

**Water Resources Department (WRD),
The State of Rajasthan,
Republic of India**

**THE PREPARATORY SURVEY
ON
RAJASTHAN WATER SECTOR LIVELIHOOD
IMPROVEMENT PROJECT**

**FINAL REPORT
Advanced Version
Volume – I Main Report**

February 2017

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

NIPPON KOEI CO., LTD.

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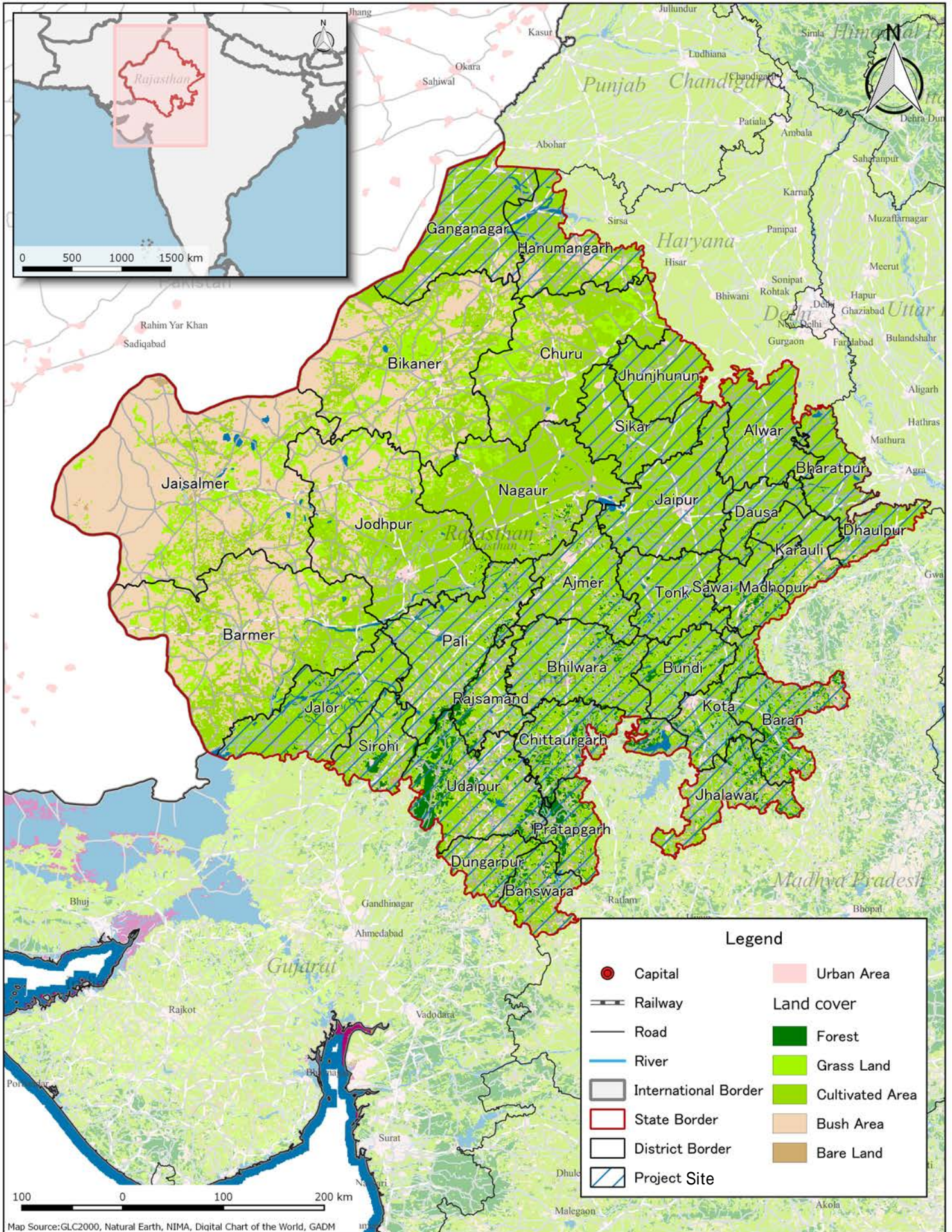
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Preparatory Survey on Rajasthan Water Sector Livelihood Improvement Project

Location Map of the Survey Area



- Photographs -

The Preparatory Survey on Rajasthan Water Sector Livelihood Improvement Project

 A photograph showing a long, straight canal filled with water, bordered by earthen banks. In the background, there are some trees and a few people standing near a small structure or bridge over the canal.	 A photograph of a large, shallow body of water, likely a water logging area. Two men are standing on the sandy bank in the foreground, looking towards the water. The sky is clear and blue.
<p>Irrigation water from <i>Indira Gandhi Nahar Priyonjna</i> (Hanumangarh District)</p>	<p>Water Logging Area (Ganganagar District)</p>
 A photograph showing a large field of green mustard plants. In the background, there are power lines and a clear sky. An inset photograph shows a close-up of a sprinkler irrigation system spraying water onto the crops.	 A photograph of a concrete canal structure, likely an outlet structure. Several people are standing on the concrete walls, and there are some rocks and debris on the ground in the foreground.
<p>Mustard cultivation with sprinkler irrigation (Hanumangarh District)</p>	<p>Field Survey for preparation of Model DPR (West Banas Irrigation Project, Sirohi District) Canal System (Outlet Structure)</p>
 A photograph showing a group of people gathered around a table covered with a colorful patterned cloth. They appear to be in a discussion or meeting. There are some plates of food on the table.	 A photograph showing a large group of people sitting on the ground in a circle, engaged in a discussion or meeting. They are outdoors, and there are trees in the background.
<p>Discussion with WUA (Bundi District)</p>	<p>Discussion with WUA (Hanumangarh District)</p>

Source : JICA survey team

- Photographs -

The Preparatory Survey on Rajasthan Water Sector Livelihood Improvement Project



Introduction Seminar on Japanese Technologies for Agriculture (Jaipur District)



Demonstration of Refractometer for officers from DoA/DoH (Jaipur District)



Interview with advanced farmers (Hanumangarh District)



Field survey of SHG and Farmers' club activities assisted by NABARD (Alwar District) Wheat cultivation with compost



Visit to Orange Processing Unit (NGO) (Jhalawar District)



Discussion with Women's Group (Hanumangarh District)

Source : JICA survey team

The Preparatory Survey on Rajasthan Water Sector Livelihood Improvement Project

Executive Summary

Background of the Project (1)

Present Situation of Agriculture and Irrigation in the Rajasthan State

Rajasthan State, located in the northwest of India, is the largest state in the country. Its land area is 342,239 km² with a population of 68 million (2011).

From the strategic view points of Japan, following points are noted:

1. In the state, there is “Neemrana Industrial Park for Japanese Firms”, which could be a center of agricultural food processing and marketing possibly.
2. “Delhi–Mumbai Industrial Corridor (DMIC)”, which contributes acceleration of transportation of goods and peoples of the state, will be developed soon in the state.

Because about 70% of the population is engaged in agriculture and the agriculture sector holds 30% of the state’s gross domestic product (GDP), the agriculture sector is considered to be one of the most important industries of Rajasthan. On the other hand, from the viewpoint of water resources, which is essential to agriculture, availability of water is very scarce because the state average annual precipitation is 584 mm, which is about 54% of the national average of 1,083 mm.

Background of the Project (2)

History of the Project

For the purpose of the increase and stabilisation of agricultural production in Rajasthan State, the Government of Rajasthan implemented the Rajasthan Minor Irrigation Improvement Project (RAJAMIIP) from 2005 to 2015 under a JICA official development assistance (ODA) loan. Following RAJAMIIP, Rajasthan WRD made a program whose final objective is the reduction of poverty through technical support to agricultural practice, enhancement of value added agriculture, and improvement of livelihood in addition to the rehabilitation of existing irrigation facilities. The Rajasthan WRD compiled such program as this Project, Rajasthan Water Sector Livelihood Improvement Project (RWSLIP), and requested a support for of JICA ODA loan.

Gender Mainstreaming

The state government put huge efforts on various activities, under strong initiative of the honorable chief minister of the state, to improve the status of women in the mainstreaming of development equality and to facilitate integration of women to the society. In line with such state policy, the Project includes several gender mainstreaming activities such as formulation of WUA women wing in water management and empowerment of women in agriculture.

Project Purpose

The development objective of the Project is to improve the livelihood of beneficiaries in the project target area through the following:

- i) Rehabilitation and modernisation of the existing medium and small irrigation schemes,
- ii) Establishment of sustainable operation and management system of irrigation facilities by implementing the participatory irrigation management on water users associations (WUAs),
- iii) Increase the productivities and improvement of quality of agriculture produce,
- iv) Improvement and diversification of food value chain in agriculture produce market by strengthening farmers' groups and promotion of high value-added produce, and
- v) Gender mainstreaming of women in agriculture sector.

Project Component

No	Component
Component-1	Participatory Irrigation Rehabilitation Works
Component-2	Fostering and Capacity Enhancement of Water Users Organizations
Component-3	Irrigated Agriculture Intensification and Diversification
Component-4	Agro-processing, Marketing, and Promotion of High-value Added Agricultural Produce
Component-5	Gender Mainstreaming in Agriculture and Water Sector
Component-6	Project Management and Monitoring
Component-7	Consulting Services

Overall Implementation Schedule

Non-disclosure information

Scope of Works

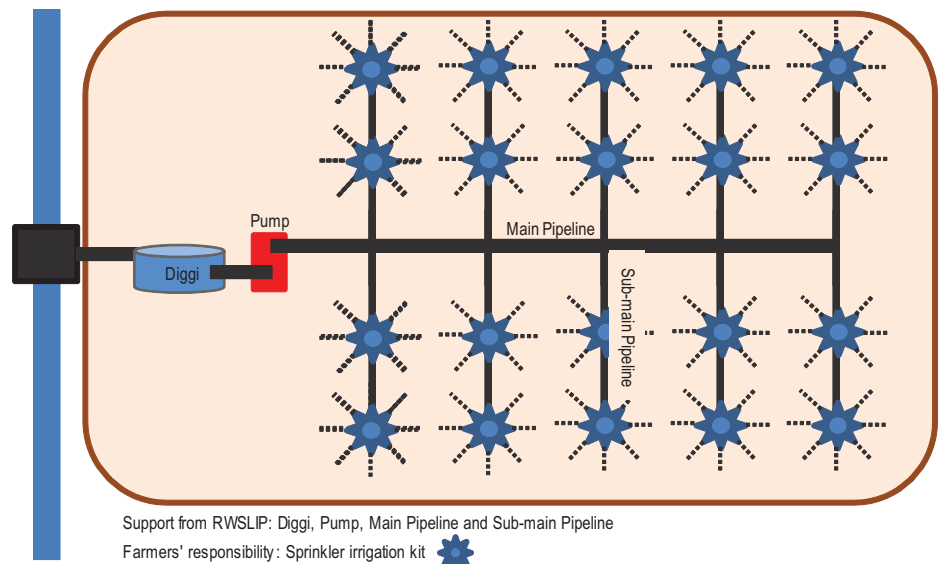
Component 1 : Participatory Irrigation Rehabilitation Works

Sub-component No	Scope of Works
1.1	Rehabilitation of Irrigation Facilities
1.2	Promotion of Micro Irrigation System
1.3	Introduction of Water Users Association (WUA) Constructive Facilities
1.4	Support to Women Friendly Activities

