FEDERAL DEMOCRATIC REPUBLIC OF NEPAL
MINISTRY OF IRRIGATION
MINISTRY OF AGRICULTURE DEVELOPMENT
NEPAL AGRICULTURE RESEARCH COUNCIL

PREPARATORY SURVEY
ON
JICA'S COOPERATION PROGRAM
FOR AGRICULTURE AND RURAL DEVELOPMENT
IN NEPAL

- FOOD PRODUCTION AND AGRICULTURE IN TERAI -

FINAL REPORT
MAIN REPORT

OCTOBER 2013

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

NIPPON KOEI CO., LTD.
VISION AND SPIRIT FOR OVERSEAS COOPERATION (VSOC) CO., LTD.
C.D.C. INTERNATIONAL CORPORATION

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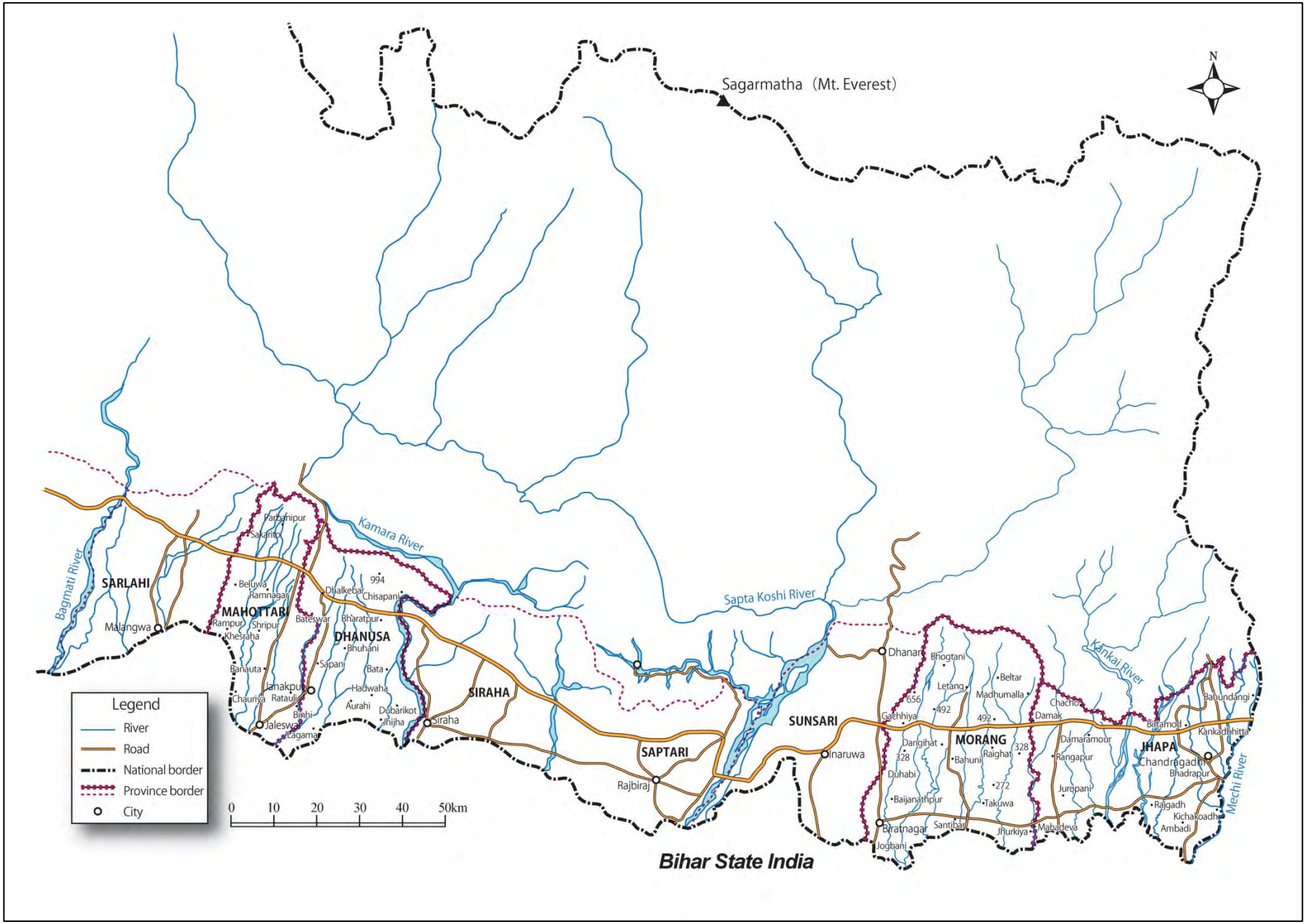
LIST OF VOLUMES

Map of Study Areas



Detailed Map of Study Areas

Photographs (1/4)

The Preparatory Survey on JICA's Cooperation Program for Agriculture and Rural Development in Nepal, Food Production and Agriculture in Terai

01 Kankai Headwork (Jhapa)

Kankai Irrigation Project Headwork, which was originally constructed in 1979, has been well maintained over the 30 years. Water was flowing in May 2013.

04 Hardinath Headwork (Dhanusa)

Hardinath Irrigation Project Headwork has functioned over 40 years since completed in 1967. Water is not much in May 2013

02 Kankai Irrigation System (Jhapa)

Main Canal of Kanaki Irrigation Project, close to the tail end, and the heads of Branch Canals.

05 Hardinath Irrigation System (Dhanusa)

Farmers were carrying farm products along one of branch canal of the Hardinath Irrigation System.

03 Meeting with WUA members (Jhapa)

Discussion with key members of WUA in Kankai irrigation Project about irrigated agriculture.

06 Meeting with WUA members (Dhanusa)

Farmers meeting and interview at command area in Hardenath Irrigation Project during sample survey.

Source: JICA Survey Team

Photographs (2/4)

The Preparatory Survey on JICA's Cooperation Program for Agriculture and Rural Development in Nepal, Food Production and Agriculture in Terai

07 Early Paddy and Pigeon Pea (Kankai)

A farmer is cultivating early paddy with irrigation water from tube-well. Pigeon pea is also planted on farm bunds.

10 Brinjal Cultivation (Dhanusa)

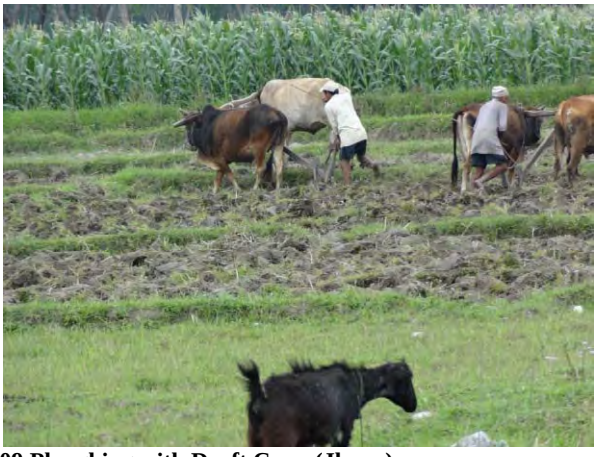
A farmer is cultivating brinjal successfully in the farmland that was purchased with remittance from her husband.

08 Yam and Taro (Dhanusa)

Giant Yams and Colocasia Taros are planted in some parts of the project area for local consumption. Yam and Taro are a potential crop to export to India where the demand is increasing these days.

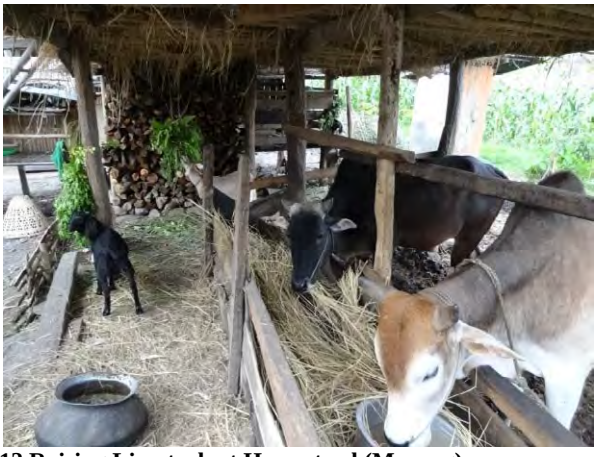
11 Banana Planting in Paddy Fields (Dhanusa)

Bananas are planted in some farmlands instead of paddy. Banana is one of alternative crops for increasing agriculture income in Terai.



09 Ploughing with Draft Caws (Jhapa)

Farmers are ploughing farmlands with draft caws for normal paddy cultivation. This traditional method is still common in Terai.



12 Raising Livestock at Homestead (Morang)

Livestock is a good side business of many farmers for earning. This farmer is raising cattle and goats in his homestead.

Source: JICA Survey Team

Photographs (3/4)

The Preparatory Survey on JICA's Cooperation Program for Agriculture and Rural Development in Nepal, Food Production and Agriculture in Terai

13 Local Market (Morang)

A vegetable booth in a retail market operated by the local municipality at Mahendra Nagar in Morang, having large selection of farm products.

16 Local Weekly Market (Morang)

A local weekly market in Morang, dealing with wide variety of commodity. A woman is selling her farm products at a spot of the open market.

14 Kalimati Market (Kathmandu)

Kalimati Vegetables and Fruits Market in Kathmandu is a wholesale market managed by the government.

17 Carrying Vegetables to Birtamod Market (Jhapha)

A man carrying vegetables, which are imported from India, to the Birtamod Market in Jhapa.

15 ARS Seed Paddy Storage (Dhanusa)

Seed paddy storage of the Agriculture Research Station (ARS) at Balachapi in Danusa.

18 Traditional Paddy Storage (Morang)

Most of farmers are keeping their paddy yield at their house premises with traditional storage shed.

Source: JICA Survey Team

Photographs (4/4)

The Preparatory Survey on JICA's Cooperation Program for Agriculture and Rural Development in Nepal, Food Production and Agriculture in Terai

19 DDC Office (Mahottari)

Interview with an officer of District Development Committee (DDC) at Mahottari about development plan of his district.

22 DADO Service Desk (Jhapa)

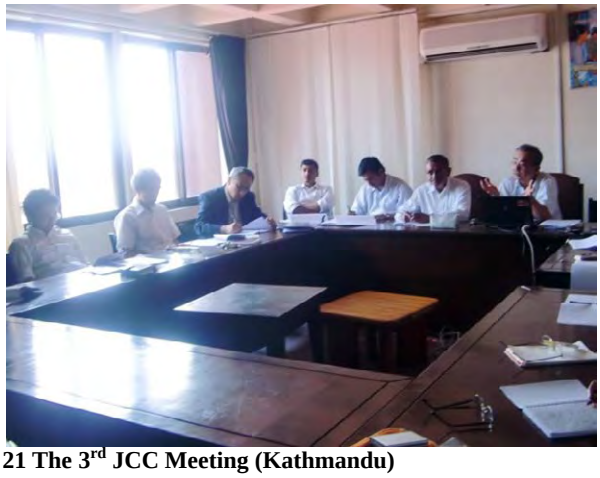
Service desk set at the District Agriculture Development Office (DADO) for technical assistance to farmers.

20 Agro-vet in remote rural community (Dhanusa)

There is Agro-vet shop even in remote area. Paddy seed, fertilizer, insecticide, sprayer are the main items that they are selling.

23 Consultation Workshop (Dhanusa)

The district level consultation workshop on the "Pilot Scheme On-farm Development" was organized by the JICA Survey Team at Tarhara on 6th August and Hardinath on 8th August 2013.



21 The 3rd JCC Meeting (Kathmandu)

The 3rd JCC Meeting on the Draft Interim Report was held at the Department of Irrigation office on 11th June 2013.

24 The 4th JCC Meeting (Kathmandu)

The 4th JCC Meeting on the Draft Final Report was held at the Department of Irrigation office on 25th August 2013.

Source: JICA Survey Team

I. FRAMEWORK OF THE PREPARATORY SURVEY

Background of the Preparatory Survey

01. Nearly 80% of all Nepalese households are dependent on agriculture, and 66% of the working population is engaged in the agriculture sector. These contributed to 34% of the total gross domestic product (GDP) of the country in 2010/2011. Structures of agricultural production remarkably differ between the Terai plains at altitudes ranging from 60 m to 300 m, and the highland areas at high altitudes of more than 300 m. The Terai Region, which is often referred to as the granary of Nepal, makes up 53% of the total cultivated area or 81% of the total irrigated farmlands in the country. Almost 70% of rice, 58% of wheat, and 59% of vegetables in the country are produced in the Terai plains. ***(1.1)***

02. The Agriculture Perspective Plan (APP) of the Government of Nepal (GON) for the 1995/96-2014/15 period emphasizes the need for an increase in food crop production in the Terai plains by strengthening the year-round irrigation system, improving agricultural roads, enhancing farming technology, promoting effective agricultural extension, and strengthening the implementation mechanism of the local government. However, previous political instability and internal conflicts, which ended in a general election for the Constituent Assembly in 2008, have hindered agricultural and irrigation development in Nepal. Improvement of agricultural productivity of the Terai plains is therefore one of the crucial issues in agricultural development of the country as well as sustainable livelihood improvement in the rural areas. ***(1.1)***

03. Consequently, GON comes up with an agricultural development strategy which aims to improve agricultural productivity and profitability in the Terai plains. A request for assistance for the 'Project for participatory small-scale irrigation development with borehole and shallow well' has been submitted to the Japan International Cooperation Agency (JICA) in 2011, following the emerging demands to support irrigation development in the Terai plains in 2009. In response to the request, JICA conducted the 'Study on Food Crop Production and Agriculture' followed by a supplemental study to analyze the potential needs for assistance and future approach. In 2012, GON submitted a proposal for a technical cooperation project (TCP) entitled the 'Irrigated Agriculture Strengthening Project'. ***(1.1)***

Objective of the Preparatory Survey

04. The main objective of the preparatory survey (hereinafter referred to as the Survey) is to formulate JICA's cooperation program and to justify the TCP requested by GON in order to support irrigated agricultural development in the Terai plains, as specified under the APP, through document review, interview with stakeholders, field surveys, and data analysis. ***(1.2)***

Methodology

05. The targets of the Survey included the relevant government agencies at the central and local levels, and other donor agencies as mentioned below. ***(1.4.1)***

- ***Government agencies in Nepal and other donor agencies:*** General information, data,

and documents on agricultural and rural development were collected from relevant organizations to understand the present situation of irrigated agriculture in Nepal. Furthermore, discussions and interviews with the officers in charge of the organizations have been carried out to identify the advantages and constraints faced by past project implementation. The target interviewees are from the Department of Irrigation (DOI), the Department of Agriculture (DOA), and the Nepal Agricultural Research Council (NARC) at the central level, the District Development Committee (DDC) of the four target districts of the Terai plains, and the Village Development Committee (VDC) of the concerned villages. Regarding the proposed TCP, related information and official documents were acquired from DOI and other relevant government agencies. ***(1.4.1)***

- ***Target districts****:* The target districts, which are located in the Terai plains, are: (i) Jhapa, (ii) Morang, (iii) Dhanusha, and (iv) Mahottari. The target districts are specifically focused on the project sites and surrounding areas of the ongoing Medium Irrigation Project (MIP) of DOI, the Community Managed Irrigated Agriculture Sector Project (CMIASP) of the Asian Development Bank (ADB), and the Integrated Crop and Water Management Program (ICWMP) of GON. ***(1.4.1)***
- Sample surveys with focus group discussions (with ten sample groups) and a farm household survey (sample of 120 households) were conducted in these target areas focusing on the survey components of irrigation, agriculture, water management, water users association (WUA), farming, trade and marketing, support system, to farmers and other relevant issues. ***(1.4.1)***

II. DEVELOPMENT POLICIES AND LEGISLATION ON THE AGRICULTURE AND IRRIGATION SECTORS

Policies and Development Plans of the Agriculture and Irrigation Sectors

06. The GON has development policies and strategies covering agriculture and irrigation sectors in Nepal. The policies and strategies closely related to the preparation of direction of irrigated agricultural development in the Terai plains are tabulated as follows. ***(2.1)***

Major Policies and Strategies for Agriculture Sector

Title	Description
Agriculture Perspective Plan (APP) (19956/96-2014 /15) ***(2.1.3)***	◆ Long-term plan for 20 years and the most comprehensive plan for agricultural and rural development with the objectives of poverty alleviation and food security through accelerating agricultural growth. ◆ Targeting agricultural growth at 4.9% per annum in the agricultural gross domestic product (AGDP) and reducing the incidence of poverty to 14% in rural areas by 2015. ◆ Six strategies described as follows: (i) Accelerated economic growth through technology guided agricultural development, (ii) Agricultural growth creating production demand with multiplier effects on all sectors of the national economy, (iii) Higher employment growth as mechanism of attaining social objectives, (iv) Public policy and investment focusing on a small number of priorities building on past investment in human capital, and physical infrastructure and institutions (v) A package approach to development specific to Terai hills and mountains that would recognize the powerful complementarities of public and private investments in order to ensure their coordination, and (vi) Broader participation of key stakeholders that ensures regional balance and involvement of women.

<table>
<tr><th>Title</th><th>Description</th></tr>
<tr><td>Agriculture Development Strategy (ADS)
(2.1.4)</td><td>◆ Prepared by the Ministry of Agricultural Development (MOAD) with the support of ADB along with several development partners in accelerating agricultural growth for the next 20 years after APP.
◆ The vision of ADS: To have “a self-reliant, sustainable, competitive, and inclusive agriculture sector that drives economic growth and contributes to improved livelihood and food and nutritional security.”
◆ Four strategic components: (i) governance, (ii) productivity, (iii) profitable commercialization, and (iv) competitiveness emphasizing social development, natural resources development and economic sustainability, development of the private sector and cooperative sector, and connectivity to market infrastructure, information system and power infrastructure to accelerate agricultural growth.</td></tr>
<tr><td>Water Resource Strategy 2002
(2.1.5)</td><td>◆ Aiming to support the achievement of national development goals through water resources development.
◆ Approaches are focused on:
(i) Integration of irrigation planning and management in agricultural development,
(ii) Improved management of existing irrigation systems, to improve planning and implementation of new irrigation systems,
(iii) Development of year-round irrigation in order to support the intensification and diversification of agriculture,
(iv) Strengthening of local capacity in planning, implementation and management of irrigation,
(v) Encouragement of land consolidation in order to enhance irrigation efficiency and agricultural production, and
(vi) Improved groundwater resources development and management.</td></tr>
<tr><td>National Water Plan 2005
(2.1.6)</td><td>◆ Contributing to the overall national goals of economic development, poverty alleviation, food security, public health and safety, decent standards of living for the people and protection of the natural environment in a balanced manner.
Targets of Irrigation Subsector, National Water Plan 2005
<table>
<tr><th>Indicators</th><th>2007</th><th>2017</th><th>2027</th></tr>
<tr><td>Year-round irrigation</td><td>49% of the total irrigated area</td><td>64% of the total irrigated area</td><td>67% of the total irrigated area</td></tr>
<tr><td>Average cereal yield in irrigated area</td><td>By 15% over the 2001 level</td><td>By 28% over the 2001 level</td><td>By 44% over the 2001 level</td></tr>
<tr><td>Average cropping intensity</td><td>More than 140 % in year-round irrigated areas</td><td>More than 164 % in year-round irrigated areas</td><td>More than 193% in year-round irrigated areas</td></tr>
<tr><td>Average cropping intensity of cereal crops</td><td>More than 126%</td><td>More than 134%</td><td>More than 143%</td></tr>
<tr><td>Overall cropping intensity</td><td>More than 160%</td><td>More than 170%</td><td>More than 200%</td></tr>
<tr><td>Development of the potential area</td><td>71%</td><td>81%</td><td>97%</td></tr>
<tr><td>Irrigation efficiency</td><td>35%</td><td>45%</td><td>50%</td></tr>
<tr><td>Irrigation service contribution collection</td><td>By 30% of the operation and maintenance (O&M) cost</td><td>By 45% of the O&M cost</td><td>By 75% of the O&M cost</td></tr>
</table>
Source: National Water Plan 2005</td></tr>
<tr><td>National Seed Vision (2013-2025)
(2.1.7)</td><td>◆ Addressing the need of seed sector to assure availability of improved crop varieties and seed quality at the request of the National Seed Board, MOAD, with financial assistance from Swiss Agency for Development and Cooperation (SDC).
◆ Envisaging doubling the number of location specific for improved varieties and increasing the seed replacement rate at least up to 25% for cereal crops and over 90% for vegetables crops.</td></tr>
<tr><td>Agriculture Sector Development in the Three-Year Plan (TYP)
(2.1.8)</td><td>◆ Objectives: (i) to enhance food and nutritional security, employment generation and poverty reduction and balance of trade by means of its modernization and commercialization considering the agriculture sector as the backbone of the national economy and (ii) to improve the economic status of rural people by increasing the production and productivity of agricultural and livestock commodities in line with the requirements of farmers and other stakeholders.
◆ Toward ensuring food and nutritional requirements by enhancing agricultural productivity through commercialization of agricultural and livestock commodities and development of rural infrastructure.</td></tr>
</table>

<table>
<tr><th>Title</th><th>Description</th></tr>
<tr><td></td><td>◆ Achievements in the agriculture sector in TYP are as follows:
<table>
<tr><th>Products</th><th>Targets at the Final Year of the Plan (1,000 MT)</th><th>Production Situation by the FY 2012/13 (1,000 MT)</th><th>Achievements (%)</th></tr>
<tr><td>Cereals</td><td>9,633</td><td>8,738</td><td>90.7</td></tr>
<tr><td>- Grain legumes</td><td>377</td><td>Not reported in the Thirteenth TYP (NR)</td><td>NA</td></tr>
<tr><td>Fruits</td><td>775</td><td>1,087</td><td>140.2</td></tr>
<tr><td>Potato</td><td>2757</td><td>(NR)</td><td>NA</td></tr>
<tr><td>Vegetables</td><td>3601</td><td>(NR)</td><td>NA</td></tr>
<tr><td>Milk</td><td>1605</td><td>(NR)</td><td>NA</td></tr>
<tr><td>Meat</td><td>329</td><td>(NR)</td><td>NA</td></tr>
</table>
Note: NR: not reported in TYP; NA: Not applicable
Source: Thirteenth TYP</td></tr>
<tr><td>Irrigation Sector Development in the Three-Year Plan (TYP) (2.1.8)</td><td>◆ Objectives: (i) To establish efficient, sustainable, effective, and reliable irrigation systems in agricultural lands and to enhance year-round irrigation, and (ii) To preserve human settlements and agricultural lands as well as constructed infrastructure that could be affected by water-induced disaster.
◆ Strategies: (i) To expedite the programs related to small- and medium-surface irrigation and groundwater irrigation projects which provide immediate returns and create employment, (ii) To enhance irrigation programs which are being executed under multipurpose water resources development to increase agricultural production, alleviate poverty, and generate employment, (iii) To maintain coordination with agencies working for irrigation and water-induced disaster control, (iv) To ensure efficient and effective management and sustainable operation through regular maintenance of the completed irrigation system, (v) To make construction as well as operation and maintenance sustainable, effective and economical in all executing organizations of flood control and irrigation projects, (vi) To undertake study, research, design and implementation of environmental assessment, climate change adaption measures, and employment generating activities, (vii) To conduct projects in tune with cost recovery system by making the function of irrigation facilities sustainable and reliable, and (viii) To implement special programs for lakes and watershed areas, which are water sources for irrigation development.
◆ Achievements in the irrigation sector in TYP are as follows:
<table>
<tr><th>Program</th><th>Targets (ha)</th><th>Achievements (ha)</th><th>Percentage (%)</th></tr>
<tr><td>Surface irrigation project</td><td>36,650</td><td>15,616</td><td>42.6</td></tr>
<tr><td>Groundwater irrigation project</td><td>162,075</td><td>42,680</td><td>26.3</td></tr>
</table>
Source: 13th 3-year Plan</td></tr>
</table>

Prepared by the JICA Survey Team

Policies and Legislation on the Agriculture and Irrigation Sectors

07. Major policies and legislation on the agriculture and irrigation sectors are tabulated as follows ***(2.2.1 and 2.2.3)***:

Major Policies and Strategies for Agriculture Sector

Sector	Major Policies and Legislation
Agriculture ***(2.2.1)***	◆ National Agriculture Policy 2004 (NAP) ◆ National Seeds Policy 2000 ◆ Agribusiness Promotion Policy 2006 ◆ Nepal Agriculture Extension Strategy (NAES) 2007 ◆ NARC's Strategic Vision for Agricultural Research (2011-2030)
Irrigation ***(2.2.3)***	◆ Water Law 1853 Nepal ◆ Irrigation Regulation (1989/2000) ◆ Irrigation Policy (1992/1997/2003/2013 followed by series of amendments)

Prepared by the JICA Survey Team

08. Major weaknesses or shortcomings of implementation of policies for the agriculture and irrigation sectors are summarized as follows ***(2.2.2 to 2.2.4)***:

Policy Gaps in Agriculture and Irrigation Sectors

Sector	Policy Gaps Observed
Agriculture ***(2.2.2)***	◆ ***Incomplete land consolidation*** hindering the application of improved agricultural technology. ◆ ***Productive lands being converted into housing complex*** in unwarranted and unorganized manner. ◆ ***Lack of overall agricultural legislation*** to implement the National Agriculture Policy. ◆ ***Insufficient linkage among farmers groups under DOA and WUA under DOI*** for undertaking cooperative support to agriculture.
Irrigation ***(2.2.4)***	◆ ***Insufficient mechanism for ensuring sustainability of WUA*** after construction works. ◆ ***Lack of provision of VDC's role*** in the Local Governance Act. ◆ ***Missing on elaborating development needs for on-farm management improvement works to meet service standard*** in the policy. ◆ ***Insufficient description on irrigation service fee (ISF) collection and sanctioning actions*** in the policy. ◆ ***No legal framework on WUAs*** in accessing marketing and cooperative support. ◆ ***No practical description on water use*** in beneficial and economical manner. ◆ ***Missing the mechanism of cost recovery*** for O&M of irrigation system.

Prepared by the JICA Survey Team

III. PRESENT CONDITIONS OF THE AGRICULTURE AND IRRIGATION SECTORS IN NEPAL

Implementation Structures and Roles for Agricultural and Irrigation Development

09. **The Ministry of Agriculture Development (MOAD)** is the central apex body of GON which looks after the country's agriculture sector and related fields. MOAD consists of five divisions, two centers, one research and development council, four departments, four projects and autonomous bodies of one research council, four corporations and a few development committees and boards. ***(3.1.1)***

10. **The Department of Agriculture (DOA)** is one of three departments under MOAD. DOA bears the overall responsibility for agricultural growth and development of agriculture sector. DOA has 12 directorates. Each directorate can be categorized based on their main responsibilities, as follows: (i) agricultural commodity development (horticulture, vegetable, fisheries, crop development directorates), (ii) training and extension (agricultural training, agricultural extension), (iii) cross-cutting issues (crop protection, soil management, agricultural engineering), and (iv) agricultural commodity promotion such as agribusiness promotion, industrial entomology development, and postharvest management. ***(3.1.1)***

11. The available human resources and equipment and facilities of DOA are summarized in the following table ***(3.1.1)***.

Human Resources at the Headquarters of DOA

Classification	I	II	III	JT/JTA	Admin.	Other	Total
DOA	4	11	25	0	12	20	72

Source: DOA
Grade I: DG, Deputy DG and its equivalent
Grade II: Director and its equivalent
Grade III: Graduates and its equivalent
JT/JTA: JT/JTA certificates and its equivalent
Other: drivers, maintenance staff and others

Equipment and Facilities

Item / Dept.	Motor vehicle	Motor cycle	Cycle	Photo-copy	Fax	Computer	Laptop	Multi-Media
DOA	12	39	0	5	3	25	6	3

Motor vehicles: 11 4WDs, 1 bus
Source: DOA

12. **The Nepal Agricultural Research Council** (NARC) is an apex body for agricultural research in the country with the ultimate goal of poverty alleviation along with sustainable growth of agricultural production through the development of appropriate technologies in different aspects of agriculture. NARC has a two-tier body, i.e., the Council and the Executive Board. The Council is chaired by the Minister for Agriculture Development and consists of 16 members. It is responsible for making policies for agricultural research. On the other hand, the Executive Board is chaired by the Executive Director of NARC. It is in charge of executing research programs approved by the Council. ***(3.1.1)***

13. **The District Agricultural Development Office (DADO)** is an executing agency under DOA. A DADO is established in each district. After the decentralization of the agricultural extension service delivery, agricultural extension activities are currently carried out through DADO. Each DADO operates through a network of four to five service centers, with each covering two to four VDCs. Extension coverage includes issues related to crop cultivation practices. ***(3.1.1)***

Implementation Structures and Roles for Irrigation Development

14. In Nepal, the Ministry of Irrigation (MOI) and the Ministry of Local Development (MOLD) are both engaged in expanding irrigated areas through their respective departments. The MOI is the responsible agency for irrigation development. Their services range from small-scale to large-scale irrigation systems in Nepal. The MOLD is the responsible agency for local infrastructure development and its services. However at present, MOLD is responsible for rural infrastructure development in accordance with the decentralization policy. They provide services to enhance the technical capability and participation of local authorities in rural development. Under these ministries, DOI and the Department of Local Infrastructure Development and Agricultural Road (DOLIDAR) were respectively organized to provide services for irrigation development. At present, DOLIDAR is responsible for small-scale irrigation development (irrigation area of less than 25 ha in hills and more than 200 ha in Terai). It is currently executing community irrigation projects financed by ADB in 12 districts (four in Terai and eight in the hilly and mountainous regions) of the Western, Mid-Western and Far Western development regions of Nepal. Human resources of DOI at the headquarter is limited as shown below. ***(3.2.1)***

Human Resources of the DOI

Grade or Classification of Staff	I	II	III	Technical/Administrative /Financial Support Staff	Total
National Base	17	150	587	1,023	1,775
Headquarter	6	28	38	108	178

Grade I: DG, Deputy DG and the equivalent
Grade II: Director and the equivalent
Grade III: Graduates and the equivalent
Source: DOI

15. The main roles of the regional district offices are to review tender evaluation after recommendation of the winner for projects valued at more than Rs70 million, to monitor work progress, quality control, and supervision of the projects implemented at the district level, and to conduct seminars and workshops at the regional level. The five regional directorate offices of the Eastern, Central, Western, Mid-Western, and Far Western development regions cover the 75 districts of Nepal. Each regional office has three to four senior divisional engineers (SDEs) and one sociologist having different roles and responsibilities. ***(3.2.1)***

16. In essence, the main roles and functions of MOI and DOI at the different levels are summarized as follows ***(3.2.1)***:

Major Roles and Functions of MOI and DOI at Different Levels

No	Level of Organization	Roles and Functions
1	Ministry of Irrigation	Its key functions are to develop policies, acts, and plan for conservation, regulation and utilization of irrigation; to conduct survey, research, and feasibility study on irrigation and its utilization; to carry out construction, O&M, and promotion of multipurpose irrigation projects; and to carry out human resources development, capacity building, etc.
2	Department of Irrigation	Its key mandates are to plan, develop, maintain, operate, manage, and monitor different modes of environmentally sustainable and socially acceptable irrigation and drainage systems, from small- to large-scale surface systems, and from individual to community groundwater schemes.
3	Regional Directorate Office	Key functions of regional offices are review of recommendation on tender evaluation forwarding to the Director General (DG) after recommendation, in case the project value costs more than Rs70 million, monitoring of work progress of the projects implemented at the district level, quality control and supervision, conduct of seminar and workshops at the regional level for progress review and planning.
4	Irrigation Development Division Offices	The key functions of Irrigation Development Division Offices (IDDOs) are project selection, demand collection, project listing, screening, prioritizing; conducting feasibility survey; designing and preparing tender documents; tendering after approval; implementing, supervising development works and forwarding documents beyond its approval capacity or level.

Source: Prepared by the JICA Survey Team *based on the information obtained from each organization*

17. Issues and problems faced by DOI in the organization and staff management during the implementation of past irrigation development projects are summarized as follows:

- Civil service administration is governed by the Civil Service Act. Government officials are transferred from one place to another after two years of service. This is not a suitable administrative process to retain a trained and experienced manager for the significant implementation of the project. Sustainability of strategies and approaches has also declined.
- Transfer of project staff is influenced by political persons.
- Project features differ by donor; hence, the ability requirements of staff also differ in quality and degree. DOI has great strength in engineering services but is very weak in specific staff requirements for development and management.
- The established organization and management for projects do not continue after the completion of the project. Hence, the recipient WUA community is left due to the discontinuation of linkage and support.

- In some cases, a district IDDO also has to provide services to other nearby districts (e.g., some district IDDO looks after Morang District, and IDDO of Mahottari District looks after Dhanusha District). In this situation, base project implementation units by district are needed for regular communications and WUA support. ***(3.2.1)***

Budget Allocation of Implementation Agencies

18. In both the agriculture and irrigation sectors, budget allocation process is decentralized at the district level. In principle, the annual plan and budget is firstly proposed at each district, and is compiled at the department to be sent to the central ministries within the budget ceiling. After checking and revision at the ministries, the overall annual budget is sent to the Ministry of Finance (MOF) for review and adjustment. Then, MOF releases the budget to respective ministries, from the ministries to the departments, and finally from the departments to respective district level for expenditure. Shortcomings observed during the Survey were generally related to insufficient number of human resources at the central and district levels to manage the procedure. As a result, slow compilation and submission of necessary documents are affecting the entire process to be ineffective. ***(3.1.2 to 3.2.2)***

Present Conditions of Agriculture and Irrigation Sectors

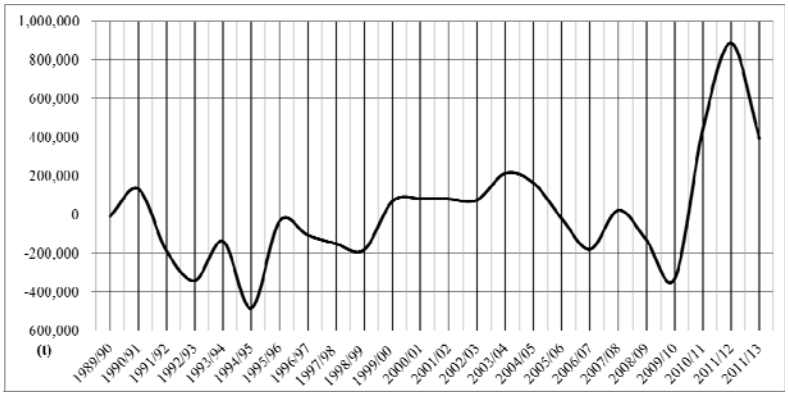
19. Agriculture is the most important sector in the Nepalese economy, as 65.6% of the population is engaged in agriculture in 2001. The national GDP in 2010/11 was Rs1,536,000 million, and the population in 2011 was 26,494,504. Accordingly, the per capita GDP in 2011 was Rs57,974.3 (US$660.3), which is the second lowest in South Asia following Afghanistan. Agricultural lands in Nepal are mainly categorized into three, i.e., the flat area in Terai, undulated area/river basin valley areas in the hills, and mainly pasture areas in the mountains. The extent of the cultivated area and paddy area in each geographical category with demography data are shown in the following table. ***(3.3.1)***

Cultivation Area in Each Geographical Category in 2011/2012

Category	Terai	Hill	Mountain	Nepal
Cultivation Area (1,000 ha)*1	(1,396.7)	(1,038.6)	(218.7)	(2,654.0)
Paddy Area (1,000 ha)	1,068.0	395.5	68.1	1,531.6
Household (1,000 nos.)	2,527.6	2,532.0	363.7	5,423.3
Population (1,000 nos.)	13,318.7	11,394.0	1,781.8	26,494.5

Note: *1 Data on Agriculture Census 2001, CBS,
Sources: Nepal Agriculture Statistics 2011/12, Ministry of Agriculture and Co-operatives, Census Report 2011, CBS

20. The requirement of the cereals per capita per year is presumed at 193 kg according to the DOA statistics. The annual food balance of six kinds of cereals, i.e., rice, maize, wheat, millet, barley, and buckwheat from 1989/90 to 2012/13 is illustrated in the figure above showing that production and productivity of cereals have been improved in recent years especially in the last three years as the surplus of cereal production is substantial. ***(3.3.1)***



Source: Prepared by the JICA Survey Team based on Statistical Information of Nepalese Agriculture, 2011/12, and other data, Ministry of Agricultural Development, Agri-Business Promotion and Statistics Division, and Statistical Year Book Nepal, 2011, CBS.

Food (Cereals) Balance in the Last 23 Years

21. Despite the cereals production and surplus as discussed above, paddy imports have been increasing recently as shown in the right table. The reasons why paddy imports are increasing despite the surplus of cereal production in recent years are assumed as follows: (i) maize consumption shifted from one of main cereals for the people to be used as forage of livestock, and (ii) rice consumption has increased, owing to changes in diet according to economic development. The present quantity of rice consumption is reported at 122 kg/capita/year.[1] In the same year wheat consumption was 56 kg/capita/year[2], which was all produced in Nepal. ***(3.3.1)***

Rice Import in Recent Years

No.	Year	Import (Mt)
1	2008/09	98,767
2	2009/10	86,814
3	2010/11	114,421
4	2011/12	292,043
5	2012/13	420,000*1

Note: Published in a newspaper News on 30th June 2013 in a newspaper, Kanthipur

Source: JICA Survey Team assessment based on the data of Statistical Information on Nepalese Agriculture (2008/09 to 2011/12) MOAD

22. The National Seed Policy of 1999 for the first time had a provision for private sector involvement in the seed trade and seed variety development. NARC has implemented the development of new varieties, and DOA is responsible for the extension of seeds. The District Seed Self Sufficiency Program (DISSPRO) facilitates and strengthens the local level seed production. The Community Based Seed Production Program (CBSP) is a program jointly organized by DOA, NARC, and farmer groups for cereal seed production. Presently, there are four different seed supply agencies involved in the seed sector in Nepal, namely, public sector-led agencies (NARC, DOA, NSC, etc.), community-led agencies (DISSPRO, CBSP, cooperatives), private sector-led agencies (Seed Entrepreneurs' Association of Nepal (SEAN), agro-vets, seed companies), and import-led agencies (SEAN, agro-vets, importers, and distributors) . Although in 2010, the New Seed Act was promulgated and many vegetables and fruits seeds were approved, however, new seeds and farming skills have not been disseminated. ***(3.3.1)***

[1] Crop Situation Update, A Joint Assessment 2013 Winter Crops, MOA, FAO & WFP

[2] The quantity of edible wheat is 81 % of the wheat harvest.

23. Fertilizer supply, which was deregulated in 1997 with lifting subsidies, was brought under government control with reintroduction of subsidies in 2009. There is still a mismatch between the estimated current fertilizer demand of 586,000 t annually and the actual sales of 144,813 t in 2011/12. Most of the officers in the districts indicated fertilizer shortage as an issue. ***(3.3.1)***

24. Sharing the free trade border line of approximately 1,700 km, the Terai area of Nepal and Uttal Pradesh (UP) District, Bhihar District, and West Bengal of India are the most important areas for trade of agricultural products in Nepal. Although the export of agricultural products is promoted through the Agricultural Commodity Export Promotion Program under Agri. Business Promotion and Marketing Development Directorate (ABP&MDD) of DOA, Nepal has a serious trade imbalance in aggregate. The trade deficit situation is worsening in recent years and Nepal's reliance on imported products is increasing. ***(3.3.1)***

25. Many conditions have to be taken into consideration for future recommendation of exportable agricultural commodities, i.e., 1) Existence of markets abroad especially India and/or Bangladesh, 2) Trend of prices according to the demand of the market, 3) Availability of market-related facilities such as cold storage especially for perishable commodities, and 4) Feasibility of farming by Nepali farmers, including skills, conditions of weather, soil, land area, etc. As for the trend of prices in Nepal, the prices of all vegetables have almost doubled. The average annual growth rates of potatoes and onions have risen to 15.9% and 11.9%, respectively, from 2003/4 to 2009/10, following a 9.2% increase for tomatoes and 8.2% for ginger. Therefore, it is rational to focus first on these commodities. ***(3.3.1)***

26. DADO takes main responsibility for agricultural technical extension services. These extension workers are called junior technicians (JTs) and junior technical assistants (JTAs). They are assigned in the Agriculture Service Centre (ASC) and/or Agricultural Contact Centre (ACC) under the DADO and in Livestock Service Centre under the District Livestock Service Office (DLSO). ***(3.3.1)***

27. DOA in the 1990s has shifted agricultural extension services system from Training and Visit (T&V) system to farmer group approach (including farmer to farmer, field farmers school, and so on) in consideration of cost performance of T&V. The DOA decreased the number of agricultural subservice centers and JT/JTAs, which promoted farmers to formulate a "farmer group". Under the facilitation of JT/JTAs, a farmer group of 20-24 people is formed in order to receive technical advice from government agencies. After the group is registered under the government agencies where it is located, the group can then receive extension services from JT/JTAs. ***(3.3.1)***

28. Nepal has about 6,000 rivers consisting of four major rivers, namely, the Mahakali, Karnali, Narayani and Koshi rivers, which originate from the Himalayas, and five medium rivers, namely, the Kankai, Kamula, Bagmati, Weat Rapti, and Babai rivers, which originate from the Mahabharat range. Nepal also has other small rivers which originate from the Siwalik range. All the rivers flow from the north to south and finally join the Ganges River in India. During the summer monsoon season from June to September, rain pours down on the

southern slope of Nepal and water is collected by the rivers. The four major and five medium rivers have perennial flow, which could provide year-round irrigation. In small rivers, perennial flow is limited and most small rivers have floods during summer monsoon season and have little water in winter season. Runoff from all the river system is estimated at 225 billion m^3. This flows down as well as charge groundwater aquifers, which are a reliable irrigation source from groundwater. Under the Survey, the concerned major and medium rivers are the Kankai, Koshi, and Kamula rivers, which flow from the Eastern Development Region to the Western Development Region. ***(3.3.2)***

29. GON has internalized the definition of integrated water resources management Integrated Water Resource Management (IWRM) as a process which promotes coordinated development and management of water, land, and related resources, in order to maximize the resulting economic and social welfare in an equitable manner, without compromising the sustainability of vital ecosystems. IWRM concept is adopted in the Irrigation Water Plan (2005) and the Integrated Water Resources Management in Action, WWAP, DHI Water Policy, UNEP-DHI Centre for Water and Environment 2009. ***(3.3.2)***

30. Irrigation areas are classified according to each ecological regions, and geographical areas are estimated as shown in the table below. ***(3.3.2)***

Updated Irrigated Area as of 2007/08

(Unit: ha)

Region	Hills	Mountain	Terai	Total
Eastern	52,108	1,875	341,409	395,392
Central	57,062	17,599	301,523	376,184
West	45,095	1,789	149,846	196,731
Mid-Western	25,971	6,141	99,369	131,481
Far Western	12,171	9,371	82,278	103,820
Total (ha)	192,407	36,775	974,425	1,203,607
%	16.0	3.1	80.9	100

Source: Database for irrigation development in Nepal, March 2007, Planning, Design and Monitoring & Evaluation Division, DOI

31. Based on water resources for irrigation, there are two types of system, namely, the surface irrigation system and groundwater irrigation system. System management of surface irrigation system is further classified into agency managed irrigation systems (AMISs) and farmer managed irrigation systems (FMISs), based on the ownership and management initiation. As for AMISs, in major, large and medium irrigation system, DOI constructed permanent irrigation facilities such as headworks like dams, barrage, or weir with long canal networks up to tertiary canals and associated water control and water measuring structures. Such systems are either jointly managed with WUAs or solely managed by DOI, employing large number of field engineers, supervisors, and gate operators along with adequate logistics (equipment and office spaces). On the other hand, FMISs spreading all over Nepal consists of simple inundation canal system without permanent water diversion system and adequate water control structures. FMIS is roughly estimated at 12,000-15,000 schemes in Nepal. ***(3.3.2)***

32. There are other two types of irrigation system, namely: (i) groundwater irrigation system and

(ii) non-conventional irrigation system (NITP). The two types of tube wells such as deep tube well type and shallow well type are popular. Depth of deep tube wells are more than 100 ft (30 m). Shallow tube wells ranges from 60 ft to around 100 ft in depth. On the other hand, NITP started in 2002 to promote the use of alternative technology other than conventional irrigation technology and techniques. This system is established with the goal of providing technology, skills, and services to the poor and disadvantaged people to increase production and productivity of high-value crops by providing micro-irrigation services. Types of irrigation system are rainwater harvest (tank irrigation), treadle pump, low cost water storage (Thai jars, soil-cement tanks), sprinkler irrigation, and drip irrigation. ***(3.3.2)***

33. Rehabilitation of irrigation system with participatory concept of water users started since the promulgation of Irrigation Regulation in 1989 and Irrigation Policy (amendment) in 1992. GON implemented the rehabilitation of old FMIS projects and the transfer of AMIS in large and medium irrigation projects through Irrigation Line of Credit Project 1989 (ILC), National Irrigation Sector Project 1999 (NISP) and Irrigation Water Resource Management Project 2008 (IWRMP) by the World Bank (WB) and through Irrigation Sector Project 1989 (ISP), Irrigation Management Transfer Project 1994 (IMTP), Second Irrigation Sector Project 1997 (SISP), Community Managed Irrigated Agriculture Sector Project 2006 (CMIASP) by ADB. In all above completed projects, two concepts were understood: (i) First concept is the rehabilitation of existing FMIS and then returning the system to the farmers. FMIS of about 131,670 ha have been rehabilitated. (ii) Second concept is applied to AMIS in the projects, in which the irrigation systems are rehabilitated and that the management of the rehabilitated system was transferred to WUAs as Joint Management Irrigation System (JMIS) between the agency and WUA. By doing this, the irrigation systems are kept under a joint management approach. DOI has kept a command area of 325,919 ha under joint management concept (Irrigation Handbook of DOI, 2012/13). ***(3.3.2)***

34. A system of sharing responsibility for canal operation and maintenance existed in the practice of AMIS, DOI in process of rehabilitation works and transfer of the rehabilitated works to WUA. These practices got institutionalized in DOI and were reflected through the Memorandum of Understanding (IMTP) and Irrigation Management Transfer Agreement (IWRMP). ***(3.3.2)***

35. The DOI has established maintenance work system of irrigation facilities; however, an advanced concept on maintenance work system is prepared under the implementation of IWRMP. The advance concept is the asset management system on irrigation facilities, and ISF collection is planned to provide the required amount of the maintenance work budget. ***(3.3.2)***

36. The DOI executed four pilot projects on water management improvement at different locations in Terai and hills of Nepal from 1985 to 2003. The four projects are the Irrigation Management Project (IMP, 1985-1992), Special Project in Nepal (SPIN, 1995-1998), On-farm Water Management Sub-component (OFWMSC, 1992-2002), and Integrated Crop Water Management Project (ICWMP, 2002/03 to present). The lessons learned from the

abovementioned projects for future implementation of farm water management projects are as follows:

- For achieving the increased agricultural production: to develop adequate on-farm irrigation facilities with efficient, effective, and manageable water management by empowered WUAs.
- For successful implementation of the program: to provide reasonable incentives to field staff in meetings and/or in workshops and give power to WUA for decision making during platform meetings.
- For sustainable development of the project: to develop management and financial capacity of WUA as a multifunctional entity, of which the WUA has a linkage with markets and cooperatives prior to the end of the project. ***(3.3.2)***

37. The organizational structure of the National Federation of Irrigation Water Users Association is broadly divided into four levels, namely, (i) Central level consisting of the National Assembly, National Council, National Executive Committee and Secretariat Committee, (ii) Regional level consisting of the Regional Coordination Committee, (iii) District level consisting of the District Assembly and District Executive Committee, and (iv) Local level consisting of Water Users Assembly and WUAs. These levels are coordinated with millions of irrigation water users. ***(3.4)***

38. The Irrigation Policy 2013 gives the clauses on cost sharing for WUAs in construction or rehabilitation works of irrigation facilities. The cost sharing for WUA is indicated by the percentage against the total estimated cost of construction or rehabilitation works as shown below. ***(3.4)***

Contribution Portion by the Users in the Project

(Unit: %)

Types of Irrigation Project/System	Percent of Investment in Headworks	Percent of Investment in Main Canal	Percent of Investment in Branch/ Sub-Branch and Tertiary Canal	Percent of Investment in Water Course
(I) For New Construction Works				
Major/large and multipurpose IPs	0	0	5	3
Medium irrigation project	0	0	3	5
Small irrigation project	0	0	3	5
(II) For Rehabilitation Works				
Major/large and multipurpose IPs	0	0	3	5
Medium irrigation project	0	0	5	7
Small irrigation project	7			
(III) Repair and Maintenance Works Major/ large/multipurpose/medium and small irrigation system (AMIS & FMIS)	10			

Source: Irrigation Policy, 2013

IV. PRESENT CONDITION OF TARGET DISTRICTS IN THE TERAI PLAINS

Natural Condition

39. The general features of the four districts, in terms of land extent, demography and climate, are summarized in the following table. ***(4.1.1)***

General Feature of the Target Districts

No.	Description	Unit	Jhapa	Morang	Dhanusa	Mahottari	Nepal (Kathmandu)
1	Area	km^2	1,609.5	1,822.0	1,188.7	1,000.6	147,180
2	Number of VDC*2	nos.	49	65	107	79	3,193
3	Population*3	1,000	812.7	965.4	754.8	627.6	26,494.5
4	Household (HH)*3	1,000	184.4	213.9	138.2	111.3	5,427.3
5*1	Annual Rainfall	mm	2,587	1,861	1,485	1,029	1,503
6*1	Monthly Max. Ave. Temperature	^0C	35.7	36.7	37.4	38.4	31.5
7*1	Monthly Min. Ave. Temperature	^0C	5.7	7.5	7.5	8.3	1.1

Note: *1 Data of lines 5, 6, and 7 in Kathmandu are analyzed by the JICA Survey Team based on daily data from 1991 to 2011*2 District Development Profile of Nepal, 2012, Mega Publication and Research Center, *3 Census Data in 2011
Source: Compiled by the JICA Survey Team

Sociocultural Background and Consideration

40. Up to the 19th century, the Terai plains were a deep forest, and a small number of indigenous people such as Tharu, Rajbansi, Gangain Tajpuria and Dhimal lived in and cultivated the land. Many of these indigenous nationalities were not Hindu. However, in 1854, the Rana ruler established the Mulki Ain, which is the first legal code of Nepal, and defined all Nepali whoever Hindu or not Hindu by the caste hierarchy. Since then, the people in Terai have been treated as second-class citizens in Nepal. ***(4.2.1)***

41. The ancestors of the Madhesi people came from northern India from the end of the 19th century up to the early 20th century. While GON conducted some reclamation programs and promoted the resettlement of hill population into the Terai Region, hill people were not interested in living in Terai because of malaria. Instead of hill people, many Indian laborers (lower castes) were employed for reclamation of the forest and land in Terai. Maithili, Bhojpuri, and Avadhi languages mainly spoken among Madhesi society are used from the northern part of India and the Terai Region. After the success of a malaria control program, mass migration from the hill and mountain regions to the Terai plains started in the 1950s. ***(4.2.1)***

42. Current composition of ethnic group in the four districts is shown in table below. ***(4.2.2)***

General Feature of the Target Districts

District	Hill B/C/T	Hill Janajati	Terai Janajati	Madhesi	Dalit	N/A	Total
Jhapa	39.3%	27.4%	19.1%	10.3%	1.4%	2.5%	100.0%
Morang	24.0%	26.0%	21.6%	21.2%	5.1%	2.0%	100.0%
Dhanusa	3.8%	6.5%	4.3%	67.1%	17.2%	1.0%	100.0%
Mahottari	3.5%	7.5%	4.0%	68.1%	15.8%	1.0%	100.0%

Source: JICA Survey Team, using the raw data of Mega Publication Research Centre, "District Development Profile of Nepal 2012"

43. Since majority of farmlands in Central Terai had already been cultivated by the Madhesi

people in the 1950s, new comers from the hills resettled in Eastern Terai. In general, hill B/C/T people value good education, so the Jhapa and Morang having many hill B/C/T people marked high literacy rates among the four districts, and the population aged 5 years and above by educational attainment are also better than the national average. In contrast, the literacy rates of Dhanusa and Mahottari are low. Especially, among women, Dalits and Terai Janajati have less educational opportunities. ***(4.2.2)***

44. The Madhesi have grievances as they are treated as second-class citizens by hill people for a long time. They considered having less political influence in the government bureaucracy and political system. Indeed many Madhesi people had not received Nepali citizenship, and could neither acquire land ownership nor could avail government benefits, while Terai contributes 70% of agricultural production, 65% of the GDP, and 76% of the total revenue. The Madheshi Movement was launched in January 2007 just after the agreement between Maoist and the Seven Party Alliance. The armed groups of Madhesi are reportedly engaged into kidnapping, extortion, and killing of political party activists. Many government officers from the hills and mountains fled out from Terai. GON and Madhesi parties reached to an agreement in February 2008. Thus, the results of it, Madhesi were able to increase the proportion of seats in the Constituent Assembly, and succeeded to include their political entitlements in the Interim Constitution. ***(4.2.3)***

45. The number of migrants from Terai to foreign countries has increased in a decade. Especially the four districts ranked among the top five mother districts of the total migrants in the country. The main reason for migrating is the shortage of work opportunities and low price of labor. While the increase in migration causes labor shortage in the agriculture sector in the four districts, it further contributes to poverty alleviation there. Many recipient households purchase lands for farming and/or spend their income to children's education. Also they purchase TV and radio, and increase their accessibility to various kind of information including new technology on cultivation, marketing, and so on. ***(4.2.3)***

46. Incidents like the Madhesi Movement and the increase in the number of migrants (remittance) have changed the society of Terai. Madhesi can now be entitled as Nepali citizen as well as enhance their quality of lives. On the other hand, as many warned, they might favour their own advancement rather than helping in community development. When some community-based development programs were conducted, it took some time for social mobilization as well as a need for reminder to have collective action and benefits. ***(4.2.4)***

Agriculture

47. As for the landholding in the target districts, the ratio of marginal farmers, who operate less than 1.0 ha of farmland in Jhapa and Morang districts is 62% more or less, while in Dhanusa and Mahottari districts is about 72%. There are more middle class farmers, who own farmland of 1-5 ha, in Jhapa and Morang districts than in Dhanusa and Mahottari districts by approximately 10%. ***(4.3.1)***

48. The total cultivation areas of the four target districts against the total national figure accounted more than 76% for cereals, 14% for cash crops and 34% for fruits, while

cultivation areas for pulses and spices accounted less than 10%. The production of cash crops is also exceeding 10% of the national production. Tea and jute production is prevalent, as the ratios account 77% for jute and 86% for tea as compared with the whole production in Nepal. It is also noted that the sugarcane production is nearly 20% of the national production. Potato production is nearly 10% of the national production. Although pulses and spices production in the four districts is not much, fruit production is substantial as mango accounted 16% of the national share. Both banana and pineapple accounted nearly 30% of the national production. The share of the production of areca nut and coconut exceeded 95% of the national production. The target areas have high potential for fruit production ***(4.3.3)***

49. The average yield of paddy and wheat in the four target districts and Nepal for the past three years, i.e., 2009/10, 2010/11, and 2011/12, is given in the following table.

Average Yield of Paddy and Wheat in Four Districts for Three Years
(2009/10, 2010/11 and 2011/12) Unit: kg/ha

No.	Crops	Jhapa	Morang	Dhanusa	Mahottari	Nepal
1	Paddy	3,400	3,340	2,888	2,318	3,003
2	Wheat	2,627	2,345	2,371	2,207	2,272

Source: Prepared by the JICA Survey Team based on Statistical Information of Nepal Agriculture, MOAD for three years

The average paddy yields in Jhapa and Morang districts are higher than the national average by 10%, but the figures in Dhanusa and Mahottari districts are lower by 5% and 23%, respectively. As for wheat, yields in Jhapa, Morang, and Dhanusha are higher than the national average by 15%, 3%, and 4%, respectively. Average wheat yield in Mahottari District is the lowest among the four districts and lower than the national average. Taking into account other crops, the agricultural productivities in Mahottari District are considered low. ***(4.3.4)***

50. Jhapa's total average use of fertilizer (254 kg/ha) is at a reasonable range. Morang's (104 kg/ha) and Dhanusa's (129 kg/ha) average use of fertilizers are less. In addition, according to the Soil Analytical Laboratory in the Terai Region, the pH of soil in these four districts tend to be acidic. Especially, Jhapa's range of pH is from 4.5 to 5.5 in substantial areas. In such pH condition, rice, millet, upland rice, buckwheat, sweet potato, potato, yam, garlic, ginger, and tea are the suitable crops for cultivation. However, balanced application of fertilizers based on soil diagnosis with technical guidance is inadequate in these target districts. Therefore, farming communities, extension staff, and other stakeholders should acquire correct and appropriate knowledge on farming skills. ***(4.3.6)***

51. Official statistics on the production and use of farmyard manure/compost are not available. In Terai, most farmers are raising livestock (mainly dairy cattle and buffalo) which is one of the major and interlinked components of farming system, and it also provides manure for agricultural lands to enhance and sustain crop productivity. According to the results of the Sample Survey on Agricultural Activities, around 65% of farmers apply manure/compost. Most of the manure is produced at farmyards, or some farmers utilized biogas slurry to make compost. In case of Dhanusa and Mahottari districts, 13 Mt of manure were applied for vegetables and pulse. While, in Jhapa and Morang, farmers apply 5–7 Mt of compost for rice,

cereal, and potato. In Jhapa, they use chemical fertilizer in addition to manure. ***(4.3.6)***

52. The use of pesticides is common in all the surveyed districts. However, data shows that the use of pesticides varies depending in the districts. Use of liquid pesticides is highest (167 mL/ha) in Jhapa, while in Dhanusa District usage of dust pesticides (3.595 kg/ha) is higher. In Morang, 11 ml/ha of liquid and 0.6 kg of powder pesticides are used. Dust pesticide used in Jhapa is 0.13 kg/ha, while the amount of liquid pesticide used in Dhanusa is 0.22 mL/ha. No data was obtained for Mahottari District. Information passed on to farmers seems to be poor. Therefore, it is essential to conduct awareness program on proper use of pesticides and its health/environmental hazards to farming communities and suppliers, as well. In addition, the Integrated Pest Management provided by DADO through farmers' schools located in several places will be fully utilized to minimize the usage of chemicals. ***(4.3.6)***

53. The improved cereal seeds are supplied at 1,245 t in Jhapa District and 3,460 t in Morang District. Annual cereal seed requirements of the four districts are estimated at 5,091 t, 5,531 t, 7,262 t, and 4,666 t for Jhapa, Morang, Dhanusha, and Mahottari, respectively. Morang uses adequate new seeds for cultivation. Although the National Seed Company Limited (NSCL), private seed companies, and agro-vets supply improved seeds of modern varieties to farming communities, the amount does not met the farmers' demand. ***(4.3.6)***

54. Under the community-based seed production program, potato and legumes seeds are produced at Morang and Dhanusa districts. The Agriculture Research Station, Belachapi, in Dhanusa produces foundation seeds and certified seeds of vegetables and green manure plants, etc. However, the quantity of seeds produced by these public institutions is not fulfilling the demand. ***(4.3.6)***

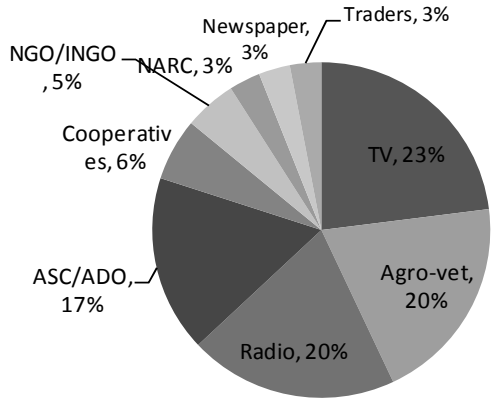
55. Currently, main service suppliers can be categorized into government agencies (DADO and District Livestock Service Office (DLSO)), community organizations, non-government organizations (NGOs) (local and international), cooperatives, private sector organizations, and donor project/program implementation bodies. ***(4.3.7)***

Actual Number of Main Agriculture Related Service Suppliers in the Four Districts

Category / District	ASC/ACC of DADO	Service Office of DLSO	CBOs (including FGs)	Cooperatives	NGOs	Agro-vet
Jhapa	6	17	NA	654	357	444
Morang	7	17	NA	975	438	725
Dhanusa	11	18	NA	473	628	28
Mahottari	6	16	161	631	558	82

Note: Details of the cooperatives are shown in Table_
Source: DADO Annual Reports (2010/2011) of the four districts, Nepal Agricultural Cooperative Federation, The number of NGOs is registered at the Social Welfare Council (SWC) Nepal

56. The Farm Household Survey revealed where farmers obtained their needed agricultural technical services. The results showed that 20% obtained their knowledge and skills from Agro-vet, 17% from Agriculture Service Center (ASC) and DADO, 6% from cooperatives, and 5% from NGOs/INGO, although majority of information resources came from media like radio, newspapers, and TV. ***(4.3.7)***



Source: Farm Household Survey

Type of Rendered Technical Services receive

57. The current extension methodologies of DADO are as follows: a) to form farmer groups and cooperatives, b) to conduct Farmers' Field School, c) to enhance farmer to farmer extension, d) to support pocket package, e) to show improved knowledge and skills through demonstration farms, and f) to promote agricultural alliance. These services are delivered through farmer group (FG) and/or some progressive farmers; however, many of the FGs have stagnated or already stopped operations. According to the Farm Household Survey, among the respondents, 20% uses public service providers like ASC (DADO) and NARC, and half of them obtained their needed knowledge and skills from media like TV, radio, and newspapers. More than 90% of the respondents want JT/JTAs to increase the frequency of consultation and field visits and to update their knowledge and skills. DADO asserts that limited human resources and financial constraints hamper their activities. ***(4.3.7)***

58. Some NGOs and cooperatives are carrying out agricultural development activities in the four districts. NGOs aim to increase farmers' income and to improve their standard of living. Their approach is community-led development, i.e., maximize the use of its local resources (human, physical, financial, information, natural, social resources) instead of accepting large inputs from the outside. Whereas the approach can raise their awareness as well as change their behavior in a long-term basis, the coverage area is still small. Cooperatives are quite active in the Eastern Terai (Jhapa and Morang). Some cooperatives invest their common profits to agricultural farms and/or livestock rearing. Also, they compile the needs of their member farmers and collectively access to DADO, DLSO, and NARC. Agro-vet is also one of the important actors in the field of agricultural extension, but many farmers claimed that their knowledge is insufficient. ***(4.3.7)***

59. Agricultural credit is provided for the farmers by formal and informal financial institutions. Currently, saving and credit cooperatives have been increasing even in remote areas, still many farmers borrow money from informal money lenders. The main reasons are the distance of formal institutions from their area and the transaction cost. ***(4.3.7)***

60. The strengths and weaknesses of major agricultural service providers are summarized in the table below. Considering the characteristics of each service provider, an efficient and effective framework of agricultural extension services should be created. ***(4.3.7)***

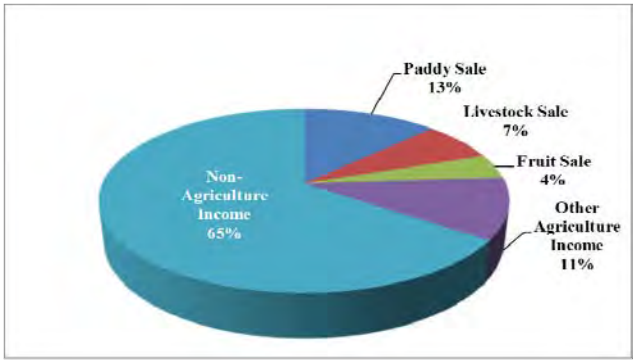
Strengths and Weaknesses of Major Agricultural Service Providers

Strength/ Weakness / Organizations	Strength	Weakness
GOs (DADO, DLSO, NARC, etc.)	● Free service ● Certified SMS, JT/JTA ● Authority over policy implementation ● Sustainable	● Mobility (Transportation) ● Quantity (number of SMS, JT/JTA) ● Latest knowledge and skills ● Inefficient structure of extension services ● Less number of female extension workers ● Linkage between GOs ● Linkage with other stakeholders ● Planning and management skills
NGOs	● Social mobilization ● Participatory action planning ● Supervision (monitoring) ● Inter-sectoral intervention to villages (farmers) ● Mobility	● Project based intervention (no budget, no project) ● Agricultural technical advice ● Some are influenced by political parties/power.
Cooperatives	● Farmers' initiatives ● Operating a saving and credit system within its members ● Corrective actions against marketing, purchasing of inputs, negotiation with outsiders ● Some cooperatives have storages, mills, tractors	● Limited agricultural and market experts ● Limited power over policy making ● Management skills (accountability and transparency) ● Strongly depending on the capacity (quality) of leaders ● Some are influenced by political parties/power
Private Sector	● Clear mission/vision/goal ● Logical intervention for agricultural development in their target area.	● Not common well (commercial-led decision makings) ● The number is very much limited

Source: Prepared by the JICA Survey Team

61. Four-wheel tractors are primarily used for land ploughing in Jhapa, Morang, and Dhanusa districts, though their number has yet to be increased. The use of harvester and power tiller is also increasing. It is evident that agricultural mechanization is taking place in the districts. The agricultural machineries are owned by individual farmers or cooperatives. These machines are usually rented out to neighboring farmers at the VDC level. In Morang, it was reported that the use of tractor and power tiller for ploughing saves 30-40% of the cost. Agricultural mechanization is an option to address the issue of labor shortage in these districts. ***(4.3.8)***

62. According to the household survey, income sources of farmers are illustrated in the right figure, explaining the following characteristics: (i) since the average agricultural income is at 35% only, many farm households would be below the poverty line in Nepal; (ii) employment and remittance are the main sources of non-agricultural income;



Source: Prepared by the JICA Survey Team based on Household Survey

Breakdown of the Average Farmers' Income of Farmers from Different Sources

(iii) income from paddy sales of farmers operating less than 1 ha of land is very small, which is less than 20% of the agricultural income; and (iv) the number of family members in a household are many, at 9.7 persons/household on average. For wider landholding, such as families with more than 2 ha of land, the number of family members is more than 12 persons/households, which may be one of the characteristics in Terai. ***(4.3.9)***

63. The JICA Survey Team assumed that medium class farm households are farmers operating 1.0-2.0 ha of farm area, at an average of 1.37 ha with an average income of Rs254,009/household/year (Rs27,284/capita/year), while their average agricultural income is only Rs82,766/household/year (Rs8,996/capita/year). Although the average whole income per capita per year is above the poverty line, the agricultural income per capita per year is far below the poverty line, as one household is composed of 9.7 members. Taking the average income of the agricultural commodities into consideration, the typical cropping pattern and labor requirements were estimated, as shown in the table below. ***(4.3.10)***

Estimated Cropping Pattern and Labor Requirement of Medium Farmers

Crop	ha	Net Income (Rs.)	Cropping Schedule												Labor Requirement	
			1	2	3	4	5	6	7	8	9	10	11	12	Family	Hired
Paddy	**1.37**	35,234													77	97
Vegetable	-	6,313													3	8
Other Crop	-	14,885													42	25
Fruit	-	6,211													6	4
Livestock	-	19,873													60	0
Total	-	82,516												**Total**	**188**	**134**

Source: Prepared by the JICA Survey Team

Irrigation, Water Management, and Water Users Associations

64. Terai has a typical monsoon climate characterized by rainy season from May to October in the Eastern Development Region, and from May to September in the Central Development Region. The rest of the year is dry season in the respective regions. The maximum, minimum, and average annual rainfall for the last 20 years in four districts is summarized below. ***(4.4.1)***

Annual Rainfall in the Terai Plains

(Unit: mm)

No.	Description	Jhapa	Morang	Dhanusa	Mahottari	Kathmandu
		In Jhapa	In Biratnagar	In Janakapur	In Jaleshwor	
1	Max.	3,761	2,677	2,563	1,533	1,871
	Year	1998	1998	2007	1999	2002
2	Min.	1,697	1,300	862	462	1,093
	Year	2006	1994	1995	2010	1992
3	Ave.	2,587	1,861	1,485	1,029	1503

Source: Prepared by the JICA Survey Team based on DOI

65. The small rivers are the source of medium- and small-scale irrigation projects, and the present situation of water resource and major irrigation projects is summarized below. ***(4.4.1)***

Water Resources for the Irrigation Projects in the Four Districts

Districts	Average Annual Rainfall (mm)	Main River	Total Irrigable Area (ha)	Irrigated Area 2007 (ha)
Jhapa	2,587	Kankai, Biring, etc.	109,530	70,593
Morang	1,861	Betauna Khola, Patheri, etc.	99,959	65,702
Dhanusha	1,485	Bhaluwa, Astiwash, Whadhar, etc.	72,925	32,357
Mahottari	1,029	Kantawa, Bighi, Daha, Banke, etc.	60,633	27,172

Source: JICA Survey Team

66. The land area irrigated by groundwater resource is at 20,134 ha in Jhapa, 2,245 ha in Morang, 14,232 ha in Dhanusa, and 8,927 ha in Mahottari as shown below. ***(4.4.1)***

Groundwater Resources for Irrigation in the Four District Areas

Districts	Total Area (ha.)	Total Irrigated Area (ha)	Surface Irrigation (ha)	Tube Well Irrigation (ha)
Jhapa	109,530	109,530	70,593	21,034
Morang	102,938	99,959	65,702	22,425
Dhanusha	72,925	72,925	32,357	14,232
Mahottari	60,649	60,633	27,172	8,927

Source: Database, 2007

67. There are around 168 surface irrigation projects consisting of two major projects, five large-scale projects, 161 medium-scale projects, and 175 deep tube wells in the four district areas, as well as groundwater irrigation system projects consisting of 175 deep tube wells and 25,175 shallow tube wells which have been widely developed in the four district areas. The complete list is shown below. ***(4.4.1)***

Existing Irrigation Projects in the Four Districts

No	Irrigation System	Jhapa	Morang	Dhanusha	Mahottari	Total
1	Major	Kankai -1	Sunsari-Morang -1	Kamala- West	UHPI- Rato IP	2
2	Large	-	Lohandra / Letang	-	Bighi-2 Upi,Rato	5
3	Medium	47	64	26	24	161
4	Small scheme/tube wells	NA	NA	NA	NA	
5	Deep tube wells	17	11	80	67	175
6	Shallow tube wells	8,215	8,187	4,563	4,210	25,175

Source; Database, 2007; IDDOs

The irrigated areas covered by these different schemes are summarized below.

Irrigation Areas of the Existing Irrigation Projects

No.	Irrigation System	Jhapa (ha)	Morang (ha)	Dhanusha (ha)	Mahottari (ha)
1	Major	7,000	34,000	12,400	-
2	Large	-	4,012	-	10,000
3	Medium	16,517	19,082	13,560	8,895
4	Small (estimated)	48,230	9,049	7,104	9,058
5	Tube well	21,034	22,425	4,232	8,927
	Total	92,781	88,568	37,296	36,880

Source; Database, 2007; IDDOs and estimated small irrigation schemes

68. Issues and problems on irrigation system and facilities, maintenance and water management identified during the Survey are as follows: ***(4.4.1)***

Issues and Problems of Irrigation System and Facilities, Maintenance and Water Management

Description	Problems	Caused by
Main Irrigation System	Improperly quantified and no timely water distribution to tertiary irrigation blocks	Passive coordination activities on water management among WUA and government agencies.
		No regular activities of government agencies to WUA after construction or rehabilitation works.
	Flooding from main and branch canals or inundation problems in paddy field along main and branch canals in summer season.	No establishment of water distribution and control mechanism from intake to main and secondary canals in summer season.
		No strategy of GON on drainage development for large- and medium-scale irrigation systems.
	Improper maintenance works of intake and main canal system.	Monitoring system on main irrigation system is not regularly done.
		Budget of maintenance works is provided by project base.
	Difficulty of year-round irrigation.	Lack of water resource in winter and spring seasons.
		No integrated water use with other irrigation areas in the same basin.
	Low participatory of WUA on rehabilitation works.	Poor dissemination of project implementation to WUAs.
On-farm Irrigation System	Lack of on-farm irrigation facilities.	Lack of on-farm irrigation facilities in large- and medium-scale irrigation systems.
		No fixed course of tertiary canal in medium-scale irrigation systems .
	Lack of tertiary canals and field channels.	Lack of on-farm irrigation system.

Source: Prepared by the JICA Survey Team

69. Issues and problems on on-farm water management and WUA that were identified during the Survey are as follows: ***(4.4.1)***

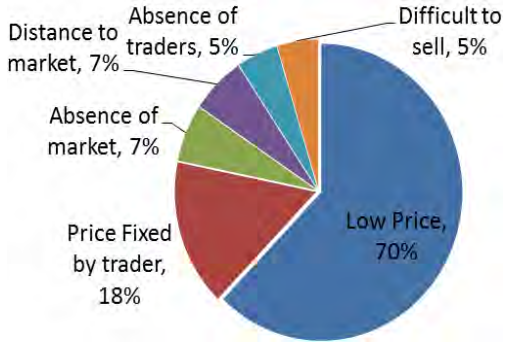
Issues and Problems on On-farm Water Management and WUA

Description	Problems	Caused by
On-farm Water Management	Flooding from main and branch canals or inundation problems in paddy field in summer season.	No coordination among IDDO and WUAs on water distribution and control from intake to main and secondary canals in summer season
	No water distribution plan	No crop cultivation plan
WUA	Low awareness or no interest with the functions of WUAs	Inadequate mobilization approaches of IDDO on registration and renewal of documents
		Lack of ownership of WUA on irrigation facilities at on-farm level.
	Difficulty in proper water management and communication	Shortage or lack of technical support of DTT and IDDO
	No matching tariff of ISF	Shortfall of monitoring for collection mechanism of ISF
	Cost over-run of operation and maintenance cost	Low tariff of ISF
	Low collection rate of ISF	No legal background on fines to WUA violators
	Unsatisfactory and insufficient maintenance works	Poor participation of WUA members
		No periodical technical and financial services for maintenance works from IDDO
	Unclear operation cost	Salaries of operators and members of WUA in charge of the collection of ISF are paid using the collected ISF, and the operators and members of WUA carried out the ISF collection in self-serving manner.

Source: Prepared by the JICA Survey Team

Marketing of Agricultural Products

70. The proportion of agricultural commodities sales to the total production depends on the village, which range from 0-50% for rice and 0-75% for vegetables in the Survey area. Market distribution system also differs depending on rice paddy or vegetables/fruits. Farmers sell 65% of their rice paddy to big collectors who sell it to traders or rice mills, while 20% is distributed to traders or rice mills through small collectors. The remaining paddies are distributed directly by the farmers to rice millers or other farmers as consumers. On the other hand, for vegetables/fruits, 50% of their products are sold directly to consumers, and farmers also sell 20% each to wholesalers or retailers. There is a bigger chance for farmers to negotiate the price of vegetables/fruits to their customers than for the price of rice paddy, however, vegetable is still produced for self-sufficiency purposes, and the volume of production for sale is very limited at present***.(4.5)***



Source: Sample Survey on Agriculture Distribution and Marketing by the JICA Survey Team

Marketing Issues rRaised by Farmers

71. There are several types of markets selling vegetables/fruits operating in the Survey area, namely, local weekly market, collection center, and transit market. Wholesale market and retail market are grouped within the category of local weekly market. The Birtamod Wholesale Market in Jhapa is the largest in terms of annual business transaction in the target districts. ***(4.5)***

72. Nearly 90% of farmers raised price issues as marketing-related problem. Nepalese rice cannot compete with Indian rice because of its low price since it is highly subsidies in terms of fertilizers, electricity, and irrigation costs. Farmers have very weak bargaining power which results in domination on price determination of traders and mill owners. There are many reasons that deprive farmers from having a strong bargaining power, i.e., farmers have to sell their products at low price because of needed cash, farmers can no longer wait for a better time to sale their produce due to limited storage, they have no knowledge that collective purchase of inputs and delivery of products strengthen their bargaining power, or they even disregard the price as problem to their lives. ***(4.5)***

73. Public support for marketing development is very weak. Minimum Support Price (MSP) is not endorsed yet at the national level, and public service from DADO tends to focus on the construction of marketing facilities such as collection center. Market information through media is not accessible to farmers who mostly rely on traders who control the price especially for rice paddy. ***(4.5)***

74. Networking is weak among marketing-related stakeholders such as farmers, traders, mill owners, DADO officers, District Office of the Chamber of Commerce, processing plant owners, NGOs, and cooperatives. ***(4.5)***

75. The present situation of agricultural trade with neighboring countries, especially India is very much unbalanced. Across the free trade border to India, every kind of commodity is freely flowing into Nepal. Kakarbitta in Jhapa District is the largest land port in Nepal, and rice and potato are the major imported commodities, while wheat and maize are also delivered through Biratnagar in Morang as well as rice. Since the price of Indian rice is 20% to 25% cheaper than that of Nepalese rice due to subsidies by the Government of India (GOI), Nepalese rice is regarded as uncompetitive. A further market survey in the border area from both sides of Nepal and India shall be necessary for a more precise analysis since there are many variables for comparison in terms of price and marketability of paddy/rice. ***(4.5)***

76. Some products such as junar, orange, cardamom, ginger and tea are exported to India by these target districts. Lentil is delivered to Bangladesh regularly. Production of tomato, ginger and some fruits such as banana and papaya can be further improved for possible export due to already existing production pockets and distribution channels. ***(4.5)***

77. According to the results of the Survey, the issues, constraints, countermeasures and potentials, on agriculture, irrigation, institution and marketing components are summarized in the following tables:

Issues, Constraints, Countermeasures, and Potentials on Agriculture

Issue	Constraints	Countermeasure	Potential
Small farm plots owned by farmers	Low productivity	To conduct land consolidation of scattered farm plots.	Experience on land consolidation models is available in Nepal.
	Difficult to use large-scale machinery	To use small-scale agricultural machineries and equipment.	Officers, NGOs and some project successfully implemented paddy and other cultivation with small-scale farm machineries.
Low productivity of paddy	Inadequate and untimely fertilizer supply	To order in advance the necessary amount of fertilizers by group (WUA, FG, etc.) and distribute it by themselves.	There are some cooperative groups conducting group purchasing system.
	Inadequate seed replacement	To increase the supply of improved seeds through community-based seed production program.	There are some farmer groups producing improved seed in Jhapa and Morang.
	Shortage of farm inputs	To cultivate using compost, green manure with chemical fertilizers in a proper way.	Many farmers are producing and using farm yard manure.
	Labor shortage	To mechanize farming system.	Subsidies for purchasing agricultural machineries are available.
		To obtain farm machineries by group.	There are some samples of group formation for machine purchase.
Low productivity of paddy	Inappropriate extension system	To strengthen the capacity of FG and WUA to utilize existing extension system.	Most farmers are willing to receive extension services.
Low agricultural income	Increasing emigrant workers	To introduce labour saving agriculture.	Farm machineries are increasing in the areas.
	Low introduction of high value crop	To select and cultivate high profitable crops to increase income.	Banana is cultivated in the paddy fields. Banana and other fruits are imported from India.
No cultivation schedule shared with farmers, officers and other stakeholders	Collective actions are not taken in preparing cultivation schedule with irrigation schedule	To prepare cultivation schedule with irrigation schedule by all stakeholders collectively.	WUA/FO leaders and district level officials and relevant organizations have similar knowledge on cultivation schedule.

