FORM 19

CHECKLIST FOR FEASIBILITY STUDY

Name of Project : Kholaseudi Nadekhet Beurabagar IP
District : Doti

	Check list	Yes	No
i)	Data regarding water source is authentic and based on field verification (Check with low flow study data)	(√)	( )
ii)	Water right issues have been clearly identified. (Any evidence shown ?)	( )	(x)
iii)	Signature of all beneficiaries' Land holding are as stated in the 'Application Form'. Upfront cash deposit at the rate of NRs 60/- per ha is made.	(√)	( )
iv)	social data is fully supplied.	(√)	( )
v)	Existing organization of farmers are capable to manage, operate and mobilize resources for construction and O & M.	(√)	( )
vi)	Agriculture data inputs with existing and future cropping pattern and yields are supplied by DADO.	(√)	( )
vii)	Location and system layout plan enclosed.	(√)	( )
viii)	Crop water requirement estimated and Canal water duties realistic.	(√)	( )
ix)	Proper identification of all works required with quantity estimates.	(√)	( )
x)	District rates with analysis of item rates and attached to the detailed cost estimates.	(√)	( )
xi)	Detailed design with drawings and Cost estimations are submitted in case of 'Minor New'.	( )	( )
xii)	Implementation Schedule and Work plans attached.	(√)	( )
xiii)	Full economic evaluation done in accordance with normal practice.	(√)	( )
xiv)	Proposal for environmental protection Measures are incorporated.	(√)	( )

Form 21

GOVERNMENT OF SUDURPASHCHIM PROVINCE
MINISTRY OF PHYSICAL INFRASTRUCTURE DEVELOPMENT
THE APPRAISAL AND APPROVAL COMMITTEE
(Appraisal of Feasibility Report)

Project Summary

Name of project	:	Kholaseudi Nadekhet Beurabagar IP
Location	:	Adarsh Ga. Pa. 3, Doti
Gross Command Area	:	5.84 Ha
Total Project Cost (NRs.)	:	3,555,000.00
Cost per Hectare (NRs.)	:	608,800.00
ERR	:	11.71%

Project description:
Kholaseudi Nadekhet Beurabagar IP is a demand driven irrigation Project. It lies in Adarsh Ga. Pa. 3 of Doti district. Farmers are very enthusiastic about the project and prepared to mobilize and contribute resources for the construction work according to the prevailing irrigation policy. The project area is a food deficit area and can be transformed to food surplus area after the construction of this project.

Hence, it is recommended for appraisal and approval.

For the appraisal of the project under reference, the following documents and information are available for review:
1. Farmers' Request Form
2. Detail feasibility study report with cost estimate.

The MoPID herewith confirm that it has appraised the Kholaseudi Nadekhet Beurabagar irrigation project for implementation.

_____	_____	_____	_____	_____
WRIDDO (Division Chief)	Engineer (MoPID)	Account Officer (MoPID)	Under-Secretary (MoPID)	Province-Secretary (MoPID)

Form 22C

GOVERNMENT OF SUDUR PASCHIM PROVINCE
MINISTRY OF PHYSICAL INFRASTRUCTURE DEVELOPMENT
WATER RESOURCES AND IRRIGATION DEVELOPMENT DIVISION OFFICE
DOTI

FORM FOR APPROVAL OF Project FOR IMPLEMENTATION

1. **Project : Kholaseudi Nadekhet Beurabagar IP, Adarsh Ga. Pa. 3, Doti**
2. **Description of work : Construction of Canal and Canal Structures**
3. **Estimated Amount: NRs. 26,91,000.00**
4. **Certified :**
    a. The drawings and measurements of the proposed work are based on field verification
    b. The design and estimate of the proposed work is based on departmental norms and general engineering principles in practice.
    c. The proposed estimate is prepared based on approved rate and rate analysis norms.
    d. All the numbers and arithmetical calculations carried out in this estimate are correct.

…….	…….	…….
Submitted by	Checked by	Forwarded by
(sub-Engineer)	(Engineer)	(Division Chief)

5. Recommended (Water Resources and Energy Unit, MoPID)
   The submitted cost estimates and drawings are correct in accordance with the approved departmental norms and follow the general engineering principles in practice hence is recommended for approval.

…….	…….
Engineer	Sr. Div. Engineer

6. Approved :
   For this work, the drawings and an amount of NRs……...is approved.

…….
Province Secretary
MoPID

APPRAISAL FOR FEASIBILITY STUDY

The MoPID herewith confirms that the project has fulfilled the following necessary data documents, required for the Project approval/implementation. The project report submitted by WRIDDO; Doti has been checked as per following checklist.

Name of Project	**:**	**Kholaseudi Nadekhet Beurabagar ISP**
District	**:**	**Doti**
VDC/Municipality	**:**	**Adarsh Ga. Pa. 3**
Command Area	**:**	**5.84 Ha (GCA)**
Project cost	**:**	**NRs. 3,555,000.00**
Cost/Ha	**:**	**NRs. 608,800.00**
EIRR	**:**	**11.71%**

1) Data regarding water sources seems to be authentic. (Check with low flow and water balance has been properly computed.)
2) No water right issues have been seen and clearly identified.
3) Signatures of beneficiaries, land holdings are as stated in the "Application Form" Upfront cash deposit is made.
4) Social data is duly supplied.
5) Existing organizations of farmers are committed to managing, operating and mobilizing resources for construction and O & M.
6) Agriculture data inputs with existing and future cropping patterns and yields are collected and supplied by DADO.
7) Location and system layout plans are enclosed.
8) Crop water requirements estimated, and canal duties are realistic.
9) Proper identification of works required with quantity estimates.
10) Analysis of items of rates based on approved district rates are attached in the detailed cost estimate.
11) Detailed designs with drawings submitted are found to be as per engineering ethics.
12) System operation plan has been prepared and it is realistic.
13) Implementation schedules and work plans attached.
14) Full economic evaluation done in accordance with normal practice.
15) Proposal for minor environmental protection measures if any in future are incorporated.
16) Project does not have any problems with the resettlement plan.

The project is therefore recommended for approval/implementation.