Highlight 1: Micro Irrigation

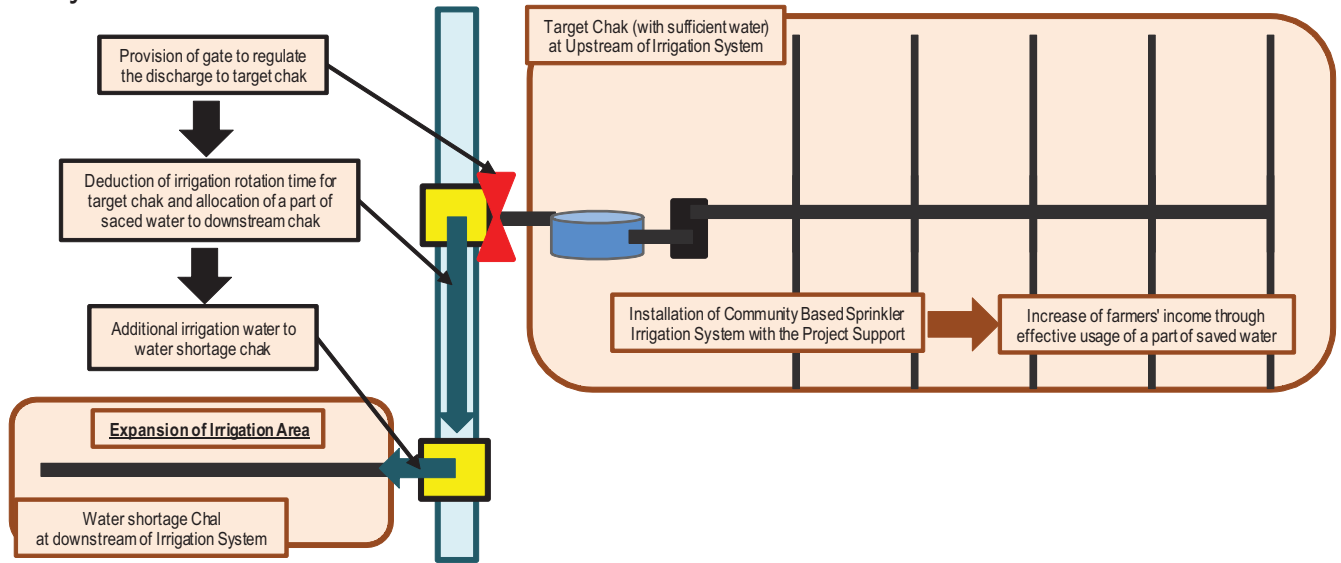
Purpose

- i) Expansion of irrigation area and increase of irrigation efficiency “within the target *chak*” through effective use of water saved through the introduction of sprinkler irrigation system
- ii) Expansion of irrigation area and increase of irrigation efficiency “at the downstream water shortage *chak*” through additional irrigation water supply from the target *chak* using a part of saved water.



Highlight 1 : Micro Irrigation

Method for generating additional irrigation water supply from upstream *chak* to the downstream: Using a part of saved water which will be created by introduction of micro irrigation system.



Support Conditions from Project depending on Allocation of Water to Downstream Chak

Estimated Water Saving Effect	Allocation of water to Downstream Chak	Benefit in the Target Chak	Project Support	Farmers' Responsibility (with Government Subsidy)
36%	20%	16%	Full support (diggi, pipeline system and pump w/solar panels)	Sprinkler irrigation kit
	10%	26%	Partial support (diggi, pipeline system and pump wo/solar panels)	Solar panels and sprinkler irrigation kit
	0%	36%	No support from RWSLIP	Full responsibility

Scope of Works

Component 2: Fostering and Capacity Enhancement of Water Users Organizations

Sub-component No	Scope of Works
2.1	Establishment of WUA Support Mechanism
2.2	Capacity Building of WUA Management
2.3	Improvement of Agriculture Linkage
2.4	Corpus Fund for WUAs

Scope of Works

Component 3: Irrigated Agriculture Intensification and Diversification

Sub-component No	Scope of Works
3.1	Training of Trainers for Agriculture
3.2	Exposure Visit for Agriculture Trainers
3.3	Improvement of Agriculture Support System
3.4	Agriculture Farmer's Training
3.5	Agriculture Demonstration farm

Districts Targeted in Agriculture and Marketing

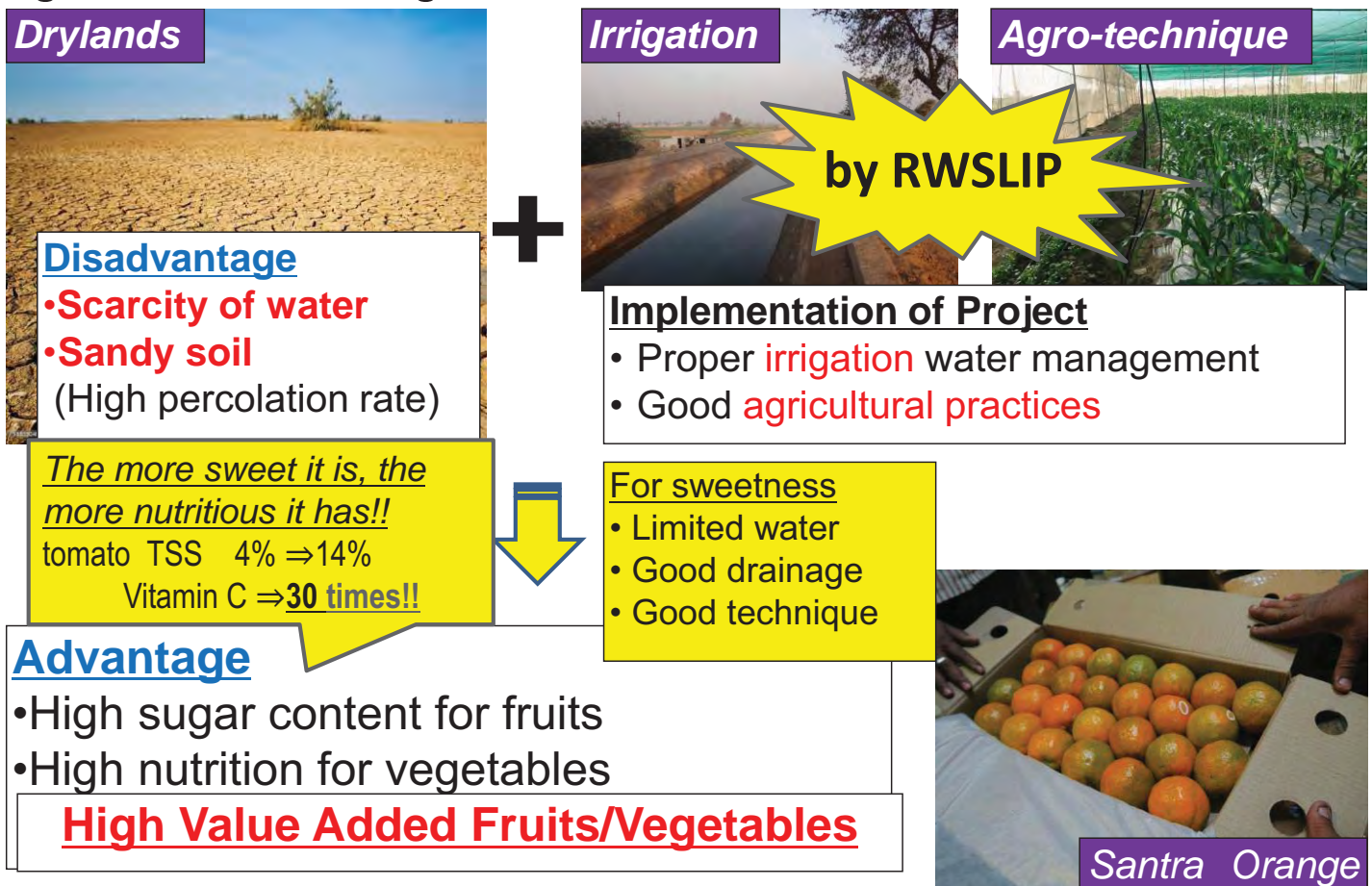
Area	Produces	No.	Location / variety	Targeted Districts
Tourist places	Exotic vegetables	1	Ajmer	Ajmer
		2	Alwar	Alwar
		3	Sawai Madhopur	Sawai Madhopur
		4	Jaipur	Jaipur, Tonk
		5	Jodhpur	Jodhpur, Pali
		6	Chittorgarh	Chittorgarh
		7	Udaipur	Udaipur
Citruses production Area	Kinnow mandarine	1	Hanumangar	Hanumangar
		2	Ganganagar	Ganganagar
	Santra orange	1	Jhalawar	Jhalawar
		2	Kota	Kota
Agro Food Park	Cereals, pulses, oilseeds	1	Ganganagar	Ganganagar, Hanumangar
		2	Jodhpur	Jodhpur, Pali
		3	Kota	Kota, Bundi, Baran, Jhalawar
Mega Food Park	Cereals, pulses, oilseeds	1	Ajmer	Ajmer, Sawai Madhopur
Agro Export Zone	Spice seeds	1	Corinader	Kota, Bundi, Baran, Jhalawar, Chittorgarh
		2	Cumin	Nagaur, Barmer, Jalore, Pali and Jodhpur

Scope of Works

Component 4: Agro-processing, Marketing, and Promotion of High-value Added Agricultural Produce

Sub-component No	Scope of Works
4.1	Farmer interest groups (FIG) Formulation for Cooperative Activities
4.2	Connecting with Large-size Consumers (matching meeting)
4.3	Connecting with Small-size Consumers (exotic vegetables)
4.4	Brand Building for High-value Agricultural Produce

Highlight 2 : Agro-processing, Marketing, and Promotion of High-value Added Agricultural Produce



Highlight 2 : Agro-processing, Marketing, and Promotion of High-value Added Agricultural Produce

Fruits and vegetables in Rajasthan have higher sugar content than those of products in Japan

Cucumber

Himachal: 4.0%

Chandigarh: 3.5%

	Orange	Cucumber	Tomato	Fruit Tomato
In Japan	12-14 %	2-3 %	4-5 %	8-10 %
In Rajasthan	14-16 %	8 %		10 %



Comparison: High Value Added Fruits/Vegetables

- (1) Organic → Invisible (cannot check it instantly)
 → Need the certificate
 → Not tangible (cannot feel it)
- (2) Sugar-content → Visible (can check instantly by Refractometer)
 → Tangible by the taste




Handy Refractometer
(Available in India)

Scope of Works Component 5 : Gender Mainstreaming in Agriculture and Water Sector

Sub-component No	Scope of Works
5.1	Supporting the Institutionalisation of Gender Mainstreaming in Water Management
5.2	Enhancement of Women's Capability and Participation in WUA
5.3	Capacity Building on Agricultural Technologies through SHGs

Highlight 3: Gender Mainstreaming: Women Friendly Facilities

Contents: Through participatory approach with the women wing, women friendly facilities shall be design and constructed along the canals. It is expected that the members of the women wing would be motivated and empowered by learning through those activities.	
Expected Budget	1% of estimated cost for the rehabilitation of canal system
Activity	<ul style="list-style-type: none"> • Discussion and settlement among women wing members. • Selection of facilities <ul style="list-style-type: none"> ✓ Steps/stairs ✓ Foot bridges ✓ Other ideas to be developed by women themselves
	
Responsible Organisation	Construction and management: WRD Facilitation: WCD

Highlight 4: Gender Mainstreaming: Women Friendly Trees

Contents: By planting trees along canals, environmental conditions in/around the project sites should be conserved. At the same time, the women wing could be empowered through operation of those trees including financial support by income generated by trees and its fruits.	
Expected Budget	Number of trees/WUA: 1,667 INR 120 / tree, 1 tree / 3 m and 5 km / WUA
Activity	<ul style="list-style-type: none"> • Discussion and settlement among women wing members • Selection of tree varieties • Discussion and decision of operation and maintenance system • Actual operation
Responsible Organisation	Preparation: WRD Facilitation and management: WCD

Highlight 5 : Gender Mainstreaming in Participatory Irrigation Management (Revision of PIM-Act)

In order to secure project activities by women member in WUA, following clause shall be included in the present PIM-Act. The WRD and JICA mutually agreed to revise the PIM-Act with following clauses.