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Issues, Constraints, Countermeasures, and Potentials on Irrigation and Water Management

Issues	Constraints	Countermeasure	Potential
Shortfall provision and poor formation of main irrigation system	Improperly quantified and no timely water distribution to tertiary irrigation blocks	Enhancement of linkage among all stakeholders using the same platform.	Irrigation Policy 2013
		Improvement of roles and functions of IDDO and enhancement of linkage among all stakeholders using the same platform.	Lesson learned from SPIN
	Flooding from main and branch canals or inundation problems in paddy field along main and branch canals in summer season	Enhancement of technical support to gate operators through workshops and field training and provision of motivation and incentives for gate operator.	Rehabilitation projects being carried out with donors' assistance
		Enhancement of on-farm drainage system development at the on-farm level.	
	Improper maintenance works of intake and main canal system	Enhancement of technical support to IDDO and/or DTT through workshops and field training.	Rehabilitation projects being carried out with donors' assistance
		Improvement of monitoring mechanism and establishment of asset management of irrigation facilities.	Irrigation Policy 2013
	Difficulty of year-round irrigation	Enhancement of conjunctive use with deep and/or shallow tube wells.	Rehabilitation projects being carried out with donors' assistance Irrigation Policy 2013 and Strategies of the Thirteenth TYP
	Low participation of WUA on rehabilitation works	Enhancement of dissemination and linkage among all stakeholders using the same platform.	Rehabilitation projects being carried out with donors' assistance and Irrigation Policy 2013
Lack or shortfall of on-farm irrigation system	Lack of on-farm irrigation facilities	Enhancement of construction of on-farm irrigation and drainage system by community contract method through the enhancement of linkage among all stakeholders. Reformation of WUAs to follow branch and/or tertiary irrigation block base.	Irrigation regulation 1988/89 and Irrigation Policy 2013, and lessons learned from SPIN and OFWMSC
	Lack of tertiary canals and field channels	Enhancement of technical support to WUAs as well as IDDO and DTT through workshops and field training.	
Poor formation of on-farm water management	Flooding from main and branch canals or inundation problems in paddy field in summer season	Enhancement of construction of on-farm irrigation and drainage system by community contract method through the enhancement of linkage among all stakeholders.	Lessons learned from SPIN and OFWMSC, Irrigation Regulation 1988/89 and Irrigation Policy 2013
	No water distribution plan	Enhancement of linkage among all stakeholders using the same platform.	
Poor formation and collapse of WUA	Lack of awareness or no interest with the function of WUAs	Enhancement of incentives and motivation to WUAs such as the commercialized agriculture development and the multifunction of WUAs.	Proposed Strategies of ADS, Irrigation Policy 2013
	Difficulty in proper water management and communication	Enhancement of technical support to DTT, IDDO, and WUAs through workshops and field trainings.	Irrigation Policy 2013 and Strategies of the Thirteenth TYP
	No matching tariff of ISF	Improvement of concept on tariff management for ISF.	Irrigation Policy 2013
	Cost over-run of operation and maintenance cost		
	Low collection rate of ISF	Improvement of concept on application of fine clauses to violators of WUA member.	Lessons learned from SPIN and OFWMSC and Irrigation Policy 2013
	Unsatisfactory and insufficient maintenance works		
		Enhancement of technical services of IDDO using the same platform.	
	Unclear operation cost	Enhancement of improvement of IFS collection mechanism including periodical auditing system.	

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Issues, Constraints, Countermeasures, and Potential in the Institutional Aspect

Issues	Constraints	Countermeasures	Potential
90% of farmers have not received agricultural extension services	Small number of JT/JTAs	To increase the number of extension workers	It is difficult for DOA to increase its budget to employ extra JT/JTAs (negative)
		To improve the quality of JT/JTAs' knowledge and skills (services)	NARC has some training programs for JT/JTAs
		To involve other stakeholders like NGOs, cooperatives and private sector into agricultural extension services.	There are local NGOs, cooperatives and private sector organizations.
	Limitation of budget for extension service delivery	To increase the efficiency of existing service delivery.	Please refer to the potentials against "inefficiency and ineffectiveness of existing extension service system"
	Inefficiency and ineffectiveness of existing extension service system	To know which kind of agricultural technologies/skills needed by the farmers and/or market demand.	Can learn from the success stories of some WUA, farmers groups, cooperatives, and NGOs
		To utilize media (TV/radio) for disseminating information and technology (skill) needed by the farmers.	NLSS III revealed that 41.1% of HHs in Eastern and Central Terai have radios and 41.8% of them have TVs.
		To utilize local human resources.	People who earned secondary education and above are 36.8% in Jhapa, 35.5% in Morang, 32.6% in Dhanusa, and 26.8% in Mahottari
		To promote that agricultural business entities come into Terai (Quality of agricultural extension).	Some agricultural processing companies already existed in the four districts
	Too small number of recipient farmers	To reform existing farmers groups.	It has to incorporate existing FGs into WUA, or vice versa
	Lack of mobility of JT/JTAs	To provide motor bicycles and fuel for JT/JTAs.	DOA allocates small amount of budget for improving JT/JTAs' mobility every year.
	Low motivation of JT/JTAs	To provide some incentives for JT/JTAs.	DOA (DADO) rewards the efforts of JT/JTAs .
	Language problem of JT/JTAs	To utilize local human resources.	Please refer to the potentials against "inefficiency and ineffectiveness of existing extension service system"
Coordination between DOI and DOA for irrigated agricultural development is not sufficient	Low linkage between production and water management	To have district agricultural development plan (annual production plan) based on the information about water availability from DOI.	The DOI, DOA, NARC and ADBL have already established an implementation structure for irrigated agriculture project (ICWMP and other projects)
Majority of FGs and WUAs have been inactive or have stopped their activities	Low interests of member farmers	At present time, group formulation has been done by JT/JTAs and IDDO staffs. Generally, local NGOs and cooperatives have better skills and experiences on social mobilization and awareness raising. As much as possible, it is better to seek for DADO and IDDO's cooperation in group formulation stage.	There are local NGOs, CBOs and cooperatives.
Women's participation in agricultural development activities is insufficiently taken care of.	Small number of female JT/JTAs	To increase the number of female JT/JTAs	GON claims that 30% of staff should be female.
		To utilize local youth (female)	GON claims 30% of staff should be female. Female population who earned secondary education and above in Jhapa and Morang are 37.05% and 34.75%, respectively. which shows high potential.

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Issues, Constraints, Countermeasures, and Potentials on Marketing

Issues	Constraints	Countermeasures	Potential
Unfavorable price setting for agricultural products	Weak bargaining power on market price by farmers	To improve the quality of products	Improvement of product quality is one of the major mandates of JT/JTAs
		To deliver agricultural products collectively	Cooperatives have experiences on collective delivery
	Minimum support price is not endorsed yet	To allocate budget	Recommended price has been already submitted by ABP&MDD in 2012
Poor storage and transportation	Lack of interest on proper storage and transportation by farmers	To construct storage facilities	A number of large warehouse are under construction in Morang District
		To store products collectively	CADP (by ADB) implemented awareness training/seminars in Jhapa and Morang districts
		To hold awareness training for better transportation of products	CADP implemented awareness training/seminars in Jhapa and Morang districts
			- DADO has budget for granting plastic cage for transportation of products
	Lack of collection center and its management	To construct collection center and provide management training	- There are well managed centers in the target districts
Poor storage and transportation	Transportation means are limited	To rent transportation and deliver the products properly	Cooperatives have experiences on collective delivery
	Poor road condition	Improvement of roads	DDC has budget and attends to road improvement
Public assistance for marketing is weak	Lack of budget for marketing	To utilize budget efficiently based on market oriented and farmers' need	- DADO can hold seminars/workshop on marketing
			- ABP&MDD plans to allocate DADO officers in charge of marketing
	Lack of opportunity to create linkage	To promote linkage among stakeholders	- CC&I District Office in Morang is active in the promotion of linkage among stakeholders
	Lack of farmers' awareness toward importance of wider linkage	To provide awareness training/workshop	- DADO has budget for training/seminar
			- CADP implemented awareness training/seminars in Morang District in Jhapa and Morang
	Market facilities are not well developed	To allocate budget for marketing facilities	- DADO's priority on construction of marketing facility is high

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V. LESSONS LEARNED FROM ONGOING AND PAST IRRIGATED AGRICULTURAL DEVELOPMENT PROJECTS ASSISTED BY DONORS

General

78. It is clarified that many issues and problems on the implementation and post-project evaluation have been commonly occurring in major projects in Terai. Similarly, issues and problems will be envisaged in the future implementation of irrigated agricultural development programs in Terai, if no careful attention is given to address such issues and problems. ***(5.1)***

Lessons Learned from Projects and Directive Strategies

79. Issues and problems from development projects in the agriculture and irrigation sectors' projects are summarized below. In addition, directive strategies for development based on the issues and problems are elaborated respectively. ***(5.3)***

Issues and Problems of Agricultural Development Projects

Major Elements of the Project	Management for Project	Agriculture	Marketing	Community/ Linkage
Summary of Issues, Problems and Lesson Learned	(1) Delay in scheduling of sub-project activities especially of infrastructures development (2) Budget disbursement or allocation problems	No further action and performance of ACC on operational modalities	(1)Inadequate market and marketing functionaries. (2)Weakness of market competitiveness due to higher production cost. (3) Web-based monitoring framework for marketing is incomplete.	(1) Roles and responsibilities of stakeholders for project implementation were not specified. (2) Inadequate coordinated effort among stakeholders.

Major Elements of the Project	Planning/ Management	Technology/ Technique	Institutional Arrangement	Extension Services
Summary of Issues, Problems and Lesson Learned	(1) No systematic seed planning and production. (2) Unavailability of fertilizer and seed within the desired quantity and improper delivery time. (3) Project design without the participation of stakeholders.	(1) Inadequate technical know-how in application of modern technologies.	(1) Social inclusiveness in the project was limited because of low literacy. (2) Very short time frame for institutional reform and the bank (fund) initiated the institutional reform only.	(1) Weak agricultural extension services in the project reduced farmers accessibility. (2) Limited number of extension staff hindered the delivery of extension services to needed farmers. (3) Weak research and extension linkage slowed down the modern technology transfer and dissemination process.

Prepared by the JICA Survey Team

Directive Strategies for Development in the Agriculture Sector

Major Elements of the Project	Management of the Project	Agriculture	Marketing
Summary of Directive Strategies	Management of project should be carried out to timely address the issues and problems, also to have a transparent and objective criteria in institutional assessment and high priority to monitor the project activities.	It is essential to develop progressive farmers' groups into model cooperatives and to involve farmers into agribusiness	Development plan, practical production activities and other reinvestment activities in agriculture sector should be linked with market development and marketing function, and sustainability of the farm-market linkage has to be ensured.

Major Elements of the Project	Community/Linkage	Planning/ Management	Project Implementation
Summary of Directive Strategies	(1) It is essential to promote the private sector and NGOs in social mobilization and delivery of technology to farmers and community. (2) Roles and functions of stakeholders should be clear in supporting marketing and production activities. And harmonious linkage of stakeholders should be enhanced.	Project should be formulated with strategic planning such as broad-based stakeholder participation with appropriate vision and long-term implementation modality.	Project should be implemented with literacy program such as adult education and leadership training in area where literacy is low and training should be implemented at the initial stage of the project.

Prepared by the JICA Survey Team

Issues and Problems of Irrigation Development Projects

Major Elements of Project	Dissemination of Project Implementation to Stakeholders and Communities	Land Acquisition	Water Resource	Soil Erosion and Landslide
Summary of Issues, Problems, and Lesson Learned	(1) Passive dissemination activities of executing body (2) Weak farmers on the project due to inadequate and weak dissemination activities. (3) Inconsistent dissemination and inadequate information materials	Minor and small problems on land acquisition, however, WUAs especially, in case of FMIS solve the problems by themselves.	(1) Decreasing trend of river water resource affected by the deforestation in the watershed area (2) Water shortage of water resource disregard rational and efficient water utilization	(1) Much soil erosion on the canal bank (2) Canal system affected and suffered from landslides in hill side areas (3) Poor water management suffered from sediment on the canal and erosion of canal embankment

Major Elements of the Project	Flood	Construction/ Supply of Construction Materials	Agriculture and Farm Management including Agricultural Input	Market and Relevant Facilities/ Infrastructures
Summary of Issues, Problems and Lesson Learned	Damages of irrigation facilities, crops and farm land due to flood and inundation in paddy field and floods during monsoon season	Weakness on quality control of construction works	(1) No special/ intensive agriculture extension service, (2) Only regular DADO extension service without linkage among all stakeholders. (3) Availability of fertilizer and high quality seed are limited and not assured.	(1) Generally, most projects do not make provisions on market development activities . (2) Few projects had very limited provisions up to collection centres. (3) Middleman dominantly carried out the trading and farmers are generally deprived of potential gain.

Major Elements of the Project	Human Resource	Institutional Aspects of Government Agencies for Implementation	Institutional Aspect of WUA	Legal Aspects for Project Implementation
Summary of Issues, Problems and Lesson Learned	(1) DOI has qualified manpower but very limited. (2) Same person participate in trainings several times	(1) Difficulty to coordinate among the diverse stakeholders including government agencies. (2) DOI has capability to administer project implementation but implementation is spanning for many years due to limited budget thus takes longer time for project completion. (3) Project level staff are loaded with other programs and also had to make decision under political pressure. Low attention was given to M&E activities.	(1) A large number of WUAs are not registered. (2) WUAs do not have office spaces (3) No special support programs to upgrade/ enhance the capability of WUA. (4) WUAs become defunct after project construction due to lack of work sharing function among WUA members. (5) Less attention is given for WUA capacity building activities.	Government regulation and act have not legally empowered the functions of WUAs such as collection of ISF, stoppage of vandalism and protecting canal and structures.

Prepared by the JICA Survey Team

Directive Strategies for Development in the Irrigation Sector

Major Elements of the Project	WUA	Supporting Facilities for O&M Works
Summary of Directive Strategies	(1) Re-organization of WUA shall be required to enhance ownership of system and to improve operation and management activities and maintenance activities. (2) Improvement on wide gaps of WUA members for field activities and enhancement of human resource of WUA in maintenance works and record bookkeeping needs. (3) WUA should be established as the representative of a community and should participate in all stages of project implementation. (4) GON should provide training on water distribution and financial management to WUA to optimize the collection of the ISF. (5) Prolonging of the term limit of WUA officers. (6) Improvement of the WUA constitutional provision in order to elect two-thirds of its members and also need to retain one-third of its members. (7) Participation of WUA to project implementation should be enhanced in order to ensure security of construction works and low-cost option.	WUA office should be established and constructed to sustain the roles and functions of WUA and to enhance all activities.

Major Elements of the Project	Agricultural and Farm Management	Marketing
Summary of Directive Strategies	As agricultural Agriculture extension services of private sector will give much impact to the increase outcome of irrigated farm land and irrigation areas, as well as farmer groups will be able to attain higher crop production. It is necessary to enhance the coordination with the private sector on extension services.	(1) It is necessary to improve or develop farm-to-market roads in coordination with both district and village development committees. (2) It is also necessary to construct collection centers to help farmers have easy access to markets and be able to sell more of their produce. (3) Irrigation projects should be designed with strong components to support irrigated agriculture and promote access to input and output marketing. There should be provision to deliver services not only through government organizations but also through other service providers such as NGOs and the private sector.

Major Elements of Project	Human Resource	Institutional Development of Community
Summary of Directive Strategies	(1) It is necessary to increase the number of qualified technical staff at the field level with training for capacity building. (2) Other trainings for WUAs are also necessary, especially women farmers of WUA. (3) It is also necessary to prepare more compact and intensive training programs with ensured coordination among the agencies concerned.	It is necessary to enhance social mobilization in the community, to provide irrigation facilities and/or tube wells and to provide training program on agriculture extension services at the village level in order to give good impact, of which WUA can act as reliable facilitators between the project and beneficiary groups for effective project implementation and sustainability.

Prepared by the JICA Survey Team

Significant Issues and Problems in relation to the Formulation of Irrigated Agriculture Program in Terai

80. In the agriculture sector, the major issues and problems include the following: (i) institutional constraints on agricultural extension, (ii) supply management of seeds and fertilizers, and (ii) the mechanism and legal situation of FGs. Among others, the major constraints related closely to the formulation of TCP are shown in the table below.

Issues and Problems of Agricultural Development Projects

- Inadequate strategy and passive orientation of government agencies on development program to stakeholders and users and lack of participatory approaches.
- Improper consultation and irrigation services of government agencies to WUA due to shortfall capacity of government agencies (shortage of qualified staff and operation budget).
- Lack of institutional capacity building programs of WUA and DOI and DOA.
- Lack of strategic WUA development approach (lack of on-farm irrigation facilities and on-farm water management) or a mere traditional approach of WUA training. ,
- Poor or lack of institutional and policy support for WUA (lack of linkage and communication with other supporting institution, problems on WUA constitution, low possibility of multipurpose function of WUA).
- Lack of on-farm irrigation facilities (lack of WUA office) to ensure sufficient management and year-round irrigation.
- Poor project implementation due to lack and weak linkage of WUA with stakeholders.
- No assurance of fertilizer and seeds supplies to farmers and lack of intensive agriculture input in the project areas.
- Inadequate management of WUA such as water management program, budget provision and practical control on water supply activities
- Lack of market access road and collection centers
- Lack of marketing organization and self-governing organization operated by the WUA that are legally empowered.

Source: Prepared by the JICA Survey Team

VI. SCENARIO FOR IRRIGATED AGRICULTURAL STRENGTHENING IN THE TERAI PLAINS

Background for the Formulation of Development Scenario

81. The outline of the TCP requested by GON is tabulated as follows: ***(6.1.1)***

Outline of Technical Cooperation Requested by GON

Item	Description
Title	◆ Irrigated Agriculture Strengthening Project (July 2012)
Objective	◆ To increase irrigation efficiency of developed irrigation systems of MIP implemented by GON's own fund. ◆ To bring irrigation and agriculture together for agricultural production enhancement, as the coordination of three line agencies, DOI, DOA and NARC is not adequate to achieve the objectives.
Overall Goal	◆ To increase irrigated agricultural productivity and agricultural income of farmers
Purpose	◆ To develop adequate model of irrigated agriculture based on WUA

Source: Prepared by the JICA Survey Team based on the application

82. Through the Survey, the JICA Survey Team identified issues for major subjects consisting of agriculture, irrigation, institution, and marketing. In order to attend such issues and constraints, it is appropriate to formulate a comprehensive program for irrigated agriculture development including TCP requested by GON. The items to be covered by the program are selected taking into account the following aspects: (i) Consistency with the needs of stakeholders in the areas and society, (ii) Consistency with GON policy on irrigated agriculture, (iii) Consistency with the request of GON, (iv) Consistency with JICA's position paper, (v) Sustainability of program, (vi) Effectiveness of program, (vii) Limitation of resources of JICA Cooperation Program, and (viii) Risk factors. ***(6.1.4, 6.1.5&6.1.6)***

Direction of the Irrigated Agriculture Development in the Target Districts

83. According to the Survey, the JICA Survey Team proposes to take "community-based development approach" facilitated by the government officials to adopt a bottom-up method on decision making to plan and implement the development program. The following three steps shall be practiced to materialize the bottom-up method: (i) on-farm development through community contract, (ii) collective action applying platform concept for extension of agricultural technologies and farming skills, and (iii) increase in market access through strengthening linkage with stakeholders. ***(6.2.1)***

84. Recently, the domestic production of cereals is self-sufficient, and the surplus has been observed in the last three years. On the other hand, the import of rice in the last five years has been increasing. Taking into account the population increase, self-sufficiency of food is important for the Nepalese economy. ***(6.2.2)***

85. The following table shows the future projection of cereal balance between production and demand:

Projection of Cereals Balance in the Future

No.	Description	2011/12	2021/22	2031/32
1	Actual and Projected Population (1000)	26,494.5	30,296	34,644
2	Quantity of Cereals Required	5,113.4	5,847.1	6,458.0
3	Cereal Produced/to be Produced	6,037.7	6,339.6	6,656.6
4	Balance	+924.3	+492.5	+198.6

Source: Prepared by the JICA Survey Team based on the data of 2011/12 Census and production data in 2011/12

Cereal production would be sufficient even if only incremental production is 5% in ten years. ***(6.2.2)***

86. Despite the food sufficiency in cereals as a whole, as discussed above, self-sufficiency

condition in paddy became worse in recent years as the imports of rice have been increasing in the past several years. The JICA Survey Team assessed possible self-sufficiency conditions in 2031/32 after 20 years, using the highest production of paddy in 2011/12 in Nepal as tabulated below. The table shows that the demand and supply of rice in Nepal would be almost balanced in 2012/22, if productivity is improved and irrigable area is increased based on the assumptions made by the JICA Survey Team. ***(6.2.2)***

Projection of Rice Balance in the Future

Unit: 1,000 Mt

No.	Description	2011/12	2021/22	2031/32
1	Actual and Projected Population (1,000)	26,494	30,296	34,644
2	Quantity of Rice to be Required	3,232.3	3,696.1	4,226.6
3	Rice Produced/to be Produced	2,766.9	3,690.8	4,368.8
4	Balance	-465.4	-5.3	+142.2

Source: Prepared by the JICA Survey Team based on the data of the 2011/12 Census

87. According to the household survey conducted by the JICA Survey Team, it was identified that the average agricultural income of the 120 sampled households was around 35% of the total income, and 44% of the households were below the poverty line in Nepal. In this context, increasing farmers' agricultural income is urgently attended to. In addition, the JICA Survey Team considered that an agricultural development plan for farmers, who operate 1–2 ha of farmland, will be encouraged to practice agricultural diversification, though increase of paddy production would be the first priority. ***(6.2.2)***

88. The following three farming plans were prepared as samples taking into consideration the following conditions: (i) For fruit cultivation, only banana and papaya are listed, as these could be harvested in a year and quickly obtain income. It may take a few years to obtain income if mango, litchi, jackfruit and other tree bearing fruits are planted. (ii) Three dairy cows for rearing are considered as livestock management could be carried out by family laborers and the by-products of cereals and grasses available in surrounding areas could be mainly used as forage, though there are many other options such as goats and poultry rearing. (iii) As for vegetables, onion and chilli are considered though there are many other options. (iv) One household will operate 1.37 ha of paddy area in addition to the homestead area of 0.1-0.3 ha. ***(6.2.3)***

Farming Plan A

Crop	ha	N/ Income (Rs.)	Prod. Cost (Rs)	G/ Income (Rs)	Cropping Schedule												Labor Requirement	
					1	2	3	4	5	6	7	8	9	10	11	12	Family	Hired
Paddy (by Seeder)	1	44,535	36,965	81,500													83	25
Chilli	0.2	23,852	9,398	33,250													70	7
Onion	0.2	20,750	22,450	43,200													43	43
Papaya (Paddy field)	0.2	180,699	45,519	226,219													25	15
Banana (Pddy field)	0.17	22,682	15,001	37,683													21	13
Cattle (Homestead)	3 nos.	73,931	30,549	104,480													111	0
Total	1.77	366,449	159,882	526,332												**Total**	**353**	**103**

Source: JICA Survey Team

Farming Plan B

Crop	ha	N/ Income (Rs.)	Prod. Cost (Rs)	G/ Income (Rs)	Cropping Schedule 1	2	3	4	5	6	7	8	9	10	11	12	Labor Requirement Family	Hired
Paddy (by Seeder)	1.1	48,989	40,662	89,650													91	28
Chilli	0.12	14,311	5,639	19,950													42	4
Papaya (Paddy field)	0.15	135,525	34,140	169,664													19	11
Onion (Homesead)	0.05	5,188	5,613	10,800													11	11
Cattle (Homestead)	3 nos.	73,931	30,549	104,480													111	0
Total	1.42	277,943	116,603	394,544												**Total**	**274**	**54**

Source: JICA Survey Team

Farming Plan C

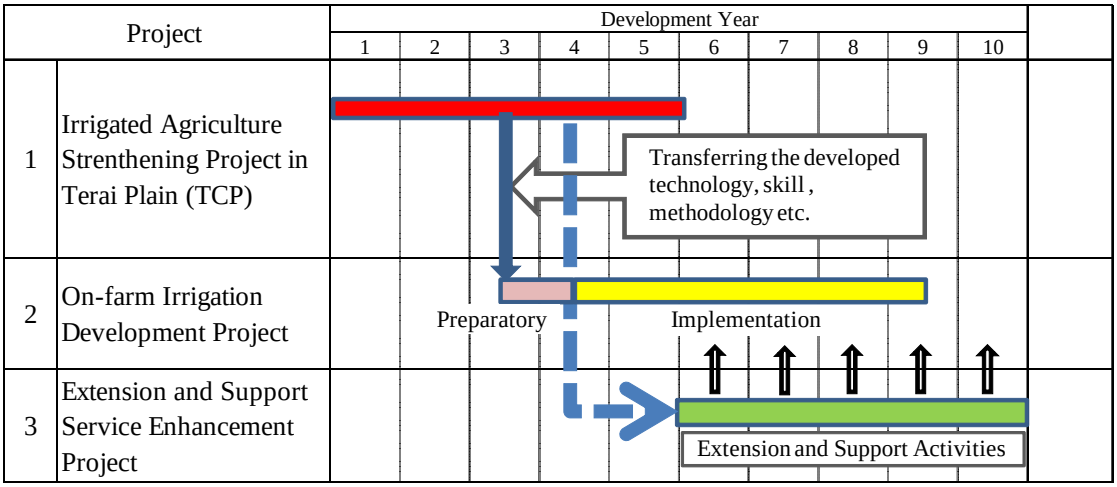
Crop	ha	N/ Income (Rs.)	Prod. Cost (Rs)	G/ Income (Rs)	Cropping Schedule 1	2	3	4	5	6	7	8	9	10	11	12	Labor Requirement Family	Hired
Paddy (by Seeder)	1.00	44,535	36,965	81,500													83	25
E. Paddy (by Seeder)	0.40	17,814	14,786	32,600													33	10
Chilli	0.15	17,889	7,049	24,938													52	5
Onion	0.15	15,563	16,838	32,400													32	32
Papaya (Paddy field)	0.10	90,350	22,760	113,109													13	8
Banana (Pddy field)	0.17	22,682	15,001	37,683													21	13
Cattle (Homestead)	3 nos.	73,931	30,549	104,480													111	0
Total	1.97	282,763	143,948	426,710												**Total**	**345**	**93**

Source: JICA Survey Team

89. During the sowing/planting and harvesting season, problems occurred due to labor shortage. Adoption of mechanization (rent machinery with proper system and change cultivation practice by using small inexpensive machinery), improvement of cultivation method (direct seeding of paddy by manual seeder, parachute paddy transplanting, and using of short maturity variety of paddy), and cropping system (with available family labor force) are necessary to solve labor shortage. ***(6.2.4)***

Development Strategy

90. The GON requested for JICA assistance to develop an adequate model of irrigated agriculture. However, stand-alone projects in the limited area and by limited people concerned may not be sustainable and not be widely disseminated. Therefore, some sort of sustainability plan to expand the approach of the project and scaling up into national framework would be required. In this viewpoint, the JICA Survey Team proposes the 10-year irrigated agricultural development program for Terai as described below : ***(6.3.1&6.3.2)***



Source: Prepared by the JICA Survey Team

Scenario and Tentative Schedule of Development Program

91. The proposed development program consists of three projects, of which implementation period is five years each. The first project is the pilot stage to introduce and implement

effective irrigated agriculture development in Terai plains through 'Irrigated Agriculture Strengthening Project'. The second project is related to an on-farm irrigation development to expand the area of on-farm development that will be established in the first project and the third project is for extension support services enhancement in the second project area.. ***(6.3.2)***

92. Priority of the project area would be implemented under the development program by taking into account the following aspects: (i) availability of water for year-round irrigation, (ii) headwork of the project is stable and functioning, (iii) structures of main and branch canals are provided and functioning, (iv) availability of technical data of the project such as canal layout map, plan, discharge, and structure drawings, etc., and (v) existence of registered WUA and organizations handling O&M. ***(6.3.3)***

93. The outline of the three projects are discussed and tabulated as follows: ***(6.3.4)***

Outline of Projects in the Development Program

Phase	Project	Description
1	Irrigated Agriculture Strengthening Project	◆ 1st phase of the program officially requested by GON ◆ Objective: Development of a model for irrigated agriculture in Terai. ◆ Target area: 960 ha, to be covered by on-farm development with community contract ◆ Beneficiaries: 730 households of farmers ◆ Establishment of a coordination mechanism of stakeholders consisting of: (i) government officers, (ii) leaders of WUA and FG, (iii) cooperatives, and (iv) private sectors, etc. ◆ Period: 5 years
2	On-Farm Irrigation Development Project	◆ Objective: Expansion of experience and lessons learned under the pilot project for on-farm development ◆ Target area: Other areas for about 10,000 ha ◆ Activities: (i) On-farm development with community contract, (ii) re-formulation of WUA, (iii) various trainings for strengthening WUAs and FGs.
3	Extension and Support Services Enhancement Project	◆ Objective: Diversification of activities particularly materializing value-added agriculture through various support activities. ◆ Adopting the experiences and lessons learned under the 1st phase project on the soft component

Source: Prepared by the JICA Survey Team

94. The Irrigation Policy 2003 defines the establishment of WUAs to be engaged in irrigation water management. However, there is no legislation on farmer organizations except the concept of FG to receive agricultural extension services. DOA registers FG in connection with receiving agricultural extension services by DOA. Although the Cooperative Act allows farmers to establish agricultural cooperatives, the function is mainly on marketing of inputs and produce. The JICA Survey Team, therefore, made it clear with farmer organizations to identify all kinds of agricultural activities including receiving extension services, support, subsidies, etc. Farmer organizations shall either be legislated under WUA or under DOA separately. The JICA Survey Team would like to recommend to GON to provide a legislation related to farmer organizations. ***(6.3.5)***

VII. CONCLUSION AND RECOMMENDATIONS

Conclusion

95. Considering the constraints and needs, the matching consistency with development policies and strategies of GON, the difficulty for GON in establishment of sustainable and practical model for on-farm irrigation development, as well as, irrigated agricultural development in Terai, the appropriate development approaches for the irrigated agricultural development in Terai are principally suggested through stepwise implementation, as follows:

- 1st Step: Introduction and implementation of the effective irrigated agricultural development at the pilot scheme area of the existing irrigation project,
- 2nd Step: Dissemination of the pilot approaches to other irrigation areas for demonstration, and
- 3rd Step: Follow up activities to enhance sustainability. ***(7.1)***

Recommendations on Implementation

96. For the implementation of other two projects under the proposed development program, the JICA Survey Team recommends to GON the following actions: (i) Development and sharing of dissemination plan/strategy of the pilot approaches are to be established both for on-farm development with community contract and enhancement of extension and support services through simultaneous implementation of the requested project; and (ii) Implementation of institutional improvement of WUAs and FGs, and other inevitable development such as improvement of water management and farm management of other existing surface irrigation project areas, where rehabilitation works of headworks, intake structures, main and branch canals and other relevant structures are already completed and faced malfunction problems on water management at the on-farm level. ***(7.2)***

97. Other recommendations for start-up action for the project are: (i) Set up of implementation structure with consent of DOI and DOA in order to ensure sustainable development of the program', (ii) Budget of running costs, facilities, and services to be provided by the GON initiative, and (iii) Demarcation of project implementation in the proposed TCP area among the ongoing projects by other agencies and assisted by other donors, if necessary. ***(7.2)***

PREPARATORY SURVEY
ON JICA'S COOPERATION PROGRAM
FOR AGRICULTURE AND RURAL DEVELOPMENT IN NEPAL
FOOD PRODUCTION AND AGRICULTURE IN TERAI

FINAL REPORT

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Abbreviations

ABP&MDD	–	Agri. Business Promotion and Marketing Development Directorate
ADB	–	Asian Development Bank
ADBN	–	Agricultural Development Bank of Nepal
ADS	–	Agriculture Development Strategy
AEC	–	Agro Enterprise Center
AGDP	–	Agricultural Gross Domestic Product
AMIS	–	Agency Managed Irrigation System
APP	–	Agriculture Perspective Plan
APP-IAP	–	APP Implementation Action Plan
APP-ISR	–	APP Implementation Status Review
APPSP	–	Agriculture Perspective Plan Support Program
ASCs	–	Agriculture Service Centers
CADP	–	Commercial Agriculture Development Project(ADB)
CBO	–	Community Based Organization
CBS	–	Central Bureau of Statistics
CBSP	–	Community Based Seed Production Program
CDR	–	Central Development Regions
CIP	–	Community Irrigation Project (ADB)
CGISP	–	Community Groundwater Irrigation Sector Project
CMIASP	–	Community-Managed Irrigated Agriculture Sector Project (ADB)
COMCAP	–	Community Mediation Capacity for Peaceful and Harmonious Society Project
DADC	–	District Agricultural Development Committee
DADO	–	District Agricultural Development Office
DDC	–	District Development Committee
DDG	–	Deputy Director General
DFID	–	Department for International Development UK
DG	–	Director General
DHM	–	Department of Hydrology and Meteorology
DISSPRO	–	District Seed Self Sufficiency Program
DLS	–	Department of Livestock Services
DLSO	–	District Livestock Service Office
DOA	–	Department of Agriculture
DOI	–	Department of Irrigation
DOLIDAR	–	Department of Local Infrastructure Development and Agriculture Roads
DOLS	–	Department of Livestock Services
DTWs	–	Deep Tube Wells
DWIDP	–	Department of Water Induced Disaster Prevention
EU	–	European Union
FAO	–	Food and Agriculture Organization
FFS	–	Farmer Field School
FG	–	Farmer's Group
FMIS	–	Farmer Managed Irrigation System
FO	–	Farmers' Organization
FSN	–	Food Security and Nutrition
FY	–	Fiscal Year
GDP	–	Gross Domestic Product
GOI	–	Government of India
GOJ	–	Government of Japan
GON	–	Government of Nepal
GIZ	–	Deutsche Gesellschaft für Internationale Zusammenarbeit
GWRDB	–	Ground Water Resource, Development Board
IAPP	–	Interim Agriculture Perspective Plan
ICT	–	Information and Communication Technology

ICWMP	–	Integrated Crop and Water Management Program
IDDO	–	Irrigation Development Division Office
IFAD	–	International Fund for Agricultural Development
ILCP	–	Irrigation Line of Credit Project
IMD	–	Irrigation Management Division of DOI
IMDO	–	Irrigation Management Division Office
IMT	–	Irrigation Management Transfer
INGO	–	International Non Governmental Organization
IP	–	Irrigation Policy
ISF	–	Irrigation Service Fee
ISP	–	Irrigation Sector I Project
IWRM	–	Integrated Water Resources Management
IWRMP	–	Irrigation and Water Resources Management Project (WB)
JADP	–	Janakpur Zone Agriculture Development Project (JICA)
JCC	–	Joint Coordination Committee
JICA	–	Japan International Cooperation Agency
JT	–	Junior Technician
JMIS	–	Joint Managed Immigration System
JTA	–	Junior Technical Assistant
KTM	–	Kathmandu
LIC	–	Irrigation Line of Credit Project
MIP	–	Medium Irrigation Project
MOAD	–	Ministry of Agriculture Development
MOAC	–	Ministry of Agriculture and Cooperatives
MOF	–	Ministry of Finance
MOFALD	–	Ministry of Federation and Local Development
MOLD	–	Ministry of Local Development
MOI	–	Ministry of Irrigation
MSP	–	Minimum Support Price
NAES	–	Nepal Agriculture Extension Strategy
NARC	–	Nepal Agriculture Research Council
NAP	–	National Agriculture Policy
NCCI	–	Nepalese Chamber of Commerce and Industry
NFC	–	National Food Corporation
NFIWUAN	–	National Federation of Irrigation Water Users' Association, Nepal
NGO	–	Non-Governmental Organization
NITP	–	Non-conventional Irrigation Technology Project (of DOI)
NLSS	–	Nepal Living Standards Survey
NPC	–	National Planning Committee
NSC	–	National Support Committee/National Seed Company
NWP	–	National Water Plan
NWRS	–	National Water Resources Strategy
O&M	–	Operation and Maintenance
ODA	–	Official Development Assistance
OFWM	–	On-Farm Water Management
OPEC	–	Organization of the Petroleum Exporting Countries
OVOP	–	One Village One Project
PAF	–	Poverty Alleviation Fund
PDM	–	Project Design Matrix
PQO	–	Plant Quarantine Office
Rs.	–	Nepal Rupees
SDC	–	Swiss Agency for Development and Cooperation
SEAN	–	Seed Entrepreneurs' Association of Nepal
SFCL	–	Small Farmers Cooperative Limited
SFDB	–	Small Farmers Development Bank (Sana Kisan Bikas Bank in Nepali)
SISP	–	Second Irrigation Sector Project

SLC	–	School Leaving Certficate
SMS	–	Subject Matter Specialists
SSNP	–	Social Safety Net Project
STWs	–	Shallow Tube Wells
TA	–	Technical Assistance
T&V	–	Training and Visit system
TCP	–	Technical Cooperation Project
T/G	–	Target Group
ton	–	Metric ton
TYP	–	Three Year Plan
USAID	–	United States Agency for International Development
VDC	–	Village Development Committee
WB	–	World Bank
WTO	–	World Trade Organization
WUAs	–	Water Users Associations
WUG	–	Water Users' Group

Measurement Units

Extent

cm^2 = Square-centimeters (1.0 cm x 1.0 cm)

m^2 = Square-meters (1.0 m x 1.0 m)

km^2 = Square-kilometers (1.0 km x 1.0 km)

ha = Hectares (10,000 m^2)

ac = Acres (4,046.8 m^2 or 0.40468 ha.)

Volume

cm^3 = Cubic-centimeters (1.0 cm x 1.0 cm x 1.0 cm or 1.0 m-lit.)

m^3 CM = Cubic-meters (1.0 m x 1.0 m x 1.0 m or 1.0 k-lit.)

lit l = Liter (1,000 cm^3)

Length

mm = Millimetres

cm = Centimetres (cm = 10 mm)

m = Meters (m= 100 cm)

Km = Kilometres (Km = 1,000 m)

Inch = 2.54 cm

ft = foot (0.3048 m)

mile = 1,609.34 m

Weight

gr = Grams

kg = Kilograms (1,000 gr.)

ton = Metric ton (1,000 kg)

MCM = 1,000,000 cu-m = 810.68 acre-ft

ac-ft = 1,233.83 m3

Time

sec. = Second

min. = Minutes (60 sec.)

hr. = Hours (60 min.)

yr. = Year

Others

°C = degree Celsius

R = Right angle

kPa = Kilopascal (1,000 Pa)

Currency

US$ = United States Dollar

JPY = Japanese Yen

Rs. = Nepali Rupees

CHAPTER 1 FRAMEWORKS OF THE PREPARATORY SURVEY

1.1 Background of the Preparatory Survey

Nearly 80% of the households in Nepal are dependent on agriculture, and 66% of the working population is engaged in the agriculture sector. These contributed to 34% of the total gross domestic product (GDP) of the country[1] in 2010/2011. Structures of agricultural production remarkably differ between the Terai plains at altitudes from 60 m to 300 m, and the highland areas at altitudes of more than 300 m.

The Terai region, which is often referred to as the granary of Nepal, makes up 53% of the total cultivated area or 81% of the total irrigated farmlands in the country. Almost 70% of rice, 58% of wheat, and 59% of vegetables in the country were produced in the Terai plains[2] in 2011/12.

The Agriculture Perspective Plan (APP) of the Government of Nepal (GON) for the period 1995/96-2014/15 emphasizes the need for an increase in food crop production in the Terai plains by strengthening the year-round irrigation system, improving agricultural roads, enhancing farming technology, promoting effective agricultural extension, and strengthening the implementation mechanism of the local government.

However, previous political instability and internal conflicts, which ended in a general election for the Constituent Assembly in 2008, have hindered agricultural and irrigation development in Nepal. Improvement of agricultural productivity of the Terai plains is therefore one of the crucial issues in the agricultural development of the country as well as sustainable livelihood improvement in the rural areas.

Consequently, GON comes up with an agricultural development strategy which aims to improve agricultural productivity and profitability in the Terai plains.

A request for assistance for the 'Project for participatory small-scale irrigation development with borehole and shallow well' has been submitted to the Japan International Cooperation Agency (JICA) in 2011, following the emerging demands to support irrigation development in the Terai plains in 2009. In response to the request, JICA conducted the 'Study on Food Crop Production and Agriculture' followed by a supplemental study to analyze the potential needs for assistance and future approach. In 2012, GON submitted a proposal for a Technical Cooperation Project (TCP) entitled the 'Irrigated Agriculture Strengthening Project'.

1.2 Objective of the Preparatory Survey

The main objective of the preparatory survey (hereinafter referred to as the Survey) is to formulate JICA's cooperation program and to justify the TCP requested by GON in order to support irrigated agriculture development in the Terai plains, as specified under the APP, through document review, interview with stakeholders, field surveys, and data analysis.

[1] Agricultural Development Strategy: A brief, Surya Prasad Paudel TA Team, ADS Formulation 13 June 2011,Narayangarh
[2] Nepal Agriculture Statistics 2011/12, Ministry of Agriculture and Cooperatives

1.3 Technical and Operational Approaches to the Preparatory Survey

1.3.1 Technical Approach

(1) Reflection on the lessons learned from past and ongoing agricultural and irrigation development programs/projects

A lot of agricultural and irrigation development projects have been implemented in Nepal with the assistance of donor agencies such as the World Bank (WB), Asian Development Bank (ADB) and JICA. Meanwhile, some other projects are still ongoing.

It is crucial to understand the background, objectives, approaches, and impacts of the previous and ongoing projects, as well as to reflect on the lessons learned and issues identified from these experiences in formulating the strategic framework for mid-term irrigated agriculture development program and the proposed TCP.

Analysis of lessons and issues identified in previous similar programs/projects was made with categorization according to project scale and aid modalities, namely, technical cooperation, official development assistance (ODA) loan, and grant aid.

(2) Consistency with the policies and legislation of GON in the formulation of agricultural and irrigation development programs/projects

The GON has implemented irrigation and agricultural development projects to follow the objectives and strategies of the APP. However, sustainable improvement of agricultural productivity as well as increase in agricultural production cannot be achieved in the long run. In the long-term development program, namely the Agricultural Development Strategy (ADS), GON is discussing the new development objectives and strategies for irrigation and agricultural development in Nepal with technical assistance of donors. The existing and new irrigation policy is also being discussed to fit in the new agricultural development strategies.

These objectives and strategies of the new long-term development program and policies shall be taken into account during the Survey. These programs/projects shall be studied to attain consistency with the new agricultural development program and policies, through discussion and coordination among the different government agencies in addition to the analysis of the survey results.

(3) Identification of effective implementation approaches of the proposed TCP based on the studies of the irrigated agriculture development program

For the effective implementation of irrigated agriculture development in Terai, irrigated agriculture development program aiming at sustainable medium-term development, and effective implementation of the developed model shall be formulated, referring to the survey results on the agriculture development program in Terai such as constraints and development strategies of GON, the needs in the target area and its' societies, the issues and problems on irrigated agriculture in the target areas and sustainability of the implementation of the project

The proposed TCP aims at the establishment of an extension system of modern agricultural and irrigation technologies through the water users associations (WUAs) as intermediate agents. Accordingly, the analysis of issues and problems in the WUA's functions and situation are made focusing mainly on (i) motivation for registeration of membership, (ii) budget for operation and

mainteance (O&M) activities, and (iii) institutional management capacity. The medium-term program of ten years consists of three projects. The first of the three projects (referred to as "TCP") in response to GON's request is formulated. Furthermore, the relevance and effectiveness of the proposed TCP along with the medium-term irrigated agriculture development program are assessed.

In addition to the above, other aspects such as social context, political structure, and security situation are clarified to come up with effective development approaches for future projects.

1.3.2 Operational Approach

(1) Joint coordination meeting with the Joint Coordination Committee (JCC) of GON

Prior to the commencement of the Survey in Nepal, the JCC consisting of the Department of Irrigation (DOI), Department of Agriculture (DOA), and National Agriculture Research Council (NARC) was established at the central level as the counterpart agency for the implementation of the Survey. The kickoff meeting was held on April 5, 2013 to explain and discuss the inception report of the Survey.

A total of four joint coordination meetings were held during the field works of the Survey in Nepal including the kickoff meeting to explain and discuss the draft interim report at the end of the first Survey and at the beginning and end of the second Survey.

The minutes of the joint coordination meetings are shown in Supporting Data A.

(2) Meetings and exchanges of project information with other donor agencies

Meetings with other donors, especially ADB, and technical consultant teams belonging to the ongoing irrigated agriculture development projects under donor assistance were also held in order to exchange project information and to learn past operational experiences in projects in Nepal.

(3) Execution of the field surveys using the contracted Nepalese consultants

In line with the field survey carried out by the JICA Survey Team, other sample surveys on agriculture and relevant sectors, such as i) farm household survey, ii) sample survey on water management and WUAs, iii) sample survey on agricultural activities, agricultural distribution, input supply system, and marketing, and iv) sample survey on agricultural market, were carried out by the Nepalese consulting firms in the four target districts for two months from early April to June 2013.

The sample surveys were conducted in 16 irrigation project areas, which vary geographically, economically, and socially, for the subjects on water management and WUAs; and in 12 villages in the 16 irrigation project areas for the subjects on agricultural activities, agricultural distribution, input supply system, and marketing. Household surveys were conducted in 120 households (HH) (30 HH in each district) that were randomly selected in the villages.

The outline, method, and schedule of the Sample Survey entrusted to the Nepalese Consultant are summarized in SP-G-1, and the Survey report was submitted to JICA separately.

(4) Assignment of Nepalese experts

Nepalese experts with comprehensive knowledge and extensive work experience on irrigated agriculture in the Terai plains were assigned during the Survey in Nepal.

1.4 Methodology and Work Plan of the Preparatory Survey

1.4.1 Methodology

The targets of the Survey included the relevant government agencies at the central and local levels, and other donor agencies as mentioned below.

(1) Government agencies in Nepal and other donor agencies

General information, data, and documents on agricultural and rural development were collected from relevant organizations to understand the present situation of irrigated agriculture in Nepal. Furthermore, discussions and interviews with the officers in charge of the organizations have been carried out to identify the advantages and constraints faced by past project implementation.

The target interviewees included DOI, DOA, and NARC at the central level, the District Development Committee (DDC) of the four target districts of the Terai plains, and the Village Development Committee (VDC) of the concerned villages.

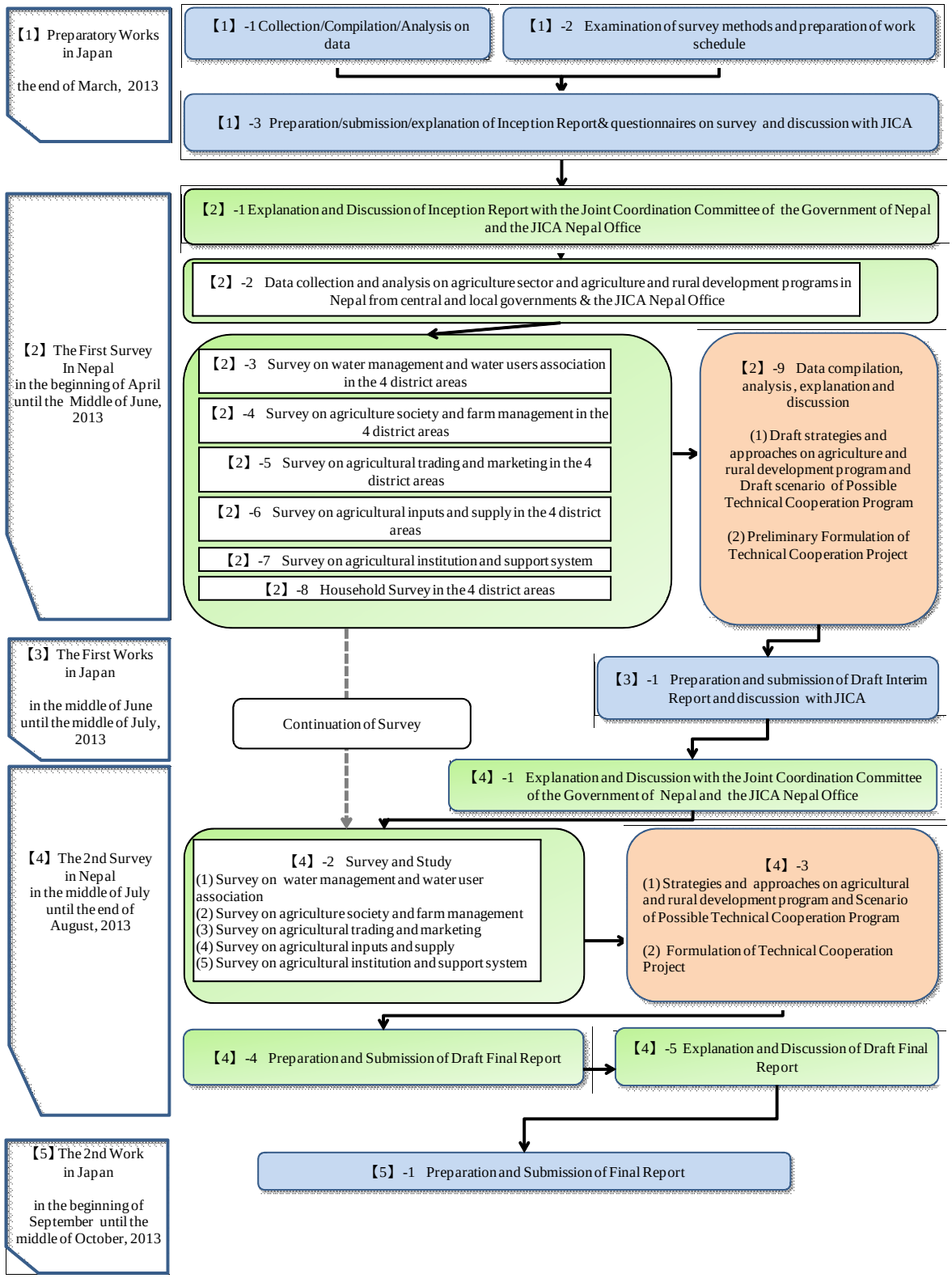
Regarding the proposed TCP, related information and official documents were acquired from DOI and other relevant government agencies.

(2) Target districts

The target districts, which are located in the Terai plains, are: (i) Jhapa, (ii) Morang, (iii) Dhanusha, and (iv) Mahottari. The target districts are specifically focused on the project sites and surrounding areas of the ongoing Medium Irrigation Project (MIP) of DOI, the Community Managed Irrigated Agriculture Sector Project (CMIASP) of ADB, and the Integrated Crop and Water Management Program (ICWMP) of GON. Sample surveys with focus group discussions (with ten sample groups) and a farm household survey (sample of 120 households) were conducted in these target areas focusing on the survey components of irrigation, agriculture, water management, WUA, farming, trade and marketing, farmer's support system, and other relevant issues.

1.4.2 Work Flow

The work flow of the major activities carried out in the Survey is illustrated in Figure 1.4.1 below.



Source: JICA Survey Team

Figure 1.4.1 Work Flow of the Survey

1.4.3 Work Schedule

The Survey is executed for seven months from the end of March until the end of October 2013. Figure 1.4.2 shows the work schedule and major activities of the Survey.

Activities		YR 2013							
		Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.
1. Preparatory Works in Japan (End of March 2013)									
(1)	Collection/compilation/analysis of existing data								
(2)	Examination of survey methods and preparation of work schedule								
(3)	Preparation/submission/explanation of the inception report and discussion with JICA								
2. First Field Survey Works in Nepal (Early April to mid June 2013)									
(1)	Explanation and discussion of the inception report with the Joint Coordination Committee of the Government of Nepal and the JICA Nepal Office								
(2)	Data collection and analysis on agricultural sector and agriculture and rural development programs/projects in Nepal and Terai plains								
(3)	Survey on the water management and water users associations in target districts								
(4)	Survey on the agricultural farm management in target districts								
(5)	Survey on the agricultural training and marketing in target districts								
(6)	Survey on the agricultural inputs and supply								
(7)	Survey on agriculture institution and support system								
(8)	Farm household survey in target districts								
(9)	Data collection, analysis, explanation and discussion for the draft interim report								
3. First Home Works in Japan (Mid June to mid July 2013)									
(1)	Preparation and submission of the draft interim report and discussion with JICA								
4. Second Field Survey Works in Nepal (Mid July to end of August 2013)									
(1)	Explanation and discussion of the interim report with the Joint Coordination Committee and the JICA Nepal office.								
(2)	Supplemental field survey by the survey team								
(3)	Strategies and approaches on agriculture and rural development cooperation program and formulation of technical cooperation project								
(4)	Preparation and submission of the preliminary draft final report								
(5)	Presentation of and discussion on the preliminary draft final report								
5. Second Home Works in Japan (Early September to mid October 2013)									
(1)	Preparation and submission of the draft final report								
(2)	Preparation and submission of the final report								
	Submission of Reports		Inception Report		Interim Report		Draft Final Report		Final Report

Source: JICA Survey Team

Figure 1.4.2 Work Schedule of the Survey

CHAPTER 2 DEVELOPMENT POLICIES AND LEGISLATION ON AGRICULTURE AND IRRIGATION SECTORS

2.1 Policies and Development Plans of Agriculture and Irrigation Sectors

2.1.1 General

The Government of Nepal (GON) has development plans, vision, and strategies covering various agriculture and irrigation subsectors in Nepal. The following plans, vision and strategies are closely related to the preparation of a directive formulation of irrigated agriculture development in Terai:

(i) Agriculture Perspective Plan (APP) (1995/96-2014/15), (ii) Agriculture Development Strategy (ADS), (iii) Water Resource Strategy 2002, (iv) National Water Plan 2005, (v) National Seed Vision (2015-2025), and (vi) the Three-Year Plan and the Thirteenth Three-Year Plan.

Out of the plans, vision, and strategies mentioned above, GON has other policies, acts, and legislations related to the formulation of an irrigated agriculture development plan. Table 2.1.1 broadly shows the framework of these plans, vision, strategies, and legislation.

Table 2.1.1 Major Plans and Legislations of the Agriculture and Irrigation Sectors in Nepal

Description	Plan and Vision	Policy, Act, and Legislation
Agriculture Sector Ministry of Agriculture (MOA)	Agriculture Perspective Plan (1995/96-2014/15)	National Agriculture Policy 2004
	Agriculture Development Strategy (under preparation)	National Seeds Policy 2000
	National Seed Vision (2013-2025)	Agribusiness Promotion Policy, 2006
		Nepal Agriculture Extension Strategy (NAES), 2007
		NARC's Strategic Vision for Agricultural Research (2011-2030)
Irrigation Sector Ministry of Irrigation (MOI)	Water Resource Strategy 2002	Water Law 1853 Nepal
	National Water Plan 2005	Irrigation Regulation (1989/2000)
		Irrigation Policy (1992/1997/2003/2013)

Source: JICA Survey Team

The plans, vision, and strategies are discussed below.

In addition, other policies, strategies, and acts of the agriculture and irrigation sectors, of which have some relevant to the formulation of an irrigated agriculture development, are also shown in the supporting data (SP-B-1 to SP-B-4), including the Three-Year Interim Plan (TYP) by the Planning Commission of the Government of Nepal (2007/2008-2009/10).

2.1.2 General Trend of Development Policies and Plans

The general trend of the policies and development plans in the agriculture and irrigation sectors of Nepal is described below.

The Agriculture Perspective Plan (APP), which is aimed at 20-year agricultural development (1995-2014), was studied in 1995 with technical assistance from the Asian Development Bank (ADB), and the study resulted in the establishment of the National Support Committee (NSC) under the National Planning Committee (NPC). The policies, objectives, and strategies of the APP were incorporated in the Ninth Five-Year Plan (1997/98-2001/02) and principally endorsed to the Agriculture Sector Development on the National Development Plan after 2001/02.

On the other hand, the Water Resource Strategy 2002 was enacted and has incorporated strategic objectives of irrigation development, such as the enhancement of integrated development, year-round irrigation with intensification and diversification development of agriculture, capacity building of local human resources in planning, implementation, and management of irrigation, etc., in order to contribute in achieving the national development goals.

While in the irrigation sector, the National Water Plan 2005 emphasizes the strategies to promote the strategic objectives of the Water Resource Strategy 2002.

In 2007, the Implementation Status Study of the United Kingdom Department for International Development (UK DFID) was made with technical assistance from ADB. Recommendations to give more flexibility to the APP were issued. The strategies and approaches recommended by the study were incorporated in the Three-Year Interim Plan and endorsed to the Three-Year Plan (2010/11–2012/13) and the Thirteenth Three-Year Plan (2013/14–2015/06).

ADS was made with technical assistance from ADB and other donors to provide the development vision following the APP, based on the review and assessment of development progress in the agriculture sector.

Recently, GON has enacted the National Seed Vision (2013–2025), which was prepared for the enhancement of ensured availability of improved crop varieties and seed quality by the Ministry of Agricultural Development (MOAD) with the assistance from the Swiss Agency for Development and Cooperation (SDC), in order to increase agricultural production and enhancement of food security.

As mentioned above, the national policies and strategic approaches of the agricultural development plans are always influenced and gradually improved by the recommendations and proposals of the studies with technical assistance from donors.

2.1.3 Agriculture Perspective Plan (APP: 1995/96- 2014/2015)

The APP is a long-term plan spanning 20 years, and is the most comprehensive plan for agricultural and rural development. It covers diverse subsectors of agricultural and rural development including agriculture, irrigation and water control, livestock, horticulture, high value and low volume commodities, forestry, agribusiness, credit, agricultural roads, gender issues, power, and environment. The objectives of the APP are poverty alleviation and food security by accelerating primarily the agricultural growth of the nation.

The particular objectives of APP are as follows:

- Accelerate agricultural growth rate through increased factor productivity;

- Alleviate poverty and achieve significant improvements in the standard of living through accelerated growth and expanded employment opportunities;
- Transform subsistence agriculture into commercial agriculture with diversification of crops and inclusion of comparative advantage;
- Expand economic transformation opportunities by fulfilling the preconditions for agricultural development;
- Identify immediate-, short-, and long-term strategies for implementation; and
- Provide guidelines in preparing periodic plans and programs in the future.

The APP targets an agricultural gross domestic product (AGDP) growth rate of 4.9% per annum, and a reduced poverty incidence of 14% in the rural area by 2015.

For successful achievement of the objectives, the following strategies are provided:

- Accelerated economic growth through technology guided agricultural development,
- Agricultural growth creating production demand with multiplier effects on all sectors of the national economy,
- Higher employment growth as a mechanism of attaining the social objectives,
- Public policy and investment focusing on a small number of priorities building on past investment in human capital and physical infrastructures and institutions,
- A package approach to development specific to the Terai hills and mountains that would recognize the powerful complementarity of public and private investments in order to ensure their coordination, and
- Broader participation of key stakeholders that ensures regional balance and involvement of women.

The APP emphasizes demand-driven commercialization with green revolution approach in agricultural modernization in Terai, as well as horticulture, livestock, and high value commodities in hills and mountains with well-coordinated production and marketing systems. It specifically includes irrigation system using Shallow Tube Wells (STWs) as a strategy of promoting green revolution in Terai.

The APP received the backing of all governments as well as political parties, forming the backbone of the Ninth Plan (1997/98–2001/02), and the Tenth Plan (2002/03–2007/08). It continues to be the guiding document thereafter the periodical plans and national agricultural policies and programs.

However, the implementation of the APP has been restricted due to national capacity, resource constraints, lack of awareness, misinterpretation, and change of national political context. The targets of the APP could not be achieved through accelerated agricultural growth only.

In 2006, a review study on the implementation status of APP was made with the support of the UK DFID in order to identify areas of concerns to be focused in the APP implementation plan. The following suggestions were given:

- Remove long-term rigid targets on priority inputs and develop a three- to five- year rolling plan that would provide flexibility in developing a needs based plan over time.
- Eliminate trickle-down growth model and reduce excessive public sector leadership in the design and implementation of plan, and develop broad-based equitable growth model on the principles of sustainable livelihood and sector-wise approach with decentralized planning and service delivery.

- Retain the positive facets of the APP such as cross-sectoral model or inter-ministerial approach, coordinated approach and prioritization concept of implementation.
- Develop conflict-sensitive development strategies including risk reduction components.
- Include labor concerns and mechanization of agriculture with trade dimension in agricultural production and marketing.

2.1.4 Agricultural Development Strategy (ADS)

(1) Background and Purpose

Over the past 16 years and at the termination point of the APP in 2014, the nation has observed the following: (i) slow agricultural growth, (ii) diverse domestic issues such as new political context, social inclusion, out-migration of youth, low agricultural productivity, agricultural trade deficit, limited human resources capacity, and declining government investment in the agriculture sector[1], and (iii) various international contexts such as unstable and increasing food prices, climate change, and rapidly growing regional markets.

It was increasingly perceived by the different stakeholders of GON and the society at large that the initial formulation of the APP required revision in view of several factors such as: (i) a new national and international context; (ii) a general perception that the APP had not been successful in achieving its main targets; and (iii) practical matter of the validity period of the APP (1995-2014) approaching its end; and (iv) the need of a new long-term strategy.

In this context, ADB along with several other donors as well as the MOAD has prepared the Agricultural Development Strategy (ADS), for accelerating agricultural growth for the next 20 years after the APP.

(2) Vision of ADS

The vision of ADS is to have "a self-reliant, sustainable, competitive, and inclusive agriculture sector that drives economic growth and contributes to improved livelihood and food and nutrition security."

Four strategic components related to (i) governance, (ii) productivity, (iii) profitable commercialization, and (iv) competitiveness are emphasized with social development, natural resources development and economic sustainability, development of private and cooperative sectors, and connectivity to market infrastructure, information system and power infrastructure to accelerate agricultural growth.

The ADS also emphasizes the improvement of food and nutrition security, poverty alleviation, surplus import of agricultural crops and inputs, and difference of farmer's income.

The ADS attempts to attain the following targets: a) lowering rural poverty from 35% to 10%; b) reducing food poverty from 16% to 1%, and c) two-fold increase in annual AGDP growth rate from the current 3% growth.

[1] The ADS assessment report clearly describes the declining investment from government and donors in both the research and extension subsectors of the agriculture sector. Donor support in agriculture declined after 2002/03. This period also coincides with ten years of political conflict and insecurity in the nation.

The ADS proposes new mechanisms to improve the implementation as well as relies on building the existing government mechanisms. Moreover, the ADS enhances partnership among key stakeholders, such as the NPC, MOAD, other related agencies, farmer organizations, cooperative organizations, and private sector organizations.

The ADS proposes four new institutions, namely, the ADS Commission, Coordination Committees, ADS Implementation Support Unit, and ADS Implementation Trust Fund for the implementation of prioritized national programs as mentioned below.

- Food and Nutrition Security Program
- Decentralized Science, Technology, and Education Program
- Value Chain Development Program
- Innovation and Agro-entrepreneurship Program
- Core Programs

The Core Programs are the existing programs already implemented by the government agencies at the ministry level or department level. The activities in the Core Program are primarily to support the continuation of existing program activities in agriculture, irrigation, rural roads, subsidy, etc., and plans of the agencies.

However, the ADS is not yet endorsed and implemented by GON.

2.1.5 Water Resource Strategy 2002

The Water Resource Strategy 2002 aims to support the achievement of the national development goals through water resources development.

(1) Objectives/Targets

The enhancement of a sustainable and efficient irrigation system is emphasized, focusing on rural economic development, food security, rural employment, and prosperity of individual farmers.

(2) Strategies and Approaches

The following approaches are emphasized:

- To integrate irrigation planning and management in agricultural development.
- To improve management of existing irrigation systems.
- To improve planning and implementation of new irrigation systems.
- To develop year-round irrigation in order to support the intensification and diversification of agriculture.
- To strengthen local capacity in planning, implementation, and management of irrigation.
- To encourage land consolidation in order to enhance irrigation efficiency and agricultural production.
- To improve groundwater development and management.

The projects will then be selected and developed, taking into consideration sustainable agricultural development.

The approaches mentioned above aim for the enhancement of a partnership among the Ministry of Agriculture and Cooperatives (MOAC), the Department of Irrigation (DOI), and individual water users associations (WUAs) for institutional development, agricultural development, such as crop intensification and diversification for farmers, and cooperation development in transferring of information on integrated water management, and maintenance works of facilities in the same basin base.

The approaches also emphasize that district agencies or groups of districts are assigned responsible organizations in sponsoring irrigation development and jointly coordinate water allocation and management. These approaches aim to enhance local ownership and agriculture productivity as well as sustainability in selected irrigation projects through strengthening of local human resources in planning, implementation, and management.

2.1.6 National Water Plan 2005

The National Water Plan 2005 (NWP) was prepared to enhance the strategic objectives of the Water Resource Strategy 2002, and was subsequently approved by GON in January 2002.

The NWP includes programs in all strategically identified output activities so that these programs, in consonance with each other, will contribute in maximizing the sustainable benefits of water use.

The NWP emphasizes on integrated, optimized, and effective water use through river basin management.

The integrated water resource management is defined as a process to strengthen the coordinated water resources development and management among water, land, and related resources without compromising the sustainability of vital ecosystems.

(1) Objectives/Targets

The objective of the NWP is to contribute to the overall national goals of economic development, poverty alleviation, food security, public health and safety, decent standards of living for the people and protection of the natural environment in a balanced manner.

(2) Strategies and Approaches

The NWP emphasizes the strategies on integration, coordination, decentralization, popular participation, and implementation of water-related programs within the framework of good governance, equitable distribution, and sustainable development

In view of the availability of human and financial resources, the constraints on building the institutional capacity and progress, as well as the development targets for the irrigation subsector, such as year-round irrigation area, irrigation efficiency, crop yield, cropping intensity and irrigation service contribution collection have been revised in view of the medium-term development base figures and targets set in 2017 and 2027 as shown in the Table 2.1.2.

Table 2.1.2 Targets of the Irrigation Subsector in the NWP

Targets	2007	2017	2017
Year-round irrigation	49% of the total irrigated area	64% of the total irrigated area	67% of the total irrigated area
Average cereal yield in irrigated area	By 15% over the 2001 level	By 28% over the 2001 level	By 44% over the 2001 level
Average cropping intensity	More than 140% in year-round irrigated areas	More than 164% in year-round irrigated areas	More than 193% in year-round irrigated areas
Average cropping intensity of cereal crops	More than 126%	More than 134%	More than 143%
Overall cropping intensity	More than 160%	More than 170%	More than 200%
Development of the potential area	71%	81%	97%
Irrigation efficiency	35%	45%	50%
Irrigation service contribution collection	By 30% of the O&M cost	By 45% of the O&M cost	By 75% of the O&M cost

Source: National Water Plan 2005

The strategies and approaches of the NWP are closely related to development strategies in program formulation of irrigated agriculture development in Terai, especially, in the extension of year-round irrigation system and crop intensity, irrigation efficiency, and irrigation service.

(3) Approaches of NWP

Approaches of irrigation sub-sector are broadly categorized into three terms i.e. short-term, medium-term, and long-term and executed accordingly. Five key approaches are respectively compiled into the each different term programs.

(i) Short term:

To support farmers' cropping decisions and to cooperate in water management and O&M scheme.

(ii) Medium term:

To provide reliable irrigation services and to assist in efficient planning of new irrigation schemes, including those for expanding areas with multi-purpose uses.

(iii) Long term:

To ensure the availability of efficient, reliable and sustainable irrigation systems to all irrigated areas.

The five key approaches and prospective activities are as shown below.

(a) To Prepare an Integrated Program for Irrigated Agriculture Development

- Implementation of groundwater projects in new areas
- Implementation of crop intensification and diversification in irrigated areas
- Formulation of pilot project with voluntary land consolidation
- Strengthening market improvement system

(b) To Improve System Management of the Existing Irrigation Schemes

- Conjunctive use of surface and groundwater programs in the existing C Irrigation Projects in the Terai

- Rehabilitation of FMISs and AMISs
- Transfer of management WUAs in rehabilitation of AMISs
- Farm management development in the existing AMISs to increase cropping intensity
- Adequate drainage system program in water-logged and inundated areas
- On-station research and on-farm water management pilot program
- Raising Irrigation Service Fees (ISF) in joint managed/AMISs as per the Irrigation Policy of 2003
- On-farm water management in farmers' schemes through participation of the beneficiaries
- Irrigation water delivery in volumetric basis system in some pilot schemes where WUAs are involved.

(c) To Improve Planning and Implementation of New Irrigation Systems

- New Surface Water (SW) and Groundwater (GW) irrigations projects in the hill areas and Terai
- Expansion of micro-irrigation such as drip irrigation system with water harvesting facilities, sprinkler system, and treadle pumps, for small farmers
- New multipurpose irrigation projects with a hydroelectric generation component, groundwater exploration and investigation to support new GW projects
- Improvement of quality control in construction activities as well as work standards

(d) To Strengthen Capacity of Local Level Institutions and Their Project Implementation Ability

- Irrigation management training to stakeholders
- Digital mapping of all irrigated areas
- Capacity-building program of local government institutions

(e) National Capacity Building of Farmers

- Establishment of a Water and Land Management Institute under an agricultural institution
- Regular training for farmer functionaries at different levels

(4) Achievement

(i) Initiating the Non-conventional Irrigation Technology Project

DOI has implemented the Non-conventional Irrigation Technology Project (NITP) for more than 85 schemes with irrigation area of over 1,800 ha since 2003.

(ii) Development of the Potential Area.

DOI has implemented irrigation development projects and achieved supplying irrigation to the area size of 1,311,000 ha, equivalent to approximately 74 % of the potential irrigated area (1,765,840 ha)

(iii) Increase in Cropping Intensity

Both shallow and deep tube wells contribute to supplement irrigation water in the monsoon season, and cropping intensity at progressive development of DTW improved by over 200%.

For example, the Dekawr group in Rupandehi district reports that crop intensity is 100% of paddy in summer, 100% wheat or maize in winter, and around 50% cowpea, maize and green gram in spring for a total cropping intensity of 250%: it is one of the best managed DTWs in the Terai (Irrigated Agricultural and Water Resource Assessment Report 1 May 2012).

(iv) Irrigation Service Fee Collection

DOI has been working more efficiently to collect ISF, in cases of large projects such as IWRMP. The collection achievement ratio of ISF has been the range of 40-50 % of O&M cost.

(v) Increase in Crop Yield

The national average yield of cereal crop have increased to 3.44 ton/ha from 2.47 ton/ha for improved varieties of paddy and over 2.04 ton/ha from 1.95 ton/ha of wheat in irrigated areas (Data source: Irrigation Annual booklet 2009/10, DOI).

(vi) Irrigation Efficiency

Although quantitative assessment of irrigation efficiency has not been carried out, the DOI is taking a strategy to enhance on-farm irrigation water management based on the participation of WUAs to improving and increasing irrigation efficiency such as implementation of CMIASP and IWRMP through ICWMP programs.

2.1.7 National Seed Vision (2013-2025)

The Seed Sector Development Strategy (Seed Vision 2013-2025) has been prepared to address the need of the seed sector to assure availability of improved crop varieties and seed quality at the request of the National Seed Board (NSB), MOAD, with financial assistance from SDC.

(1) Objectives/Targets

The National Seed Vision aims for the enhancement of crop productivity, high income, and employment generation through the achievement of self-sufficiency and export promotion of high quality seeds.

The framework of the vision are as follows; variety development and maintenance, seed multiplication, seed processing and conditioning, seed marketing and seed use.

The seed vision envisages doubling the number of location specific improved varieties and increasing the seed replacement rate at least up to 25% for cereals and over 90% for vegetable crops. It is expected that public and private seed laboratories will be strengthened to test and analyze seed samples.

The vision also emphasizes partnership with the private sector in seed production specifically in Terai, as well as market accessibility to community sectors such as farmers group and cooperatives in rural areas, particularly in the remote areas i.e., hills and mountainous regions.

(2) Strategies and Approaches

The seed vision proposes five strategies in one overarching direction:

- Strengthen varietal development, release and maintenance breeding using diverse gene pool both from local and exotic sources;
- Support public, community, and private enterprises in seed multiplication, processing, and conditioning through efficient seed quality services;

- Enhance marketing skills of seed entrepreneurs and invest in seed related infrastructure;
- Promote the use of quality seeds by diversifying farmers' choice including the use of local genetic resources; and
- Create an enabling environment by developing efficient and effective public, community and private seed related organizations with a healthy business culture.

The national seed policy does not specify any approach in the document. However, the seed policy, legislation, and regulation are the major policy frameworks that must be followed by the public and private sectors involved in seed business. Through these seed activities of the agencies and private sector concerned, major achievements on seed are shown below.

- A total of 232 crop varieties of cereals, grain legumes, vegetables, and other crops have been released in 2010. Similarly, more than 250 crop varieties have been registered of which more than 225 are hybrids of rice, maize, and vegetables. Vegetables dominate the list of hybrids.
- National seed balance is prepared based on the annual national seed supply and demand situation. In seed multiplication, the role of the private and community sectors are increasing. District Level Seed Self Sufficiency Program (DISSPRO), Commercial Seed Multiplication Program, Community Seed Bank (CSB) as well as many Community-Based Seed Production (CBSP) programs of the government and donor funded projects are also involved in multiplying seeds of food and vegetable crops.
- The quantity of certified/improved seed production of food and vegetable crops by formal sector was 37,320 t in 2010.
- Private sector handles more than 90% of the formal vegetable seed trade and supplies significant amount of hybrid seeds of maize, rice, and vegetables. Altogether, there are 17 seed laboratories established in different parts of the country by public and private sectors.
- The current seed storage capacity is estimated to be about 11,000 t, of which 8,700 t is with the government-owned National Seed Company Limited, and 2,300 t is with the private sector and other public agencies.
- Vegetable seed is mostly marketed by traders and agro-vets. Over 1,854 seed entrepreneurs and 829 trained seed traders were registered with the NSB until 2010.

2.1.8 Policies and Strategies on Agricultural Development in the Three-Year Plans and the New Three-Year Plan

(1) Agriculture Sector Development

The significant role of the agriculture sector has been realized in since the inception of the First Five-Year Plan, and the agriculture sector has been identified as the prioritized sector with high potential to contribute to the national economic growth. However, investment in agriculture has not been proportionately allocated to match with the order of priority on contribution to national development.

Until the Eighth Five-Year Plan (1992/93- 1996/97), resource allocation remained above 25% for the agriculture and related sectors. The relative share of investment to the agriculture sector started declining from the Ninth Five-Year plan (1997/98-2001/02) onwards.

The review of periodical plans indicated that the annual growth rate of the agriculture sector in terms of AGDP was 2.7% in the 1990s, whereas it rose up to 2.8% per annum in 2001 to 2006. The highest growth rate, which reached 4.7%, was recorded in 2006/07.

After the successful People's Movement 2006, the two three-year plans, namely, the Three-Year Interim Plan 2007/08-2009/10 (TYIP) and the Three-Year Plan 2010/11-2012/13 (TYP) have been implemented. Furthermore, the Three-Year Plan 2013/14-2015/16, also known as the Thirteenth Three-Year Plan (13th TYP) will be newly implemented.

The agriculture sector development plans of the TYP and the 13th TYP are summarized below.

(i) Agriculture Sector Development of the TYP

The major challenges of the agriculture sector include low agricultural production and productivity, changing monsoon rainfall pattern, climate change, inadequate irrigation facility, less utilization of appropriate technology, less accessibility of farmers in the markets, widening gap between research and extension in agriculture, and inadequate development of agro-industry.

Despite these problems, good prospects for agriculture were visualized that could contribute to the national economy. In this backdrop, the TYP was developed in line with the APP and the National Agriculture Policy (2005).

(a) Objectives

- To enhance food and nutritional security, employment generation and poverty reduction and balance of trade by means of its modernization and commercialization considering the agriculture sector as the backbone of the national economy.
- To improve economic status of rural people by increasing the production and productivity of agricultural and livestock commodities in line with the requirements of farmers and other stakeholders.

(b) Strategy

Efforts will be centered toward ensuring food and nutritional requirements by enhancing agricultural productivity through commercialization of agricultural and livestock commodities and development of rural infrastructure. The following strategies were emphasized:

- To enhance competitive capacity by making improved breed livestock easily available, and reducing the cost of livestock production.
- To carry out effective quality control, monitoring, and regulation of agricultural food and livestock commodities.
- To develop climate change resilience technology, and to disseminate conservation, promotion, and utilization of agricultural biodiversity.
- To encourage organic agriculture.
- To coordinate research, extension, and education.
- To encourage contract farming and cooperative farming.
- To develop and extend the agricultural market.

In the review of the TYP, it was evaluated that the agriculture sector targeted to achieve an AGDP

growth rate of 3.6% per annum. However, the growth rate remained at 3.3% in the plan period, because of labor shortage, increased agricultural land use for non-agricultural purposes, negative effect of climate change in agriculture, timely unavailability of agricultural inputs, land fragmentation, poor access to knowledge and technologies, limited commercialization and competitiveness, and inadequate market-oriented agricultural production system.

The contribution of the agriculture sector to the GDP at the end of the interim plan was at 33.5%. Overall, the share of the agriculture sector has been declining in the national economy.

Table 2.1.3 Achievements in the Agriculture Sector in the TYP

Agricultural Products	Targets at the End of TYP (1,000 MT)	Production Situation in FY 2012/13 (1,000 MT)	Achievement (%)
Cereals	9,633	8,738	90.7
Grain legumes	377	Not reported in 13th TYP (NR)	NA
Fruits	775	1,087	NA
Potato	2757	(NR)	NA
Vegetables	3601	(NR)	NA
Milk	1605	(NR)	NA
Meat	329	(NR)	NA

Note: NR: not reported in TYP; NA: Not applicable
Source: 13th TYP

(ii) Agriculture Sector Development of the 13th TYP

Considering the achievements of the TYP, the following objectives are emphasized in the 13th TYP:

- To increase agricultural and livestock production and improve its productivity.
- To create agricultural and livestock production systems into commercial and competitive systems.
- To minimize the negative effects of climate change by generating and disseminating environment-friendly agricultural technologies.
- To conserve, rejuvenate, and sustainably use agro-biodiversity.

(2) Irrigation Sector Development

Potential irrigable areas under surface and groundwater sources are estimated at approximately 1,7666,00 ha of arable land. These areas are limited due to rugged topography and land form.

Taking into consideration the limited potential irrigable area, it is significantly important to develop an irrigation system that would sustain and maintain food security in the future. On-farm development is also one of the essential activities in irrigation development in Nepal in order to boost food security.

Under these conditions, the TYP and the 13th TYP emphasize the following objectives and strategies on irrigation development:

(i) Irrigation Sector Development of the TYP

The irrigation facility is available to 1.2 million ha of land, of which approximately 68% is of potential area. The irrigation facilities suffered malfunction for water delivery and/or irrigation, and water resources for irrigation are not always available for year-round irrigation. Consequently, the achievements have not attained the target objectives of the TYP due to issues and problems of

institutional water management and maintenance works of irrigation facilities.

The major problems are as follows: lack of collaborated efforts to carry out programs of agriculture in coordination with irrigation and water-induced prevention control, lack of availability of irrigation water throughout the year in the project site, and inadequate repair and maintenance.

Considering these problems, the following objectives had been set forth for the TYP:

- To establish an efficient, sustainable, effective, and reliable irrigation system in agricultural lands and to enhance year-round irrigation.
- To preserve human settlements and agricultural lands as well as constructed infrastructure that could be affected by water-induced disaster.

The following strategies are emphasized in order to achieve the objectives of the TYP:

- To expedite the programs related to small- and medium-surface irrigation and groundwater irrigation projects which provide immediate returns and create employment.
- To enhance irrigation programs which are being executed under multipurpose water resources development in order to increase agricultural production, alleviate poverty, and generate employment.
- To maintain coordination with agencies working for irrigation and water-induced disaster control.
- To ensure efficient and effective management and sustainable operation through regular maintenance of the completed irrigation system.
- To make construction as well as operation and maintenance sustainable, effective, and economical in the executing organizations of flood control and irrigation projects.
- To undertake study, research, design, and implementation of environmental assessment, climate change adaptation measures, and employment generating activities.
- To conduct projects in tune with cost recovery system by making the function of irrigation facilities sustainable and reliable.
- To implement special programs for lakes and watershed areas, which are water sources for irrigation development.

During the period of the TYP, irrigation facilities were constructed in agricultural land covering 83,542 ha including rehabilitation of farmer managed irrigation systems (24,058 ha) and non conventional irrigation systems (1,188 ha) which is from the regular program of the DOI. A total of 131,100 ha of agricultural land was irrigable, of which 36% of the said area received the year-round irrigation facilities.

However, issues and problems still exist in the irrigation sector, such as inadequate availability of water resources, insufficient repair and maintenance of irrigation infrastructure, weak water management, inadequate collection of water service fees or ISF, and inadequate institutional capacities.

The achievements are given in Table 2.1.4.

Table 2.1.4 Achievements in the Irrigation Sector during the TYP Period

No	Program	Unit	Target of the TYP	Achievement of the TYP	Achievement in Percentage
Construction					
1	Surface Irrigation Project	ha	36,650	15,616	43
2	Groundwater Irrigation Project	ha	162,075	42,680	26
	Sub total	ha	198,725	58,296	69
Rehabilitation					
3	Farmer Managed Irrigation System (FMIS)	ha	NA	24.058	NA
4	Non Conventional Irrigation System	ha	NA	1,188	NA
	Subtotal	ha	NA	25,246	NA
Total		ha	198,725	83,542	69

Note: NA: Not applicable
Source: 13th TYP and Handbook of DOI, 2012/13.

(ii) Irrigation Sector Development of the 13th TYP

Considering the achievement status of the TYP, the objectives of the 13th TYP were set up in order to use available water resources effectively through integrated water resources development and sustainable irrigation development.