SALIENT FEATURES

1.	**NAME OF PROJECT**	:	Kholaseudi Nadekhet Beurabagar Irrigation Project
	Category		Rehab
2	**Location**		
2.1	District	:	Doti
2.2	Municipality	:	Adarsh 3
2.3	District Headquarter	:	Silgadhi
2.4	Province	:	Sudur Paschim
2.5	Physiographic Division	:	Hill
2.6	Accessibility		
	a. Nearest Airport	:	Doti andDhangadhi
	b. Nearest Roadhead	:	Kholaseudi Nadekhet Beurabagar (8 km)
2.7	Geographical Features CA		
	a. Latitude	:	29.371205^0
	b. Longitude	:	80.875999^0
2.8	Elevation	:	859.00
2.9	Marketing Facilities	:	Dipayal
3	**Command Area**		
3.1	Gross Command Area	:	5.84 Ha
3.2	Net Command Area	:	5.14 Ha
3.3	Soil type	:	Loamy, GBM
4	**Hydrology**		
4.1	Hydrological Region/ Basin	:	5 / Karnali
4.2	Name of source	:	Sailigad Khola
4.3	Type of source	:	Perennial
4.4	Measured discharge	:	400 lps
4.5	Catchment Area	:	166 sq. km.
4.6	Bed Material/River stage	:	Course Sand, Gravel, and Boulder
4.7	River Stage	:	Boulder
4.8	Water Right Problem	:	None
5.	**CANAL**		
5.1	Main Canal length	:	2.8 km (contour canal)
5.2	Canal shape	:	Rectangular
5.3	Design discharge at intake	:	50 lps
5.4	Ideal canal length	:	50 m
6	**Geology**		
6.1	Geological formation	:	Depositional and erosional
6.2	Geology of diversion site	:	Flat
6.3	Geology of canal alignment	:	Contour canal with GBM soil
7	**Beneficiaries**		
7.1	Population	:	500
7.2	Households	:	100
7.3	Household size	:	5.0

7.4	Food Situation	:	Deficit
8	**Project Cost**		
8.1	Total Project Cost	:	3,555,000.00
8.2	Project Construction Cost	:	26,91,000.00
8.3	Cost per Ha	:	608,800.00
9	**Economic Analysis**		
9.1	EIRR	:	11.71 %
9.2	B/C Ratio at 10 % discount rate	:	1.15
9.3	B/C Ratio at 12% discount rate	:	1.00
9.4	Benefit from project after irrigation	:	Rs 465.57 thousand/year
10	**Environmental Situation**	:	Environment friendly and positive impacting
12	**Demand of Project**	:	Genuine and Deman Driven
13	**Recommendation**	:	Strong

EXECUTIVE SUMMARY

1. Farmers of project area are expecting assistance from relevant agencies to construct an irrigation system in their command area of about 5.84 Ha. They submitted Request form to include their Project.
2. The project is intended to irrigate 5.14 Ha. (NCA) of land of Adarsh Ga. Pa. 3 in Doti District It will be irrigated from perennial source Sailigad Khola.
3. The total beneficiaries' households are 100 Nos with population of 500 Nos.
4. The command area has good potential for intensive irrigated agriculture. The present cropping intensity is 139%. This data is collected from DADO Doti and local inquiries.
5. Available flow is sufficient to irrigate all the area according to the design cropping pattern. The future cropping intensity is 241%.
6. Proposed plans of construction/existing include the following component.
   The cost of proposed development plan is NRs. 3,555,000.00 and construction plan is 26,91,000.00 of which 7 will be contributed by farmers' participation in form of canal excavation and others, amounting NRs. 172,225.00.
7. According to Environment Protection Rules 2077, only IEE study is carried out if command area is less than 500 ha in hill. Most of the insignificance shown in study are ranked D1 category.

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ABBREVIATIONS

AEC	-	Agricultural Enterprises Centre
AO	-	Association Organizer
ASC	-	Agriculture Service Centre
B/C ratio	-	Benefit/Cost ratio
BOQ	-	Bill of Quantities
C.I.	-	Cropping Intensity
CAD	-	Computer Aided Design
DADO	-	District Agriculture Development Office
DDC	-	District Development Committee
DG	-	Director General
DOI	-	Department of Irrigation
DTM	-	Digital Terrain Model
EIA	-	Environmental Impact Assessment
EIRR	-	Economic Internal Rate of Return
FSL	-	Full Supply Level
HH	-	Household
JT/JTA	-	Junior Technician/Junior Technician Assistant
KWh	-	Kilo Watt hour
LCB	-	Local Competitive Bidding
LCS	-	Labour Contracting Society
LRMP	-	Land Resource Mapping Project
MIP	-	Medium Irrigation Project
MoPID	-	Ministry of Physical Infrastructure Development
MOI	-	Ministry of Irrigation
NARC	-	Nepal Agricultural Research Council
NGO	-	Non-Governmental Organization
NPV	-	Net Present Value
O&M	-	Operation and Maintenance
PDSP	-	Planning and Design Strengthening Project
ToR	-	Terms of Reference
VDC	-	Village development Committee
WB	-	World Bank
WRIDDO	-	Water Resources and Irrigation Development Division Office
WUA	-	Water Users' Association
WUG	-	Water Users' Group
WUO	-	Water Users' Organization

1.0 INTRODUCTION

1.1 BACKGROUND

The economy of Nepal is sustained mainly by its agricultural production. The bulk of the population (about 81%) is involved in the agricultural sector. The rapid growth in population has led to the demise in per capita agricultural production of the nation. The situation is further aggravated by the unavailability of New land that can be brought under cultivation on one hand and the steady decrease of available land due to encroachment by human settlements and New infrastructure. Under such a context, the priority is to increase production in the farmlands already available for which irrigation is one of the main requirements.

Department of Irrigation has initiated medium irrigation project from the fiscal year 2061/062. G/N policy initiatives have focused demand driven local initiative and farmers' participation from the initial stage to provide a framework of long term sector lending for irrigation. For the fulfillment of the objectives, it is important to promote farmers' participation in planning, construction and management of the irrigation system and it is more important to involve farmers in operation and maintenance of the system in view of limited budget of G/N and to improve productivity. Experience has shown that in such schemes, the investment of resources is low, Project gestation and capital recovery duration is short, the beneficiary farmer groups express formal and active participation from planning to construction of such Projects and most importantly, the proper operation and maintenance of such Projects are simple and hence understood and accepted by such farmer groups laying the foundation for sustainable development in this sector.

The process for implementation and the ultimate handover of the Project is such that the initial request for the Project must come from most of the farmers. A formally established water users' group registers such requests in the concerned Irrigation Office. Such Projects are implemented only after they are screened through a rigorous process of identification survey and feasibility assessment. In addition to this, the Projects are prioritized at all stages and top-ranking ones (the number also depends on the allocated budget) after screening them through feasibility assessment, are approved for implementation.

1.2 HISTORICAL BACKGROUND OF THE PROJECT

Kholaseudi Nadekhet Beurabagar IP is a rehab project, which intends to irrigate 5.84 Ha of land of Adarsh Ga. Pa. 3 of Doti district. The source is Sailigad Khola, which is perennial one. The project is intended to satisfy 500 Nos populations of 100 Nos households, which is expected to lift the standard of life of the people. The command area is terraced land and gently slopped.

