadeldhura	Hill	29	901	70	450,495	168,499	-	98,000	98,000	3,379	1,400	22%	58%
Goiladi	Darchula	Mountain	26	300	35	329,762	93,342	-	35,000	35,000	1,346	1,000	11%	37%
Limuda	Baitadi	Hill	50	806	104	462,800	140,550	-	60,000	60,000	1,200	577	13%	43%
Nwali	Baitadi	Hill	40	597	40	435,720	131,160	-	55,000	55,000	1,375	1,375	13%	42%

ANNEX: F Component Wise Total Expenditure of IWRMP ('000 NRs)

Components	IWRMP-OS				IWRMP-AF (NFCP)			IWRMP-AF					Total				
	IDA grant	GoN	Water users	Total	IDA (loan)	GoN	Total	IDA loan	IDA grant	GoN	Water users	Total	IDA Loan	IDA Grant	GoN	Water Users	Total
Component A: Rehabilitation and Modernization of Irrigation Infrastructure	2,585,307	479,685	284,979	**3,349,971**	0	0	**0**	1,787,855	711,783	446,964	147,448	**3,094,050**	**1,787,855**	**3,297,090**	**926,649**	**432,427**	**6,444,021**
Component B: Irrigation Management Transfer	851,291	133,373	0	**984,664**	0	0	**0**	725,274	299,098	181,319	106,136	**1,311,827**	**725,274**	**1,150,389**	**314,692**	**106,136**	**2,296,491**
Component C:Institutional and Policy Support for Improved Water Management	171,434	11,776	0	**183,210**	0	0	**0**	0	4,055	0	0	**4,055**	**0**	**175,489**	**11,776**	**0**	**187,265**
Component D: Integrated Crop and Water Management Program	694,835	102,598	27,045	**824,479**	1,122,688	9,081	**1,131,770**	202,040	459,982	52,439	15,069	**729,530**	**1,324,728**	**1,154,817**	**164,118**	**42,114**	**2,685,779**
TOTAL EXPENDITURE	**4,302,866**	**727,433**	**312,024**	**5,342,323**	**1,122,688**	**9,081**	**1,131,770**	**2,715,169**	**1,474,918**	**680,722**	**268,653**	**5,139,462**	**3,837,857**	**5,777,785**	**1,417,236**	**580,677**	**11,613,555**

PHOTOGRAPHS
(COMPONENT A)

PHOTOGRAPHS
(COMPONENT B)


महाकाली सिंचाइ प्रणाली दोस्रो चरण
बेल्डाँडी शाखा नहर
मुख्य जानकारीहरु:
बेलौरी मूल शाखा नहरको चेक्ने :०+८४२ किलोमीटर
नहरको लम्बाई :२५७२ किलोमीटर
नहरको सिंचित क्षेत्र :२२५ हेक्टर
टर्सरी नहरहरुको संख्या :
नहरमा छोडिने पानीको मात्रा (डिस्चार्ज) :२८८ लीटर प्रतिसेकेन्ड
बेलौरी मूल शाखा नहर
बेल्डाँडी माइनर
बेल्डाँडी शाखा
मूलनहरबाट छोडिने पानीको वितरण तालिका
बारी याम
१बर्षे बाली
२हिंदे रचैतेबाली
आइतबार
सोमबार
मंगलबार
बुधबार
बिहिबार
शुक्रबार
खुल्ला
बन्द
२४ घण्टा
बिहान ६:३० देखि बेलुकी ७:३० बजे सम्म
सिंचाइ विभाग, सिंचाइ तथा जलस्रोत व्यवस्थापन आयोजना,
महाकाली पथरैया मोहना सिंचाइ व्यवस्थापन डिभिजन, महेन्द्रनगर(कञ्चनपुर)

PHOTOGRAPHS

(COMPONENT C)

Government of Nepal
Ministry of Energy, Water Resources & Irrigation
Department of Irrigation
IRRIGATION MANAGEMENT DIRECTORATE
Mahakali Patharaiya Mohara Irrigation Management Divison
Kanchanpur

	Border Weir	Daiji VRB
Water Depth (Realtime)	0.33 m	0.37 m
Discharge	4.14 m³/s	0.51 m³/s

Sun Aug 19 2018 12:16:14 GMT+0545 (Nepal Time)

PHOTOGRAPHS
(COMPONENT D)


सिंजल योजना तर्जुमा गोष्ठी


तोरीको बीउ उत्पादन कार्यक्रम