The proposed strategies for the 13th TYP are listed as follows:

- To implement with high priority small- or medium-surface and underground irrigation projects that produce immediate results and generate employment.
- To avail year-round irrigation facilities by implementing irrigation programs under a multipurpose water reservoir and watershed based inter transbasin water resources project.
- To coordinate with relevant stakeholders and interrelated programs during project implementation.
- To establish efficient user groups for sustainable, effective, and efficient management and implementation after regular and updated maintenance of irrigation systems of completed projects.
- To undertake study, research, design, and implement irrigation structure development, and projects implementing environmental assessment, climate change adaptation measures, and employment generating activities.
- To establish sustainable and reliable irrigation services, implement projects through collection of water service fees from water users groups in order to cover maintenance and implementation costs.
- To implement irrigation development programs in coordination with relevant institutions and conserve and rehabilitate locally available water reservoirs, ponds, wetlands, and natural springs.

The 13th TYP aims to add 176,275 ha of irrigable area through the development of irrigation facilities, and to attain the overall target irrigation area of 1,487,275 ha in Nepal.

2.2 Policies and Legislation on the Agriculture and Irrigation Sectors

2.2.1 Major Policies and Legislation on the Agriculture Sector

(1) National Agriculture Policy (NAP), 2004

Considering the diverse problems, challenges, and opportunities in the agriculture sector, national commitment to international treaties and agreements, i.e., sustainable development agenda, millennium development goals, and agriculture perspective plan, need to respond to people's increased expectations through agriculture. The GON promulgated the NAP in 2004. The vision of the NAP is to improve national living standards through sustainable agricultural development and by transforming a subsistence agricultural system into a commercial and competitive sector. Focused on high and sustainable economic growth and commercial and competitive agricultural systems that ensure food security and poverty alleviation, the following three objectives for the agriculture sector were set:

- To increase agricultural production and productivity;
- To make Nepalese agriculture competitive with regional and international markets by developing bases of commercial and competitive agricultural systems; and
- To properly conserve, promote, and utilize natural resources, the environment, and biodiversity.

The NAP emphasizes the supply of main production inputs, i.e., seeds, fertilizers, and breeds of livestock, based on market demand. It also encourages the use of hybrid seeds, as well as production and use of improved breeds of livestock. The policy proposes to regulate the use of genetically modified organisms.

The policy intends to classify farmers as either rich or poor in resources, and support them accordingly. In particular, the policy commits to provide subsidies and support to marginal and poor farmers who own less than 0.5 ha of land. The policy is committed to provide tax write-off facilities to private and non-government organizations (NGOs) when spending on agricultural research and development.

(2) National Seeds Policy 2000

Effective distribution of high quality seeds is fundamental in achieving the target of increased agricultural production. Easy access of farmers to quality seeds is still a challenge. The Seed Act (1988) and the Seeds Rules (1998) have already been promulgated in order for farmers to avail quality seeds and to make necessary arrangements for production, processing, and testing of seeds.

The objectives of the policy are:

- To make it easy to acquire quality seeds of different crops in required quantities, as well as to produce and promote exportation of quality seeds,
- To establish an effective seed business in existing world markets, and
- To conserve indigenous genetic resources and coordinate with concerned agencies to ensure national rights over the resources.

The policy considers seven prime areas for the growth of the seed sector ensuring adequacy of quality seeds, reliable market, and appropriate monitoring and regulation. The seven prime areas are as follows: (i) variety development and maintenance, (ii) seed multiplication, (iii) quality control, (iv) increased involvement of private sector, (v) seed supply, (vi) institutional strengthening, and (vii) biotechnology.

(3) Agribusiness Promotion Policy, 2006

The policy aims at enhancing the participation of the private sector in the development of

infrastructure needed for agricultural market, trade, and agro-based industries, as well as exporting quality goods and developing the market network. The policy stresses on the need to establish infrastructure development as a cornerstone for agricultural commercialization in the country where traditional subsistence farming is predominant as well as to strengthen public-private partnership. The policy is flexible and friendly to overall promotion of agribusiness and marketing in the nation.

(4) Nepal Agriculture Extension Strategy (NAES), 2007

The Nepal Agriculture Extension Strategy (NAES) aims at contributing to national poverty reduction by increasing the efficiency and productivity of agriculture and promoting competitiveness in the value chain of the agricultural system. The objectives of the NAES are as follows:

- To build the capacity of farmers, and increase the capacity of agricultural extension agencies for participatory livelihood analyses; and to undertake strategic actions focused on: (i) improvement of capital assets, (ii) reduction of risks, and (iii) transformation of structures and processes.
- To highlight partnership and synergistic pluralism among different partners and agencies through: (i) pro-poor service delivery, (ii) transformation of subsistence agriculture toward commercialization, and (iii) increase of capacity for commercialized agriculture;
- To enhance agricultural commercialization by promoting the production of raw materials needed by agro-based industries, and supporting the establishment and operations of eco-friendly agricultural industries; and
- To motivate the frontline extension workers by constantly updating them on (i) technical knowledge and (ii) social skills.

(5) Nepal Agricultural Research Council (NARC) Strategic Vision for Agricultural Research (2011-2030)

The vision of NARC focuses on agricultural research for development to address the issues on food security, production and competitiveness, through the effective and efficient use of scientific knowledge in order to increase agricultural productivity and manage natural resources in a sustainable way.

The major agricultural research areas include field crops, horticulture, livestock, fisheries, on-farm water management, agroforestry, related natural resources, socioeconomic aspects, postharvest operations, gender issues, and policy research.

In order to deliver technologies in efficient and effective ways, it is emphasized to enhance the capacities of the following five thematic sectors of intervention: (i) crops and horticulture; (ii) livestock and fisheries; (iii) natural resources management and climate change, (iv) biotechnology and outreach, (v) technology dissemination and extension.

The following strategies are emphasized in attaining the national agricultural goals, namely, food and nutritional security and sustaining livelihood of the people:

- To emphasize the development of region-specific agricultural research program, bearing in mind ecological diversity, socioeconomic situations, and research and development actors.
- To prioritize a participatory system-based research approach that incorporates multiple disciplines and addresses multiple commodities.

- To include environmental sustainability, inclusiveness, growth promotion, and income generation as distinguishing features of all research undertakings.
- To use indigenous knowledge, traditional practices, and local resources in research and technology development initiatives for sustainable development.
- To promote commercial agriculture by generating postharvest technologies that create value-added products from cereal crops, cash crops, vegetables, fruits, livestock, poultry, fisheries and their downstream processing opportunities.
- To identify the problems and needs of stakeholders in the input industries and service providers such as farm machinery, irrigation equipment, agrochemicals and animal feeds, as well as collaborate with relevant stakeholders in technology generation and dissemination.
- To establish a strong incentives system to retain/recruit qualified staff and get the best out of them for the benefit of the country.
- To build strong partnerships with the government and a wider stakeholders/civil society, national and international research centers, donors, and private sector to move the system from agricultural research and development to agricultural research for development. This will contribute to establishing a national agricultural research system that provides a favorable environment for a broad and pluralistic participation and resource coordination among all potential service providers and beneficiaries.

2.2.2 Policy Gap in the Agriculture Sector

The agriculture sector has developed several policies, regulations, and acts but implementation remains as the major challenge to attain the national development goals. Analysis of policies indicates that the NAP and other agricultural related policies are of progressive nature that will address development needs, socioeconomic aspirations, environmental issues and biodiversity conservation for sustainable use.

The major weaknesses or shortcomings of these policies are as follows:

- The issue on land consolidation has not been considered, thus hindering the application of improved agricultural technologies especially farm mechanization, irrigation, and overall on-farm development activities.
- Productive lands are being converted into housing complexes, unwarranted and unorganized urban development structures, or other development activities. The pace of transformation is going at a rapid rate but there is no policy to regulate or control these unwarranted activities.
- The agriculture sector lacks overall agricultural legislation to implement the NAP, since the policy itself has weak implementation status.
- Farmer groups (FGs, under DOA) and WUAs (under DOI) have not been linked to undertake agricultural services and cooperative support.

Gaps exist between the contents of the policies and their implementation, thus hindering the attainment of the visualized development goals.

2.2.3 Major Policies and Legislation on the Irrigation Sector

The most relevant legislations for the preparation of directive formulation of irrigated agriculture development in Terai are as follows: the Water Law, Irrigation Regulation and Irrigation Policy, especially, legislations on property of facilities, responsibility of operation and management, and shared responsibility of WUAs on operation and maintenance (O&M) works.

The GON has three relevant acts concerning water resource and irrigation, i.e., (i) Irrigation Act 1961, (ii) Water Tax Act 1966, and (iii) Water Resource Act 1968/1992. The general outline of these acts are shown in the SP-B-4 .

(1) Water Law 1853 Nepal

For the first time, GON enacted the Water Law of Civil Act 1853 Nepal, and this act ensured riparian rights and prior use rights. Most farmers managed functional irrigation systems under this act along with their internal rules.

(2) Irrigation Regulation (1989/2000)

The Irrigation Regulation (1989) was institutionalized through the accumulated studies and experiences of and learning from implementation process on the pilot projects of participatory water management such as the Irrigation Water Management Project (USAID, 1985), the Irrigation Line of Credit (WB, 1988), the Irrigation Sector Project (ADB, 1988), and the Irrigation Sector Support Project (UNDP/WB/ADB, 1989).

The Irrigation Regulation (1989) provides the legal framework on the formation of water user organizations. Furthermore, it was used in the provision of the Water Resources Act 1992 as basic material. With this, the Irrigation Regulation (2000) was promulgated.

(3) Irrigation Policy (1992/1997/2003/2013)

To support the objectives of the Eighth Five-Year Plan (1992-97), which are to increase agricultural productivity and production, the Ministry of Water Resource promulgated the very liberal and broad Irrigation Policy (1992). This policy supports the transfer of irrigation management to WUAs, farmers' participation through established associations, rehabilitation of management transfer project and ISF collection by WUAs. Also, it focuses on demand-driven and process-oriented rehabilitation of Farmer-Managed Irrigation Systems (FMIS). One of the objectives of this policy is to bring uniformity to the implementation procedures of all institutions.

The 1997 amendment of the Irrigation Policy 1992 declares the roles of the government to focus on areas of wider national importance such as review and development of sector policy on irrigation, resources mobilization, economic analysis, and technological development while maximizing the participation of private and non-government sectors. The policy emphasizes demand-driven approach to irrigation development.

The Irrigation Policy 2003 was brought out to enforce the concept of decentralization, autonomous and WUAs self-managed irrigation schemes in order to support increasing agricultural production, reduction of poverty and food insecurity, and creation of rural employment opportunities as perceived by the APP. The prime focus of this policy is the extension of irrigation services even to marginal

farms, implementation, effective and integrated water use for irrigation, use of unconventional irrigation systems, rainwater harvesting, ponds, sprinklers, drip paddle pumps, and other irrigation approaches.

The Irrigation Policy 2013 was enacted in August 2013. The Irrigation Policy 2013 emphasizes the vision for sustainable and reliable year-round irrigation services to increase agricultural productivity.

Furthermore, the objective of the Irrigation Policy 2013 is to develop a sustainable irrigation sector through the maximum utilization of available water resources, effective water management by year-round irrigation and institutional reform by empowering human resources.

To follow the said objective, the Irrigation Policy 2013 focuses on major strategies, such as integrated development and management at the river basin base, protection of agricultural land, smooth linkage and coordination among stakeholders on water management, year-round irrigation development with conjunctive use, enhancement of drainage system management, possibility of national and foreign private investments in irrigation development such as construction, operation and management, and participatory of WUAs in construction works.

In addition, new strategies, such as (i) uniformity of contract method for NGOs, (ii) handing over of partial management system to branch committee of WUAs with main committee' supervision in overall management system, and (iii) enhancement of implementation of the ICWMP carried out by joint operation of DOA, DOI, and NARC in all rehabilitated irrigation systems with higher priority, are emphasized.

The distinguished strategies of the Irrigation Policy 2013 are year-round irrigation development, enhancement and privatization of irrigation systems.

2.2.4 Policy Gaps in the Irrigation Sector

Although several changes and improvements occurred in the evolution of irrigation policies, regulations, and acts, some weaknesses or shortcomings still occur in irrigation legislation development, as follows:

- The WUAs are active during irrigation scheme construction, but then become inactive later during the operation and maintenance period. The polices and acts developed so far do not speak about post-construction mechanism to sustain WUAs activities.
- Although the Local Governance Act provides a foundation for important roles to support irrigation schemes, the Village Development Committee (VDC) roles have never been mentioned to support WUAs from the beginning of the formation state to the functional stage.
- The policies do not tell or focus on the conditional case and development needs for intensive on-farm management improvement works required to meet service standard concept on water delivery to the fields of farmers and increase food production demand to meet the food security situation.
- The policies and acts are inexplicit about ISF collection and sanctions against ISF non-payers and vandals of canal structures.

- There are no legal frameworks in which WUAs are ensured of getting agricultural marketing and cooperative support and links for sustainable WUAs functions. In fact, WUAs are left in isolation.
- The policies and regulations do not elaborate about how to implement the principles of beneficial use, economic efficiency, and equity of water use in practice.
- The policies and acts do not speak about any mechanism on cost recovery for adequate operation and maintenance of canal structures.

CHAPTER 3 PRESENT CONDITIONS OF THE AGRICULTURE AND IRRIGATION SECTOR IN NEPAL

3.1 Agriculture Sector

3.1.1 Implementation Structures and Roles for Agriculture Development

(1) Central Level

The Ministry of Agricultural Development (MOAD) is the central apex body of the Government of Nepal (GON) which looks after the country's agriculture sector and related fields. The vision, mission, and objectives of MOAD are defined as follows:

1. Ministry of Agricultural Development

Vision:

To improve the standard of living of the people through sustainable agricultural growth by transforming from a subsistence farming system to a competitive and commercialized one.

Mission:

To promote knowledge-based farming by transferring modern agricultural technologies through mass media communication, and developing effective linkage between research and extension system.

Objectives:

- To reduce poverty through increased agricultural production and productivity;
- To make Nepalese agricultural products competitive in the regional and world markets by developing its foundation on commercial and competitive agricultural system; and.
- To conserve natural resources, environment and ecological diversity, and utilize them for sustainable agricultural development.

The MOAD consists of five divisions, two centers, one research and development council, four departments, four projects and autonomous bodies of one research council, four corporations and a few development committees and boards.

The Department of Agriculture (DOA) is one of three departments under MOAD. The DOA bears the overall responsibility for agricultural growth as well as the development of the agriculture sector. The objectives of the DOA are defined in the following box:

2. Department of Agriculture

General Objectives:

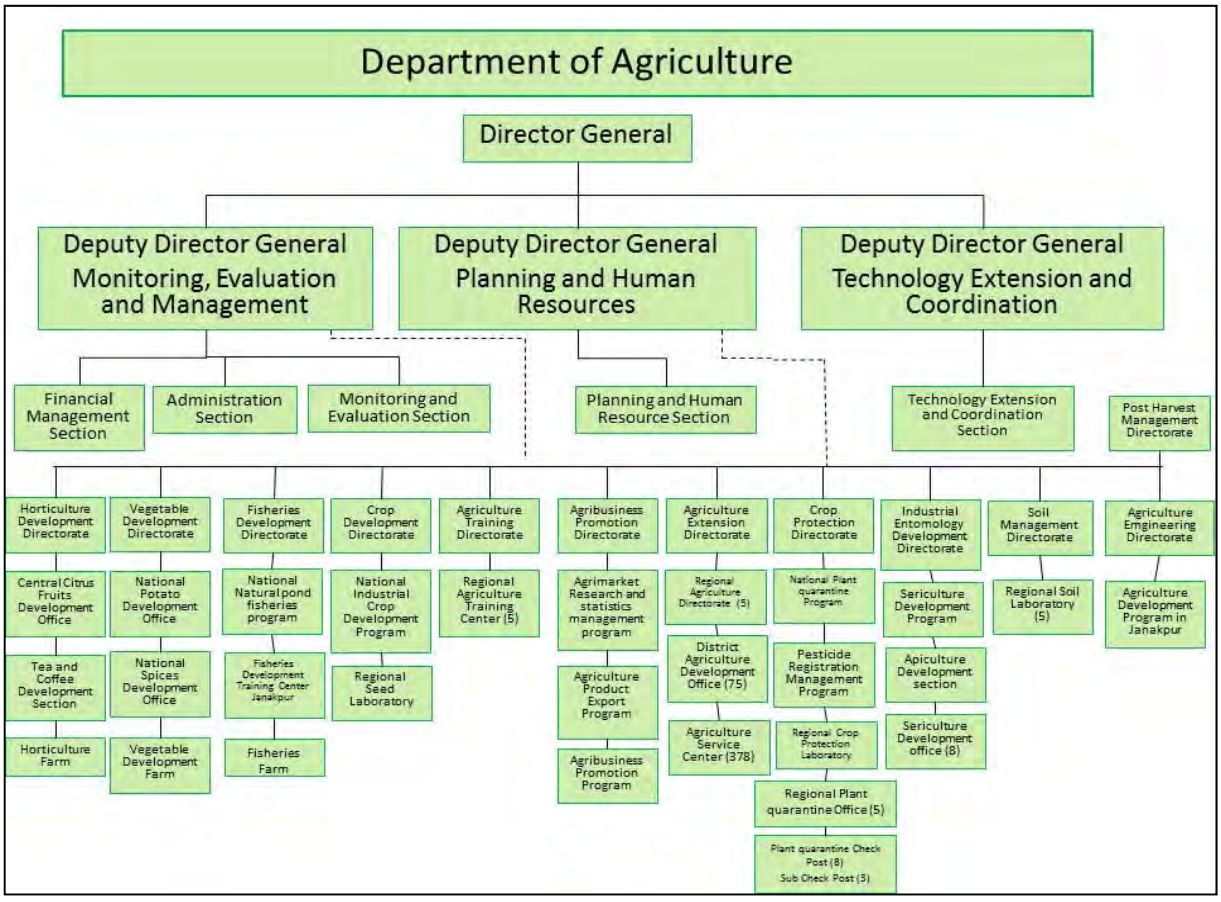
In view of the high population growth, limited land area, growing poverty, environmental imbalance, involvement of private and non-government organizations, decentralization, and competitiveness and economic liberalization in the international arena, the general objectives of this department has been to support and help achieve food security and poverty alleviation

by the transformation of agriculture through diversification and commercialization.

Specific Objectives:

- To increase agricultural production based on geographical diversity;
- To support food security by increasing food production and maintain the internal supply of food stuff;
- To increase the production and productivity of raw materials for agro-industries;
- To support producers who have comparative advantages through appropriate market management;
- To increase the availability of off-farm employment by supporting small industries and enterprises;
- To support export poverty alleviation by increasing employment opportunities for small, marginal and women farmers;
- To screen and standardize the technologies by doing adoptive research; and
- To strike balance between agricultural development and conservation.

According to the objectives of the DOA, it formed its organizational structure, as shown in Figure 3.1.1 below.



Source: JICA Survey Team based on DOA

Figure 3.1.1 Organizational Structure of the DOA

The DOA has 12 directorates. Each directorate can be categorized based on their main responsibilities, as follows:

- Agricultural commodity development: horticulture, vegetable, fisheries, crop development directorates
- Training and extension: agriculture training, agricultural extension
- Cross cutting issues: crop protection, soil management, agricultural engineering
- Agricultural commodity promotion: agribusiness promotion, industrial entomology development, postharvest management

These directorates are guided by three deputy director generals (DDGs). The DDG for planning and human resources is responsible for the overall implementation of strategies, policies, and plans. Also, he/she allocates his/her human resources based on the current policies and strategies. The DDG for technology extension and coordination provides technical guidance to the respective directorate and districts. Lastly, the DDG for monitoring, evaluation and management is in charge of monitoring and evaluation of the planned activities.

The available human resources and equipment and facilities of the DOA are summarized in Table 3.1.1 and Table 3.1.2, respectively. The human resources in the headquarters of the DOA are quite limited. However, the DOA has human resources, besides in its headquarters, stationed in six national programs, six agriculture training centers, 11 fishery training centers, 17 laboratories, 21 horticulture and vegetable development farms/centers, and 15 quarantine check posts.

Table 3.1.1 Human Resources at the Headquarters of the DOA

Classification of Staff	I	II	III	JT/JTA	Admin.	Other	Total
DOA	4	11	25	0	12	20	72

Grade I: DG, Deputy DG and the equivalent
Grade II: Director and the equivalent
Grade III: Graduates and the equivalent
JT/JTA: JT/JTA certificates and the equivalent
Others: drivers, maintenance staff and others
Source: DOA

As mentioned above, the DOA aims to improve the standard of living of the poor by means of increasing agricultural productivity. Also, it intends to increase the competitiveness of agricultural commodity in the international market by means of modernizing current farming practices and enhancing local agribusiness/agricultural industries. Therefore, the main responsibilities of the DOA are to make policies and regulations, to allocate budget to regional offices and district offices, to provide technical guidance in response to inquiries from districts, and to conduct monitoring and evaluation of field activities.

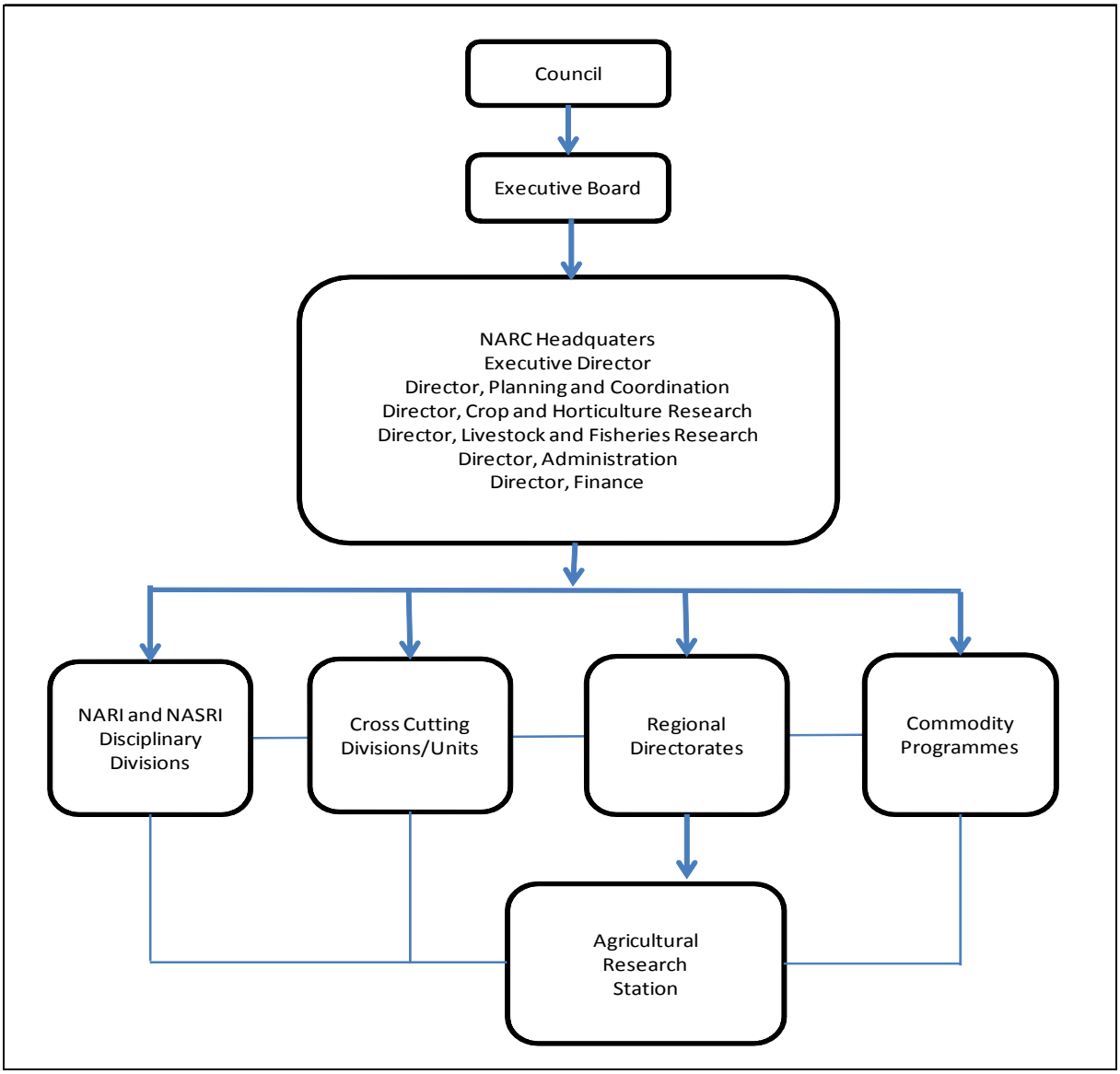
However, as Table 3.1.1 shows, there is quite a small number of staff at the headquarters of the DOA. Many staff claimed that they are too busy handling various reports, statistics and/or daily consultations with all 75 districts. It is also difficult for them to work out various issues with related agencies.

Table 3.1.2 Equipment and Facilities

	Motor vehicle	Motor cycle	Cycle	Photocopy	Fax	Computer	Laptop	Multimedia
DOA	12	39	0	5	3	25	6	3

Motor vehicle: 11 4WD, 1 Bus
Source: DOA

The Nepal Agricultural Research Council (NARC) is an apex body for agricultural research in the country with the ultimate goal of poverty alleviation with sustainable growth of agricultural production through the development of appropriate technologies in different aspects of agriculture. The NARC has a two-tier body, namely, the Council and the Executive Board. The Council is chaired by the Minister for Agricultural Development and consists of 16 members. It is responsible for making policies for agricultural research. On the other hand, the Executive Board is chaired by the Executive Director of NARC. It is in charge of executing research programs approved by the Council.



Source: NARC website

Figure 3.1.2 Organizational Structure of NARC

The headquarters of NARC manages the National Agricultural Research Institute (NARI), the National Animal Science Research Institute (NASRI), commodity programs, and the Regional Agricultural Research Stations (RARS), as shown in Figure 3.1.2. The NARI has nine disciplinary divisions and deals with 11 national commodity research programs. It conducts science research for crops such as rice, wheat, grain legumes, oilseeds, sugarcane, citrus, potato, jute, ginger, hill crop, etc. On the other hand, NASRI has five disciplinary divisions and deals with three national commodity

research programs. It conducts its study on livestock and fish. Cross-cutting divisions/units include; Division of Communication, Publication and Documentation, Division of Socio Economics and Agricultural Research Policy, and Division of Outreach Research.

The RARS are allocated to each of the following development regions: Far Western, Mid-Western, Western, Central and Eastern development regions. There are some agricultural research stations under the RARS. These agricultural research stations deal with special matters such as horticulture, pastures, goats, fishes, etc.

Table 3.1.3 Location of NARC's Regional Agricultural Research Stations

Development Region	Far Western	Mid-Western	Western	Central	Eastern
RARS	Doti	Napalgunj	Lumle	Parwanipur	Tarahara
Agricultural Research Station		Surkhet Jumla Dailekh	Malepatan Polkhara Begnas Bandipur Tanahun	Belachapi Dhanusa Dhunche, Rasuwa Trisuli Nuwakot Ranighat Parsa	Pakhribas Dhankuta

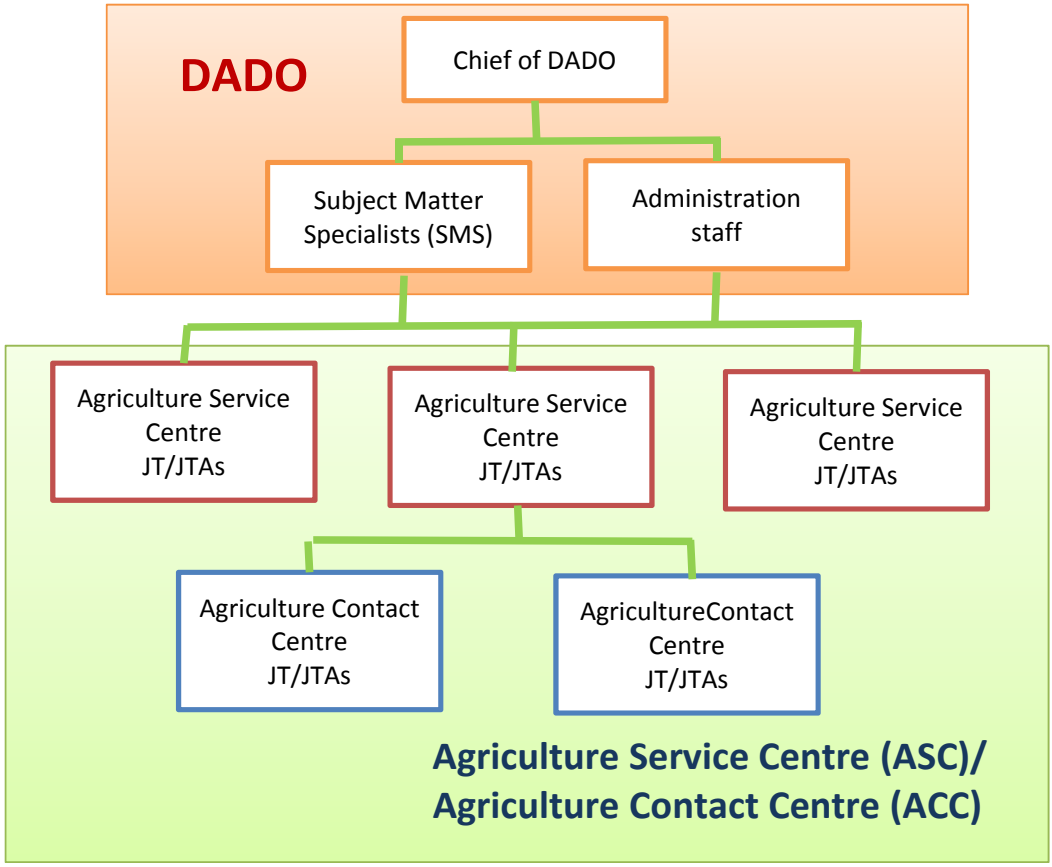
Source: NARC Website

Technical handover seminars, and regional and district agriculture technology working groups (RATWG and DATWG, respectively) are the bridges connecting agricultural research and extension. The needs for research are raised and discussed in the RATWG and DATWG,. Research results are also shared among the group members for dissemination.

(2) Regional and District Levels

The District Agricultural Development Office (DADO) is the executing agency under DOA. One DADO is established to each district in the country. After the decentralization of agricultural extension service delivery, agricultural extension activities are currently carried out through DADO.

Each DADO operates through a network of four to five service centers; each of which covers two to four Village Development Committees (VDCs). Extension coverage includes issues related to crop cultivation practices.



Source: JICA Survey Team

Figure 3.1.3 Organizational Structure of DADO

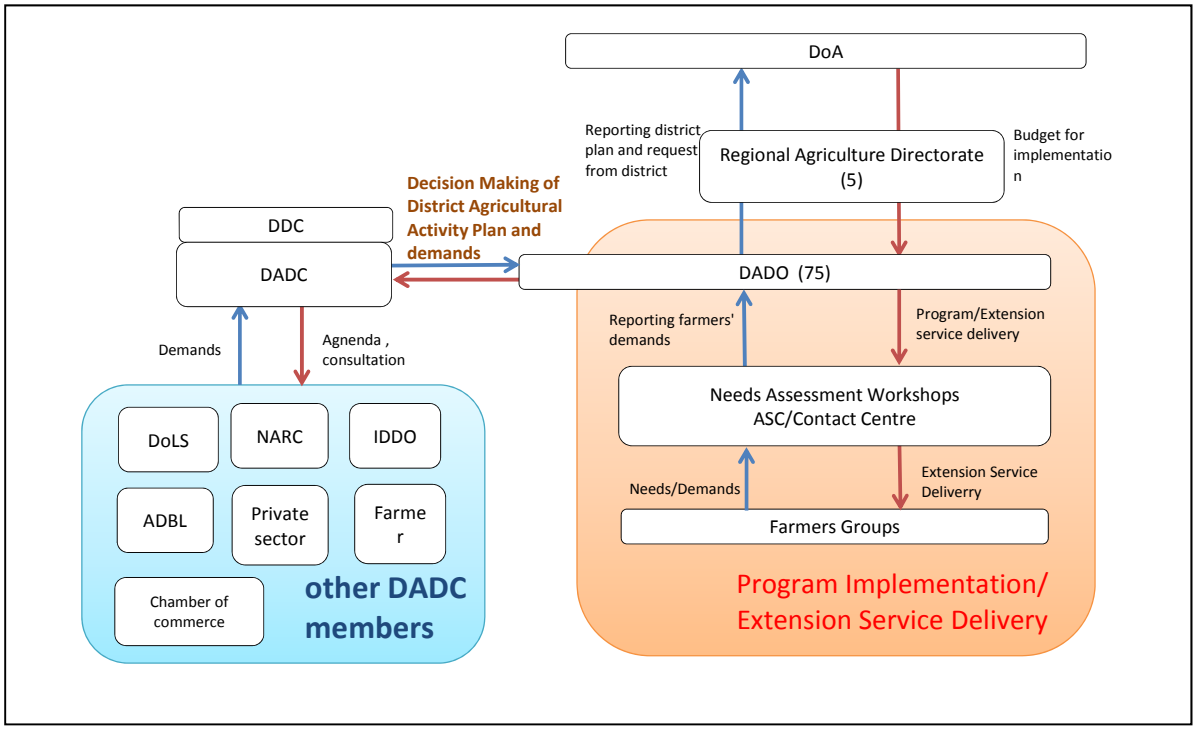
3.1.2 Budget Allocation of Implementing Agencies

(1) Planning and Budget Flow

Agricultural development planning is decentralized at the district level. The DOA allocates the budget to each DADO based on its annual plan. Plans are established at the District Agricultural Development Committee (DADC).

The DADC is headed by the chairperson of the District Development Committee (DDC). Other members include the DADO chief as the secretary, the chair of Veterinary Office, Divisional Cooperative Office, Divisional Irrigation Office, agriculture farms, NARC, Agricultural Development Bank Ltd., a representative of the Chamber of Commerce, and two representative farmers.

The process of planning is firstly implemented with the completion of a needs assessment workshop at each Agriculture Service Center (ASC) (*Ilaka* level) by DADO. The participants of the workshop are representatives of DADO and farmers. The DADO compiles the needs proposed during the workshop, drafts the district plan, and prepares the cost estimation. Then, DADO presents these proposals to the DADC, and members of the DADC reviews and amends it, and/or adds some requests/revisions to it. Finally, DADO finalizes the proposal and submits it to the DOA.



Source: JICA Survey Team

Figure 3.1.4 Plan and Budget Flow from DOA to DADO

The plan mainly includes the execution of workshops, seminars, trainings, and monitoring.

(2) Budget of the Four Districts in the Past Three Years

The budget for implementation of the district plan is taken from the development expenditures. The administration expenditures include salary, fuel, electricity and water bills, and office maintenance costs. Besides conducting special programs such as the Dhanusha DADO in December 2011, their main activities are to conduct needs assessment workshops, seminars, and trainings.

Table 3.1.4 Budget of the Four DADOs in the Past Three Years

DADO	Year	Unit	Administration expenditure	Development expenditure	Remarks
Jhapa	2010/11	Rs.	11,800	11,041	
	2011/12	Rs.	13,100	14,541	
	2012/13	Rs.	14,100	8,811	
Morang	2010/11	Rs.	11,034	8,750	
	2011/12	Rs.	13,493	10,207	
	2012/13	Rs.	14,367	7,143	
Dhanusa	2010/11	Rs.	18,059	10,997	
	2011/12	Rs.	14,098	31,167	Fish Development Program: Rs. 2,500,000 Onion Farming Program: 6,800,000 Market Construction: 12,600,000 Sub total: 21,900,000
	2012/13	Rs.	13,756	14,018	
Mahottari	2010/11	Rs.	9,800	9,800	
	2011/12	Rs.	12,000	12,000	
	2012/13	Rs.	7,756	7,756	

Source: DOA

Bulk of the administration cost is allocated to the salaries of human resources. The human resources of the four districts are shown in Table 3.1.5. While the remaining administration cost can be used for maintenance of office equipment and facilities. For example, fuel expenses for motor vehicles for junior technician(JT)/junior technical assistants(JTAs) are included in the administration cost.

Table 3.1.5 Human Resources of the Four DADOs (up to August 2013)

Office	I	II	III	JT/JTA	Admin	Others	Total	Active No.	Remarks
Jhapa	0	1	8	18	3	13	43	43	
Morang	0	1	6	24	4	15	50	46	(3positions of III lelel are vacancy)
Dhanusa	0	1	6	24	2	16	49	49	
Mahottari	0	1	8	20	3	11	43	37	

Source: DOA

Many claimed that the mobility of JT/JTAs is not appropriate to cover their treatment area. Indeed, the number of motor vehicles, bicycles, and cycles is not enough for all subject matter specialists(SMSs) and JT/JTAs. Also, the expenditure on fuel is quite limited.

Table 3.1.6 Equipment and Facilities of the Four DADOs

DADO	Motor Vehicle (4WD, Bus, Jeep)	Motor Bicycle	Cycle	Photo copy	Fax	Computer	Laptop	Multi media
Jhapa	1	10	15	2	1	8	1	1
Morang	1	10	20	1	1	6	1	1
Dhanusha	1	6	15	0	1	4	1	1
Mahottari	1	2	0	1	1	2	1	0

Source: DOA

(3) Shortcomings

From the field survey, the JICA Survey Team pointed out the following:

- Considering their set objectives (goals), the human resources in both central and district levels is too small to achieve them.
- If the current human resources and total budget are not changed dramatically, the DOA has to consider how to maximize the utilization of available local resources (human, social, natural, financial, information, and physical resources). For example, they could entrust the services with the private sector, cooperatives, and non-government organizations (NGOs).
- DADO is established as a coordination body for agricultural development, but many of the members only discuss their district agricultural development within given frameworks such as workshop, seminar, training, etc. As a result, plans are shortsighted and/or in an ad hoc manner.
- They are likely to abandon any idea of developing because of financial constraints before figuring out some way to utilize given resources.
- Two farmers are chosen as representatives of farmers to participate in the DADC. However, it is doubtful that they represent all farmers through a fair selection process.
- Also the participants of the workshops, seminars, trainings, and other activities conducted by DADO only include target farmers (members of farmer groups and some progressive farmers). These opportunities are not appropriately distributed to farmers who need the knowledge and skills.

3.2 Irrigation Sector

3.2.1 Implementation Structures and Roles for Irrigation Development

(1) Related Government Agencies on Irrigation in Nepal

In Nepal, the Ministry of Irrigation (MOI) and the Ministry of Local Development (MOLD), are both engaged in expanding irrigated areas through their respective departments. The MOI is the responsible agency for irrigation development. Their services range from small-scale to large-scale irrigation systems in Nepal. The MOLD is the responsible agency for local infrastructure development and its services. However at present, MOLD is responsible for rural infrastructure development in accordance with the decentralization policy. They provide services to enhance the technical capability and participation of local authorities in rural development.

Under these ministries, the Department of Irrigation (DOI) and the Department of Local Infrastructure Development and Agricultural Road (DOLIDAR) were respectively organized to provide services for irrigation development.

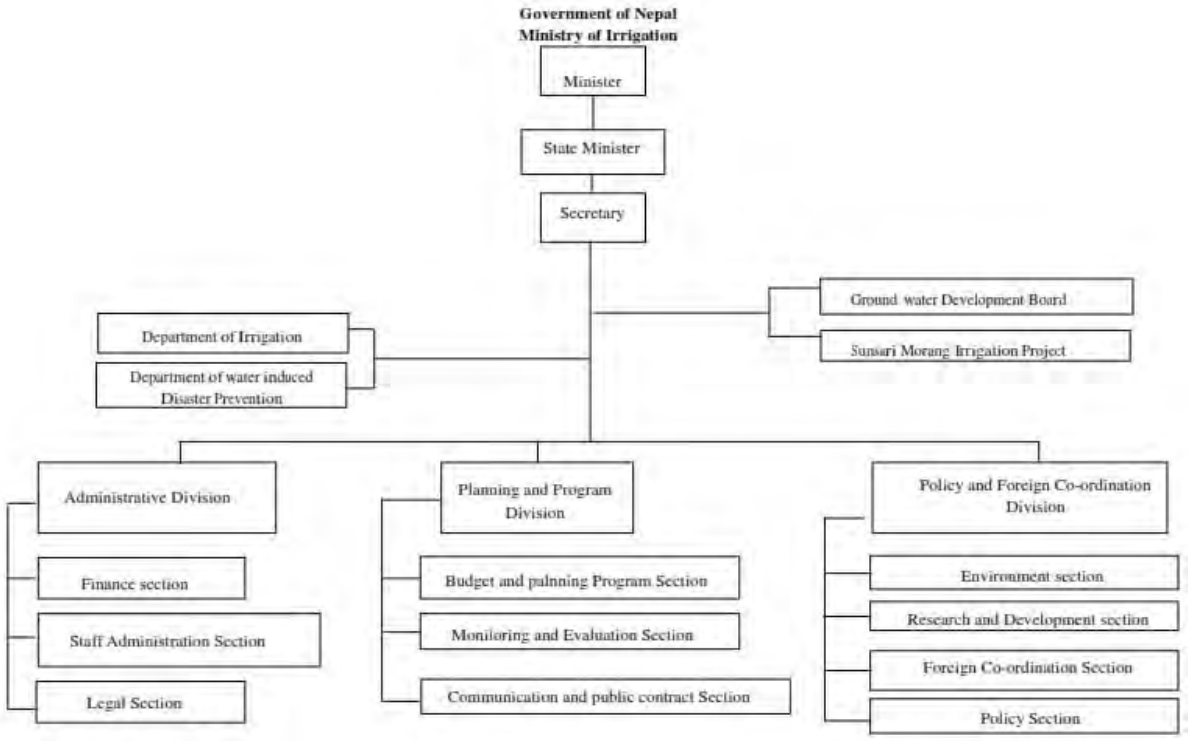
At present, the DOLIDAR is responsible for small-scale irrigation development (irrigation area of less than 25 ha in hills and more than 200 ha in Terai). It is currently executing community irrigation projects financed by the Asian Development Bank (ADB) in 12 districts (four in Terai and eight in the hilly and mountainous regions) of the Western, Mid-Western and Far Western development regions of Nepal.

(2) Organization Structure of MOI

The main roles of MOI are to prepare policies on irrigation services and development, to coordinate with foreign assistance organizations regarding irrigation development in Nepal, to prepare the plan and program for the development of its irrigation services, and to manage the implementation of

irrigation development in order to achieve the agricultural development targets.

The MOI has two departments, namely, the DOI, which is engaged in irrigation services and development, and the Department of Water Induced Disaster Prevention (DWIDP), which is engaged in services and development for the prevention of water-induced disasters. The MOI also has three divisions, namely, the Policy and Foreign Coordination Division, the Planning and Program Division, and the Administrative Division. Each of these respective divisions has three to four sections, as shown in Figure 3.2.1 below.



Source: Handbook DOI 2012/13

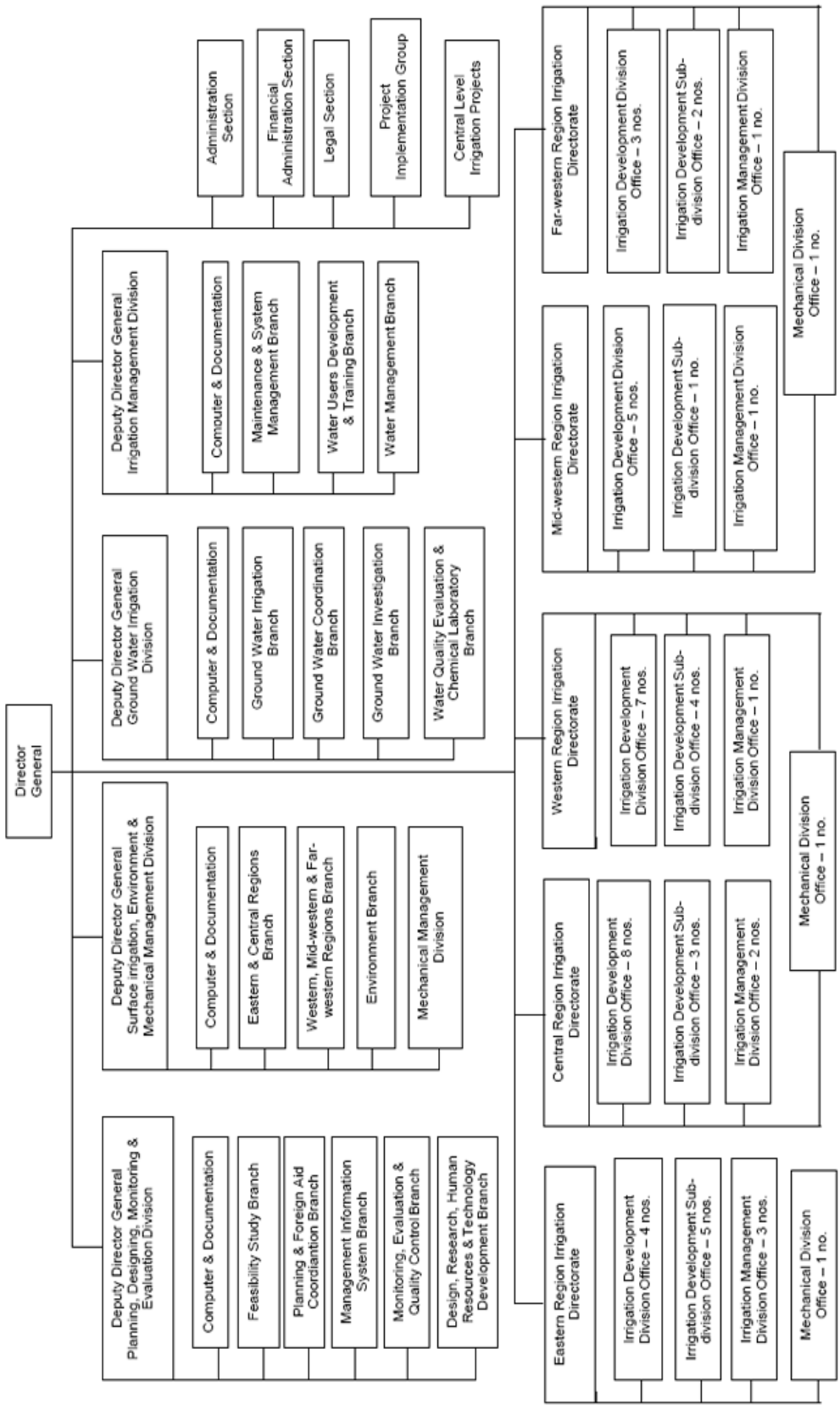
Figure 3.2.1 Organizational Structure of MOI

(3) Organization of DOI

The main roles of DOI is to engage with all irrigation services and irrigation development through the irrigation development divisions offices which are located at the district levels, as well as the five regional offices located at the five development regions of Nepal.

The Director General (DG) of DOI is supervised by the secretary of MOI. The DOI, under its DG, has four divisions, namely, (i) Planning, Designing, Monitoring and Evaluation Division, (ii) Surface Irrigation, Environment and Mechanical Management Division; (iii) Ground Water Irrigation Division; and (iv) Irrigation Management Division.

Each of these divisions are headed by a DDG. Apart from these divisions, administrative branches, financial branches, and legal branches are also directly administered by the DG, as shown in Figure 3.2.2.



Source: Handbook DOI 2012/13

Figure 3.2.2 Organizational Structure of DOI

The available human resources of the DOI are summarized in Table 3.2.1. Human resource of DOI at national level are 1,775 officers and staff covering head quarter, regional offices, irrigation development division offices and some national irrigation development offices. Human resources of DOI at the headquarter is limited as shown below.

Table 3.2.1 Human Resources of the DOI

Grade or Classification of Staff	I	II	III	Technical/Administrative/ Financial Support Staff	Total
National Base	17	150	587	1,023	1,775
Headquarter	6	28	38	108	178

Grade I: DG, Deputy DG and the equivalent
Grade II: Director and the equivalent
Grade III: Graduates and the equivalent
Source: DOI

(4) Regional Directorate Office

The main roles of the regional district office are to review tender evaluation after recommendation of the winner for projects valued at more than Rs70 million, to monitor work progress, quality control, and supervision of the projects implemented at the district level, and to conduct seminars and workshops at the regional level.

The five regional directorate offices of the Eastern, Central, Western, Mid-Western, and Far Western development regions cover the 75 districts of Nepal. Each regional office has three to four senior divisional engineers (SDEs) and one sociologist with different roles and responsibilities.

(5) Irrigation Development Division Office (IDDO)

There 26 IDDOs including 20 irrigation development subdivision offices at the district level have been established. Each IDDO is supervised by a respective regional directorate office. Therefore, each division office has to manage irrigation services in more than one district area.

Also, there are eight irrigation management divisions and three mechanical divisions in the overall organization of DOI.

Generally, the average placement of manpower at each office include 25 to 28 staff, which consist of nine engineers, two account personnel, two administration staff, and other low level staff.

(6) Major Roles and Function of MOI and DOI

Major roles and functions of MOI and DOI at the different levels are summarized in Table 3.2.1 below.

Table 3.2.2 Major Roles and Functions of MOI and DOI at Different Levels

No	Level of Organization	Roles and Functions
1	Ministry of Irrigation (MOI)	Its key functions are to develop policies, acts and plan for conservation, regulation and utilization of irrigation; to conduct survey, research, and feasibility study on irrigation and its utilization; to carry out construction, operation and maintenance, and promotion of multipurpose irrigation projects; and to carry out human resources development, capacity building, etc.
2	Department of Irrigation (DOI)	Its key mandates are to plan, develop, maintain, operate, manage, and monitor different modes of environmentally sustainable and socially acceptable irrigation and drainage systems, from small- to large-scale surface systems, and from individual to community groundwater schemes.

3	Irrigation Management Division, DOI	Its key mandates are monitoring and evaluation of works and activities under IMD, assisting DOI in formulating policy and acts, coordination with other divisions under DOI, planning Irrigation Management Transfer program for handing-over of Agency Managed Irrigation System to WUA, developing program for privatization or contracting irrigation system, preparing plans and programs of institutional development for irrigation system handover, preparing policy and practice on water management, conducting research on water management, and planning and conducting WUA capacity development training for WUAs of completed irrigation systems under DOI. It also plays roles of receiving and checking annual programs and other documents received from different sections (Water management, WUA development, training and O&M), and sending to DG for approval as well as guiding regional and district offices on irrigation policy implementation and then reporting to DG about the policy implementation status.
4	Mechanical Division, DOI	Its key mandates are preparing policy and procedures on equipment management, keeping inventory of equipments under DOI, preparing budget for maintenance of the equipments based on priority, informing updated status of equipments to all divisions under DOI every three months, strengthening equipment workshop centre in all major projects, training manpower who operates equipments time to time, preparing specification of the equipments, preparing norms on leasing equipments, providing equipment services to IDDOs in each region.
5	Regional Directorate Office	The key functions of the regional offices are to review the recommendation on tender evaluation, and forward it to the DG after recommendation for projects valued at more than Rs70 million; to monitor the work progress of projects implemented at the district levels; to conduct quality control and supervision; to conduct seminars and workshops at the regional level for progress review and planning.
6	Irrigation Development Division Office (IDDO)	The key functions of IDDOs include carrying out project selection, demand collection, project listing, screening, prioritization; conducting feasibility survey; designing and preparing tender documents; tendering after approval; implementing, and supervising development works; and forwarding documents beyond its approval capacity or level.

Source: Handbook DOI 2012/13

(7) Issues or Problems in Organization and Staff Management

The DOI faced many issues and problems in regarding the organization and staff management during the implementation of past irrigation development projects. A summary of the issues and problems is as follows:

- Civil service administration is governed by the Civil Service Act. Government officials are transferred from one place to another after two years of his/her service. This is not a suitable administrative process to retain a trained and experienced manager for the significant implementation of the project. Sustainability of strategies and approaches has also declined.
- Transfer of project staff is influenced by political persons.
- Project features differ by donor; hence, the ability requirements of staff also differ in quality and degree. The DOI has great strength in engineering services but is very weak in specific staff requirements for development and management.
- The established organization and management for projects do not continue after the completion of the project. Hence, the recipient WUA community is left due to the discontinuation of linkage and support.

- In some cases, a district IDDO also has to provide services to other nearby districts (e.g., some district IDDO looks after Morang District, and the IDDO of Mahottari District looks after Dhanusha District). In this situation, base project implementation units by district are needed for regular communications and WUA support.

(8) Relationship of DDC on implementation of small irrigation project at district level

District Development Committee (DDC) is headed by the Local Development Officer (LDO) under the supervision of the District Council (DC) as the deliberative body of the DDC. The DC comprises of the VDC Chairpersons, Vice-Chairpersons, Municipality Mayors and Deputy Mayors, Members of the DDC, members of the House of Representatives and the National Assembly within the district (ex-officio member) and its 6 nominated members.

The LDO has Executive Committee comprising of the President, Vice President and Members who represent the respective area, members of the House of Representatives and the National Assembly within the district (ex-officio member) and other 2 members and has the overall responsibility to implement all sub-projects including irrigation and agriculture development at district level.

The DDCs implemented only small irrigation development at district level in coordination among all agencies involved in the project. The District Development Fund (DDF) of DDC disburses the sub-projects cost, of which are allocated from the Ministry of Local Development (MOLD), on project base to the District Technical Office (DTO) as responsible execution agency.

In implementation of irrigation and agriculture development projects, functions of the IDDO and DADO in relating with the implementation of the sub-project are as follows.

(i) IDDO

IDDO has responsibility to supervises planning of irrigation program and monitor implementation from time to time in the sub project areas, facilitating a linkage among WUAs on irrigation development including coordination meetings. There are no any concerns on budget allocation and disbursement of construction cost.

(ii) DADO

DADO supervises planning agricultural extension program executed by DDC, monitoring implementation of agriculture program from time to time and facilitating farm-to-market linkages for participating WUAs in the sub project area, such as supply of seed and fertilizer and collection and marketing of agriculture products including coordination meetings with all actors involved in the project agricultural services each trimester to share information, resolve problems and bottlenecks, and facilitate cooperation.

3.2.2 Budget Allocation of Implementation Agencies

(1) Planning and Budget Flow

The Ministry of Finance (MOF) declares the national level budget plan before the end of each fiscal year in the Parliament with a budget ceiling for each sector. The sector budget ceilings become the available budget for sector programs. The primary level at which budget preparation actions start is the

district offices. Annual programs are developed at IDDO or concerned centrally at the operated project level. The basis of budget planning will be the uncompleted or new development activities and existing operation cost. The annual plan and budget prepared at each district are compiled at the department. The compiled budget is then sent to the MOI within the ceiling amount of budget. After check and revision at the MOI, the overall annual budget is sent to the MOF. After review and adjustment of the overall budget, the MOF releases the budget to respective ministries, then from the ministries to the departments, and finally from the departments to the respective district level offices for expenditure.

The statement of the department on the expenditure is prepared at the district level office and compiled at the central level projects. It is then ultimately submitted to donors for cost reimbursement in case of donor-assisted projects. Departments send the compiled statement to the MOF and the Auditor General's Office for annual audit. Budgets or expenditures from Rs.10 million to Rs.30 million are approved at the district level. Expenditures ranging from Rs.30 million to Rs.70 million are approved by the regional directors, while expenditures more than Rs.70 million are approved by the DG of DOI. Budget flow from the central level to the district level is ensured by the account section of the former and the project manager. Proper utilization of funds for the planned program is monitored regularly by the regional offices.

Table 3.2.3 Trend of Annual Budget Received by DOI

Fiscal Year	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13
Budget (Rs million)	5,350	5,551	5,690	7,838	8,623	10,046
Expenditure (Rs million)	4,008	5,063	5,021	6,766	NA	NA

Source: Program Division, DOI

Table 3.2.3 shows the increasing trend of budget allocation in the irrigation sector.

(2) Present Issues on Budget Management

Despite the proposal of proper planning and budget allocation, project implementation has much suffered from interruption of budget flow as described below.

- It has been almost an ongoing practice to release late Nepal's first semester budget. Majority of the planned activities during this period remained untouched.
- Compilation and submission of statement of expenditures at the district and central levels are generally slow, constraining the timely release of the next semester budget.
- Frequent changes in the political environment have delayed allocated budget releases from the center. This has hampered the regular progress of projects.
- The slow process adopted for sending authorized letters needed for spending budget also has resulted in the slow progress of the project.
- Generally in donor supported projects, the submission of statement of expenditures is generally slow causing late reimbursement, which impacts a timely budget release.

3.3 Present Conditions of the Agriculture and Irrigation Sectors

3.3.1 Present Conditions of the Agriculture Sector

(1) General

Agriculture is the most important sector in the Nepalese economy. About 65.6% of the population are engaged in agriculture in 2001[1]. The gross domestic product (GDP) of Nepal in November 2010 was Rs1,536,000 million[2], and the population in 2011 was 26,494,504[3]. Accordingly, the per capita GDP in 2011 was Rs57,974.3 (US$660.3)[4], which is the second lowest in South Asia, following Afghanistan.

The agriculture sector amounts to Rs675,411 million or 29%[5] of the gross output of industrial sectors, which is Rs2,306,738 million in 2011/12. Although the agriculture sector ratio against the gross output is not large, the ratio of agricultural households, which numbered to 3,337,400 in 2001, is 80% against the total number of households in Nepal, which was 4,174,374 in 2001[6]. Although the ratio of agricultural households in the 2011 census decreased from the 2001 figure (80%) since the data in 2011 is not available at present. The weight of agriculture should be significant and the importance of the agriculture sector in the Nepalese economy is substantial.

(2) Agricultural Land and Landholding

(i) Agricultural Land

Nepal has a wide range of topography and climate. Its altitude varies from 60 m to 8,848 m and the climate varies from subtropical in the Terai to polar in the high mountains. The country stretches from east to west with a mean length of 885 km and from south to north with an average width of 193 km. The total area is 147,181 km^2. Land use is reported as shown in Table 3.3.1.

Table 3.3.1 Land Use in Nepal

No.	Description	Area	
		(1,000 ha)	(%)
1	Cultivated Agricultural Land	3,091	21.0
2	Uncultivated Agricultural Land	1,030	14.3
3	Forest (including shrubs of 1,560 ha)	5,828	39.6
4	Grass Land and Pastures	1,766	12.0
5	Water	383	2.6
6	Others	2,620	1.8
	Total	14,718	100.0

Source: Nepal Agriculture Statistics 2011/12, MOAC Agri-Business Promotion and Statistics Division

Agricultural land in Nepal is mainly categorized into three, i.e., the flat area in Terai, undulating areas/river basin valley area in hills, and mainly pasture area in mountains. The extent of the cultivated area and paddy area in each geographical category with demography data is shown in Table 3.3.2.

[1] Agricultural Census 2001, CBS
[2] National Account Estimate, 2013, CBS Nepal
[3] National Population and Housing Census 2011, Nov. 2012, CBS Nepal
[4] Converted by the exchange rate on 18 May 2013 which is US$1.0 = Rs87.70.
[5] National Account Estimate 2013, CBS, Statistical Information of Nepalese Agriculture 2011/12, Agri-Business Promotion and Statistics Division, MOAC based on the Census in 2001/02 as agricultural data on Census 2011/12 are not issued yet.
[6] Calculated based on the agricultural Census 2001, CBS

Table 3.3.2 Cultivation Area in Each Geographical Category in 2011/2012

Category	Terai	Hill	Mountain	Nepal
Cultivation Area (1,000 ha)*1	(1,396.7)	(1,038.6)	(218.7)	(2,654.0)
Paddy Area (1,000 ha)	1,068.0	395.5	68.1	1,531.6
Household (1,000)	2,527.6	2,532.0	363.7	5,423.3
Population (1,000)	13,318.7	11,394.0	1,781.8	26,494.5

*Note: *1 Data on Agriculture Census 2001, CBS,*
Sources: Nepal Agriculture Statistics 2011/12, Ministry of Agriculture and Co-operatives, Census Report 2011, CBS

(ii) Agricultural Land Holdings

The number of households involved in agriculture in Nepal is large. Marginal farmers who own farmlands less than 1.0 ha, are nearly 75% of the total in 2001, while their total landholding area is only 39% as shown in Table 3.3.3.

Table 3.3.3 Farmland Holding Distribution in Nepal

Size of Holding	Number (1,000)	Percent (%)	Cumulative Percent (%)	Area (1,000 ha)	Percent (%)	Cumulative Percent (%)
Less than 0.5 ha	1,578.9	47.3	47.3	390.2	14.7	14.7
0.5 < X < 1.0 ha	915.7	27.4	74.7	641.7	24.2	38.9
1.0 < X < 5.0 ha	817.4	24.5	99.2	1,428.2	53.8	92.7
X ≧5.0 ha	25.4	0.8	100	194	7.3	100
Total	3,337.4	100		2,654.1	100	

Source: Calculation based on Agriculture Census 2001, CBS

Although the available data at present is in 2001, the present number of households owning less than 1.0 ha should be more. This is because it was reported that the fragmentation of farmlands has been increasing[7]. The change in the number of households, from 3.3 million in 2001 to 5.5 million in 2011, indicates that the fragmentation would have been taken place due to the decline of farm families.

(iii) Productivity

The productivity of cereals in Nepal are lower than its neighboring countries as compared in Table 3.3.4 below.

Table 3.3.4 Comparison of Major Cereals' Productivities in Nepal and Neighboring Countries

Unit: t/ha

No.	Crops	Nepal	India	Bangladesh	Pakistan	Sri Lanka
1	Paddy	3.0	3.6	4.2	3.6	3.6
2	Wheat	2.3	3.0	2.6	2.8	-
3	Maize	2.3	2.5	6.2	3.9	2.7

Source: FOSTA 2011

(3) Agricultural Production and Food Balance

(i) Agricultural Production

The GON has been implementing various agricultural development projects in the last few decades, this resulted in the increase of irrigated area and production of cereals as shown in Table 3.3.5.

[7] Land Reform Monitoring Indicators, Community Self-reliance Center, Kathmandu, 2012

Table 3.3.5 Changes in Cultivation Area and Products of Major Cereals

Unit: Area; 1,000 ha, Production; t, Productivity; t/ha

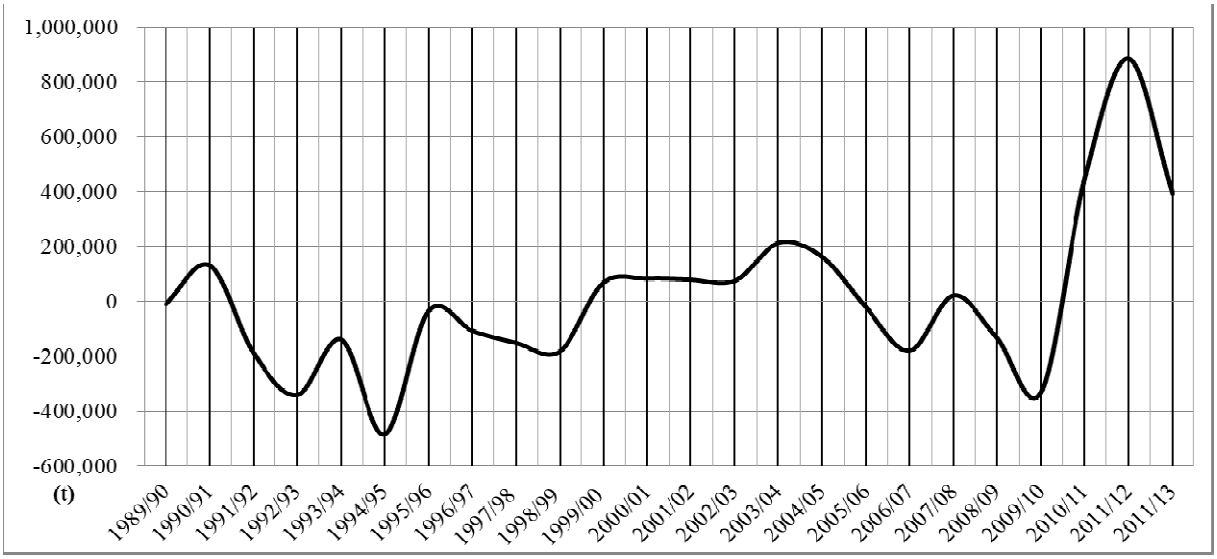
No	Year	Paddy			Maize6			Wheat		
		Area	Production	Productivity	Area	Production	Productivity	Area	Production	Productivity
1	1992/93	1,262	2,585	2.0	775	1,291	1.7	614	765	1.2
2	1993/94	1,450	3,496	2.4	754	1,254	1.7	611	899	1.5
3	1994/95	1,368	2,906	2.1	771	1,302	1.7	624	942	1.5
4	1995/96	1,497	3,579	2.4	792	1,331	1.7	654	1,013	1.6
5	1996/97	1,511	3,711	2.5	794	1,317	1.7	667	1,072	1.6
6	1997/98	1,506	3,641	2.4	799	1,367	1.7	640	1,030	1.6
7	1998/99	1,514	3,710	2.5	802	1,346	1.7	641	1,086	1.7
8	1999/00	1,551	4,030	2.6	819	1,445	1.8	660	1,184	1.8
9	2000/01	1,560	4,216	2.7	824	1,484	1.8	641	1,158	1.8
10	2001/02	1,517	4,164	2.7	826	1,511	1.8	667	1,258	1.9
11	2002/03	1,545	4,133	2.7	836	1,569	1.9	669	1,344	2.0
12	2003/04	1,559	4,456	2.9	834	1,590	1.9	665	1,387	2.1
13	2004/05	1,542	4,290	2.8	850	1,716	2.0	676	1,442	2.1
14	2005/06	1,549	4,209	2.7	851	1,734	2.0	672	1,394	2.1
15	2006/07	1,440	3,681	2.6	870	1,820	2.1	703	1,515	2.2
16	2007/08	1,549	4,299	2.8	870	1,879	2.2	706	1,572	2.2
17	2008/09	1,556	4,524	2.9	875	1,931	2.2	695	1,344	1.9
18	2009/10	1,481	4,024	2.7	876	1,855	2.1	731	1,557	2.1
19	2010/11	1,496	4,460	3.0	906	2,068	2.3	767	1,746	2.3
20	2011/12	1,531	5,072	3.3	871	2,179	2.5	765	1,846	2.4
21	2012/03	1,421	4,505	3.2	850	1,999	2.4	760	1,882	2.5

Source: Statistical Information on Nepalese Agriculture 2011/12, Agri,-business Promotion and Statistics Division, MOAC, and data collected from DOA.

The details of production and balance between production and consumption of cereals per year from 1989/90 to 2012/13 are shown in SP-D-1.

(ii) Trend of Cereal Production and Balance

The annual food balance of six kinds of cereals (i.e., rice, maize, wheat, millet, barley, and buckwheat) from 1989/90 to 2012/13 is illustrated in Figure 3.3.1. The details of production for the six cereals are shown in SP-D-2. The requirement of the cereals per capita per year is presumed at 193 kg in the DOA statistics.



Source: Prepared by the Study Team based on Statistical Information of Nepalese Agriculture, 2011/12, and other data, MOAD, Agri-Business Promotion and Statistics Division, and Statistical Year Book Nepal, 2011, CBS.

Figure 3.3.1 Food (Cereals) Balance in the Last 23 Years

Based on the GON's efforts to implement several agricultural development projects, and resuming fertilizer subsidy as shown in the Figure 3.3.3 hereunder, the production and productivity of cereals have been improved in the recent past; especially in the last three years as the surplus of the cereal production is substantial.

(iii) Import of Rice and Consumption

Despite cereal production and surplus as discussed above, paddy imports have been increasing recently as shown in Table 3.3.6.

Table 3.3.6 Rice Import in Recent Years

No.	Year	Import (t)
1	2008/09	98,767
2	2009/10	86,814
3	2010/11	114,421
4	2011/12	292,043
5	2012/13	420,000*1

Note: News on 30th June 2013 in a newspaper, Kanthipur
Source: JICA Study Team assessment based on data from Statistical Information on Nepalese Agriculture (2008/09 to 2011/12) MOAD

The reasons why paddy imports are increasing despite of the surplus of cereal production in recent years are assumed as follows:

- Maize consumption shifted from one of the main cereals for people to forage of livestock.
- Rice consumption has increased, owing to changes in diet according to economic development.

The present quantity of rice consumption is reported at 122 kg/capita/year.[8] In the same year wheat consumption was 56 kg/capita/year[9], which was all produced in Nepal.

The JICA Survey Team assumed that the consumption quantity of the rice at present (122 kg/capita/year) would be close to maximum, taking into the consideration the experience in Japan, Sri Lanka and the present wheat consumption in Nepal.

[8] Crop Situation Update, A Joint Assessment 2013 Winter Crops, MOA, FAO, and WFP

[9] The quantity of edible wheat is 81% of the wheat harvest. Although the Crop Situation Update stated that the wheat consumption is 17 kg/capita/year, more than 1 million wheat flour is surplus and there is no explanation how to handle the surplus.

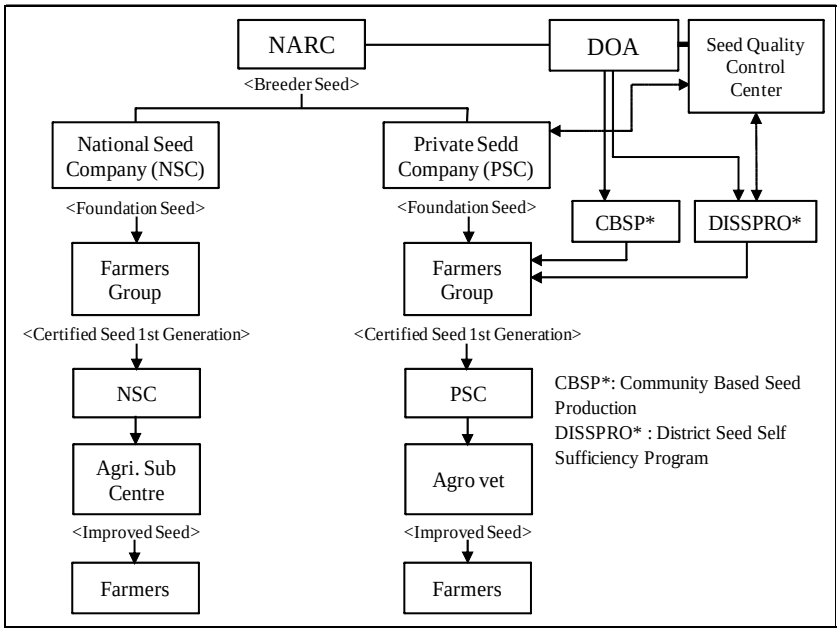
In Japan, the maximum rice consumption was 118 kg/capita/year in 1962 after the Japanese economy has recovered from the destruction of war. Wheat consumption in the same year was 31 kg/capita/year[10]. On the other hand, consumptions of rice and wheat flour in Japan in 2010 were 61 and 38 kg/capita/year, respectively. In Sri Lanka, rice consumption has been increasing. By 2012, rice consumption was 114 kg/capita/year while wheat consumption was 24 kg/capita/year. Rice is produced in Sri Lanka but most wheat is being imported.

(4) Seed and Fertilizer

(i) Seed

(a) Source Seed Production and Seed Distribution System

The DOA is mandated for the extension of seed which covers all districts. The NARC has implemented the development of new varieties and supply of seeds until 1998. The National Seed Policy of 1999 for the first time had a provision for private sector involvement in the seed trade and seed variety development. Since the Ninth Five-Year Plan (1995/96-1997/98), the District Seed Self Sufficiency Program (DISSPRO) has been initiated to facilitate and strengthen local level seed production for local demand. The Community Based Seed Production Program (CBSP) is a program based on a bottom-up approach jointly organized by DOA, NARC, and farmer group for cereal production. The formal institutional set up for the delivery of seed is shown in Figure 3.3.2. Presently, Nepal has four different seed supply agencies: public sector led (NARC, DOA, NSC, etc.), community-led (DISSPRO, CBSP, and cooperatives), private-led (SEAN[11], agro-vets, and seed companies) and import-led (SEAN, agro-vets, importers, and distributors) that are involved in seed sector development.



Source: JICA Study Team

Figures 3.3.2 Seed Multiplication Institutional Setup for Formal Seed System

(b) Source Seed Production

Although NARC mentioned that the production of source seed such as breeder and foundation seeds

[10] Food balance sheet published by the Ministry of Agriculture, Forestry and Fisheries, Japan.

[11] Seed Entrepreneurs' Association of Nepal (SEAN) is a private company founded in Kathmandu in 1999. The SEAN had received technical and financial support from the Seed Sector Support, and involved in the commercialization of national hybrid maize varieties and in developing hybrid tomato varieties in technical collaboration with NARC.

are sufficient to maintain seed distribution cycle, quantity supply of certified/improved seed is insufficient. The seed supply system in Nepal is underdeveloped as reflected by the country's seed replacement rate of only 9 % in 2010/11 for major crops as shown in Table 3.3.7. Seed replacement rate is a very important factor to improve productivity. Seed replacement rate is the percentage of area sown out of the total area of crops planted in the season using certified/improved seeds other than farm saved seeds. Therefore, there are more than 90% of seeds that are supplied through farm saved seeds or informal sector's seeds.

Table 3.3.7 Seed Replacement Rate (Certified Seed) Trend

Crop	2007/08			2008/09			2009/10		
	TSR (t)	TSS (t)	SRR (%)	TSR (t)	TSS (t)	SRR (%)	TSR (t)	TSS (t)	SRR (%)
Paddy	77,472	4,643	6.0	77,463	5,071	6.6	77,797	6,788	9%
Maize	17,019	990	5.8	17,403	1,040	6.0	17,508	1,147	7%
Wheat	80,645	5,531	6.9	84,777	7,007	8.3	83,394	8,245	10%
Millet	NA	NA	NA	2,655	3	0.1	2,659	53	2%
Lentil	NA	NA	NA	5,685	33	0.6	7,352	230	3%
Oilseeds	NA	NA	NA	1,533	17	1.1	1,841	52	3%
Vegetables	NA	NA	NA	1,457	1,037	71.0	1,457	1,009	69%
Total	175,234	11,164	6.3	190,973	14,208	7.4	192,008	17,524	9%

*Note: *Estimated, TSR: Total Seed Required, TSS: Total Seed Supplied, SRR: Seed Replacement Rate*
Source: Seed Quality Control Center 2010/11, DOA

(c) Certified/Improved Seed Production

The DISSPRO is producing about 40% of the total certified/improved seeds in the country. Also, the National Seed Company (NSC) is producing 26% of the total certified/improved seeds, while private registered companies produce 24%, and CBSP at 4%, as shown in Table 3.3.8 below. Seed production trend of DISSPRO and CBSP would have seed production initiatives in the rural area according to future farm demands. To do so, regional-wise seed production plan based on cultivation schedule would be indispensable.

Table 3.3.8 Certified/Improved Seed Production in 2009/10

No.	Crop	Certified / Improved Seed Produced from Different Programs (t)									
		GF	NICDP	NSC	STC	DISSPRO	CBSP	CSB	PSC	NGO	Total
1	Rice	120	0	960	0	3,840	0	50	1,700	120	6,790
		2%	0%	14%	0%	57%	0%	1%	25%	2%	100%
2	Maize	1	0	0	0	490	420	20	200	15	1,146
		0%	0%	0%	0%	43%	37%	2%	17%	1%	100%
3	Wheat	20	0	3,350	610	2,300	0	50	1,860	50	8,240
		0%	0%	41%	7%	28%	0%	1%	23%	1%	100%
4	Others	0	0	58	0	410	250	60	520	50	1,348
		0%	0%	4%	0%	30%	19%	4%	39%	4%	100%
Total		141	0	4,368	610	7,040	670	180	4,280	235	17,524
		1%	0%	25%	3%	40%	4%	1%	24%	1%	100%

Note: 1) Seed potato is not including with this Table. 2) DISSPRO: District Seed Sufficiency Program, CBSP: Community Based Seed Production Program, CSB: Community Seed Bank, GF: Government Farms, NICDP: National Industrial Crop Development Program, NSC: National Seed Company, STC: Salt Trading Corporation, PSC: Private Seed Companies, NGO: Non-Government Organization
Source: Crop Development Directorate, DOA 2010/11

(ii) Fertilizer

Fertilizer is one of the priority inputs identified by the Agriculture Perspective Plan (APP), which remains a largely undersupplied agricultural input. Fertilizer supply which was deregulated in 1997 was again brought under government control in 2009, thereby reintroducing the subsidy that was phased out in 1997. Since 2009, the government has entrusted the Agriculture Input Company Limited to import and distribute the subsidized fertilizers. Despite the revival of subsidies, there is still a big mismatch between the estimated annual current fertilizer demand of 586,000 t and the actual sales of 144,813 t in the 2011/12, as shown in Figure 3.3.3. Most officers in the districts indicated fertilizer shortage as an issue.

	2000/01	2001/02	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12
(t)	146,365	140,766	174,382	138,758	122,706	91,553	90,848	53,753	12,810	10,329	110,013	144,813

Source: MOAD and AICL

Figure 3.3.3 Sales of Chemical Fertilizers

(5) Public Organizations relating to Marketing Development

(i) Agribusiness Promotion and Marketing Development Directorate (ABP&MDD)

As Nepal became a member of the World Trade Organization (WTO) on 11 April 2004. The responsibility to promote agribusiness and export was entrusted to ABP&MDD. At present, the directorate implements three programs, namely: 1) Marketing Research and Statistics Management Program, 2) Agribusiness Promotion Program, and 3) Agricultural Commodity Export Promotion Program. A detailed objectives and strategies of these programs are found in SP-F-1.

Budget allocation of the three ABP&MDD programs as well as ABP&MDD itself under DOA is listed in Table 3.3.9 below.

Table 3.3.9 Budget of Market Programs by ABP&MDD, DOA

Name of Program	2010/2011(Rs)	2012/2013(Rs)
Agribusiness and Marketing Development Directorate	n.a.	338,136,000
Agri Market Research and Statistics Management Program (AMRSMP)	8,158,000	10,505,000
Agriculture Product Export Program (APEP)	8,471,000	22,038,000
Agribusiness Promotion Program (APP)	6,581,000	11,180,000

Source: ABP&MDD Annual Progress Report 2010/11

(ii) National Food Corporation (NFC)

(a) Organization Characteristics

The National Food Corporation (NFC) under the Ministry of Supply is responsible for the stabilization of food in Nepal. Main functions of NFC include: 1) Purchase and sale of grains (mainly rice) with the official price set in each of the 36 districts where NFC offices are stationed[12], and 2) Provision of food to marginal areas such as the Western Development Region.

As for facilities, 56 NFC offices are located in 36 districts and offices, where Jhapa and Morang manage several branch offices. A warehouse with an 11,000 t capacity is available in Jhapa as well as five storages with a total capacity of 8,000 t in Morang. In Dhanusha District, there is a grain storage of 3,000 t and a mill house. There is no NFC facility in the Mahottari District.

(b) Price Setting

The NFC district offices usually sell rice in districts where NFC mills are located. The NFC district offices also sell rice through the central NFC but only during large festivals, such as Dhasaing and Thihar, so as to adjust with the market price which sharply increases in such moments.

As for buying rice, NFC purchases both rice from traders by auctions and paddy directly from farmers. The NFC also purchases maize and wheat but in a much smaller amount than rice and paddy.

The NFC price is set by the Paddy/Rice Procurement Committee under the supervision of the chief district officers of the concerned districts in each 36 offices mainly during the harvest period (January to February) ever year. Winter rice is not targeted to price setting, and the price of wheat is set around April to March. The District Price Committee fixes the price when buying from farmers based on the information from local traders, mills in Nepal as well as Indian paddy/rice market price. Consequently, the price that the Price Committee sets is not much different from that of the Indian price at each border area so as to evade impact in the Indian market price.

The NFC's procurement price and its impact, however, need to be further studied to assess paddy/rice market price in the Terai area. For example, when the influx of cheaper Indian rice in 2000 lowered the price of local paddy in Western Nepal, NFC has set a slightly higher price. Farmers have hoped that such prices would offset their losses but the NFC procured only around 6,000 t of paddy and so not all farmers benefitted from the NFC price[13].

(c) Agro Enterprise Center (AEC)

The AEC is the agricultural wing of the Federation of Nepalese Chamber of Commerce and Industry (FNCCI), promoting market oriented private sector of agro-enterprise in order to increase the value and volume of high-value products of Nepal.

Major activities of the AEC are as follows: policy advocacy, advice/study, agro-business information service including marketing information services (MIS), and trade and business development focusing on trade fair/exhibitions and new business development.