The proposed irrigation project is a rehab scheme which is a genuine demand driven project. The farmers in the project area are facing problems with acquisition of water for irrigation. So, the farmers made a formal demand for construction of the new

project by submitting the project request form. The farmers agreed to follow the rules and regulations as per irrigation policy to construct the project.

The farmers of the project area were found to be hard working and quite aware of the benefits of modern farming. Their efforts to gain more produce from their fields have been hampered mainly due to scarcity of water and weak canal system and weak headwork for water acquisition. The main crop of the area is paddy, which is completely rain-fed in nature. Winter crops are limited to maize, wheat etc. however some hardworking and enterprising farmers are cultivating vegetables and have managed to sell their products in the nearby markets.

The farmers in the project area were found very enthusiastic about the possibility of irrigation facilities and have reached the conclusion that Sailigad Khola could be the potential source of irrigation.

Figure 1-1 Bird View of Project Area

1.3 OBJECTIVE AND SCOPE OF WORKS

In order accomplish the aforementioned objectives, the scope of the study as provided in the Terms of Reference (TOR) can be summarized as below:

a) Collect, Compilation, Computation and processing all the hydrological, meteorological, agricultural, hydro-geological, social and institutional data.
b) Assessment of the crop water requirement and designing sustainable cropping patterns in various alternatives compatible with optimum use of irrigation water to gain highest economic return.
c) Study of existing farmer organization interaction and their co-operation in participatory approach for implementation and operation of the Project.
d) Detail work and reports on social, economic and institutional aspects of beneficiaries together with their involvement potential during implementation and highlighting the constraints.
e) Preparation of design and drawing as per requirement e.g. L-section, X Section of canal, Lay out plan showing intake location etc and river cross section and L-section of the river etc.
f) Estimations of economic appraisal considering with and without Project. Estimation of direct benefits of the Project, Cost Benefit Ratio (BCR) and EIRR.
g) Preparation of detailed works on operation and maintenance aspects of the Project with realistic explanation of crucial problem that the Project could face and pragmatic measures to counter them.
h) Initial Environmental Effect (IEE) Study: Environment aspects before and after the Project, with aspects to vegetation, land erosion, slides and slips, sediment problem in watershed and Project area. It will also include measures on flood control work, along with irrigation measures for environment improvement.
i) Preparations of Bill of Quantity analysis of rate based on current G/Nepal approved rate and prepare cost estimate.
j) Prepare implementation program for proposed Project.

k) Narrative reports giving detailed account of all works prepared and submitted finally and contents in three volumes.
Volume I – Main Report
Volume II - Appendices
Volume III- Drawings

1.4 APPROACH AND METHODOLOGY

The approach in conducting the job is completely guided by the TOR. For this, farmers were randomly selected from head, middle and tail reach were interviewed. A short meeting was also conducted with the ad-hoc water user association. The methodology mainly consisted of following phases:

1.4.1 Inception Phase

1.4.2 Team Composition

The complete work was performed in four stages. They are desk study stage, detail field survey stage, information compilation analysis and design stage and report writing stage. A team of exports consisting of Irrigation Engineer, Civil Engineer, Designer, Geologist, Sociologist, Agri-economist, Hydrologist, Overseers, Surveyors, Draft person and Computer expert were involved in each stage of study.

1.4.2.1 Desk Study

During this phase of the study, the consultant collected all physical data, geological and geographical information, climatological records of the Project area, other information and reviewed the existing documents, proposed alignment of the canal.

1.4.2.2 Map Study

Activities under this heading consists essentially of:
a. Study of collected maps to be awareness of sites in the study area and ascertain Project structure locations such as the intake sites, canal alignment.
b. Preparation of a Study Area Reference Plan to the scale 1: 25,000 with the help of topographical maps and
c. Plot the proposed sites on the Reference Map.

1.4.2.3 Preparation of Field Study Programs and Procedures

Activities under this heading consisted essentially of:
a. Preparation of detailed guidelines and procedures for conducting the field study,
b. Preparation of a site visit and the
c. Time schedule of the visits,
d. Preparation of a list of works to be conducted in the sites to be visited,
e.Preparation of the field data sheets,
f. Preparation of questionnaires for interviews with local people.

1.4.2.4 System Walk – Through Survey

The walk-through survey of the project was carried out with the beneficiaries. All significant features and constraints of the system were noted. A detailed inventory of the system was prepared. The system was inspected from head to tail with interaction with as many beneficiaries as possible.

The exact alignment with accurate cross–sections was finally set out by the survey team. A walk over survey along the selected alignment of the sub – Project was performed by a team of geologists, irrigation engineer and surveyors. The walk over survey offered the opportunity for the necessary shift and realignment in the route and for readjustment in the canal slope. The walk over survey undertook along the entire length of the proposed canal in order to visualize comprehensively all the advantageous and constraint conditions in their respective field studies. This was also minimizing unstable areas. A level, Compass, altimeter, Geological Hammer were used during this phase of the study.

1.4.2.5 Synthesis and prioritization of Identified problems

This is important activity after the completion of walk-through surveys. All problems may be interrelated and some may be solved or minimize when major problems are tackled. Screening of listed problems was carried out to prioritize the major problems to be taken carefully. The beneficiaries were jointly participated in this activity.

1.4.2.6 Detailed Field Work Phase

A meeting was held at Project site with local people to find out their views regarding, impact on ecology due to the Project, economy of the area and other advises which was the main basis for the mitigation procedures to be implemented for the protection of environment. The participation of the local peoples in these key issues, the consultant thinks is, in –editable for effective implementations of these procedures.
During the fieldwork, all the major problems due to the existing canal system were noted. The team members were briefed for constant interaction among team members and farmers. The site visits were performed from intake to command area together with local people.

The survey team members visited the diversion structures, canal alignments and topographical survey of headwork were conducted. The longitudinal section and cross section survey of the canal alignments and structure points were taken. GPS

- Compass
- Prism
- Measuring tapes

The detail of the fieldwork is described in following heads.

1.4.2.7 Survey of canal Alignment and Geological Study

Longitudinal survey of canal alignment was carried out by GPS. Alignment survey was carried out by open traversing of the canal alignment.

The geologist conducted walk over survey through the alignment for identifying the material and landslide, quarries. The geologist looked after their natural state and made undisturbed or disturbed sampling to test for their classification. A comprehensive study of soil and rocks was done which shall be the basic of determining soil parameters. All relevant geomorphologic and manmade features likely to affected the construction or function of the irrigation system was noted.

1.4.2.8 Material survey

A Material Survey was conducted during the field-work. Construction material quarry sites with availability of material for quarrying was performed. This study was conducted keeping the point of view of location of quarry sites for the construction materials their availability and values.