- (1) Formulate long-term as well as annual action plans of gender mainstreaming in WUA, and establish monitoring system
- (2) Allowing participation of both men(husband) and women(wife) from a member household in WUA meetings
- (3) Formation of Women's Wing in WUA
- (4) Women's ratio of 33% of WUA Committee
- (5) One seat for the representative of Women's Wing in the WUA Committee

The Preparatory Survey
on
Rajasthan Water Sector Livelihood Improvement Project

Final Report

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Abbreviations

AAO	Assistant Agricultural Officer	CWC	Central Water Commission, Ministry of Water Resources
ACD	Agricultural Credit Disbursement	CWL	Culturable Waste Land
ACL	Agro-Climatic Zones	DAP	Daily Activity Profile
AE	Assistant Engineer	DARE	Department of Agricultural Research & Education
AES	Agriculture Extension Services	DC	Distributary Committee
AEZ	Agri Export Zone	DCR	Domestic Consumption Rates
AFP	Agro Food Parks	DDP	Dairy Development Program
AIBP	Accelerated Irrigation Benefit Program	DEA	Department of Economic Affairs
ANI	Artificial and Natural Insemination	DEE	Directorate of Extension Education
APEDA	Agriculture and Processed Food Export Development Authority	DF/R	Draft Final Report
APFMISA	Andhra Pradesh Farmers Management of Irrigation Systems Act	DMIC	Delhi Mumbai Industrial Corridor
APIS	Agro-Product Industry Scheme	DMPCU	District Milk Producers Cooperative Unions
APMC	Agriculture Produce Marketing Committee	DoA	Department of Agriculture
AR	Annual Report	DoC	Department of Cooperative
ASS	Agricultural Support Services	DoC	Department of Cooperative
AWP	Arid Western Plain	DoH	Department of Horticulture
B/C	Benefit Cost Ratio	DOI	Irrigation Department
BCM	Billion Cubic Meter	DOP	Department of Planning
BDO	Block Development Officer	DPR	Detail Project Report
BE	Budget Estimated	DPST	Development Plan for Scheduled Tribes
BIP	Bureau of Investment Promotion	DRR	Directorate for Resettlement and Rehabilitation
BLT	Base Level Training	DSP	Dam Safety Project
BPL	Below Poverty Line	DTSG	District level Technical Support Group
BSR	Basic Statistics of Rajasthan	E&M	Engineering and Management
CAD	Command Area Development	EAC	Expert Appraisal Committee
CAMP	Command Area Micro Plan	EC	Environment Clearance
CCA	Cultivable/Cultivable Command Area	EE	Executive Engineer
CDG	Cooperative Demonstration Group	EGR	Economic Growth Rate
CE	Chief Engineer	EIA	Environmental Impact Assessment
CEO	Chief Executing Officer	EIRR	Economic Internal Rate of Return
CF	Cluster Federation	EMG	Environment Management Guidelines
CFS	Cattle Feed Sale	EMoP	Environment Monitoring Plan
CGM	Chief General Manager	EMP	Environment Management Plan
CGRH	Central Government for Rural Housing	EPA	Environmental Protection Agency
CHC	Community Health Centres	ERR	Economic Review of Rajasthan
CO	Community Organizer	ESC	Environmental and Social Consideration
COE	Centre of Excellence	ESMF	Environment and Social Management Framework
COP	Cost of Production	ESMS	Environmental and Social Management System
CPC	Central Processing Center	ESS	Environmental and Social Safeguards
CPCB	Central Pollution Control Board	ESZ	Eco Sensitive Zones
CPI	Consumer Price Index	F/C	Foreign Currency
CRP	Community Resource Person	F/R	Final Report
CRW	Canal Rehabilitation Works	FC	Forest Clearance, Farmer's Club
CSO	Civil Society Organizations	FCA	Forest Conservation Act

FCP	Farmers' Club Programme	IFMS	Integrated Finance Management System
FI	Financial Intermediary	IGNP	<i>Indira Gandhi Nahar Priyonjna</i>
FIA	Farm Input Agencies	IMR	Irrigation Management Research
FIG	Farmer Interest Groups	IMTI	Irrigation Management and Training Institute
FIRR	Financial Internal Rate of Return	INM	Integrated Nutrition Management
FM	Field Manual, Farm Mechanization	IPM	Integrated Pest Management.
FO	Farmer's Organizations	IREDA	Indian Renewable Energy Development Agency Ltd
FOB	Free on Board	ISO	International Organization for Standardization
FOM	Field Operation Manual	IT/R	Interim Report
FPA	Forest and Protected Areas	ITDA	Integrated Tribal Development Areas
FPC	Farmers Producer Company	IWRM	Integrated Water Resources Management
FPF	Food Processing Fund	JE	Junior Engineer
FPO	Farmer Producer Organizations	JICA	Japan International Cooperation Agency
FSC	Famer Services Centre	JNNSM	<i>Jawahar Lal Nehru</i> National Solar Mission
FSI	Forest Survey of India	KAFP	Kota Agro Food Park
FSPM	Farm Sector Promotion Fund	KAFFPUOA	Kota Agro Food Park Unit Owners Association
FVC	Food Value Chain	KC	<i>Kisan</i> Clubs
GC	General Condition	KCC	<i>Kisan</i> Credit Card
GCA	Gross Command/Cropped Area	KPC	<i>Kisan</i> Producer co./Coop.
GDP	Gross Domestic Product	KVK	<i>Krishi Vigyan Kendras</i> (Agriculture Science Centres)
GHG	Green House Gases	L/C	Local Currency
GIA	Gross Irrigated Area	LAA	Land Acquisition Act
GIS	Geographical Information System	LC	Letter of Credit
GoI	Government of India	LDP	Livestock Development Policy
GoR	Government of Rajasthan	MADA	Modified Area Development Approach
GRB	Gender Responsive Budget	MCT	Multi Crop Thresher.
GSDP	Gross State Domestic Product	MCWC	Mother and Child Welfare Centres
GSI	Geological Survey of India	MF	Ministry of Finance
GSS	Government Strategies and Schemes	MFP	Mega Food Park
GVI	Government Veterinary Institution	MFPI	Ministry of Food Processing Industries
GWD	Ground Water Development	MFPS	Mega Food Park Scheme
HRIS	High Resilience Irrigation System	MGNREGA	Mahatma Gandhi National Rural Employment Guarantee Act
HSC	Health Sub Centres	MGNREGS	Mahatma Gandhi National Rural Employment Guarantee Scheme
IAY	<i>Indira Awas Yojana</i>	MHRD	Ministry of Human Resources Development
IC/R	Inception Report	MIS	Micro Irrigation System, Management Information System
ICA	Irrigable Command Area	MM	Milk Marketing, Minutes of Meeting
ICAR	Indian Council of Agricultural Research	MMISFA	Maharashtra Management of Irrigation Systems by the Farmers Act
ICDS	Integrated Child Development Services	MMR	Maternal Mortality Rate
ICLP	Integrating Crop and Livestock Production	MoCI	Ministry of Commerce and Industry
ICR	Implementation Completion Report	MOD	Minutes of Discussion
ICSA	Indigenous Communities and Social Assessment	MOEF&CC	Ministry of Environment, Forest & Climate Change, Government of India
IDC	Interest During Construction	MOU	Minutes of Understandings
IDM	Integrated Disease Management	MP	Milk Procurement
IEBR	Internal & Extra Budgetary Resources		
IESC	Integration of Environment and Social Consideration		

MPP	Malaria Prevention Program	PC	Project Coordinators, Project Committee
MS	Methods of Survey	PCA	Project Components and Activities
MWMS	Modernized Water Management System	PCB	Pollution Control Boards
NABARD	National Bank for Agriculture and Rural Development	PCC	Pollution Control Committee
NADP	National Agriculture Development Plan.	PDCA	Plan Do Check Action
NADS	National Agriculture Development Scheme	PDCS	Primary Dairy Cooperative Societies
NAIP	National Agricultural Innovation Project	PEA	Project Executing Agency
NAIS	National Agricultural Insurance Scheme	PESA	<i>Panchayat</i> (Extension to the Scheduled Areas) Act
NARO	National Agricultural Research Organisation	PHC	Primary Health Centres
NBA	National Biodiversity Authority	PHM	Post Harvest Management
NBM	National Bamboo Mission	PHR	Poverty Headcount Ratio
NEP	National Environment Policy	PIM	Participatory Irrigation Management
NFM	National Horticulture Mission	PMU	Project Management Unit
NFP	National Forest Policy	PO	Partner Organisations
NFPM	National Food Processing Mission	PoP	Package of Practices, Pilot Project
NFSM	National Food Security Mission	PPC	Primary Processing Centers
NGO	Non-Governmental Organization	PPI	Participatory Planning and Implementation
NGT	National Green Tribunal	PPP	Public Private Partnership
NIA	Net Irrigated Area	PR	Project Report
NIAM	National Institute of Agricultural Marketing	PS	Panchayat Samities
NMAET	National Mission on Agriculture Extension & Technology	PSK	<i>Pashu Seva Kendra</i>
NMOOP	National Oil Palm Mission	PST	Preparatory Survey Team
NMPB	National Medicinal Plant Board	PV	Photovoltaic
NP	National Parks	PVTG	Particularly Vulnerable Tribal Groups
NPPW	National Perspective Plan for Women	QAM	Quality Assurance Management
NPSP	National Protein Supplementation Program	R&R	Resettlement and Rehabilitation
NPV	Net Present Value	RACP	Rajasthan Agriculture Competitiveness Project
NRCSS	National Research Centre on Seed Spices	RAJAMIIP	Rajasthan Minor Irrigation Improvement Project
NREGA	National Rural Employment Guarantee Act	RAJEEVIKA	Rajasthan <i>Grameen Aajeevika Vikas Parishad</i>
NRLM	National Rural Livelihood Mission	RCC	Reinforced Cement Concrete
NRMP	National Resettlement and Rehabilitation Policy	RDPRD	Rural Development and Panchayat Raj Department
NSA	Net Sown Area	RE	Revised Estimation (Budget)
NSSO	National Sample Survey Organisation	RFMIS	The Rajasthan Farmers' Participation in Management of Irrigation Systems
NWIC	National Water Informatics Centre	RHDS	Rajasthan Horticulture Development Society
NWP	National Water Policy	RIC	Rights of Indigenous Communities
O&M	Operation and Maintenance	RIF	Rehabilitation of Irrigation Facilities
ODA	Official Development Assistance	RIICO	Rajasthan State Industrial Development and Investment Corporation Ltd.
OEI	Other Education Institutes	RIPA	Rajasthan State Institute of Public Administration
OF	Organic Farming	RIPS	Rajasthan Investment Promotion Scheme
OJT	On- the- Job Training	RKVY	<i>Rashtriya Krishi Vikas Yojana</i> (National Agriculture Development Program)
OMR	Organisation and Management Reforms	RMSFS	Risk-Minimizing and Subsistence-oriented Farming Systems
OPPA	<i>Odisha Pani Panchayat Act</i>	RRB	Regional Rural Banks
PACS	Primary Agricultural Credit Societies	RRBWRPA	Rajasthan River Basin and Water Resources Planning Authority'
PAU	Punjab Agriculture University		