[12] There used to be 105 of NFC offices before the democratization.
[13] Source: Nepali Times, Issue #18, November 2000

In 2012, the AEC launched the OVOP programs[14] for areca nuts produced in Jhapa District and for fish produced in Dhanusa District. The AEC is also currently implementing a marketing project for value added ginger with the construction of a multipurpose collection center in Jhapa.

(6) Trade of Agriculture Products

Sharing the free border line of approx. 1,700 km, the Terai area of Nepal and Uttal Pradesh (UP) District, Bhihar District, and West Bengal of India are the most important areas for trade of agricultural products in Nepal.

Although the export of agricultural products is promoted through the Agricultural Commodity Export Promotion Program[15] under ABP&MDD of DOA, Nepal has a serious trade imbalance in the aggregate. The deficit situation is worsening in recent years and Nepal's reliance on imported products is increasing.

(i) Present Condition of Agricultural Import

The agricultural commodities imported from India and from other countries to Nepal are presented in Table 3.3.10. All commodities except for palm and sunflower oils are imported from India.

Table 3.3.10 Key Commodities Imported from India and Other Countries, 2010/2011

Commodities Imported (Total)		Commodities Imported from India	
Commodities	Value (Rs)	Commodities	Value (Rs)
Semi milled/wholly milled rice	5,752,454,058	Semi milled/wholly milled rice	4,879,924,659
Maize	3,698,496,477	Maize	3,512,515,108
Crude palm oil	3,698,379,753 (Indonesia)	Rice in the husk	3,239,902,340
Rice in the husk	3,240,487,912	Soya beans	2,177,280,999
Crude sunflower oil	2,710,822,591 (Ukraine)	Potatoes, fresh or chilled	2,144,505,318
Soya beans	2,189,371,753	Onions and shallots	1,171,264,964
Potatoes, fresh or chilled	2,144,516,431	Dried leguminous vegetable	621,733,293

Source: Statistical Information on Nepalese Agriculture 2011/12, Agribusiness Promotion & Statistics Division, MOAD

Especially in case of rice, the volume of imported rice from India has been increasing since 2010/2011, as indicated in Table 3.3.11.

Table 3.3.11 Trend of Quantity of Rice Imported from India

Year	Quantity (t)		Value (Rs1,000)	
	Total	India	Total	India
2008/09	98,767	89,295	1,823,979	1,467,538
2009/10	86,814	86,138	2,527,557	1,699,419
2010/11	114,421	111,325	2,325,911	2,226,617
2011/12	292,043	274,497	9,117,200	8,224,085

Source: Prepared by JICA Survey Team based on the Statistical Information on Nepal Agriculture 2008/09, 2010/11, 2011/12, and Agriculture Commodity Export Promotion Program of ABP and MDD, DOA

[14] Details of the OVOP programs in Nepal are described in Progress Report on the Project for the Master Plan Strategy on High Value Agricultural Extension and Promotion in Sindhuli Corridor in Nepal, JICA, December 2011,

[15] Refer to SP-F-1

(ii) Present Condition of Agricultural Exports

The agricultural commodities exported from Nepal to other countries and to India in particular, are indicated in Table 3.3.12. Nepal's leading export commodities are cardamom, lentil, and tea. Also, cardamom, tea, and forest products, such as extracts from timber, are exported to India.

Table 3.3.12 Key Commodities Exported to Other Countries and India (2011/2012)

Commodities Exported (Total)		Commodities Exported to India	
Commodities	Value (Rs)	Commodities	Value (Rs)
Cardamom	3,496,733,092	Cardamom	3,459,048,692
Lentils	2,677,969,900	Black tea fermented	1,344,116,824
Black tea fermented	1,495,977,799	Forest products	859,322,792
Forest products	859,322,792	Ginger	506,082,126
Ginger	507,590,352	Betel nuts (fruits)	429,416,183
Betel nuts (fruits)	429,416,183	Vegetable fats & oil	228,542,190
Vegetable fats & oil	229,972,329	Lentils	193,816,141

Source: Statistical Information on Nepalese Agriculture 2011/12, Agribusiness Promotion & Statistics Division, MOAD

(7) Constraints for Nepalese Agricultural Exports

It is prevailingly stated by many stakeholders including famers, DADO and Plant Quarantine Office(PQO) staff, and business enterprises such as traders and mill owners, and central government officials that Nepal's agriculture sector cannot compete with India's because Indian agricultural commodities are much cheaper due to heavy subsidies. Particularly, the price of Indian paddy is generally 20-25% lower compared to that of Nepalese paddy[16].

The previous JICA survey[17] also pointed out that the Indian economy has very limited interest in Nepali products. The major states which adjoin to target district borders are west Bengal to Jhapa District, Bihar State in Morang and Dhanusa. In these areas, large-scale agricultural development for grains and vegetables is very much active with provisions from the Government of India (GOI), giving various incentives under favorable policies for agricultural development. The JICA survey concluded that the potential of agricultural exports from Nepal is basically very low unless Nepal can export high valued products which are not available during off-season in the Indian states.

From the Nepalese exporter's side, it is also very difficult for them to obtain export licenses from GOI, since the Indian government has less confidence in Nepali products which might disguise its origin[18]. In order to receive export licenses from GOI, exporters need to fulfill the hygiene criteria set by GOI and proof of origins of products. Even in such circumstances, there is no certificate system to guarantee the quality of agricultural products in Nepal. The cost is too high for exporters if they would use foreign certification system instead[19].

(8) Potential of Nepalese Agricultural Exports

Many conditions have to be taken into consideration for future recommendation of exportable agricultural commodities, i.e., i) Existence of markets abroad especially India and/or Bangladesh, ii)

[16] Information from the collectors during the Sample Survey on Agriculture Distribution and Marketing
[17] Final Report of the Preparatory Survey on Private Sector Development in Nepal (Translated by the JICA Survey Team, March 2013)
[18] Interview with exporters in Kalimati Market in KTM
[19] Interview with ABP&MDD

Trend of prices according to the demand of the market, iii) Availability of market related facilities such as cold storage especially for perishable commodities, and iv) Feasibility of farming by Nepali farmers, including skills, conditions of weather, soil, land area, etc.

As for the trend of prices in Nepal, the price of all vegetables has almost doubled. The average annual growth rates of potatoes and onions have risen to 15.9% and 11.9%, respectively, from 2003/4 to 2009/10, following a 9.2% increase for tomatoes and 8.2% for ginger[20]. Therefore, it is rational to focus first on these commodities.

Seasonality is another strategic factor to consider. In general, vegetables from Terai can flow at hilly areas of Nepal in winter and at early summer to India. In summer, early winter, and early summer seasons, vegetable is good for sale. However, vegetable during winter season is not appropriate for export, since the production of winter vegetables is high in India during winter period[21].

The following are other examples which can be recommended as potential commodities at this point:

(i) Tomato

Tomato is recommended as one of the potential vegetables for export to India in summer due to the following factors. Tomato production is exceptionally highly commercialized in Terai. Out of the different vegetables products in Terai, there are some scales of production (area and volume) for tomato. Area under tomato cultivation is high in target districts with a established market chain for tomato, especially from Dhalkebar market and Birtamod market to India. For example, tomatoes are imported from India for use as an ingredient of sauces and juices at processing plants in Morang.

(ii) Ginger

Nepal is the third largest producer of ginger in the world[22] and has exported more than Rs50.6 million in 2011/12 as one of 19 beneficiary elements[23] that have been identified in the Nepal Trade Integration Strategy (NTIS), 2010 for trade in the international market. Since the geophysical and climatic condition in Nepal is sufficiently favorable for ginger production, more than 20 districts in Nepal including Morang are practicing in ginger farming. However, in contradiction to these favorable factors, poor farmers who produces ginger have to sell them at prices lower than or even the production cost. This is because Indian ginger, which is cheaper, is largely produced and exported, thereby drastically dropping the price of ginger as what happened in 2012[24].

Even considering these negative factors, however, ginger is still a promising commodity as it can be dried, powdered, and sliced for use as an ingredient for cooking and also for its medicinal value. Such value addition through processing is the key to its stable exportability in the future.

[20] Progress report on the Project for the Master Plan Study on High Value Agriculture Extension and Promotion in Sindhuli Road Corridor in Nepal (JICA, Dec.,2011)
[21] Interview with ABP&MDD
[22] The statistics of the Food and Agriculture Organization (FAO)
[23] 19 export priorities: 7 Agro-based (large cardamom, ginger, honey, lentils, tea, noodles, medicinal and essential oils); 5 industrial products, an 7 service areas (tourism, labour, health, education, information technology, engineering and hydro-electricity), National Agriculture Sector Development Priority (NASDP) for the Medium-Term (2010/11-2014/15), MOAD, July, 2010
[24] Policy and Regulatory Requirements for Agricultural Commercialization in Nepal (Vijoy Mallic, Joint Secretary, Agriculture Business Promotion and Statistics Division, MOAC, April, 2012)

(iii) Fruits

Banana and papaya can be options as recommended fruits for export, since there is available land for its cultivation. There is a banana production area of 1,750 ha in 2010/11 in Jhapa[25]. Morang is the second largest production area of banana in Nepal with 10,635 t in 2010/11[26]. The comparatively short cultivation period (one year) of banana and papaya is also an advantage for farmers to increase their income. Papaya has a large potential for export since there is past achievement of production of papaya in Dhanusa, reaching 1,409 t and 15.15 t/ha of productivity in 2010/11[27], while 24% of the bananas and papayas consumed in Nepal are imported from India.

Aside from commodities abovementioned, areca nuts, black pepper, and early summer season vegetables such as pointed gourd were recommended by GON due to their profitability[28].

(9) Agricultural Extension Services by DOA/DADO

(i) Present Situation

As mentioned in Sections 3.1.1 and 3.1.2, the DADO takes main responsibility for agricultural technical extension services. These extension workers are called junior technicians (JTs) and junior technical assistants (JTAs). They are assigned in the Agriculture Service Centre (ASC) and/or Agricultural Contact Centre (ACC) under the DADO and in Livestock Service Centre under the District Livestock Services(DLSO). The actual number of service centers are listed in Table 3.3.13. This means that one center covers about ten VDCs, and one JT/JTA is responsible for about 3-4 VDCs.

The majority of JT/JTAs are School Leaving Certificate(SLC) passer and take JT/JTA courses conducted from technical education and vocational training. The existing courses are presented in Table 3.3.13.

Table 3.3.13 Existing JT/JTA Courses, Council of Technical Education and Vocational Training

Course	Certificate	Period	Entitlement
I. Sc in Agriculture (Plant Science)	Diploma	3 years	SLC passer
I. Sc in Agriculture (Animal Science)	Diploma	3 years	SLC passer
Junior Technician Assistant Course in Livestock Production/Animal Health	T.SLC	15 months	SLC passer
Junior Technician Course in Agriculture/ Veterinary/Livestock	JT certificate	1 year	3-year-experience as JTA

Source: JICA Survey Team

(ii) Extension Methodology

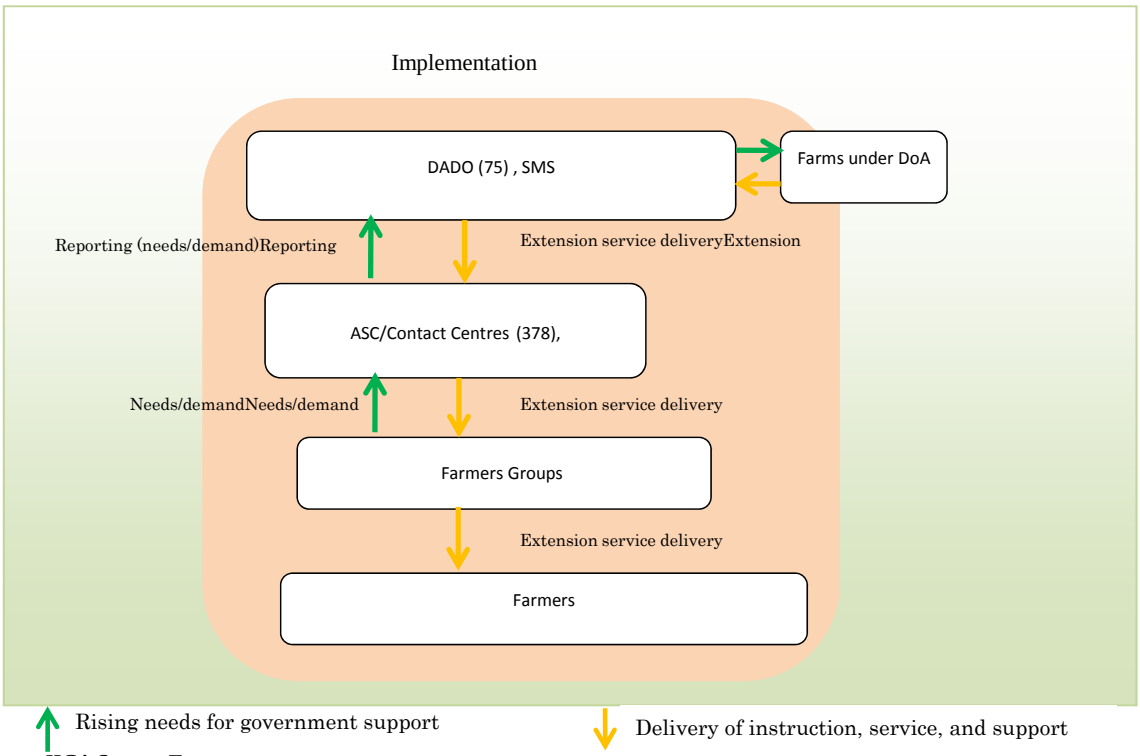
The DOA in the 1990s shifted the agricultural extension services system from Training and Visit system (T&V) to a farmer group approach (including farmer to farmer, field farmers school, and so on) because of the consideration of cost performance of T&V. DOA decreased the number of agricultural sub-service centers and JT/JTAs, which promoted farmers to formulate a “farmer group”.

[25] Statistical Information on Nepalese Agriculture 2011/2012, Agribusiness Promotion and Statistics Division, Statistics Section, MOAD
[26] Kathmandu Post, November 11, 2010
[27] **S**tatistical Information on Nepalese Agriculture 2011/2012, GON, MOAD, Agri-Business Promotion and Statistics Division Statistics Section
[28] Interview with ABP&MDD

Under the facilitation of JT/JTAs, who wants to have technical advices from government agencies, gathers his/her companies (20-24 people) and forms a farmer group. After the group is registered to the government agencies where it is located, they can receive extension services from JT/JTAs.

According to the Directorate of Extension in DOA[29], a farmer group is obligated to:

- Establish their own rules and regulations by themselves,
- Have a common/shared goal,
- Enhance meaningful interaction among its members,
- Have stable relationship among its members,
- Enhance the ownership of respective member, and
- Respect interdependence among its members.



Source: JICA Survey Team

Figure 3.3.4 Flow of Agricultural Extension Services (Implementation)

The Directorate of Extension in DOA promotes the following types of extension services:

- Farmer Groups and Cooperatives
- Public-Private Partnership (PPP)
- Farmers' Field School
- Farmer to farmer (FtF) extension
- Pocket Package
- Demonstration Farm
- Agriculture Alliance

[29] Directorate of Agricultural Extension, DOA (2008/09), "Formulation and Operation Procedure of Farmers Group, 2065/66"

3.3.2 Present Condition of Irrigation and Water Management

(1) Water Resource for Irrigation

(i) Available Water Resource for Irrigation

Nepal has about 6,000 rivers consisting of four major rivers; the Mahakali, Karnali, Narayani and Koshi rivers which originate from the Himalayas, and five medium rivers namely; Kankai, Kamula, Bagmati, Weat Rapti and Babai which originated from the Mahabharat range. Nepal also has other small rivers which originated from the Siwalik range. All the rivers flow from the north to south and finally join the Ganges River in India.

During the summer monsoon season from June to September, rain pours down on the southern slope of Nepal and water is collected by the rivers. The four major and five medium rivers have perennial flow, which could provide year round irrigation. In small rivers, perennial flow is limited and most small rivers have floods during summer monsoon season and have little water in winter season.

Runoff from all the river system is estimated at 225 billion m^3. This flows down as well as charge groundwater aquifers, which is reliable irrigation source from groundwater.

Under the Study, the concerned major and medium rivers are the Kankai, Koshi and Kamula rivers from the Eastern Development Region to the Western Development Region.

(ii) Integrated Water Resource Development Concept

Water resource development programs such as hydropower development projects, irrigation development projects, municipal and domestic water development projects, drainage development and flood alleviation control projects, industrial and other private sector development projects, etc. have been individually and respectively implemented on a technical viewpoint. Only the supply side has been driven, not carefully respecting the demand-driven and the integrated water resource development in the same basin for enhancing the optimization of effective water resource use. Also, environment and social impacts were not fully considered.

Therefore, water issues and conflicts have intensively occurred in the basin and rational water use could not be achieved in terms of efficiency, equity, and environmental considerations for the benefits of all stakeholders in the basin.

These experience issues led to think the concept of an integrated water resources management (IWRM) that opens a window for a holistic perspective in balancing the competing demands, e.g., domestic, agriculture, hydropower, industrial, cultural, and environmental subsectors.

The GON has internalized the definition of IWRM as a process which promotes coordinated development and management of water, land, and related resources, in order to maximize the resultant economic and social welfare in an equitable manner, without compromising the sustainability of vital ecosystems. The IWRM concept is adopted in the Irrigation Water Plan (2005) and the Integrated Water Resources Management in Action, WWAP, DHI Water Policy, UNEP-DHI Centre for Water and Environment 2009 as shown below.

by 2007:
- Year-round irrigation increased to 50% of the irrigated land
- Agency managed irrigation systems are managed jointly with water user associations

by 2017:
- Year-round irrigation increased to 66% of irrigated land
- 80% of all irrigable land shall be served by irrigation schemes
- The APP targets regarding irrigation will be achieved

by 2027:
- 90% of all irrigable land provided with year-round irrigation
- Irrigation system efficiency increased to 60%

(2) Irrigation and Drainage System

(i) Irrigation Area

The Handbook of DOI for 2012-2013 shows a cultivation area of about 2,641,742 ha and irrigable area of 1,765,840 ha. Out of the total irrigable area, the present irrigated area is estimated at around 1,311,000 ha in 2012/13. Although clear breakdown of the irrigated area is not available.

While the database for irrigation development in Nepal, March 2007 was prepared by the Planning, Design and Monitoring & Evaluation Division of DOI. Therefore, irrigation area is used in the discussion on irrigation area of Nepal.

Irrigation areas are classified according to each ecological regions and geographical area are estimated as shown in Table 3.3.14.

Irrigated area in Terai is estimated at about 80% of the total irrigated area.

Table 3.3.14 Updated Irrigated Area as of 2008

(unit: ha)

Development Region	Hills	Mountain	Terai	Total
Eastern	52,108	1,875	341,409	395,392
Central	57,062	17,599	301,523	376,184
West	45,095	1,789	149,846	196,731
Mid-Western	25,971	6,141	99,369	131,481
Far Western	12,171	9,371	82,278	103,820
Total (ha)	192,407	36,775	974,425	1,203,607
%	16.0	3.1	80.9	100

Source: Database for irrigation development in Nepal March 2007, Planning, Design and Monitoring and Evaluation Division, DOI

(ii) Surface Irrigation System

Based on water resource for irrigation, there are surface irrigation system and groundwater irrigation system based on type of water resource for irrigation. System management of surface irrigation systems is further classified into agency managed irrigation systems (AMSs) and farmer managed irrigation systems (FMISs), based on the ownership and management initiation.

In addition, a mixed type of system management, namely, Joint Management System (JMIS) occasionally and locally exists.

(a) Agency Managed Irrigation Systems (AMIS)

Irrigation systems are constructed and managed by DOI with or without bilateral aids.

Irrigation Policy 2003 classifies the surface irrigation system according to the irrigation area, ecological region and geographical area as shown in Table 3.3.15.

Table 3.3.15 Classification of Irrigation System

unit (ha)

Irrigation System	Hilly Area	Terai Area
Major Irrigation Systems	More than 1,000	More than 5,000
Large Irrigation Systems	500-1,000	2,000-5,000
Medium Irrigation Systems	25-500	200-2,000
Small Irrigation Systems	Less than 25	Less than 200

Source: Irrigation Policy 2003

In major, large, and medium irrigation systems, DOI constructed permanent irrigation facilities such as headworks such as dams, barrage, or weir with long canal networks up to tertiary canals and associated water control and water measuring structures. Such systems are either jointly managed with WUAs or solely managed by DOI, employing large numbers of field engineers, supervisors, and gate operators along with adequate logistics (equipment and office spaces).

Under irrigation management transfer schemes, the lower part of all canal networks starting from the branch canals are being managed by farmers. Total irrigation area completed by the DOI is 587,770 ha, equivalent to about 45% of the total recorded area (approximately 1,311,000 ha) as shown in the Handbook of DOI, 2012.

(b) Farmer Managed Irrigation Systems (FMISs)

Farmer managed irrigation systems (FMISs) spreading all over Nepal consists of simple inundation canal systems without permanent water diversion system and adequate water control structures. FMIS is roughly estimated at 12,000-15,000 schemes in Nepal. The total irrigated area of the FMIS documented by DOI is estimated at about 381,814 ha equivalent to about 29% of the total area. At present, the two donors such as ADB and World Bank (WB) are assisting in the rehabilitation of such systems.

(iii) Groundwater Irrigation System

The two types of tube wells such as deep tube well type and shallow well type are popular. Depth of deep tube wells are more than 100 ft (30 m). Shallow tube wells ranges from 60 ft to around 100 ft in depth.

The groundwater irrigation area is estimated at 342,376 ha, equivalent to about 26% of the total irrigated area. Groundwater irrigation systems are specially scattered all over Terai area.

(iv) Non-Conventional Irrigation Systems

Non-conventional Irrigation Technology Project (NITP) started in 2002 to promote the use of alternative technology other than conventional irrigation technology and techniques.

This system is established with the goal of providing technology, skills, and services to the poor and disadvantaged people to increase production and productivity of high-value crops by providing

micro-irrigation services.

Type of irrigation system are rain water harvest (tank irrigation), treadle pump, low cost water storage (Thai jars, soil-cement tanks), sprinkler irrigation, and drip irrigation. Nearly ten agencies such as government organizations (GOs), NGOs, international non-government organizations (INGOs) have managed unconventional irrigation systems and methods, with an irrigation area estimated at about 44,770 ha, as shown in Table 3.3.16.

Table 3.3.16 Non-Conventional Irrigation System

No.	Organization	Area (ha)	Households (HH)	Area per Household (ha/HH)
1	Agricultural Bank-Nepal	28,987	29,035	0.998
2	IDE-INGO	9,815	119.406	0.082
3	SISP-DOI	2,280	7,800	0.292
4	NITP-DOI	1,823	4,850	0.376
5	DEPROSC-NGO	1,211	4,139	0.293
6	SAPROS-NGO	335	3,852	0.087
7	MDI	168	1,001	0.168
8	CEAPRED-NGO	129	741	0.174
9	VDRC- Local- NGO	21	229	0.092
10	HELVETAS - INGO	5	27	0.185
	Total	44,774	171,080	0.262

Source: DOI

At present, the system faced two issues such as enhancement of technical guidance and training and strengthening of marketing activities.

Farmers are ready to adopt these non-conventional technologies and switch over to high value crop farming. However, there is need for proper guidance and training regarding these technologies, benefits, technological aspects, associated farming practices, etc.

Apart from agricultural aspects, farmers need to be imparted with marketing knowledge, i.e., dynamics of market, market forces, rapacious middlemen, along with the importance of collective saving, roles of the cooperatives, etc.

(v) Drainage Canal System

In the irrigation development programs in Nepal, technical concepts and strategies on drainage development are not familiar.

Excess water from paddy fields flow mostly into natural streams and rivers. Inundation of excess water occurs in the paddy field. Paddy cultivation has occasionally been suffering from the inundation of excess water and flood in the monsoon season.

(3) Responsible System Management for Surface Irrigation System in case of AMIS, JMIS and FMIS

Surface water irrigation projects are broadly categorized depending on regional and graphical condition such as hill area and Terai, scale of project area and management system of WUA or Agency.

The responsibility of system management, of which consists of responsibility of self-management of irrigation system and WUA, water management and maintenance works are broadly categorized as shown below.

Table 3.3.17 Responsibility of DOI and WUA on System Management

Description	Management System	Agency Managed Irrigation System (AMIS)		Joint Management System (JMIS)		Farmer Managed Irrigation System (FMIS)	
	Irrigation Facilities	Main System	On-farm	Main System	On-farm	Main System	On-farm
Construction /Rehabilitation	Major Scale Irrigation System	IDDO/DOI	Tertiary canal : IDDO/DOI & Lower grade canal from tertiary canal: WUA	IDDO/DOI	WUA	Only Rajapur System by WUA	WUA
	Large Scale Irrigation System	IDDO/DOI	WUA	IDDO/DOI	WUA	Only Chhatish Mauja System by WUA	WUA
	Medium Scale Irrigation System	IDDO/DOI	WUA	IDDO/DOI and WUA	WUA	WUA	WUA
	Small Scale Irrigation System	✻	✻	✻	✻	WUA	WUA
Water Management	Major Scale Irrigation System	IDDO/DOI	WUA	IDDO/DOI	WUA	Only Rajapur System by WUA	WUA
	Large Scale Irrigation System	IDDO/DOI	WUA	IDDO/DOI	WUA	Only Chhatish Mauja System by WUA	WUA
	Medium Scale Irrigation System	IDDO/DOI	WUA	WUA and IDDO/DOI	WUA	WUA	WUA
	Small Scale Irrigation System	✻	✻	✻	✻	WUA	WUA
Maintenance Works	Major Scale Irrigation System	IDDO/DOI	WUA	IDDO/DOI	WUA	Only Rajapur System by WUA	WUA
	Large Scale Irrigation System	IDDO/DOI	WUA	WUA and IDDO/DOI	WUA	Only Chhatish Mauja System by WUA	WUA
	Medium Scale Irrigation System	IDDO/DOI	WUA	WUA and IDDO/DOI	WUA	WUA	WUA
	Small Scale Irrigation System	✻	✻	✻	✻	WUA	WUA

Note: ✻ Not applicable

Source: JICA Survey Team based on information from DOI

(4) On-farm Irrigation System and Irrigation Method

The GON has constructed and/or rehabilitated many large- and medium-scale irrigation projects. Main irrigation facilities such as headworks, free intake structures, main and secondary irrigation canals and related structures were constructed and/or rehabilitated. However, GON has entrusted the construction and O&M works of on-farm irrigation to WUAs. On-farm irrigation facility, such as turnout structures and tertiary canals were not well and sufficiently constructed, especially for medium-scale irrigation projects.

Tertiary irrigation block area approximately ranges from 30 to 100 ha. Land leveling is not commonly well implemented. Due to physical conditions, irrigation water supply has much suffered from these conditions of on-farm facilities. Improper water management such as plot to plot irrigation on the paddy field is carried.

As a result, the envisaged targets of crop yield and production have not been attained. Even the enhancement program on improvement of farm management and strengthening agricultural extension works were executed.

(5) Management of Rehabilitated Irrigation Projects

(i) Dissemination and Approaches

Rehabilitation of irrigation system with participatory concept of water users started since the promulgation of Irrigation Regulation in 1989 and Irrigation Policy (amendment) in 1992. The GON implemented the rehabilitation of old FMIS projects and the transfer of AMIS in large and medium irrigation projects through ILC (1989), NISP (1999) and IWRMP (2008) by WB and through ISP (1989), IMTP (1994), SISP (1997), CMIASP (2006) by ADB. In all above completed projects, two concepts were understood:

- Rehabilitation of existing FMIS and then returning their system to farmers. About 131,670 ha under FMIS have been rehabilitated.
- AMIS in the projects, in which irrigation systems are rehabilitated and that the management of the rehabilitated system has been transferred to WUAs as Joint Management Irrigation System (JMIS) between agency and WUA.

By doing this, irrigation systems are kept under a joint management approach. The DOI has kept a command area of 325,919 ha under the joint management concept (Irrigation Handbook of DOI, 2012/13).

(a) Bottom-Up Approaches for Rehabilitation and Turnover of Irrigation System

In the case of FMIS rehabilitation, recently completed projects adopted a demand driven process oriented approach as guided by the Irrigation Policy (1992), which stopped the past trend of supply or central oriented approaches for project selection and implementation.

The latest bottom-up approaches are implemented during project identification, collection to project completion in cases of the Community Managed Irrigated Agriculture Sector Project (CMIASP) assisted by ADB and the Irrigation and Water Resource Management Project (IWRMP) component- A assisted by WB. The approaches can be best cited in Table 3.3.18 below as an example.

Table 3.3.18 Examples of Bottom-Up Approaches

CMIASP (FMIS) (Central and Eastern Development Regions)	IWRMP-Component-A (FMIS) (Western, Mid-Western and Far Western Development Regions)
(1) Information campaign by central project After preparation of management issues to all DDCs and VDCs and a letter that provides a clear information and process of the project, these information letters are sent to district WUA federation and NGOs. (2) Interested farmers will form an ad-hoc WUA committee and request rehabilitation to the management unit of district subprojects with endorsement of concerned VDC and DDC with a deposit of amount at the rate of Rs50 per ha. (3) After this, projects are screened and identified, verified, conducted feasibility study and prepared implementation plan. After the completion of the detailed design and cost estimates, the project is appraised and approved, followed by project approval, tendering and implementation of physical construction and implementation of other supporting programs. Monitoring actions are carried out during this period.	(1) Dissemination of project information Dissemination on project demand is executed to irrigation communities/farmers groups/WUA using leaflets, radio, pamphlets, seminars, workshops held by sub project offices. (2) Registration on project rehabilitation is conducted in a form signed by many users/farmers with advanced deposit at the rate of Rs50 per ha in the district project office. (3) Afterwards, the projects are shortlisted. A feasibility study is made and social and environment management plans are also prepared. Appraisal and approval processes for implementation are taken. After formation and registration of WUAs, agreement on the implementation of rehabilitation works is mutually signed between subproject offices and WUA. Then the project is implemented and commissioned, and new reformed system is operated, and finally evaluated for its target performance.

Source: JICA Survey Team based on information from DOI

(b) Screening Criteria of the GON for Project Selection

In case of FMIS, after receiving the demand form on rehabilitation works from farmers, candidates proposed by IDDO are evaluated by the steps screening method, such as (i) the shortlisting of the projects by applying a certain criteria and (ii) the field survey criteria being used by DOI. However, the screening criteria are different depending on the approaches of each project.

For example, the following criteria were adopted in cases of the CMIASP and the IWRMP.

Table 3.3.19 Screening Criteria for Selection of Projects (Examples)

CMIASP (FMIS)	IWRMP-Component A (FMIS)
<u>Shortlisting Criteria</u> (i) Adequate filling up of demand form, (ii) High potential for irrigated agricultural development strategy, (iii) Area has equal land distribution or more than 40% of the benefit area owned by farmers having less than 1 ha, (iv) More than 50% households are beneficiaries and area less than 1000 ha, (v) Subproject cost not exceeding US$100/ha (vi) No previous investment, and (vii) No major land and social related issues.	The demand form is reviewed on the basis of information like salient features of the project and the site verification with following criteria is made (i) Availability of water (ii) Strength of IDDO (iii) Status of irrigation infrastructures (iv) Socio-environmental consideration (v) Agriculture situation (vi) Accessibility (vii) Risk factors (viii) Beneficiary commitment <<Highest scorer candidate is selected for the project>>

Source: JICA Survey Team based on information from DOI

(c) Conditionality of Turnover on the Rehabilitated Schemes and Transfer of Management to WUA

Conditionality for turnover of the rehabilitated scheme and transfer of management to WUA is discussed between GON and donors, the minimum requirements of turnover and transfer of

management at the end state of the scheme are mainly discussed, focusing on effective physical condition of scheme, sustainable function of WUA, and effective and optimized water delivery.

For example, the Irrigation Management Transfer Project (IMTP) assisted by ADB and Irrigation Management Transfer of IWRMP (IMT/IWRMP) assisted by WB, envisioned the end state of schemes such as the candidacy and the qualification of the schemes for turnover of the scheme and transfer of management to WUA as shown in Table 3.3.20 below.

Table 3.3.20 Conditionality of Turnover Rehabilitated Schemes and Transfer of Management to WUA (Examples)

IMTP assisted by ADB	IMT/ IWRM assisted by WB
The project aimed to develop, refine, and institutionalize the process and strategy for transferring O&M or ownership of AMIs. The following end conditions of the irrigation schemes were anticipated prior to turn over of the projects. (i) Physical system improvement for better performance (ii) Establishment of 14 sustainable and effective water users association. (iii) Water delivered by participatory irrigation schedule and calibrated structures.	The project aimed to achieve the following conditions for the management transfer of the canal systems. (i) Physical performance (efficiency, water management, conveyance) of the schemes improved. (ii) WUAs are financially and institutionally sustainable, and as an organization become self-governing, self-financing and self–regulating. (iii) Reliable bulk water service delivery by DOI and efficient and equitable irrigation service delivery to users by WUA.

Source: JICA Survey Team based on information from DOI

(ii) Sharing of Operation and Maintenance Responsibility with WUA in Joint Management Systems

A system of sharing responsibility for canal operation and maintenance existed in the practice of Agency Managed Irrigation System (AMIS). The DOI is in the process of rehabilitation works and transfer of the rehabilitated works to WUA. These practices were and institutionalized by DOI and reflected through a memorandum of understanding and an irrigation management transfer agreement (IMTP). This practice is further explained below:

(a) Agency Managed Irrigation System (AMIS)

Generally, before the implementation of a project, an agreement which states all rules and responsibility items and mechanism of sharing project development activities between parties are signed by WUA and DOI authorities.

Operation, maintenance, and water delivery activities up to the main canal are kept under DOI responsibility, whereas, maintenance and operation of all branch canals, tertiary and field channels fall under WUA management.

The WUAs have to establish an office system and take care of other handed over equipment, houses and land. It has to deliver water to users based on jointly developed crop calendar. WUA shall also collect ISF and other resources for financial management tasks of the organization.

The DOI does regular monitoring works on WUA's water delivery practices, ISF collection status and financial records and their maintenance tasks are monitored by the WUA office. DOI accomplishes all the activities as stated and written in the agreement document during the period of project implementation. For any irrigation related conflicts that arise in the projects, DOI and WUA settle

them jointly.

(b) Farmers Managed Irrigation Systems (FMIS)

The FMIS are rehabilitated jointly with cost sharing basis.

Generally after project selection, an amount at the rate of 0.5% of the total cost has to be deposited by WUA and then an agreement stating the participatory process of project implementation is signed between WUA and DOI. WUA has to share 3% to as high as 15% of the total construction costs (in cash) for headworks in accordance with policy provisions (Refer to Data Book 3.3.1, Irrigation Policy, 2003).

In addition, WUA has to maintain on-farm irrigation facilities from tertiary canal to lower grade canals using its own budget.

After turning over the rehabilitated schemes to farmers, it becomes WUAs' obligation to operate, maintain and manage the irrigation schemes in order to sustain their own resources for harvesting the benefits.

(iii) Maintenance of the Work System

The DOI has established maintenance work systems of irrigation facilities, following the traditional process such as identification of demand for maintenance works, quantity estimate of the works, cost estimates, and contract. However, an advanced concept on maintenance work system is prepared under the implementation of IWRMP.

The advance concept is the asset management system on irrigation facilities, and ISF collection is planned to provide the required amount of the maintenance work budget. The ongoing practice of this new maintenance system is shown in Table 3.3.21 below:

Table 3.3.21 Maintenance Works System of IWRMP

Maintenance Activities	Agency Managed Irrigation System	Farmer Managed Irrigation System
(i) Maintenance survey	(i) Government engineers conduct observation and measurement survey and prepare the estimate	(i) WUA committee member form a team of maintenance need assessment survey to conduct walk through process documenting damaged structures and canal
(ii) Approval of maintenance works	(ii) By IDDO, Senior Divisional Engineer or Regional Director	(ii) Work is approved by main committee
(iii) Implementation of works	(iii) Tendering process appoints local contractor and work is completed by themselves	(iii) Work is completed by labor contribution (per household or per ha) and cash from users and employing local labor and mason a force major approach
(iv) Monitoring	(iv) Ongoing activities are monitored by engineers	(iv) Monitoring work is done by the chairperson and secretary
(v) Payment of bills/ works	(v) On actual measurement basis	(v) Labors are paid on a per day basis and items are mostly paid on a lump sum basis
(vi) Categories of maintenance works done a) Periodic Works b) Regular Works c) Emergency Works	(vi) a) Performed once a year b) Canal cleaning, trash rack cleaning by regular permanent staff c) Emergency work estimates is prepared and reliable contractors are awarded with works directly	(vi) a) Performed once a year b) Performed before each crop season c) All users gather people

Source: JICA Survey Team based on information from DOI

(6) Historical Background of Enhancement in Water Management and Lessons Learned

(a) Historical Background

The DOI executed four pilot projects on water management improvement at different locations in Terai and hills of Nepal from 1985 to 2003. The four projects are the Irrigation Management Project (IMP, 1985-1992), Special Project In Nepal (SPIN, 1995-1998), On-farm Water Management Sub-Component (OFWMSC, 1992-2002) and Integrated Crop Water Management Project (ICWMP, 2002/03 to present).

Two pilot projects, IMP and SPIN, were assisted by USAID and FAO while the other two projects were executed or being executed using regular DOI budget.

The IMP was initiated to develop sustainable irrigation water management practice with a view to internalize WUA and water management process within DOI, thereby increasing the capacity of DOI.

As a result of IMP, under the Irrigation Management Division (IMD) was established under DOI. The WUA development and participatory irrigation development processes were also incorporated in the Irrigation Regulation 1988/89. These processes and practices were implemented by ILC (WB) and ISP (ADB) projects.

The IMP limited its scope to water system management and WUA development, leaving aside much attention to on-farm water management development.

As a complement to IMP, the SPIN program started in 1995 as an on-farm management program to support food security program of the government. It demonstrated the increase of crop yield and agricultural production using technology of the integrated crop water management through farmers.

Despite its encouraging results and aim to replicate the program through internalized process in DOI, their program was discontinued by both FAO and DOI due to poor coordination among agency, famers and donors. Shortfall of incentives among stakeholder, especially farmers and passive support of agency to farmers also caused the discontinuation of the program.

Acquiring sufficient knowledge and experience through IMP and SPIN, DOI launched OFWMSC with the assistance of FAO. Similar programs were implemented at 40 pilot sites within 20 districts under the Irrigation Line of Credit Project (ILC) and Irrigation Sector I Project (ISP). These programs, similar to that of SPIN, were implemented in order to increase agricultural production by enhancing the performance and sustainability of the rehabilitated projects.

As a result, crop yield increased and farmers adopted furrow irrigation practices successfully by developing on farm infrastructures, optimized application of inputs, technology and knowledge, and by developing O&M capacity to farmers.

However, their project was discontinued after three years because of poor incentives of government staff such as no administrative supports in their participation at workshops and training programs and also due to too much conflicting advisory inputs such as different and individual activities from the each agency due to weak coordination and/or poor linkage among agencies concerned and conflictions with WUA and farmer groups due to no harmonious activities and cooperation among the agencies.

Just to keep up with past spirit of on-farm water management program, IMD, DOI in coordination with DOA and NARC, is executing ICWMP in 22 districts with a view to increase agricultural yield through technical staff training (TST) and field demonstration programs in close coordination with DOA and NARC. TST is a regular program of IMD, DOA and NARC which performs activities through the District Coordination Committee (DCC) and District Technical Team (DTT) in the district level.

(b) Lessons Learned on Water Management

Turning to the lessons learned from the four projects, the lessons learned and recommendations are obtained for future implementation of farm water management projects.

(i) For Achieving Increased Agricultural Production

To develop adequate on-farm irrigation facilities with efficient, effective and manageable water management by empowered WUAs.

(ii) For Successful Implementation of the Program

To provide reasonable incentives to field staff in meetings and/or in workshops and give power to WUA for decision making during platform meetings

(iii) For Sustainable Development of the Project

To develop management and financial capacity of WUA as a multifunctional entity, of which, the WUA has a linkage with markets and cooperatives prior to the end of the project.

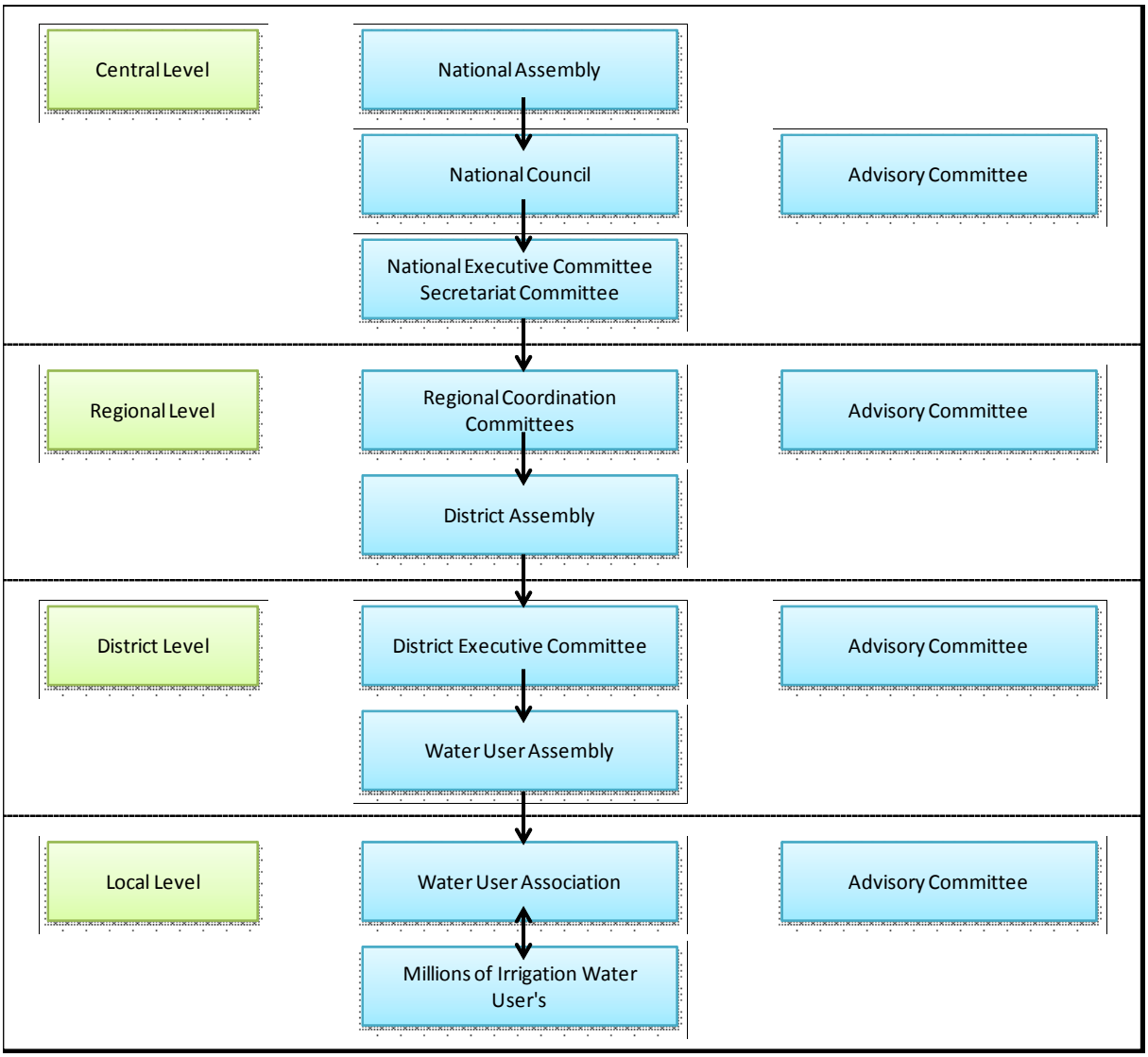
The outline and the achievements and lessons learned from the four projects are shown in SP-C-16.

3.4 Water User Association

(1) Organizational Structure of WUA Federation

The organizational structure of the National Federation of Irrigation Water Users Association, Nepal (NFIWUAN) is given in Figure 3.4.1.

The organizational structure is broadly divided into four levels, namely; (i) Central level consisting of the National Assembly, National Council, National Executive Committee and Secretariat Committee, (ii) Regional level consisting of the Regional Coordination Committee, (iii) District level consisting of the District Assembly and District Executive Committee and Local Level of Water Users Assembly and WUAs.



Source: Constitution of NFIWUAN, 1999

Figure 3.4.1 Organizational Structure of NFIWUAN

These levels of structures are coordinated with millions of irrigation water users.

The main function, duties, responsibility and right of central, regional, district and local levels are given in Table 3.4.1 below.

Table 3.4.1 Duties and Responsibilities of Organizations at Different Levels

Levels	Description	Duty	Rights and Responsibilities
Central Level			
National Assembly	It is the apex body of NFIWUAN. It is conducted every five years. If it is not conducted within five years, then the decision of the National Executive Committee can be extended for six months	Conduct elections of the National Executive Committee and formulate the vision, policy, and strategy to fulfill the goals and objectives of the federation	Develop work plans and give necessary direction to the National Council and National Executive Committee for its implementation. Discuss on the proposals proposed by the National Executive Committee and its ratification. Give necessary direction to the president, vice president, general secretary, treasurer, and members of the National Executive Committee. Formation of account committee.
National Council	It is conducted each year except during years when national assemblies are held as well as the last year of conducting national assembly. The date, venue, and time for National Assembly are fixed by the National Executive Committee. The same process is followed for the district council.	Discuss on the progress report and budget report presented by the National Executive Committee and forwarded for rectification. Discuss on the yearly policy, plan, and program and budget as well as forwarding it for rectification.	Ratification of essential regulation and by regulation Give necessary direction to the National Executive Committee.
National Executive Committee	This committee has one president, vice president, general secretary, secretary and treasurer. All these executive members are elected during the National Assembly. Five female elected candidates from five development region, five development regional presidents, 14 elected members from 14 zones and one elected Dalit candidate.	Perform the activities as per direction provided by the National Assembly and Council. Prepare the income and expenditure report to present on the National Council for ratification and implement as per the approved by the National Council.	Prepare the policy, plan, and program and present National Assembly and council for ratification and implement as per the direction provided by the National Assembly and Council. Actively involved in fulfilling the objectives of the federation. Employ office staff as per the requirements. Select and nominate the advisory committee. Prepare and implement the required rules, regulation. Select the auditor and fixed his incentive.
Regional Level			
Regional Coordination Committee	For the formation of the Regional Coordination Committee, the representatives are selected from the National Assembly from the districts of related development regions. They select Regional Coordination Committee members.	Work in order to fulfill the objectives of the federation. Perform the works and responsibilities assigned by the National Executive Committee	Work as a network between the District Executive Committee and the National Executive Committee. Perform the work mentioned in the regulation.

District Level			
District Assembly	It is formed by district executive members (from 11 WUAs of district) and other 2 members from each 500 ha irrigated area in the district. Out of these two members one should be female member.	It conducts election of district executive committee. It develops work plan, accepts budget and program and guide district level council and executive committee for implementation.	It appoints district level executives by election. It approves or disapproves annual budget and expenditures submitted by executive members. It has right to dismiss any member of executive committee using two third majority of its members.
District Executive Committee	It is formed by incorporating 11 irrigation WUA districts. These WUAs and District Executive Committee should be a member of the federation. The term of the members of District Executive Committee is five years.	Do the necessary task to fulfil the objectives of the federation. Work as a network among the WUAs in the district.	Do annual renewal of members. Sum up renewal and membership fees and divide it equally, 50% for district and 50% for national committee. The national committee will forward 10% for the regional committee.
Advisory Committee	National executive committee will form an 11 member advisory committee. The advisory committee will provide necessary suggestions to fulfil the objectives of the federation. The committee will support the activities of the national executive committee. Former president is the ex-officio member of the advisory committee.	Provide advice to the national, regional and district level committees of the federation.	Provide necessary suggestion, guidelines, and direction for policy, strategy, planning and program of the federation in order to fulfil the objectives of the federation.

Source: Constitution of NFIWUAN, 1999

(2) Registration of WUA and Yearly Renewal of WUA

The WUAs have the responsibility to register or renew their organizations to IDDO and to authorize irrigation projects with registration documents.

As for registration of WUAs, WUAs have to prepare supporting documents consisting of the formation of ad-hoc WUA committee, list of members of the ad-hoc committee, WUA constitution, salient features of the irrigation systems, and list of beneficiary farmers in the command area for registration.

The WUAs have to prepare the registration form of IDDO or the application letter to IDD or project chief on registration of WUA and submit these documents with supporting documents to IDDO or the project chief. After making any necessary inquiry upon application by IDDO or project offices, users association shall be registered within seven days before the issuance of a registration certificate.

As for renewal of registration on WUA organization, WUAs have to submit annual auditing reports and works plans approved by the General Assembly to IDDO. It is responsible works for WUA to renew WUA organizations every year as per rules and regulations of DOI.

(3) Roles and Functions of WUA

Main roles and functions of WUA to be required in the Irrigation Policy 2003 are listed below:

- Manage canal operation and maintenance works.
- Avail water to user farmers at the appropriate time and in proper quantity, as required by the type of crops and the condition of land.
- Keep the record of the land in which services could not be availed and to recommend exempting the irrigation service fee to be paid by such users.
- Distribute water to new user farmers without causing any harm to the previous users who are receiving the service
- Mobilize people participation for maintenance of the irrigation system
- Construct additional structures to increase its irrigable area considering the supply of water.
- In case it requires technical advice while repairing and maintaining the structures the WUA may request to the concerned irrigation office. If such request is made, the concerned irrigation office shall provide necessary technical service.
- Maintain up to date records, including records of the ISF to be paid by the user for the use of service made available. Records shall show expenditures incurred for the maintenance as well as balance of funds.
- Submit the annual progress report of the organization within the fiscal year to the concerned irrigation office along with the financial statement of the WUA and all details of the service made available to the users in that fiscal year
- Coordinate the activities relating to operation, maintenance and water distribution from the main, secondary, and tertiary canal systems.
- Establish a separate fund for the maintenance of irrigation systems and the structures.
- Involve in different activities of implementation and management of the project/system
- Conduct capacity building activities from the beginning of the project's physical construction to make more effective the transfer process of the system and management.
- Conduct regular meeting and general assembly yearly.
- Renew the organization yearly.
- Coordinate with line agencies.

(4) Cost Sharing on Construction or Rehabilitation Works of Irrigation Facilities

Irrigation Policy 2013 gives the clauses on sharing cost for WUAs in construction or rehabilitation works of irrigation facility. The sharing cost for WUA is indicated by the percentage against the total estimated cost of construction or rehabilitation works, as shown in Table 3.4.2. The sharing cost is paid in labor provision.

Table 3.4.2 Contribution Portion by the Users in the Project

(unit: %)

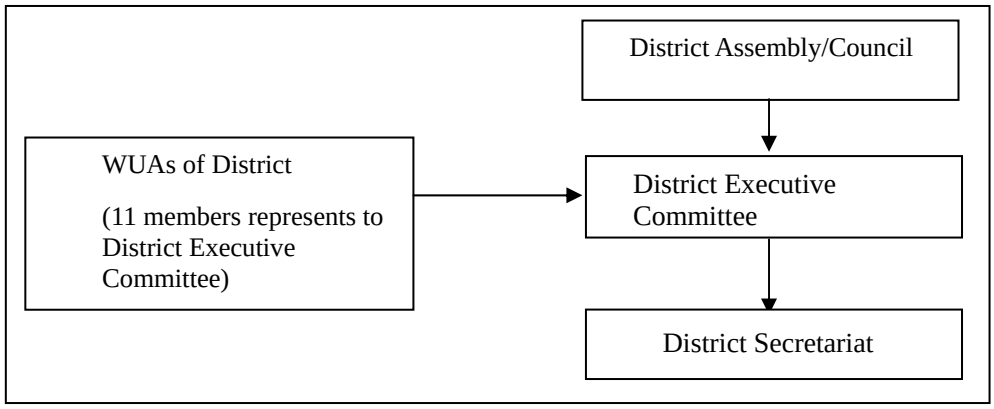
Types of Irrigation Project/System	Percent of Investment in Headworks	Percent of Investment in Main Canal	Percent of Investment in Branch/ Sub-Branch and Tertiary Canal	Percent of Investment in Water Course
(I) For New Construction Works				
Major/Large and Multipurpose IPs	0	0	5	3
Medium Irrigation Project	0	0	3	5
Small Irrigation Project	0	0	3	5
(II) For Rehabilitation Works				
Major/Large and Multipurpose IPs	0	0	3	5
Medium Irrigation Project	0	0	5	7
Small Irrigation Project	7			
(III) Repair and Maintenance Works for Major/Large/Multipurpose /Medium and Small Irrigation Systems (AMIS & FMIS)	10			

Source: Irrigation Policy, 2013

(5) WUA Federation at the District Level

(i) Organization

At the district level, a district assembly at the top, a district working committee at the middle and a district secretariat at the bottom are the prime levels to form district level functions. Organization of the district level WUA federation is shown in Figure 3.4.2



Source: Irrigation Policy 2013

Figure 3.4.2 WUA Federation (District Level)

(ii) District Assembly/Council

The following representatives are represented in the District Assembly:

- The district executive committee consists of executive members and members.
- Irrigation WUAs with command area of less than 500 ha are represented by two representatives (one male and one female), while irrigation WUAs with command area of more than 500 ha have a representative for every 500 ha. The WUA must be a member of the federation.

The District Assembly should be conducted in the presence of the National Executive Committee (at least a member of the National Executive Committee should be present during the district assemblies).

The District Council should be conducted every year except the year when the District Assembly is held.

The District Executive Committee is formed by incorporating 11 WUA districts (irrigation WUA registered in relevant sectors or farmer managed irrigation systems).

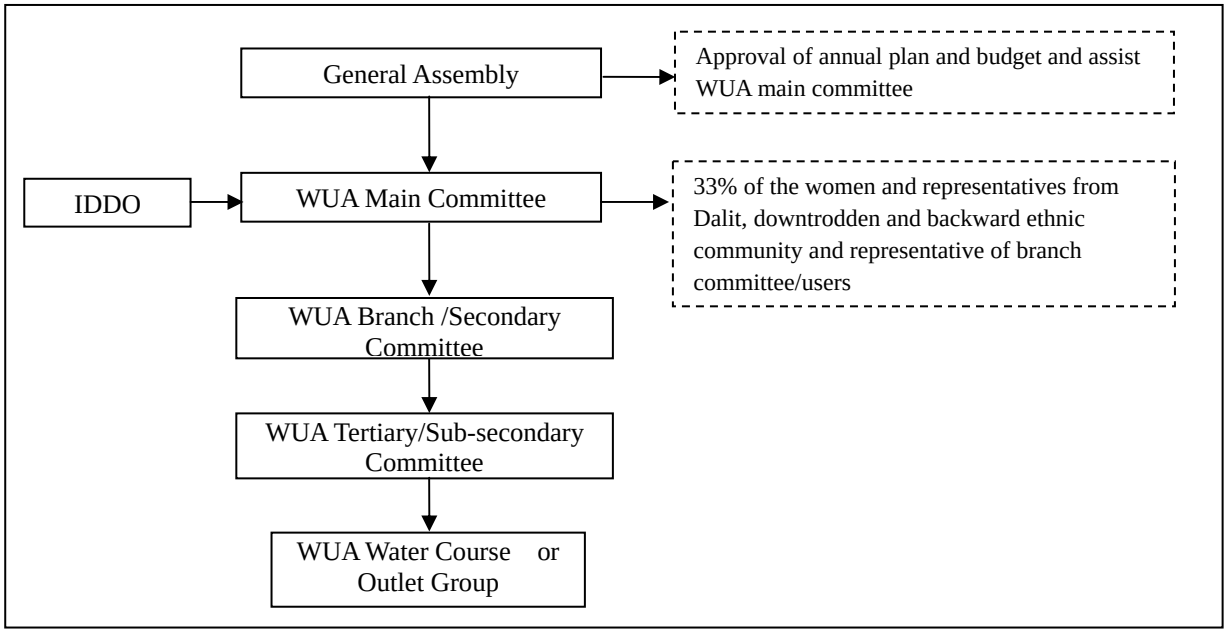
These irrigation water users association and district executive committee should be members of the federation. The term of responsibility of District Executive Committee members is five years. Due to any special reason, the District Assembly cannot be conducted within a time when the period can be extended for six months based on the decision of the majority of its members of the District Executive Committee.

The duties, responsibilities and rights of the District Executive Committee are as follows:

- To do the necessary tasks to fulfill the objectives of the federation.
- To work as a network among irrigation WUAs in districts.
- Provide membership to district irrigation water user groups.
- To do annual renewal of members.
- In sum, renewal and membership fees will be equally divided at 50% for district and 50% for national committee. The national committee will forward its 10% share for the regional committee.

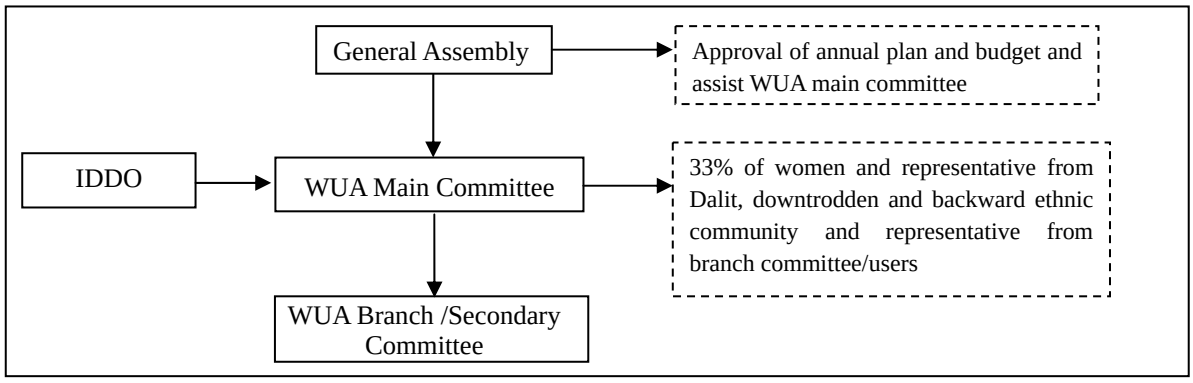
(2) WUA at Surface Irrigation Systems

At present, WUAs of surface irrigation systems are generally organized between two cases as shown in Figures 3.4.3 and 3.4.4 depending on the scale of irrigation areas.



Source: Irrigation Policy 2013

Figure 3.4.3 Organizational Structure of Large and Medium Scale Irrigation Systems



Source: Irrigation Policy 2013

Figure 3.4.4 Organizational Structure of Small-Scale Irrigation Systems

The main functions of the WUA Main Committee, WUA branch/secondary committees, WUA tertiary/sub-secondary committees and WUA water course/outlet groups are given in Table 3.4.3.

(i) General Assembly

The members of the General Assembly are elected from WUA members from the bottom to top committee.

The number of General Assembly members and their duration depends on the constitution of WUAs.

The General Assembly is organized at least once a year in most of the irrigation projects.

The level of participation of users during General Assembly is very poor. A large majority of users do not participate on General Assembly meetings. One of the main reasons of poor participation is due to poor irrigation conditions. Users are not getting water regularly, hence, express less interest and willingness in participating in the assembly.

The General Assembly has right to approve annual and budget plans or any proposals prepared by the WUA Main Committee. At least two-thirds of the members of the General Assembly should be present to approve any proposal or document.

If two-thirds of the members is not available, the annual plan, budget and any proposal can be approved the next day by half of the majority of all members. The General Assembly members also have vital roles to monitor the activities of all WUA committees from top to bottom.

Table 3.4.3 Main Function of WUA Committees and Groups

Committee and Group	Description	Main Function
WUA Main Committee	This committee is the top level committee of WUA organization at the canal systems. Members are elected from the members of bottom WUA committee. It is composed of with at least 33% of the women representation and representation from Dalit, downtrodden and backward ethnic communities. The number of members and duration depends as per committee constitution.	Conduct annual audit, General Assembly, and renew their registration annually. Prepare an annual plan and budget and take approval from the General Assembly. Provides services to farmer members. Manage construction works, water management and collection of ISF. Monitoring of ongoing activities and coordination with stakeholder organizations.
WUA Branch/Secondary Committees	Formed in the branch/secondary level of irrigation systems. The number of committees depends on the number of branch/secondary of the canal systems. Members are elected from WUA members of bottom WUA committees and farmer members. The number of executive members and their duration depends as per committee constitution.	Assist the WUA Main Committee as per their need. Perform all types of works as per work assigned by the WUA Main Committee. Provide services to their members as per their needs.
WUA Tertiary/Sub-Secondary Committees	Formed in the tertiary/sub-secondary level of irrigation systems. The number of members depends on the number of tertiary/sub secondary. Committee members are elected from bottom WUA committees and farmer members. Number of executive members and their duration depends as per committee constitution.	Assist WUA Main and Branch/Secondary Committees as per their need. Perform all types of works in their tertiary/sub-secondary as per the work assigned by the WUA Main and Branch/Secondary Committees. Provide services to farmer members as per their needs.
WUA Water Course/Outlet Groups	These are bottom level committees of WUA organization at canal system. Committees are formed at the water course/outlet level of irrigation systems. Members are elected from the WUA farmer members. The number of executive members and their duration depends as per groups' constitution.	Assist WUA main, branch/secondary and tertiary/sub-secondary committees as per their needs. Perform all types of works at outlets/ water courses assigned by other top level committees. Provide services to farmer members as per their needs. Play advisory role to top level committees.

Source: Irrigation Policy 2013, Irrigation Regulation 2000

(ii) Coordination with Stakeholders

The main stakeholder organizations working with WUA committees are IDDO, DADO, Water Induced Hazard Division Office (WIHDO), DDC, VDC, INGOs, NGOs and cooperatives. Generally, the WUA Main Committee coordinates with these organizations as per the need of their committees. Stakeholder organizations support WUA committees technically and financially to promote their activities as per the needs and requirements of the WUA committee. Sustaining the WUA committee's coordination with stakeholder organizations

The following present conditions and problems on coordination activities of WUA among the relevant government agencies are found out.

- Passive coordination activities among WUA and government agencies concerned.
- Concerned government agencies do not have any regular activities for WUA especially after construction works, but these agencies occasionally provide coordination activities as shown in Table 3.4.4.

Table 3.4.4 Coordination Activities of WUA Among Relevant Government Agencies

Government Agencies	Regular Activities for WUA	Occasional Coordination Activities
IDD	No	● Provides budget for maintenance ● ICWMP, CMIASP
DADO	No	● Support for commodity-wise farmers group ● WUA can apply for Small irrigation scheme ● ICWMP, CMIASP
DDC	No	● WUA can apply for agriculture sector budget (15% of district development budget)

Source: Field Survey, 2013

3.5 Ongoing Projects Implemented by the Government

Major ongoing projects implemented by the GON include two projects in the irrigation sector as shown below.

(1) Medium Irrigation Project (MIP)

The MIP was initiated by DOI since fiscal year (FY) 2004/05. It has continuously implemented in over 75 districts of Nepal by DOI. The main purpose of this project is to rehabilitate and upgrade the exiting medium-scale irrigation projects managed through farmer managed irrigation system (FMIs) and thereby expanding irrigable areas in order to support the improvement of agriculture productivity in preference with backward areas and communities.

At present, 184 irrigation schemes covering 27,897 ha have been rehabilitated and 288 medium irrigation schemes having a potential irrigated area of 64,230 ha are under regular maintenance stages.

(2) Integrated Crop and Water Management Program (ICWMP)

The ICWMP was initiated in FY 2002/03 to contribute the visions and the target set by the APP. This program is regularly implemented by the IMD of DOI in 22 districts from the Eastern to Western development regions with linkage among DOA and NARC.

The main objective of this program is to increase agricultural production, productivity and cropping intensity in completed irrigation system by implementing agricultural technology in an integrated manner at farms. The program emphasizes to extend crop diversification, commercialization and productivity. The following are the specific objectives of this program:

- Delivery of ensured irrigation services in targeted irrigation areas.
- Institutional development of WUA
- Sustain irrigation systems by increasing the effectiveness of O&M needs
- Increase active participation of women farmers in water management and agriculture

In ICWMP, capacity building programs executed by DADO such as TSTs, farmer schools and research works implemented by NARC are running in 22 districts.

The program implementation works are accomplished through the DCC and DTC. For better coordination and policy guide, a central coordination committee is formed at the department level.

Regarding the implementation of the ICWMP, it is noted that all irrigation facilities would be completed with higher priority.

3.6 Water Right Issues with India

With a large geohydrological region, the Ganges Brahmaputra basin is shared by Nepal and India. Nepal occupies a large part of the upper catchments of four major sub-basins of the Ganges River, such as the sub-basins of Mahakali, Karnali, Saptagandaki, and Saptakosin. These rivers originate from the Trans-Himalayan region and flow southwards, crossing Nepal and joining Ganges in India. About 40% of Ganges flow during monsoon and about 71% flow during the dry season of Nepal. *(D.N.Dhungel, S.B. Pun –eds,The Nepal- India -Water Relationship)*

Big barrages have been constructed near the national border of Nepal at three major rivers, namely, the Koshi, Mahakali, and Gandaki rivers, to divert river water for sharing a very nominal flow. Nepal is the upper riparian and India is the lower riparian as far as riparian water users are concerned.

However, the issues related to water occurs in the tributary basins of the Ganges River, such as the Koshi, the Mahakali, and the Gandaki rivers, due to certain hidden activities of India. These issues are causing inundation problems along the southern border due to the construction of embankments, barrages and other structures very close to the Nepali border and without paying any compensation.

Another critical issue is closely concerned with the strategic water resource development in the left bank basin of the Ganges River, including the Nepal area. India has proposed a comprehensive water resource development concept, including river linking development projects on the left bank area of the Ganges River some distance beyond to Nepali border. This creates an uneasy environment and situation to construct multipurpose dams in the Nepalese side. Because of this, India imposes unofficial restrictions for the construction of multipurpose high dams in Kankai, Bagmati and other rivers.

Furthermore, there has been no concern shown by India for the internal utilization of available water in the existing irrigation projects.

In spite of some on-going water issues mentioned above, better practices of resolving them through negotiations, bilateral talks and discussions have been established through the Indo-Nepal Joint Ministerial Commissions on Water Resources.

As an example, a conflict resolution meeting can be cited in a meeting held at New Delhi on 15 February 2012 between the two ministers of Nepal and India for the following projects: the Pancheswor Multipurpose Dam project, Saptakosi High Dam, and Sunkosi Storage cum Diversion.

Other signs of improved relations on water treaty and right issues are also cited from the Mahakali treaty signed by the then Prime Minister of India, Mr. P.V. Narshimha Rao, and then Prime Minister of

Nepal, Mr. Sher Bahadur Deobwa, in February 1996 for joint utilization of a transboundary water resource in the Mahakali River.

Accordingly, there is tendency to settle water rights issues with India at major rivers through bilateral talks and discussions.

At present, river water from major rivers such as the Koshi, the Mahakali, and the Gandaki is being used freely for irrigation as well as for other purposes such as municipal and domestic water in the Nepal area, without any diplomatic negotiations with India.

In addition, there is no international regulation and limitation on water use of other medium and small rivers in the Terai Plain.

3.7 Environmental Assessment Guidelines for Project Implementation

The GON enacted the Environmental Protection Act 1997 (EPA) and Environmental Protection Rules 1997 (EPR) to conduct initial environmental examination (IEE) and environmental impact rules. At present, GON suggests to conduct a strategic environmental assessment (SEA) for any types of project in the planning stage to review any environmental concerns and to assess the robustness of development activities; in accordance with the recommendation of the WB. However, there is no legal provision to conduct SEA at present.

In experience, three types of environmental assessment studies for DOI projects such as SEA, IEA and EIA have been conducted for some irrigation development projects. Other environmental assessment study, social and environmental management plan were also prepared and conducted during the implementation of projects, with assistance from the WB.

The SEA requires following a five-step process: (i) Screening step with two approaches by participatory consultation with technician and expert groups, (ii) Scoping step with precise plan and program using a checklist, (iii) Preparation of environmental report (ER) step with detailed assessment of the selected precise plan and program by review and study of expert, consultation, checklist, etc. to divide the provision into four categories, (iv) Decision making step with completion of ER and finding of impact mitigating measures by consultation and study on ER, and (v) Monitoring step.

Taking into consideration the suggestion of GON on SEA, EPA as well as IEA and the experience of DOI on environmental assessment studies, it is proposed to conduct SEA in the next step of the survey for the technical cooperation project.

CHAPTER 4 PRESENT CONDITIONS OF TARGET DISTRICTS IN THE TERAI PLAINS

4.1 Natural Condition

4.1.1 General Features of the Target Districts

The general features of the four districts, in terms of land extent, demography and climate are summarized in Table 4.1.1.

Table 4.1.1 General Features of the Target Districts

No.	Description	Unit	Jhapa	Morang	Dhanusa	Mahottari	Nepal (Kathmandu)
1	Area	km^2	1,609.5	1,822.0	1,188.7	1,000.6	147,180
2	Number of Village Development Committee VDC*2	nos.	49	65	107	79	3,193
3	Population*3	1,000	812.7	965.4	754.8	627.6	26,494.5
4	Household (HH)*3	1,000	184.4	213.9	138.2	111.3	5,427.3
5*1	Annual Rainfall	mm	2,587	1,861	1,485	1,029	1,503
6*1	Monthly Max. Ave. Temperature	^0C	35.7	36.7	37.4	38.4	31.5
7*1	Monthly Min. Ave. Temperature	^0C	5.7	7.5	7.5	8.3	1.1

*Note: *1 Data of lines 5, 6, and 7 in Kathmandu are analyzed by JICA Survey Team based on daily data from 1991 to 2011*2 District Development Profile of Nepal, 2012, Mega Publication and Research Center, *3 Census Data in 2011*
Source: Compiled by JICA Survey Team

Among the target districts, Morang District is the largest area, while Mahottari District is the smallest. Likewise with the trend in household number and population, where Morang District is the largest and Mahottari District is the smallest.

The number of family members in the household in Jhapa and Morang districts are smaller than the national average, while that in Dhanusa and Mahottari districts are more than the national average.

As for the average annual rainfall, there is a substantial difference in each district for the last 20 years. In Jhapa District, the average annual rainfall is more than double of that in Mahottari District.

4.2 Sociocultural Background and Consideration

4.2.1 Historical Background of Terai Region (Jhapa, Morang, Dhanusa, and Mahottari)

(1) Historical Context of the Four Districts

Up to the 19th century, the Terai plains was a deep forest. Indeed the name of Jhapa means “canopy” in Rajbansi word, meaning covered with dark and dense forest. Among the four districts, the land of Morang had historically been governed by various kingdoms since the seventh century. Dhanusa has been famous for its religious places since ancient age, therefore, many Hindu pilgrims have visited the Janaki Temple in Dhanusadam and Vivah Mandap. According to the Hindu mythology, a part of Lord Shiva’s bow was broken by Lord Rama who was indeed bestowed with great powers, and was the one destined to marry Sita from Dhanusadam.

In ancient times, the population in Terai was very small because of the deep forest where Anopheles mosquitoes thrive and transmit malaria and other diseases. They were Tharu people who resided from central and western Terai. Ethnic groups who speak Maithili language lived from central to eastern Terai; The Rajbansi, Gangain Tajpurria and Dhimal people lived in eastern Terai. These indigenous ethnic groups in the Terai Region are generally called "Madhesi". However, Tharu people are not considered as Madhesi.

The Tarai/Madhes belt was incorporated into the Shah Kingdom in the late 1700s. Most of it was lost to the East India Company after the Gorka rulers did poorly in the Anglo Nepali War of 1814/16 which ended with the signing of the Sugauli Treaty in 1816. Then again, after the 1857 Sepoy Mutiny (or alternatively known as the "first war of independence") in India, Nepal was rewarded for its loyalty to the British regime by the return of sections of the Tarai that had been lost through the Sugauli Treaty.

From the point of view of the Shah/Rana rulers of Nepal, the fertile Tarai lands were seen as a place of malaria however, it was valued primarily as a source of revenue through collection of taxes and *birtas* or land grants that could be given to reward loyal subjects (mostly Parbatiya courtiers but also some local landlords). The Parbatiya rulers had little concern for the welfare of either the indigenous inhabitants of the Tarai or the Maithili, Bhojpuri, and Avadhi speaking people. Hindu groups who through the ebb and flow of historical conquests found themselves within the territory of Parbatiya rulers in Kathmandu, as borders shifted at various times during the 18th and 19th century.

(2) Nepal Legal Code (*Mulki Ain*)

In 1854, Jung Bahadur, the first Rana Prime Minister of Nepal, promulgated the Nepal Legal Code or *Mulki Ain*. It ruled whether they were Hindu or not, all Nepali were socially defined by the caste system. After that, the caste system has been a major determinant of the society, in terms of social status and life chances.

Missing from the *Muluki Ain* Hierarchy were many groups from the Tarai/Madhes – the plains of Nepal bordering on India. Among those missing were a number of 'untouchable' occupational groups such as the Dom, Chamars, Musahars and Tatma who are today among the poorest in Nepal. Some 26 middle-ranking Tarai castes and Janajati groups from the Tarai area were also not recorded in the original *Muluki Ain.* This reflects the marginal position of the Tarai/Madhes subjects and the relative lack of attention they received from the Kathmandu-based government during this period.

(3) Migration to Terai Region

The Rana rulers who wanted to increase the national revenue had to expand their cultivated lands. So they allocated tracts in Terai to political and military elites as a reward for their works. However, the migration to Terai was never been attractive to the hill people while the migrants from India increased. They never resided and cultivated the lands by themselves instead they employed tenants from various regions and made them exploit and cultivate the land. Also, Jung Bahadur established the first legal code that Nepali are entitled to the alienation of land through sale or purchase to foreign nationals residing in Nepal. Thus Kansakar[1] stated that "the reclamation of the Terai was linked with the

[1] V.B.S. Kansakar, "Land Resettlement Policy as a Population Distribution Strategy in Nepal"

immigration of a large number of Indians".

In the 1920s, the Nepali government promoted the Resettlement and Reclamation Program, but again failed to get the interest of the hill people to migrate to Terai Region. Meanwhile, the Indian government was constructing railways, and the demand for Sal trees, which was used for railway sleepers, increased in India. Many Indian forest contractors and Indian immigrants came to Terai Region, and purchased Sal trees in Terai at cheaper price. The absent landowners of Terai, who were the ruling class, their supporter and/or favorites, benefitted from the said business. By the 1950s, a certain number of Indian origin migrants had already resided in Nepal, especially in Dhanusa and Mahottari districts.

In the 1950s, Nepal suffered from devastating floods and occasional landslides. These caused shortage of cultivated lands in the hilly area. On the other hand, the World Health Organization (WHO) helped the Nepalese government to conduct malaria eradication program in the Terai Region since 1953. The program significantly decreased malaria incidents in 1960. Many of the flood victims in hill region migrated to Terai; it recorded that by 1960, 27,759 ha of forest and bush areas in Chitwan District were exploited by 5,233 migrated households. The Nepalese government established "the Nepal Resettlement Company" in 1964, and executed mass migration from the Hill Region to Terai Region in the 1960s and 1970s.

As mentioned above, at the start of the mass migration, a large part of Terai including Dhanusa, Mahottari, and Morang were already owned, cultivated, and tilled by people of Indian origin and indigenous people. The main landowners in the four districts are hill high castes, the Madhesi high caste and the Tharu. It was only an alternative means for the migrants from the hills to encroach on government forest lands like Jhapa.

4.2.2 Socioeconomic Characteristics of the Four Districts

(1) Current Composition of Ethnic Group in the Four Districts

This Survey divided ethnic groups into five main categories, namely, Hill B/C/T, Hill Janajati, Terai Janajati, Madhesi, and Dalit, as shown in Table 4.2.1. It shows that Jhapa and Morang are hill people dominated society while Dhanusa and Mahottari are Madhesi people dominated society. This is because, as mentioned above, when mass migration from the Hill Region came into the Terai Region in the 1950s, Madhesi and Terai Janajati people had already occupied and cultivated the main part of Terai. Only the forest area (Jhapa, Morang, and the northern part of Terai) is left for the new comers.

Table 4.2.1 Ethnic Group Composition in the Four Districts

District	Hill B/C/T	Hill Janajati	Terai Janajati	Madhesi	Dalit	N/A	Total
Jhapa	39.3%	27.4%	19.1%	10.3%	1.4%	2.5%	100.0%
Morang	24.0%	26.0%	21.6%	21.2%	5.1%	2.0%	100.0%
Dhanusa	3.8%	6.5%	4.3%	67.1%	17.2%	1.0%	100.0%
Mahottari	3.5%	7.5%	4.0%	68.1%	15.8%	1.0%	100.0%

Source: JICA Survey Team, using the raw data of Mega Publication Research Centre, "District Development Profile of Nepal 2012"

Many scholars consider that Terai indigenous ethnic groups (adibasi) are Tharu, Jhangad, Rajbansi,

Gangai, Santhal/Satar, and Dhimal. Madhesi people are generally defined as people who reside in the Terai Region and speak Maithili, Bhojpuri, Awadhi, Tharu, Northern Bengali, Nepali and Khari Boli. The main ethnic groups of Madhesi are Kewat, Mallah, Lohar, Nuniya, Kahar, Lodha, Rajbhar, Bing, Malli, Kamar, Dhuniya, Yadav, Teli, Kiri, Kurmi, Sonar, Baniya, Kalwar, Thakur/Hazam, Kunu, Sudhi, Kumhar, Haluwai, Badhai, Barai, and Bhediyar/Gaderi.

Table 4.2.2 shows the population in the four districts by religion. More than 80% of the population in the four districts is Hindu, which can be assumed as the cultural basis in Terai. Many pointed out that during the 104 years of Rana ruling, regardless whether they were Hindu or not, all Nepali were socially defined by the caste system, thus this enhanced the Hinduization and Sanskritization of indigenous ethnic groups (Bhattachan, 2003).

Table 4.2.2 Population in the Four Districts by Religion

	Total Population	Religion						
		Hindu	Buddh-ism	Islam	Kirat	Christ-ianity	Prakriti	Others
Jhapa	812,650	649,151 (80.0%9	39,321 (4.8%)	25,974 (3.2%)	67,572 (8.3%)	15,743 (1.9%)	11,739 (1.4%)	3,150 (0.4%)
Morang	965,370	774,905 (80.3%)	39,873 (4.1%)	46,755 (4.8%)	63,213 (6.5%)	15,849 (1.6%)	21,755 (2.3%)	4,020 (0.4%)
Dhanusa	754,777	674,367 (89.3%)	11,220 (1.5%)	63,099 (8.4%)	165 (0.0%)	652 (0.1%)	568 (0.1%)	4,706 (0.6%)
Mahottari	627,580	528,663 (84.2%)	12,699 (2.0%)	83.696 (13.3%)	66 (0.0%)	878 (0.7%)	41 (0.0%)	1,537 (0.3%)

Note: Others are Bon, Jainism, Bahai, Sikhism, and undefined
Source: CBS (2011)

(2) Human Resource

Under the Hindu caste system, Brahmin (Bahun) is the traditional caste of educators, scholars, and priests. So in general, Hill B/C/T people were regarded as individuals that value good education. Indeed, Jhapa and Morang, which have large Hill B/C/T population, marked high literacy rates in 2011 as shown in Table 4.2.3. In Jhapa, the total number of people who can both read and write and who can only read is 76.8% (wherein 84.2% are male and 70.4% are female). While in Morang, it is 72.6% (wherein 80.7% are male and 65.1% are female). Considering that the national total figure is 69.3% (wherein 77.6% are male and 60.0% are female), it is clear that the literacy rates in Jhapa and Morang are quite high in both gender.

The literacy rates of Dhanusa and Mahottari are lower than that of Jhapa and Morang. As Table 4.2.3 shows, the total literacy rate of Dhanusa is 53.8%, and Mahottari is 48.9%. Especially, the illiterate rates of female in these said districts are more than half of the female population.