1.4.2.9 Hydrological Study

The Hydrologist conducted a Hydrological study. This was done as required for the source river and cross drainage structure, by carefully analyzing the rainfall data and flood data and hydrological analysis was done. Catchment area was calculated from topographical maps and other field information. Flow measurement of the source river was taken by float method. Sub-basin approach was used for water resource assessment of the Project. Inventory of water uses upstream and downstream of the proposed intake site was prepared.

1.4.2.10 Agriculture Survey

Agriculture survey was performed to determine the present agriculture practice of the farmers. A checklist form of the feasibility study report was used to collect the real agriculture data of the Project area. The team seriously analyzed the existing information and dates which affected the future situation in the Project area after the implementation of the Project.

In the same way details on existing cropping pattern and on problems encountered by farmers were looked in depth. The required field data related to crop water requirement depending upon the future cropping pattern to match the need and expectation of beneficiaries was taken.

1.4.2.11 Environmental Study

Environmental aspects of the Project area was studied in detail, preparing all necessary protective methods which must be undertaken during the implementation of the Project. Protection of environment is one of the most sensitive issues presently considered seriously, while implementing any infrastructure development Projects. Hence, the survey team looked into the environmental aspects of this Project, to avoid unnecessary environmental destruction of this Project.

Environmental studies are needed to restrict undesirable effects and identify appropriate measures.

Impact prediction can be made using:

- A qualitative approach that relies on general knowledge of impacts of similar Projects, or specific result of comprehensive studies of similar Project.
- A quantitative approach based on the use of simple mass balance and environmental dilution calculations and
- A quantitative approach based on the use of mathematical models for multiple environmental factors.

Checklist for IEE was used as a tool for environmental assessment:

In view of the fact that the Irrigation Project is based on the critical foundation of participation by beneficiaries who are to be involved in all components Project activities including cost sharing, operation, and maintenance, for the long run of the Project. In order to achieve this goal thoroughly interaction was done with the local people. During field study period mainly the following activities were performed.

Engineering Aspects :

a) Selection of head work site and topographical survey of the site.
b) Canal alignment survey and site survey of appurtenant structures.
c) Marking of command area survey (traverse survey).
d) Construction material survey for head work sites and canal system and the appurtenant structures.
e) Other infrastructure study.

Hydrological/ Argo-Meteorological Aspects:

a) Catchment area and its condition.
b) Hydrology of source of river, high flows and low flow estimation.
c) Measurement of discharge, flow records,
d) Collection of hydrological and meteorological data.

Agricultural Aspects :

a) Land use map with respect to Irrigated, rained cultivation, urban, barren and marshy area and validated at site.
b) Existing cropping pattern.
c) Cropping area, crops grown and planting and harvesting details.
d) Yields, production static and marketing.
e) Discussion on proposed cropping pattern.
f) Extension services and existing facilities.

Environmental Aspects:

a) Catchment area conditions
b) Sedimentation, erosion, seepage and slippage problem.
c) Water logging and inundation problems.
d) Impact on Health, sanitation, drinking water and water borne diseases and agrochemical.

Socio-economic Aspects:

a) Population, growth rate, No. of household, No. of family members.
b) Land holding, crops production, expenditure and marketing,
c) Migration
d) Education

e) Participation in water's organization.

Institutional Aspects:

a) Formation, constitutional and function of existing WUA,
b) Resource mobilizations and conflict management,
c) Water management and O & M,
d) Beneficiaries intention,
e) Training necessary

1.4.3 **Post Fieldwork Phase**

After the completion of the field verification work by the Consultant's team of experts including, design specialists started the design works based upon the results of field data.

1.4.3.1 Intake Design

An intake is proposed is temporary intake. Keeping it as in the original condition

1.4.3.2 Canal Design

As canal alignment passes through steep topography, pipe canal is proposed to convey water. Size of canal was designed considering the available flow in the source and existing terrain slope. Since source discharge cannot fulfill the crop water requirement in the conventional way, a reservoir tank is proposed to collect the water.

1.4.3.3 Other Structure

Other Structure such as cross drainage structures, retaining walls, etc were proposed and designed for slope protection and stability.

1.4.3.4 Environment

Protection of environment is one of the most sensitive issues during implementation of any infrastructure Projects. During the selection of alignment, full attention was given to environmental issues. Environmental aspects were considered at each stage of design work to prevent damage to the environment. The consultant chose appropriate measures in design to protect environment.

1.4.4 **Drawing and Maps**

Based on the engineering survey and design, the consultant prepared necessary maps and working drawing as specified in the TOR.

- Location map of proposed Project
- Project layout map
- Longitudinal & cross section of main canal

1.4.5 **Bill of Quantities and Cost Estimation**

Based on detailed engineering design and drawing, Project cost was derived. This entailed the following three stages:

a) Quantity surveying

Engineering and structural drawing, detailing and the specifications are the fundamental basis for quantifying work items. Items of work involved was first classified, grouped and sub-grouped. Quantities of work under each group and sub-groups were found out by means of the standard practice of quantity surveying. Items of same specification added to derive the abstract of bill of quantities.

b) Unit price Analysis

Construction items for which unit prices or lump sum prices are to be bid by contractors are analyzed considering the followings to derive their unit cost:

- Standard G/N Norms of unit price analysis and other accepted norms for LCB contracts
- Market prices/Basic rates approved by the local authority
- Availability of materials on local markets or alternative cost of imported materials
- Lead distances for import of materials to the site and cost of transportation
- Wages of skilled and unskilled labor
- Overheads and profits

c) Costing

Cost estimates was prepared based on the outcome of quantity survey and unit price analysis.

1.5 PROJECT AREA

1.5.1 Location and Background

The proposed Kholaseudi Nadekhet Beurabagar ISP is in the South-west part of the district, Doti and district headquarters. The project area lies in the Adarsh Ga. Pa. 3, Doti

1.5.2 Accessibility

The project area is ca. 200 km north of Dhangadhi. The route to reach the project area is Dhangadhi – Budar – Syaule-Doti-Adarsh -Site. Doti is 840 km from Kathmandu.

1.5.3 Command Area

The proposed irrigation project has a command area of 5.84 Ha. The command area has been determined from Remote Sensing. It lies on the left bank of Sailigad Khola. Majority of the command area lies in tail point. The command area has good potential for intensive irrigated agriculture. The command area was determined by GPS traverse survey and verified on topographical map of the area.

1.5.4 Environment Profile

The climate is subtropical so as can be expected in the Himalaya area of Nepal. As there exist no long-term discharge records for this river, the flood discharge is sought to be estimated based on the rainfall and catchment characteristics. The soil type in the command area is sandy loam and clay loam.

1.5.5 Geographical Features

A comprehensive geological investigation was carried out on the proposed project in order to determine site features and soil properties. The geological investigations includes the desk study, reconnaissance survey and detailed field study.