RSAMB	Rajasthan State Agriculture Marketing Board	SWOT	Strength (S), Weakness (W), Opportunity (O), and Threat (T)
RSBB	Rajasthan State Biodiversity Board	SWP	State Water Policy
RSPCB	Rajasthan State Pollution Control Board	SWR	Surface Water Resources, Shadow Wage Rate
RSWP	Rajasthan State Water Policy	SWRC	State Water Resources Council
RSWRAC	Rajasthan State Water Resources Advisory Council	SWRPD	State Water Resources Planning Department
RVIP	River Valley and Irrigation Projects	T&V	Training and Visit
RWSLIP	Rajasthan Water Sector Livelihood Improvement Project	TC	Territorial Constituency
RWSRP	Rajasthan Water Sector Restructuring Project	TCA	Total Cropped Area
SAP	State Agriculture Policy	TDF	Tribal/ Vulnerable Communities Development Framework
SAPROF	Special Assistance for Project Formulation	TDP	Tribal/Vulnerable Communities Development Plan
SAU	State Agriculture University	TNFMIS	The <i>Tamil Nadu</i> Farmers' Management of Irrigation Systems
SBI	State Bank of India	TOR	Term of Reference
SC	Scheduled Caste, Steering Committee	ToT	Training of Trainers
SCADA	Supervisory Control And Data Acquisition	TRA	Total Reported Area
SCDP	SC Development Plan	TSG	Technical Support Groups
SCF	Standard Conversion Factors	TSS	Total Soluble Solids
SDAH	State Departments of Animal Husbandry	TWD	Tribal Welfare Department
SDPR	Sample Detailed Project Reports	TWSM	Traditional Water Security Management
SE	Superintending Engineer	UN	United Nations
SEAC	State level Expert Appraisal Committee	UNFCCC	United Nation Framework on Climate Change
SEIAA	State Level Environment Impact Assessment Authority	UV	Ultra Violet
SER	State Economic Review	VAT	Value Added Tax
SERP	Society for Elimination of Rural Poverty	VC	Vulnerable Communities
SES	Solar Energy Systems	VCA	Value Chain Analysis
SFAC	Small-Farmers Agri-business Consortium	VCDP	Vulnerable Communities Development Plan
SFPM	State Food Processing Mission	VCIS	Vulnerable Communities and Implementation Schedule
SFR	State Forest Report	VLEO	Village Level Extension Officer
SGA	State's Geographical Area	VO	Village Organisation
SHG	Self Help Groups	VP	Village Panchayats
SIAM	State Institute of Agricultural Management	VVV	<i>Vikas</i> Volunteer <i>Vahini</i>
SID	Survey, Investigation and Design	WB	World Bank
SIP	Stagewise Implementation Program	WBOM	World Bank's Operational Manual
SIS	Surface Irrigation System	WBOP	World Bank Operational Policy
SLCC	State Level Coordination Committee	WBSP	World Bank Safeguard Policy
SPCB	State Pollution Control Board	WCD	Department of Women and Child Development
SPIP	Solar Pump Installation Programme	WDA	Water Deficient Area
SPP	Solar Power Plants	WDP	Women Development Plan
SRA	Society Registration Act	WDT	Water Disputes Tribunal
SRR	Seed Replacement Rate	WE	Women Empowerment
SSA	Soil Salinity Assessment	WEB	Well-organised Executing Body
SSWR	Safe and Sustainable Water Resources	WHO	World Health Organisation
ST	Scheduled Tribe	WIC	Water Intensive Crop
STDF	Scheduled Tribe Development Framework	WPP	Wind Power Plants
SWAT	Soil and Water Assessment Tool	WR	Western Rajasthan
SWC	Soil Water Conservation	WRA	Water Regulatory Authority

WRCM	Water Resources Conservation and Management	WSR	Water Scarce Region
WRD	Water Resource Department	WUA	Water Users' Association
WRIS	Water Resources Information System	WUATSG	Water User Association Technical Support Group
WRP	Water Resource Projects	WUO	Water User Organization
WRPES	Water Resources Planning & Environmental Sustainability	WW	Women Wing
WSP	Water Sector Projects	WWC	Water-wise Crops

Measurement Units

Area

cm² = Square-centimetre(s)
m² = Square-metre(s)
km² = Square-kilometre(s) (1,000,000 m²)
ha = Hectare(s) (10,000 m²)
acre = Acre(s) (4,046.8 m² or 0.40468 ha.)
bigha = 0.16ha

Length

mm = Millimetre(s)
cm = Centimetre(s)
m = Metre(s)
km = Kilometre(s) (1,000 m)

Currency

USD = United State Dollars
USD 1.0 = JPY 113.1 = INR 67.0
(as of 1st April 2016)
JPY = Japanese Yen
INR = Indian Rupee

Volume

cm³ = Cubic-centimetre(s)
m³ = Cubic-metre(s)
L = Litre(s) (1,000 cm³)
Pl = 10⁻¹² Litre (s)
MCM = Million Cubic Metre(s)
BCM = Billion Cubic Metre(s)

Weight

g = Gram(s)
kg = Kilogram(s) (1,000 gr.)
ton = Metric Ton(s) (1,000 kg)
t = Metric Ton(s)

Time

sec = Second(s)
min = Minute(s) (60 sec.)
hr = Hour(s) (60 min.)

Indian Numbering

Lakh(s) = Hundred Thousand (100,000)
Crore(s) = Ten Million (10,000,000) or
100 lakhs

CHAPTER 1 INTRODUCTION

1.1 General

This is a final report prepared by the JICA survey team for the Rajasthan Water Sector Livelihood Improvement Project (RWSLIP), hereinafter referred to as “the Project”, which was agreed upon between the Water Resource Department (WRD) of the State of Rajasthan in the Republic of India and the Japan International Cooperation Agency (JICA).

1.2 Background of the Project

Rajasthan State, located in the northwest of India, is the largest state in the country. Its land area is 342,239 km² with a population of 68 million (2011). Because about 62% of the population is engaged in agriculture and the agriculture sector holds 23.6% of the state’s gross domestic product (GDP), the agriculture sector is considered to be one of the most important industries of Rajasthan. On the other hand, from the viewpoint of water resources, which is essential to agriculture, availability of water is very scarce because the state average annual precipitation is 584 mm, which is about 54% of the national average of 1,083 mm.

In order to cope with such limited water resources, irrigation has been developed for a long time. According to the Project Report (PR) of RWSLIP prepared by the Rajasthan WRD, 25.6% of the total cultivation area of 18.3 million ha is irrigated. However, these old irrigation facilities became increasingly degraded due to insufficient maintenance and such degradation causes various problems such as decrease of water flow due to leakage and/or sedimentations and difficulties of adequate water distribution. As a result, stable production is not secured and the farmer’s income from agricultural activities is not improved. Furthermore, such condition is one of the reasons of Rajasthan State’s high poverty ratio at 24.8%, which is the 13th worse amongst the 29 states in India. In order to reduce such high poverty ratio, livelihood improvement through rehabilitation of irrigation facilities, stable water supply, and increase of production are the urgent issues for Rajasthan State.

For the purpose of the increase and stabilisation of agricultural production in Rajasthan State, the Government of Rajasthan implemented the Rajasthan Minor Irrigation Improvement Project (RAJAMIIP) from 2005 to 2015 under a JICA official development assistance (ODA) loan. In addition to the rehabilitation of the irrigation facilities, the project enhanced and organised water users associations (WUAs) that are the main actors of the operation and maintenance of the facilities rehabilitated under the project. In addition, farming support activities were implemented in collaboration with the Department of Agriculture (DoA) and contributed to the improvement of agricultural production. In order to disseminate these achievements to other areas, Rajasthan WRD made a program whose final objective is the reduction of poverty through technical support to agricultural practice, enhancement of value added agriculture, and improvement of livelihood in addition to the rehabilitation of existing irrigation facilities.

The Rajasthan WRD compiled such program as this Project and submitted the PR to JICA for request of JICA ODA loan.

1.3 Objectives of the Survey

The objectives of the survey are to collect and analyse the necessary data and information listed below, and to formulate and evaluate the Project based on the lessons learnt from the result of RAJAMIIP for smooth appraisal of the ODA loan project funded by JICA.

- | | |
|---------------------------------|--|
| Data Collection and Analysis | Project Formulation and Evaluation |
| ▪ Irrigation facilities, | ▪ Components of the Project, |
| ▪ Farming practice technique, | ▪ Implementation schedule, |
| ▪ Mechanisation, | ▪ Institutional arrangements for implementation, |
| ▪ Vegetable cultivation, | ▪ Procurement, |
| ▪ Water users association, | ▪ Implementation plan, |
| ▪ Food processing, | ▪ Total project cost, |
| ▪ Agricultural value chain, and | ▪ Natural and social environmental considerations, |
| ▪ Gender mainstreaming. | ▪ Economic and financial evaluation, |

- Operation and effect indicators, and
- Suggestion necessary for implementation of the yen loan project.

1.4 Survey Area

In total, 27 districts in Rajasthan State (districts where the candidate irrigation sub-projects are located, except the desert area).

1.5 Implementing Agency

The implementing agency of the Project is the Rajasthan WRD, which is responsible for irrigation projects. Meanwhile, the technical supports for farming and water users association will be implemented in collaboration with the other organisations and departments such as Department of Agriculture (DoA), Department of Horticulture (DoH), and non-government organisations (NGOs). In addition, collaboration with the Department of Women and Child Development (WCD) will also be essential for the activities on gender issues.

1.6 Scope of the Survey

In order to accomplish the above objectives, the JICA survey team will carry out the survey taking into consideration that “the survey results will be dealt with the basic material for loan appraisal”, “the survey results should include the particular focus points for the appraisal work by JICA”, and “the environmental social considerations should be examined carefully”. The survey will be compiled into reports, and finalised through discussion with the relevant departments in Rajasthan State.

CHAPTER 2 PRESENT CONDITION OF SURVEY AREA

2.1 National and State Policy for Agriculture and Irrigation Sector

India is basically an agriculture-oriented country. Agriculture is the primary source of livelihood in the rural area which constitutes 70% of India's population and 75% of the deprived populace, i.e., scheduled caste (SC) and scheduled tribes (ST). Agriculture growth is a prerequisite for the sustainable economic and social development of the nation. Irrigated agriculture contributes more than 50% of the agriculture output. The gap between created and utilized agriculture potential is widening. The water sector is now encountering a challenging situation and four issues are of particular concern, i.e.: productivity, sustainability, investment, and financial discipline along with water management.