Table 4.2.3 Population Aged Five Years and Above by Literacy Status in the Four Districts (2011)

	Jhapa		Morang		Dhanusa		Mahottari	
	Male	Female	Male	Female	Male	Female	Male	Female
Population aged > 5 years	349,759	394,198	423,298	456,931	340,300	339,145	275,017	281,254
Can read and write	288,007 (82.4%)	270,608 (68.7%)	333,245 (78.7%)	288,442 (63.1%)	206,250 (60.6%)	136,444 (40.2%)	155,532 (56.5%)	102,810 (36.5%)
Can read only	6,299 (1.8%)	6,748 (1.7%)	8,339 (2.0%)	9,181 (2.0%)	10,973 (3.2%)	11,816 (3.5%)	6,858 (2.5%)	6,972 (2.5%)
Cannot read and write	55,364 (15.8%)	116,708 (29.6%)	81,549 (19.3%)	159,055 (34.8%)	121,992 (35.9%)	189,351 (55.8%)	111,795 (40.7%)	170,409 (60.6%)
Not stated	89 (0.0%)	134 (o.o%)	165 (0.0%)	253 (0.1%)	1,085 (0.3%)	1,534 (0.5%)	832 (0.3%)	1,063 (0.4%)

Source: CBS 2011

Next, seeing the population aged five years and above in terms of educational attainment, Jhapa and Morang districts marked more than the national averages. It should be noted that, in these districts, not only male but also female attained the middle and higher education.

On the other hand, Dhanusa and Mahottari districts lagged a little behind. Especially, on female education level where it is much lower than that of Jhapa and Morang districts. One of the reasons is that Madhesi people have been treated as second-class citizens in Nepal. They have fewer opportunities to access education up to date. Another reason can be attributed to that of many Madhesi people overlooked the importance of female education. If they have the money, they prefer their son(s) to attend school rather their daughter(s). Lastly, the population of Dalits in Dhanusa and Mahottari districts is larger than that of Jhapa and Morang districts.

Table 4.2.4 Literate Population Aged 5 Years and Above by Educational Attainment (Level Passed)

	Secondary (9-10)	School Leaving Certificate* (SLC) and Equivalent	Intermediate and Equivalent	Graduate and Equivalent and Above
Nepal Total	**11.54%**	**10.16%**	**6.44%**	**2.84%**
Nepal Male	11.75%	10.55%	6.85%	3.47%
Nepal Female	11.28%	9.69%	5.94%	2.08%
Jhapa Total	**15.90%**	**12.52%**	**5.98%**	**2.40%**
Jhapa Male	14.82%	12.16%	6.46%	3.14%
Jhapa Female	17.06%	12.91%	5.47%	1.61%
Morang Total	**13.61%**	**12.98%**	**6.06%**	**2.89%**
Morang Male	13.25%	12.62%	6.55%	3.80%
Morang Female	14.03%	13.39%	5.49%	1.84%
Dhanusa Total	**12.13%**	**10.49%**	**6.50%**	**3.44%**
Dhanusa Male	13.22%	11.60%	7.39%	4.47%
Dhanusa Female	10.48%	8.81%	5.16%	1.88%
Mahottari Total	**10.16%**	**9.28%**	**5.39%**	**1.98%**
Mahottari male	11.30%	10.55%	6.30%	2.63%
Mahottari female	8.46%	7.38%	4.01%	1.00%

Note: School Leaving Certificate is the examination conducted for students at the end of the 10th grade (secondary school)
Source: CBS 2011

(3) Women, Dalits and Indigenous Nationalities

Since the established of the *Mulki Ain* in 1854, the society of Nepal has been dominated by Hill B/C/T male population that practice patronage relationship and adopt patriarchal society. Also Newars and

Medhesi Brahmins are doing well economically with large proportions of their population are clustered in the top quintiles. Whereas the women, Dalits, and indigenous nationalities have been restrained to voice out their opinions and were discriminated for a long time.

The Constitution and the Civil Rights Act in 1955 prohibited discrimination against any citizen on ground of 'religion, race, sex, caste, tribe, ideological conviction, or any of these', and also prohibited on the basis of caste, be discriminated against as untouchables,, be denied access to any public place or be deprived of the use of public utilities. However, the mindset of the people has not changed and the enforcement is still lax.

The Constitution of 1990 described the country as "multi-ethnic, multi-lingual, and democratic" state, and at the first time, all communities were given the rights to preserve and promote their languages, scripts, and cultures. However, the Constitution also declared that Nepal is a Hindu Kingdom. It means allowing the continuation of caste-based system. Many pointed out the contradictions within the Constitution.

The Interim Constitution of 2007 describes Nepal as 'an independent, indivisible, sovereign, secular, inclusive, and federal democratic republican state', and the nation has multi-ethnic, multi-religious, and multicultural characteristics. However, there are many deputes about the procedures on establishing a new Constitution, because Nepal had not have her own Constitution since 2007.

[Terai Context]

(i) Women

(a) Madhesi Community

Whether she belongs to a dominant caste or to the minorities, women were not ensured the same rights as men under the patriarchal Nepali society. In the Madhesi community, women are obligated to practice *purdah* (wearing of veil) more than other Terai based Janajatis, and are ordered to desist from talking to outsiders. They are expected to remain silent within the family and community settings; therefore, their socialization is restricted to other female members of the household and community.

This social norm is the underlaying factor for the low educational status of the Madhesi people as shown in Tables 4.2.3 and 4.2.4. The shortage of female teachers and the distance of their place to higher educational institutions are barriers for Madhesi women to attend classes. Madhesi women mainly go on foot while women in Jhapa and Morang prefer to use bicycles and/or motorcycles (sometimes cars), and they are order to desist from taking public transportation without some attendance.

Some of the Madhesi women who belong to landlord families like Yadav and Rajput can access to higher education and professional jobs. It can be said, however, that majority Madhesi women are left the backward, illiterate, and tradition-bound status. Early marriage, dowry, rape, and/or domestic violence against women are still frequently reported from Madhesi community.

(b) Terai Janajati Community

Terai based Janajati includes many indigenous nationalities having different ethnicities, languages, religions and cultures. Majority of these people are not Hindu, but Hindu traditional practices can

prevail over their original sociocultural norms.

In the Terai Janajati community, women can express their opinions in their family and community, even sometimes to outsiders, and also they participate in social activities such as cooperatives and various women development groups including microfinance. Even if the cooperative consists of both gender, women join the management meeting and express their opinions and ideas.

(ii) Dalits

The National Dalit Commission (NDC) defined the Dalit community as a caste-community who have been kept far behind in social, economic, educational, political and religious spheres and are deprived of human dignity and social justice due to caste-based discrimination and untouchability.

There are certain numbers of the Dalit population living in Terai. Mostly, they are situated in Dhanusa and Mahottari than Jhapa and Morang districts. In general, they are grouped into Hill Dalits and Terai/Madhesi Dalits, as defined below:

- Hill Dalits: Kami, Damai/Dholi, Sarki, Bodi, Gaine, and unidentified Dalits
- Terai/Madhesi Dalits: Chamar/Harijan, Musahar, Dushad/Paswan, Tatma, Khatwe, Dhobi, Baantar, Chidimar, Dom, and Halkhor

The 'caste-based untouchability' refers to any discriminatory practice against the community describing as water polluting, purification requiring, and so on. The NDC reported that discrimination is practiced by non-Dalits against Dalits and also by "upper caste" Dalits against "low caste" Dalits. Currently, the practice of caste-based untouchability is concerned mainly on religious and sociocultural sites like entering Hindu temples, eating food in festivals and wedding parties, and marriage.

Some major issues of Dalits have been incorporated in the Interim Constitution, but many issues are left unresolved. Especially, the low enforcement of the rules, as well as, the mindset of the people has remained unchanged.

The socioeconomic status of the Dalits, especially the women, is very low. The condition of Madhesi Dalit is worse than that of Hill Dalits. Many of Dalits are landless. According to the survey by the Institute for Integrated Development Study (IIDS), about 85% to 90% of Madhesi Dalits are landless. According to the survey of the IIDS (2008), "among all the Dalit caste groups, Kami, Damai, and Sarki of the Hills are relatively better off than the others; however, 65%-68% of Kami, Damai and Sarki lived below absolute poverty line.

(iii) Indigenous Nationalities

As mentioned before, various indigenous nationalities lived in Terai. Among them are the Tharu people, who were the oldest dwellers in Terai according to scholars. The Tharu population was estimated at 1,737,470 according to the National Population and Housing Census 2012. Eastern and central parts of Terai have 34% of the total Tharu population.

Other indigenous nationalities in Terai are Jhangad (total of 37,429 people), Rajbansi (115,242 people), Gangai (36,988 people), Santal/Satar (51,735 people), Dhimal (26,298 people), Tajpuria (19,213

people), Meche (4,867 people), Koche (1,635 people), Kisan (1,739 people), Munda (2,350 people), and Kusbdiya/Patharkatta (3,182 people). There are also unidentified indigenous nationalities in Terai. Many of the indigenous nationalities live in the eastern part of Terai, and some in central Terai.

Though they have been influenced by Hinduism for a long time, they still maintain their culture and religions. Besides Tharu, many of the indigenous nationalities are landless and poor. They earn their living through agricultural labor, livestock husbandry, and bamboo baskets and/or winnowing trays making.

4.2.3 Current Issue and Social Influence

(1) Madhesi Movement

As mentioned above, the Madhesi are culturally and ethnically related to the northern groups of India. This causes one of the discriminating perspectives of the Hill people against the Madhesi. The Madhesi have accumulated some grievances like being treated as second class citizen by Hill people for a long time, and to have less political influence in the government bureaucracy as well as in the political system. Also after commencement of mass migration from the Hill to Terai, Madhesi have deemed that Hill B/C/T exploited their lands.

Indian Madhesis, under the Citizenship Act of 1964 and the Constitution of 1990, were debarred from citizenship certificates. Due to this case, they could neither acquire land ownership nor could avail government benefits. The Citizenship Law was amended in November 2006 making it possible for people born in Nepal before 1990, and those residing in Nepal permanently, have the right to acquire Nepali citizenship.

The Maoist Movement or known as the "People's War" started its slogan that all Nepali including the Madhesi, Janajati, women, and Dalits had to obtain their human rights and to utilize their social, economic and political entitlements as Nepali citizens. The Seven Party Alliance and the Maoists (SPAM) focused on their political agenda, paying little attention to federalism, autonomy, inclusion, proportionate representation, and republican Nepal. The Madhesi claimed their dissatisfaction with this agenda.

The Madhesi leaders claimed that more than 40% of Madhesi population still has not receive their citizenship, and that Madhesi only got less than 10% of gazette level employees' jobs while their population is one-third of the Nepali population. Also they demanded that infrastructure should correspond to the contribution of Madhes to the country's gross domestic product (GDP), allocated in the following percentages: 70% of agricultural production, 65% of the GDP and 76% of the total revenue.

The pro-Terai political party, known as the Madhesi People's Rights Forum (MPRF), launched demonstrations on 16 January 2007 to demand greater autonomy and more representation in the government. A number of armed groups clashed with each other, even the police and the Moaists. Also, they committed various crimes, such as kidnapping for ransom, extortion, and killing of political party actors. These groups were active in nine districts, namely, Morang, Sunsari, Siraha, Dhanusa, Mahottari, Bara, Parsa, and Rautahat.

Box:

1. Major Demands of the Organizations involved in Madhesi Movement

Their major demands are as follows:

- Declaring all those killed during the movement martyrs and providing compensation;
- Withdrawal of cases filled during the Madhesi movement and release of those arrested;
- United Nations (UN) technical assistance during talks; dismissal of Home Minister Sitaula;
- Establishing participatory democracy; a federal system with the right to self-determination;
- A constitutional arrangement for an autonomous Madhes;
- Appointment of Madhesis in government departments in Madhes;
- Half of all positions in state institutions and government-owned media bodies for Madhesis;
- Recognition that Madhesis have the right to the natural resources in Madhes;
- Affirmative action and quotas for Dalits and stringent action against discrimination and untouchability;
- Protection of Muslim religious and linguistic rights;
- Establishment of a Madrasa Board;
- Declaration of Muslim festivals as public holidays;
- Creation of a Muslim Personal Law;
- A three-language policy in government and education which would allow the use of local mother tongue, Nepali or Hindi and English;
- Making it easier for Madhesis to get citizenship, including by sending citizenship-distribution teams to villages;
- Investing at least 75% of taxes raised from Madhes in the region;
- Return of property seized by the Maoists;
- Declaration of dates for constituent assembly elections immediately followed by dissolution of the interim legislature and formation of a representative caretaker government;
- An electoral system based fully on proportional representation; and
- Reconstitution of the election commission; and removal of restrictions on regional and caste based parties. In the talks, MJF also expressed its commitment to a democratic republic.

2. Demands of TJMM-Jwala Singh

- Terai should be declared an independent state;
- There should be proportionate participatory by determining constituencies on the basis of population;
- All the police, army and administration in Terai should evacuated and Madhesi people should be posted there;
- Population census should be conducted in Terai under the supervision of Madhesis;
- All the revenue collection from Terai should be spent for the development of Terai;
- All the Madhesi killed by the state and Maoists should be declared martyrs and Rs1.5 million should be provided as compensation;
- Citizenship should be issued from the central to district level in coordination with the Madhesis;
- The land of Madhesis captured by Maoists should be given back; and
- Maoists should end their ‘donation drive’ and tax collection in Terai.

Source: Conflict Study Centre, Situation Update 45 (6 August 2007), Annex – II and III

An agreement with the United Democratic Madhesi Front was reached on 28 February 2008, and ended the general strike. They agreed that the share of seats reserved for the Madhesi increased from 20% to 30%; and an extension on the deadline of filing for the election set for the constituent parties of the United Madhesi Democratic Front (Madhesi Jana Adhikar Forum, Terai-Madhesi Loktantirik Party and Sadbhavana Party) and some others.

[Influence on the society in Terai]

After the Madhesi Movement, the representatives from Madhesi to the Constituent Assembly increased. The Interim Constitution clearly declared that Nepal is 'an independent, indivisible, sovereign, secular, inclusive, and federal democratic republican state', and the nation has multi-ethnic, multi-religious, and multicultural characteristics'. Although the Interim Constitution was amended in line with Madhesi political parties, many of the demands, which Madhesi movement groups had, have not yet been fulfilled so far.

The Maoist Movement and Madhesi Movement raised the identity of ethnic minorities. One best thing that happened is the promotion of the entitlements of Madhesi, Dalits and indigenous nationalities. On the other hand, it let the political conflict penetrate into the village/community level.

(2) Migration

Nepal has long tradition of overseas employment, particularly migrating to Indian cities. The current trend of migration has shifted from India to other countries. Mostly, people who are better off prefer to migrate to developed countries such as Australia, South Korea, Japan, Israel, Europe, and the United States of America (USA). Those persons belonging to the middle and low income earning groups mostly go to Malaysia and Gulf countries such as Qatar, Saudi Arabia, and the United Arab Emirates (UAE). Those who cannot afford to go to the two destinations mentioned above have often migrated to India and mostly worked in the labor sector.

Based on the data obtained from the Department of Foreign Employment, migrants of the four districts between 2003/04 and 2009/10 are presented in Table 4.2.5. However, it does not include data on the number of migrants before the period and those who returned in the same period. The table does not also reflect the number of migrants who went to foreign countries on their own expense. But some claimed that a total number of 2.4 million people went abroad as migrant workers.

The four districts sent a large number of people abroad for foreign employment. These districts are among which ranked into the top five sending districts in the whole country, i.e., first place is Dhanusa (6.71%), second is Jhapa (5.28%), third is Siraha (4.78%), fourth is Morang (4.24%), and fifth is Mahottari (3.97%). The migrant workers from Terai are mostly males.

The reason behind the high proportion of foreign employment in Terai can be attributed to some socioeconomic conditions, such as lack of employment opportunities, insurgency movements of Maoist and Madhesi, and geographic advantages over others in accessing to India.

Table 4.2.5 Migrants between 2003/04 and 2009/10 in the Four Districts

District	Total Number of Migrants (persons)	Percentage of Total Migration (%)
National	**867,979**	**100.00**
Jhapa	58,277	5.28
Morang	45,877	4,24
Dhanusa	36,807	6.71
Mahottari	34,439	3.97

Source: Department of Foreign Employment

The Third Nepal Living Standards Survey (NLSS III, 2011) reported that the proportion of all households that received remittances was 56% in Nepal. In Terai, two of three households received remittances, and the per capita remittance in Terai was about two and a half times compared to that of people in the mountains who are receiving on average.

The Nepal Rastra Bank, Janakpur conducted a case study about the socioeconomic impacts of remittances in Dhanusa District in 2011/12. The study revealed that the remittance recipient households spent mainly their income on land purchase, food consumption, and wedding expenditure. Regarding agricultural income, the recipient households have shown substantial increase in income.

Also they reported that the remittance per migrant worker is Rs14,000/month on average. This indicates that the income of migrant workers is relatively low. This is because majority of the migrant workers were unskilled workers who took an average of two to three years formal education.

Large proportion of migration expenditure comes from borrowings and small amount of savings. Migrants borrowed money from informal lenders for their travelling expenses. The money lender charged 40% interests per annum on average. In the study of the Nepal Rastra Bank, only 14% of total borrowings of these households came from banks and financial institutions, and their interest rate is about 16.6% per annum. One reason is the limited branches of banks. Also since the bank branches are concentrated in the urban areas, it is very inconvenient for people living in the rural areas to avail of bank services. The other main reason is that various procedures related to borrowing are too complicated for poor people in the rural areas.

[Social influence of migration in Terai]

The remittances have changed the lifestyle of recipient households. According to the study of the Nepal Rastra Bank (2012) and Food and Agriculture Organization (FAO) 2010, the remittance recipient households purchase land for farming purpose. As many pointed out that the size of cultivated land largely affect their living standard, while poor recipient households intend to secure first their food. In the field survey, many informants including Dalits people stated that the remittances they received are sent for purchasing farm lands.

Also many remittance recipient households increased their educational expenditure for their children and sometimes adults. The Nepal Rastra Bank reported that both children's study hours at home and women's decision-making on children's education increased. In the field survey of the JICA Survey Team, some Dalit households sent their children to boarding schools in the urban areas using remittance income. The recipient households have radios, TVs, and telephones compared with those who are not recipient households. Furthermore, their accessibility to information and knowledge has

been improved.

Whereas, the income coming from remittances have been expanding their capabilities and opportunities to invest for the next generation, economic disparity among the community has occurred. Some non-government organizations (NGOs), which have been carrying out community development in the rural areas, claimed that people have changed for their own benefit and became well-off community. Therefore, the NGOs now take a longer time for social mobilization and awareness raising than before.

4.2.4 Due Diligence in the Implementation of JICA Programs/Projects

- The Madhesi and Dalit societies, Terai Janajati society, Hill B/C/T society, and Hill Janajati society have different characteristics even though they have been strongly influenced by Hindu Region. In the implementation of JICA programs/projects, it has to take an appropriate approach with enough consideration of their norms.
- While foreign employment has been increasing, the agricultural sector in Terai has been facing male labor shortage. Thus, it has to take account of women as main actors in agricultural development.
- After the People's War and the Madhesi Movement, the demands of Madhesi and Dalits have materialized up to some extent. In particular, the number of seats in the Constituent Assembly and the Interim Constitution increased. However, it can be said that these movements have stimulated ethnic identity of the people in Terai, and the power of village (community) units of each political party have strengthened and intervened in various disputes that occurred in the villages (community).
- The JICA Strengthening Community Mediation Capacity for Peaceful and Harmonious Society Project (COMCAP) in cooperation with the Ministry of Local Government established some community mediation centers in Mahottari and Sindhuli districts. The COMCAP paid serious attention to the balance of ethnic groups when it selects mediators. Also in cooperation with the District Development Committee (DDC) and target Village Development Committee (VDC), COMCAP invites all political units in any meeting, and shares the project's activities and progress with all stakeholders at the same time.
- When JICA conducts any technical cooperation projects (TCPs) in the Terai Region, the benefits of technical assistance have to be distributed to all ethnic groups in a well-balanced manner. Political influence has penetrated into the village and community level broadly, especially for the last decade. The project has to deal fairly with the political cadre in the community while keeping certain distances.
- Social mobilization is always necessary before and/or at the beginning of the project.

4.3 Agriculture

4.3.1 Land Resources and Landholdings

Land use of the four districts is summarized in Table 4.3.1.

Table 4.3.1 Present Land Use of the Four Districts in 2008

Unit: ha

No.	Description	Jhapa	Morang	Dhanusa	Mahottari
1	Cultivation	124,002	123,710	77,364	64,292
2	Forest	18,077	44,110	26,528	21,290
3	Sand / River	9,792	6,329	3,607	3,807
4	Plantation	2,580	-	-	-
5	Grass Land	2,421	2,896	2,311	2,111
6	River/ Streams	1,593	1,300	859	596
7	Shrubland	930	1,239	2,980	3,504
8	Orchard	391	644	2,287	2,220
9	Pond or Lake	370	581	-	-
10	Barrenland	321	279	833	686
11	Swamp	163	326	-	-
12	Built-up Area	153	34	1,773	1,305
13	Others	156	755	326	252
	Total	160,949	182,203	118,868	100,063

Sources: Prepared by JICA Survey Team based on District Development Profile 2012, Nepal Land Use Project and the Project Team recast

The cultivated lands in the target districts are about 65% of the total area excluding Jhapa District, where 77% of the area is under cultivation. The forest areas in the three districts other than Jhapa District are more than 20% of the total land area though Jhapa's forest area is only 11%. Plantation area in Jhapa District is mainly for tea production.

4.3.2 Landholdings

The farm landholdings in the four districts are shown in Tables 4.3.2 - 4.3.5.

Table 4.3.2 Farm Landholdings in Jhapa District

Size of Holding	Number (1,000)	Percent	Cumulative Percent	Area (1,000 ha)	Percent	Cumulative Percent
Less than 0.5 ha	43.0	41.9%	41.9%	8.3	7.6%	7.6%
0.5 ha and under 1 ha	21.4	20.8%	62.7%	16.0	14.6%	22.2%
1 ha and under 5 ha	36.7	35.8%	98.5%	75.0	68.5%	90.7%
5 ha and over	1.6	1.5%	100.0%	10.2	9.3%	100.0%
Total	102.5	100.0%		109.5	100.0%	

Source: Prepared by JICA Survey Team, based on Agricultural Census 2001, Central Bureau of Statistics

Table 4.3.3 Farm Landholdings in Morang District

Size of Holding	Number (1,000)	Percent	Cumulative Percent	Area (1,000 ha)	Percent	Cumulative Percent
Less than 0.5 ha	45.18	39.7%	39.7%	8.4	7.2%	7.2%
0.5 ha and under 1 ha	24.96	22.0%	61.7%	17.8	15.3%	22.5%
1 ha and under 5 ha	41.94	36.9%	98.6%	78.6	67.4%	89.9%
5 ha and over	1.65	1.5%	100.0%	11.8	10.1%	100.0%
Total	113.73	100.0%		116.5	100.0%	

Source: Prepared by JICA Survey Team, based on Agricultural Census 2001, Central Bureau of Statistics

Table 4.3.4 Farm Landholdings in Dhanusa District

Size of Holding	Number (1,000)	Percent	Cumulative Percent	Area (1,000 ha)	Percent	Cumulative Percent
Less than 0.5 ha	43.4	50.5%	50.5%	10.52	13.7%	13.7%
0.5 ha and under 1 ha	18.9	22.0%	72.5%	13.68	17.8%	31.5%
1 ha and under 5 ha	22.8	26.5%	99.0%	44.21	57.6%	89.1%
5 ha and over	0.8	1.0%	100.0%	8.37	10.9%	100.0%
Total	86.0	100.0%		76.78	100.0%	

Source: Prepared by JICA Survey Team, based on Agricultural Census 2001, Central Bureau of Statistics

Table 4.3.5 Farm Landholdings in Mahottari District

Size of Holding	Number (1,000)	Percent	Cumulative Percent	Area (1,000 ha)	Percent	Cumulative Percent
Less than 0.5 ha	34.4	48.2%	48.2%	7.7	11.4%	11.4%
0.5 ha and under 1 ha	16.3	22.9%	71.1%	11.5	17.0%	28.3%
1 ha and under 5 ha	19.0	26.7%	97.8%	36.9	54.5%	82.8%
5 ha and over	1.6	2.2%	100.0%	11.7	17.2%	100.0%
Total	71.3	100.0%		67.8	100.00%	

Source: Prepared by JICA Survey Team, based on Agricultural Census 2001, Central Bureau of Statistics

The ratio of marginal farmers, who operate less than 1.0 ha of farm land, in Jhapa and Morang districts is 62% more or less, while in Dhanusa and Mahottari districts is about 72%. Middle class farmers, who own farm land of more than 1 ha or less than 5 ha, are more in Jhapa and Morang districts than in Dhanusa and Mahottari districts at approximately 10%.

4.3.3 Cultivation Area and Crop

Table 4.3.6 shows the cultivation area of crops of each target district in 2011/12 in comparison with the Nepal as a whole.

Table 4.3.6 Cultivation Area of Crops in Four Target Districts in 2011/12

Unit: ha

No.	Description	Jhapa	Morang	Dhanusa	Mahottari	Total 4 Districts	Nepal
1	Paddy	89,400	78,200	65,000	34,776	267,376	1,531,493
2	Wheat	7,500	16,875	38,450	26,785	89,610	765,317
3	Maize	24,600	15,100	2,019	2,435	44,154	871,387
4	Other Cereals*1	3,108	1,575	301	225	5,209	316,335
	Total Cereals	124,608	111,750	105,770	64,221	406,349	3,484,532
5	Oil Seeds	3,500	13,250	3,402	3,114	23,266	214,835
6	Potato	10,140	5,750	2,325	3,550	21,765	190,250
7	Sugercane	205	2,150	3,605	6,500	12,460	64,472
8	Jute	650	7,453	0	0	8,103	10,540
9	Tea	9,500	0	0	0	9,500	18,149
10	Other Cash Crops*2	3	0	300	33	336	1,893
	Total Cash Crops	23,998	28,603	9,632	13,197	75,430	500,139
11	Lentil	2,005	5,700	2,565	4,125	14,395	207,630
12	Pigeon Pea	459	350	816	1,050	2,675	17,471
13	Black Gram	1,275	680	51	229	2,235	27,496
14	Grass Pea	220	725	540	303	1,788	9,176
15	Other Pulses*3	2,812	1,574	181	1,447	6,014	72,550
	Total Pulses	6,771	9,029	4,153	7,154	27,107	334,323
16	Ginger	374	1,250	53	15	1,692	20,256
17	Garlic	43	380	79	N.A.	502	5,911
18	Chili	135	260	244	145	784	6,691
19	Other Spices*4	60	365	121	40	586	47,016
	Total Spices	612	2,255	497	200	3,564	79,874
20	Mango	1,245	658	2,150	1,500	5,553	40,110
21	Banana	1,776	1,025	100	88	2,989	12,503
22	Litchi	125	225	402	113	865	6,480
23	Arecanut	2,585	801	4	9	3,399	3,687
24	Other Fruits*5	5,731	2,709	2,656	1,710	12,806	12,536
	Total Fruits	11,462	5,418	5,312	3,420	25,612	75,316
	Grand Total	167,451	157,055	125,364	88,192	538,062	4,474,184

*Note: *1; Other cereals include millet, buck wheat and barley.*
**2; Other cash crops include tobacco, cotton and coffee.*
**3; Other pulses include chick pea, horse gram, soya bean and others.*
**4; Other spices include cardamon and turmeric.*
**5; Other fruits include guava, papaya, jackfruit, pineapple and coconut*
Source: Prepared by the JICA Study Team based on statistics published by MOA

The total cultivation areas of the four target districts against the national total figure accounted more than 76% for cereals, 14% for cash crops and 34% for fruits, while cultivation areas for pulses and spices accounted less than 10%.

4.3.4 Crops and Crop Production

(1) Production of Major Crops in Four Districts

The production of major crops in each district in 2011/12 as compared with the national production is summarized in Table 4.3.7.

Table 4.3.7 Production of Major Crops in the Four Districts in 2011/12

Unit: 1,000 t

No.	Crops	Jhapa	Morang	Dhanusa	Mahottari	Combined Total	Nepal
	Cereals						
1	Paddy	321.8	277.6	185.3	97.4	882.1	5,072.2
2	Maize	72.5	45.3	6.5	2.6	126.9	871.4
3	Millet	2.2	1.8	0.3	0.2	4.5	278.0
4	Wheat	25.2	40.4	90.4	64.8	220.8	1,846.1
5	Buckwheat	1.3	0	0	0	1.3	10.0
	Cash Crops						
1	Oil Seeds	3.4	12.5	2.0	2.7	20.6	214.8
2	Potato	163.8	11.0	30.2	41.2	246.2	2,584.3
3	Tobbaco	0	0	0.4	0.1	0.5	2.6
4	Sugarcane	6.5	141.9	151.4	260.3	560.0	2,930.4
5	Jute	0.7	10.5	0	0	11.2	14.4
6	Tea	16.0	0	0	0	16.0	18.7
	Pulses						
1	Lentil	2.2	6.3	2.0	3.7	14.2	208.1
2	Chickpea	0.1	01	0	0	0.2	8.2
3	Pigeon Pea	0.4	0.6	0.6	0.5	2.1	14.8
4	Black Gram	1.1	0.6	0	0.2	1.9	22.5
5	Grass Pea	0.3	0.5	0.5	0.3	1.6	8.7
6	Horse Gram	0.3	0	0.2	0.2	0.7	5.9
7	Soya Beans	0.1	0.5	0	0	0.6	28.3
8	Others	2.2	1.0	0.1	1.0	4.3	24.0
	Spices						
1	Cardamom	0	0.1	0	0	0.1	6.0
2	Ginger	4.6	13.1	0.4	0	18.1	255.2
3	Garlic	0.4	1.1	0.2	N.A	N.A	40.6
4	Turmeric	0.5	1.1	0.2	N.A	N.A	4.3
5	Chili	0.7	1.1	0.3	N.A.	N.A.	6.7
	Fruits						
1	Mango	19.2	3.8	19.0	11.0	53.0	328.9
2	Banana	35.5	9.1	1.0	1.3	46.9	168.5
3	Guava	2.0	0.6	0.4	0.3	3.3	37.4
4	Papaya	0.6	0.8	1.4	1.1	3.9	30.7
5	Jackfruit	0	0.4	0.6	0.5	1.5	22.1
6	Pineapple	3.5	0.7	0.3	0.2	4.7	17.0
7	Litchi	0.9	2.1	2.0	0.5	5.5	37.4
8	Areca nut	7.6	1.3	0	0	8.9	9.2
9	Coconuts	1.2	5.5	0	0	6.7	7.0

Sources: Prepared by JICA Survey Team base on the statistics published by MOAD, CBS, etc.

The combined production of cereals in the four districts is more than 10% of the national production; especially, paddy production exceeded 17% of the country's total production. Maize and wheat are also significant as the production exceeded 10% of Nepal's production.

Same thing with the production of cash crops which exceeded 10% of the national production. Tea and

jute production is prevalent, as the ratios accounted 77% for jute and 86% for tea in comparison with the whole production in Nepal. It is also noted that the sugarcane production is nearly 20% of the national production. Potato production is nearly 10% of the national production.

Although pulses and spices production in the four districts is not much, fruit production is substantial as mango accounted 16% of the national share. Both banana and pineapple accounted nearly 30% of the national production. The share of the production of areca nut and coconut exceeded 95% of the national production. The target areas have high potential for fruit production.

(2) Yield of Crop Production

The average yield of paddy and wheat in the four target districts and Nepal for three years, i.e., 2009/10, 2010/11, and 2011/12, as shown in Table 4.3.8.

Table 4.3.8 Average Yield of Paddy and Wheat in Three Years for the Four Districts and Nepal (2009/10, 2010/11 and 2011/12)

Unit: kg/ha

No.	Crops	Jhapa	Morang	Dhanusa	Mahottari	Nepal
1	Paddy	3,400	3,340	2,888	2,318	3,003
2	Wheat	2,627	2,345	2,371	2,207	2,272

Sources: Prepared by JICA Survey Team based on Statistical Information of Nepal Agriculture, MOAD for the past three years

The average paddy yields in Jhapa and Morang districts are higher than the national average by 10%, but the figures in Dhanusa and Mahottari districts are lower by 5% and 23%, respectively. As for wheat, yields in Jhapa, Morang, and Dhanusha are higher than the national average by 15%, 3%, and 4%, respectively. Average wheat yield in Mahottari district is the lowest among the four districts and lower than the national average. Taking into account other crops, the agricultural productivities in Mahottari district are considered low.

4.3.5 Livestock

Livestock rearing has been considered as an important agricultural activity in Nepal. Traditionally, cattle and buffaloes have been used for ploughing the farm land, though in Terai their functions are being replaced by tractors. However, the demands for milk and meat have been increasing, therefore encouraging livestock rearing including fowl and goat production. Livestock is also important for promoting organic agriculture for better utilization of agricultural by-products. Table 4.3.9 shows the present livestock population in the target districts.

Table 4.3.9 Livestock Population in the Target Districts in 2011/12

Unit: Number

No.	District	Cattle (%)		Buffalos (%)		Goat (%)		Pig (%)		Fowl (%)	
1	Jhapa	328,014	5	135,257	3	228,166	2	47,611	4	1,164,302	3
2	Morang	273,329	4	148,588	3	240,335	3	44,104	4	1,308,981	3
3	Dhanusa	82,645	1	68,979	1	182,174	2	5,796	1	438,299	1
4	Mahottari	87,366	1	65,205	1	133,410	1	7,078	1	475,932	1
	Total	674,151	9	458,957	9	992,650	10	104,589	9	3,624,470	8
	Nepal	7,244,944	100	5,133,139	100	9,512,958	100	1,137,489	100	45,171,185	100

Sources: Agricultural Information of Nepalese Agriculture 2011/12, MOED, Agri-Business Promotion and Statistics Division

Table 4.3.10 shows the present number of dairy animals and milk production in the target districts in 2011/12.

Table 4.3.10 Dairy Animals and Milk Production in the Target Districts in 2011/12

No.		Milk Cow (No.) (%)		Milk Buffalo (No.) (%)		Cow Milk (Mt) (%)		Buffalo Milk (Mt) (%)		Total Milk (Mt) (%)	
1	Jhapa	47,516	5	29,400	2	26,965	6	31,261	3	58,227	4
2	Morang	36,495	4	36,011	3	19,826	4	34,735	3	54,561	3
3	Dhanusa	13,200	1	18,257	1	6,219	1	16,513	1	23,337	1
4	Mahottari	10,853	1	17,029	1	5,747	1	21,290	2	27,307	2
	Total	108,064	11	100,697	8	58,757	13	103,799	9	163,432	10
	Nepal	998,963	100	1,331,037	100	468,913	100	1,153,838	100	1,622,751	100

Sources: Agricultural Information of Nepalese Agriculture 2011/12, MOED, Agri-Business Promotion and Statistics Division

Since there are many farmers who experienced livestock production in the target districts, promotion of livestock development is one of the prospective agricultural activities.

4.3.6 Fertilizer and Seeds

(1) Chemical Fertilizer

The analysis of fertilizer usage indicated that the fertilizer use is highest in Jhapa District as shown in Table 4.3.11. Generally, fertilizer sales and average fertilizer use showed a declining trend in all three districts. Jhapa's total average use of fertilizer (254 kg/ha) is at reasonable range, while low average use of fertilizers was recorded for Morang and Dhanusa districts. For example, the reasonable use of fertilizers in rice was 206 kg/ha, in maize was 204 kg/ha, and wheat was 194 kg/ha[2].

Table 4.3.11 Fertilizer Use in the Target Districts

District	Jhapa		Morang		Dhanusa	
Types of fertilizer	Fertilizer sale (Mt)	Ave. fertilizer use (kg/ha)	Fertilizer sale (Mt)	Average fertilizer use (kg/ha)	Fertilizer sale (Mt)	Average fertilizer use (kg/ha)
Urea	12,500 (-19.34%)	127	7,402 (-59.66%)	69	4,012 (-2.74%)	52
DAP	8,990 (-23.35%)	91	3,317 (-56.92%)	31	4,847 (-3.54%)	63
Potash	3,580 (-29.58%)	36	412 (-81.52%)	4	1,101 (+5.76%)	14
Others	NA	NA	205 (-81.69%)	2	NA	NA
Total	25,070	254	11,131	104	9,960	129

*Note: * Numbers in parenthesis indicate an increase (+) or decrease (-) compared to previous year*
Source: DADO Annual Agriculture Development Program and statistics publications of Jhapa (2010/11); Morang (2011/12); Dhanusa (2009/10); NA= Not available

In addition, according to the Soil Analytical Laboratory in the Terai Region, the pH of soil in these four districts tend to be acidic. Especially, Jhapa's pH of soil is ranging 4.5–5.5 in substantial areas because it has experienced a lot of rain. In such pH condition, rice, millet, upland rice, buckwheat, sweet potato, potato, yam, garlic, ginger and tea are the suitable crops for cultivation. However, balanced application of fertilizers based on soil diagnosis with technical guidance is indispensable for farmers to sustain production and productivity in order to develop further agricultural production. Therefore, farming communities, extension staff, and other stakeholders should acquire correct and appropriate knowledge on farming skills, as well as areal cultivation planning is important to avoid areal risks on cultivation.

[2] A baseline survey covering more than 1,600 (LI-BIRD-FORWARD-SUPPORT Foundation-CARIAD / DFID 2011).

Fertilizer is among the prioritized inputs in the Agriculture Perspective Plan (APP) but it remains largely undersupplied. In 2012/13, there is still an annual big mismatch between the estimated fertilizer demand of 586,000 t and the actual sales of 145,672 t in Nepal. Most of the districts visited by the crop assessment missions of the Department of Agriculture (DOA) indicated fertilizer shortage as an issue.

(2) Farm Yard Manure/Compost

Official statistics are not yet available on the production and use of farm yard manure/compost. In Terai, most farmers are raising livestock (mainly as dairy cattle, buffalo, goat) which is one of the major and interlinkage components of farming systems, as well as a major source of income. Raising livestock also provides manure for agricultural land to enhance and sustain crop productivity. According to the results of the Sample Survey on Agricultural Activities, around 65% of farmers apply manure/compost as shown in Table 4.3.12. Most of farm manures are produced by the farmers themselves at their farmyards, or some utilized biogas slurry to make compost. Otherwise, some procure manure from their neighbors at reasonable price (Rs2–Rs7/kg). In case of Dhanusa and Mahottari districts, 13 t of manure were applied for vegetables and pulse. While, in Jhapa and Morang districts, farmers apply 5–7 t of compost for rice, cereal, and potato. Jhapa's farmers used chemical fertilizer in addition to manure.

Table 4.3.12 Use of Farm Yard Manure/Compost in the Four Districts

District	Jhapa		Morang		Dhanusa		Mahottari	
Crop	(kg/ha)	(Rs./ha)	(kg/ha)	(Rs./ha)	(kg/ha)	(Rs./ha)	(kg/ha)	(Rs./ha)
Paddy	912	6,750	507	3750	-	-	-	-
Maize	-	-	-	-	-	-	-	-
Other Cereal	1,486	11,000	1,622	12,000	-	-	-	-
Pulse	-	-	-	-	6,486	48,000	5,676	42,000
Oilseeds	1,216	9,000	1,622	12,000	-	-	-	-
Sugarcane	-	-	324	2,400	-	-	-	-
Jute	-	-	-	-	-	-	-	-
Vegetable	-	-	-	-	6,486	48,000	5,676	42,000
Potato	1,824	13,500	2,892	21,400	811	6,000	1,892	14,000
Fruits	-	-	-	-	-	-	-	-
Total	5,438	40,250	6,967	51,550	13,783	102,000	13,244	98,000

Source: Prepared by JICA Survey Team based on Sample Survey on Agricultural Activities

(3) Use of Pesticides

The use of pesticides is common in all the surveyed districts. Liquid pesticides usage is highest (167 ml/ha) in Jhapa District, while use of dust pesticides (3.595 kg/ha) is higher in Dhanusa District than other districts. Dust pesticide is applied in the rice field for controlling stink bug or commonly known as 'Gundhi bug' during panicle initiation stage in Dhanusa District. Compared with the dosage of pesticides per hectare and the average use of pesticide in Jhapa, Morang and Dhanusa districts, the average usage of pesticide of the three districts is low except for dust pesticide as shown in Table 4.3.13.

Table 4.3.13 Pesticide Use in Surveyed Districts

Types of Pesticides	Jhapa		Morang		Dhanusa	
	Pesticides sale	Av. pesticide use*1	Pesticides sale	Av. pesticide use*1	Pesticides sale	Av. Pesticide use*1
Liquid	(L)	(mL)	(L)	(mL)	(L)	(mL)
	16,560 (-3.49%)	167	1,200 (-1.55%)	11	1,700	22
Dust	(kg)	(kg)	(kg)	(kg)	(kg)	(kg)
	12,800 (-7.78%)	0.13	65,000 (-4.97%)	0.602	275,000	3.595
No. of Agro-vets	353 (+ 12.06%)	NA	337 (+4.65%)	NA	NA	NA

Note: Per cents in parenthesis indicate an increase (+) or decrease (-) compared to previous year
**1 Depending on the District Annual Report 2011*
Source: DADO Annual Agriculture Development Program and statistics publications of Jhapa (2010/11); Morang (2011/12); Dhanusa (2009/10); NA= Not available

Interactions have revealed that most farmers obtained pesticides from agro-vets and used them according to the advice of agro-vets. However, majority of agro-vets does not have appropriate knowledge on agro-chemicals, therefore the contents and quality of information passed on to the farmers seems to be poor. Therefore, it is essential to conduct awareness program on proper usage of pesticides and its health/environmental hazards to farming communities and suppliers. In addition, the Integrated Pest Management provided by District Agricultural Development Office (DADO) in several places through a farmers' school shall be fully utilized to minimize the usage of chemicals.

(4) Seed Supply Situation

(i) Cereal Seed

The improved cereal seeds are supplied at 1,245 t in Jhapa District and 3,460 t in Morang District as shown in Table 4.3.14. Total cereal seed requirements of the four districts are estimated in Table 4.3.15. In this estimate, annual seed requirement of cereals is 5,091 t for Jhapa District and 5,531 t for Morang District, and their seed replacement ratios become 24% and 63%, respectively. Morang's seed replacement ratio is highly acceptable result, whereas the national average of seed replacement ratio is only 9%.

Although the National Seed Company (NSC), private seed companies, and agro-vets supply improved seeds of modern varieties to the farming communities, the amount of improved seed supply has not met farmers' demand. Interaction with district level officers indicated that the seed supply in these four districts is primarily dominated by the informal sector in the forms of farm-saved seeds, traditional farmers to farmers' seed exchange and local-level seed trading.

Table 4.3.14 Cereal Seeds Sale in the Four Districts

Improved Seed Sale	Jhapa	Morang
	(Mt)	(Mt)
Institutional Source:	225 (+13.63%)	1,220 (-18.12%)
Private Source	1,020 (+9.32%)	2,240 (+9.26%)
Total	1,245	3,460

*Note: *Numbers in parenthesis indicate an increase (+) or decrease (-) compared to previous year*
Source: DADO annual publications of Jhapa (2010/11); Morang (2011/12)

Table 4.3.15 Cultivation Area and Seed Requirement

Description		Unit	Rice	Wheat	Maize	Total
District	Required Seed	(kg/ha)	40	120	25	-
Jhapa	Cultivation Area	(ha)	89,400	7,500	24,600	121,500
	Seed Requirement	(t)	3,576	900	615	5,091
Morang	Cultivation Area	(ha)	78,200	16,875	15,100	110,175
	Seed Requirement	(t)	3,128	2,025	378	5,531
Dhanusa	Cultivation Area	(ha)	65,000	38,450	2,019	105,469
	Seed Requirement	(t)	2,600	4,614	50	7,264
Mahottari	Cultivation Area	(ha)	34,776	26,785	2,435	63,996
	Seed Requirement	(t)	1,391	3,214	61	4,666
Total	Cultivation Area	(ha)	267,376	89,610	44,154	401,140
	Seed Requirement	(t)	10,695	10,753	1,104	22,552

Source: Prepared by JICA Survey Team based on Statistic Published by MOAD

Meanwhile, the Regional Agricultural Research Station (RARS) Tarahara has been working with Farmers' Seed Producer Groups in Jhapa and Morang districts for producing certified seeds of rice, wheat, maize, and lentil since 2011. These groups produced certified seeds by receiving foundation seeds from RARS and sale certified seeds to farmers groups and agro-vets each year. The RARS provided subsidy at the initial phase, and now, the subsidy has been abolished. Currently, RARS encourages seed producer groups through regular technical support and supervision, training for seed production, and assist in field certification, lab test, and tagging etc.

The District Seed Self Sufficiency Programme (DISSPRO) and Community-based Seed Production Program are also being implemented by the District Agricultural Development Office (DADO) with the support of the Crop Development Directorate, Hariharbahawan, as shown in Table 4.3.14. But, the area under the seed program is limited to the entire cultivated area of the districts under DISSPRO. It lacks motivation to transform the districts into seed self-sufficient districts. Seeds produced from such initiatives have not been properly linked to quality seed production, seed sale, and distribution chain. Under the program of DOA, subsidy and support will be provided in 2012/13 for the establishment of seed storage facility (up to Rs300,000), purchase of seed processing equipment (up to Rs.100,000), and creation of revolving fund for sustainable seed system (up to Rs100,000).

Seed renewal rate of paddy is higher than other cereal crops. Most farmers, who are living close to government seed farms or concerning to community-based seed production program farms, renew their paddy seed once in two or three years. However, many farmers who are living in remote areas applied their own-saved seeds or purchased Indian seeds sold in the village market. Accordingly, it is necessary to establish the seed supply mechanism.

Table 4.3.16 Community-based Seed Production: Cereals

Seed Production Program	Jhapa (ha)	Morang (ha)	Dhanusa (ha)	Mahottari (ha)
Rice	70 (+34.61)	250 (+ 0%)	30 (+20%)	10 (NA)
Maize	30 (+20.0)	15 (+25%)	NA	NA
Wheat	5 (-200%)	220 (-43.58)	30 (+20%)	NA
	(Declining wheat seed production due to fertilizer unavailability)			

Note: Numbers in parenthesis indicate an increase (+) or decrease (-) compared to previous year
Source: DADO annual publications of Jhapa (2010/11); Morang (2011/12); Dhanusa (2009/10); Mahottari (2009/10)

(ii) Vegetable/Fruit Seed

Under the community-based seed production program, seed potato and seed legumes are produced in Morang and Dhanusa districts as shown in Table 4.3.17. The Agriculture Research Station (ARS), Belachapi, Dhanusa/Pakhribas, and Dhankuta also produce foundation seeds and certified seeds of vegetables and green manure plants, etc. In 2010/11, 73 kg of foundation seeds were produced at ARS, Belachapi in Dhanusa District as shown in Table 4.3.18. However, several quantities of seed products produced by public institutions are not fulfilling the demand. Therefore, most of the vegetable/fruit seeds sold by private sectors, such as agro-vets and other traders, are not necessarily certified seeds. In 2010, although many improved foreign vegetable seeds are registered under the Seed Act, such seeds and cultivation methods are not properly extended in the field yet.

Table 4.3.17 Community-based Seed Production: Vegetables

Seed Production Program	Jhapa (ha)	Morang (ha)	Dhanusa (ha)	Mahottari (ha)
Potato	-	55 (+10%)	-	-
Grain legumes	-	-	5 (NA)	-

Note: Numbers in parenthesis indicate an increase (+) or decrease (-) compared to previous year, NA: Not available
Source: DADO annual publications of Jhapa (2010/11); Morang (2011/12); Dhanusa (2009/10); Mahottari (2009/10),

Table 4.3.18 Vegetable Seed Production at ARS, Belachapi

No.	Crops	Variety	Level	(kg)
1	Brinjal	Nilma Long	FS	1.1
2	Brinjal	Nilma Round	FS	2.25
3	Tomato	NCL	FS	1.25
4	Tomato	Roma	FS	1.3
5	Tomato	Pusha Rubi	FS	1.2
6	Tomato	Amrapali	FS	3.8
7	Broad leaf maustard	Him Chaura Pat	FS	20.7
8	Bhindi	Komal	FS	15
9	Radish	40 days	FS	24.48
10	Chillies	Jwala	FS	2.3
		Total		73.38

Note: FS - Foundation Seed
Source: Annual Report ARS, Belachapi, Dhanusa (2010/11)

4.3.7 Extension Services

(1) Present Condition

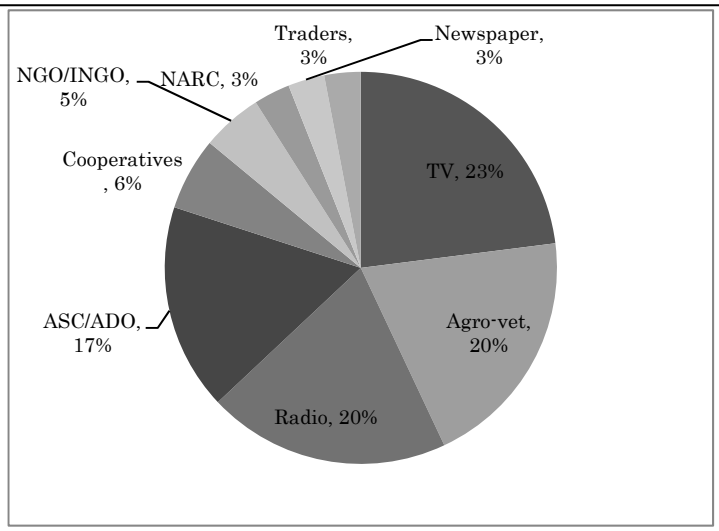
Currently, main service suppliers can be categorized into government agencies (DADO and District Livestock Service Office(DLSO), community organizations, NGOs (local and international), cooperatives, private sector organizations and donor project/program implementation bodies.

Table 4.3.19 Actual Number of Main Agriculture-related Service Suppliers in the Four Districts

District	ASC/ACC of DADO	Service Office of DLSO	CBOs (including FGs)	Cooperatives	NGOs	Agro-vet
Jhapa	6	17	NA	654	357	444
Morang	7	17	NA	975	438	725
Dhanusa	11	18	NA	473	628	28
Mahottari	6	16	161	631	558	82

Source: DADO Annual Reports (2010/2011) of the four districts, Nepal Agricultural Cooperative Federation,
The number of NGOs are registered to the Social Welfare Council (SWC) Nepal

The Farm Household Survey revealed where farmers obtained their needed agricultural technical services. As a result, 20% from Agro-vet, 17% of them obtained their knowledge and skills from Agriculture Service Center (ASC) and DADO, 6% from cooperatives, and 5% from NGOs/INGO, although the majority of information resources came from the media like radio, newspapers, and TV.



Source: Farm Household Survey

Figure 4.3.1 Types of Technical Services Received

(2) DADO

As mentioned in Section 3.3.1, DADO and junior technicians/junior technical assistants (JT/JTAs) formed many farmer groups (FGs) under the strong initiatives of DOA, but they have not been able to provide the services needed by all FGs after the formulation. Some of the FGs have already been dissolved. A 2007 study reported that merely 35% of the total FGs in Nepal are active[3]. The major reason for the inactivity of FGs can be attributed to the shortage of extension services in terms of quality and quantity provided by the JT/JTAs.

In the Farm Household Survey, 25% of all respondents are members of the FGs, but 91.7% of them have never visited an agricultural service center (JT/JTAs); 96.7% claimed that the services of ASC (JT/JTAs) are inadequate; and 93.3% complained the service quality. Therefore, the JT/JTAs have not satisfactorily followed up the FGs after their formulation.

The DADO recognized the situation well but have not taken appropriate actions yet. With this situation, DADO explained the obstacles as follows:

- Shortage of human resources;
- Shortage of budget for activities;
- Lack of opportunities to improve JT/JTAs' knowledge and skills;
- Shortage of physical facilities such as deteriorated office and residential buildings, transportation (motorcycles and others);
- Low salary;
- Low motivation (incentives and ethics): low salary, not local resident, limited mobility; and
- Language problems.

The DADO claimed that these difficulties mentioned above impede their actions to follow up all FGs.

The JT/JTAs are not necessarily local people, as some are being transferred to other districts after a

[3] ABTRACO, 2007, 'Report on the Impact Study on Farmers' Group Approach Adopted in Agricultural Extension System of Nepal', Directorate of Agriculture Extension, DoA

certain periodic time (about three years). As agricultural products and needed technologies in Terai differ from places such as hills, even though the staff know about agriculture in hill area they cannot apply his/her knowledge/skills directly in Terai. Also Madhesi people have different cultural/social norms and languages; sometime it impedes smooth communication between extension workers and farmers.

Facing the shortage in the numbers of JT/JTAs, there is a need to consider the system (mechanism) on how to transfer needed technologies and skills to all recipient farmers (FGs). One way is to adopt the traditional "trickle down" system, which the JT/JTAs transfer the needed technologies to progressive farmers, and the farmers' practice would be naturally disseminated to the other farmers around him. In Nepal, this system has been tried in the 1980s. However, it was not appreciated very much because the system failed to disseminate the services to the other farmers but was only able to improve the technologies of the progressive farmers.

The current extension system is the improved traditional extension system. In order to minimize the unfair distribution of extension services, the government made a rule that FG has to consist of various ethnic groups, castes, women, and any other vulnerable groups as members. This would be one solution in terms of fair distribution, but unfortunately it does not work to increase the efficiency and effectiveness of the service provision.

(3) NGOs

The legal foundation for the operation of civil society organizations in Nepal is laid by the Social Service Act. All newly created domestic NGOs are required to register either with the appropriate government office, the Social Welfare Council (SWC), or the Chief District Office (CDO). Registration with SWC is renewable annually by presenting the NGOs financial report and paying the specified fees.

Of the more than 30,000 NGOs exist in Nepal, 16,425 are registered with the SWC and about 15,000 with the appropriate local authorities, often the CDO. The focuses of most NGOs registered to SWC are community development, services to youth and women, and environmental projects.

(i) Varieties of NGOs Working in the Four Districts

Based on the interview in the field survey, NGOs can be categorized into the following groups:

- International NGOs
- Local NGOs supported by international non-government organizations (INGOs)
- Local NGOs influenced by political wings
- Local NGOs supported by religious groups
- Local NGOs supported by other groups/individuals

As mentioned above, many NGOs have been working for education, health, and sanitation sectors. While some NGOs conduct agricultural extension services. Majority of the NGOs conducting agriculture activities consider that the agricultural extension service is done as part of the income generation activities for the poor.

Main NGOs working in the agricultural sector are; Friends of Dhanusa, SUYUK (Care International),

Aasman-Nepal, DSS, Jawas in Dhanusa; Action Aid (INGO) in Mahottari, Heifer International (INGO) in Jhapa and Morang districts. Some examples of these NGOs are shown in the box below.

[Box] Some NGOs' Agricultural Extension Activities

1.Heifer International

Heifer International is an INGO based in the US. They opened the Nepal Office in 1997. Their expertise is on poverty alleviation and social development through the livestock sector.

Heifer's JT/JTAs in collaboration with NARC and DOLS introduces improved animal management technologies, AI, animal health services to their community groups. Also considering the development of the livestock value chain, Heifer forms trade alliance among cooperatives, community groups, and traders. Also it runs production and marketing enterprises.

2. Aasman-Nepal

The Aasman-Nepal is a local NGO established in 1999 in Janakpur, Dhanusa. Since its establishment, it has been working for education and health improvement of children and women. Besides the activities, it conducts agricultural development activities for target communities.

Their taken extension methodology is mainly T&V, and JT/JTAs, employees of Aasman Nepal, visit its target communities and give agricultural technical advice. As their target groups are poor farmers with small cultivation lands, the JT/JTAs advises them to form small group and to cultivate together. Obtaining technical support from the JT/JTAs, the groups collectively purchase fertilizer and other agricultural inputs, set up some groundwater irrigation, and sell their agricultural products at near market. On the process, the group members are gradually increasing their income and savings.

Aasman-Nepal supports that the target can apply for the Poverty Alleviation Fund (PAF) of the GON. The fund from PAF is used for "revolving fund" of the community livestock project.

(b) Social Mobilization (Social Preparation) by NGOs

Before initiating any types of activities, NGOs always conduct social mobilization to their target communities and people. The social mobilization aims to enhance people's understanding about their common problems and the necessity of solution, in order to reach an agreement (common goal and roadmap). Thus, social mobilization is very much necessary to increase the target group's ownership on their activities, and to ensure the sustainability of intervention effects. Through their daily activities, NGOs have accumulated social mobilization skills and experiences.

(c) Saving and Credit Activities as an Entrance Point

After the social mobilization and formulation of community organizations (COs), many NGOs conduct saving and credit activities as an "entrance point" to the target groups. Through this activity, they train the target groups on how to do organizational management, bookkeeping and action planning. Then they gradually expand their activities in the community.

(d) Utilization of the Poverty Alleviation Fund (PAF)

The GON established the Poverty Alleviation fund (PAF) in order to realize the goals (poverty alleviation) of the Tenth Five-Year Plan (2003-2008) of Nepal. It is governed by the Poverty Alleviation Fund Act, 2011. The head is the Chairperson of the Council of Ministers. The fund is provided to Community-based Organizations (CBOs) involved in their development works. It has the

following four main supporting areas:

- Social mobilization
- Capacity building
- Income generation
- Rural community infrastructure

The PAF is a demand driven program, also known as a demand led community-based approach to alleviate poverty. The CBO makes its action plan and proposal on the basis of their capacity and local resource potentials. When the proposal is approved by PAF, they receive the planned fund directly. The NGOs, as facilitator, ensure that the CBO can implement all processes smoothly, and monitor the funds if it was used properly. The PAF recommends to the CBO to get the technical support of NGOs, and/or private organization as a facilitator when the CBO makes the action plan and proposal to PAF.

The beneficial districts are limited, but Dhanusa and Mahottari districts are included in the target districts of PAF. In the field survey conducted by the JICA Survey Team in Dhanusa and Mahottari districts, it was confirmed that some CBOs supported by NGOs have been conducting livestock rearing projects. They use the fund as a revolving fund.

Also this fund can be used for community infrastructure. In this case, the PAF require 20% of cost sharing with the community in order to raise their ownership. This is also applicable for rehabilitation of irrigation canals.

(e) Problem of NGOs working in agricultural sector

While NGOs have good social mobilization skills, their level of expertise (knowledge and skills) in agricultural development is lower than DADO, DOLS, and NARC. Also the treatment areas are quite small. Their existing intervention is very much limited in the four districts.

(4) Cooperatives

(a) Present condition

Up to date, as Table 4.3.20 shows, there are 2,739 cooperatives in the four districts. These cooperatives are registered to the Ministry of Cooperative and Poverty Alleviation. In the registration, they are categorized into; agriculture cooperatives, dairy cooperatives, beetle-nut cooperatives, tea cooperatives, fruits and vegetable cooperatives, multi-purpose cooperatives, herbal cooperatives, electricity cooperatives, saving and credit cooperatives, health cooperatives, bee keeping cooperatives, consumer cooperatives, and others. Their differences are only on their type of transactions. Multipurpose cooperatives and saving and credit cooperatives can invest in any business, but the investment of other cooperatives has to be specified (registered) in their business. Saving and credit activities are conducted not only by the saving and credit cooperatives but also by other types of cooperatives.

Table 4.3.20 Types of Cooperatives in the Four Districts

SN	Type of Cooperatives	Jhapa		Morang		Dhanusa		Mahottari	
		#	%	#	%	#	%	#	%
1	Agriculture Cooperatives	195	29.8	123	12.6	184	29.2	132	27.5
2	Dairy Cooperatives	24	3.7	25	2.6	19	3.0	38	7.9
3	Beatle nut Cooperatives	13	2.0	-	-	-	-	-	-
4	Tea Cooperatives	6	0.9	1	0.1	-	-	-	-
5	Fruits and Vegetable Cooperatives	10	1.5	10	1.0	1	0.2	2	0.4
6	Multipurpose Cooperatives	111	17.0	145	14.9	45	7.1	12	2.5
7	Herbal Cooperatives	10	1.5	11	1.1	-	-	-	-
8	Electricity Cooperatives	4	0.6	4	0.4	4	0.6	-	-
9	Saving and Credit Cooperatives	266	40.7	606	62.2	223	35.4	114	23.7
10	Health Cooperatives	3	0.5	3	0.3	1	0.2	1	0.2
11	Bee keeping Cooperatives	-	-	3	0.3	-	-	1	0.2
12	Consumer Cooperatives	12	1.8	8	0.9	84	13.3	116	24.1
13	Others	-	-	35	3.6	69	11.0	65	13.5
Total Cooperatives		654	100.0	974	100.0	630	100.0	481	100.0
District Cooperatives Federation		8		7		4		5	

Source: Nepal Agriculture Cooperative Federation

Cooperatives are managed by representative of shareholders, saving, bank loans and other profits. Among the cooperatives in the four districts, majority are saving and credit cooperatives (1,209: 44%), agriculture cooperatives (634: 23.1%), and multipurpose cooperatives (313: 11.4%). Eastern Terai (Jhapa and Morang) has more number of cooperatives than central Terai (Dhanusa and Mahottari), and the size of shareholders per cooperative in eastern Terai is also larger than in central Terai.

(a) Small Farmers Cooperative Ltd. (SFCL)

The cooperatives in eastern Terai are more matured than the cooperatives in central Terai. For example, the Small Farmers Cooperative Ltd. (SFCL) is a saving and credit cooperative. The member cooperatives of SFCLs are available in almost all districts, and in the four districts. There are 20 cooperatives in Jhapa, 18 in Morang, 13 in Dhanusa, and 6 in Mahottari.

Among them, some SFCLs in Jhapa and Morang have more than 15 years of experience, and have expanded their business besides saving and credit, such as:

- Loan to agricultural and/or livestock related business,
- Proxy service of remittance,
- Holding common (cooperative's) lands,
- Farming and rearing livestock in the lands for commercial purpose,
- Insurance for agricultural products and livestock, and
- Management of cooperative's grocery shops and so on.

They invest the common profits to common (cooperative's) lands and/or cooperative's grocery shops, then invest the profits derived from lands and shops for member of cooperatives and also use it for welfare services like health check and/or excursion trips for the members.

(b) Multi-purpose Cooperatives

As mentioned in Section 4.2.2, the eastern part of Terai has relatively high population of Hill Brahmin and Chhetri. These high caste people are educated, and have large human network from government sector to private sector. Many successful cooperatives are led by such hill high caste leaders.

They have very good linkages not only with government extension service providers but also private entities depending on the needs of the members.

The next box shows some cooperatives, who are performing well in terms of agricultural development.

[Box] Some Cooperatives' Agricultural Development Activities

1. Mechi Multipurpose Cooperative Ltd. (Jhapa)

Mechi Multipurpose Cooperative Ltd. in Jhapa has more than 5,000 shareholders, and has been developing various services for its members, i.e., saving and credit, proxy service of remittance, operation of agricultural inputs shops, agricultural development services, and marketing. They collaborate with NARC, DADO and DOLS, and participate in the activities of NARC, DADO, and DOLS. It can be said that the cooperative is successfully managed. They already started to disseminate their management skills and experiences to newly established cooperatives in Jhapa.

In terms of agricultural related service, the cooperative purchases paddy from the member at a bit higher price compared with the middle men/rice mills, and sells it at wholesale price after milling the paddy. The cooperative promotes multiplication of rice and wheat seeds, and distributes them not only to the members but also to NARC. The cooperative owns a tractor, storage facilities, and a mill, and rent the tractor to its members at a cheaper price.

2. Mul Krishak Cooperative Ltd. (Jhapa)

Mul Krishak Cooperative Ltd. has 278 shareholders. The cooperative asserts that they are not much interested in saving and credit, rather they are concentrated on agricultural development of its members. Within the cooperative, there are four FGs of DADO. Receiving closed consultation from JT/JTAs and SMSs, they built eight small irrigation projects for commercial vegetable farming, seed production projects, and soil testing program.

DADO trains the member farmers in vegetable seed production, micro-nutrients use, agriculture lime use, pesticides use, and improved compost pit. Also their commercial skills are supported by the Council of Technical Education and Vocational Training. Indofil Company provided the member farmers with rice pest management.

Also the cooperative conducts dairy program, around 180 L of milk is collected from 70 farmers and sold in the market. The profits are used for artificial insemination (AI), parasite control, and vaccinations of cow. They have an agreement on the participation in AI mission program with DOLS.

(iii) Problems of Cooperatives

In Terai, many saving and credit cooperatives are established everywhere. However, some cooperatives were just established as recipients of the fertilizer distribution policy and other political intentions. The quality control of cooperatives is not properly done well by the government.

(5) Community Based Organization (CBO)

The CBO in Nepal is defined as a traditionally formulated organization such as ethnic groups or religious groups. It is not confirmed that CBOs commit any special agricultural extension activities in the field survey.

Besides CBOs, when NGOs and/or donors conduct their project activities in the field, they formed some groups based on the location/characteristics of the community. These groups are also called "community-based organizations". They are most likely to dissolve or disappear after the termination of the project.

(6) Agro-vet

According to the household survey, respondents frequently get agricultural inputs from agro-vet.

Table 4.3.21 Respondents Purchase Inputs Items from Agro-vet

Input Item	Percentage of Agro-vet
Improved seeds	50.8%
Chemical fertilizer	40.0%
Plant protection materials	73.3%

Source: Household Survey Results

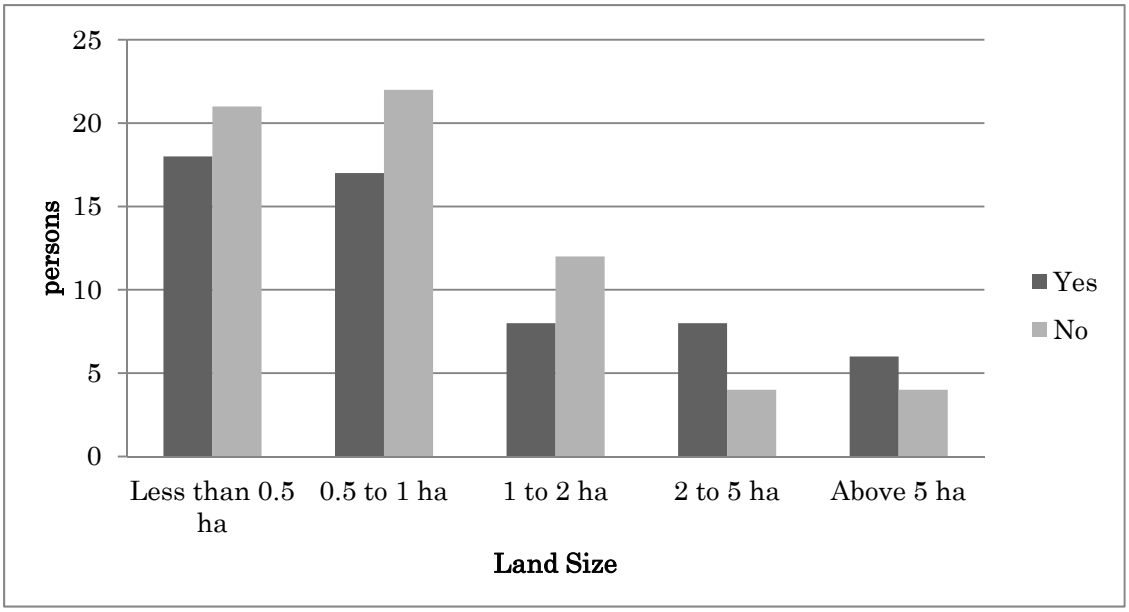
The farmers who the JICA Survey Team interviewed in the field survey stated that they purchase chemical fertilizer and other agricultural inputs in the agro-vet. In turn, they are given instructions by the shopkeepers of agro-vet on how to use the fertilizer, however, the shopkeepers do not always have enough knowledge about the products, and sometimes they just read the explanation written at the package.

The GON obligates agro-vet to register with DADO where their shop is located but are not interested to enhance their staff's knowledge about the products.

A total of 1,279 agencies responsible in handling chemical substances are registered with DADO where their shop is located. These entities include agro-vets, cooperatives, and others. Majority of these are agro-vets. Agro-vet is a private entity, and majority of the farmers purchase their agricultural inputs from the agro-vets in the market. The number of agro-vet shops are 444 in Jhapa and 725 in Morang. Whereas, Dhanusa and Mahottari districts have only 28 shops and 82 shops, respectively. This clearly shows the difference in demand and affordability of farmers in the eastern and central Terai.

(7) Agricultural Credit: Formal and Informal Finance

According to the Farm Household Survey, owners of less than 2 ha of land have difficulties in accessing loan.



Source: Farm Household Survey

Figure 4.3.2 Easiness to Access Loan

(i) Formal finance

The Agriculture Development Bank Ltd. (ADBL) was established in 1968 as a state-owned bank under the Agriculture Development Bank Act for the development of the agriculture sector. It was transformed as a parasternal bank governed under the Nepal Rastra Bank and incorporated as a public limited company in 2005.

When it was still a state-owned bank, the bank provided credit to small farmers under group liability with government subsidy. Due to switching of government policy into open market policy, the bank was privatized; thus their current operation focuses more on commercialization as an autonomous organization, though still largely owned by the government.

Financial services for small farmers are now handled by the Small Farmers Development Bank that was established by the ADBL through the Small Farmer Development Programme, which was carried out since 1975. As a commercial bank, the ADBL-Credit Division does not provide loans less than Rs50,000 as the administration cost of this kind of loan is too high.

The ADBL still focuses primarily on investment in agriculture. According to the regulation, 10% of general commercial bank's investment should go to agriculture. Of which 23% of this, goes largely to the livestock sector. At the same time, the largest default rate is in agricultural loans because the higher risk of agricultural activities which are highly dependent on the environment condition. As a whole, only about 5% of their total loans are considered bad loan.

The Small and Micro Enterprise Development Division of ADBL provides wholesale lending for micro-enterprises through cooperatives since 2007/08. It provides micro-credit up to Rs.1 million for micro-enterprise development and a collateral based programme with annual interest of 12% to individual or groups. The scheme is that clients bear 20% equity fund and the 80% is a loan provided by the bank. ADBL, with the support of GON, is launching the crop and livestock insurance scheme. The GON availed Rs60 million to the bank for the insurance scheme purpose.

(ii) Informal finance

Farmers who experienced difficulty in accessing formal financial institutions tend to prefer borrowing from money lenders in the community. These lenders are traders, rice millers, business persons in town and others. The study conducted by Nepal Restra Bank (2012) stated that the interest rate of these money lenders is 40% per annum on average and sometimes even more.

In return to the money they lend, their harvests of rice and other commodities are compromised as security. As long as these farmers borrow money from traders and/or rice millers they cannot sell their products freely as they are bounded by the terms and conditions of the money lenders.

(8) Cross-cutting Issues on Extension Service Delivery

(i) Lack of social preparation for FGs

In the 1990s, the government recognized that any development initiatives were notably conducted effectively if empowered farmers participated in these activities proactively, and if the policy of implementing the FG extension approach was adopted. From the beginning, the government considered that "carrying out agricultural extension activities solely by JT/JTAs was not only a numerical problem of non-availability, but also suffered conceptually" (Sharma, 2011); and it expected the CBOs, cooperatives and NGOs to involve in the social preparation works of the FGs with JT/JTAs. Social preparation includes:

- Social mobilization: to identify their (common) problems (development issues), existing resources, manageable matters and unmanageable matters by their own, priority of development needs
- Group forming
- Setting up their own management rules and/or regulation, mission, vision, goals
- Making an (annual) action plan

The FG approach also assumes that CBOs and cooperatives would take over the management and operation of the FGs sustainably.

The DADOs in the four districts organized the contact lists of cooperatives, CBOs, and some NGOs. Some cooperatives, CBOs, and NGOs have invited JT/JTAs to their command areas and received technical advice from them. In the field survey conducted in Jhapa by the JICA Survey Team, JT/JTAs in DADO knew well about the main cooperatives' activities because they frequently exchange information. Basically, they have been carrying out their activities respectively; however, the expected collaboration in implementing the FG approach has not been confirmed in the four districts.

The JT/JTAs solely formed FGs along with the guidelines entitled "Formulation and Operation Procedure". As they are not always trained as social workers, they have not done enough social preparation. In general, any groups, which have not developed strong will and members' commitment, encountered difficulty in sustaining themselves. Indeed, many FGs have already been out of operation or dissolved if JT/JTAs have not done their follow-up after the formation of FGs.

On one hand, the government expects the CBOs, cooperatives, and NGOs to work with DADO in terms of agricultural extension; on the other hand, they have their own purposes and activities. Also

there are some limitations when executing their expected work as partner of DADO.

- Small size: small manpower, resources, and operation
- Policy: independence (autonomous), different discipline/philosophy
- Regional preference (density of CBOs, cooperatives, and NGOs)
- Limited capacities for agricultural technology development
- Limited capacities for putting exact agricultural development needs from farmers

In the case of NGOs, they most likely get some pressure from donors to produce short-term outcomes.

(ii) Lack of demand-driven extension services and weak collaboration with other stakeholders

Many criticize that public sector agricultural extension gives too much weight on technology transfer, as well as the supply driven approach.

Currently, the extension demand of farmers have been drastically extended and comprehensive, for example, access to farm inputs (seeds, fertilizer, and chemical substances), credit, agricultural/livestock insurance, emergency responses to diseases/pest infestations, marketing channels, promotion of products/markets, and exports.

Especially in Terai, many new varieties of seeds and agricultural inputs come from India with unidentified diseases. Such new varieties and/or products are used not only by progressive farmers but also by ordinary farmers widely. Also farmers in Terai frequently face tight competition with cheaper agricultural products from India.

Also chronic labor shortage derived from migrants in Terai increases the necessity of agricultural modernization such as mechanization, improved seeds, and other improved agricultural technologies/skills.

However, considering the scarcities of financial and human resources, it is impossible that government organizations would solely respond to these demands. Though the MOAD and DOA recognized well the strong need for different types of public private partnership in agricultural extension and development programs, they are pushing for strong collaboration with the private sector, cooperatives, and NGOs in the field of agricultural extension. However, it has not been realized at the field level in the four districts.

The main reasons are as follows;

- Poor leadership of DADO/DLSO on enhancing the corrective actions,
- Unavailable study and analysis of current extension demands of farmers by DADO/DLSO,
- No strategic objectives of all partners in the district,
- No corrective action plan,
- No mechanisms for working together, and
- No agreement about roles and responsibilities among all stakeholders.

Also DOA has not given any appropriate instruction to DADO on how to implement the public-private partnership policies at the district level, and there is a large gap between policy and practice.

(iii) Strengths and weaknesses of each service provider

Based on the discussion above, the strengths and weaknesses of major agricultural service providers are summarized as shown in Table 4.3.22. Considering these characteristics of each service provider, the efficient and effective framework of agricultural extension services should be reformed.

Table 4.3.22 Strengths and Weaknesses of Major Agricultural Service Providers

	Strength	Weakness
Government Organizations (DADO, DLSO, NARC, etc.)	• Free service • Certified SMS, JT/JTA • Authority over policy implementation • Sustainable	• Immobility (Transportation) • Limited quantity (number of SMS, JT/JTA) • Lack the latest knowledge and skills • Inefficient structure of extension services • Less number of female extension workers • Poor linkage between government organizations • Poor linkage with other stakeholders • Lack planning and management skills
NGOs	• Social mobilization • Participatory action planning • Strong supervision (monitoring) • Inter-sectoral intervention to villages(farmers) • Mobility	• Project based intervention (no budget, no project) • Lack agricultural technical advice • Some are influenced by political parties/power
Cooperatives	• Farmers' initiatives • Operating a saving and credit system within the members • Corrective actions against marketing, purchasing of inputs, negotiation with outsiders • Some cooperatives have storages, mills, tractors	• Less agricultural and market experts • Limited power over policy making • Poor management skills (accountability and transparency) • Strongly dependent on the capacity (quality) of leaders • Some are influenced by political parties/power
Private Sector	• Clear mission/vision/goal • Logical intervention for agricultural development in their target area.	• Not well-known (commercial-led decision makings) • Number is very much limited

Source: JICA Survey Team

4.3.8 Agricultural Machinery

Four-wheel tractors are primarily used for land ploughing in Jhapa, Morang, and Dhanusa districts. The number of tractors are most plenty in Jhapa (1,075), followed by Morang (710), and Dhanusa (172). The use of harvesters and power tillers have also been increasing. It is evident that agricultural mechanization is taking place in these districts. The agricultural machineries are owned by individual farmers or cooperatives. These machines are usually rented out to neighboring farmers at the VDC level. Tractors are rented out in these districts at a price range of Rs800-1,000 per hour. In Morang, it was reported that the use of tractors and power tillers for ploughing saved 30% to 40% of the cost. Agricultural mechanization is an option to address the issue of labor shortages in these districts. Table 4.3.23 shows the agricultural machineries available in the target districts.

Table 4.3.23 Number of Agricultural Machineries in the Target Districts

Type of Machinery/ Tools	Jhapa	Morang	Dhanusa	Mahottari
Thresher	275 (+7.84%)	1,140 (21.7%)	636 (+1.76%)	NA
Tractor (4W)	1,075 (+38.70)	710 (9.56%)	172 (+2.99%)	NA
Pumping set	2,710 (+4.31%)	4,340 (6.73%)	1,063 (+2.71%)	NA
Power tiller		372 (95.78%)		NA
Sprayer/duster	3,359 (+1.17%)	2250 (+5.63)	1,148 (+0.88%)	NA

*Note: * Numbers in parenthesis indicate an increase (+) or decrease (-) compared to previous year*
Source: DADO annual publications of Jhapa (2010/11); Morang (2011/12); Dhanusa (2009/10); Mahottari NA= Not available

4.3.9 Farmers' Income

The JICA Survey Team has carried out the household survey by subcontracting it to a Nepalese consultancy firm. The household survey was carried out for 120 samples, and was equally split into 30 samples for each target district.

(2) Summary of the Household Survey

Out of 120 samples, 104 households possessed irrigated farm land, while the 16 households have only rainfed farmland. The average household incomes "with irrigation" and "without irrigation" are summarized in Table 4.3.24:

Table 4.3.24 Average Household Income with Irrigation and without Irrigation

Unit: Rs.1,000/HH/year

No.	Description	All Samples (120)		With Irrigation		Without Irrigation	
		Average	Median	Average	Median	Average	Median
1	Agricultural Income	119.7	48.0	133.4	56.7	30.8	15.0
2	Non-agricultural Income	225.3	163.0	236.7	166.7	151.7	89.6
3	Total Household Income	345.0	211.0	370.0	223.4	182.5	104.6
	Ratio (1/3)	34.7%	22.7%	36.0%	25.4%	16.9%	14.3%

Source: Household Survey under the Sample Survey

Based on the table above, the following findings were drawn:

- Households without irrigation farmland are very poor.
- Average agricultural income of households is more or less 35% even though irrigation farmlands are available.
- Difference between the average and median is substantial.

(2) Agricultural Income Depending on Farm Size

As seen in the above table, the average agricultural income is 35% of the whole household income, but the ratio differs depending on the farm size as shown in Table 4.3.25.

Table 4.3.25 Ratio of Agricultural Income Depending on Farm Size

No.	Description	Farming Area				
		Less than 0.5 ha	0.5 to 1.0 ha	1 to 2 ha	2 to 5 ha	Above 5 ha
1	Total Household Income (Rs.)	335,311	214,297	254,019	471,838	919,725
2	Agricultural Income (Rs.)	43,730	54,601	82,766	298,320	529,225
3	Ratio (2/1) (%)	13.0	25.5	32.6	63.2	57.5

Source: Household Survey under the Sample Survey

The agriculture income of small farmers whose farm area is less than 1.0 ha is very small, compared with farmers who operate more than 2 ha, which obtained substantial agricultural income at approximately 60% of their total income. Taking this situation, farmers who operate 1.0–2.0 ha of farmland in Terai somehow regard agriculture as very important as it is a major source of income as well as for farmers operating more than 2 ha farm. However, for farmers operating less than 1.0 ha have to find other sources of income than agriculture, unless they will get higher income from agriculture by introducing high-valued crops and/or group farming.

The average farmers' incomes and sources at different farm sizes of FGs are shown in Table 4.3.26.