All relevant maps, reports, aerial photographs are analyzed during the desk study. A survey was carried out to evaluate the cause of slip. The topographical maps of 1:25000 scale and aerial photographs of 1:20000 scale were used during the fieldwork. The aerial photographs are extensively used in the desk study as well as in the field study. The soil types, rock structure, direction and inclination of slope, hydro-geological and hydrodynamic conditions, land use pattern and vegetative condition was incorporated in the field study.

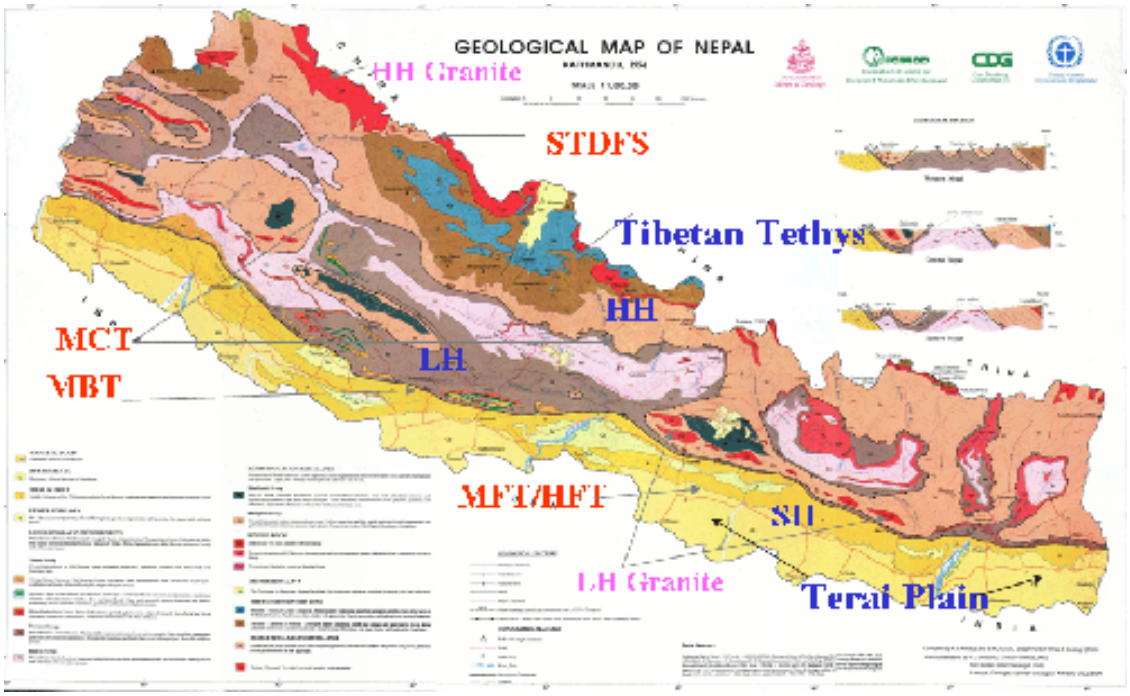
1.5.5.1 Regional Geology

Nepal Himalaya can be divided into the following major five tectonic zones separated by different thrust and faults. The tectonic zones with their characteristics are tabulated as follows from south to North.

Table 1-1 Characteristics of Tectonic Zone

S. N.	Geological Units	Characteristics
1	Tibetan Tethyan Himalayan Zone	Sedimentary rocks such as Shale, Limestone and sandstone ranging in age from Cambrian to Cretaceous.
STD		
2	Higher Himalaya	High grade metamorphic rocks i.e. gneiss, migmatite, schist, quartzite and marbles
MCT		
3	Lesser Himalaya	Un-fossiliferous sedimentary and meta-sedimentary rocks such as shale, sandstone, limestone, dolomite, slate, phyllite, schist and quartzite ranging in age from pre-Cambrian to Eocene.
MBT		
4	Siwalik	Fluvial sedimentary rocks consisting of mudstone, siltstone, sandstone and conglomerate of Neogene to quaternary age
MFT		
5	Terai	Alluvium sediments of Pleistocene to recent age.

Figure 1-2 : Geological Map of Nepal



1.5.6 Agri-Support Services

Agricultural Extension:
Agricultural Extension and training at the district level is handled by Agricultural Development Offices (ADO). The ADO is assisted by Assistance Production Officers, Junior Technicians (JTs), Junior Technicians Assistants (JTAs) who conduct VDC level agricultural extension and training program activities in the district.

Input supply:
The Agricultural Input corporation (AIC) at Doti is responsible for procurement and distribution of agricultural inputs such as Chemical Fertilizers,

Agricultural credit
The Agricultural Development Bank of Nepal (ADB/N) branch office bank at Doti is responsible for the supply of agricultural credit to the farmers in the district.

Market
The area for its commercial transaction is much linked with Budar, Dhangadhi and Mahendranagar.

2.0 ENGINEERING

2.1 WATER RESOURCES ASSESSMENT

2.1.1 Assessment of Flow in the Source

Sailigad Khola is the only source river of the proposed Project. Field inspection & verification of calculation of area using Toposheet revealed that the Catchment area of Kholaseudi Nadekhet Beurabagar consists of:

- Thick vegetation cover 70%
- Cultivated land 15%
- Grazing land and other 50%

Basin Sub-basin approach to Water Resource Assessment:

Sub-basin approach is used to water resource assessment. There is no contribution in surface runoff from snowmelt. Only subsurface flow contributes to the base flow. Flow of water at the proposed intake sites of the Kholaseudi Nadekhet Beurabagar was measured by float method. The value of discharge was 400 lps on 26 April 2023. For the purpose of predicting April flow, the flow measured during feasibility study is considered as convenient and more reliable. Mean and 80% reliable flows are calculated based on the measure flow and are presented in Appendix.

Using PDSP Manual M-3, For Hydrological Region 5 predicted April flow for Kholaseudi Nadekhet Beurabagar was calculated 353.8 lps. The low value of the predicted April flow is due to the high value of the Non dimensional hydrograph in region 5. Mean monthly flows were obtained for each source river with the help of Regional Non-dimensional Hydrograph for Region 5.

Therefore, 80% reliable April flow of Sailigad Khola = 301.7 lps.

2.1.2 Present water utilization from the source

Water resources of this river is being utilized primarily for irrigation. However, other usages of this river includes religious and drinking water for livestock. Currently, so many Farmers Managed Irrigation System (FMISs) draw water from this river. Some of these FMIS have been aided under Irrigation Sector Project.