2.1.1 National and State Policies for Irrigation Sector

(1) National Water Policy

A national water policy (NWP) is formulated by the Government of India (GoI) to govern the planning and development of water resources and their optimum utilization. The first NWP was adopted in September 1987, subsequently modified in 2002, and finally adopted in 2012. The NWP seeks to address issues such as scarcity of water; inequality in its distribution; and lack of unified perspective in planning, management, and utilization of water resources. Under the constitution, states have the authority to frame suitable policies, law, and regulation on water. The NWP proposes an overarching national legal framework of general principles on water which can be used by the states to draft their own legislation on water governance. The scenario of water resources and their management generated several concerns, namely:

- Frequent variation in availability of water that results in occurrence of related disasters such as flood and increased erosion;
- Inadequate access to safe drinking water and water for sanitation and hygiene continues to be a problem;
- Groundwater, although a community resource, continues to be perceived as individual property. It is exploited inequitably and without any consideration for sustainability; and
- Grossly inadequate maintenance of existing irrigation infrastructure results in wastage and underutilization of available resources. As a result, there is a widening gap between irrigation potential created and utilized.

Details of the NWP such as basic principles and main features are given in Attachment 2.1.1.

(2) National Rural Employment Guarantee Act

The National Rural Employment Guarantee Act, also known as the "Mahatma Gandhi National Rural Employment Guarantee Act" (MGNREGA), is an Indian labour law and social security measure that aims to guarantee the 'right to work' and ensure livelihood security in rural areas by providing at least 100 days of guaranteed wage employment in a financial year to every household whose adult members volunteer to do unskilled manual work.

The primary objective of the act is augmenting wage employment for the poorest of the poor while the secondary objective is to strengthen natural resource management through works that address causes of chronic poverty, like drought, and thus encourage sustainable development. The act is an attempt to provide a legal guarantee of employment to anyone in rural areas willing to do casual manual labour at a statutory minimum wage. MGNREGA marks a paradigm shift from all precedent wage employment programmes. It provides a statutory guarantee of wage employment. It also provides a rights-based framework for wage employment. Employment is dependent upon the worker exercising the choice to apply for registration, obtain a job card, and seek employment for the time and duration that the worker wants. At least one third of individuals to whom work will be allocated shall be females. MGNREGA has extensive inbuilt transparency safeguards.

(3) State Water Policy (SWP)

In 2005, the Government of Rajasthan (GoR) adopted a draft state water policy (SWP), which was in conformity with the NWP, that outlines the government's development framework for the long-term sustainable development and management of water resources in the state. The SWP was further refined in 2010 and finally adopted. The SWP is in line with the best international practices in the water sector, radically shifting from predominantly engineering-based solutions to local community-based water management solutions. The Rajasthan State Water Policy, 2010 also describes the critical status of water in the state.

The objective of the SWP is:

- To adopt an integrated and multi-sectoral approach to water resources planning, development, and management on a sustainable basis taking river basin / sub-basin as unit.

Main features of the SWP are as follows:

- For water resources management and planning purposes, the order of priority has been fixed, giving highest priority to supply of safe drinking water for human and livestock consumption followed by agriculture use.
- The integrated water resource management (IWRM) approach will be adopted.
- Water resources will be developed in a well-planned way.
- All new projects shall be planned based on micro watershed planning so as to ensure equity in the use of surplus water.
- Priority will be fixed for different uses of water distribution.
- Maintenance of existing projects will be done along with the construction of new projects.
- The policy will be directed towards reducing irrigation water demand through both increased irrigation efficiency and optimum utilization of available surface water resources. Any imbalance will also be narrowed through the application of a wide variety of water conservation measures, including effective artificial recharge.
- Demand-based water management will replace the supply-based management in water policy.

In addition, the GoR plans to implement SWP within a long-term programmatic framework for introducing water sector reforms. In order to achieve the goals, certain policy reforms are required in the water sector (see Attachment 2.1.2).

2.1.2 National and State Policies for Agriculture, Agro-processing and Market Sector

(1) National Policies

The National Agriculture Policy (NAP) 2000 seeks to actualize the vast unlimited growth potential of Indian agriculture, strengthen rural infrastructure to support faster agricultural development, promote value addition, accelerate the growth of agro business, create employment in rural areas, secure a fair standard of living for the farmers and agricultural workers and their families, discourage migration to urban areas, and face the challenges arising from economical liberation and globalization.

The salient features and details of the agricultural policies are given below and Attachment 2.1.3, respectively:

- i) Greater private sector participation through contract farming;
- ii) Price protection for farmers;
- iii) Dismantling of restrictions on movement of agricultural commodities throughout the country;
- iv) Rational utilisation of the country's water resources for optimum use of irrigation potential;
- v) High priority to development of animal husbandry, poultry, dairy and aquaculture;
- vi) Capital inflow and assured markets for crop production;
- vii) Exemption from payment of capital gains tax on compulsory acquisition of agricultural land;
- viii) Minimum fluctuation of commodity prices;
- ix) Adequate and timely supply of quality inputs to farmers;
- x) High priority towards rural electrification; and
- xi) Setting up of agro processing units and creation of off-farm employments in rural areas.

(2) State Agricultural Policies 2013

The state has framed the State Agriculture Policy 2013 to ensure food and nutritional security and economic empowerment and doubling of the production of food grains in the next ten years to attain a minimum agriculture growth of 4% per annum.

Major strategies of the State Agriculture Policy 2013 are as follows:

- i) Integrated farming system approach especially for dry land agriculture
- ii) Organic farming
- iii) Micro irrigation system (drip irrigation system)
- iv) Integrated nutrient management (INM)
- v) Integrated pest management (IPM)
- vi) Farm mechanization
- vii) Fodder production
- viii) Ensure the quality of inputs like fertiliser, insecticides, and seeds
- ix) Infrastructure facilities
- x) Alternative utilisation of renewable energy (mainly solar)
- xi) Extension support and capacity development
- xii) Improving the livelihood of farmers; crop-horticulture-livestock integrated farming systems, and creating better livelihood options through agro processing and value addition will be promoted

The detailed description of the State Agriculture Policy 2013 in the state of Rajasthan is given in Attachment 2.1.4.

(3) State Action Plan

The state action plan for agriculture sector is summarised in Attachment 2.1.5.

2.1.3 Subsidies by National and State Governments

At the time of the Japan International Cooperation Agency (JICA) preparatory survey, the following subsidies are provided by the state government:

- i) Pipelines on farm
- ii) Solar pump
- iii) Sprinkler system
- iv) Drip irrigation
- v) Water storage (*diggi* = farm pond) and water hose
- vi) Protected cultivation

In addition to the above subsidies, farmers also can enjoy the subsidies provided by the national government or national agencies in India as follows:

- i) Subsidy under the National Food Security Mission (wheat)
- ii) Subsidies under the National Food Security Mission (pulse, oilseeds, and maize).
- iii) Free training on IPM and IPM materials

Details of the above subsidies are compiled in Attachment 2.1.6 and Attachment 2.1.7.

2.2 Natural and Socio-Economic Condition

2.2.1 Area and Population

Total geographical area of the state is 342,239 (3.422 *lakh*) km², occupying 10.40% of the country. Administratively, Rajasthan State is divided into 7 divisions and 33 districts, which are further divided into 244 subdivisions. Three fifths of the state area is part of 'Great Thar Desert' which is larger than all the states of the country except Madhya Pradesh, Utter Pradesh, Andhra Pradesh, and Maharashtra. Diverse geological formations and extreme meteorological conditions characterise the state.

The total population of the state as per the 2011 census is 68.55 million (5.7% of the country), which is now estimated as 74 million (as of 2016), and is the 7th highest population among the Indian states. The sex ratio of Rajasthan is 926 females per 1,000 males. The overall density of the population is 201

persons per km² against the all India figure of 382. The labour force constitutes about 43.55% of the total population. Of the total population, 17.83% (12.22 million) belongs to the SC community, whereas another 13.48% of the population (9.24 million) belongs to the ST community. The number of households in the state is 12.71 million.

2.2.2 Topography

Rajasthan is located in northwest India; Rajasthan borders Punjab in the north, Haryana and Uttar Pradesh in the northeast, Madhya Pradesh in the east, and Gujarat in the south. On the western side, it shares a long stretch of border with the neighbouring country Pakistan. The topographic features of Rajasthan are the Thar Desert and the Aravalli Range, which runs through the state from southwest to northeast, almost from one end to the other, for more than 850 km. The Aravalli Range forms a line across the state running roughly from Guru Peak (1,722 m), near the town of Abu (Mount Abu) in the southwest, to the town of Khetri in the northeast. About three fifths of Rajasthan lie northwest of the Aravalli, leaving two fifths on the east and south direction. These are the two natural divisions of Rajasthan. The northwestern tract is generally arid and unproductive, although the character shifts gradually from desert in the far west and northwest, to comparatively fertile and habitable land toward the east. This area includes the Thar Desert, which is the most densely populated desert in the world, with a population density of 83 people per square km. The southeastern area, higher in elevation (100 m to 350 m above sea level) and more fertile, has a much diversified topography. In the south lies the hilly tract of Mewar. In the southeast, a large area of the districts of Kota and Bundi forms a tableland; and to the northeast of these districts is a rugged region (badlands) following the alignment of the Chambal River.

2.2.3 Climate and Rainfall

Rajasthan has varying climate, like its varying topography, which varies from arid to sub-humid. The Aravalli Range cradles Mount Abu, the sole hill station of Rajasthan. The mountain range, eastern fertile plains, and western arid plains experience different climatic conditions. The area west to Aravalli is characterised by extreme temperatures and long periods of severe droughts, accompanied by high winds and low humidity. On the eastern side of Aravalli, there is considerable variation in the amount of rainfall and range of temperature.

The entire state has the following three major seasons:

- Summer season (March to mid-June)
- Rainy season (mid-June to September)
- Winter season (October to February)

Marked variations in seasonal and diurnal range of temperatures occur across the state, apart from the most characteristic phenomenon of a warm-dry continental climate. The month of March marks the beginning of summer and the temperature starts rising through April, May, and June. In the western part, the maximum daily temperature varies from 40 °C to 45 °C. Occasionally it rises to 50 °C during the summer months. January is the coldest month of the year. The minimum temperatures may fall to -2 °C at night in some places.

The spatial distribution of the rainfall varies largely in the eastern and western parts due to their topography. In the south, some areas of the state receives an average of more than 1,600 mm rainfall per year (1,638 mm in Mount Abu), and some areas in the western part (Jaisalmer and Barmer districts) receive rainfall of as low as 100 mm/year. The Aravalli Range forms a barrier in the westerly sweep of the monsoon, such that the southeastern part of the state enjoys higher precipitation and is extensively inhabited with surging pressure for water. To the west side of the Aravalli Range, the climate is characterised by low rainfall (average of 321.9 mm for the past 100 years) with erratic distribution. The 100-year average rainfall of 23 eastern districts is 714.8 mm, while the annual 100-year average rainfall of the whole state is 583.7 mm. The annual rainfall in different places of the state is erratic, and varies significantly.

2.2.4 River System

Rajasthan State comprises 15 defined river basins (remaining area of Rajasthan has been defined as Outside Basin, which is designated as Basin No.16), which differ in sizes and potentialities. The smallest river basin within Rajasthan is Sukli River basin (990.44 km²), and the largest basin is Luni River basin (69,302.11 km²). The reason for the large variation in the rainfall pattern of Rajasthan is due to its topography. The 15 major basins are Shekhawati, Banganga, Gambhir, Parbati, Sabi, Banas, Chambal, Mahi, Sabarmati, Luni, West Banas, Sukli, Other Nallahs of Jalor, and Ghaggar (refer to Figure A2.2.1 below). Besides, there is a large part of Western Rajasthan which is not covered by any river valley and defined as Outside Basin.