Table 4.3.26 Average Household Income and Sources Depending on Farm Size

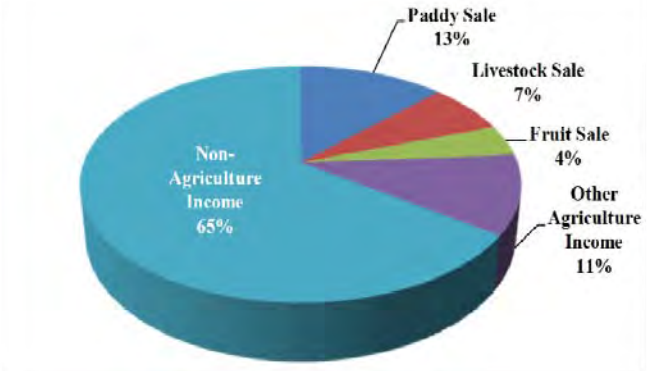
Unit: Rs./Year

No.	Income Source	Farming Area					Total	HH Average
		Less Than 0.5 ha	0.5 to 1.0 ha	1 to 2 ha	2 to 5 ha	Above 5 ha		
		Number of Samples						
		39	39	20	12	10	120	
1	Paddy Sale	2,073	10,621	35,234	125,262	256,880	5,271,690	43,931
2	Wheat Sale	792	2,481	3,200	16,583	55,800	948,643	7,905
3	Maize Sale	1,631	2,437	4,630	10,583	6,000	438,248	3,652
4	Vegitable Sale	2,108	1,046	3,763	4,117	1,170	259,370	2,161
5	Potato Sale	979	349	2,550	11,417	4,600	285,796	2,382
6	Sugarcane Sale	2,406	5,715	750	12,600	33,000	812,919	6,774
7	Jute Sale	0	251	805	1,250	0	40,889	341
8	Fruit Sale	12,410	6,260	6,211	13,792	76,245	1,780,304	14,836
9	Other Crop Sale	5,167	462	250	5,083	15,560	441,127	3,676
10	Livestock Sale	16,164	19,851	19,873	72,633	18,970	2,863,341	23,861
11	Fisheries Sale	0	5,128	5,500	25,000	61,000	1,219,992	10,167
	Sub Total for Agriculture Income	43,730	54,601	82,766	298,320	529,225	14,362,319	119,686
	Per Capita Agriculture Income Rs./Year	4,707	6,067	8,996	24,654	42,002		12,338
12	Timber/Firewood Sale	641	0	2,000	0	500	69,999	583
13	Employment	95,513	16,692	67,800	58,333	94,500	7,376,991	61,475
14	Wage	41,385	27,333	13,000	8,333	0	3,039,998	25,333
15	Trade & Business	16,026	32,000	21,000	24,167	170,000	4,283,018	35,692
16	Agri. Machinery Rent	38,462	3,846	0	15,000	51,000	2,340,012	19,500
17	Remittance	76,154	56,667	59,500	50,000	40,000	7,370,019	61,417
18	Other Income	23,400	23,158	7,953	17,685	34,500	2,532,042	21,100
	Sub Total for Non-Agriculture Income	291,581	159,696	171,253	173,518	390,500	27,012,079	225,101
	Total	335,311	214,297	254,019	471,838	919,725	41,374,398	344,787
	Average Family Member	9.3	9.0	9.2	12.1	12.6		9.7
	Per Capita Income Rs./Year	36,054	24,336	27,284	38,995	72,994		35,545

Note: Amounts in income column in each farming area are average for each income source.
Source: Household Survey of the Study Team

The table above is illustrated in Figure 4.3.3. Based on the same table and figure, the following facts below became clear:

Since the average agricultural income is approximately at 35% only, many farm households would be below the poverty line in Nepal4. As it was found that 44% of surveyed households (120) are below the poverty line.



Source: Farm Household Survey

Figure 4.3.3 Breakdown of the Average Farmers' Income on Different Sources

[4] Based on the result of Nepal Living Standard Survey III (2010/11) and applying the consumers' price index of NRB, the poverty line in 2012/13 is assumed to be Rs.22,473/capita/year.

- Employment and remittance are the main sources of non-agricultural income.
- The income from paddy sales by farmers operating less than 1 ha of land is very small, which is less than 20% of the agricultural income.
- The number of family members in a household are many, average is at 9.7 persons/household. For wider land holding, such as families with more than 2 ha of land, the number of family members is more than 12 persons/household, which may be one of the characteristics in Terai[5].

4.3.10 Cropping Pattern of Medium-level Farmers

There are substantial differences of rainfalls and ethnicity in the target districts, and some of the specific agriculture crops are being cultivated in different district, which are tea in Jhapa, jute in Morang and sugarcane in Dhanusa and Mahottari. However, there should not be not much difference for general agriculture such as cereals, fruits, livestock, vegetables, and so on. The JICA Survey Team considers that it is not necessary to plan separate agriculture plan in each district.

The JICA Survey Team assumed that medium-class farm households are farmers operating 1.0-2.0 ha of farm area, at an average of 1.37 ha. Around 20 farmers are available as shown in Table 4.3.16 above. Their average income is Rs254,009/household/year (Rs27,284/capita/year), while their average agricultural income is only Rs82,766/household/year (Rs8,996/capita/year). Although the average whole income per capita per year is above the poverty line, the agricultural income per capita per year is far below the poverty line, as one household is composed of 9.7 members.

Taking the average income of the agricultural commodities into consideration, typical cropping pattern and labor requirement were estimated as shown in Table 4.3.27

Table 4.3.27 Estimated Cropping Pattern and Labor Requirement of Medium Farmers

Crop	ha	Net Income (Rs.)	Cropping Schedule												Labor Requirement	
			1	2	3	4	5	6	7	8	9	10	11	12	Family	Hired
Paddy	**1.37**	35,234													77	97
Vegetable	-	6,313													3	8
Other Crop	-	14,885													42	25
Fruit	-	6,211													6	4
Livestock	-	19,873													60	0
Total	-	82,516												**Total**	**188**	**134**

Source: JICA Survey Team

The total household income and agricultural income from paddy sale is 13% and 43%, respectively. It is required to increase productivity in order to increase household income. However, even after the productivity be improved to 5.0 t/ha, the paddy income will not give substantial impact for the household income, as shown in Table 4.3.28.

[5] Similar phenomenon was reported in the report entitled "Rice escalation along value addition on paddy" June 2012, MOAD, ABP&MDD.

Table 4.3.28 Comparison of Paddy Income of a Medium Farmer

Description	Unit	Present yield	Improved	Increment
Land area	ha	1.37	1.37	0
Main Paddy yield	kg	3,391	5,000	1,609
Self Consumption	kg	1,537	1,537	0
Paddy sale	kg	1,854	3,463	0
Income	kg	35,234	65,812	30,578

Source: Prepared by JICA Survey Team based on Farm Household Survey

The increment of income by the increasing productivity of paddy is limited to Rs30,578/household/year. Therefore, it is necessary to diversify agricultural activities including livestock in addition to improving paddy farming.

Since agriculture is the most important industry in Nepal as 80% of households are depending on it, the agriculture sector should continuously be developed to feed majority of the Nepalese population. Although the remittance of immigrant workers has been helping poor farmers and the Nepali economy in general, agriculture is very important for Nepal taking into consideration family matters, environmental issues, land conservation, landscape aspect, and so on, and it is not realistic for all farmers will go for immigrant works.

4.3.11 Overview of Agriculture in the Target Areas

As discussed in the preceding sections, the overview of agriculture in the target districts is summarized as follows:

- The main crops in the target areas are cereals particularly paddy. The average income of cereals including paddy 46.4%, and if paddy alone is 36.7% of the agricultural income.
- Based on the survey, the average annual farmers' agricultural income of the 120 samples was Rs119,686, which is only 35% of the total average income. Farmers who operate more than 2.0 ha of farm land, get more than 60% of the annual income from agriculture, while farmers operating at less than 0.5 ha, 0.5–1.0 ha, and 1.0–2.0 ha, get an annual agriculture income at 13%, 26%, and 33%, respectively. Labor shortage due to migrant workers is an important issue. Mechanization has been expanding but it is recommended to introduce manual sowing machine, transplanting machine, and weeding machine to attend labor shortage and cost reduction of farming in addition to machinery use.
- Most of farmers in the area are self-dependent, and cooperative activities are limited, though there are some successful agricultural cooperatives operating. There is poor coordination among GON department as well as GON with NGOs, cooperatives and the private sector. Community contract with CBOs including WUA for on-farm development guided by experienced persons with GON officers will give farmers the opportunity to carry our cooperative works and create cohesive community.
- There are farmers who achieved a yield of 5 t/ha of paddy in the target areas. Therefore, there are good-skilled farmers available, who personally obtained such skills from officers and relevant others. Therefore, there is potential to improve the skills of other farmers, and support would be provided to them.

- New skills and seeds are now available, however, farmers as well as GON officers namely JT/JTA do not possess adequate and practical skills and knowledge due to lack of training and exposure to such skills, etc.
- There is a large potential for agricultural diversification as more than 50% of agricultural income came from other crops than cereals. Livestock, fruits, and vegetable cultivation are potential sources of income. Sugarcane in Mahottari and Dhanusha, jute in Morang and tea in Jhapa also have high potential and targets for agricultural diversification.
- It shall be confirmed if these potential agricultural products could materialize with improved technology and skills.

4.4 Irrigation, Water Management, and WUAs

4.4.1 Irrigation

(1) Climate and Rainfall

The Terai has a typical monsoon climate characterized by rainy season from May to October in the Eastern Development Region and from May to September in the Central Development Region and dry season in the respective regions in other months.

The average annual rainfall for the last 20 years, from 1992 to 2011, ranges from 1,029 mm in the Central Development Region to 2,587 mm in the Eastern Development Region. Accordingly, the trend is that there is more rainfall is in the Eastern Development Region than in the Central Development Region.

Rainfall is intensively concentrated during the rainy season and the amount of rainfall in the monsoon season constitutes more than 93% of the annual rainfall. The maximum, minimum, and average annual rainfalls for the last 20 years in the four districts are summarized in Table 4.4.1.

Table 4.4.1 Annual Rainfall in the Terai Plains

(Unit: mm)

No.	Description	Jhapa	Morang	Dhanusa	Mahottari	Kathmandu
		at Jhapa sta.	at Biratnagar sta.	at Janakapur sta.	at Jaleshwor sta.	
1	Max.	3,761	2,677	2,563	1,533	1,871
	Year	1998	1998	2007	1999	2002
2	Min.	1,697	1,300	862	462	1,093
	Year	2006	1994	1995	2010	1992
3	Ave.	2,587	1,861	1,485	1,029	1503

Source: Department of Hydrology and Metrology

(2) Water Sources for Irrigation

(i) Surface Water Source

There are large and medium rivers that originate from the mountain area, such as Kankai, Koshi, and Kamala rivers, while other small rivers originate from the Siwalik Range in the Terai plains of the Central and Eastern development regions.

Large and medium rivers have perennial water flow whereas other small rivers have perennial or seasonal water flow; however, there is little or no water flow at the end of the dry season.

The Koshi River is the largest river basin in Nepal with a total catchment area of 60,400 km^2, out of

which 46% or 27,863 km^2 lies in Nepal and the remaining in Tibet, China. The average discharge of the Koshi River is approximately 1,409 m^3/s, equivalent to around 45 billion m^3 per annum in Chatra. The river is the source of irrigation water for the Sunsari Morang Irrigation Project. River water is diverted to the free intake structure of the left river bank, and the diverted water discharge is always controlled by the intake gate. However, the intake discharge varies and is greatly influenced by the water level in the river, especially during the dry season when the water level decreases.

The Kankai River, a medium river in the Jhapa District, has a catchment area of 1,189 km^2 and an average discharge of about 49 m^3/s. It provides irrigation water to the Kankai Irrigation Project of about 7,000 ha throughout the year, with the provision of a diversion weir. The Kamala River, also one of the medium rivers, flows between Siraha and Dhanusha districts and provides irrigation water for the Kamala Irrigation Project in Dhanusa District covering an area of about 12,400 ha.

The small rivers are the source of medium- and small-scale irrigation projects. The present situation of water resources and major irrigation projects are summarized in Table 4.4.2 below.

Table 4.4.2 Water Sources for the Irrigation Projects in Four Districts

District	Average Annual Rainfall (mm)	Main River	Total Irrigable Area (ha)	Irrigated Area in 2007 (ha)
Jhapa	2,587	Kankai, Biring etc	109,530	70,593
Morang	1,861	Betauna Khola, Patheri, etc	99,959	65,702
Dhanusha	1,485	Bhaluwa, Astiwash, Whadhar, etc	72,925	32,357
Mahottari	1,029	Kantawa, Bighi, Daha, Banke, etc	60,633	27,172

Source: JICA Survey Team

(ii) Groundwater Source

The potential for groundwater in Terai has been recognized and many tube wells have been constructed under various projects. As discussed in the preceding Chapter2, the dynamic groundwater reserve available in Terai is 8,800 MCM and the present annual utilization of groundwater is 756 MCM for irrigation and 297 MCM for drinking purposes. Therefore, groundwater balance that is yet to be exploited is approximately 7,747 MCM.

It is not clarified whether substantial water for irrigation would be available in the groundwater resources in the four district areas. For example, a field of about 20,000 ha could be easily irrigated with 140 MCM of water, which is only 1.8% of the available groundwater in Terai.

At present, the land irrigated by groundwater resources are 20,134 ha in Jhapa, 2,245 ha in Morang, 14,232 ha in Dhanusa, and 8,927 ha in Mahottari, as shown in Table 4.4.3 below.

Table 4.4.3 Groundwater Resources for Irrigation in the Four District Areas

District	Total (ha)	Total Irrigated (ha)	Surface Irrigation (ha)	Tube well Irrigation (ha)
Jhapa	109,530	109,530	70,593	21,034
Morang	102,938	99,959	65,702	22,425
Dhanusha	72,925	72,925	32,357	14,232
Mahottari	60,649	60,633	27,172	8,927

Source: Database, 2007[6]

[6] Database 2007 (Development of Database for Irrigation Development in Nepal 2007) prepared by Division of Planning, Design and Monitoring and Evaluation, DOI. The database was prepared by local consultants with assistance of Agriculture Development Bank, Nepal (ADBN), Care Nepal, GTZ Nepal and SNV Nepal. Periodical update of the database was

(3) Human Resources and Budget of IDDOs in the Four District Areas

(i) Human Resources of Concerned IDDOs

There are three IDDOs providing irrigation services in the four district areas, namely, Jhapa/Illam, Sunsariy/Morang, and Mahottari/Dhanusa. Each IDDO covers different irrigation services in two district areas. The typical human resources in one IDDO is one senior divisional engineer, eight to ten engineers, two to four sub-engineers, and two account officers, as shown in Table 4.4.4.

Table 4.4.4 Human Resources of the Three IDDOs

Position	IDDO Jhapa/Illam	IDDO Sunsary/Morang	IDDO Mahottari/Dhanusa
Senior Divisional Engineer	1	1	1
Engineer	8	10	8
Sub Engineer	2	4	2
Account Officer/Accountant	1+1	1+1	1+1
Administration/Support Staff	15	14	12

Source: IDDO and DOI

(ii) Financial Situation of Concerned IDDOs

The programs in the fields are planned, budgeted, and implemented after approval (if the tender amount does not exceed Rs10 million or Rs30 million) through IDDOs located in the districts. The IDDOs are headed by the senior divisional engineer (SDE) and under him are engineers, sub-engineers, and association organizers, the numbers of which depend on the requirements of the project A separate section for finance and administration is established in each district to assist the SDE.

The overall budget flow trend at the three division offices are given in Table 4.4.5 below. The administrative budget is around 10% of the development budget. However, the majority of the fund flow at the district is still from donor-assisted programs such as the Community Managed Irrigated Agriculture Sector Project (CMIASP).

Table 4.4.5 Annual Budget of IDDOs (Unit Rs1,000)

Area	Programs	2009/10	2010/11	2011/12
Jhapa - Illam	CMIASP	26,545	29,289	29,590
	AMIS	5,000	17,500	41,362
	NITP	2,650	2,440	3,315
	MIP	54350	47,721	72,525
	TOTAL	88,545	96,950	146,792
Morang- Sunsari	CMIASP	19,930	33,014	45,130
	AMIS	3,200	1,550	1,600
	NITP	1,350	1,900	1,600
	MIP	38,500	29,908	30,400
	TOTAL	62,980	66,372	78,730
Dhanusha- Mahottari	CMIASP	91,325	55,326	78,924
	AMIS	800	500	1085
	NITP	375	3075	3610
	MIP	43,000	54,750	118,253
	TOTAL	135,500	113,651	201,872

Source: DOI

suspended after 2007. At present, the concerned parties are discussing further activities to update the database in the preparatory survey on the extension of implementation of Irrigation and Water Management Project (IWRMP) as (Technical Assistance of the WB).

(4) Exiting Irrigation Projects and Irrigation Areas

There are around 168 surface irrigation projects consisting of two major projects, five large-scale projects, and 161 medium-scale projects, and 175 deep tube wells in the four district areas, as well as groundwater irrigation system projects consisting of 175 deep tube wells and 25,175 shallow tube wells which have been widely developed in the four district areas. The complete list is shown in Table 4.4.6 below.

Table 4.4.6 Existing Irrigation Projects in the Four Districts

No	Irrigation System Category	Jhapa	Morang	Dhanusha	Mahottari	Total
1	Major	Kankai-1	Sunsari- Morang-1	Kamala-West	UHPI-Rato IP	2
2	Large	-	Lohandra / Letang	-	Bighi-2, Upi, Rato	5
3	Medium	47	64	26	24	161
4	Small Scheme / Tube wells	NA	NA	NA	NA	
5	Deep Tube wells	17	11	80	67	175
6	Shallow Tube Wells	8,215	8,187	4,563	4,210	25,175

Source; Database, 2007; IDDOs

The small irrigation system covering an irrigation area of less than 200 ha is roughly estimated at 9,058 ha based on the information of IDDO and DADO. Small irrigation projects are managed by FGs/WUA; however, definite information on the small projects are not well clarified yet.

The irrigated areas covered by these different schemes are summarized in Table 4.4.7.

Table 4.4.7 Irrigation Areas of the Existing Irrigation Projects

No.	Irrigation System Category	Jhapa (ha)	Morang (ha)	Dhanusha (ha)	Mahottari (ha)
1	Major	7,000	34,000	12,400	-
2	Large	-	4,012	-	10,000
3	Medium	16,517	19,082	13,560	8,895
4	Small (estimated)	48,230	9,049	7,104	9,058
5	Tube well	21,034	22,425	4,232	8,927
	Total	92,781	88,568	37,296	36,880

Source; Data base, 2007; IDDOs and estimated small irrigation schemes

(i) Major-scale Irrigation Projects

There are two major irrigation projects, namely, Kankai Irrigation System Project along the Kankai River in Jhapa District and Kamala West Irrigation Project along the Kamala River in Jhapa and Dhanusa districts.

Water is diverted from the river through the headwork using sluice gates and delivered to the fields through the main canal, branch canals, and tertiary canals with series of water control structures such as head regulators, cross regulators, and drops. Water is released into the tertiary canals through the proportional or gated weir structures, then from tertiary to the fields through tertiary level outlets (about five to seven in number). The smallest tertiary block in Kankai is designed for 30 ha.

The tertiary canals in Kamala were not fully constructed, so water enters the field from small farmer-made ditches or from field to field.

(ii) Large-scale Irrigation Projects

Large-scale irrigation projects generally consist of concrete weirs in the river, main canals with adequate water control structures, and branch canals with minor water control structures.

Branch canals with controlled head regulators deliver water to the tertiary canals. However, the tertiary and field canals in majority of the projects were not constructed in a planned way.

(iii) Medium-scale Irrigation Projects

Medium-scale irrigation projects are mostly farmer-managed irrigation systems (FMIS), originally constructed and managed by the community farmers themselves.

The medium-scale irrigation projects were rehabilitated and improved under the International Land Coalition (ILC), Nepal Irrigation Sector Project (NISP) of WB, Irrigation Sector Project (ISP), and Second Irrigation Sector Project (SISP) of the Asian Development Bank (ADB). Most of the rehabilitated medium-scale irrigation projects in the four districts have concrete weirs in the river, 3-4 km of main canal, and 3-4 km of branch canals. However, in some cases, free intakes (side intakes on one bank of the river) are constructed, or even temporary boulder dams are constructed to divert the water from the river.

In rehabilitation projects the major works involved are the rehabilitation and repair of the main and secondary canals including structures such as diversion structures, check gates, drops, footbridges, and additional provisions for the check gate structures of the main canal. However, improvements of the tertiary canals, division boxes, and field channels are not done at all. Farmers divert water from branch outlets to field channels that were constructed by FGs.

The tertiary canals and field channels have to be properly sectioned to convey bigger water discharge to match the irrigation water demand following farm management, but existing canals do not have the capacity. Smaller canal capacity results to flooding and waterlogged conditions in the paddy fields. Furthermore, farmers cut the tertiary bunds or banks to divert water to the paddy fields.

Such cut banks are then filled with soil removed from previously cut banks. These phenomena done by the farming communities at the tertiary level result in heavy water losses due to breaches and leakages.

(iv) Small-scale Irrigation Projects

The irrigation projects below 200 ha that fall under this category are constructed and managed by the farmers themselves.

No concrete structures are provided in these types of canals. Water from the river is diverted with temporary builders or brush diversions and delivered to farmers with their own norms and rules.

(5) Irrigation Methods

In major- and large-scale irrigation projects, water is systematically delivered to the fields within the farm block through tertiary canals. However, many tertiary canals are poorly maintained and are not functioning well. Also, field channels are not constructed. Hence, a “plot to plot” irrigation method is mostly being carried out in the irrigation areas for paddy and wheat cultivation. Heavy water losses from the irrigation projects in the four districts are reported (from the farmers).

From 2002 to 2006, a research study on water losses was executed in the Pancha Kanya Irrigation Project under the Strengthened Actions for Governance in Utilization of Natural Resources (SAGUN) by DOI with assistance from the United States Agency for International Development (USAID). It was

reported that water losses were estimated at 49% of the discharge available in branch outlets excluding application losses.

(6) Issues and Problems of the Irrigation System and Facilities, Maintenance, and Water Management

Many issues and problems on irrigation system and facilities, maintenance, and water management were discussed in Chapter 3 and in this chapter, as summarized in Table 4.4.8.

Table 4.4.8 Issues and Problems of the Irrigation System and Facilities, Maintenance, and Water Management

Description	Problems	Causes
Main Irrigation System	Improper quantification and untimely water distribution to tertiary irrigation blocks	Passive coordination activities on water management among the WUAs and government agencies
		No regular activities done by government agencies with WUAs after construction or rehabilitation works
	Flooding from main and branch canals or inundation problems in paddy fields along the main and branch canals during the summer season	No establishment of water distribution and control mechanism from intake to main and secondary canals during the summer season
		No strategy on drainage development for large- and medium-scale irrigation systems from GON
	Improper maintenance works of intake and main canal systems	Monitoring system on the main irrigation system is not regularly done
		Budget for maintenance works is provided by project base
	Difficulty of year-round irrigation	Lack of water sources during winter and spring seasons
		No integrated water use with other irrigation areas in the same basin
	Low participatory of WUAs on rehabilitation works	Weak dissemination of project implementation to WUAs
On-farm Irrigation System	Lack of on-farm irrigation facilities	Lack of on-farm irrigation facilities in large- and medium-scale irrigation systems
		No fixed course of tertiary canal in medium-scale irrigation system
	Lack of tertiary canals and field channels	Lack of on-farm irrigation system

Source: JICA Survey Team

4.4.2 WUA and Water Management

(1) Registered WUA and Command Area

For legalization, WUAs have to register or renew in the IDDO or authorized irrigation project with the required registration or renewal documents. The irrigation division office simply registered WUAs without adequate social mobilization approaches. As a result, users are not aware or not interested in the functions of the WUAs. They renew the registrations of WUAs to get support from the irrigation office. All the committee members are not aware of their roles and responsibilities. They are working mostly on regulating water supply. The command area covered by the irrigation systems in the four districts and the number of registered WUAs are given in Table 4.4.9 below.

Table 4.4.9 Command Area and Registered WUAs in Four Districts

District	Irrigation Projects (No.)	Command Area (Ha)	Registered WUA	Federation of WUA
Jhapa	86	109,530	77	1
Morang	101	99,959	42	1
Dhanusha	68	72,925	38	1
Mahottari	30	60,633	19	1
Total	285	343,074	176	4

Source: JICA Survey Team, 2013 based on DOI data

(2) Situation of WUA's Activities in the Surface Water Irrigation Project

(i) Organizational Situation of WUA

The organizational situation of the 17 sample survey irrigation systems of Jhapa, Morang, Dhanusha, and Mahottari districts are given in SP-C-4.

It shows that the female representatives in the main committee of Bigihi, Panchain, Cheru Maisthan, Hardinath, Dudhumati. Ke. Bho. Le. Na, Bhuwa chisang, and Lower Kisini Khola irrigation systems are less than the required representative of 33%. Representatives from Dalits, the downtrodden and backward ethnic group, are not clear. The main and branch committees are involved in water distribution and irrigation service fee (ISF) collection. The number of members in the main committee vary from 9 to 25. The chairman, vice-chairman, secretary, treasurer, and members are the major posts of WUA's main and branch committees. The main and branch committees are mostly involved in water distribution and ISF collection activities.

(ii) Coordination with Stakeholders

The main stakeholder organizations who work with the WUA committees are the IDDO, DADO, Water Induced Hazard Division Office (WIHDO), DDC, VDC, INGOs, NGOs, and cooperatives. Generally, the WUA Main Committee coordinates with these organizations as per needs of their committees. The stakeholder organizations support the WUA committees technically and financially to promote their activities based on the needs and requirements of each WUA committee. Organizations are essential to sustain the WUA committee's coordination with stakeholders.

The following present conditions and coordination problems on the activities of WUA among relevant government agencies were observed:

- Passive coordination activities among WUA and concerned government agencies; and
- Concerned government agencies do not have any regular activities for WUA especially after construction works, but they occasionally provide coordination activities as shown in Table 4.4.10.

Table 4.4.10 Coordination Activities of WUA among Relevant Government Agencies

Government Agencies	Regular Activities for WUA	Occasional Coordination Activities
IDDO	No	Provide budget for maintenance ICWMP and CMIASP
DADO	No	Support for commodity-wise FGs WUA can apply for small-scale irrigation scheme ICWMP and CMIASP
DDC	No	WUA can apply for agriculture sector budget (15% of district development budget)

Source: Field Survey, 2013

The WUA committee is active or functioning in all irrigation projects except in Jallad WUA. It was dissolved only recently because of internal conflict. However, the irrigation situation in the Jallad irrigation system is almost the same as that of other surveyed irrigation systems during winter and spring seasons. Women's representation is nearly one forth on most of the committees; however, it is lesser in Hardinath and Ke. Bho. Le. Na WUA. Executive committee meetings are not organized

regularly in most of the irrigation projects, but only when required. Committee meetings are generally organized once or twice a year, mostly for making decisions related to water management and mobilization of labor for repair and maintenance of the canal systems.

(iii) Management Activities of the Main and Branch Committees Influenced by the Scale of Command Area

The regular management activities of the main and branch canal committees are construction management, water management, ISF collection and management, canal maintenance, resource management, institutional development management, and office management. In addition, the main and branch committees have to manage the activities as per needs of the beneficiary farmers and when conflict arises in the canal systems.

The IDDO provides technical and financial support to the WUA Main Committee for the conduct of activities to be carried out by the committee. To conduct these activities there should be cash or labor contribution from the beneficiary farmers. The WUA have to play a vital role for resource mobilization.

Furthermore, the IDDO and WUA jointly monitor these ongoing activities. When the conflict between the farmers arises due to insufficient water distribution or stealing of water by cutting the banks of the canal systems, the WUA members generally manage such types of conflicts by themselves.

(iv) Mechanism for the Preparation of the Irrigation Water Distribution Plan

In the surveyed irrigation systems of the four districts the preparation of water distribution plan there is not practiced by the WUA members themselves. The IDDO and project offices assist them to prepare the irrigation water distribution plan. At present, water distribution is operated within limited users on the basis of the farmers' interests. The WUA does not have the integrated crop cultivation plan in each irrigation blocks, such as the secondary and tertiary irrigation blocks. Therefore, in most cases, the gate operator and the main and branch committees manage water distribution at the field level based on the requests of farmers or on their experiences on situations concerning crop plantation.

The water distribution system and mechanism is not surely established during summer. Water is abundant in the summer season, even flooding from the canals. There is no mechanism to control and regulate water supply. Water flows freely in the main and branch canals during the summer season, and farmers irrigate crops individually as per their requirements. These activities often resulted to flooding from canals or inundation at paddy fields due to the absence of a systematic drainage.

Water control or regulation structures are poorly developed. Likewise, field canals are inadequately developed. Plot to plot irrigation is carried out in the summer. Water is scarce during winter and spring seasons, especially for wheat and early paddy. Moreover, water is distributed on rotational basis throughout winter and spring.

The committees distribute water to the branch canals on rotational basis, which vary from two to seven days per crop season. Water is distributed at least twice, first after three to five weeks of planting wheat and second after eight to ten weeks of planting. Farmers adjoining the main canals pump water directly to irrigate crops. The committees are not enforcing any rule to discourage such practices. The committees distribute water to branch canals on rotational basis and specific time periods or days

are allocated for each branch canal. Branch committees/main committees look after the distribution in crop fields. Water is distributed based on the land area from head to tail, and temporary water courses are constructed to supply water. A specific duration (in hours) is also allocated for each crop. Time starts once it reaches the crop fields.

SP-C-5 mainly highlighted the situation of water management, cultivation plan, and water management plan of the irrigation systems of the districts of Jhapa, Morang, Dhanusha, and Mahottari in Nepal.

There are no systematic canal operations in most of the canal systems except in Bhuwa chisang where no WUA committees are involved in the preparation of a cultivation plan. Water distribution plans are mainly prepared by the WUA main committee and approved by the general assembly in Pachain and Cheru Maisthan in Mahottari District, Dhanuji Bandh IP in Dhanisha District, and Bhuwa Chisang in Morang District. The main and branch committee members of Hardinath (west) IP of Dhanusha and Ke. Bho. Le. Na. in Morang District are involved in the preparation of the water distribution plan.

(v) Mechanism of the ISF Collection

The committee that determines the ISF rate is led by IDDO or the project chief at each district to follow the irrigation policy of 2003.

The members of the committee are representatives from IDDO, DADO, chairman of the WUA Main Committee, and members of the National Federation of Irrigation Water Users Association (NFIWUAN). The committee that determines the ISF rate is chaired by the IDDO chief. The ISF rate is finalized depending on the expenditures of the WUA committee on office management, operation and maintenance (O&M) of the canal systems, and institutional development activities. The ISF rate is basically paid in cash per ha per crop season; however, actual payment of ISF varies because sometimes it is paid in-kind and on yearly basis, depending on the situation of the WUA, as shown in SP-C-6.

The branch, tertiary, and outlet committees also support them in the collection of data in determining the ISF rate. The determined rate should be passed in the Generally Assembly meeting of the WUA committee.

The WUA through ISF has created income for operaion and maintenance (O&M) works of the irrigation systems, especially the on-farm irrigation system, but is also dependent on external agencies while their internal resources mobilization through ISF is less. The ISF collection is very limited and not sufficient for repair and maintenance works. The committee is highly dependent on external agencies for repair and maintenance, whereas WUA contribution is very minimal.

The WUA main committee prepared by-laws to collect ISF. Branch, tertiary, and outlet committee members assist the main committee in collecting the ISF in the irrigation system with the preparation of a farmers list for each branch and tertiary, receipts, and ISF collection cards. In some cases, the WUA committee also hired staff for ISF collection.

(vi) Sharing of ISF Collected from WUA Members

The WUA Main Committee has to manage the collected ISF and needs to make arrangements for the

sharing of the collected ISF based on the rules and regulations of the irrigation policy in 2003 to sustain the O&M budget.

The sharing rate between GON, DOI, and WUA varies according to the canal operation systems as shown in Table 4.4.11. The canal system of most projects in the four districts is Case 4: "All the canals below the main canal are managed by WUA and other canals are managed by GON", as shown in Table 4.4.11. In this system, WUA have to pay 10% of the total amount of the collected ISF to GON and 10% to DOI. The remaining 80% of collected ISF can be used by WUA for office management, O&M works, and other essential works to be required in the canal systems.

Table 4.4.11 Arrangement in Sharing of Collected ISF from Users

Level of Participation in the Operation System	Sharing of Irrigation Service Charges Collected from Users (in %)		
	Central Maintenance Fund, DOI	National Treasury of GON	To be retained by the WUA
1.Water course and there under operated by the users association and above the water course managed by GON	40	40	20
2.Tertiary and there under operated by the users association and above than tertiary managed by GON	30	30	40
3.Secondary canal and there under operated by the users association and above than secondary canal managed by GON	20	20	60
4. All the canals lower than the main canal managed by the users association and other canals managed by GON	10	10	80
5. All the structures including main canal other than head works managed by the users association.	5	5	90
6. In case of complete transfer of the project	0	5	95

Source: Irrigation Policy, 2003

The status of the ISF collection mechanism at irrigation systems in the sample survey area such as ISF, ISF collectors, ISF collection ratio, and payment of ISF to GON are shown in SP-C-6.

The ISF collection trend in most of the irrigation projects is very poor. The main, branch, and tertiary committee members are involved in the ISF collection. Sometimes the WUA committee uses gate operators and hires staff for ISF collection.

(vii) Low Tariff and ISF Collection Rate

The following present conditions and problems on the ISF collection of WUAs were observed:

(a) Low collection rate of ISF for summer season paddy and passive payment orders on fines by WUA

As shown in SP-C-6, only seven out of the 15 WUAs (around 53%) did not collect ISF for summer season paddy because members of the said WUAs think that the water in the paddy fields is rainfall water and not irrigation water since the irrigation projects were not functioning well.

On the other hand, the other three WUAs, which implement strict rules, said that they would stop water distribution to members if they violate or do not pay the ISF on time. Moreover, it was found out that the collection rate of ISF for summer season paddy is nearly 100%.

The majority of WUAs were not able to collect ISF as they have envisioned. They will issue payment orders on fines to WUA violators because of social pressure in the society.

(b) Unmatched ISF tariff and shortfall in monitoring the collection mechanism of ISF

The unified rate of ISF for all users may cause the refusal of ISF payment. Most WUAs collect ISF once a year regardless of water usage and the ISF rate is the same for everyone although a few farmers get water during winter and spring seasons only. Therefore, others felt that it is unfair to pay the same amount of ISF with those who get water more than once.

The ISF is the main financial source of all the irrigation systems. The collection rate of ISF at sample survey area varies from Rs150 to Rs2,950 per ha per year depending on the canal system. The ISF rate that ranges from Rs150 to Rs300 per ha per year is low and should be revised. The ISF rate could not meet the annual expenditure requirements of WUA for office management and O&M cost of the canal systems.

(viii) Maintenance Situation under FMIS and agency-managed irrigation systems (AMIS)

In the case of the 15 sample survey projects in the four districts, two management systems exist, i.e. FMIS and jointly managed irrigation system (JMIS). In the case of the FMIS project described in Section 3.3.3, WUAs provide maintenance budget by collection of ISF from members of WUA. Moreover, it maintains all irrigation facilities from the main and branch canals on a cost sharing basis and maintain on-farm irrigation facilities with their own budget.

However, in JMIS, the responsibility of O&M works is shared between IDDO for the O&M works of headworks, intake and main canals and WUA for O&M works of branch canals and on-farm irrigation systems.

In the case of JMIS, WUA have to contribute in cash or in-kind 10% of the total amount of maintenance works to maintain the branch canals.

Maintenance works are mostly and regularly carried out by WUA with the participation of WUA member; however, bigger maintenance works such as rehabilitation works of intake structures and main canal systems are undertaken by GON.

Sharing of maintenance works are broadly divided as shown below.

(a) Regular maintenance works carried out by WUA

- Shaping of the canal section such as clearing of the canal; and
- Small repair works of canal lining and minor structures.

(b) Maintenance works carried out by GON on contract basis (from bidding process to awarding of works to the contractor)

- Rehabilitation of intake structure;
- Rehabilitation of structures; and
- Canal lining.

In the sample survey on the 15 projects, the unsatisfactory and insufficient maintenance of irrigation

facilities, especially on-farm irrigation facilities were found out. The shortfall on maintenance budget, poor participation of the WUA member, and the absence of periodic technical and financial services for maintenance by government agencies greatly affect the maintenance works of irrigation facilities, as shown in SP-C-7.

In addition, severe conditions in the rehabilitation of irrigation facilities in the main system could be one of the reasons that would affect the proper implementation of big maintenance works such as for intake structures and main and branch canals.

SP-C-7 shows the involvement of WUAs in maintenance works, source of maintenance budget, maintenance cost, and participation of WUA in maintenance works under the management of FMIS and JMIS.

As a result of the 15 sample projects, the maintenance activities of the WUAs are mostly focusing on the maintenance of earthen canals excluding main canals, followed by maintenance of main canals and other structures. The participation of WUAs in canal cleaning is 53%.

Only 27% of the canal systems have implemented penalty rules. The IDD, VDC, DADO, and DDC are the main sources of maintenance budget for canal maintenance works.

(IX) Financial Balance of WUA and Cost Allocation for O&M Works

The following present conditions and problems on financial management were observed:

(a) Poor financial management of O&M works

Proper information on financial management are not available to WUAs, as shown inSP-C-8.

(b) Unclear Operation Cost

The WUAs intend to strengthen ISF collection and add gate operators or other staff to collect ISF.

On the other hand, the operators are given authority by DOI for water distribution. Their salaries are paid with the collected ISF. In this connection, operators or other staff of WUA collects more amount of ISF than what the main committee or branch committee does. Then, practically the financial balance of ISF is not clear.

(c) Cost over-run of O&M Cost

Irrigation rules in 2003 stipulate the establishment of a separate fund for the O&M works of irrigation facilities and deposit at least 10% of the total amount of ISF income in the funds. The WUAs have to pay 10% of the total amount of ISF to GON as per income tax. In most cases of WUAs, the O&M costs are cost overruns as compared to the total income of the WUA, such as ISF income, and are carried over. Moreover, WUAs also depend on government support for maintenance works.

SP-C-8 shows the financial balance of WUA and the proportion of O&M cost. This table represents the different sources of income and expenditure of WUAs. It also visualizes the proportion of O&M cost. The proportion of O&M cost depends on other official costs of WUAs. If the office management cost is high then the proportion of O&M cost is reduced. The proportion of operation cost varies from 3.5% to 48.2%. Similarly, the proportion of maintenance cost varies from 18.6% to 79.8%.

(3) Issues and Problems on On-farm Water Management and WUA

Many issues and problems on water management and WUA discussed in this chapter are summarized in Table 4.4.12.

Table 4.4.12 Issues and Problems on On-farm Water Management and WUA

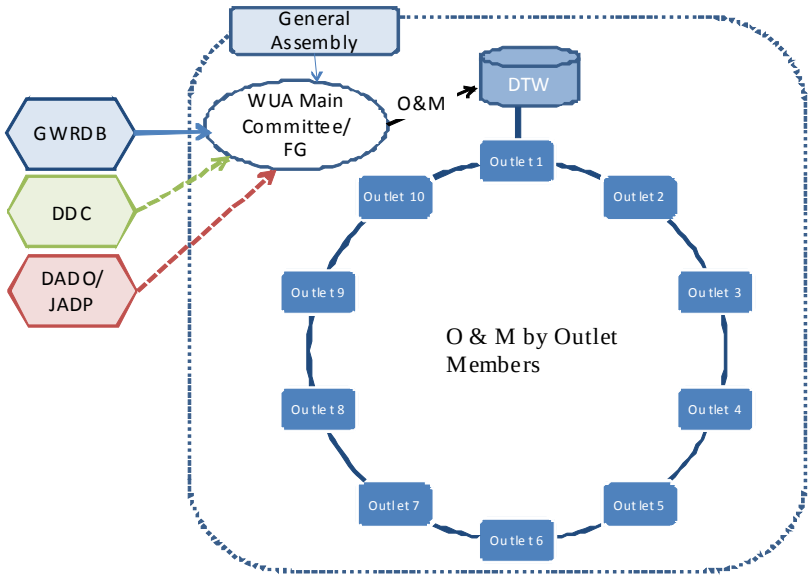
On-farm Water Management	Flooding from main and branch canals or inundation problems in paddy fields during summer season	No coordination on water distribution and control from intake to main and secondary canals during summer season among IDDO and WUAs
	No water distribution plan	No crop cultivation plan
WUA	Less awareness or no interest on the functions of WUAs	No adequate mobilization approaches of IDDO on registration and renewal of documents
		Lack of ownership of WUA on irrigation facilities at on-farm level
	Difficulties of proper water management and communication	Shortage or lack of technical support of DTT and IDDO
	No matching tariff of ISF	Shortfall of monitoring for collection mechanism of ISF
	Cost overrun of operation and maintenance cost	Low tariff of ISF
	Low collection rate of ISF	No legal background on fine to violators of WUA
	Unsatisfactory and insufficient maintenance works	Poor participation of WUA members
		No periodic technical and financial services for maintenance works from IDDO
	Unclear operational cost	Salary of operators and members of WUA in charge of ISF collection is paid using collected ISF and the operator and members of WUA carried out the ISF collection in a self-serving manner

Source: JICA Survey Team

(6) Situation of WUA's Activities in Groundwater Irrigation Projects

(i) Organizational Situation of WUA

The organization of WUAs in groundwater irrigation systems – deep tube well (DTW) is shown in Figure 4.4.1.



Source: JICA Survey Team

Figure 4.4.1 Organization of WUA in Deep Tube Well Irrigation Systems

Figure 4.4.1 clearly explains the interlinkage between Ground Water Resource Development Board (GWRDB), DDC, DADO/Janakpur Agriculture Development Project (JADP), General Assembly, WUA Main Committee, and beneficiary farmers of outlets. The WUA Main Committee prepares the annual budget plan containing office expenditures and O&M costs. The prepared annual budget plan should be approved by the general assembly. The WUA also collects pump operation cost from beneficiary farmers on the basis of pump operation time. The GWRDB provides direct technical support to the WUA Main Committee. The DDC and DADO/JADP also provides indirect technical and financial support to the WUA Main Committee. The salient features of the 12 groundwater irrigation systems of the four districts are given in SP-C-9.

The number of executive committee members in groundwater irrigation systems varies from 7-18. In these committee members the number of women members varies from 11% to 39%. Binihi of Dhanusha and Pragati Krisak Samuha of Morang meet only 33% of the female membership requirements. The female members in the executive committee of Morang and Dhanush districts are higher compared to Jhapa and Mahottari districts. The executive committee is functional in DTW; however, they are either inactive or less active. Committee meetings are organized only when required and there is no regular organization of meetings. Majority of the committee members participate in meetings, mainly to take decisions related to the repair and maintenance of pumps when required. The general assembly is not organized, hence users are less aware. Likewise, executive committees are also inactive or less active and committee meetings are too irregular. The executive committee meetings of shallow tube well (STW) groups are not organized as well and almost dysfunctional. Villagers even forget the committee members. The situation of the committee and pump operation activities in groundwater irrigation projects (DTW) is shown in Table 4.4.13 below.

Table 4.4.13 Situation of the Committee and Pump Operation Activities in Groundwater Irrigation Projects

No.	District	Name of the System	Committee Member				Gate Operator (Head)	Activities of the Committee	Actual Pump Operation in the Fields
			Male	Female	Total	% of Female			
1	Jhapa	Prithivinagar Maheshpur	9	2	11	18%	1	less active	
2	Jhapa	Suryodaya	0	0	0	0	1	not functioning	Individual pump operation
	Subtotal		09	02	11	18%	2		
3	Morang	Sundar Samuhik Krisak	9	2	11	18%	1	less active	
4	Morang	Indrapur	8	3	11	27%	1	active	
5	Morang	Sansari Mai	0	0	0	0	0	not functioning	Individual pump operation
6	Morang	Pragatisil Krisak Samuha	11	7	18	39%	0	active	Individual pump operation
7	Morang	Gyandhara	0	0	0	0	0	not functioning	Individual pump operation
	Subtotal		28	12	40	84%	02		
8	Dhanusha	Naktajhij	8	1	9	11%	1	active	
9	Dhanusha	Binihi	4	3	7	43%	0	inactive	Individual pump operation
10	Dhanusha	Bateswor 7	5	2	7	29%	1	NA	
	Subtotal		17	06	23	83%	02		
11	Mahottari	Shiva Parbati	9	2	11	18%	1	less active	
12	Mahottari	Sanakishan	0	0	0	0	0	not functioning	Individual pump operation
	Total		09	02	11	18	01		

Source: JICA Survey Team

(ii) Mechanism to Prepare an Irrigation Water Distribution Plan and Field Situation

There is no existing mechanism to prepare an irrigation water distribution plan in the groundwater irrigation systems of four districts. The STW users have privately owned pumps and flexible prices so that they can use STWs whenever they want. Although DTW users need to use communal facilities, they get water on a first-come first basis without a water distribution plan. Water is abundant but it is very difficult to fulfill the demands of all users. Farmers only place their demand for water when there are no other alternatives available for irrigation. As a result, demand is very high. However, irregular supply of electricity together with voltage fluctuations creates problems to fulfill the demand of all farmers. Farmers had to sit on long queues to get water for irrigation.

The situation of irrigated areas, irrigation facilities, and water management in groundwater irrigation projects are given in SP-C-10 The table in the annex shows the irrigation and irrigated areas of all DTW and STW systems in the four districts. In most of the tube well areas the irrigated area is equal to the actual irrigation area. The table also shows the pumps used by tube wells and their discharge capacity. The cropping pattern along with water distribution methods is also highlighted.

(iii) Tariff and ISF Collection Rate

Users are collecting ISF based on electricity consumption. The cost is very high despite government's subsidy on tariff for electricity supplied for irrigation. The amount is just adequate to pay electricity bills and operator expenses. Users cannot afford for large-scale O&M. They often look for external support when expenses are to be made. The ISF needs to cover the electricity charge of Rs3.66 per unit with 50% subsidy for agricultural use, operator's salary, and O&M cost. Most WUAs of DTWs set the rate of ISF per unit because it is easy to calculate and also to justify. In average it cost 40 units per hour for DTW irrigation systems. The average rate of groundwater irrigation project is more than Rs3,000. Majority of ISF rate per ha/year is approximately Rs2,000, but still more than three times as that of surface irrigation projects. The average ISF of surface irrigation projects is around Rs600 per ha/year. Consequently, the farmers of groundwater irrigation systems use irrigated water for emergency only and do not use its full capacity. The situation of ISF collection in the groundwater irrigation systems of the four districts is given in SP-C-11

(iv) Situation of Maintenance Works

Deep tube wells expenses are mostly for electricity bills followed by operator fees. Very few have contributed for repair and maintenance and are confined only among those who received support from external agencies. Maintenance works of the 12 groundwater irrigation projects are summarized as follows:

(a) Regular maintenance works carried out by WUA

Most of WUAs do not conduct maintenance works like those for surface irrigation systems which are required regularly. Only the Pragatisil Krisak Samuha in Morang District has a regular maintenance plan as a group to clean up the canals twice a year, in December and June, just after each paddy season. It is because they are active as a FG that is supported by the agricultural service center nearby. Usually users repair and maintain canals to avoid water leakages when they use the facilities. Some WUAs of DTWs use ISF for minor maintenance but in most cases it is difficult to collect additional funds for

major maintenance works.

(b) Maintenance works carried out by government agencies

Since the systems are smaller and simpler than surface irrigation systems, government agencies believe that users can maintain the system by themselves. Only JADP has a regular program on rehabilitation of tube wells and DTW monitoring. They visit the DTW sites once a year to check the condition of supported DTWs, and compile inventory list with its condition. They also have a program to replace old machines with suitable ones for the current situation. For example, Bateswor's seven WUAs have not fully used DTW until JADP recently replaced the generator with an electric system because the fuel consumption of the generator was costly. The GWRDB has a small budget for maintenance at around Rs100,000 per year. They select the sites based on information and recommendations from AOs and engineers.

As mentioned above, government agencies do not have regular maintenance budget for groundwater irrigation systems except for JADP and GWRDB.

The situation of maintenance works at the 12 groundwater irrigation systems of the four districts are presented in SP-C-12. Major sources of the maintenance cost of the canal systems managed by WUAs are ISF and additional funds collected from users. Users involved in the correction of water leakage works and for the major maintenance of pump sets and canal systems required external sources for maintenance. The GWRDB, JADP, DDC, and VDC are external line agencies which support WUAs for the maintenance works of groundwater irrigation systems. The level of participation in the collection of maintenance funds in most of the groundwater systems of the four districts is satisfactory.

(v) Financial Balance of WUA and Cost Allocation for O&M Works

Irrigation fee remains the main source of income for the entire studied DTW irrigation projects. None of the STWs have generated income. The WUA is making expenditures on operator's fee, electricity, repair and maintenance, and operational expenses. None of the STWs has a group related to income and expenses. The DTWs are using expenses mostly to pay electricity bills followed by operator's fee. Very few have contributed for repair and maintenance and that too are confined among those who received support from external agencies. Most of the DTW WUA have little savings from operations and are mostly kept for repair and maintenance of pumps when required. Financial management is very poor and this is mainly because accounting books are not maintained properly. The limited external resource mobilization and ISF is just sufficient to pay electricity charges and operator expenses. The financial balance of WUA and proportion of O&M cost in groundwater irrigation projects (DTW) are shown in SP-C-13

4.5 Marketing of Agricultural Products

4.5.1 Present Situation of Domestic Markets

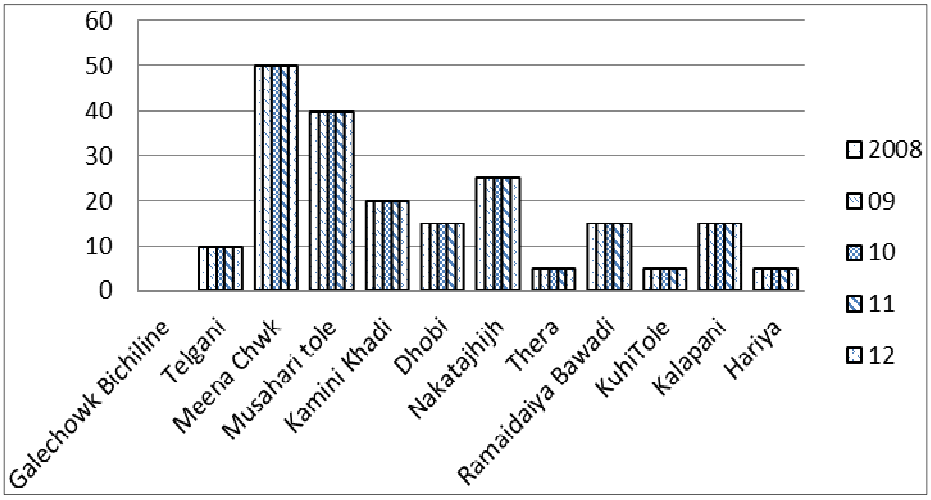
(1) Market System of Paddy

(i) Ratio of Sale to Production

According to the sample survey on agriculture distribution and marketing, the proportions of main rice

and early rice[7] sales have not changed in recent 5 years in all the survey areas and it widely depends on the village. As Figure 4.5.1 indicates, 50% of main rice produced is sold in Meena Chowk village, while none of the rice is sold in Galechowk Bichiline village. Both of the said villages are in Jhapa District.

Farmers in the survey areas asserted that there have been no major improvements in the agricultural facilities, especially for irrigation that would increase production and productivity of paddy.



Source: Sample Survey on Agriculture Distribution and Marketing by JICA Survey Team

Figure 4.5.1 Proportion of Sale for Main Rice in the Target Districts

(ii) Distribution System of Paddy

(a) Small collectors

Small collectors are popularly known as *kantawal*, operating their business in villages. They are also collectors or commission agents of big traders. Around 10 to 12 small collectors are operating at village/production pockets and operating mostly in seasons. They have a weighing machine together with limited storage capacity of nearly one to two rooms. Their storage and purchasing capacity is around 5 to 10 t per month. They sell paddy immediately or store it for about a month. Most of these small collectors buy paddy on cash basis, as farmers generally do not prefer to sell it on credit. Normally, small farmers are the main suppliers of small collectors.

(b) Collectors

The big collectors are operating at the village level. Nearly two to three collectors are operating at the village level with storage capacities that varies from 100 to 200 t. They generally buy paddy after harvest and wait for price hike, from which they can make profit. They also provide loans to farmers for the purchase of production inputs such as seeds and fertilizers with less interest rate. They generally buy paddy on cash and/or credit, taking around seven days for payment. These collectors have contracts with big traders or mill owners to sell their products. Traders also provide loan to collectors to purchase paddy.

[7]Main rice is cultivated in rainy (Monsoon) season in the Terai area, while early rice is harvested before rainy season.

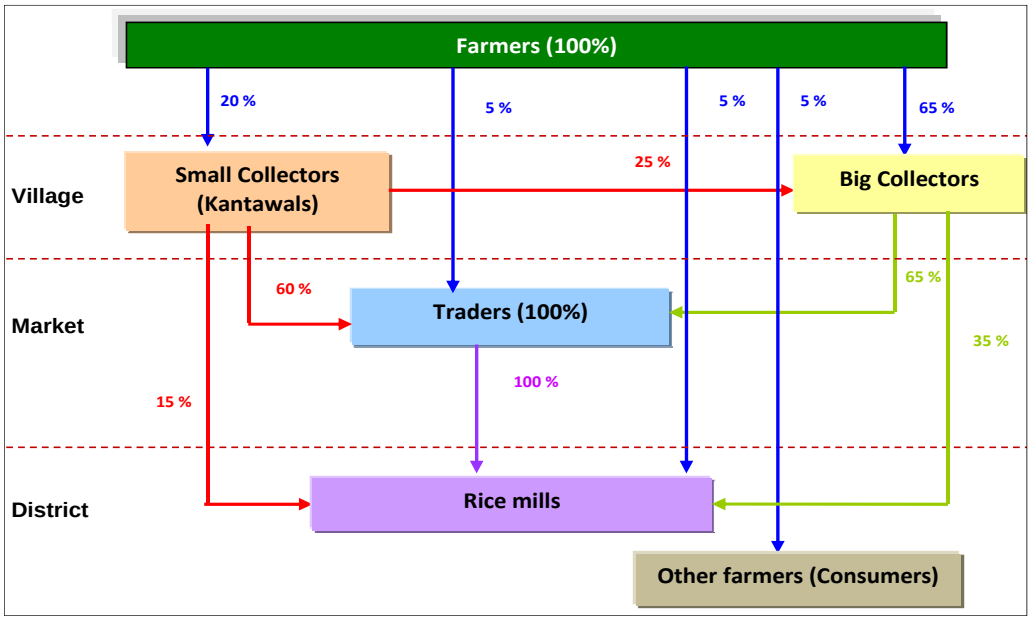
(c) Traders

Traders are operating at the market center with stocks of paddy waiting for the price hike. They directly purchase from collectors or employ their commission agents at the village level. Traders also provide loans to collectors to purchase and maintain stocks of paddy. Likewise, they have connections with big rice mills that also sells paddy.

(d) Mill owners (Factories)

Mill owners and factories operate at the center of the district or market. They generally purchase paddy, do milling, and packaging. The rice is then sold to consumers through their commission agents. While mill owners also purchase paddy directly from traders and collectors, farmers have less access to sell products due to high demand. Thus, farmers with small lands cannot fulfill their demand.

According to the Farmer Household Survey, farmers sell 49% of the total produced paddy in the market on average while 51% is for self-consumption. The marketable paddies are sold by farmers to buyers. Farmers in the survey area sell paddy to collectors, traders, and rice mills. Figure 4.5.2 presents the marketing flow of paddy. The trading of paddy takes place in three levels. First is at the village level, where small and big collectors operate. Second is at the market level, where traders operate, and third at the district level where mills operate. Collectors purchase paddy in a small scale and then packs them up to sell to traders, who generally operate at the main roads or major market centers. These traders sell paddy to rice mills. Very few farmers also sell paddy to rice mills and consumers directly. For the mill owners, however, it is more preferable to buy paddy directly from farmers, since inappropriate management of storage spaces by collectors/traders often deteriorates the quality of paddy[8]. It should be a significant benefit to farmers if they could bring their paddy directly to the mills without selling it to collectors who determine the paddy price which is always favorable to them, not to farmers.



Source: Sample Survey on Agriculture Distribution and Marketing by JICA Survey Team

Figure 4.5.2 Distribution System of Paddy in the Surveyed Districts

[8] Interview with the mill manager in Morang District

The following marketing chains of paddy are observed in the survey area:

- Farmers - Big collectors - Traders - Rice mills
- Farmers - Small collectors - Big collectors - Traders - Rice mills
- Farmers - Traders - Rice mills
- Farmers - Rice mills
- Farmers - Other farmers (consumers)

Among the five types of marketing chains above, the first two are quite common in all the target districts. Farmers generally prefer to sell paddy to big collectors operating at the village level because they get loans from collectors to purchase seeds and chemical fertilizers.

(iii) Distribution of Paddy from Production Pockets to Mills in the Target Districts

Table 4.5.1 below presents the major production pockets of paddy along with traders and big rice mills operating in each district.

Table 4.5.1 Production Pockets/Collection Centers, Traders, and Rice Mills in the Target Districts

District	Production Pockets/ Collection Centers	Traders (Main Road)	Rice Mills (Factory)
Jhapa	Budhabare, Shivgunj, Damak, Chandragadhi, Garamani, Anarmani, Surunga, Topgacchi, Sanischare, Gauradaha, Maharanijhoda, Juropani	Birtamod, Damak, Budhabare, Garamani, Gaurigunj	Khanar (Sunsari), Gaurigunj, Damak, Birtamod
Morang	Belbari, Kaseni, Aamgachhi, Tankisinuwari, Bahuni, Bayarban	Pathari, Rangeli, Dainiya, Karsiya, Biratnagar, Tankisinuwari, Urlabari	Biratnagar, Urlabari, Khanar (Sunsari), Duhabi (Sunsari)
Dhanusa	Sapahi, Baniniya, Ramdaiya Gopalpur, Thera, Kachuri, La Bagewa, Mauhahi, Barmajhiya, Raghunath pur, Thilla Bhatiyan, Sabaila, Makantaha, Paterwa, Khariyani, Yedukoha, Gothkoyalpur and Chora Koyalpur	Mahendranagar, Jaleswor, Pipra	Mahendranagar (Dhanusa), Janakpur
Mahottari	Ratauli, Bhramapura, Ekaraiya, Sahorwa, Banauli, Dharampur, Singhyahi, Pipara, Dami Madai, Bhangaha, Sripur, Ankar, Nainhi, Balwa, Loharpatti, Sahasaula	Jaleswar, Ramgopalpur, Pipara, Gausala, Bardibas, Aurahi	Mahendranagar (Dhanusa), Janakpur

Source: Sample Survey on Agriculture Distribution and Marketing by JICA Survey Team


Collection Center of Paddy in Jhapa

The locations of production pockets tend to be relatively concentrated in each district in the southern part of Mahottari and Morang districts, or in the central part of Dhanusa. Many of the pockets/collection centers and traders are located in the neighboring area, while some traders are seen near the district borders especially in Morang and Jhapa. In the case of Mahottari and Dhanusa, the paddy produced in various production pockets is assumed to be transported to Mahendranagar and Janakapur for milling via several spots, where traders handle the paddy from farmers to the mills. Paddy traders generally do not operate in open markets, but instead, they are located outside market places and operate through their commission agents or traders.

(iv) Selection of Buyers

In each rice production area, nearly about two to three buyers (collectors) are operating and farmers actually have certain choices to select buyers. Likewise, each buyer's price varies between 5 to 10 paisa per kg to attract more farmers. Though price is the important criteria for selecting buyers, farmers generally prefer the collectors whom they trust or who are have been in business for a long time. Timely payment or immediate cash payment is also one of the criteria for the selection of buyers. Farmers prefer not to sell products to new traders because they have less confidence or trust in them.

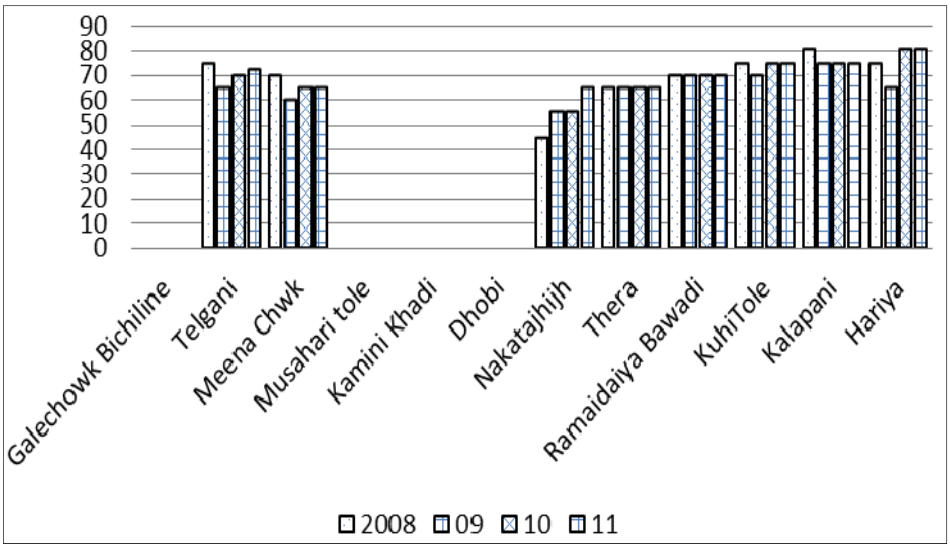
Farmers generally select those traders/collectors who provide them credit for the purchase of production inputs at low interest rates. Collectors generally charge interest rates from 24% to 36% per year on loan. Farmers immediately sell their paddy after harvest to pay back their loan to traders.

(2) Market System of Vegetables

(i) Introduction

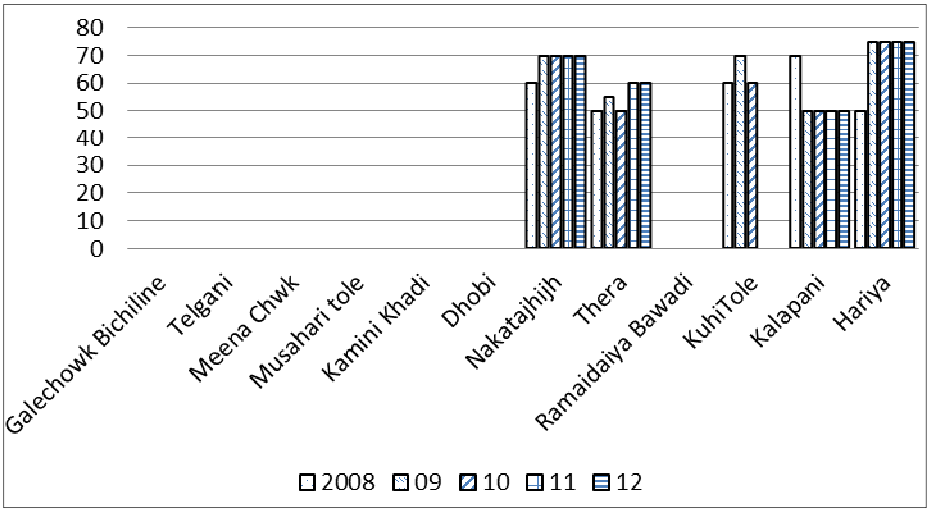
Vegetables are produced in a small scale mostly for cash income. Very few farmers are growing commercially in the survey area. Major vegetables grown in the survey area are tomatoes, cucurbits, lady's finger, cabbage, and cauliflower.

The sample survey on agricultural distribution and marketing revealed a clear difference among the villages in the sale of vegetables as indicated in Figure 4.5.3 and Figure 4.5.4. Among the villages where vegetables are produced for sale, the proportion is increasing except for winter vegetables in the villages of KhhiTole and Kalapani in Mahottari District.



Source: Sample Survey on Agriculture Distribution and Marketing by JICA Survey Team

Figure 4.5.3 Proportion of Summer Vegetables for Sale in the Target Districts



Source: Sample Survey on Agriculture Distribution and Marketing by JICA Survey Team

Figure 4.5.4 Proportion of Winter Vegetable for Sale in the Target Districts

(ii) Types of Market

Farmers bring products to local weekly markets and sell them to consumers. The government has developed marketing centers/facilities at few strategic locations for retailing and wholesaling of vegetables. Vegetables generally come from nearby areas and adjoining districts. A few commodities also come from India which depends on the location of the market. Most of the vegetables are consumed within the district while very few go outside district.

The following types of market are operational in the target districts:

(a) Local Weekly Markets

As part of the rural Nepalese culture for a long time, a local weekly market is very common on a particular day of the week at a designated place in a village[9]. Commodities are mostly collected by individual farmers who bring their produce for sell. The buyers may be another farmer, a local resident of the village, a local retailer who will purchase that day to sell locally on other days or a petty trader. Traders also collect products in the market and sell them to other large markets.

Local Weekly Market in Bardibas, Mahottari

(b) Collection Centers

Collection centers are usually situated on the side of rural roads or highways, where local retailers, petty traders, and agents of large main market wholesalers hang out. They bargain with local farmers for the products available in the season. Cash is used most of the time, but goods may be given on credit to regular traders. Retailers use this place to purchase smaller quantities for sale in nearby markets. Traders and agents dispatch goods in the main markets. The market area is occupied each day only for a short duration. The regularity of the market is guided by the harvest season. The Bardibas market in Mahottari is an example of a collection center. Collection centers may be organized or not in terms of its management.

Collection Center in Bardibas, Mahottari

(c) Transit Markets

Transit markets play an important role in the supply of food, vegetables, and fruits to remote districts. These markets import and forward products to other areas in the hills and mountains. Most transit markets are strategically located on arterial main roads. Transit markets exchange various commodities. However, designated areas are not regulated by the government and are spontaneously established and recognized by the citizens. Moreover, it is like a commercial town across the road. The Dhalkebar market in Dhanusa District is also known as a transit market.

Transit Market in Dhalkebar, Dhanusa

[9] It is usually located in the village square or on both sides of the road/pathway leading to the village.

(d) Wholesale Markets

Wholesale markets are exclusively located in large towns and cities like Kathmandu and Birtamod. These markets are more organized and have permanent structures like sheds, storage spaces, and roads. The volume of transaction is substantial and products are dispatched to other towns of Nepal or across the border to India. The central government, local municipality, and private sector support the establishment of wholesale markets. Rates of products in the markets are decided by the traders which are mostly dependent on the mechanisms of supply and demand. Large individual producers and FGs have direct access to these markets. Small producers are usually not entertained here. The wholesale merchants sell in bulk to retailers and suppliers in towns such as Kathmandu and Pokhara.

Wholesale Market in Birtamod, Jhapa

(e) Retail Markets

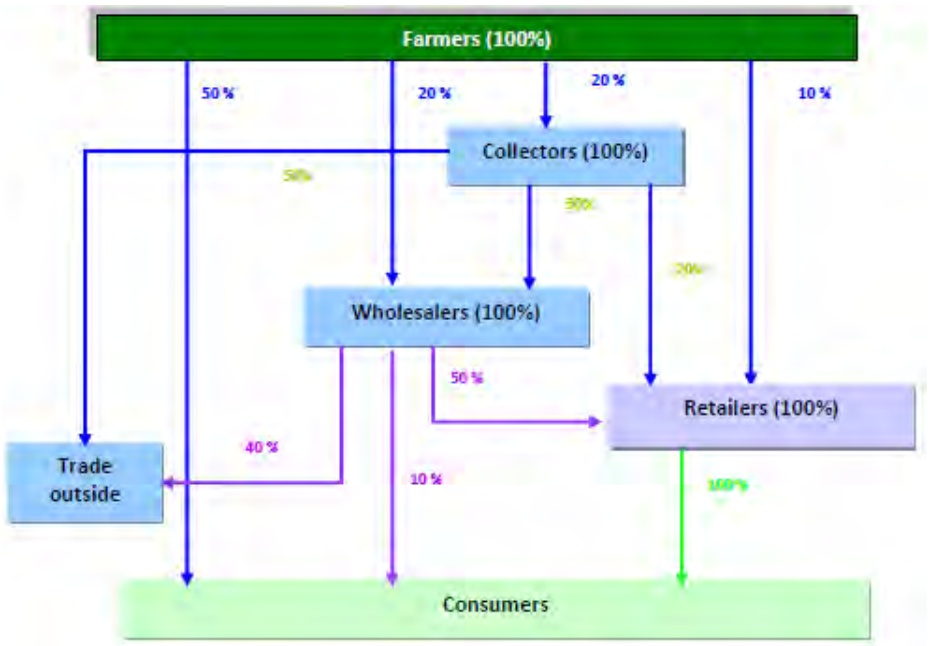
Retail markets are situated in municipal areas. They are usually close to the wholesale market and at times in the same vicinity. However, a town may have a number of retail outlets in a single city. Retail markets serve the local consumers. The products are acquired from local wholesalers, but at times, retailers are known to procure goods directly from farmers/producers at a cheaper price. The farmers are normally from the immediate vicinity of the town. These markets usually have permanent sheds for which retailers pay rent to the local municipality.

Retail Market in Dhanusa

As shown in SP-F-2, the collection centers, wholesale and retail markets are located at junctions of highways and/or at the nearby border to India.

(iii) Distribution System of Vegetables

Farmers generally sell vegetables directly at local markets, particularly at local weekly markets. They bring their products in small baskets (around 20 kg) and sell them to consumers directly. Collectors generally operate at the roads or village level, purchase vegetables from farmers, and sell them to wholesalers or retailers within and outside the districts. The involvement of collectors is quite visible in the case of tomatoes and potatoes. Wholesalers operate at the major market center of each district. They purchase directly from farmers and sell to retailers. Figure 4.5.5 presents a marketing channel for the sale of vegetables. Value addition and processing of vegetables are not existent at present.



Source: Sample Survey on Agriculture Distribution and Marketing by JICA Survey Team

Figure 4.5.5 Marketing Channel of Vegetables

As described in Figure 4.5.5, trading of vegetables takes place in three levels, first is at the village level, where collectors operate, second at the wholesale level or at the district level market center such as Dhalkebar, Birtamod, and Bardibas markets. Third is outside the district level, where big traders or retailers exist such as Kalimati, Pokhara and Narayanghat markets.

Collectors purchase vegetables and then trade them outside the districts or sell to wholesalers. Wholesalers, who generally operate at major market centers, sell products to retailers or traders located outside the districts, especially in Kathmandu, Pokhara, and Narayanghat markets. Very few farmers sell products directly to traders, as such practice is not common. The use of cooperatives is virtually non-existent in all the survey areas.

The distribution system of vegetables in Terai is completely different from that in the hills. This is mainly because of the scale of production, availability of local markets, accessibility, and organization of farmers. In the hills, farmers are organized into groups and cooperatives. Cooperatives facilitate sales of products and locally demanded products are sold while production is high.

In the Terai plains, production of vegetables is less and scattered. Farmers generally cultivate vegetables in small areas to generate additional income for households. Local markets are widely developed and vegetables are sold although scale of production is very small.

The following six market chains are observed in the target districts:

- Farmers - Consumers
- Farmers - Wholesalers - Retailers - Consumers
- Farmers - Collectors - Wholesalers - Retailers - Consumers
- Farmers - Retailers - Consumers
- Farmers - Collectors - Wholesalers - Traders (outside the district)
- Farmers - Collectors - Traders (outside the district)

Among the above six types of market chains, farmers-consumers and famers-wholesaler-retailers-consumers are the most common type in all the survey areas. Farmers generally sell vegetables to consumers directly because of the small volume of products. The last two channels are the most common for tomatoes and potatoes.

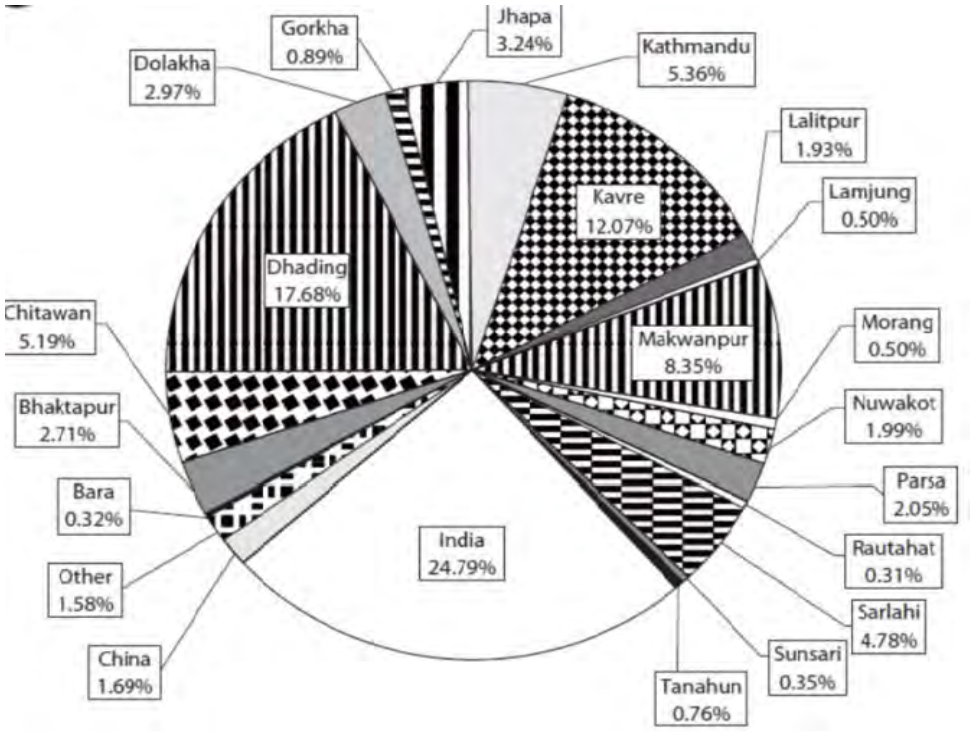
(iv) Selection of Buyers

Farmers generally operate small stalls at each market facility center during market day. They sell products directly to consumers and retailers in nearby markets. However, few farmers directly sell products in bulk quantities to retailers and wholesalers. They contact traders/collectors operating at the market centers and sell their products. Farmers have a selection of traders operating in each market.

(v) Vegetable Distribution from the Target Districts to Kathmandu

Kathmandu is the largest consumption area of agricultural products. The Kalimati Fruits and Vegetables Market in Kathmandu is the largest market in Nepal, with daily arrival that ranges from 600 to 650 t of commodities valued at Rs15 million to Rs20 million per day. The total arrival was 235,092 t in 2012/13, and as shown in Figure 4.5.6, India is the largest origin of commodities at 24.7% (58,067.72 t), Jhapa District at 3.24% (7,616.98 t), and Morang District at 0.5% (1,175.46 t) .

Kalimati Market in Kathmandu



Source: Kalimati Fruits and Vegetables Market Development Board (May 2013)

Figure 4.5.6 Product Origins and the Proportion of Jhapa and Morang in the Kalimati Market in 2012/2013

Major commodities that arrived from India, Jhapa, and Morang are listed in Table 4.5.2 below. This figure represents the market demand of Kathmandu, and the large potential left for Jhapa and Morang as supply area instead of India.

Table 4.5.2 Major Commodities and Volume Supplied from India, Jhapa, and Morang to Kalimati Market in Kathmandu in 2012/2013

(Unit: t)

	India		Jhapa		Morang	
	Commodities	**Volume**	**Commodities**	**Volume**	**Commodities**	**Volume**
1	Onion	20,188	Potato	4,037	Pointed Gourd	485
2	Potato	18,703	Tomato	464	Okra	84
3	Watermelon	4,237	Chili	426	Bitter Gourd	64
4	Lime	1,789	Bitter Gourd	414	Jackfruit	53
5	Mango	1,566	Cucumber	426	Potato	44
6			Onion	21	Mango	11

Source: Yearly Report 2012 of Kalimati Fruits and Vegetable Market, partially translated from Nepalese into English by JICA Survey Team

(3) Price Issues

(i) Determination of Paddy Price

Most of the farmers, especially small farmers, sell their paddy to collectors immediately after harvest due to the urgent need for cash and also, due to lack of storage facilities. Although the price can be determined by both buyers and farmers, collectors/buyers actually set the price of paddy in most cases. Even large farmers have lesser roles in setting the price of paddy. Traders/mill owners set the price of paddy based on production and availability in the market. Guided by these, collectors set prices at the village level, which is slightly lower than the traders' price (about Rs1/kg).

Farmers have less influence in setting the price, which is mainly because of the low price of paddy flowing in from India. Big collectors know the price of India's paddy flowing into Nepal, since 50% of the paddy they handle comes from India. Furthermore, according to the farmers, the price of Indian paddy across the border is 20-25% lower compared to that in Nepal. Nepalese farmers cannot compete with the price of paddy from India mainly because of the availability of cheap production inputs such as seeds and fertilizers with subsidies from the Government of India (GOI). In a situation further compounded by porous border that allows illegal inflow of agricultural products, prices are dictated by what prevails in the Indian market[10].

In addition, famers cross-check or enquire price of nearby collectors/traders prior to the sale of paddy. They can bargain on price only if price varies significantly. Apart from this, they have a chance to choose the collectors who give higher price.

The following five methods were observed in setting the price:

- Prevailing market price;
- Negotiation between buyers and sellers;
- Quality and size;

[10] Source: Final Report on the Review of Food Production and Agriculture in Nepal Toward Formulation of JICA's Support Strategy: Food Security Support (March 2012)

- Marketing cost and profit margin; and
- Price agreement before harvest.

Of the five methods mentioned, the prevailing market price was the main criterion used in setting prices by most of the buyers followed by the negotiation between buyers and sellers. The quality and size, marketing cost, and profit margin are not considered when determining prices.

The bargaining power of buyers and sellers often depends on the storage capacity, and a rice mill usually has larger storage. The storage capacity of the big collectors is around 40-50 t, whereas small collectors do not have such storage capacity. The price range negotiated between farmers and small/big collectors tends to be minimal that is Rs0.5 to Rs1/kg.

The price of paddy varies from season to season. Price is less during the time of harvest (season) while it increases during the summer season (off-season). Large-scale farmers generally sell paddy during the summer season while small farmers sell immediately after harvest.

Table 4.5.3 below presents season and off-season prices of paddy among different market agents. The price of paddy varies by variety as well.

Price is generally determined by the mill owner. The price then spreads to traders, collectors, and farmers. Table 4.5.3 below indicates that the profit margin of collectors, traders, and mill owners vary from Rs1 to Rs2/kg after meeting all their marketing expenditures. Traders and collectors generally hold or store products to increase their profit by buying paddy at a low price and selling them when the price is high.

Table 4.5.3 Purchase Price of Paddy in the Survey Area (Rs/kg)

District	Collectors		Traders		Mill Owners	
	Season	Off-season	Season	Off-season	Season	Off-season
Jhapa	16-20	20-24	20-22	22-26	22-24	26-28
Morang	16-20	20-24	20-22	22-26	22-24	26-28
Dhanusa	16-20	20-24	20-22	20-25	22-24	24-26
Mahottari	16-20	20-24	20-22	22-26	22-24	24-26

Source: Farm Household Survey by JICA Survey Team

(ii) Price Information on Paddy

Farmers get price information from 1) buyers (collectors), 2) personal communication with traders/mill owners of local market centers, and/or 3) mass media (radio or television). For farmers, personal communication with buyers and traders/mill owners of local market centers are the most important source of price information. Very few farmers have access to price information through mass media, such as radio or television. Farmers generally do not listen to price information provided through mass media mostly because such information does not match with the market price obtained by farmers from big collectors. Farmers tend to believe that the latest market price can be obtained from big collectors who own large storage (who can control the price) and know much about the most recent price.

(iii) Difference of Farm Gate Price, Retail Price, and Wholesale Price of Paddy

According to the DOA survey in 2011/2012, there was not much difference in farm gate prices among paddy varieties in the target districts, as listed in Table 4.5.4.

Table 4.5.4 Farm Gate Price of Paddy in the Target Districts in 2011/2012

District	Variety	Quantity(kg)	Price(Rs/kg)	Value(Rs)
Jhapa	Chaite-2	4,065.00	15.35	62,397.75
	Randha 12	4,083.00	15.35	62,674.05
Morang	Chaite-4	3,984.00	15.30	60,955.20
Dhanusha	Jaya	3,807.00	15.15	57,676.05

Source: Cost of Production and Marketing Margin of Cereal, Cash, Vegetable & Spices Crops, Nepal (2011/2012), MOA&C, DOA, Agribusiness Promotion & Marketing Development Directorate, Marketing Research & Statistics Management Program, 2012

According to the results of the sample survey, the average farm gate price in the target districts increased in 2012/2013 at Rs18.9 except for the farmers who own less than 0.5 ha of land. Even though the proportion for sale out of the total produced paddy is quite small, these farmers' farm gate prices decreased from the average prices in 2011/12.