Most of the irrigation systems are the indigenous farmers managed irrigation system and built long time ago. Farmers built most of these systems with local inventiveness and resources. Consequently, these system do not have the permanent diversion structures, regulating structures and other canal related structures. Due to lack of regulating intakes, the river flood damages most of the intake during monsoon and flood water gets into canal and also into command area. Similarly, user farmers with the help of local material and forest product construct these intake or diversion structures in every irrigation season or after every flood events. This has created the adverse impact in forest depletion and deposition of excess material in river channel. At present, operation and maintenance of these system is a big problems to the farmers combined with the river erosion.

2.1.3 **Crop Co-efficient and Irrigation Efficiency**

Crop coefficient and Irrigation Efficiency for different crops are taken from PDSP Manual M_3 and presented in Appendix:
Irrigation Efficiency

Field Efficiency	:	0.75 (Paddy), 0.60 (Dry foot Crops)
Distribution Canal Efficiency	:	0.70
Major Canal Efficiency	:	0.70

2.1.4 **Scheme water balance computations and Interpretation**

Water requirement computation is carried out for Monsoon paddy, Spring Paddy, maize, wheat, potatoes, Pulses, Sugarcane, Fruits, Soyabean, W. Vegetables, S. Vegetables & oilseed are presented in appendix of the report. The command area is terraced land. The average percolation losses are taken 4 mm per day as recommended in the PDSP Manual. Canal and field efficiencies are taken as mentioned in 2.4 above. Maximum value of intake water requirement is calculated in Nov 1st half.

A water balance has been prepared and enclosed in Appendix of this report. Considering the 80% reliable flow in the source rivers, full irrigation for monsoon paddy, spring paddy, potato, Pulses, Sugarcane, Fruits, Soyabean, wheat, oilseed, maize, Summer vegetables and Winter vegetables proposed. Water balance indicates that monsoon paddy can transplanted in whole command area. Availability of water seems shortage in some extent in spring season. So suggested applying efficient water management during spring.

The water requirement of different large projects in Planning Stage is studied as the reference. The duty of Kholaseudi Nadekhet Beurabagar Irrigation Project is 9.73 l/s/ha (GCA), which is calculated by scheme water balance.

2.2 **SURVEYS ND INVESTIGATION CONDUCTED**

The objective of the feasibility study is to investigate the plan to use surface water as a reliable source of irrigation. The present detailed feasibility study investigated the field conditions such that the technical, social and economic aspects were covered in full. The leading farmers in particular and all other farmers in general were asked to express their views in an interaction meeting about the Project and any helpful suggestion that they might have. This has two-fold advantages such that useful information was gathered and the feeling of the participation for the beneficiaries was ensured from the inception.

The proposed Project area is food deficit area. At present paddy, wheat and maize are the main agriculture products of the Project area. The proposed Project will substantially increase agriculture production by providing reliable irrigation facilities. Various training will be conducted during the construction period to the local farmers for construction supervision, operation and maintenance of canal structures, water distribution, improved agricultural system and other aspects related to Project activities. As a result of all the activities mentioned above, it is hoped that the Project area will be converted from food deficit area to food surplus area.

The result of the above-mentioned technical, agro-economic and social investigation is the present detailed feasibility report of the Kholaseudi Nadekhet Beurabagar IP, which has been prepared for appraisal, approval and ultimately implementation.

3.0 ENGINEERING SYSTEM DESIGN

Design of Canal

The full supply level of canal has been fixed to irrigate the highest-level possible command area and such that the canal runs under cutting. Most of the main canal alignment passes through hilly terrain. A main canal is a canal that conveys the water directly from the Head Works in the river to the command area and is often designed as a contour canal with a capacity of 50 lps. The total length of the main canal is 2.8 km.

The design criteria used by the Consultant in their detailed design are mainly based on the DoWRI's criteria, which are given in the "Planning and Design Strengthening Project" (PDSP) manuals. However, some of the criteria have been adapted, where necessary, to take into account the local conditions and the design criteria used by the previous experience. Furthermore, the views of the WRIDDO have also been considered and been expressed during several meetings with the WRIDDO.

Irrigation and drainage canals, and their related structures, have been designed taking the following basic concepts into consideration:

1. Existing facilities have been incorporated into the Rehab canal system as much as possible, based on the results of the inventory survey, especially for the drainage and road systems.
2. The canals have been designed using non-silting and non-scouring formulae.
3. Bed width and water depth relationship of irrigation canals and freeboard of canals have been determined, based on practices used in the hill area.

The bed level of proposed canal is matched with the existing canal bed level as far as possible. Existing canal runs almost entirely.

RCC lining is proposed whereas lining is necessary. RCC lining is more better than Masonry lining because -

- ✓ RCC lining maintains quality control and is durable. Due to small canal section of RCC lining, cost of RCC lining becomes cheaper than Masonry lining
- ✓ Provision of Drop and Footbridge can be ignored as RCC canal best satisfies both. This makes the economy of the project. However, drop height greater or equal to 1.0 m is designed and cost estimate has been done.
- ✓ Super passage is nothing but the Covered canal. Hence RCC covered canal satisfies the demand of super passage in cheaper mode.
- ✓ The canal passes through the landslide zone. The stability and strength of RCC canal cannot be compared with masonry canal.

CANAL STRUCTURE DESIGN

3.1.1 Hydraulic Design of Structures

The design of the structures has been divided into special structures, those that require individual calculations for the hydraulic and structural design, and standard structures, those that take their dimensions from tabulated variable dimensions.

1. Design discharge:

Q = Qu/2

Where: Q = Design discharge of the escape (m^3/s)
Qu = Intake discharge at the head of the secondary canal:
Where:
WL1 = Design water level in the canal (m)
Fb = Freeboard of the canal (m)
EL1 = Crest elevation of spillway (m): EL1 = WL1 + Fb/2
h = Designed overflow depth above the crest (m): h = Fb/2 - 0.05
Δh = Difference of height between the water surface in the irrigation canal and in drainage canal (m):
Δh = WLI + h - WL2

2. Required crest length of spillway:

Engel's formula:

$$Q = 2/3 * C * (2g)^{0.5} L^{5/6} h^{5/3}$$

Where: Q = Design discharge (m^3/s)
C = Coefficient of discharge, C = 0.855
L = Required crest length (m)
h = overflow depth (m)

3. Diameter of conduit pipe:

$$Q = A * V = \pi/4 * D^2 * V \quad (i)$$

$$V = 0.8 * (2g * \Delta h)^{0.5} \quad (ii)$$

Where: Q = Design discharge (m^3/s)
D = Pipe diameter (m)
V = Velocity in pipe (m/s)
h = Difference of height between the water surface in irrigation canal and in drainage canal.