Major rivers and their tributaries flowing through Rajasthan are Chambal, Mahi, Sabarmati, and Banas. All the rivers are seasonal, with the bulk of flow taking place during the monsoon period, i.e. June to September. As per the latest study conducted on the availability of water resources, the state's internal water resources at 50% dependability have been estimated as 28.38 billion cubic meter (BCM). The rivers and *nallahs* (tributaries) in Rajasthan are shown in Figure A2.2.2.



Source: Report on state water resources
by Tahal Consultants- SWRPD GoR 2015

Figure A2.2.1 River Basin



Source: Oxford Student Atlas for India,
Oxford University Press, 2009

Figure A2.2.2 Rivers and Nallahs

2.3 Water Resources and Irrigation Infrastructures

2.3.1 Water Resources

Rajasthan State is divided into 15 river basins consisting of 59 sub-basins. Total surface runoff in the state is 21.71 BCM, out of which 16.05 BCM can only be economically utilized due to techno-economic constraints. In addition, Rajasthan State receives water from other states on the basis of interstate agreements. Total water resources available in the state are 44.72 BCM as summarized in Table A2.3.1 below.

Table A2.3.1 Water Resources Availability in Rajasthan State (in BCM)

Surface Water	Groundwater	External Water Through Interstate Agreements	Total
16.05	10.79	17.88	44.72

Source: Vision – 2051 Water – an Illusion for Rajasthan

The average annual rainfall of the state is 583.7 mm based on the data for 100 years. The spatial distribution of the rainfall varies in the eastern and western parts. The average annual rainfall of the western part, covering ten districts, is only 321.9 mm, whereas the average annual rainfall for the remaining 23 districts is 714.8 mm. The status of groundwater in Rajasthan State is much more grave and alarming. About 90% of drinking water and 60% of the irrigation demands depend on groundwater. This condition results in the overuse of groundwater. The situation has deteriorated drastically in the last

two decades. While groundwater development was only 35% in 1984, it has reached 135% in 2014, indicating serious imbalance between the use and replenishment of the source annually.

(1) Surface Water Resources

The availability of water in the state has been assessed as shown in Table A2.3.2 below.

Table A2.3.2 Water Availability in Rajasthan State (in BCM)

Mean	25% Dependability	50% Dependability	75% Dependability
25.93	33.09	21.71	14.12

Source: *Vision – 2051 Water – an Illusion for Rajasthan*

For planning purposes, Rajasthan State has applied water availability at 50% dependability, which is 21.71 BCM of which only 16.05 BCM is economically utilisable. Most of the available water, which can be economically utilised, has already been harnessed. So far, 12.20 BCM water has been harnessed by 118 major/medium and 6,688 minor irrigation projects. Generally, surface water is harnessed at 75% dependability for irrigation purposes and 90% dependability for drinking water purposes. For water-deficit state, the Central Water Commission (CWC) has agreed in principle to adopt 50% dependability for irrigation purposes.

(2) Interstate Water

The surface water resources available in Rajasthan State are limited and cannot meet the water demands of various sectors. Rajasthan State has entered into various interstate agreements on the basis of its riparian right. So far, 17.88 BCM of water has been allocated under various interstate agreements as detailed in Table A2.3.3 below.

Table A2.3.3 Interstate Water Available for Rajasthan State

S. No	River	Allocated Share in MCM	Date of Agreement	Parties to Agreement
1	Ravi Beas (pre-partition)	1,369	04 June 1920	British Government, Nawab of Bhawalpur, and Maharaja of Bikaner
2	Sutlej	1,739	13 January 1959	Punjab and Rajasthan
3	Ravi Beas	10,604	31 December 1981	Haryana, Punjab, and Rajasthan
4	Chambal	1,973	02 March 1953	Madhya Pradesh and Rajasthan
5	Mahi	456	10 January 1966	Gujarat and Rajasthan
6	Narmada	617	07 December 1979	Gujarat, Maharashtra, Madhya Pradesh, and Rajasthan
7	Yamuna	119	12 May 1994	Delhi, Himachal Pradesh, Haryana, Rajasthan, and Uttar Pradesh
	Total	17,877		

Source: *Vision – 2051 Water – an Illusion for Rajasthan*

(3) Groundwater

The status of groundwater in Rajasthan State is complex, which is depleting in geometrical progression, with overusage to the tune of more than 135%. In Rajasthan State, the annual water table loss is 1 to 3 m. The gross annual use of groundwater in Rajasthan State is 13 BCM against a recharge of only 10.4 BCM. Around 90% of drinking water and 60% of irrigation water depend on groundwater. To quantify the dismal situation, about 80% of the 249 blocks in Rajasthan State are either overused or at a critical level as shown in Table A2.3.4 below.

Table A2.3.4 Groundwater Trend by Block in Rajasthan

Status of Ground Water	1984	1988	2001	2008
Overused (> 100%)	12	41	86	168
Critical (90 – 100%)	11	26	80	28
Semi-critical (70 – 90%)	10	34	21	20
Safe (< 70%)	203	135	49	32

Source: Groundwater Status of Blocks, PHED, Government of Rajasthan

2.3.2 Irrigation System

(1) Surface Irrigation System

The type of irrigation system is generally divided into three categories, namely; major irrigation system (culturable command area (CCA) is more than 10,000 ha), medium irrigation system (CCA is 2,000 ha - 10,000 ha), and minor irrigation system (CCA is less than 2,000 ha). Number of schemes and coverage area are summarised as shown in Table A2.3.5 below.

Table A2.3.5 Number and Coverage Area of Irrigation System

Description	Number of System	CCA in ha (1,000)
Major Irrigation System	22	3,351
Medium Irrigation System	97	
Minor Irrigation System	3,799	469
Total	3,918	3,820

Source: Interview with WRD staff

(2) Micro Irrigation

The micro irrigation technique, including drip irrigation and sprinkler irrigation, has been a mature technology since it is widely adopted in arid lands all over the world. Drip irrigation systems are used throughout arid parts of India, especially in Maharashtra, Haryana, Andhra Pradesh, and Rajasthan as shown in Table A2.3.6. Considering arid and semi-arid agro-climatic condition, sandy soil, and undulating topography, Rajasthan State has the largest potential to introduce micro irrigation system. Hence, from 2011, the state government started big promotion of micro irrigation systems using solar power. In this scheme, the government provides 86% subsidy to the farmers who want to install micro irrigation systems with solar power units to achieve water conservation at the state level. In the first year of the scheme, INR 51.5 million subsidies are paid to 1,675 farmers in 16 districts.

In the project report of the Rajasthan Water Sector Livelihood Improvement Project (RWSLIP) prepared by the Water Resource Department (WRD) in November 2015, the GoR intends to introduce micro irrigation system in at least 10% of the command area of irrigation sub-project. According to Table A2.3.6, Rajasthan State has still a lot of potential to introduce micro irrigation.

Table A2.3.6 Potential and Actual Area under Micro Irrigation in Different States

(Area in '000 ha)

State	Drip Irrigation			Sprinkler Irrigation			Micro Irrigation Total		
	Potential	Actual	%	Potential	Actual	%	Potential	Actual	%
Uttar Pradesh	2,207	10.68	0.48	8,582	10.59	0.12	10,789	21.26	0.20
Madhya Pradesh	1,376	20.43	1.48	5,015	117.69	2.35	6,391	138.12	2.16
Rajasthan	727	17.00	2.34	4,931	706.81	14.33	5,658	723.82	12.79
Punjab	559	11.73	2.10	2,819	10.51	0.37	3,378	22.24	0.66
Gujarat	1,599	169.69	10.61	1,679	136.28	8.12	3,278	305.97	9.33
Maharashtra	1,116	482.34	43.22	1,598	214.67	13.43	2,714	697.02	25.68
Haryana	398	7.14	1.79	1,992	518.37	26.02	2,390	525.50	21.99
Bihar	142	0.16	0.11	1,708	0.21	0.01	1,850	0.37	0.02
Karnataka	745	177.33	23.80	697	228.62	32.80	1,442	405.95	28.15
West Bengal	952	0.15	0.02	280	150.03	53.58	1,232	150.18	12.19
Andhra Pradesh	730	363.07	49.74	387	200.95	51.93	1,117	564.02	50.49

State	Drip Irrigation			Sprinkler Irrigation			Micro Irrigation Total		
	Potential	Actual	%	Potential	Actual	%	Potential	Actual	%
Tamil Nadu	544	131.34	24.14	158	27.19	17.21	702	158.52	22.58
Others	128	15.00	11.72	188	30.00	15.96	316	45.00	14.24
Orissa	157	3.63	2.31	62	23.47	37.85	219	27.10	12.37
Kerala	179	14.12	7.89	35	2.52	7.19	214	16.64	7.77
Chhattisgarh	22	3.65	16.58	189	59.27	31.36	211	62.92	29.82
Jharkhand	43	0.13	0.31	114	0.37	0.32	157	0.50	0.32
Himachal Pradesh	14	0.12	0.83	101	0.58	0.58	115	0.70	0.61
Nagaland	11	0.00	0.00	42	3.96	9.43	53	3.96	7.48
Goa	10	0.76	7.62	1	0.33	33.20	11	1.09	9.95
Total	11,659	1,428.46	12.25	30,578	2442.41	7.99	42,237	3,870.86	9.16

Source: Raman (2010) and Indiatat 2010

Another remarkable project for micro irrigation in Rajasthan is Narmada Major Irrigation Project. The project developed 240,000 ha of micro irrigation system with farm ponds in remote and marginal areas. The agricultural practice at that site fully depends on groundwater irrigation before the project. The project separates the scheme area into 100 ha units on the average, and farm ponds for sprinkler irrigation were installed in every unit. Small-sized water users association (WUA) was also established for operation and maintenance of irrigation systems to increase harmony and reduce conflicts among members of WUA.

2.3.3 Organisation of Rajasthan Water Resource Department

Organisation charts of Rajasthan WRD are shown in Figure B2.3.1 – Figure B2.3.7 and the estimated number of staff in each zone related to RWSLIP is shown in Table A2.3.7 below.

Table A2.3.7 Estimated Number of Staff in Each Zone

Name of Zone	Number of District	Number of Staff				
		SE	EE	AE	JE	Total
North	2	3	9	27	81	120
Jaipur	11	3	13	46	138	200
Kota	4	4	12	45	135	196
CAD Kota		2	5	16	48	71
Jodhpur	2	1	3	12	36	52
Udaipur	7	5	20	76	228	329
Total	26	18	62	222	666	968

Notes: SE-Superintending Engineer, EE-Executive Engineer, AE-Assistant Engineer; JE-Junior Engineer
Source: estimated based on the organization charts provided by WRD

2.4 Organisation by Farmers

2.4.1 Water Users Associations

(1) Policies and Acts for WUAs

(a) National Water Policy (2002)

As mentioned in Section 2.1.1(1), there is a shift towards community level empowerment and beneficiaries' responsibility for own water management under the umbrella of the IWRM process. The following paragraph is a description in the National Water Policy (2002) regarding the participatory approach to water resources management:

“Management of the water resources for diverse uses should incorporate a participatory approach: by involving not only the various governmental agencies but also the users and other stakeholders, in an effective and decisive manner, in various aspects of planning, design, development and management of the water resources schemes. Necessary legal and institutional changes should be made at various levels for the purpose, duly ensuring appropriate role for women. Water Users' Association and local bodies such as municipalities and *gram panchayats* should particularly be involved in the operation,

maintenance and management of water infrastructures/facilities at appropriate levels progressively, with a view to eventually transfer the management of such facilities to the user groups/local bodies.”