Table 4.5.5 Farm Gate Prices in the Target Districts (2012/2013)

Land Area	Hhld Having Paddy Cultivation	Total Paddy Cultivation Area (ha)	Total Paddy Production (kg)	Hhld Sold Paddy	Sold Qty. (kg)	Sold Amount	Farm Price (Sold Amout/ Sold Qty)
Less than 0.5 ha	38	14.95	48,930	8	5,480	80,855	14.8
0.5 to 1 ha	39	30.24	91,040	17	21,360	414,200	19.4
1 to 2 ha	20	29.60	100,110	19	39,812	704,680	17.7
2 to 5 ha	12	34.44	117,280	12	77,840	1,503,140	19.3
Above 5 ha	10	57.84	188,550	10	135,050	2,568,800	19.0
Total	119	167.07	545,910	66	279,542	5,271,675	18.9

Source: Farm Household Survey by JICA Survey Team

The wholesale prices of paddy in Jhapa and Morang and the retail prices of coarse rice in the target districts in 2010/2011 are shown in Table 4.5.6 and Table 4.5.7 below. Generally, while the price increases from wholesale to retail from Rs.4 to Rs.9 in a year, it is peculiar that the retail price of rice in Dhanusa District is very close to the wholesale price in Jhapa and Morang, and is even below the wholesale price in Marga (Nov/Dec).

Table 4.5.6 Monthly Wholesale Price of Rice (Coarse) in 2010/2011

(Unit: Rs)

District	Baisak	Jestha	Ashad	Sharawan	Bhadra	Aswin	Kartik	Marga	Poush	Magh	Falgun	Chaitra	Average
	April/May	May/Jun	Jun/Jul	Jul/Aug	Aug/Sep	Sep/Oct	Oct/Nov	Nov/Dec	Dec/Jan	Jan/Feb	Feb/Mar	Mar/Apr	
Jhapa	24.00	24.00	26.00	26.00	28.00	28.00	28.00	26.00	28.00	31.00	28.00	28.00	27.08
Morang	26.00	26.90	30.00	32.25	31.60	32.22	31.00	31.00	31.00	26.95	26.75	29.00	29.53

Source: Agricultural Marketing Information Bulletin (Special Issue-2011), ABP&MDD, DOA, 2011

Table 4.5.7 Monthly Average Retail Prices of Rice (Coarse) in the Target Districts in 2010/2011

(Unit: Rs)

District	Baisak	Jestha	Ashad	Sharawan	Bhadra	Aswin	Kartik	Marga	Poush	Magh	Falgun	Chaitra	Average
	April/May	May/Jun	Jun/Jul	Jul/Aug	Aug/Sep	Sep/Oct	Oct/Nov	Nov/Dec	Dec/Jan	Jan/Feb	Feb/Mar	Mar/Apr	
Jhapa	27.50	28.00	32.00	32.50	30.50	31.00	30.00	30.00	30.00	33.00	30.50	30.00	30.42
Morang	28.00	28.00	31.00	33.40	32.25	34.00	33.50	33.00	32.60	31.00	31.00	31.00	31.56
Dhanusa	25.80	25.90	26.30	26.30	33.50	37.00	33.50	25.50	29.00	33.50	35.00	35.00	30.67
Mahottari	28.00	29.00	na	na	na	na	35.00	35.00	35.00	35.00	35.00	na	32.63

Source: Cost of Production & Marketing Margin of Cereal, Cash, Vegetable & Spices Crops, Nepal 82011/12), MOA&C, ABP&MD, Marketing Research & Statistics Management Program, 2012

Table 4.5.8 Monthly Average Retail Prices of Rice (Fine/Basmati) in the Target Districts in 2010/2011

(Unit: Rs)

District	Baisak	Jestha	Ashad	Sharawan	Bhadra	Aswin	Kartik	Marga	Poush	Magh	Falgun	Chaitra	Average
	April/May	May/Jun	Jun/Jul	Jul/Aug	Aug/Sep	Sep/Oct	Oct/Nov	Nov/Dec	Dec/Jan	Jan/Feb	Feb/Mar	Mar/Apr	
Jhapa	70.00	72.50	70.00	77.50	82.00	85.00	85.00	75.00	65.00	65.00	70.00	70.00	73.96
Morang	65.00	65.00	65.60	66.80	65.14	63.34	70.72	70.00	76.00	72.00	71.00	65.00	67.92
Dhanusa	66.60	67.30	68.10	70.00	71.00	70.00	67.50	65.00	60.00	60.00	60.00	60.00	65.46
Mahottari	65.00	65.00	65.00				70.00	70.00	70.00	70.00	70.00	70.00	68.13

Source: Agricultural Marketing Information Bulletin (Special Issue-2011), ABP&MDD, DOA, 2011

Another aspect is found when comparing the average retail price at the national level and the target districts in Nepal. By comparison of the retail prices of coarse rice and fine (basmati) rice between the national average and that of the target districts, the price of coarse rice in the target districts is lower than the average price in Nepal. Whereas, the price of fine rice in target districts is higher than that of the national average.

Table 4.5.9 Average Retail Price of Rice in Nepal in 2010/11

Level of Rice	Value (Rs/kg)
Coarse Rice	34.93
Medium	43.72
Fine/Basmati	65.28

Source: National Annual Average Retail Price of Agriculture Commodities, 2011/12

(iv) Comparison between the Retail Price of Indian and Nepalese Rice/Paddy

There are numerous variable factors needed to compare the price of Indian and Nepalese rice such as year, season, location of market, and variety of rice.

The wholesale prices of basmati rice in Jhapa and Morang in Nepal and West Bengal in India are listed in Table 4.5.10. The traders' observation that the price of Nepalese rice is 20% to 25% higher than that of India's as well as the farmers' recognition toward the problems in price can be assumed as a reflection of the difference of the price of basmati rice in areas near the border.

Table 4.5.10 Wholesale Price of Basmati Rice in Jhapa, Morang, and West Bengal in 2010

Market	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**	**Oct**	**Nov**	**Dec**
Jhapa	65	67	67	65	70	70	70	75	75	75	70	75
Morang	70	69	66	60	65	54	67	62	60	68	68	74
W.Bengal	40	38	38	41	42	42	43	43	46	44	42	41

Source for Jhapa and Morang: Agricultural Marketing Information Bulletin (Special Issue-2011), ABP&MDD, DOA, 2011
For West Bengal: Agrmarknet (Exchange rate: 1 Indian Rs.≒ 1.6 Nepalese Rs in August 2013, calculated by JICA Survey Team)

(v) Price Determination for Vegetables

Most farmers, especially small farmers, sell their surplus vegetables to consumers due to lack of storage facilities and for cash. Prices can be determined by buyers, farmers, and/or both. The prices of vegetables are generally set by buyers, especially in case of purchasing in large quantities. Farmers have control only over the price of small quantities. The following four methods were observed for setting the price in the survey area:

- Prevailing market price;
- Negotiation between buyer and sellers;
- Quality, size, and quantity of products; and
- Marketing cost and profit margin.

Of the four methods mentioned above, the prevailing market price was used by most of the buyers in setting prices, followed by negotiation between buyers and sellers. Quality, size, and quantity are observed in the survey area as the third important criterion for setting the price. Marketing cost and profit margin are not considered in determining prices.

(vi) Price Information on Vegetables

Farmers get price information from 1) buyers (collectors), 2) personal communication in local market centers, and/or mass media (radio, television). The same as the case of rice, buyers and personal communication are the most important sources of price information. Very few farmers have access to price information through mass media, such as radio or television.

Wholesalers and collectors decide on the prices of vegetables based on the day-to-day volume of production. Vegetable is a seasonal product and a large volume of it is imported from India. Consequently, the vegetable market is not regarded as a commercial-based industry at present.

(vii) Policy Support and Influential Factors for Pricing

Prices of Nepalese agricultural commodities are much higher than those of the Indians thus weakening their competitiveness. Although the concept of the minimum support price (MSP) was introduced in Nepal in November 2012 to adjust the prices of agricultural products in comparison with Indian prices, the delay in its endorsement is one of the many causes that makes the prices of Nepalese commodities high. Although MOAD has received the recommended MSP[11] from Agri Market Research and Statistics Management Program AMRSMP under Agribusiness Promotion &Marketing Development Directorate (ABP&MDD) it is not endorsed yet due to the unpredictable prices and volumes of crops.

The Price Committee of the National Food Corporation (NFC) has set the district-wise paddy/rice price in 36 NFC branch offices in each district, not being able to apply the MSP. The NFC recognizes that the Indian price is much lower than the Nepalese rice price due to subsidies of GOI to agricultural inputs such as fertilizers, pesticides, and electricity. The NFC concerns that if they set their price the same as that of the Indians without subsidies from GON, the farmers could go bankrupt immediately.

For both paddy and vegetables, the prevailing market prices are set by the large traders/wholesalers in a particular market day. The traders generally consider the supply situation of the products and fix their prices. Depending on the flow of products in the market, traders increase or decrease prices, whereas sellers have less control over price. It generally appears in big markets, such as Dhalkebar in Dhanusa District and markets in Jhapa. In areas wherein a large number of agricultural products are imported from India and Bangladesh, the prices of these original countries affect traders when they fix the price. Also, the price in Kalimati market in Kathmandu is assumed to influence traders in Jhapa

[11] The MSP recommended for November to December 2013 is Rs.2,000/100 kg of paddy, which is equivalent to India's MSP.

and Morang where a certain portion of vegetables from these districts is handled in the market.

It also has to be noted that power balance of grain traders may differ from that of vegetable traders. In the case of grain, traders store grain in their storage for a long time which enables them to control the price. On the other hand, traders who deal with perishable vegetables need to sell it within a certain period of time, which enables farmers to negotiate the price.

Farmers have limited bargaining power. According to results of the Farm Household Survey, farmers asserted that the main person who decides on the price of crop is the trader/middleman (81.1%). Since the trader/middleman searches for the best price based on the mill's price, ultimately, price is fixed by the mills and farmers have less control over it.

Grain traders collect the latest market price through mobile phones and choose the right timing to buy grain at the lowest price. Most of the farmers, on the other hand, do not have any other option but to sell their products to nearby traders.

(viii) Reasons of Unfavorable Price Setting for Farmers

(a) Timing of Production Sales

As a whole, 66% of farmers sell their products when cash is needed, 24.5% sell their products immediately after harvest, and only 9.4% take into consideration the market price when they sell. It is also observed that larger farmers with an operation above 5 ha (20%) consider price when they sell products, while small farmers with less than 0.5 ha operation (6.7%) sell their products immediately after harvest.

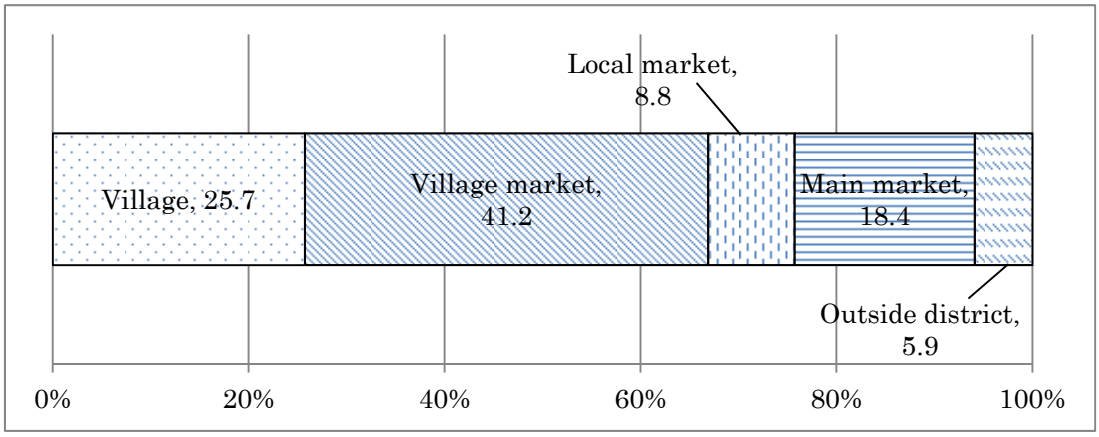
(b) Bargaining Power of Farmers

Around 86.6% of farmers bring their products to traders/middlemen, whereas 21.4% bring to wholesalers and/or 26.8% to mill owners. Several reasons can be assumed for this phenomenon such as 1) farmers and traders/middlemen have known each other for a long time and there is mutual trust among them, 2) farmers do not know other buyers, 3) traders/middlemen provide higher price than others, and 4) farmers do not have transportation to reach different buyers.

According to the Farm Household Survey, even large farmers do not produce much quantity of rice to bargain with traders/middlemen. The cost of transportation, business difficulties (loading and unloading labor problem), time-consuming transportation, and food expenses do not make it profitable to sell to traders who are operating outside the village. Instead, they prefer to sell to big collectors/middlemen in the village to save on distribution cost. There are only few traders who have purchasing capacity in the village, which gives traders bargaining power.

(c) Distance and Transportation Means to Market

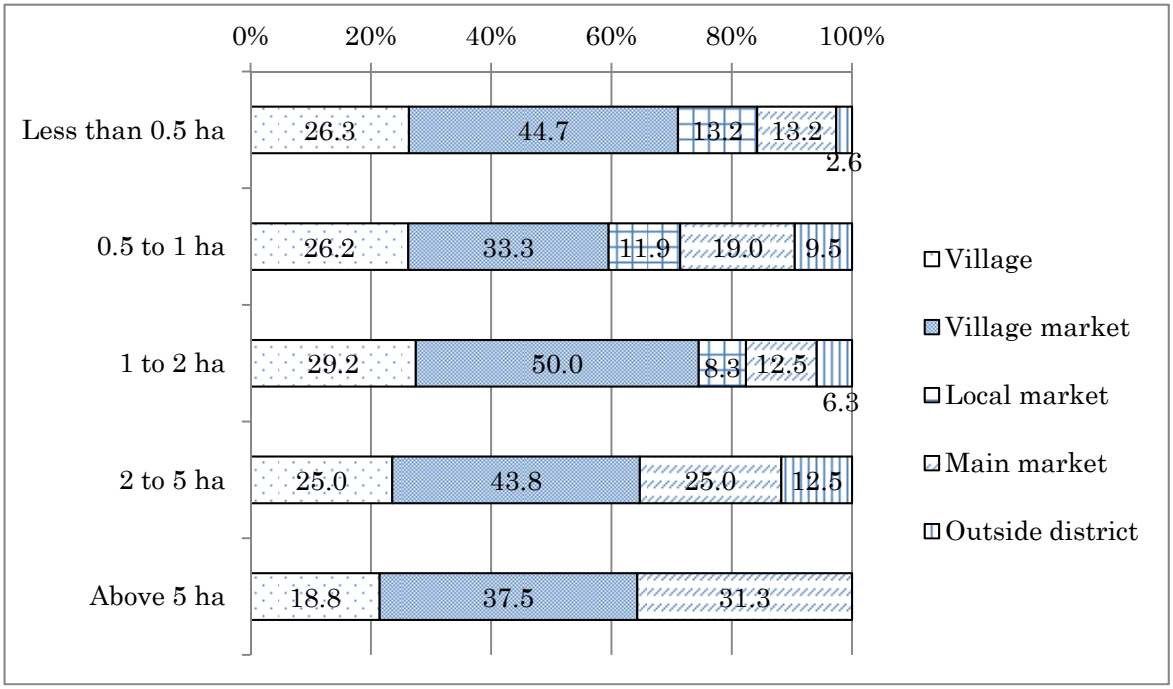
The distance of farmers within the village, between farmers and village market, local weekly market, main market, and outside the districts were surveyed. The total distance of 136 farmers to the market to sell their products is 543.7 km with an average of 4 km. Figure 4.5.7 indicates that the majority of farmers in the target districts are selling agricultural products within the village (village and village market). However, very few farmers transport their products to far away locations.



Source: Sample Survey on Agriculture Distribution and Marketing by JICA Survey Team

Figure 4.5.7 Destination of Farmers for the Sale of Products

When taking the survey results, taking into account the farmers' land area, it is obvious that smaller farmers sell their products within the village and/or nearby, while larger farmers transport their products to farther markets for better price.



Source: Source: Sample Survey on Agriculture Distribution and Marketing by JICA Survey Team

Figure 4.5.8 Sale of Farm Products by the Scale of Farmers' Land Area

The distance to the market is easily assumed as a reason in considering the means of transportation. Among the 356 farmers, 309 farmers (87.3%) carry their products to the market by themselves. Very few of them use tractors, carts, or bicycles. While nearly 90% of smaller farmers carry paddy by themselves, larger farmers use tractors or carts and only 40% of them carry it by themselves.

(d) Agricultural Market Information

It is indispensable for all the stakeholders in the agriculture sector to obtain the latest price information. From the public side, the Agribusiness Promotion and Market Development Directorate (ABP&MDD)

under DOA issues the market bulletin on the website with support from FAO. The Agro Enterprise Center (AEC) and DADO in Morang District has just started to disseminate short message service (SMS) system to wholesale and retail traders in the markets with the support of the Commercial Agriculture Development Project (CADP).

On the farmer's level, however, the results of the sample survey indicate that price information through mass media is actually not very much used among farmers. Regardless of their farm scale, farmers have four to five information sources, and majority (79.2%) of them receive price information through local shops/traders and neighbors/relatives (50.9%) in/around their village. Farmers who use telephones/mobile phones are only 0.9% and the number of farmers who receive market information from agricultural technicians is also negligibly small (1.9%).

Farmers trust information more from traders and/or big collectors who have long relationship with each other, than the general information transmitted via FM radio. The contents of the FM radio program on market price information are only partial and often do not contain basic and/or useful information for agricultural production, such as weather report or tips for better cultivation.

(4) Characteristics of Markets in the Target Districts

The market facilities of the agricultural commodities include (a) local weekly market, (b) collection center, (c) wholesale market, and (d) cold storages. The ownership, management modality, and service charge differ for each facility[12]. The major market facilities in the target districts are listed in Table 4.5.11 below.

Table 4.5.11 Major Marketing Facilities in the Target Districts

District	Local Weekly Market	Collection Center	Wholesale Market	Cold Storage (Capacity in Ton)
Jhapa	114 (Whole sale, weekly market, mid weekly market)	2	1(Birtamod)	2 (Total 4,500 in Charpane (2,500) and Damak (2,000)
Morang	166 (Wholesale, weekly market, mid weekly market)	5	1	4 (Total 14,900)
Dhanusa	43 (Wholesale, weekly market, mid weekly market)	2	4	2 (Total 3,000)
Mahottari	n.a.	n.a.	n.a.	n.a.

Source: Annual Progress Report of DADO of Jhapa (2010/11), Morang (2011/12), and Dhanusa (2009/10)

Among the markets mentioned above, the major commodities and characteristics of the markets studied are listed in Table 4.5.12. The Bitamord Market in Jhapa is the largest in terms of annual transactions among others, and most of the commodities handled in the markets of Jhapa are coming from India. The market in Biratnagar in Morang District is not an 'organized' market, but traditionally formed by local farmers and traders. Although such traditional markets are functioning in several places in Biratnagar, the Biratnagar Municipality is implementing the relocation of these markets to neighboring areas with support of DADO due to the heavy traffic they are causing in the city.

[12] The Master Plan Study, P2-57

Table 4.5.12 Major Commodities and Characteristics of Markets in the Target Districts

District	Market Name	Major Commodities	Market Operation	Area (ha)	Business Hour/Day	Market Management	Annual Transaction (Rs1,000/year)
Jhapa	Surunga	Vegetables	Seasonal, daily	n.a.	11	Committee	1,200
	Birtamod	Vegetables, fruits, spices	Daily	2.7	12	Committee	56,60,714
	Budhabare	Vegetables	Daily,	0.2	11	Committee	19,200
	Dhulabari	Vegetable	-Most vegetables are imported from India				n.a.
	Badrapur	Vegetables	-Sellers/buyers are Nepalese, Indians, Bangladesh				n.a.
Morang	Katahari	Vegetables, fish, fruits	Daily	0.13	14	Committee	36,000
	Biratnagar	Vegetables, fish	-Most commodities transfer between Biratnagar-KTM. -Cabbage and watermelon are exported from this market to India -Onions: local(1month), India(11months) Garlic from India -Potato from India (10 months), Bhutan(5 months), Nepal(2month)				n.a.
			-Fish: local (more fresh & higher value than Indian fish)				
Dhanusa	Dhalkebar	Vegetables, fruits, spices	Twice/week	4	12	Committee	n.a.
			-5,000 visitors/day				136,236
			-50 wholesalers+ retailers				
			-Famers sell individually. No group sellers.				
			-Watermelon, pointed goad, tomato, eggplant, fruits are exported to India				
	Mahendranagar	Live animals, vegetables, fruits	Twice/week	1.43	12	Committee	47,330
Mahottari	Bardibas	Cereals, vegetables, fruits, fish, live animals, meat	Twice/week	2.33	12	Committee	84,050
	Gausala	Cereals, vegetables, live animal, meat	Twice/week	6.66	14	Committee	77,541
	Aurahi	Vegetables, cereals, meat	Twice /week	1.33	4	Committee	37,966

Source: Combined interview with DADO staff in charge of marketing and Sample Survey on Agriculture Distribution and Marketing by JICA Survey Team

(5) Issues of Market-related Infrastructure

(i) Market Facilities

Major issues raised by each DADO of the target districts are related to underdevelopment of market such as lack of market itself, land, cold storage, shed to protect agricultural commodities and livestock from rain, and even toilet facilities. Table 4.5.13 shows the particular points indicated by DADO in each district.

Table 4.5.13 Issues Raised by DADO in the Target Districts

District	Issues
Jhapa	While the northern part of the district, hill side of the East-West Highway[13] is appropriate for vegetable and fruit production due to its fertile soil (production of 123,689 t in FY2011), the construction of a cooling center is not realized due to lack of budget of DADO.
Morang	Even though Biratnagar is the second largest city in Nepal next to Kathmandu[14] in terms of population, there is no wholesale market in the area and the space for traditional wholesale and retail markets are too small so it becomes an obstacle to the main road nearby.[15]
Dhanusa	There are few markets with water supply system and/or shed installed, and such market environment deteriorates the freshness of fish and vegetables. While the volume of agricultural commodities such as rice, fish, and vegetable is increasing, the market areas are not sufficient.
Mahottari	The sale of vegetables and fruits in Bardhibas Market is actively functioning; however, it is difficult for DADO to expand the market due to some accounting issues. Problems in the management of the marketing committee limit variety of commodities to be handled in Gausala Market.

Source: Interview with DADO

(ii) Condition of Roads

Although the connectivity is relatively good in the Terai area as a whole, the JICA Survey Team observed that the road conditions in and around the village in the target districts need to be further improved.

(6) Marketing Related Development Programs by DADO in the Target Districts

(i) Development Programs

Development Programs related to marketing upon DDC's approval are implemented by each DADO. The major activities related to marketing and commonly implemented by DADO are listed below.

- Annual book publication;
- Program implementation seminar;
- Price collection;
- Investment study report on wheat, whole green lentil, sugar cane, and vegetable cauliflower;
- Establishment of local weekly market and its execution;
- Discussion seminar between government organizations and NGOs;
- Farmers and traders discussion seminar;
- Problem identification and solving seminar in service centers and district levels;
- District level agricultural market management training;
- Crop cutting;
- Evaluation of pocket region program by the chief of the Agriculture Development Committee;
- Staff meeting for technical discussions;
- Grant for market roofs and/or shades; and
- Monitoring and evaluation.

[13] Santinagar VDC, Bhudhabar VDC, and Bahunghangi VDC

[14] Population: Refer to 4.1.General Feature of the Four Target Districts

[15] DADO have submitted the wholesale development plan in Biratnagar to the Community Agriculture Development Project (supported by ADB in 2009～2013), however, the plan did not materialize due to short construction period.

The other marketing/commercial agriculture related programs by each DADO are listed in SP-F-3. The annual progress reports on these programs are reported by DADO to DOA; however, the monitoring and evaluation system of both DOA and DADO is still weak at present[16].

(ii) Actual Expenditures for Marketing Related Activities by DADO

The DADO formulates the annual plan for agricultural activities based on the development policy of MOAD followed by the approval from DDC. The planning officer is responsible for marketing of agricultural products in the respective district as well as the implementation of marketing related activities.

The total expenditure and marketing program of DADO for FY 2011/2012 as well as plans for FY 2013/2014 in the target districts are described in Table 4.5.14 as follows:

Table 4.5.14 Actual Expenditure of DADO and Marketing Related Expenditure in FY 2011/12

District	Total Actual Expenditure (Rs)	Actual Expenditure Related to Marketing (Rs. 2011/12)
Jhapa	19,773,420	3,000,000
Morang	15,604,000	2,300,000
Dhanusa	44,700,000	12,600,000
Mahottari	n.a.	n.a.

Source: Annual Report and interview with DADO (FY 2011) in the Target Districts

(a) Jhapa District

The amount of actual expenditure in FY 2011/2012 was Rs19,773,420 and the marketing related activities out of it was only Rs3,000,000. This trend has not changed in the last three years[17].

The activities of FY 2012/2013 include the production of dissemination posters and booklets related to marketing, collecting marketing information (twice/month), and broadcasting of program via FM radio.

<Plan for FY 2013/2014>

Although DADO was in the process of formulating the annual plan for FY 2013/2014 at the time of the interview, the tentative plan was described by the planning officer as follows:

- Construction of collective collection center in Bitamor VDC;
- Provision of plastic cage with vegetable producers;
- Broadcasting of market prices of agriculture commodities including meats via FM radio; and
- Study on value chain of commodities such as tea, turmeric, and raw ginger.

It is expected that DADO, with donor support, would construct cold storages for vegetables in t he northern part of Jhapa District, namely, Santi Nagar VDC, Vhudabar VDC, and Bahungchangi VDC. The soil in these areas is appropriate for vegetable and fruit cultivation, and in fact, a total of 123,689 t of vegetable was produced in 2011/2012.

The DADO also prioritizes in strengthening the capacity of cooperatives in order to maximize farmers'

[16] Interview with DOA
[17] Interview with DADO staff in charge of marketing in Jhapa District

bargaining power to traders.

(b) Morang District

The actual expenditure in 2011/12 was Rs15,604,000. Rs2,300,000 was spent for marketing related programs[18]. The DADO in Morang expressed that they implement very limited activities such as training on marketing, provision of plastic boxes, and promotion of cooperatives. In addition to these activities, DADO constructed five collection centers, and purchased land with an area of 3.5 ha from VDC and school in Biratnagar for the development of wholesale market in FY 2011/12.

<Plan for FY 2013/2014>

Construction of walls surrounding the planned wholesale market (Rs1,500,000) as well as development of the market itself (Rs2,000,000) have been planned in the next fiscal year.

(c) Dhanusa District

The total actual expenditure of DADO for FY 2011/2012 was Rs44,700,000, of which Rs12,600,000 was allocated for market construction. Since a small amount of the budget was allocated for marketing three years ago[19] and considering the expenditure for marketing in FY2010/11[20], it can be assumed that DADO in Dhanusa started to recognize the importance of marketing for agricultural development in the district. However, the majority of budget for marketing has been allocated for the construction of facilities from the beginning until this date.

<Plan for FY 2013/2014>

As for FY 2013/2014, DADO plans to allocate Rs6,700,000 for the promotion of marketing. The construction of collection centers will be the only activity for the next fiscal year as well.

The priority areas for the future construction/development of collection centers are, namely, 1) Edukuha where 60% of agricultural products of Dhanusa District are produced, 2) Danusadam, 3) Mahendranagar, 4) Dabylie, and 5) Bakaline (near the Indian border).

(d) Mahottari District

The actual expenditure of DADO in Mahottari in 2011/12 was not available. The DADO expressed in an interview that it has started to construct collection centers in the district five years ago.

<Plan for FY 2013/2014>

The DADO in Mahottari also expressed their priority on increasing the production of the 'Elephant Yam' which gives high yield and grows in the northern part of the district (Kisannagar, Hath let, Graham, and Haisarwa) without much human labor.

As mentioned above, the budget for the marketing program in DADO is very limited in the target districts and programs are often concentrated on infrastructure development such as construction of

[18] Annual Report of DADO Morang
[19] Interview with the planning officer in charge of marketing, DADO, 11 May, 2013
[20] Actual expenditure of DADO in Dhanusa for marketing related activities was Rs5,000,000 (17.6%) among its total actual expenditure of Rs28,414,000 in FY2010/11.

collection centers and/or market sheds but not much focus on the farmers' needs.

In terms of human resources, a planning officer is responsible for marketing related activities at present. The ABP&MDD has requested the GON to appoint a staff in charge only of the markets in DADO. If the request is approved, the allocation of staff will be carried out within a couple of months.

4.5.2 Present Condition and Issues of Agricultural Export and Import in the Target Districts

The Plant Quarantine Offices (PQO) are located in Nepal-India border to check diseases of imported and exported plants, issuing the Phyto Sanitary Certificate to prove security of the plants along with international agreement such as SPS[21]. The following subsections are information collected at PQO in Jhapa, Morang, and Mahottari. The PQO in Mahottari covers the border areas in Dhanusa and Mahottari districts.

(1) Import

The import of agricultural commodities in the Nepalese-Indian border checked by the PQO are presented in Table 4.5.15 below. Grains has the largest volume being imported from India, followed by potato, onion, and vegetables.

Table 4.5.15 Import of Major Commodities and Volume in FY 2011

District (Location)	Import		
	Major Commodities and Volume (t)		Trend/Issues
Jhapa (Kakarbitta)	Rice	5,455	Import of vegetable from India increases during off-season in Nepal. Volume of import is not largely changed as compared to FY 2011. All kinds of vegetables are imported from India, and import of potato from Bhutan is also increasing. The PQO carefully checks the quality of plant seeds; however, packed articles are not targeted for plant quarantine.
	Potato	1,408	
	Wheat and Maize	0	
Morang (Biratnagar)	Wheat and Maize	33,877	The number of certificates issued by the PQO increased from 287 in FY 2002 to 1,262 in FY 2011. All the agricultural commodities that PQO checks come from India.
	Rice	12,936	
	Potato	8,242	
Dhanusa and Mahottari (Jaleswor in Mahottari)	Onion	1,283	Import of onion, potato, tobacco powder, and mango seedlings is increasing. There is no check post in the Indian side in the area and the certificate is issued only in the Nepalese side.
	Rice	177	
	Wheat	28	
	Pumpkin	24	
	Beans	20	
	Cabbage	11	

Source: Annual report of PQO (FY2011) and interviews with the Plant Quarantine Officer

(2) Export

The major commodities to be exported from the target districts are listed in Table 4.5.16. The Kakarbitta in Jhapa District is the largest land port among the target districts, followed by Biratnagar in Morang and Jaleswor in Mahottari.

[21] SPS: Sanitary and Phytosanitary Measures of WTO Treaty

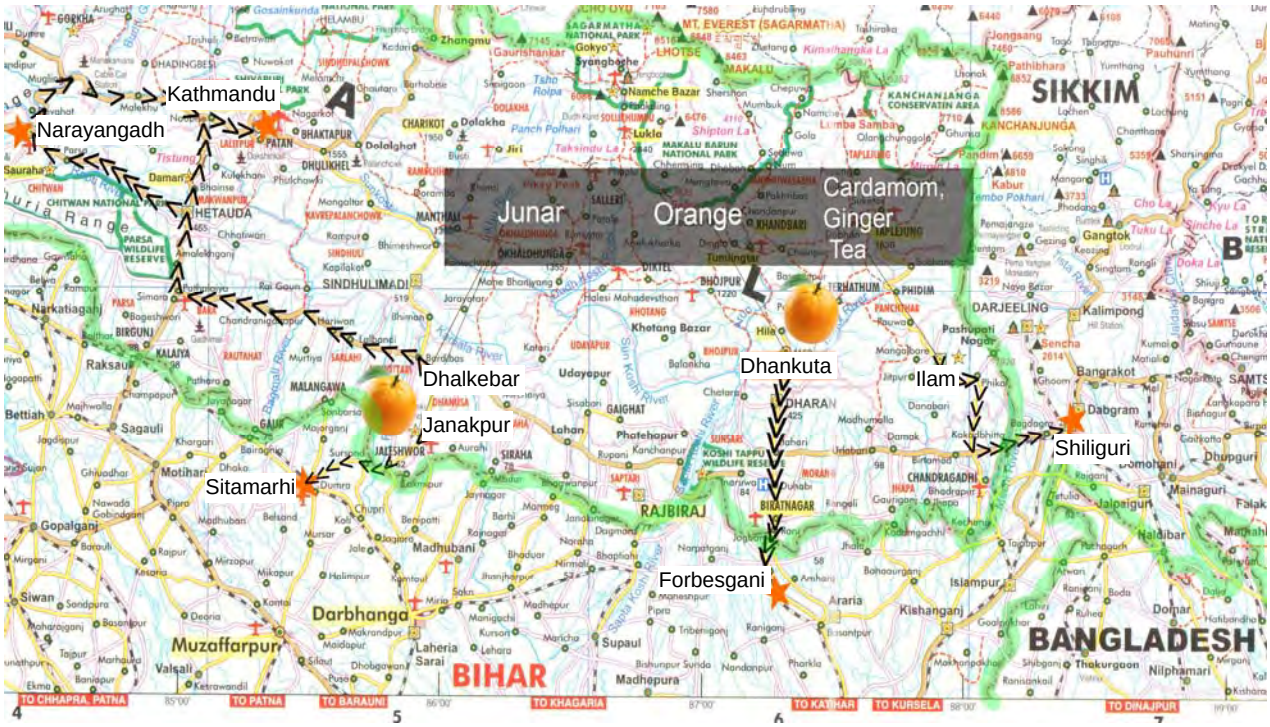
Table 4.5.16 Export of Major Commodities and Volume in FY 2011

District (Location)	Export		
	Major Commodities (t)		Issues/Situation
Jhapa (Kakarbitta)	Broomrape	26,807	-Lentil and gingers are exported to India (West Bengal) and Bangladesh. -Especially lentil is exported mainly to Bangladesh. -Broomrape and ginger are distributed to the central region in Nepal (Hetauda). -Nepal cannot export rice to India because of India's law, but it is an open border and the Nepalese farmers cross the border for milling paddy.
	Lentil	26,028	
	Ginger	19,489	
Morang (Biratnagar)	Beatle nuts	5,892	-Major destinations for export are India (ginger, herbs, seeds, cardamom, cinnamon, onion, cabbage, tomato, vegetables, and maize, etc.) Bangladesh (lentils), Italy (herbs), Turkey, UAE, and Singapore (maize). -Tea produced in Jhapa is exported only from Biratnagar, but receives no checking from PQO as it is packed. -Large cardamom is exported by air to Arab countries and Pakistan via India, but volume is not large.
	Large cardamom	5,061	
	Legumes	118	
Dhanusa and Mahottari (Jaleswor in Mahottari)	Tobacco powder	124.2	-Whereas Nepalese traders/farmers need to obtain a license to export to India, Indian traders/farmers do not need it[22].
	Mango	2.18	
	Pointed gourd	1.00	

Source: Annual Report of PQO (FY2011) and interviews with the Plant Quarantine Officer

(3) Distribution Routes of Agricultural Commodities from Nepal to India[23]

As seen in Figure 4.5.9, ABP&MDD indicated that major commodities are distributed from the pocket areas in the hill side via major markets in the target districts to India and Bangladesh.



Source: Prepared by JICA Survey Team

Figure 4.5.9 Distribution of Nepalese Agricultural Commodities to India and Bangladesh

[22] In the Nepal trade policy, however, no licenses are required for the export and import of products other than those banned or quantitatively restricted items (www.fncci.org/policy.php).
[23] Interview with ABP&MDD

(i) Jhapa

- Cardamom, ginger, tea, and orange flow from Ilam via Birtamod, Jhapa to Shiliguri in India. The flow of commodities is on a regular basis (every year).
- Lentil, orange, and vegetable seeds also flow from Dhankuta via Birtamod to Bangladesh and Shiliguri in India; however, the flow of these commodities, except for lentil, is not on a regular basis. Since Bangladesh and Bhutan has a special treaty, and are connected by boarder, Bangladesh imports several commodities from Bhutan. Therefore, only when commodities in Bangladesh are scarce, the trade between Dhankuta and Bangladesh is activated.

(ii) Morang

- The oranges in Dhankuta flow down to Dharan wholesale market. From there, it moves to Morang and to the western side from Sunsari Market in the East-West Highway up to Narayanghat in Chitwan District. Also, it flows to Pharbisgunj in India via Biratnagar, Morang District.
- Aside from oranges, summer vegetables such as green peas also flow to India through Morang.

(iii) Dhanusa

- Junar flows from Sindhuli and Ramechap districts to the Dhalkebar Wholesale Market in Dhanusa District. It also moves to Narayanghat and Kathmandu markets.

(iv) Mahottari

- Junar arrives at Sindhulimadr Wholesale Market in Sindhuli by the Sindhuli Road, and from the market, it moves to Jaleshwar/Bhittharoad in Mahottari, and then to Sitamadhi in India.

(4) Influence of India and Bangladesh in the Markets of the Target Districts

As indicated in Table 4.5.17, the majority of cereals, pulses, and spices are imported from India in Gausara Market in Mahottari District. Moreover, the cereals, fruits, and vegetables in the Mahendranagar Market in Dhanusa District are brought from India.

Table 4.5.17 Influence of India and Bangladesh in Major Markets in the Target Districts

(Unit: % of trade volume)

Market In	M1	M2	M3	M4	M5	M6	M7	M8	M9
Origin of cereals			75	50					
Indian traders to bring cereals			75	38					
Origin of pulses			90	40					
Indian traders to bring pulses			75	38					
Origin of vegetables		20				60			30
Indian traders to bring vegetables						30			30
Origin of fruits	50	10	50	60	60	40			
Indian traders to bring fruits	50	60	50	70		50			
Origin of spices	60	90	100	70		50			
Indian traders to bring spices	60	90	100	70		50			
Origin of live animals				30					
Indian traders to bring live animals				50					
Origin of Fish				5		80			
Indian traders to bring Fish				10					
Market Out	M1	M2	M3	M4	M5	M6	M7	M8	M9
Place of sales of vegetables						25			
Buyers of vegetables						20			
Place of sales of fruits						15			
Buyers of fruits						20			
Place of sale of spices(India)						30			
Placce of sales of spices (Bangladesh)						55			
Buyers of spices (India & Bangladesh)						20			

Note: M1: Bardibas (Mahottari), M2:Dhalkebar(Dhanusha), M3: Gaushala (Mahottari), M4: Mahendranagar (Dhanusha), M5: Aurahi(Mahottari), M6: Birtamod (Jhapa), M7: Kathari (Morang), M8: Surunga(Jhapa), M9 :Budhabare(Jhapa)
Source: Sample Survey on Agriculture Distribution and Marketing by JICA Survey Team

As Table 4.5.17 indicates, heavy dependency on Indian agricultural commodities in the target districts are observed among the markets in the target districts. However, there is a large room to mitigate such dependence through agricultural development in these areas.

4.5.3 Cross-cutting Issues of Marketing in the Target Districts

(1) Farmers' Recognition toward Marketing

The Farm Household Survey identified that 49.1% of farmers believed that there are no problems related to marketing, while 50.9% admitted there are problems. The difference in proportion depends on the district, as listed in Table 4.5.18. It is assumed that the reason for the difference in the target districts is that the farming scale in Jhapa and Morang is more on the commercial level, whereas farming in Mahottari and Dhanusa is more for self-consumption.

Table 4.5.18 Proportion of People Expressing Existence of Problems Related to Marketing in the Target Districts

District	Answer (%)	
	Yes	No
Jhapa	88.7	13.3
Morang	77.8	22.2
Dhanusa	10.7	89.3
Mahottari	25.9	74.1
Average	50.9	49.1

Source: Farm Household Survey by JICA Survey Team

The major problems revealed in the Farm Household Survey are low price of products, following less control on price (price fixed by traders), inadequate market facilities, absence of transport, and storage facilities, as shown in Table 4.5.19.

Table 4.5.19 Types of Problems and the Number of Farmers that Responded[24]

Problems	Number	%
Low price	40	70.2
Price fixed by trader	10	17.5
Absence of market	4	7.0
Distance to market	4	7.0
Absence of traders	3	5.3
Difficult to sell	3	5.3
Poor market	2	3.5
Transport facility	2	3.5
Storage facility	1	1.8

Source: Farm Household Survey by JICA Survey Team (multiple answers)

(2) Linkage among Market Related Stakeholders

(i) Linkage between DADO and the Chamber of Commerce and Industries (CC&I) District Office

The Federation of Nepalese Chamber of Commerce and Industries (FNCCI) has 60 district level branches. Among the target districts, the activities and future plans of two district branches were identified in SP-F-4.

The linkage between DADO and the private sector is hardly observed except for the collaborative activities between DADO and the CC&I district office in Dhanusa District for the implementation of OVOP projects.

(ii) Linkage between Farmers and Processing Plants

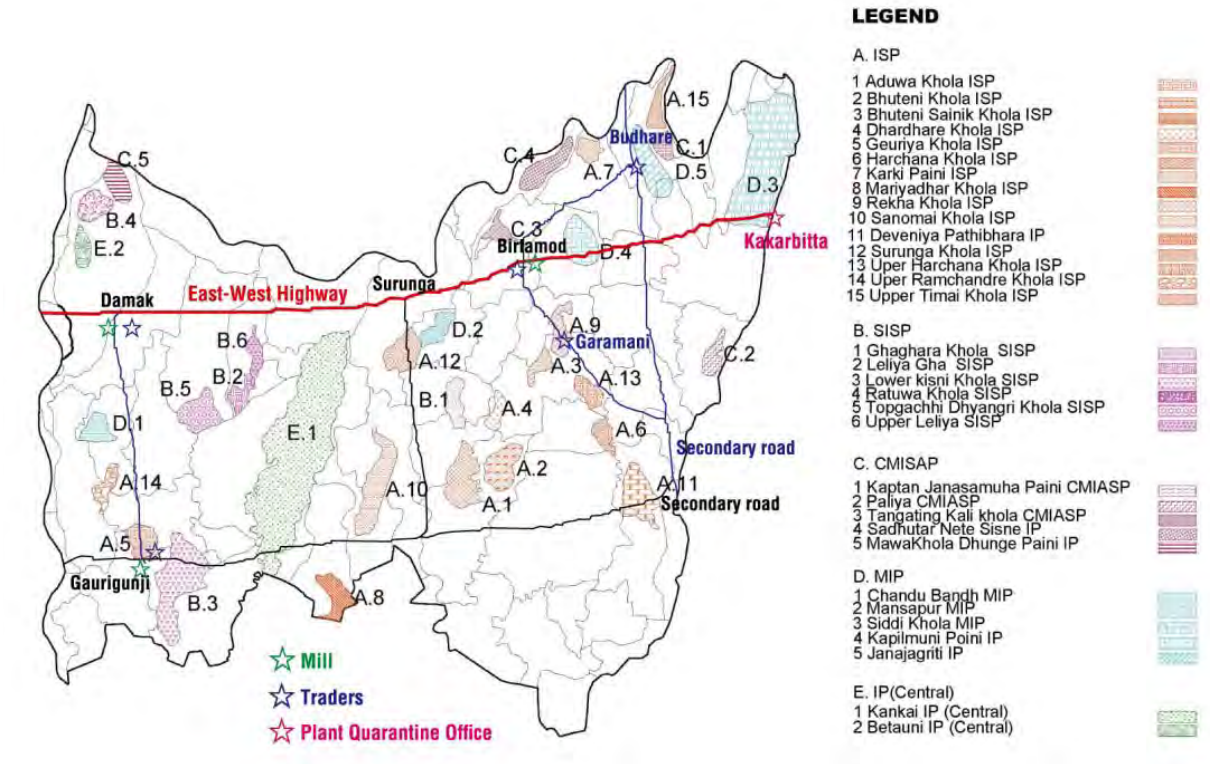
There are some processing plants identified in the survey area, but the raw materials for processing like tomatoes are all imported from India. Although the processing plant can be a market for farmers, there is no chain which connects the producers and the processing plant at present.

[24] There were 57 respondents and they responded in 70 items as a whole. Percentage was calculated from 70 in the Farm Household Survey.

4.5.4 Characteristics of Major Markets in Kankai and Hardinath Irrigation Areas

The present market situation in Kankai in Jhapa District and Hardinath in Morang District are described in Figure 4.5.10 and Figure 4.5.11, respectively.

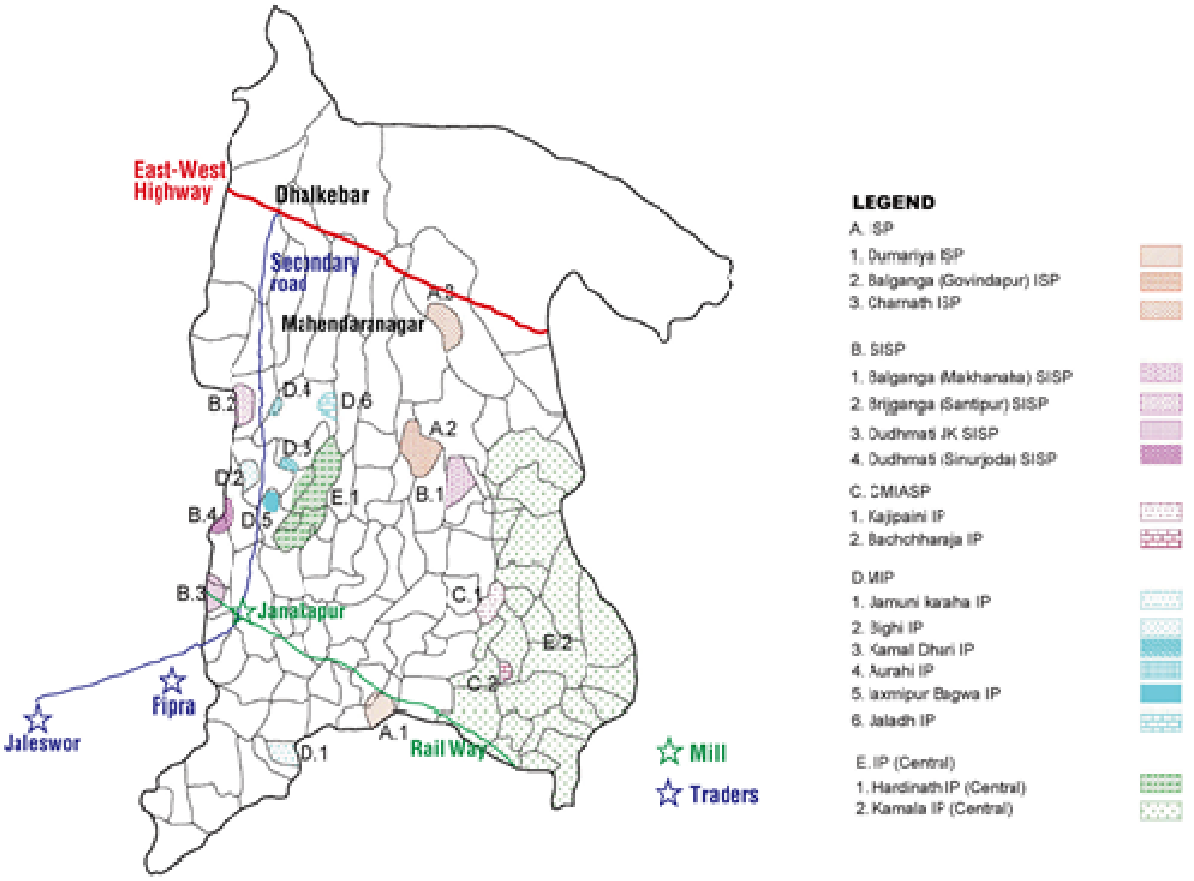
The Kankai irrigation area is surrounded by the East-West Highway in the north and secondary roads in other directions. The approximate distance from major markets to Kankai irrigation area is 3 km from Surunga, 10 km from Birtamod, and 15 km from Budhabare. The Birtamod Market, which is surrounded by mills and traders, is the largest among other markets in the Eastern Development Region in terms of area size as well as the amount of business transactions.



Source: Prepared by JICA Survey Team

Figure 4.5.10 Kankai Irrigation Area in Jhapa District with Market Information

As for the Hardinath irrigation area in Dhanusa District, the two major markets nearby are Dhalkebar on the East-West Highway and Mahendranagar.



Source: Prepared by JICA Survey Team

Figure 4.5.11 Hardinath Irrigation Area in Dhanusa District with Market Information

SP-F-5 indicates that Dhalkebar Market in Dhanusa District functions as a retail as well as a wholesale market. The number of traders operating retail businesses in all the markets is high except for the Birtamod Wholesale Market. Retail trading also occurs in the wholesale market especially during market days. While producers (farmers) and small collectors come for retailing, traders control the wholesale business. Since the management committee records only wholesale trading, no information about retail trading is available.

The sale of vegetables, fruits, spices, meat[25] and fish are handled in Birtamod Market in Jhapa District. As for retailing, Dhalkebar Market handles the sale of meat in large quantities.

The sources of agricultural produce delivered into the markets are mostly from adjoining areas, within and/or nearby district, and India except in Surunga Market where all the products are coming from the adjoining areas. More detailed data of each market are discussed in SP-F-5.

4.6 Summary of Issues and Constraints, Countermeasures, and Potentials

The JICA Survey Team carried out the studies to grasp the present conditions of irrigated agriculture in Nepal and Terai, specifically the target districts, to review the implemented and ongoing project, as

[25] Meat are mostly chicken and goat, less buffalo and pork.

well as the government policies relating to irrigated agriculture. Also, through the study, the JICA Survey Team was able to clarify the issues and constraints. Furthermore, countermeasures to rectify and improve the issues and constraints for irrigated agricultural development in the Terai plains, particularly in the target districts, were studied carefully taking into consideration the potential at present. The JICA Survey Team shall formulate the framework of the JICA cooperation program and projects based on the studies, which is required in the survey.

Results of the survey, issues and constraints, countermeasures, and potential of the components on agriculture, irrigation, institution, and marketing of the survey are summarized in Tables 4.6.1 to 4.6.4 below.

Table 4.6.1 Issues and Constraints, Countermeasures, and Potentials on Agriculture

Issue	Constraints	Countermeasure	Potential
Small farm plots owned by farmers	Low productivity	To conduct land consolidation of scattered farm plots	Experience of land consolidation models is available in Nepal.
	Difficult to use large-scale machinery	To use small-scale agricultural machineries & equipment	Officers, NGO & some project, successfully implemented paddy and other cultivation with small scale farm machineries.
Low productivity of paddy	Inadequate and untimely fertilizer supply	To order necessary amount of fertilizers in advance by group (WUA, FG etc.) and distribute by them	There are some cooperative groups conducting group purchasing system.
	Inadequate seed replacement	To increase supply of improved seeds through community based seed production program	There are some farmer groups producing improved seed in Jhapa and Morang.
	Shortage of Farm Inputs	To cultivate with compost, green manure with chemical fertilizers in proper way	Many farmers are producing and using farm yard manure.
	Labor shortage	To mechanize farming system	Subsidy for purchasing agricultural machineries are available.
		To obtain farm machineries by group	There are some samples of group formation for machine purchase.
	Inappropriate extension system	To strengthen capacity of FG and WUA to utilize existing extension system	Most of farmers are willing to receive extension services.
Low agricultural income	Increasing emigrant labours	To introduce labour saving agriculture	Farm machineries are increasing in the areas
	Low introduction of high value crop	To select & cultivate high profitable crops to increase income	Banana is cultivated in the paddy fields, and banana and other fruits are imported from India.
No cultivation schedule shared with farmers, officers and other stakeholders	Collective actions are not taken for preparing cultivation schedule with irrigation schedule.	To prepare cultivation schedule with irrigation schedule by all stakeholders collectively	WUA / FO leaders and District level officials and relevant organizations have similar knowledge about cultivation schedule.

Source: JICA Survey Team

Table 4.6.2 Issues and Constraints, Countermeasures, and Potential on Irrigation and Water Management

Issues	Constraints	Countermeasure	Potential
Shortfall Provision and Poor Function of Main Irrigation System	Improperly quantified and no timely water distribution to tertiary irrigation blocks	Enhancement of linkage among all stakeholder using the same platform	Irrigation Policy 2013
		Improvement of role and function of IDDO and enhancement of linkage among all stakeholder using the same platform	Lesson learned from the SPIN
	Flooding from main and branch canals or inundation problems in paddy field along main and branch canals in summer season	Enhancement of technical supports to gate operators through workshops and field training and provision of motivation and incentives for gate operator	Rehabilitation projects being carried out with donors' assistance
		Enhancement of on-farm drainage system development at on-farm level.	
	Improper maintenance works of intake and main canal system	Enhancement of technical support to IDDO and /or DTT through workshops and field training	Rehabilitation projects being carried out with donors' assistance
		Improvement of monitoring mechanism and establishment of asset management of irrigation facilities	Irrigation Policy 2013
Main Irrigation System	Difficulty of year-round irrigation	Enhancement of conjunctive use with deep and/or shallow tube wells	Rehabilitation projects being carried out with donors' assistance
			Irrigation Policy 2013 and Strategies of the 13th Three-Year Plan
	Low participatory of WUA on rehabilitation works	Enhancement of dissemination and linkage among all stakeholder using the same platform	Rehabilitation projects being carried out with donors' assistance and Irrigation Policy 2013
Lack or Shortfall of On-farm Irrigation System	Lack of on-farm irrigation facilities	Enhancement of construction of on-farm irrigation and drainage system by community contract method through the enhancement of linkage among all stakeholders	Irrigation regulation 1988/89 and Irrigation policy 2013, and lessons learned from SPIN and OFWMSC
		Reformation of WUAs to follow branch and/or tertiary irrigation block base	
	Lack of tertiary canals and field channels	Enhancement of technical support to WUAs as well as IDDO and DTT through workshops and field training	
Poor Function of On-farm Water Management	Flooding from main and branch canals or inundation problems in paddy field in summer season	Enhancement of construction of on-farm irrigation and drainage system by community contract method through the enhancement of linkage among all stakeholders	Lessons learned from SPIN and OFWMSC, Irrigation regulation 1988/89 and Irrigation Policy 2013
	No water distribution plan	Enhancement of linkage among all stakeholder using the same platform	
Poor function and collapse of WUA	Less aware or no interest with function of WUAs	Enhancement of incentives and motivation to WUAs such as the commercialized agriculture development and the multifunction of WUAs	Proposed Strategies of ADS., Irrigation Policy 2013
	Difficulty of proper water management and communication	Enhancement of technical support to DTT, IDDO and WUAs through workshops and field trainings	Irrigation Policy 2013 and Strategies of the 13th Three-Year Plan
	No matching tariff of ISF	Improvement of concept on tariff management for ISF	Irrigation Policy 2013
	Cost over-run of operation and maintenance cost		
	Low collection rate of ISF	Improvement of concept on application of the fine clauses to violators of WUA member	Lessons learned fro the SPIN and OFWMSC and Irrigation Policy 2013
	Unsatisfactory and insufficient maintenance works		
		Enhancement of technical services of IDDO using the same platform	
	Unclear operation cost	Enhancement of improvement of IFS collection mechanism including periodical auditing system	

Source: JICA Survey Team

Table 4.6.3 Issues and Constraints, Countermeasures, and Potential in the Institutional Aspect

Issues	Constraints	Counter Measures	Potential
90% of farmers have not received agricultural extension services	Small number of JT/JTAs	To increase the number of extension workers	It is difficult for DOA to increase its budget to employ extra JT/JTAs (negative)
		To improve the quality of JT/JTAs' knowledge and skills (services)	NARC has some training programs for JT/JTAs
		To involve other stakeholders like NGOs, Cooperatives and private sector into agricultural extension services	There are local NGOs, Cooperatives and private sector.
	Limitation of budget for extension service delivery	To increase the efficiency of existing service delivery	Please refer to the potentials against "inefficiency and ineffectiveness of existing extension service system"
	Inefficiency and ineffectiveness of existing extension service system	To know which kinds of agricultural technology/skills farmers and/or markets demand	It can learn about success stories of some WUA, Farmers Groups, Cooperatives, and NGOs
		To utilize media (TV/radio) for disseminating information and technology (skill) needed by farmers	NLSS III reveals that 41.1% of HHs in eastern and central Terai have radio and 41.8% of them have TV.
		To utilize local human resources	the people who passed secondary and above are 36.8% in Jhapa, 35.5% in Morang, 32.6% in Dhanusa, and 26.8% in Mahottari
		To promote that agricultural business entities come into Terai (quality of agricultural extension)	Some agricultural processing companies already existed in the 4 districts
	Too small number of recipient farmers	To reform existing farmers groups	It has to incorporate existing FGs into WUA, or vis-à-vis
	Lack of mobility of JT/JTAs	To provide motor bicycles and fuel for JT/JTAs	DOA allocates small amount of budget for improving JT/JTAs' mobility every year.
	Low motivation of JT/JTAs	To provide some incentive for JT/JTAs	DOA (DADO) rewards for the efforts of JT/JTAs.
	Language problem of JT/JTAs	To utilize local human resources	Please refer to the potentials against "inefficiency and ineffectiveness of existing extension service system"
Coordination between DOI and DOA for irrigated agricultural development is not sufficient	Low linkage between production and water management	To have district agricultural development plan (annual production plan) based on the information about water availability from DOI	The DOI, DOA, NARC and ADBL have already established an implementation structure for irrigated agriculture project. (ICWMP and the other projects)
Majority of FGs and WUAs have stagnated or stopped their activities.	Low interests of member farmers	Up to date the group formulation has been done by JT/JTAs and IDDO staffs. Generally, local NGOs and Cooperatives have better skills and experiences of social mobilization and awareness raising. As much as possible, the DADO and IDDO are better to seek for their cooperation in group formulation stage.	There are local NGOs, CBOs and Cooperatives.
Women's Participation to the agricultural development activities is not enough taken care.	Small number of female JT/JTAs	To increase the number of female JT/JTAs	GON claims that 30% of staff should be female.
		To utilize local youth (female)	GON claims 30% of staff should be female. Female population passed secondary and above in Jhapa and Morang are 37.05% and 34.75% respectively, which shows high potential.

Source: JICA Survey Team

Table 4.6.4 Issues and Constraints, Countermeasures, and Potentials on Marketing

Issues	Constraints	Countermeasures	Potential
Unfavorable price setting for agricultural products	Weak bargaining power on market price by farmers	To improve quality of products	Improvement of quality of products is one of major mandate of JT/JTA
		To deliver agricultural products collectively	Cooperatives have experience in collective delivery
	Minimum Support Price is not endorsed yet	To allocate budget	Recommended price has been already submitted by ABP&MDD in 2012
Poor storage and transportation	Not much care of storage and transportation by farmers	To construct storage	A large warehouse are under construction in Morang district
		To store products collectively	CADP (by ADB) implemented awareness training/seminars in Jhapa and Morang districts
		To hold awareness training for better transportation of products	- CADP implemented awareness training/seminars in Jhapa and Morang Districts
			- DADO has budget for granting plastic cage for transportation of products
	Lack of collection center and its management	To construct collection center and provide management training	- There are well managed centers in the target districts
	Transportation means are limited	To rent transportation and deliver the products	Cooperatives have experience in collective delivery
	Poor road conditions	Improvement of roads	DDC has budget and attends road improvement
Public assistance for marketing is weak	Lack of budget for marketing	To utilize budget more on market and farmers' need oriented	- DADO can hold seminars/workshop on marketing
			- ABP&MDD plans to allocate DADO officers in charge of marketing
	Lack of opportunity to create linkage	To promote linkage among stakeholders	- CC&I district office in Morang is active in promotion of linkage among stakeholders
	Lack of farmers' awareness toward importance of wider linkage	To provide awareness training/workshop	- DADO has budget for training/seminar
			- CADP implemented awareness training/seminars in Morang district in Jhapa and Morang
	Market facilities are not well developed	To allocate budget for marketing facilities	- DADO's priority is high on construction of marketing facility

Source: JICA Survey Team

CHAPTER 5 LESSONS LEARNED FROM PAST AND ONGOING IRRIGATED AGRICULTURAL DEVELOPMENT PROJECTS ASSISTED BY DONORS

5.1 General

The Government of Nepal (GON) has implemented several major irrigation and agricultural development projects with donor assistance. At present, six major development projects are being implemented in the agriculture and irrigation sectors while 29 major development projects/programs have been completed for the past two decades.

The major projects are almost cluster (sector) type projects, of which, various subprojects are included in one of the major projects. These subprojects are being implemented or are already completed for the entire Nepal, while some subprojects are also being implemented or are already completed for the Terai area only.

The major irrigation and agricultural development projects in the past two decades are shown in SP-C-17 and summarized below.

Table 5.1.1 Ongoing or Completed Major Projects with Assistance of Donors in the Past Two Decades

Description	Sector	Number of Projects
Ongoing Project in 2013	Agriculture	3
	Irrigation	3
	Sub total	6
Completed Project	Agriculture	11
	Irrigation	18
	Subtotal	29
	Total	35

Source: JICA Survey Team

In the analysis of issues and problems in implementation and post-implementation of the major projects, it was clarified that many of the issues and problems commonly occurred in the major projects located in Terai. The occurrence of similar issues and problems is predicted in future implementation of irrigated agriculture development programs in Terai, if careful attention is not given to the causes of such issues and problems.

These issues and problems are significant and can serve as useful lessons in the formulation of irrigated agricultural development in Terai. Hence, the issues, problems and lessons learned from past and ongoing projects with assistance of donors are discussed below.

5.2 Ongoing and Completed Projects

5.2.1 Ongoing Projects Implemented Through Donor Support

The major ongoing projects implemented with donor assistance are three projects in the agriculture sector and three projects in the irrigation sector.

The three projects in the agriculture sector are: (i) Commercial Agriculture Development Project, (ii) Nepal Food Crisis Response Program/Social Safety Net Project (being terminated in 2013), and (iii) Agriculture Commercialization and Trade (ongoing). The other three projects in the irrigation sector are: (iv) Community Managed Irrigated Agriculture Sector Project (CMIASP), (v) Irrigation and Water Resource Management Project (IWRMIP), and (vi) Community Irrigation Project (CIP).

Agricultural development in Nepal is in the transition of changing its directive development strategies from the development of self-sufficient food crops to commercialized agriculture. This move aims to increase agricultural income by introducing agricultural diversification programs and commercialized agricultural development programs. These changes will fit the strategies of the new medium-term agriculture development plan such as ADS and the Irrigation Policy 2013. The two ongoing agriculture development projects, namely, (i) Commercial Agriculture Development Project and (ii) Agriculture Commercialization and Trade, are one of the advanced projects. Other projects include the Nepal Food Crisis Response Program/Social Safety Net Project, which aims at reducing food poverty in small social groups and small rural areas.

The two ongoing irrigation development projects, CMIASP and IWRMIP, aim to enhance the year-round irrigation systems in the Terai plains through rehabilitation of existing headworks, intake structures and main irrigation systems. The two projects shall also enhance water management based on integrated crop diversification plans, including the improvement of roles and functions of water user associations (WUAs) through several field training programs. The other project, CIP, is focused on the enhancement of small-scale irrigation systems with farm management information system (FMIS) by rehabilitation of irrigation facilities and construction of shallow tube wells.

For CMIASP and IWRMIP, the implementation of the two projects was terminated in June 2013, but actions for the extension of its implementation are determined respectively.

The outlines, achievements and issues on the implementation of the ongoing major projects are discussed below.

(1) Commercial Agriculture Development Project (2007-2013)

(i) Outline and Objectives

This project is assisted by the Asian Development Bank (ADB) as a grant project and is being implemented in 11 districts, including Jhapa and Morang in the Eastern Development Region.

The objective of the Commercial Agriculture Development Project is to reduce poverty in 11 districts through equitable and sustainable commercialization of agriculture.

The project activities are categorized into the following five general components: (i) commercial agricultural investment and management, (ii) inclusive development of stakeholders, (iii) market information dissemination, (iv) capacity enhancement of partners, and (v) project implementation support.

(ii) Issues and Problems

- There is a growing concern among the Commercial Agriculture Alliance (CAA) stakeholders about its long-term sustainability. None of the project related documents speaks about the operational modalities of CAA[1] after the project's completion.
- Delay in scheduling of subproject activities, especially for infrastructure development involving activities to be done sequentially, is attributed to the lack of counterpart funds and lack of clarity on roles and responsibilities of stakeholders.
- Result based monitoring framework (RBMF) is incomplete since it requires the completeness, consistency and quality of data/information.

(2) Project for Agriculture Commercialization and Trade (PACT), 2009-2015

(i) Outline and Objectives

The PACT is a six-year, US$26.55 million project of the Ministry of Agricultural Development (MOAD), and is supported by the World Bank (WB). The project became effective on 13 November 2009, and the grant closing date is on 30 June 2015. The project area comprises of 25 districts located in the Central, Western, Mid-Western and Far Western development regions of Nepal, covering mid-hills and Terai geographic regions.

The objective of this project is to improve the competitiveness of smallholder farmers and the agribusiness sector in selected commodity value chains in the project's command areas.

The approaches for achieving the specified objectives are as follows: (i) helping farmer groups and cooperatives engage in profitable market-oriented production and improved access to markets through the provision of technology and information services and critical public infrastructure and linkages to agribusiness; (ii) creating and strengthening industry-wide partnerships along the value chain, thus forging linkages between producers, traders, processors, and other stakeholders; and (iii) reduction of existing obstacles in agricultural and food trade, thereby increasing the ability of farmers and agribusiness to respond to sanitary and phytosanitary (SPS) measures and food quality standards to meet domestic and international market requirements.

(ii) Issues and Problems

Changes in financial disbursement from conventional activity-based financing system to output-based financing system add complexities during the implementation of the project.

- Disbursement of competitive grant fund to appropriate grassroots organizations in agricultural projects is a daunting task.
- Existing monitoring system is weak and has constraints in the delivery of the project's output in a timely and effective way.

(3) Nepal Food Crisis Response Program (NFCRP) / Social Safety Net Project (SSNP) (2010-2013)

[1] The Commercial Agriculture Alliance (CAA) is a non-profit sharing private institution, established exclusively for the purpose of achieving the objectives of CADP. The purpose of CAA is to enhance the capabilities of CAA general members and increase investment in commercialization / agribusiness by adopting the new and modern technologies in production, processing and trading. It is managed by CAA Board, General Assembly and staff. The composition of total CAA members includes farmer groups, cooperatives, traders and processor.

(i) Outline and Objectives

The NFCRP with the assistance of WB aims to address short- and medium-term implications of the global food crisis for Nepal by improving access to food and strengthening agricultural production particularly for food insecure districts and small holders.

The SSNP was included as a support program of NFCRP to implement social safety net measures and to maintain access to food and basic needs among vulnerable households in districts with food insecurity.

The NFCRP has a program for vulnerable districts to be jointly implemented through GON/Ministry of Federation and Local Development(MOFALD). It also has a provision of essential inputs (seeds and fertilizers) to enhance agricultural productiveness to be implemented from 2010 to 2013.

Transportation subsidies for fertilizers are provided through the Department of Agriculture (DOA) and support for seed production and capacity building through the Nepal Agricultural Research Council (NARC).

(ii) Issues and Problems

- Providing service on an ad-hoc basis to satisfy the demands of all farmers even with provision of lesser quantity has not been well appreciated by recipients.
- Inadequate coordination efforts between DOA-SSNP and NARC-SSNP in the districts limit the attainment of effective results and impacts.
- There is a need for systematic seed planning and production based on the districts' needs and commitment from district line agencies to procure seeds in time and establish assured market link, distribution and proper use of seeds.
- Fertilizer availability with desired quantity and proper time has been one of the limiting factors.

(4) Community Managed Irrigated Agriculture Sector Project (CMIASP) (2006-2013)

(i) Outline and Objectives

This ADB-assisted project is a follow-up program of the Irrigation Sector Project (ISP) and the Second Irrigation Sector Project (SISP) covering 35 districts in the Eastern and Central development regions. The project started in March 2006 and ends on 30 September 2013.

The overall goal of the project is to promote inclusive economic growth while reducing poverty in the rural areas of the Central and Eastern development regions. The objective is to improve agriculture productivity and sustainability of existing small- and medium-sized FMISs suffering from low productivity and high poverty incidence, thus enhancing the livelihood of the poor, including ethnic minorities and Dalits.

Under the CMIASP, 111 irrigation subprojects (ISP) are being implemented with a total target area of 16,105 ha. The subprojects comprise of irrigation infrastructure development that involves the rehabilitation of existing irrigation infrastructure and/or expansion of the irrigation network, social development, strengthening of WUAs, agricultural development and livelihood enhancement.

At present, it is reported that around 60-65 subprojects have been completed, with the remaining

projects currently under different stages of development. Agricultural activities were implemented in almost all subprojects.

In the case of the Shikhar Kateri subproject, the cropping intensity had increased to 230%, more than the target crop intensity of 205%. Agriculture yield has also been reported to follow an increasing trend.

Almost all of the planned activities have been implemented under this project. However, the outcome has not been reported as the project completion report is under preparation.

(iv) Issues and Problems on Implementation

The CMIASP encountered the following issues and problems in several aspects of the project activities during project implementation:

- Conflicts on project implementation have risen among WUAs due to extreme passivity of the project management unit
- Land acquisition problems occurred along canal alignment in the initial stage of the project, but was later resolved by the WUAs
- Weak quality control of construction works was identified in many projects because of poor knowledge and skills of the WUAs
- Soil erosion and landslides frequently troubled the project's work progress, but was later solved during the construction stage through the inclusion of additional works.

(v) Future Project Extension

As the ongoing CMIASP will be terminated on 30 September 2013, the project completion report and evaluation report are under preparation. Most of the component outcomes have not yet been reported by the project. The second stage project extension was approved by ADB. Because of this, a technical assistance preparation team for the project has been appointed. The team is scheduled to accomplish the task by December 2013.

(5) Irrigation and Water Resource Management Project (IWRMP) (2007-2013)

(i) Outline and Objectives

The IWRMP is financed by WB and is being executed by the Department of Irrigation (DOI) in coordination with DOA and NARC. The main objectives of the project are to improve agricultural productivity of selected irrigation schemes and to enhance institutional capacity for integrated water resource management. The primary target beneficiary groups of the project are the water users or the WUAs.

The key indicators to measure the achievement of the project development objectives include the increase in productivity of selected crops, the increase in cropping intensity, the resources raised, operation and maintenance (O&M) expenditures incurred by water users groups, the extent of satisfaction of water users with regard to the delivery of irrigation services, the preparation of an integrated water resource policy and appropriate regulatory framework, and finally, the establishment of a national water resources database.

The IWRMP is comprised of the following four components, from A to D:

- Component A: Rehabilitation and Modernization of Irrigation Infrastructure
- Component B: Irrigation Management Transfer Reform
- Component C: Institutional and Policy Support for Improved Water Management
- Component D: Integrated Crop Water Management(ICWM)

(ii) Outlines of the 4 Components

Component A: Rehabilitation and Modernization of Irrigation Infrastructure

The objective of this component is to improve irrigation water service delivery in the selected schemes; Mountain (1,024 ha), Hills (10,680 ha) and Terai (1,624 ha). Under this component, support will be provided for the improvement of irrigation water delivery to about 26,392 ha through rehabilitation and improvement of 168 FMISs spread over 40 districts in Nepal. With regard to groundwater, the project will directly support deep tube well (DTW) groundwater schemes covering an estimated area of 2,100 ha.

Out of 134 FMIS projects, 74 projects covering 9,877 ha in the Western, Mid-Western and Far Western development regions of Nepal have been rehabilitated so far under this component. Still, 74 projects that cover 10,168 ha are under construction.

The WUAs in the 134 projects have been established with preliminary capacity development on preconstruction orientation and canal operation and maintenance.

The overall productivity of the 74 ISPs is found highest in vegetable produce (14.3 t/ha), followed by potato (13.3 t/ha) in cash crops. For cereals, the highest productivity is found in paddy (3.7 t/ha), followed by maize and wheat (2.6 t/ha each). Cropping intensity has increased from 145% to 182% in the Western Development Region, 110% to 192% in the Mid-Western Development Region, and 135% to 193% in the Far Western Development Region.

Component B: Irrigation Management Transfer Reform

The overall objective of Component B is the improvement of irrigation service performance and service delivery to selected irrigation systems in the Terai area through the completion and consolidation of irrigation management transfer (IMT) to the relevant WUAs.

The component is designed to address problems on large-scale irrigation system projects (AMIS projects) which have low capacity performance, poor O&M, low cost recovery, and inadequate maintenance funds.

Component B is presently working with four legally empowered WUAs, which are responsible for the O&M of four existing subprojects (AMIS). The four subprojects are located at Kankai, Sunsari Morang, Narayani, and Mahakali. The total irrigated area of the four projects is about 23,100 ha.

The present progress under Component B is very high. All activities under civil construction have been completed.

Most activities of the WUA capacity development program in Kankai have been almost completed, but

development activities of a considerable number of WUAs still remain in Sunsari, Morang, Narayani and Mahakali irrigation subprojects.

Component C: Institutional and Policy Support for Improved Water Management

The objective of this component is to help provide more effective and streamlined water resources management services at the national level within selected basins through institutional strengthening of relevant institutions, namely the Water and Energy Commission Secretariat (WECS) and DOI.

All planned activities under Component C have been completed during its project period. The activities include river basin plans, establishment of telemetry systems and initiation of rules and policy.

Component D: Integrated Crop and Water Management (ICWM)

The primary objective of this component is to increase production and to improve the productivity and profitability of agriculture with means of integration between agriculture and water management.

The sub-objectives of Component D are as follows:

- Integrated crop and water management,
- Improvement of water distribution structure at the field level, and
- Investment support for community and productive assets.

Improvement support field level channels and water distribution structures, community support for small-scale investment such as unconventional irrigation technologies, seed banks, storage facilities, market collection place and farm-to-market access facilities were provided.

(iii) Issues and Problems

Organization structure for implementation established to sustain the sustainability of project implementation from central to regional levels and to provide linage operation among the agencies concerned to the each component of the project, such as the component A to D with the separate budget flow, based on the lessons learned from the past irrigation projects.

However, overall progress of all the components has not harmoniously and simultaneously came out due to weak coordination with communities, farmers groups and WUAs, no familial and/or less qualified administration staff of regional and district agencies concerned, budget allocation problems and weal coordination and adjustment of works progress, etc and suffered the time frame of overall implementation of the 4 components of IWRMP, each other.

Furthermore, the following issues and problems were observed during the project implementation period of the Component-A and B, IWRMP.

- General farmer consultation could not be done because of the pressing need of agricultural activities of farmer
- In many cases, land acquisition tasks appeared where farmer demanded for compensation which was not provisioned in project paper

- Because of the remoteness of the projects, it was difficult to supervise timely and also WUA capacity development activities could not be implemented timely (Component A)
- Frequent flood attacks were encountered in the Kankai, Mahakali and Sunsari Morang projects, especially at edges of the command area by nearby rivers.
- The WUA capacity development programs focused on training only, thus did not meet the requirements for overall development of WUAs
- The budget allocated by the government for WUA capacity development works were not timely and adequate
- Participation of officers to workshops and field training programs were limited due to insufficient availability of qualified officers and engineers
- On-farm demonstration activities are not properly well coordinated among the agriculture sector, WUAs, and irrigation project offices. Everyone accomplished their activities separately.

(iv) Future Extension

At present, WB has agreed to fund further project extensions up to 30 June 2016 for the completion of ongoing institutional development works along with new area extension under Components A and B.

Considering present situation of the IWRMP, such as nearly completion of rehabilitation of main and secondary irrigation system (Component A) and irrigation management transfer reform (Component B) in the Kankai irrigation project located in the target Survey area, but constraints on progress of WUA capacity development assessed that WUA capacity development program focused in training only, didn't meet the requirement of overall development of WUA,

It will be absolutely significant to add the follow up development program to acceralate the early return in the project through enhancement field training of WUA capacity building with necessarily physical and institutional improvement at on-farm level, subject to demarcation of DOI between the completed works of the project and additional follow up development program.

(6) Community Irrigation Project (CIP) (February 2011 - February 2017)

The CIP is an ongoing project financed by ADB and implemented by DOLIDAR under MOLD. The scope of the project is limited to small irrigation systems in hilly areas (less than 25 ha) and in Terai.

At present, CIP is being implemented in 12 districts (Kanchanpur, Kailali, Rukum, Rolpa, Salyan, Jumla, and Mugu) on a pilot basis. Its target groups are the poor, women, etc. The project will support the rehabilitation of old farmer managed irrigation schemes with new construction and some shallow tube well construction. The activities of this project are ongoing and have not been evaluated yet.

5.2.2 Completed Projects with Donors' Support

For the past two decades, 29 major irrigated agriculture development projects consisting of 18 projects in the irrigation sector and 11 projects in the agriculture sector have been implemented and completed. These development projects were proposed under the assistance of donors, such as ADB, WB, Saudi Fund, and European Union (EU), and through bilateral assistance. The main donors of such projects are ADB and WB, as shown in detail in Table 5.2.1.

Table 5.2.1 Completed Major Projects with Assistance of Donors for the Past Two Decades

Donors	Sector	Number of Projects
WB	Agriculture	1
	Irrigation	7
	Sub total	8
ADB	Agriculture	3
	Irrigation	6
	Sub total	9
JICA	Agriculture	1
	Irrigation	0
	Sub total	1
Others	Agriculture	6
	Irrigation	5
	Sub total	11
Total	Agriculture	11
	Irrigation	18
	Sub total	29

Source: JICA Survey Team

The projects of donors were mostly implemented in the Terai plains. Areal demarcation for the development projects assisted by the two main donors was made based on the Gandaki River course such as the western area of the river for WB and eastern area for ADB.

For the past two decades, the development assistance strategies given to Nepal by the main donors are different for irrigation and agriculture. The implementation of the projects is also different.

General trend on development strategies of WB and ADB is discussed using sample major projects assisted by each donor. Furthermore, issues, problems and lessons learned on the implementation of the projects and situation after completion of the projects are to be predicted and kept in mind in order to suggest significant subjects for the formulation of a better irrigated agricultural development program in the Terai plains.

(1) Development Trend of Major Projects Completed with WB Assistance

The completed projects with assistance of WB include one agricultural development project (Agriculture Research and Extension Project (1997-2002), and three irrigation projects (Irrigation Line of Credit (1988-1997), Nepal Irrigation Sector Program (NISP) (1997-2004), and Bhairahawa Lumbini Groundwater Project (1990-1999)).

The agricultural development projects assisted by WB have addressed strategies for the improvement of management capacity on research and extension in the agriculture sector by the beginning of 2002, through the Agriculture Research and Extension Project. However, the recent strategy has been to improve the competitiveness of small farm holders and the agribusiness sector in selected commodity value chains from the Central to the Far Western development regions.

Before 1988, GON did not have adequate experience regarding the rehabilitation of existing irrigation systems, of which, farmers constructed and managed their irrigation themselves. Because of this,

irrigation development projects with assistance from WB have been addressed for the formulation strategies on rehabilitation of surface irrigation projects. These irrigation projects will be managed by farmers (FMIS) through the enhancement of participation of farmers in the western development region known as the Irrigation Line of Credit Project in the 1990s. The GON has also implemented pilot rehabilitation programs and water resources development projects.

In the latter years of the 1990s to the beginning of 2000, projects with assistance from WB have addressed the strategies on reform in the water resources sector on a national scale. The strategies aim to enhance the institutional and technical capability of government staffs in planning, management, and orienting government agencies on handing over the responsibility of O&M works to user organizations such as the NISP.

A strategy to develop groundwater resources for the improvement of agriculture productivity has been taken. Also, groundwater irrigation development project with assistance from WB have been accelerated in western Terai during the 1990s, namely the Bhairahawa Lumbini Groundwater Project. Recent projects with WB assistance are taking approaches to enhance the institutional capacity for integrated water resources management through the rehabilitation of existing large-scale irrigation projects and the enhancement of roles and functions of WUAs.

The outline, objectives and achievement of selected major projects are discussed below.

(i) Agriculture Research and Extension Project (1997-2002)

The WB provided funding to implement the Agriculture Research and Extension Project (AREP).

A review of the institutional status indicated that DOA and NARC's adopted centralized planning process were inadequate to address farmers' needs. Furthermore, weak linkages between research and extension institutions adversely affected the technology transfer and technology delivery system. Its monitoring and evaluation system was weak to motivate its working staff. The subsided input supply system in the nation was not sustainable.

The purpose of the project was designed to assist GON to improve the management capacity of agricultural research and extension by developing specific agricultural technology on the basis of close consultation with farmers and improve its technology delivery system.

(ii) Irrigation Line of Credit Project (LIC) (1988-1997)

During FY 1988-89, DOI with WB assistance implemented the rehabilitation of FMIS, construction of new surface irrigation systems and groundwater irrigation system. These were run by farmers themselves with the overall objective of sustainably boosting agricultural production through the improvement of FMIS with active participation from farmers. The assistance was a pilot effort which covered the Far Western, Mid-Western and Western development regions of Nepal (38,054 ha). It was reported that 260 irrigation projects were rehabilitated (25,995 ha), including turnover of schemes (3,119 ha), rehabilitation of tube wells (421 ha) and new construction of surface irrigation schemes (4,730 ha).