From (i) and (ii), D will be calculated as follows:

$$D = \{4/(0.8 * \pi * (2g*\Delta h)^{0.5}\}^{0.5}$$

3.1.1.1 Tail escape

Since canal ends to command area, no tail escapes are provided on the canals to evacuate excess water at the end of the canal. A tail escape has a manually operated

gate, concrete pipe, inlet, and outlet structures. Evacuated water is drained through a natural stream or drainage canal.

3.1.1.2 Foot Bridge

The footbridges at different points should be proposed for efficient of the mobility of men and animals. But provision of Footbridge is ignored as RCC cover canal best satisfies this. This makes the economy of the project.

3.1.1.3 Design parameters

The following design parameters have been used in the structural design calculations. The parameters are mainly based on the Indian Standards.

3.1.1.4 Concrete

The following grades of concrete are based on Indian standard mixes.

Permissible stresses (N/mm^2)

Grade of Concrete	Compression		Bond	Bearing	Tension
	Direct	Bending	Shear	Pressure	Bending
M150 (Mass concrete)	4.0	5.0	0.6	3.0	0.5
M200 (Reinforced	5.0	7.0	0.87	4.0	0.7

Blinding mix: Not subject to formal test requirements

3.1.1.5 Concrete strength requirements (15 cm cube strength)

Grade of concrete	Nominal		Works test	
		(N/mm^2)	(N/mm^2)	
			7 days	28 days
M150	1:2:4	20	10	15
M200	1:1.5:3	26	13.5	20

3.1.1.6 Reinforcement

High tensile reinforcement

Permissible stress in tension:	230 N/mm^2
Permissible stress in compression	500 N/mm^2
Minimum lap and bond length:	30 * bar diameter
Minimum cover to all reinforcement in-situ concrete (hydraulic structures):	50 mm
Minimum cover to all reinforcement in-situ concrete (other structures):	25 mm

3.1.1.7 Boulder masonry

cement : sand mortar:	1 : 4
Permissible compressive stress:	0.7 N/mm^2
Permissible shear stress:	0.07 N/mm^2

3.1.1.8 Design conditions

General:
The loads taken in the structural calculations are:

- ✓ own weight of structure
- ✓ soil pressure (dry or saturated)

Load due to earthquake has not been taken into consideration, as it is not customary in Nepal for small structures in irrigation systems.

3.1.1.9 Own weight of structure

The values shown in the following table are the standard unit weights of various materials used in the calculation of the own weight of structures. In case of earth, or other dead loads on the structure, these weights have also been counted as the own weight of the structure.

Materials	**Unit Weight (KN/m^3)**	**Materials**	**Unit Weight (KN/m^3)**
Steel	78.5	Dry soil	16.0
Reinforced concrete	24.0	Wet soil	18.0
Plain concrete	23.0	Saturated soil	21.5
Mortar	20.0	Gravel	18.0
Water	10.0	Boulder masonry	22.5
Timber	8.0		

3.1.1.10 Soil pressure

The calculation of earth pressure acting on a vertical wall has been made by Rankine's formula. In the calculation, the cohesion of soil and the friction between soil and the wall have not been taken into account.

Rankine's formula:

$P = \rho * z * \cos i * K$

$E = P.dz$

$= \rho * H^2/2 * \cos i * K$

$K = [\cos i - (\cos^2 i - \cos^2\phi)^{0.5}] / [\cos i + (\cos^2 i - \cos^2\phi)^{0.5}]$

Where:
- P : Earth pressure at a depth of z,
- ρ : Unit weight of saturated soil
- i : Slope of soil surface
- K : Coefficient of soil pressure
- E : Total soil pressure acting on a wall with a height, H
- ϕ : Internal friction angle of soil

In all the designs, the slope of the soil surface has been taken as i = 0. In that case the above formulae are simplified as follows:

$P = \rho * Z * K$

$E = \rho * H^2/2 * K$

$K = 1 - \sin\phi / 1 + \sin\phi$

The standard values of internal friction angle of soils are:

soil	ϕ
Sand	30^o

Silty fine sand with clay	25º
Silty to clayey soil-	15º
Soft clay	0º
clayey soil-	

4.0 AGRICULTURE SITUATION

4.1 PRESENT AGRICULTURE PRACTICE

The end of May mostly signals the start of monsoon season, but heavy rainfall does not begin until the middle of June. The rainy season continues for at least three months in general until mid-September and may extend up to early October. The traditional practices of agriculture prevail in the command area. Agricultural lands are terraced with a high gradient. The lands are suitable for intensive farming. The existing cropping pattern is as below:

Paddy -Wheat – Fallow
Paddy- Wheat -Maize
. Paddy - Potato – Fallow
Oilseed -Maize

Urea is the most common chemical fertilizer in use for paddy and maize cultivation. The application rate was reported to be 45 and 50 kg fertilizer per hectare for paddy and wheat cultivation respectively. The existing cropping pattern is shown in separate sheets. The existing cropping intensity is 139%.

4.2 FUTURE CROPPING PATTERN, INPUTS AND YIELDS

The proposed cropping pattern are presented below:

- ✓ Paddy- Wheat- Maize
- ✓ Paddy- Wheat- Oilseed
- ✓ Paddy- Wheat - Vegetables

4.3 POTENTIAL OF ACHIEVING THE PROJECTED OUTPUTS

Present full irrigated crop coverage area is 5.84 Ha. Anticipated cropping intensity will be increased to 88%. The Superior quality of food grains and vegetables can take place of inferiors. The proposed cropping area is 5.84 Ha and cropping intensity is 241%.

5.0 SOCIO ECONOMIC PROFILE

5.1 DEMOGRAPHIC CHARACTERISTICS

Majority of the stakeholders in the project area are Brahmin and the very old settlement in the district can be seen. Houses are found somewhat scattered within the villages. There are altogether 100 Nos households in the project area.

5.2 SOCIAL ORGANIZATION

The local farmers are well organized, self-initiative and highly enthusiastic. Ad-hoc WUA is registered as water users association. At present, WUA body consisting 9

members which is in the form of inclusive in nature. WUA is very active for the development of the project. They are committed to participate for construction and O&M in future according to government rules.

5.3 ECONOMY AND OCCUPATION

Agriculture is the main occupation of 95% of the economically active population. 5% of the population was reported to have other profession.

The agricultural practice is traditional in large part of the command area. Agriculture has not been mechanized and scientific though the sub- project area is fertile, and farmers have better chance of agricultural inputs and service availability.

6.0 WUA INSTITUTIONAL DEVELOPMENT STATUS

6.1 BENEFICIARIES ORGANIZATION STATUS

Proposed project being an existing project, there is existing beneficiaries' organization working for irrigation. The beneficiaries in the command area are exposed to participatory activity. They have formed organizations for participatory activities in Community Forestry, Drinking Water Supply facilities etc too.