(b) Rajasthan Farmers’ Participation in Management of Irrigation System Act (RFPMIS) (2000)

Rajasthan visualised the concept of WUA initially in the mid-90s under Chambal command on a limited scale. WRD recognized farmer’s participation in management, maintenance, and regulation of irrigation systems to build up a sense of ownership and acquire experience/expertise for future works by WUA autonomously. Accordingly, as a part of major reform under the water sector of GoR, the Rajasthan Farmers’ Participation in Management of Irrigation Systems Act (RFPMIS Act 2000) was enacted on November 20, 2000 and the RFPMIS Rule 2002 was enacted on October 22, 2002. The act provides for farmers’ participation in the management of irrigation system and for matters connected therewith or incidental thereto. The act provides for the delineation of water users’ area and territorial constituencies. Under the act, the command area of an irrigation system is delineated based on administrative viability and hydraulic basis for the different levels of farmers organisations (FOs), i.e., WUA at the primary level, distribution committee (DC) at the secondary level, and project committee at the project level. Every water users’ area is divided into territorial constituencies that shall not be less than four but not more than ten¹, as may be prescribed.

The object of FOs is to inculcate, promote, and secure distribution of water among its users on an equitable basis, adequate maintenance of the irrigation system, efficient and economical utilisation of water to optimise agricultural production, protect the environment, and ensure ecological balance by involving the farmers, as well as sense of ownership of the irrigation system in accordance with the water budget and the operational plan. The WUA shall perform the following functions:

- Prepare and implement a *Warabandi*² schedule for each irrigation season, consistent with the operational plan, based upon the entitlement, area, soil and cropping pattern;
- Prepare a plan for the maintenance, extension, improvements, renovation, and modernisation of irrigation system in the area of its operation and carry out such works of both distributary system and field drains in its area of operation with the funds of the association from time to time;
- Regulate the use of water among the various outlets under its area of operation according to the *Warabandi* schedule of the system;
- Record irrigation, prepare demand, and collect water tariff;
- Maintain a register of land owners as published by the revenue department;
- Prepare and maintain an inventory of the irrigation system within the area of operation;
- Resolve the disputes, if any, between its members and water users in its area of operation;
- Raise additional resources and maintain accounts;
- Conduct annual audit of its accounts;
- Conduct general body meeting and technical support group (TSG) meetings, as may be prescribed; and
- Conduct regular water budgeting and periodical social audit in the prescribed manner.

(2) Outline of WUA

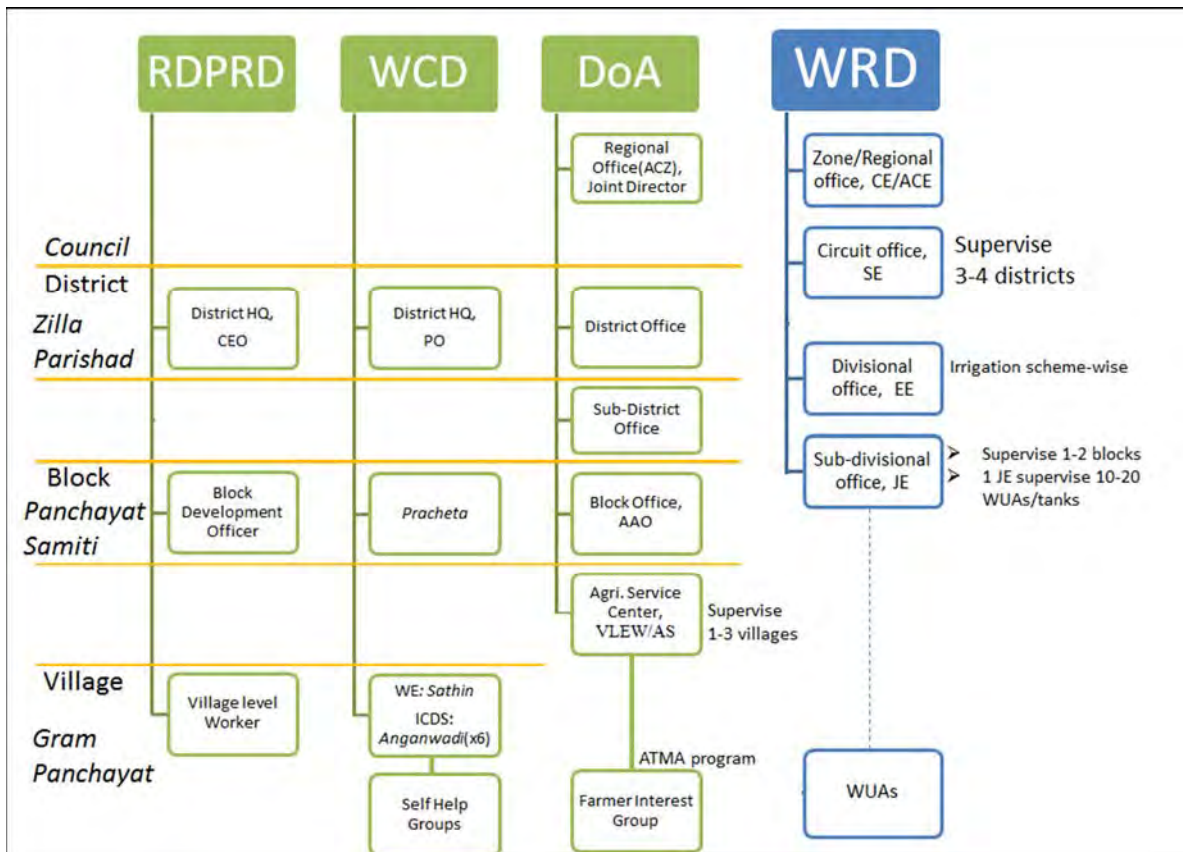
Participatory irrigation management (PIM) is the most important component of irrigation scheme so as to improve surface irrigation system, performance, efficiencies, and to develop optimum agricultural support area. WUAs shall be established with the prime objective of adopting water management techniques, modern agricultural practices, and equitable distribution of irrigation water; and with the aim to install a sense of ownership amongst the cultivators, which will motivate them to maintain the

¹ Every WUA area has been divided into territorial constituencies (TCs) on the basis of following norms: Area up to 500 ha=4 TCs, Area from 501 ha to 1000 ha=6 TCs. In this report, number of WUA is calculated by dividing CCA by 1000 (ha). Example for sub-project of 6,500 CCA, number of WUA is estimated as 7 (=6500/1000). Area of each WUA is estimated 928.57 ha (=6500/7). Thus, number of TCs is supposed to be 6.

² *Warabandi* means fixing of turns for irrigation water for each farmer on water course and the one of the irrigation water management system by fixing rotation time of supply of irrigation water to each farmer by “*Kacha*” or “*Pucca*”, which is commonly implemented in Rajasthan State.

infrastructure by their own resources through capacity building. In general, after rehabilitation of the sub-projects, the management of the system shall be transferred to the WUAs.

The following Figure A2.4.1 shows the existing structure of organisations related to WUA. Most organisations have offices based on the local government administrative unit but WRD establishes its offices based on irrigation schemes. Moreover, WRD does not have staff mandated to monitor WUA in the field. For major irrigation scheme, WRD conducts weekly meeting, inviting WUA representatives in the circuit office. Since minor schemes (less than 300 CCA) used to be handed over to *Panchayat Raj* institutes, WUA hardly meets the junior engineer (JE) in charge after completion of the construction work. Organizational composition of WUA is shown in Attachment 2.4.1.



Source: JICA survey team

Figure A2.4.1 Comparison of Organisations of Line Departments

(3) Present Condition of WUA

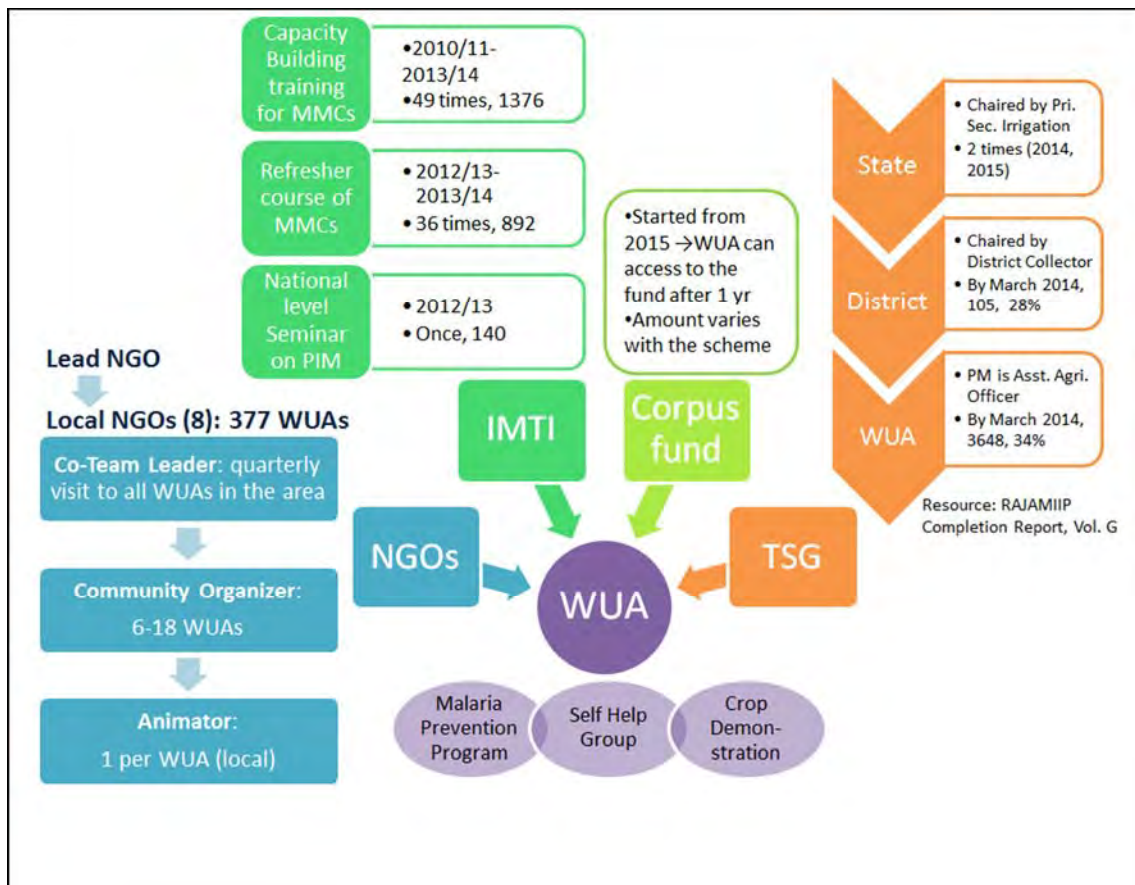
(a) General

Since the PIM concept was introduced under RFP MIS 2000 as described in the previous section, actual transfer process of irrigation schemes has still a long way to go. It was observed that parts of the irrigation schemes in the state have been transferred to WUAs in the Rajasthan Minor Irrigation Improvement Programme (RAJAMIIP) and Rajasthan Water Sector Restructuring Project (RWSRP), which are funded by JICA and the World Bank, respectively. However, WUAs are not so active in many cases at the field level. In particular, in minor irrigation schemes, PIM is a totally new concept for water users, because they are used to be handed over to a local government (*Panchayat Raj* Institute) and maintained by the government budget.