Overall, project performance was good. Cropping intensity increased by 25% over the 125% project benchmark. Rice yield increased by 30%, wheat by 50% and maize by 50% over the benchmark data.

Farmers adopted a rotational practice of water distribution. Many agricultural trials, such as varietal trial, fertilizer trial, and cropping pattern trial, demonstrated considerable impacts on traditional farming techniques of the farmers.

(iii) Nepal Irrigation Sector Program (NISP) (November 1999-June 2004)

As a follow up of LIC, the NISP project was launched by DOI with financial assistance from WB in the Far Western, Mid-Western, Western and Eastern development regions, covering an irrigable area of 68,735 ha. The project was aimed at introducing reforms in the water resource sector on a national scale, contributing to the National Water Resource Development Plan. In general, it aims to increase the productivity of irrigation schemes through large-scale adoption of proven technical intervention. It was aimed to support the government with institutional and technical capability in water planning, management and orienting public agencies by handing over their O&M responsibility to user organizations.

The overall performance of the project as rated by the evaluation team was satisfactory (PPAR- 20 June 2008). Crop yields in FMIS and cropping intensity was better than the district coverage. Crop yield increased by 36% in Terai. Cropping intensity also increased by 47% as reported.

The projects led to adoption of the new National Strategy 2002 and the National Water Plan 2005 which were built upon the Water Resource Act and Regulation of 1992.

(iii) Bhairahawa Lumbini Ground Water Project (BLGWP) (1990-1999)

Located in Rupandehi District of western Terai, Nepal, BLGWP was financed by WB and implemented by DOI. The overall purpose of this project was to promote groundwater sources and to improve agricultural productivity in order to reduce poverty in Rupandehi District.

Altogether, 79 DTWs were installed to provide irrigational services in 9,249 ha of land. About 78 deep DTWs after installation were turned over to the WUAs for their own management and utilization.

(2) Development Trend of Major Projects Completed with ADB Assistance

The major projects completed include two agricultural development projects (Secondary Crops Development Project (1989-1904) and the Crop Diversification Project (2001-2006)), and four irrigation projects (Irrigation Sector Project (ISP) (1989-1994), Second Irrigation Sector Support Project (SISP) (1997-2003), Irrigation Management Transfer Project (IMTP) (1995-2004) and Community Groundwater Irrigation Sector Project (CGISP)(1999-2008)).

The agricultural development projects have addressed the strategies for the improvement of farm income. Secondary crops are to be increased through strengthening extension services for technical and market information, provision of credit and institutional development. This action has been done in the early of 1990s through the Secondary Crops Development Project (SCDP) and was later renamed as the Crop Diversification Project to address the strategies in increasing the production and market development for secondary crops in the early 2000. Recently, development strategies for agriculture are focused on addressing the development of commercial agriculture.

The irrigation development projects assisted by ADB have addressed first the strategies in enhancing the participation of farmers, cost sharing mechanism, responsibility of O&M works for irrigation

development and establishment of WUA. The WUAs follows the Irrigation Policy (1988) during the early 1990s. As ISP is introduced in the early of 2000s, the strategies of the projects were followed-up by SISP and IMTP. Therefore, the strengthening of WUA, the improvement of FMIS, the enhancement of extension services, the improvement of O&M works, and the turnover of management with participation of WUAs were emphasized to follow the Irrigation Policy 1992.

Also, the project has addressed the strategies to develop groundwater irrigation for small farmers through demand driven approaches and involvement of the private sector.

Recently, development strategies in surface irrigation projects address the rehabilitation of existing small and medium scale irrigation projects. The expansion of irrigation networks with improvement of the institutional aspect shall also improve agriculture productivity.

The outlines, objectives and achievement of the major projects are summarized below.

(i) Secondary Crops Development Project (SCDP) (1989-1994):

The ADB provided the SCDP to improve farm income and create rural employment opportunities by increasing the production of major secondary crops in six districts in the Mid-Western Development Region. The specific objectives of the project were to improve the productivity of secondary crops (grain legumes, oilseeds, potato, banana and others) and increase its return on investment; encourage the production of secondary crops to meet with its domestic requirements and increase export; and finally, help develop on-farm employment opportunities by widening on-farm income base of farmers and diversifying agriculture. The SCDP focused on farmers with an entrepreneurship outlook and aptitude, holdings of more than 0.5 ha for those in the mountainous and hilly regions, and above 1.0 ha in Terai. The project scope consisted of three components: (i) strengthening of extension services in technical and market information; (ii) provision of credit for secondary crops development; and (iii) institutional and management development covering the agencies involved in the Project.

The project was successful in contributing to food and nutrition security and livelihood enhancement by providing farmers with cash income and important nutritional source in their regular diet. The cultivation area of secondary crops, especially lentil, increased even in districts of the mid-hills and mountains. The demand led to agricultural extension services being made available to farmers. Extension staff were trained during the project and were motivated to deliver extension services and manage effective demonstrations to disseminated modern technologies to farming communities.

(ii) Crop Diversification Project (CDP) (2001-2006)

The CDP was prepared based on past experiences earned from SCDP, as well as other projects in agricultural and rural development. It was jointly funded by GON and ADB. The project scope included the provision of extension services for farmers groups; promotion of extension services of private sector, promotion of client oriented research activities; and support management.

The objectives of the project was to promote the production and marketing of agricultural crops with particular focus on secondary crops in pocket areas based on farmers group approach, thereby contributing to poverty reduction in poverty stricken areas of the mid western and far western development regions. The pocket area development approach for technically and commercially

feasible crops was identified in the strategy of CDP to attain the project objectives. Major achievements included the mobilization of increased number of farmer groups as well as women groups, involvement of private sector service providers including non-government organizations in social mobilization and technology dissemination, and increased farming areas under secondary crops including lentil, banana, potato, etc.

(iii) Irrigation Sector Project (ISP) (1989-1996)

The DOI implemented ISPs in 35 districts at eastern and central development regions with assistance from ADB. The Irrigation policy (1988) stressed the strategic approaches on participation of farmer groups and cost sharing mechanism for irrigation development and O&M works of canals.

As pilot tests of the approaches, DOI implemented CDCP focusing on farming communities which already managed traditional irrigation systems. DOI also provided programs to strengthen the WUAs' capacities in order to raise the livelihood of small rural farmers, reduce poverty level, and generate employment opportunities in rural areas.

The overall performance of the project remained satisfactory. The cropping intensity increased by 14% over a 149% bench mark.

(iv) Second Irrigation Sector Support project (SISP) (1997-2003)

SISP has been implemented as a follow up project of ISP. SISP was launched with the implementation of provisions for the Irrigation Policy (1992) which stresses the importance of participatory approaches of farmers in irrigation construction.

The project targeted farming communities which already managed traditional irrigation systems and strengthened WUAs in 35 districts of the central and eastern development region of Nepal. The project scope is limited to strengthening WUAs, improving FMIS, strengthening irrigation offices and providing agricultural extension services.

The project accomplished 278 sub-projects (FMIS) covering 39,757 ha from the planned 283 projects which covers 41,147 ha. About 278 WUAs were registered against 178 targets. Cropping intensity increased by 40% over the benchmark data of 170%. Agricultural yields of paddy, wheat and maize also increased due to the improvement in water availability.

(v) Irrigation Management Transfer Project (IMTP) (1995- 2004)

This ADB and United States Agency for International Development (USAID) financed and DOI operated management transfer project was aimed to support the 85 year development plan objectives and also to implement the Irrigation Policy 1992 provisions such as management transfer to WUAs.

The IMTP emphasized the need to improve the O&M of existing government operated projects through beneficiary participation and turning over O&M responsibilities. Total area transferred from the eight districts (Saptari, Dhanusha, Sarlahi, Chitwan, Nawalparasi, Kapilbastu, Kailali and Kanchanpur) was 45,563 ha.

Project performance increased considerably when irrigation system rehabilitation was finished (main branch, territory). The participation of WUAs also increased and intensive water distribution schedule

was implemented.

Capacity of 14 WUAs was developed to manage all branch canals of the jointly managed irrigation project, except for Panchakanya, which was fully turned over to farmers.

The average irrigation intensity increased by 27% and the productivity of irrigated paddy, maize and early paddy increased remarkably in three projects where farmers operated and maintained the branch canals.

(vi) Community Groundwater Irrigation Sector Project (CGISP) (1999-2008)

The CGISP was implemented with financial assistance from ADB and technical assistance from Canadian International Development Agency (CIDA). It covered 12 districts in Terai, mostly central and eastern Nepal, with the core theme of participatory tube well development integrated with agricultural support.

The main objectives of the project were to (i) increase agriculture productivity (ii) increase income of small farmers holding less than 1 ha through demand driven approach, and (iii) involvement of the private sector.

The project showed satisfactory performance in terms of increased irrigation intensity (from 58% to 224%). There was also increase in the productivity of paddy, wheat, maize, vegetables, etc. The total area developed under this program was 54,350 ha.

5.2.3 Projects Implemented by JICA

JICA has implemented one technical cooperation project on agriculture development in the Terai area and five studies on agricultural development in Nepal (two master plan studies and three feasibility studies).

Locations of the five study areas are broadly divided into two different physiographical areas, such as hilly area and Terai plain. The study area of the two agricultural development studies were done in the districts of Tarai plain, namely Jhapa, Sunsari, Dhanusha, Mahottari and Banke districts.

The outline, objectives and achievements of the technical cooperation project and the two studies in the Terai plain are summarized below.

(i) Janakpur Zone Agriculture Development Project (JADP) (1971-1984)

(a) Location and Objectives

JICA has implemented JADP in three districts, namely Dhanusha, Mahottari and Sarlahi, located in the Central Development Region. The project was implemented for 13 years from 1971 to 1984 as a technical cooperation project with objectives to raise the economic condition of farmers and to improve their living standards through enhancement of paddy, vegetables and fruit production; especially the production of improved seeds under stable groundwater resource development with linkage among related institutions.

(b) Main Activities of the Project

- Multiplication of improved seeds of vegetables and seedlings of fruits. To create vegetable and fruit farmer groups with stable crop production in all seasons by developing a year-round irrigation system using deep and shallow tube wells,
- To research marketing conditions with strengthening mechanism of market information in and around the scheme areas,
- To develop capacity building for farmer groups through the enhancement of extension service activities on technology,
- To improve management skill of farmer groups for increase of agriculture income to upgrade their living standards and
- To establish a model scheme to demonstrate vegetable and fruit production by introducing modern and scientific technologies.

(c) Achievement and Present Situation of the Project

By the end of the projects, 252 DTWs have been constructed and were being operated. At present, only 24% of the DTWs are still active, and the remaining 76% nonfunctional.

Main reasons for the nonfunctional DTWs are as follows:

- Relatively expensive cost of O&M works, especially electric power operation cost without subsidy and maintenance of pumps and generators
- Low financial profit for users due to lower farm gate prices of agriculture crops
- Shortfall of proper technical services,
- Higher risk of crop cultivation due to untimely repair and maintenance services of pump and motor, and
- Unavailability of original machine spare parts.

(d) Lessons learned

In case of the 24% area, maintenance works of groundwater irrigation facilities (DTW and pump) were carried out by WUAs or user groups. Present situation of the tube well system is as mentioned above.

Activities of the project such as production of improved paddy seeds and fruit seedlings still continued with the limit and narrow streamline of the project. Project activities always suffered from the shortfall of budget for operation and shortage of qualified and experienced staff for research and extension services.

Moreover, there are two research institutes in NARC, namely, the Rice Center and the Vegetable Research Center. These centers extend the improved varieties of paddy, vegetables and fruits near the JADP office. Two research institutes are still active in the production of seed for paddy and vegetables. Therefore, it seems that the potential of seed production and extension of an improved variety of paddy and vegetables are still big, subject to harmonious linkage among the three offices.

(ii) Two Studies in the Terai Plains

The two studies, namely, the Master Plan Study on the Terai Ground Water Resources Evaluation and Development Project (1995), and the Feasibility Study on the Sunsari River Irrigation Project (2003),

were aimed to increase cereal crop productivity and production, as well as increase agricultural income and alleviate poverty in the rural areas by developing irrigated agriculture.

Target areas of both studies are districts of Jhapa, Mahottari, Sunsari, and adjacent areas of the survey area.

The results of both the studies, issues and problems for agriculture development in the Terai plain were pointed out as shown below.

- Shortage of water resources for irrigation during winter season
- Shortage or lack of irrigation facilities, especially at farm level
- Low crop yield and cropping intensity
- Issue in the quality of fertilizer and fertilizer management
- Weakness of agricultural extension services
- Issues in marketing and related facilities

These issues and problems are almost similar with the issues and problems found out during the preparatory survey. Both the studies proposed the following development approaches:

- To include crop diversification
- To expand productivity
- To improve farm income
- To develop irrigation and drainage system
- To promote irrigated agriculture
- To develop basic rural infrastructure
- To improve irrigation policy

It was also recommended that the management and O&M of irrigation and drainage facilities and agricultural support facilities should be carried out by the WUAs and FG

These development strategies and approaches would have higher conformity to the directive strategies and approaches in formulation of irrigated agricultural development in Terai.

5.3 Lessons Learned from Projects and Directive Strategies

5.3.1 General

Analysis on issues, problems and lessons learned from past and ongoing projects with assistance of donors are made using available information, reports and documents. For the analysis, the projects are selected with the conditions that were implemented in Terai. Similar subjects were also selected in relation with irrigated agricultural development in Terai or in close relation with national development policies of the agriculture and irrigation sectors.

Furthermore, ongoing projects were selected as the minimum requirements for analysis because these projects have the most realistic conditions on the implementation of development projects. There are seven selected projects in the agriculture sector and six projects in the irrigation sector, including ongoing projects. The selected projects are as shown in Table 5.3.1 below.

Table 5.3.1 Selected Projects for Analysis on Lessons Leaned

No	Projects	Implementation Period	Donors
(1) Agriculture Sector			
1	Commercial Agriculture Development Project	2007-2013	ADB
2	Project for Agriculture Commercialization and Trade	2009-2015	WB
3	Nepal Food Crisis Response Program (NFCRP)	2010-2013	WB
4	Crop Diversification Project	2001-2006	ADB
5	Agriculture Research and Extension Project	1997-2002	WB
6	Secondary Crop Development Project	1989-1994	ADB
7	Janakpur Zone Agriculture Development Project	1971-1984	JICA
(2) Irrigation Sector			
1	Irrigation and Water Resource Management Project (IWRMP)	2007-2013	WB
2	Community Managed Irrigated Agriculture Sector Project (CMIASP)	2006-2013	ADB
3	Nepal Irrigation Sector Program (NISP)	1997-2004	WB
4	Community Ground Water Irrigation Sector Project	1996-2007	ADB
5	Irrigation Sector II Project (SISP)	1996-2002	ADB
6	Irrigation Management Transfer Project	1994-2001	WB

Source JICA Survey Team

5.3.2 Lessons Learned from the Development Projects in the Agriculture Sector

(1) Issues and Problems Analyzed in Agricultural Development Projects

Issues and problems on the implementation of the seven agricultural development projects mentioned above are reviewed in terms of eight elements of the project, as discussed below.

The issues and problems reviewed in each project are different, depending on the type of project and time frame of the project. Similar issues and problems are also found out, having no connection with the type of project and its time frame.

The issues and problems of each project are shown in SP-C-17 and broadly categorized in Table 5.3.2.

Table 5.3.2 Issues and Problems of Agricultural Development Projects

Major Elements of Project	Summary of Issues, Problems and Lesson Learned
Management of Project	(i) Delay in scheduling of subproject activities especially in infrastructure development (ii) Budget disbursement or allocation problems
Agriculture	No further action and performance of ACC on operational modalities
Marketing	(i) Inadequate market and marketing functionaries (ii) Weakness of market competitiveness due to higher production cost (iii) Web-based monitoring framework for marketing is incomplete
Community/Linkage	(i) Roles and responsibilities of stakeholders for project implementation were not specified. (ii) Inadequate coordinated effort among stakeholders
Planning / Management	(i) No systematic seed planning and production (ii) Unavailability of fertilizers and seeds with the desired quantity and improper delivery time (iii) Project design without participation of stakeholders
Technology / Technique	(i) Inadequate technical knowhow in application of modern technologies
Institutional Arrangement	(i) Social inclusiveness in the project was limited because of low literacy (ii) Very short time frame for institutional reform. Bank fund supported only the initiate.
Extension Services	(i) Weak agricultural project extension services reduced farmer access (ii) Limited number of extension staff was not in position to deliver extension services needed by farmers. (iii) Weak research and extension linkage slowed down modern technology transfer and dissemination process.

Source JICA Survey Team

The major issues and problems of projects implemented in the agriculture sector were summarized below.

(i) Institutional Aspect

Projects implemented with the involvement of multi-stakeholders face the issues of coordination between the government and its agencies, non-government organizations (NGOs), and the private sector. Weak coordination between research and extension as well as DOA and DOI has been observed in several projects. This resulted in low access of farming communities to modern technologies. It slows down the process of technology transfer, thereby making irrigation facilities not coinciding with the pocket production areas of agriculture. Furthermore, it has been observed that the number of trained extension staffs at service centers is limited to cater the needs of farmer groups. Frequent transfer of staff in the field and central level government institutions delays the project implementation process. Above all, their monitoring system is too low to keep staff motivated in delivering the desired outcome.

(ii) Market and Relevant Facilities/Structures and Networks

Inadequate market and marketing functions have hindered the achievements of the project since farmers could not sell on time or store their agriculture produce in appropriate storages. It has discouraged farming communities from adopting modern technologies with high yield potential in their field. Moreover, market information system is too weak and information dissemination is slow.

(iii) Availability of Agricultural Inputs

Agricultural inputs in terms of quantity and quality (such as seeds and fertilizers) are not available on time with limited irrigation facilities year round. This reduces the cropping intensity even in the

project area.

(iv) Policies and Legislation Support

National agricultural policies are not properly implemented to support farmer groups in pocket areas. Farmer groups and WUAs are not linked by any policy document; there is no mechanism to support/coordinate both groups. In past projects, public–private partnership was low. Private investment in the agriculture sector's research and development continues to be low.

(v) Conflict Management

Conflict situations severely affect the implementation of several projects and reduce the timely delivery of project outputs. It primarily affects field level activities including social mobilization and service and input deliveries. The staff lack the capacity and knowhow regarding conflict management in the field.

(2) Directive Strategies for Development in the Agriculture Sector

The issues and problems mentioned in the preceding section are the lessons learned. Considering these issues, major directive strategies for the development of the agriculture sector are brought out as one of the lessons learned. The directive strategies are categorized as shown in Table 5.3.3.

Table 5.3.3 Directive Strategies for Development of the Agriculture Sector

Major Elements of Project	Summary of Directive Strategies
Management of Project	Management of project should be carried out, timely addressing the project's issues and problems, transparent and objective criteria in institutional assessment, and high priority monitoring of project activities
Agriculture	It is essential to develop progressive farmer groups into model cooperatives and to involve farmers into agribusiness
Marketing	Development plan, practical production activities and other reinvestment activities in the agriculture sector should be linked with market development and marketing function. Sustainability of farm-market linkage has to be ensured.
Community / Linkage	(i) It is essential to promote private sector and NGOs in social mobilization and delivery of technology to farmers and farming communities. (ii) Role and function of stakeholder should be clear in supporting marketing and production activities. Harmonious linkage of stakeholder should be enhanced.
Planning / management	Project should be formulated with strategic planning such as broad based stakeholder participation, with appropriate vision and long term implementation modality.
Project Implementation	Projects should be implemented with the inclusion of literacy programs such as adult education and leadership training in areas where literacy is low. Trainings should be implemented at the initial stage of the project.

Source JICA Survey Team

The directive strategies for development in the agriculture sector are summarized below.

(i) Institutional aspects

The design and preparation of projects must be based on broad-based stakeholder participation, especially the project beneficiaries. It must reflect the country's national priorities to help establish full borrower ownership. Stakeholders must be involved in project planning, implementation and monitoring phases. Project activities should be launched with an awareness program at central and field levels with participation of multiple stakeholders. Roles and responsibilities of relevant

stakeholders have to clearly identify appropriate financial resources in the project document.

(ii) Market and relevant facilities/structures and networks

Production without access to the market discourages farmers to adopt new or improved farming technologies for increased production and income generation. Production planning, production activities and other investment activities in agriculture and rural development have to be linked with market development and marketing functionalities. Agricultural growth and production cannot be sustained without an assured marketing on agricultural produce.

The sustainability of farm to market linkages (backward and forward) has to be assured through a formal type of arrangement on a win-win basis between powerful market agents and small groups of producers. Failure to do so will discourage poor farmer groups to adopt its resources in agricultural commercialization.

(iii) Availability of agricultural inputs

Easy and fair access of agricultural inputs to farming communities has to be ensured when transforming subsistence agriculture to commercialization. Terai as the granary central of Nepal must receive improved quality seeds and fertilizers to increase its production, reduce poverty and livelihood of the people. The availability of these inputs has to be backed up by a year round irrigation facility available in the field. Commercial agricultural projects has supported the balance use of fertilizers and provided support for improving the irrigation facilities in Terai for semi-commercial and subsistence stakeholders. It has helped to improve the access of resources of poor farmers to inputs and irrigation water which resulted in increased high-value crop production.

(iv) Policy and legislation support

It is essential to promote private sectors as well as non-government organizations as change agents in social mobilization and technology delivery to farmers and farming communities. It has been observed that proper policy support to farming communities has helped farmers in Terai as indicated by the achievements of CADP. Farm to market time taken was reduced by 50.42% on the previous time taken. Postharvest and marketing losses decreased by an average of 45% while average farm gate unit prices of high value crops increased by 42.08% and average marketed volume per household has increased by 30.

(v) Conflict management

Conflict responsive/risk minimizing activities and approaches have to be considered in conflict affected/ prone areas during the project design and implementation phase. Central Terai is still facing security challenges. Certain factors have to be considered in the project preparation phase as a possible risk for project implementation.

5.3.3 Lessons Learned from Development Projects in Irrigation Sector

(1) Issues and Problems Analyzed in Irrigation Development Projects

Issues and problems of the six irrigation projects mentioned above are discussed from the view points of 12 project elements to be considered. Each project has a different time frame of implementation.

The types of project are also different although similar issues and problems were also found out.

The issues and problems of each project are shown in SP-C-18 and broadly categorized as shown below.

Table 5.3.4 Issues and Problems of Irrigation Development Projects

Major Elements of Project	Summary of Issues, Problems and Lesson learned
Dissemination of Project Implementation to Stakeholders and Communities	(i) Passive activities of executing body on dissemination (ii) Weak participation of farmers for the project due to inadequate and weak dissemination activities. (iii) Inconsistent dissemination and inadequate material information
Land Acquisition	Minor and small problems on land acquisition, to be solved by WUAs themselves, especially, in case of FMIS
Water Resource	(i) Decreasing trend of affected river water resources for deforestation in the watershed area (ii) Water shortage of water resource disregards rational and efficient water utilization
Soil Erosion and Land sliding	(i) Frequent soil erosion at bank canals (ii) Canal systems are affected and suffer from landsliding in hill side areas (iii) Poor water management due to sedimentation at canals and erosion of canal embankment
Flood	Damages of irrigation facilities, crops and farm land due to flood and inundation in paddy fields. Damages due to flood during monsoon season,
Construction / Supply of construction materials	Weakness on quality control of construction works
Agriculture and farm management including agricultural input	(i) No special/ intensive agriculture extension service, (ii) Only regular DADO extension service without linkage among all stakeholders. (iii) Availability of fertilizer and higher quality seed are limited and not assured.
Market and relevant facilities / infrastructures	(i) Generally, most projects do not make provisions on market development activities. (ii) Few projects had very limited provisions up to the collection centres. (iii) Middlemen dominantly carry out market trading, depriving farmers of potential gain.
Human resources	(i) DOI has qualified manpower, but has very limited amount of human resource. (ii) The same resource persons participate in trainings several times
Institutional aspects of government agencies for implementation	(i) Difficulty to coordinate among the diverse stakeholders including government agencies. (ii) DOI has capability to administer project implementation, but implementation may span for several years due to the limited budget. Also, it takes long time to complete the project (iii) Project level staff are loaded with other programs and also has to make decisions under political pressure. Low attention was given to M&E activities
Institutional aspect of WUA	(i) Large number of WUAs are not registered. (ii) WUAs do not have office spaces (iii) No special support programs to upgrade/enhance the capability of WUA. (iv) WUAs become defunct after project construction due to lack function of work sharing among WUA members. (v) Less attention is given for WUA capacity building activities.
Legal aspects for project implementation	Government regulation and act have not legally empowered functions of WUAs such as collection of irrigations service fee (ISF), vandalism prevention, and protection of canals and structures.

Source JICA Survey Team

Major issues and problems of projects implemented in the irrigation sector are summarized below.

(i) Dissemination for effective program implementation to side groups of users and stakeholders.

Issues on project information and dissemination to side groups of users and stakeholders were reported during the project implementation. Whenever program dissemination is initiated, only the main committee members are in attendance. Involvement of low-level WUAs is lacking. Inadequate project preparation with this kind of dissemination approach may lead to the weakening of WUA's

strengthening works. Furthermore, the dissemination approaches and materials were not consistent or uniform for all project level farmers.

(ii) Water resource

Deforestation in the upstream catchment area has posed a situation of water unavailability in the irrigation command area and has caused floods and landslides. Indication of water shortage during the winter crop season was also found.

(iii) Flood

Occasional flooding that hit irrigated areas were reported in some projects. There were complaints regarding flood projection budget not being made and included on the project in general. In special cases where forecast is made, mitigation measures like bank protection budget arrangement are estimated.

(iv) Agriculture and farm management

The DOA provides agriculture services intensively at irrigated areas. However, coordination, linkage and responsibility bearing between DOA and DOI appear to be very poor. As a result, there are no assurance of supply of fertilizers and seeds to farmers. Intensive agriculture input in the project area is also lacking.

(v) Market and relevant facilities/structure

Many projects did not incorporate marketing provisions in the project document. The middleman generally benefits more on the income generated from agricultural produce, thereby depriving farmers of the produces' potential benefit. There are some ADB projects such as CGISP which aims at increasing vegetable output at the collection center, however, the project could not move ahead due to poor mechanism of cooperative establishment. Farm-to-market linkage was also limited in terms of length.

(vi) Human resources

There is no doubt that for a smooth and quality outputs of the project, qualified project staffs are needed. DOI has many of them. However, the main problems are insufficient staff deputation, frequent transfer of staff and same resource person are being sent for training which hampers the project progress and quality of outputs.

(vii) Institution aspect of the Government

To achieve a successful implementation of projects, project organization with effective management capacity and a very strong institutional support are needed. It is also necessary to consult different stakeholders regarding project management and support.

However, there are situations when co-coordinating the diverse stakeholders and government agencies may deem very difficult. Certain circumstances have been experienced where there was weakness in the coordination and/or linkage among all stakeholders. Furthermore, certain decision making processes ware sometimes influenced by political persons.

(vii) Institutional aspect of WUA

Several WUAs are not yet officially registered and with no constructed offices. In this context, their capacity building and upgrading mechanism are not well established. In addition, same persons from the WUA members are trained for several subjects during capacity building training, leaving no work division among members.

(ix) Legislation support to WUA

WUAs have not yet been able to collect potential irrigation service fees (ISFs) to meet regular O&M activities of their canal system. No legal authority has been given to WUA to make the tasks mandatory. Furthermore, WUAs' control and management are weak in stopping vandalism of canals and structures, stealing of facilities such as gates, spindle, etc. and misoperation of gates.

(2) Directive Strategies for Development in Irrigation Sector

Considering the issues and problems mentioned above, the WUAs recognized them as one of the lessons learned. Major directive strategies for development in the irrigation sector were brought out. The directive strategies are categorized as shown in Table 5.3.5.

Table 5.3.5 Directive Strategies for Development in Irrigation Sector

Major Elements of Project	Summary of Directive Strategies
WUA	(i) Reorganization of WUA shall be required to enhance ownership of system and to improve operation of management activities and maintenance activities (ii) Improvement on the wide gap of WUA members' field activities and enhancement of human resources of WUA with regards to maintenance works and record booking needs. (iii) WUA should be established as a representative for the community and should participate at all stages of project implementation (iv) GON should provide training on water distribution and financial management to WUA in order to optimize the collection of ISF (v) Prolonging of the terms limit WUA officers (vi) Improvement of the WUA constitutional provision is needed in order to elect two-thirds of the members and retain one-third of the members (vii) Participation of WUA during project implementation should be enhanced to ensure security of construction works and low-cost option
Supporting Facilities for O & M works	WUA office should be established and constructed to sustain its roles and functions and to enhance all activities.
Agriculture and Farm Management	Agriculture extension services of the private sector give much impact to increase outcomes at the irrigated farm, land, and farmer groups are able to serve higher crop production. It is necessary to enhance the coordination with the private sector on the extension services.
Marketing	(i) It is necessary to improve or develop farm-to-market roads in coordination with both district and village development committees. (ii) It is also necessary to construct collection centers to help farmers easy access to markets and sell more of their produce. (iii) Irrigation projects should be designed using strong components to support irrigated agriculture and promote access to input and output marketing. There should be provision to deliver services not only through government organizations but also through other service providers like NGOs and the private sector.
Human resource	(i) It is necessary to increase to an adequate the number of qualified technical staff at field level; with training for capacity building. (ii) Other trainings for members of WUA are also necessary, especially women farmers. (iii) It is also necessary to prepare more compact and intensive training programs with ensured coordination among the agencies concerned
Community	It is necessary to enhance social mobilization in the community, to provide irrigation facilities and/or tube wells and to provide training program on agriculture extension services at village level. This is important in order to give a good impact, of which, WUA can act as a reliable facilitator between the Project and beneficiary groups for effective project implementation and sustainability.

Source JICA Survey Team

Major directive strategies for development in the irrigation sector are summarized below.

(1) Participatory Approaches on Project Implementation with Communities/WUAs/Farmers

For smooth and successful implementation of irrigation programs, it is important to enhance the dissemination on projects implementation through community meetings and consultation. Intensive strengthening of people awareness, prior to the commencement of implementation of irrigation development program / project, is also important.

Participation of WUA, project beneficiaries and the community should be enhanced at all stages of the project implementation to enhance ownership of irrigation facilities and responsibility of management.

(2) Supporting Facilities for O&M Works

WUA office should be constructed in order to intensify water management activities at the field level

and to enhance logistic activities such as keeping records, conducting regular meetings, operate diversified activities beyond O&M works, and establish linkages and communication with other supporting institution.

(3) Agriculture Development and Marketing

It is necessary to develop a unified and effective approach for agriculture extension and marketing among all stakeholders based on WUA for ensuring the linkage among government agencies as well as the private sector.

The design of irrigated agricultural development should involve strong components to promote access to marketing. There should be provision to deliver services not only through government organizations but also through other service providers like NGOs and the private sector. The economic condition of farmers cannot be improved without proper infrastructure and access to the market place.

(4) Human Resources

Several lessons appeared during the implementation of the past projects. Among them, the need to enhance the capacity buildings of the central and local government staff was pointed out, especially key persons such as administrative staff, financial staff and technical staff involved in project implementation.

The capacity building of other manpower such as resource persons of WUA and farmer groups are also needed in order to deal with their own demands reflected from field experiences.I t is also necessary to execute capacity building programs and training through field training program with experienced trainers and/or experts.

(5) Institutional Development

Capacity building program for WUAs and implementing agencies should focus on institutional to technical, financial and agricultural aspects. Not only this, WUAs need to be developed into multifunctional organization beside normal O&M implementation.

In addition, it was suggested that institutional capacity building of WUA, DOI and DOA should be executed prior to commencement of construction works and activities. Such is important in order to streamline all subsequent activities for smooth operation.

As a better process of capacity building for farmers and WUA, it is recommended to construct canal networks up to field canal networks with related structures. The process shall prove manageable water delivery service in line with execution of capacity building programs to sustain awareness of farmers and WUA on ownership

Furthermore, careful attention should be paid on the gaps among WUA members and/or WUA on existing knowledge and skill for better task performance in the field, sustainable activities in post construction phase and responsive adoption of improved technologies and practices.

It is also necessary to stagger the term limit for WUA members that are making provisions in the WUA constitution for the election of members to be retained by one third in order to sustain developed WUA capacity and managerial activities.

(6) Administrative Process of Project Implementation

The legislation on transfer of key persons should be improved mainly because of the frequent transfer of key leading personnel and the disturbance of budget management flow. Such activities were found out to result to considerable delay of project progress.

It is necessary to improve procedure on budget allocation, reimbursement and to decentralize budget expenditure for the boost up of performance and quality of project outputs.

(7) Legal Support to WUA

Several irrigation projects had experienced weak participation from WUAs as far as irrigation service fee (ISF), collection action, vandalism prevention action, and security action for irrigation canal structures.

For this, a legal entity for WUAs should be sorted out. A review on the institutional mechanism to link different activities of WUA, such as agriculture production activities and effective irrigation service delivery should be done.

5.4 Significant Issues and Problems in Relation to Irrigated Agriculture Development Program in Terai

In the agriculture sector, major issues and problems include institutional constraints on agriculture extension, supply management of seed and fertilizer and its mechanism and legal situation of farmer groups.

It is confirmed that these issues and problems are closely related in the formulation of irrigated agriculture development programs in Terai because the survey area has similar agricultural conditions such as agricultural activities and farmers groups.

However, new agriculture development strategies such as ADS emphasizes in improving agriculture from a type of agriculture with self-sustenance to commercial agriculture. The change in strategy is to increase agriculture income. It seems that the situation of agriculture in Nepal is in transition to new agriculture.

The issue and problems on commercial agriculture are not well clarified yet. However, it is necessary to remind the strategy on the formulation of irrigated agriculture development, especially the generation of agriculture income and marketing.

Major constraints relating to irrigated agriculture development in the Terai Plain are as shown below.

(i) Institutional Aspect

Projects implemented with the involvement of multi-stakeholders face issues of coordination between government agencies as well as the government, NGOs, and the private sector. Weak coordination between research and extension as well as DOA and DOI has been observed in several projects. The number of trained extension staff at service centers are also limited for them to be able to cater the needs of farmers groups.

Frequent transfer of staff at field and central level government institutions delays the project

implementation process.

Monitoring system is too low to keep staffs motivated to deliver the desired outcome.

(ii) Agricultural Inputs Availability

Agricultural inputs in terms of quantity and quality (such as seeds and fertilizers) are not available on time.

(iii) Policy and Legislation Support

National agricultural policies are not properly implemented to support farmers group in pocket areas. Farmers group and WUA are not linked by any policy document and there is no mechanism to support/coordinate both groups. Public–private partnership was also low.

The major issues and problems of the irrigation sector are focused in its constraints on human resources who are concerned with irrigation, on-farm water management, WUA system management, institutional and legal aspect of WUA and linkage among concerned stakeholders. These issues and problems on water resources and main canal system except for management problems of budget and project implementation, however, are not discussed in the projects.

It is sure that the issues and problems are generally related in the formulation of irrigated agricultural development in Terai because of the similar situation of WUA and the similar conditions of irrigation facilities in the survey area.

Major constraints closely related to the formulation of irrigated agricultural development are discussed below.

- Inadequate strategy and passive orientation of government agencies on development programs to stakeholders and users and lack of participatory approaches
- Improper consultation and irrigation services of government agencies to WUAs due to lack of capacity of government agencies (shortage of qualified staff and operation budget)
- Lack of institutional capacity building of WUAs, DOI and DOA,
- Lack of strategic development approach (lack of on-farm irrigation facilities and on-farm water management) or traditional approach from WUAs
- Poor or lack of institutional and policy supports for WUAs (lack of linkage and communication with other supporting institution, problems on WUA constitution, lack of possibility of multipurpose function of WUA)
- Lack of on-farm irrigation facilities (lack of WUA offices) to ensure sufficient management and year-round irrigation
- Poor implementation of projects due to lack and weak linkage of WUAs among all stakeholders
- No assurance of supply of fertilizers and seeds to farmers, and lack of intensive agriculture input in the project areas
- Lack of adequate management of WUAs, such as water management program, budget provision and practical control on water supply activities
- Lack of access roads to markets and collection centers
- Lack of marketing organization and self governance by legally empowered WUAs

CHAPTER 6 SCENARIO FOR IRRIGATED AGRICULTURE STRENTHENING IN THE TERAI PLAINS

6.1 Background for the Formulation of a Development Scenario

6.1.1 Request for a Technical Cooperation Project for GON

In July 2012, GON requested JICA to provide a technical cooperation project (TCP) entitled "Irrigated Agriculture Strengthening Project". Outline of the request is described below:

(1) Objectives

In the application form of GON, the following objectives are envisioned to be covered by the TCP:

- To increase irrigation efficiency of developed irrigation systems of the Medium Irrigation Project (MIP) implemented and funded by GON;
- To bring together irrigation and agriculture to enhance agricultural productivity by strengthening the coordination among the three line agencies, namely, DOI, DOA, and NARC.

The JICA Survey Team has discovered through field surveys and consultations with concerned officers that the number of MIP is very small among medium-scale irrigation projects since WB and ADB have also been assisting to rehabilitate such projects. Moreover, the objectives of the TCP are common for all surface irrigation projects. Accordingly, the JICA Survey Team proposed to select the irrigation project sites for the TCP on a broad scale without limiting to MIPs. This proposal of the JICA Survey Team was agreed by JCC and JICA.

(2) Overall Goal

The overall goal of the TCP is to increase irrigated agricultural productivity and income of farmers.

(3) Purpose of the TCP

The purpose of the TCP is to develop an adequate model of irrigated agriculture based on WUA.

6.1.2 Approach of the Survey

Taking the request of GON into account, the JICA Survey Team has carried out the literature review of the documents of previous projects, field surveys in the four districts such as the Farm Household Survey, and interview with government organizations such as DOI, DOA, and NARC in Kathmandu, DDC, DADO, IDDO, WUA and with farmers in the district level as well as other stakeholders such as cooperatives, mill owners, and marketing related entities in Kathmandu and at the fields.

The findings through the survey and consultation with stakeholders, planning for the TCP in relation to the GON policy, lessons learned, and issues and constraints, which are discussed in detail in the preceding chapters, are briefly presented in the following sections:

6.1.3 Issues and Constraints of Present Conditions

The issues and constraints of irrigated agricultural development in Nepal and the Terai plains including the target districts have been discussed in detail in Section 4.6. These were based on the

study results of the JICA Survey Team on the present conditions of irrigated agriculture, government policies, implemented and ongoing projects, and sample surveys. From the analysis, the JICA Survey Team identified the core issues in each category as shown in Table 6.1.1 below.

Table 6.1.1 Issues Identified in the Respective Component

No.	Agriculture	Irrigation	Institution	Marketing
1	Small farm plots owned by farmers	Difficulty of year-round irrigation	90% of farmers have not received agricultural extension services	Unfavorable price setting for agricultural products
2	Low productivity of paddy	Improper water management at on-farm level and significant irrigation water losses due to plot by plot irrigation method	Coordination between DOI and DOA is not sufficient	Poor storage and transportation
3	Low agricultural income	No water distribution plan	Majority of FGs and WUAs have been inactive or have stopped their activities	Weak public assistance for marketing
4	No cultivation schedule shared with stakeholders	Less awareness or no interest on the functions of WUAs	Women's participation in agricultural development activities is not enough	Weak dissemination of information on marketing

Source: JICA Survey Team

The details of the constraints derived from the issues are referred to in Tables 4.6.1 to 4.6.4 under Section 4.6.

6.1.4 Countermeasures and Potentials to Address Issues and Constraints

The countermeasures to sort out and resolve the issues and constraints are studied and identified throughout the survey period as tabulated in Tables 4.6.1 to 4.6.4. Furthermore, the potentials to materialize these countermeasures are likewise listed in detail in the said tables in Section 4.6.

6.1.5 Coverage under the Development Program

In order to sort out the issues and constraints, the JICA Survey Team considers the formulation of a comprehensive program for irrigated agricultural development in Terai. The program should include the contents of the request for the JICA technical cooperation from GON.

The development program can not necessarily cover all the issues and constraints shown in Tables 4.6.1 to 4.6.4. The items to be covered by the program are selected taking into consideration the following aspects:

- Consistency with the needs of the stakeholders in the areas and society;
- Consistency with the GON policy on irrigated agriculture;
- Consistency with the request of GON;
- Consistency with JICA's position paper;
- Sustainability of the program;
- Effectiveness of the program;
- Limitation of resources of the JICA cooperation program; and
- Risk factors.

The issues and constraints of irrigated agriculture in Nepal and the target districts which were studied in the preceding chapters as well as the possible coverage of support from the development program/TCP are summarized in Table 6.1.2 below:

Table 6.1.2 Issues and Constraints of Major Subjects for Irrigated Agriculture in the Target Districts of the Terai Plains

No.	Main Subject	Issue and Constraints	Causes
1.	Farmland	Irregularity of farmlands	Lack of efforts to level farmlands
		Complicated shaping of farmlands	No land consolidation works
2.	Main Irrigation System	WUAs and farmers are not informed on time and in detail on water distribution	Less communication between LDDO and WUA
			Less communication with WUA and between WUA and farmers
		Lack of repair for the main facilities	Lack of WUAs' participation in O&M
			Excess usage of water in some areas
3.	On-farm Irrigation System	Lack of appropriate facilities	No construction for a long period of time
			No proper O&M
4.	On-farm Water Management	Poor WUA's function in water management	Lack of on-farm irrigation facilities
			Lack of guidance to farmers by DOI
		Irregular water management	Lack of farmers' ownership
			Inequitable distribution of water
5.	Agricultural Technology and Practice	Less improved technologies and farm management	Weakened deliver services system by government institutions due to lack of funds
			Farmers do not use fertilizers and improved seeds in the proper way
		No cultivation schedule or cultivation schedule not implemented	Inadequate amount of farm inputs supply on time
			Inefficiency of regional and individual farm management
			Lack of coordination among institutions on service delivery
5.	Labor Shortage	Migration workers for domestic and abroad	Not enough income through farming
6.	Farmers' Organization (FO) / FG	Less activities	No legislation on FO and less support by GON
			Inadequate organizational capabilities and funds
7.	Funds for Agricultural Activities	Less access to agricultural credit	Inadequate credit facilities and enlightenment
8	Household Economy	Not much agricultural income	Low productivities
			Not much crop diversification
9	Marketing of Inputs and Produce	Unfavorable price setting for agricultural products	Weak bargaining power by farmers on market price
		Poor storage and transportation	Not much care on storage and transportation by farmers
			Lack of collection centers and its management
		Weak linkage among marketing stakeholders	Less awareness toward channelling farmers, public, and private sectors for the commercialization of agriculture
		Less information on marketing delivered	Market information source is limited
			Less instructions from JT/JTA on marketing

Source: JICA Survey Team

The direction of the development program is that the issues and constraints listed in Table 6.1.2 above have to be attended and improved by the cooperation program for the development of irrigated agriculture in the target districts.

The request of GON for the JICA cooperation envisages, as a goal, the improvement of agricultural productivity and increase of farmers' agricultural income through development of an adequate model

based on WUA. Accordingly, the development program shall be formulated to consist of a few phase-wise projects, taking into consideration the (1) establishment of an effective approach of irrigated agriculture development under the technical cooperation scheme in a limited area, (2) dissemination of the on-farm irrigation components of the established approach in other areas, and (3) development of the agriculture extension components of the approach in other areas.

6.2 Direction of the Irrigated Agricultural Development in the Target Districts

The background for the formulation of the development program was discussed in the preceding sections. Its formulation commenced in the identification of issues and constraints of irrigated agriculture followed by the proposal of countermeasures on the issues and constraints together with the clarification of the potentials to implement the countermeasures.

6.2.1 General Development Direction

The JICA Survey Team has observed in the field reconnaissance and surveys that in some areas farmers gather and actively participate in meetings; however, in most areas, farmers were either shy or reluctant to be involved in the discussions and in answering questions especially when officers and leaders were present.

From these observations, the bottom-level cohesion of farmers in various group activities needs to be strengthened for the implementation of the program and project.

The JICA Survey Team proposes to take the "community-based development approach" facilitated by the government officers to adopt bottom-up method on decision making to plan and implement the development program.

The following three steps shall be practiced to materialize the bottom-up method:

- On-farm development through community contract;
- Collective action applying the platform concept as discussed in Section 6.4.7 for the extension of agricultural technologies and farming skills; and
- Increase in market access through strengthening the linkage with stakeholders.

In order to implement the abovementioned steps, various trainings and workshops for the following subjects have to be carried out at the initial stage of the development program:

(1) For the Government Officers

- Trainings for upgrading skills and know-how on irrigation construction and management, agricultural production, and marketing;
- Trainings and workshops on facilitation for social mobilization and interaction with farmers in various irrigation and agricultural activities in the bottom-up method; and
- Trainings and workshops on organizational management and various activities.

(2) For the Farmers and Community Leaders

- Trainings and workshops for empowerment;

- Trainings for upgrading skills and know-how on irrigation construction and management, agricultural production, and marketing in simple and practical ways; and
- Trainings and workshops on organizational management and various activities.

6.2.2 Food Self-sufficiency

As discussed in Chapter 3, recently, the domestic production of cereals is self-sufficient and the surplus has been observed in the last three years. On the other hand, the import of rice in the last five years has been increasing annually. Taking into account the population increase, food self-sufficiency is important for Nepal's economy.

(1) Future Projection of Cereals Balance

Future consumptions of cereals are estimated as shown in Table 6.2.1 with the following assumptions:

- Cereal consumption in the future would be 193 kg per capita per year, the same as in previous years;
- Population increase ratio is 1.35% per annum, which is the same as the annual increment between 2000/01 and 2010/11 in accordance with the 2011 national census report; and
- Increment of cereal production is 5% in ten years.

Table 6.2.1 below shows the future projection of cereals balance between production and demand:

Table 6.2.1 Projection of Cereals Balance in the Future

No.	Description	2011/12	2021/22	2031/32
1	Actual and Projected Population (1000)	26,494.5	30,296	34,644
2	Quantity of Cereals Required	5,113.4	5,847.1	6,458.0
3	Cereals Produced / to be Produced	6,037.7	6,339.6	6,656.6
4	Balance	+924.3	+492.5	+198.6

Source: Prepared by the JICA Survey Team based on the data of the 2011/12 Census and production data in 2011/12

The cereal production would be sufficient even if the increment of production is only 5% in ten years.

The 5% increment of cereals in ten years might be very conservative taking into consideration the actual increment of cereals' production which is 79% for 20 years from 1991/92 (3,373,448 t) to 2011/12 (6,037,727 t).

(2) Future Projection of Rice Balance

As discussed above, despite the food sufficiency of cereals as a whole, the condition of paddy self-sufficiency became worse in recent years as the imports of rice have been increasing in the last several years as shown in Table 3.3.6 in Chapter 3.

The JICA Survey Team assessed possible self-sufficiency conditions in 2031/32, after 20 years of the highest ever paddy production in 2011/12 in Nepal assuming the following:

- The average unit yield of paddy would be 4.7 ton/ha in the Terai Region and 4.3 ton/ha in the Hill Region in 2021/22 and 5.0 ton/ha[1] and 4.5 ton/ha, respectively, in 2031/32 as the on-farm conditions would be improved as well as agricultural support with institutional strengthening is also implemented. Therefore, the motivation of farmers becomes higher, although the unit yields of paddy in 2011/12 in the Terai and Hill regions are 3,185 kg/ha and 3.041 kg/ha, respectively;
- In 2007, the irrigable area in Nepal is 1,251,400 ha[2] and GON has planned that 90% of the irrigable area would be provided with year-round irrigation by 2027[3], which is 1,588,642 ha. It is assumed that the irrigated area in 2031/32 would be 1,588,642 ha consisting of 1,255,027 ha and 333,615 ha in the Terai and Hill regions, respectively. Moreover, the irrigated area in 2021/22 would be 1,453,749 ha consisting of 1,148,462 ha in the Terai Region and 305,287 ha in the Hill Region by proportional estimation;
- The population is assumed in the same way as that of the cereals as discussed above; and
- The consumption of rice per capita per year will not be changed from the present value of 122 kg[4].

The results of the assessment are shown in Table 6.2.2 below.

Table 6.2.2 Projection of Rice Balance in the Future

(Unit: 1,000 Mt)

No.	Description	2011/12	2021/22	2031/32
1	Actual and Projected Population (1000)	26,494	30,296	34,644
2	Quantity of Rice to be Required	3,232.3	3,696.1	4,226.6
3	Rice Produced / to be Produced	2,766.9	3,690.8	4,368.8
4	Balance	-465.4	-5.3	+142.2

Source: Prepared by the JICA Study Team based on the data of the 2011/12 Census

As shown in Table 6.2.2 above, the demand and supply of rice in Nepal would be almost balanced in 2021/22, if the above assumptions are fulfilled, and rice will be self-sufficient in 2031/32.

6.2.3 Increase of Farmers' Agricultural Income

In accordance with the Farm Household Survey carried out by the JICA Survey Team, it was identified that the average agricultural income of the 120 sample households was around 35% of the total income. Approximately 44% of the households were below the poverty line of Nepal as discussed in Section 4.3.9. In this context, the increase of farmers' agricultural income is urgently attended to.

As shown in Table 4.3.26, the income of livestock, fruits, and vegetables in the agricultural income among farmers who operate less than 1 ha of farmlands, are higher than paddy sale although paddy production is the first priority in farming for food security. For other farmers, who operate more than 1 ha of farmlands, the income of livestock and fruits are significant. Taking these facts into account, the JICA Survey Team considered developing the agricultural plan of farmers, who operate farmlands of

1 There are more than 10% of farmers under the sample survey showing the unit yield exceeding 4.8 t/ha. This is one of the reasons to assume that the average yield of paddy would be 5.0 t/ha and 4.5 t/ha after 20 years in the Terai and Hill regions, respectively.

2 Final Report, Development of Database for Irrigation Development in Nepal, March 2007

3 Water Resources Strategy, Water and Energy Commission Secretariat, January 2002

4 Crop Situation Update, A Joint Assessment of the 2013 Winter Crops, MOA, FAO, & WFP

1-2 ha and whose present typical cropping pattern of farming is assumed as shown in Table 4.3.27 in Chapter 4. This will encourage agricultural diversification although increase paddy production would be the first priority.

Three farming plans are prepared as samples taking the following conditions into consideration:

- For fruit cultivation, only banana and papaya are listed since they could be harvested in a year and would generate income. It may take a few years to obtain income if mango, litchi, jackfruit, and other fruit-bearing trees are planted.
- Three dairy cows are considered for livestock management and could be carried out by family labor. The by-products of cereals and grasses available in the surrounding areas could be mainly used as forage. However, there are many options available such as goat and poultry rearing.
- Vegetables, onions, and chilies are taken up; however, there are many options.
- One household operates 1.37 ha of paddy area in addition to the homestead area of 0.1-0.3 ha.

(1) Farming Plan A

Table 6.2.3 shows that paddy cultivation in a 1.0 ha area is done during the summer season (rainy season) whereas chilli and onion in 0.2 ha each are cultivated in paddy fields during spring and winter seasons (dry season). Furthermore, papaya and banana in 0.2 ha and 0.17 ha, respectively, are also cultivated in paddy fields. A total of three cows are reared.

Table 6.2.3 Farming Plan A

Crop	ha	Net Income (Rs)	Prod. Cost (Rs)	Gross Income (Rs)	Cropping Schedule												Labor Requirement	
					1	2	3	4	5	6	7	8	9	10	11	12	Family	Hired
Paddy (by Seeder)	1	44,535	36,965	81,500													83	25
Chili	0.2	23,852	9,398	33,250													70	7
Onion	0.2	20,750	22,450	43,200													43	43
Papaya (Paddy field)	0.2	180,699	45,519	226,219													25	15
Banana (Paddy field)	0.17	22,682	15,001	37,683													21	13
Cattle (Homestead)	3 nos.	73,931	30,549	104,480													111	0
Total	1.77	366,449	159,882	526,332												**Total**	**353**	**103**

Source: JICA Survey Team

The net household income in Farming Plan A would be Rs366,449/year, which is Rs39,831/capita/year. This per capita income clears the poverty line in Nepal of Rs22,473 in 2012/13.

The labor requirement per year in Farming Plan A is 353 days for family labor which is composed of two persons (1 male and 1 female) and 103 days for hired labor, which could be arranged without difficulty.

(2) Farming Plan B

Table 6.2.4 shows that paddy cultivation in a 1.1 ha area is done during the summer season (rainy season) whereas chilli in 0.12 ha and onion in 0.05 ha are cultivated in paddy fields and homestead, respectively, during spring and winter seasons (dry season). On the other hand, papaya in 0.15 ha is cultivated in paddy fields and a total of three cows are reared.

Table 6.2.4 Farming Plan B

Crop	ha	Net Income (Rs)	Prod. Cost (Rs)	Gross Income (Rs)	Cropping Schedule												Labor Requirement	
					1	2	3	4	5	6	7	8	9	10	11	12	Family	Hired
Paddy (by Seeder)	1.1	48,989	40,662	89,650													91	28
Chili	0.12	14,311	5,639	19,950													42	4
Papaya (Paddy field)	0.15	135,525	34,140	169,664													19	11
Onion (Homesead)	0.05	5,188	5,613	10,800													11	11
Cattle (Homestead)	3 nos.	73,931	30,549	104,480													111	0
Total	1.42	277,943	116,603	394,544												**Total**	**274**	**54**

Source: JICA Survey Team

The net household income in Farming Plan B would be Rs277,943/year, which is Rs30,211/capita/year. This per capita income clears the poverty line in Nepal of Rs22,473 in 2012/13.

The labor requirement per year in Farming Plan B is 274 days for family labor composed of 2 persons (1 male and 1 female) and 54 days for hired labor , which could be easily arranged without difficulty.

(3) Farming Plan C

Table 6.2.5 shows that paddy cultivation in a 1.1 ha area is done during the summer season (rainy season) as well as 0.4 ha of early paddy (dry season). Chilli in 0.15 ha and onion in 0.15 ha are cultivated in paddy fields during spring and winter seasons (dry season). Papaya in 0.10 ha and banana in 0.17 ha are cultivated in paddy fields and a total of three cows are reared.

Table 6.2.5 Farming Plan C

Crop	ha	Net Income (Rs)	Prod. Cost (Rs)	Gross Income (Rs)	Cropping Schedule												Labor Requirement	
					1	2	3	4	5	6	7	8	9	10	11	12	Family	Hired
Paddy (by Seeder)	1.00	44,535	36,965	81,500													83	25
E. Paddy (by Seeder)	0.40	17,814	14,786	32,600													33	10
Chili	0.15	17,889	7,049	24,938													52	5
Onion	0.15	15,563	16,838	32,400													32	32
Papaya (Paddy field)	0.10	90,350	22,760	113,109													13	8
Banana (Paddy field)	0.17	22,682	15,001	37,683													21	13
Cattle (Homestead)	3 nos.	73,931	30,549	104,480													111	0
Total	1.97	282,763	143,948	426,710												**Total**	**345**	**93**

Source: JICA Survey Team

The net household income in Farming Plan C would be Rs282,763/year, which is Rs30,735/capita/year. This per capita income clears the poverty line in Nepal of Rs22,473 in 2012/13 as discussed in Section 4.3.8.

The labor requirement per year in Farming Plan C is 345 days for family labor which is composed of two persons (1 male and 1 female), and 93 days for hired labor, which could be arranged without difficulty.

6.2.4 Countermeasures Against Labor Shortage

Sowing/planting and harvesting seasons are the most critical period of labor shortage. According to the results of Sample Survey on Agricultural Activities, the percentage of labor cost of cereal, vegetable, and fruit cultivation to the total expenditure are 43%, 19.3%, and 27.1%, respectively, as shown in

Table 6.2.6. Consequently, problems on labor shortage are broadly influenced by cereal crop cultivation rather than other crop cultivations. In addition, labor requirement for the conventional method of paddy cultivation that depends on manual labor and animal power is very high. Therefore, adoption of mechanization, improvement of cultivation methods, and cropping system are necessary to solve labor shortage.

Table 6.2.6 Ratio of Cultivation Cost

Unit: %

Crop	Seeds/ Sapling	Fertilizer/ Manure/ Chemicals	Hired Labor	Family Labor	Rental of Machinery /Equipment	Irrigation	Others	Total Expense
Cereal	7.6	22.7	22.8	20.2	10.8	4.1	13.7	100
Vegetable	26.0	42.1	8.8	10.5	7.4	3.6	4.1	100
Fruit	29.7	7.1	14.2	12.9	0	0.8	35.4	100

Source: Prepared by the JICA Survey Team based on the Sample Survey on Agricultural Activities

(1) Mechanization

(i) Rent of machineries with proper system and cost

Almost all farmers do not have enough funds to purchase machineries on their own except large farmers, cooperative societies, or WUAs, who lend machineries to farmers and/or groups. In Morang District, 27 paddy farmers associated with local agricultural cooperative implemented a pilot project[5] using farm machineries such as tractor, paddy transplanter, and tractor mounted combined harvester to test the suitability of machines on a 24 ha land, and obtained good productivity. Results show that the overall farming cost was reduced to 28%. Details are shown in Table 6.2.7.

Table 6.2.7 Cost Comparison of Conventional and Mechanized Farming

(US $/ha)

Particular	Conventional Farming			Machanized Farming			Ratio
	Min	Max	Mean (1)	Min	Max	Mean (2)	(2/1)
Seed Cost	4.0	24.0	17.70	12.0	12.0	12.00	68%
Land preparation cost	45.0	138.0	80.69	29.0	59.0	40.38	50%
Nursery cost	7.0	36.0	17.17	9.0	39.0	20.45	119%
Transplanting cost	29.0	105.0	46.41	25.0	84.0	32.31	70%
cost for fertilizer	10.0	46.7	31.93	10.0	46.7	31.93	100%
Weeding cost	0.0	40.0	29.70	0.0	40.0	22.24	75%
Harvesting cost	60.0	127.0	90.48	38.0	90.0	62.81	69%
Total production cost	240.0	457.0	312.78	175.0	360.0	226.30	72%

Source: Results of the Pilot Project implemented by Buddha Air in Morang District under the company's "Corporate Social Responsibility" scheme

Costs of land preparation, transplanting, and harvesting are substantially reduced by mechanized farming.

(ii) Change cultivation practices by using small inexpensive machineries.

Introduction of manual small machines such as direct paddy seeder[6] and weeder can be practiced

[5] Buddha Air, a private airline, has introduced mechanized paddy production with a pilot project in Morang District, under the company's corporate social responsibility' scheme in 2009

[6] Direct paddy seeder is seeding directly and transplantation is not necessary.

individually by purchasing such machines. However, these small and inexpensive machineries for harvesting and threshing are not available. As a result, renting of these machineries is inevitable. Herbicide will be minimized if the manual weeder is introduced.

(2) Methods of Paddy Cultivation

It is possible to save on labor force and cost by adopting the following methods in order to change the cultivation methods other than the conventional manual transplanting methods:

(i) Direct seeding of paddy by manual seeder

About 20%-25% of costs will be reduced without transplanting by directly sowing paddy seeds through a row seeder. One person can complete the sowing of one hectare in half day. However, this method needs skills to level each parcel of paddy land as well as the levelling of water for germination. Weeding could also be made by a manual weeder.

(ii) Parachute paddy transplanting

Seedlings grow in plastic trays and each seedling is pulled and tossed into the mud after 2–3 weeks. Approximately 25%-30% of costs will be reduced and one to two persons can transplant one hectare within a day. However, it is difficult to use a manual weeder.

(iii) Using short maturity paddy variety

In Nepal, the shortest maturity paddy variety is Hardinath-1 (110 days/yield potential of 5.0 t/ha); however, there are many varieties with high yield potential (85-90 days maturity/yield potential 7–8.5 t/ha) in South Asian countries such as India and Sri Lanka. By utilizing this type of varieties, the total labor cost could also be reduced.

(3) Cropping System with Available Family Labor Force

As mentioned above, labor cost and labor force requirement for cereal crops are higher than that of other crops, especially because labor requirements are concentrated in the planting and harvesting period of cereals. In the case of fruit cultivation, labor forces and their costs are not concentrated in a certain period. Although initial investment of fruit such as seed/seedling is high, it could continuously obtain high profits within three to five years. Likewise, based on the available family labor, it is necessary to select the crops, crop sequences, and their combinations as well as the management systems/techniques used on a particular field over a period of years as the most profitable/efficient cultivation system. Thus, the farming management plans for individuals and area-wise farming management are also very important factors to effectively utilize the limited labor force/machineries in the area based on the seasonal cultivation schedule that would be prepared collectively.

6.3 Development Strategy

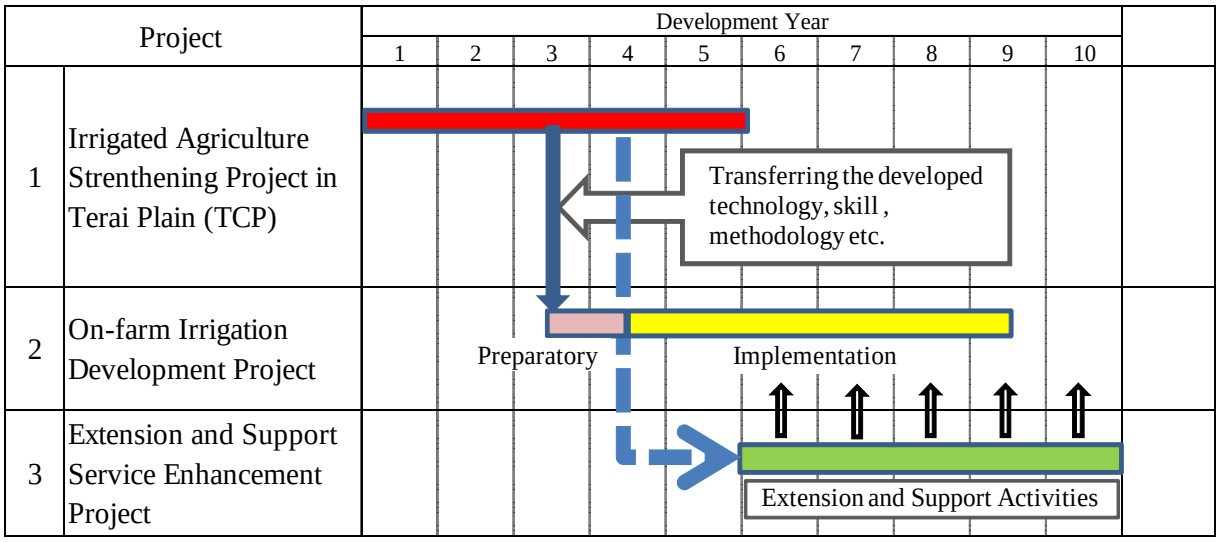
6.3.1 Formulation of the Development Program

The GON requested for JICA technical assistance to develop an adequate model of irrigated agriculture. However, stand-alone projects in the limited area and by limited people concerned may not be sustainable and not be widely disseminated. Therefore, some sort of sustainability plan to expand the approach of the project and scaling up into national framework would be required. In this

viewpoint, based on the result of the survey, the JICA Survey Team proposes the 10-year irrigated agricultural development program for Terai as described below:

6.3.2 Overall Structure and Schedule of the Development Program

The overall structure and schedule of the development program is proposed for ten years as shown in Figure 6.3.1 below.



Source: JICA Survey Team

Figure 6.3.1 Scenario and Tentative Schedule of Development Program

The proposed development program consists of three projects, of which implementation period is five years for each project. The first project is the pilot stage to introduce and implement effective irrigated agricultural development in the Terai Plain through "Irrigated Agriculture Strengthening Project". The second project is related to an on-farm irrigation development to expand the area of on-farm development that will be established in the first project and the third project is for extension support services enhancement in the second project area.

6.3.3 Potential Areas for Implementation

(1) Selection Concept

In selecting suitable candidate areas for the implementation of the development program, the JICA Survey Team examined the field conditions of not only MIPs sites but also large irrigation project sites. However, the irrigation project areas under the groundwater were excluded from the potential areas as the extent of the irrigable area is relatively smaller, although many WUAs of groundwater irrigation are functioning well at present.

Additionally, the first project (the requested TCP) aims to introduce and implement effective irrigated agriculture in Terai, and plans to introduce various new trials like community-based on-farm rehabilitation, improved agricultural technologies like farming management, seed varieties, and mechanization. Therefore, the first project should be conducted in an irrigation project area, which has better social, political, and economic conditions as well as natural perspectives.

(2) Criteria for Selection

As shown in Table 4.4.7, the total area under the surface irrigation attended by the DOI for construction and rehabilitation in the target districts is 255,500 ha. Almost all of the areas are required to improve its on-farm irrigation facilities. Accordingly, the total 255,500 ha area of the projects are the potential area for its implementation.

Priority of the project areas would be implemented under the development program by taking the following aspects into account:

- Availability of water for year-round irrigation;
- Headwork of the project is stable and functioning;
- Structures of main and branch canals are provided and functioning;
- Availability of the technical data of the project such as canal layout map, plan, discharge, and structural drawings; and,
- Existence of registered WUA and organizations handling O&M.

6.3.4 Outline of the Three Projects

(1) Irrigated Agriculture Strengthening Project (1st Phase Project)

This is the first phase of the development program, which was officially requested by GON aiming at introduction and implementation of effective irrigated agriculture in Terai. In this project, on-farm development with community contracts covering approximately 960 ha of irrigated area, relevant farmers, about 730 HH, and establishment of the coordination mechanism of stakeholders, government officers, leaders of WUAs and FG, cooperatives, and private sectors aim to improve farming practices and farmers' economy will be implemented on pilot basis.

Implementation period of the project is five years to complete various activities in pilot basis.

The Survey Team proposes the organizations that would be established jointly by GON with other stakeholders at the central and district levels.

The requested first phase project is subject to approval by GOJ. After the approval of the project, further details of the project including project design, activities, inputs, implementation arrangement, schedule, and cost estimate need to be discussed in the following mission.

(2) On-Farm Irrigation Development Project (2nd Phase Project)

This is the second phase of the program, which is expanding the experience and lessons learned under the pilot project for on-farm development to the other areas covering about 10,000 ha in the target districts. The project consists of on-farm development with community contracts, re-formulation of WUAs, and various trainings for strengthening WUAs and FGs.

(3) Extension and Support Services Enhancement Project (3rd Phase Project)

This is the third phase of the program for adopting the experience and lessons learned under the first phase project on the soft component of agricultural extension and support activities.

6.3.5 Policy Issues

In the Irrigation Policy 2003[7], defines the establishment of WUAs to be engaged in irrigation water management. However, there is no legislation on FOs except the concept of FG to receive agricultural extension services. DOA registers FG in connection with receiving agricultural extension services by DOA. Although the Cooperative Act allows farmers to establish agricultural cooperatives, the function is mainly on marketing of inputs and produce.

The JICA Survey Team made it clear with FOs to identify all kinds of agricultural activities including receiving extension services, subsidies, farmers' cooperation, marketing of inputs and produce, machine hiring services, and agricultural credit. The FOs shall be either legislated under WUA or under DOA, separately.

The JICA Survey Team would like to recommend to GON to provide a legislation relating to FOs from the experiences in Japan and Sri Lanka as shown in Table 6.3.1.

Table 6.3.1 Legislation of FO for Water Management and Agriculture

No.	Description	Japan	Sri Lanka
1	Irrigation, Water Management, WUA	Land Reform Act	Irrigation Ordinance
2	Farmers' Organization	Agricultural Cooperative Act	Agrarian Development Act

Source: Prepared by the JICA Survey Team

As an alternative to FO issues, it would also be possible to prepare a legislation to allow WUA to have functions on agricultural activities so that the association would be strengthened.

[7] It was informed by DOI that the irrigation policy was updated in August 2013. As the new policy is written in Nepalese language, it requires some time to translate and fully understand it.

CHAPTER 7 CONCLUSION AND RECOMMENDATIONS

7.1 Conclusion

7.1.1 General

In July 2012 GON requested JICA to provide a technical cooperation project (TCP) entitled "Irrigated Agriculture Strengthening Project" aiming at the development of an adequate model of irrigated agriculture based on WUAs focusing on the overall goal of improving agricultural productivity and increasing agricultural production in medium irrigation projects (MIP) including the strengthening of the coordination of the three line agencies, namely, DOI, DOA, and NARC.

In reply to the requests of GON, the JICA Survey Team was dispatched to Nepal to carry out the field survey and consult with concerned officers to formulate appropriate programs and projects in the four target districts in Terai so as to meet GON's requests. They later found out that the number of MIP among medium irrigation projects is very limited because WB and ADB have been assisting to rehabilitate medium-scale irrigation projects. Furthermore, the objectives of the requested TCP are common for all surface irrigation projects.

The JICA Survey Team identified many issues and problems of irrigated agriculture in Nepal as well as in the Terai plains including the target districts, such as (i) low productivity of paddy, (ii) low agricultural income, (iii) poor water management and weaknesses of maintenance works of irrigation canals, (iv) 90% of farmers have not received agricultural extension services, (v) majority of WUAs and FGs have been inactive or poorly participate in their activities, and (vi) poor storage and transportation for marketing.

It was clarified that agricultural production and productivities have suffered much from these issues and problems. Therefore, the JICA Survey Team considered countermeasures and potential solutions to the issues and problems, and formulated the irrigated agricultural development program in Terai as well as the target areas throughout the survey.

7.1.2 Production and Projection on Food Crop Balance in the Future

Based on the crop production data prepared by DOA, the cereal crops production have been recently self-sufficient, and the surplus has been observed in the last three years. However, the import of rice in the last five years has been increasing annually.

Taking the population increase into account, food self-sufficiency is important to Nepal's economy.

As the results of projection on cereals and paddy made by the JICA Study Team, cereal crop balance will be sufficient even if the increment of cereal production is only 5% in ten years, which is a very conservative ratio, taking into consideration the actual increment of cereals' production of 79% for 20 years from 1991/92 (3,373,448 t) to 2011/12 (6,037,727 t).

On the other hand, the condition of paddy self-sufficiency became worse in recent years as the imports of rice have been increasing in the last several years. The average yield for three years, 2009/10, 2010/11, and 2011/12, is estimated at approximately 2.3 t/ha in Mahottari District to 3.4 t/ha in Jhapa

District in Terai.

Based on the assumption of increments in population, the consumption of rice per capita per year, increment of paddy yield, and irrigation area, the rice balance is projected and that the demand and supply of rice would be almost balanced in 2021/22, if the above assumptions are fulfilled, and rice will be self-sufficient in 2031/32.

Therefore, increase of paddy production is one of the significantly indispensable components of agriculture in Nepal.

7.1.3 Agricultural Development Strategies and Irrigation Policies of GON

The objectives of agricultural development in the Thirteenth Three-Year Plan (TYP) and Agriculture Development Strategy (ADS) are to increase and improve agricultural production, and the irrigated agricultural development is focused on the agricultural development in Terai. As mentioned above, the agriculture in Nepal has recently achieved a nearly satisfied level for food security, especially on cereal crop production. However, paddy production is still at a deficit level and the agricultural income of framers is still low.

Hence, GON gives the strategies on the development of a year-round irrigation system through rehabilitation projects with GON's own resources and donor assistance, and enhancement of agricultural diversification to increase the agricultural income of farmers. Moreover, it aims to improve productivity in the overall national area, especially in the Terai plains because Terai is considered the national granary of Nepal.

In addition, the Irrigation Policy 2013 emphasizes the involvement of the private sector, cooperatives, and community-based organizations in the construction, operations, and management of irrigation systems with uniformity following the law in order to enhance the functions of WUAs and to increase job opportunities for farmers as well as rural people.

7.1.4 Issues and Constraints of Present Conditions

The JICA Survey Team identified the issues and constraints of irrigated agricultural development in Nepal as well as in the Terai plains including the target districts. They are based on the survey results on the present conditions of irrigated agriculture, government policies, lessons learned from implemented and ongoing projects, and sample surveys.

From the analysis, the JICA Survey Team identified core issues in the four categories of agriculture, i.e., (1) agriculture, (2) irrigation, (3) institution, and (4) marketing, as shown in Table 7.1.1.

Table 7.1.1 Core Issues in the Four Categories of Agriculture

No.	Agriculture	Irrigation	Institution	Marketing
1	Small farm plots owned by farmers	Difficulty of year-round irrigation	90% of farmers have not received agricultural extension services	Unfavourable price setting for agricultural products
2	Low productivity of paddy	Improper water management at on-farm level and significant irrigation water losses due to plot by plot irrigation method	Coordination between DOI and DOA is not sufficient	Poor storage and transportation
3	Low agricultural income	No water distribution plan	Majority of FGs and WUAs have been inactive or have stopped their activities	Weak public assistance for marketing
4	No cultivation schedule shared with stakeholders	Less awareness or no interest on the functions of WUAs	Women's participation in agricultural development activities is not enough	Weak dissemination of information on marketing

Source: JICA Survey Team

7.1.5 Formulation of Irrigated Agricultural Development Program

Under the current agricultural situation, the irrigated agricultural development programs are formulated, paying careful attention to the following: (i) request of GON to JICA on the irrigated agricultural strengthening project, (ii) needs of the development programs for rural areas, society, stakeholders and government agencies such as DOI, DOA, NARC, and target farmers, (iii) consistency of the policies and strategies of GON on irrigation and agricultural sectors, and (iv) the JICA Country Assistance Policy and position paper.

The GON has implemented many rehabilitation irrigation projects with assistance of donors in medium- to large-scale irrigation systems to enhance year-round irrigation system with developed programs on institutional improvement for water management and WUAs, agriculture extension, and integrated crop management. Their rehabilitation works have been focused on the rehabilitation of key structures such as headworks, and intake and diversion structures, except in the construction and/or rehabilitation of on-farm irrigation facilities. Therefore, even though the enhancement programs were executed, the envisaged targets on crop production as well as productivity have not always been sufficiently achieved and institutional deterioration of agricultural extension activities and functions of WUA have appeared. GON has recognized this shortfall of on-farm irrigation facilities as one of the reasons for the unsuccessful results of the rehabilitation projects.

Furthermore, GON has also obtained some lessons learned on the enhancement of water management from the four pilot projects, such as the Irrigation Management Projects (1985-1992), Special Program in Nepal (1995-1998), On-farm Management Subcomponent (1999-2002), and Integrated Crop and Water Management Program (2002/03). The lessons learned suggested the necessity to develop adequate on-farm irrigation facilities managed by the empowered WUAs, to provide reasonable incentives to field staff during meetings and workshops, to give power to WUAs as decision maker in

the platform[1] meetings, and to develop the management and financial capacity of WUA as a multifunctional entity. Moreover, at present, GON have been continuously implementing the Integrated Crop and Water Management Program (ICWMP) since 2002/03. However, GON is facing difficulty on the establishment of a practical model to be extended into other rehabilitated project areas for the improvement of water management at on-farm level.

The difficulty for GON on the establishment of sustainable and practical model for on-farm irrigation development as well as irrigated agricultural development in Terai shows very significant lessons in its formulation.

On the other hand, the JICA Survey Team considered that the implementation of GON's requested project ("Irrigated Agriculture Strengthening Project") alone could not improve the present issues and constraints of the target areas and Terai. Accordingly, it was proposed to plan and implement a medium-term agricultural development program to secure the sustainability of the pilot project.

7.1.6 Appropriate Development Approaches for Irrigated Agricultural Development in Terai

The following appropriate development approaches for the irrigated agricultural development program in Terai are principally suggested, considering the needs, consistency with development policies and development strategies of GON, and the difficulty of GON on the establishment of a sustainable and practical model for on-farm irrigation development as well as irrigated agricultural development in Terai:

(i) 1st Step: Introduction and implementation of the effective irrigated agricultural development at the pilot scheme area of the existing irrigation project

Taking into consideration the current difficulty and focusing of GON on the establishment of sustainable and practical model in Terai, it is recommended to give first priority to introduce and implement the effective irrigated agricultural development in the partial area of the existing irrigation project as the pilot scheme ensuring availability of water for irrigation at on-farm level.

(ii) 2nd Step: Dissemination of the pilot approaches to other irrigation areas for demonstration

The approach of the pilot project should be disseminated to other existing irrigation project areas, where the intake and main canal system of the projects have been rehabilitated and water availability for irrigation is ensured in branch canals with the appreciated cooperation among the existing district agencies as well as other stakeholders. The approach should be improved and upgraded depending on local conditions as well as the construction of on-farm irrigation facility.

(iii) 3rd Step: Follow up activities to enhance sustainability

After the first execution of the support programs, the follow-up activities on the support programs should be executed to sustain the implementation of the irrigated agricultural development.

[1] Platform is the district implementation structure of TCP to integrate IDDO, DADO, NARC, WUA, FG, and other stakeholders such as cooperatives and private sectors.

7.1.7 Proposed Irrigated Agriculture Development Program in Terai

The JICA Survey Team proposes the irrigated agricultural development program in Terai taking into account the demand on increase of paddy production, policies and strategies of GON, issues and problems of irrigated agricultural development, and appropriate approaches on irrigated agricultural development from lessons learned on past projects.

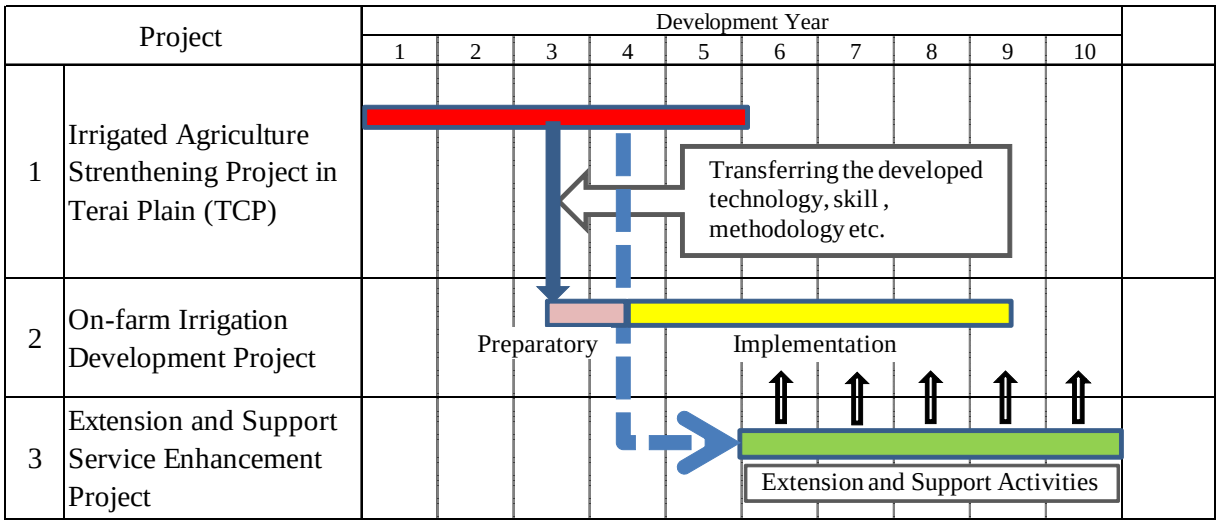
The proposed program shall consist of the following three projects;

(i) Irrigated Agriculture Strengthening Project,

(ii) On-farm development project, and

(iii) Extension and support service enhancement project.

The proposed implementation schedule of the program consisting of the three projects is shown in Figure 7.1.1 below.



Source: The JICA Survey Team

Figure 7.1.1 Proposed Implementation Schedule of the Integrated Agriculture Development

The implementation period of each project is five years, but taking into account the overlap period, the total program period is extended to ten years.

7.2 Recommendations on Implementation

(1) Implementation of the Other Two Projects of the Development Program

The JICA Survey Team would like to recommend to GON the following actions:

(i) Development and sharing of dissemination plan/strategy of the pilot approaches are to be established both for on-farm development with community contract and enhancement of extension and support services through simultaneous implementation of the requested project.

(ii) Implementation of institutional improvement of WUAs and FGs, and other inevitable development such as improvement of water management and farm management of other existing surface irrigation project areas, where rehabilitation works of headworks, intake structures, main and branch canals and

other relevant structures are already completed and faced malfunction problems on water management at the on-farm level.

(3) Others

The JICA Survey Team also recommends the following actions and activities, which should be clarified prior to commencement of the programs and projects:

(i) Set up of implementation structure with consent of DOI and DOA in order to ensure sustainable development of the program'

(ii) Budget for operational costs, facilities, and services to be provided by the GON initiative; and

(iii) Demarcation of project implementation in the proposed TCP area among the ongoing projects by other agencies and assisted by other donors, if necessary.