6.2 RESOURCE COLLECTION, MOBILIZATION AND MANAGEMENT

WRIDDO must communicate with the beneficiaries about the resource mobilization for construction, operation and maintenance as per irrigation policy. However further exercise in this regard imparting detailed information. This is necessary prior to project implementation for soliciting mass consensus and mass mobilization.

6.3 ASSESSMENT OF COOPERATION / ENTHUSIASM AND CONFLICT/CLASHES

Beneficiaries in the command area have been working in participatory concept at their community forestry, drinking water supply facilities etc. Since they are working in participatory concept, conflicts that may arise during any stage of implementation of project can be addressed and work together to solve by themselves.

6.4 STATUS OF SUPPORT AVAILED FROM OTHER AGENCIES

Realizing that it wouldn't be possible to construct the system in that mode solely by their efforts, the farmers started seeking external supports. Till now they have not been able to get any external support.

6.5 INSTITUTIONAL PLAN

The main objective of the Project implementation is not just to construct an Irrigation System considering the farmer's demand but also to make the beneficiaries fully capable of O & M of the system. To achieve this goal, the farmers must be involved in the project activities from the beginning. A WUA will be established in the project, which will be registered in WRIDDO. Before starting the project implementation, an MOA will be signed between WRIDDO-Doti and WUA. A construction supervision committee will be formed to monitor and supervise the construction activities on behalf of the WUA at the site.

7.0 PROJECT COST AND ECONOMIC ANALYSIS

7.1 CONSTRUCTION COSTS

The project cost of Kholaseudi Nadekhet Beurabagar IP is calculated based on the quantities of items and unit rates (see Appendix) of the report Volume II. Unit rate

analysis was carried out based on district rate of Doti and Kailali districts and prevailing norms for construction rate analysis of F.Y. 079/080. Detailed quantity of earthworks for the canal and headwork's structure is prepared based on the cross sections of the canal and river respectively. Besides this cost for the strengthening of WUA for operation and maintenance training and as described in socio-institutional development plan is also included in project cost. The expected total construction cost of the Project is NRs. 26,91,000.00.

7.2 ESTIMATED BENEFITS

Net incremental benefit is NRs 465570.00. Benefits with and without project is analyzed. Net incremental benefit is calculated based on total benefit without project. Crop budget and return of crops at the existing and future situation were also analyzed.

7.3 BRIEF ON ECONOMIC ANALYSIS

Economic analysis of this irrigation project was determined on the assumption that the farmers will follow the designed cropping pattern. The considered design life of the system is 20 years. Return from the project implementation was assumed 40%, 60%, 90% and 100% in the first, second, third and fourth year respectively. The construction works are planned to be completed within 2 years and implementation plan is prepared only for 2 years. Average O&M cost of a project is 3% of total project cost/year.

In the economic analysis, a distinction is made between financial and economic prices. The financial prices refers to the actual prices as they occur in the market and as paid or received by individual and companies, where the latter refers to the values which reflects the real value of an input or output to the national economy. Financial prices of goods and service are usually converted to the economic value by using conversion factors, taking account of the distortions to the price system within the national economy.

These factors are taken as follows.

Construction Cost :	0.95
With Project O&M Cost :	0.96

Assumption

1. Following assumption has been made for the economic analysis of the Project.
2. Economic Analysis is done in Economic Cost excluding VAT.
3. User contribution has also been considered as part of total cost.
4. The economic analysis has been done the cost of the Project without contingency.
5. Project life has been taken as 20 years including construction period.
6. All inputs and output have been evaluated based on the fiscal 079/080

7. The Project would start giving returns after the completion of the construction works, the annual benefit obtained increasing in the successive years until full benefit is realized at the end of the fourth year from completion.

Realization of the agricultural development with the project is assumed as follows.

Year	-	I-II	-	Nil (Construction Period)
Year	-	III	-	40%
Year	-	IV	-	60%
Year	-	V	-	90%
Year	-	VI	-	100%

It is assumed that the project will be completed in two successive years; the cash flows in these years will be distributed by 40 % and 60% respectively.

1. Cost expenditure for O&M will be started one after the Project completion.
2. The salvage value at the end of the Project life is assumed to be zero.

Results of economic analysis show that EIRR of this project is 11.71% & B/C ratio at 10 % discount rate is 1.15 and at 12 % discount rate is 1.00. Sensitivity test is carried out for 20% decrease in production, 20 % increase in construction cost and both and the values at 10% are 9.21 %, 9.58 % and 9.34 % respectively. This indicates that decrease in production is more sensitive than cost increase.

8.0 IMPLEMENTATION SCHEDULE

8.1 FINANCIAL PLANNING:

A formal mass meeting of beneficiaries was held. In the meeting farmers were informed that the rules and process of implementation. For the New projects like this minimum 7% WUA contribution of the total construction cost are necessary. The meeting decided to fulfill this requirement by doing earth excavation work.

This work breakdown is prepared considering the views expressed by the beneficiaries at the meetings held during survey work. A final agreement on this should be furnished between GoN and WUA before starting the project at implementation (see Report Vol- II).

9.0 CONCLUSIONS AND RECOMMENDATIONS

9.1 CONCLUSIONS

This area has very low agricultural productivity and is a food deficit region. The only reason being agriculture dependent on monsoon rain. No doubt, this area of the district must be utilized properly through well managed irrigation system. Local peoples of the

area also have the same demand and they are very interested in the project. For irrigating the proposed area by utilizing the water of Kholaseudi Nadekhet Beurabagar khola, the consultants has conducted a survey of main and branch canals and based on this field data, this Detailed Feasibility Study Report is prepared.

a) The Kholaseudi Nadekhet Beurabagar IP is a rehab irrigation scheme with a NCA of 5.84 Ha.

b) Farmers are very enthusiastic about the project and prepared to mobilize and contribute resources for the construction work according to the prevailing irrigation policy. They have shown commitment to share 7% of total construction cost as required for irrigation policy.

c) The proposed project is environmentally friendly. The completion of this project will help in preserving environment. The proposed Project has an EIRR of 11.71% and per hectare cost is NRs. 608,800.00

d) To guarantee a successful implementation of the project special attention needs to be paid to the following risk factors:
   - extended or prolonged implementation
   - decreased or delayed benefits
   - lack of co-ordination between beneficiaries, government organizations and the private sector
   - inadequate agricultural support program
   - inadequate operation and maintenance

   Therefore, the institutional development aspects should be implemented from the start of the project, they are:

   - beneficiary participation
   - setting up of Water Users' Organizations
   - setting up of a Steering Committee to co-ordinate the different aspects of irrigated agriculture

9.2 **RECOMMENDATIONS**

The Kholaseudi Nadekhet Beurabagar IP seems technically feasible, economically viable, socially acceptable and environmentally suitable. **Therefore, the Project is recommended for implementation.**