In addition, it seems that the WRD field and central offices do not have precise data on WUA management such as water charge collection, present status of irrigation scheme, gender composition of WUA, and so on. Systematic monitoring structure is required for the sustainable expansion of the PIM concept among the existing irrigation schemes.

(b) WUA in RAJAMIIP

The WUA component is carefully organized as shown in the following Figure A2.4.2 in RAJAMIIP.



Source: RAJAMIIP Completion Report by GITEC Consult GmbH, Final Progress Report by Gramin Vikas Trust

Figure A2.4.2 Formulation of Water Users Association in RAJAMIIP

Some of the WUAs are actively performing their role and responsibilities including water management, collection of water tariff, functioning of TSG groups, and improved agricultural practices in RAJAMIIP. However, the performance of the majority of WUAs is not satisfactory due to the following shortcomings:

- Because of the delay in the schedule of contracting non-government organisations (NGOs), there is not enough facilitation during the orientation of the project with users and formation of WUA.
- There is not enough time to mentor WUA on water management, irrigated agriculture, and management of WUA after completion of the scheme. Trainings have also been conducted in a short period. WUA could only learn about theory but not practice.
- While the management and sustainability of WUA seem to depend on its leadership, capacity building for the leadership was not well developed.

(c) Corpus Fund Introduced in RAJAMIIP in 2015

In RAJAMIIP, for financial sustainability of WUAs, the GoR further provided 2.00 lakh (INR 200,000) in the form of corpus fund in addition to the provision for sharing of water tariff and other financial resources. The Irrigation Management and Training Institute (IMTI), Kota and an NGO also carried out capacity building in an integrated manner. WUAs are authorised to utilise only the interest accrued from a fixed deposit amount of corpus fund. Since it has not yet yielded interest, the WUAs cannot utilise it yet.

(4) Good Example of WUA in the Past Project

(a) Good Example in RAJAMIIP by JICA

The NGO component was introduced for the first time under RAJAMIIP, but it was for a limited period of three years only. Role of NGOs is well appreciated since they did a remarkable performance in a certain area of the project. A total of 400 WUAs were formed. However, soft component was implemented only on 40 WUAs. The extensive capacity building extended to FOs through IMTI and NGO in particular resulted in:

- Generation of additional financial resources in the form of annual member fee at 105 sub-projects amounting to 3.65 *lakh* (INR 365,000). Although the resources generated were meager, it was certainly an encouraging achievement.
- Social awareness is generated for gender equality and empowerment by promoting formation of self-help groups (SHGs) (total of 102 having 1,158 members) and farmer clubs (total of 11 having 154 members) under 47 sub-projects. SHGs promoted small savings among their members and proved to be a powerful vehicle for the poor in their socioeconomic development.
- WUAs under 27 sub-projects developed a mechanism to generate additional financial resources to the extent of 16.26 *lakh* (INR 1.626 million) by motivating their members to contribute through collection by auctioning of fish, additional water tariff, and dry tree auction.
- The GoR is implementing several programmes, viz.: seed distribution, watershed programme, water harvesting structures, horticulture development, and MNREGA for strengthening the rural economy and the livelihood of the poor, especially marginalised groups like SC/ST and women. Convergence through creation of durable assets, rural connectivity, and augmentation in productivity helped 23,081 families of the project area of 120 WUAs.
- The performance of some of the WUAs was excellent, and they were recognized and awarded by local administrative authorities during the 67th Independence Day, viz.: *Seli Ki Nal (Pali)*, *Biratiya Kurd (Pali)*, *Sali Kin al (Pali)*, and *Kadila (Jhalawar)*.
- Performance of WUA at Tokra (Sirohi) sub-project was declared to be the best, where the president had taken initiative to mobilise and motivate farmers to develop a cohesive system. The execution of rehabilitation of watercourses was said to have been done in record time adhering to the technical specifications. The above activities of various WUAs will set an example for other FOs to adopt such strategies of the local administrative authorities on the 67th Independence Day, viz.: *Seli Ki Nal (Pali)*, *Biratiya Kurd (Pali)*, and *Sali Kin al (Pali)*.

(b) Good Example in Sri Ganganagar by World Bank

The Gang canal, which was constructed in 1927, is a major system with CCA of 3.40 *lakh* (340,000) ha. Water users organisations (WUOs) were formed in 2002 under the World Bank-assisted RWSRP. There are 1 PC, 15 DCs, and 180 WUAs who are successfully managing, regulating, and maintaining the system efficiently. The Implementation Completion and Review (ICR) mission of World Bank, headed by Mr. R. Peterson (from the Food and Agriculture Organization) is also highly satisfied with the performance of the WUOs. In 2015, WUOs planned to undertake the maintenance of the Gang main canal through the mobilisation of physical and financial resources and this was successfully implemented for a length of 30 km in record time, i.e., during closure period. This is a rare example of cooperation and understanding amongst the WUAs.

2.4.2 Farmer Producer Organisation

(1) Policy and Objectives

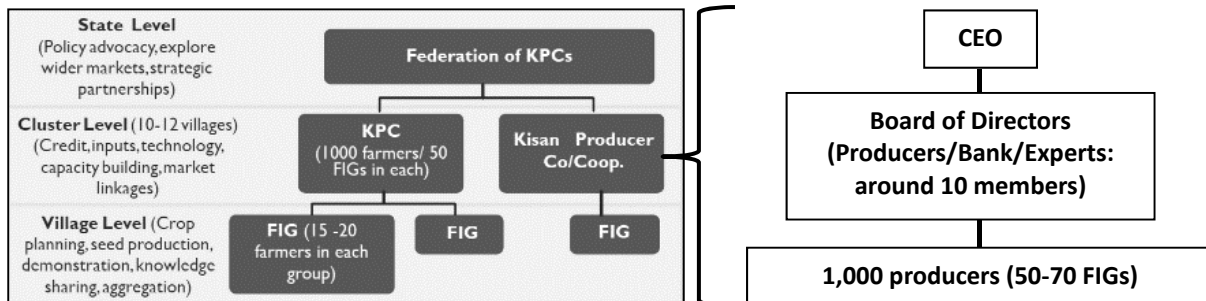
The formation of farmer producer organisations (FPOs) is given high impetus in the 12th Five Year Plan to enhance linkages between farmers and agro value chain. To promote FPOs, the Small Farmers Agribusiness Consortium (SFAC), wherein directors of every state marketing board were appointed as general directors, has been mandated since 2011 by the Department of Agriculture and Cooperation, Ministry of Agriculture, GoI. As of September 2015, 592 FPOs (around 720,000 members) have been established in 29 states in India, many of which are registered as companies (Farmer Producer Company

or FPC) under the Company Act (1956/2013) and as cooperatives under the Co-operative Societies Act (2001).

SFAC supports FPOs through the National Agriculture Development Scheme (RKVY: *Rashtriya Krishi Vikas Yojana*) fund. In the 12th Five Year Plan, FPOs are aimed to link with developing crop insurance, machinery service centres, and take seed production. The activities of FPOs include input supply (seed, fertilisers, machinery); access to financial and technical services (credit, savings, insurance, extension); marketing linkages (contract farming, procurement under minimum support prices, collective marketing); and training and networking (policy advocacy, documentation)³.

(2) Structure of FPOs

SFAC generally recommends to formulate an FPO with a minimum of 1,000 members to maximize advantage of scale for collecting marketing, as already demonstrated by the benefits of aggregating producers into FPOs during the 11th plan. Its organisation structure is explained in Figure A2.4.3. There are wings of FPO called farmer interest groups (FIGs) of around 15-20 members, spreading in and around 10-12 villages. The FIGs are expected to work on activities at the village level such as crop planning and knowledge sharing whereas FPOs are expected to work on activities at the cluster level including market linkages.



Note: Kisan Producer Co/Coop. = FPO, FIG = Farmer Interest Group

Source: Prepared by JICA survey team based on FPO Brochure 2015 (SFAC) and Process Guidelines for Promotion of Farmer Producer Organisations (SFAC)

Figure A2.4.3 Structure of Farmer Producer Organisation (FPO)

In practice, it is possible to formulate an FPO with less than 1,000 members. Such FPOs can only unofficially register but they can still receive SFAC's supports equivalent to those for official FPOs. Furthermore, producers in different districts could formulate an FPO together, as they may be regionally scattered. From the viewpoint of gender improvement, women's involvement in decision making is promoted by giving them board member positions⁴. Chief executive officers could be outsourced, for example, from the other states.

(3) Operation and Management of FPOs

SFAC has impaneled 149 consultants/organisations during the 12th Five Year Plan, such as Indian Grameen Services, as resource institutes to promote FPOs. They provide FPOs with a series of guidance, including group mobilisation, registration, business plan development, vision building for leaders, and establishment of market linkage.

Moreover, any central/state agencies/schemes can support FPOs following the Progress Guidelines for Promotion of Farmer Producer Organisations by SFAC, as seen in the case of the State Institute of Agriculture Management (SIAM). Presently, the National Food Security Mission (NFSM) and National Bank for Agriculture and Rural Development (NABARD)/State Bank of India, as sources of credit, also promote FPOs.

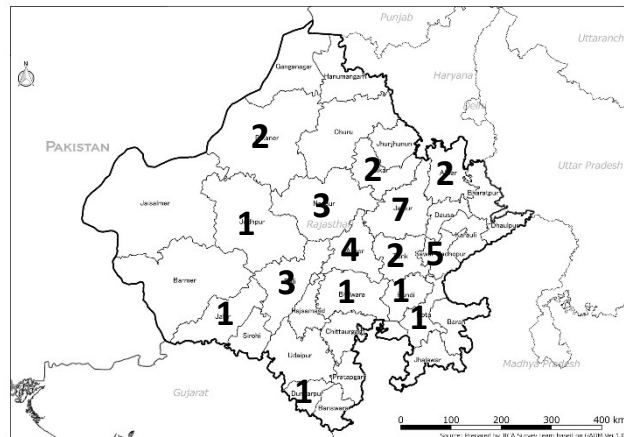
³ Executive Engineer of RSAMB (March 2016)/ Advisor of FPOs in Bundi, Nagaur, Kota, and Ajmer (Assistant Vice President & State Head of Indian Grameen Services (March 2016)/ SFAC Website (<http://sfacindia.com/>) / FPO Brochure 2015 by SFAC

⁴ Executive Engineer of RSAMB (March 2016) /Process Guidelines for Promotion of Farmer Producer Organisations (SFAC)

(4) Present Condition of FPOs in Rajasthan

In Rajasthan, under the seven resource institutes, 36 FPOs have been registered since 2013, all in legal form of producer company. They are located mainly in areas in/around consumption areas, namely, Jaipur and surrounding districts, while there are only few FPOs in remote districts (Figure A2.4.4)⁵. In addition, there are four FPOs under the registration process as of March 2016.

Major crops cultivated by the FPOs are food crops and basic vegetables, e.g., gram/mustard/ wheat/ pearl millet/ onions/ peas (Jaipur), gram/ mustard/ wheat (Bikaner), black gram/ green gram/ gram/ wheat/ mustard (Ajmer), and green gram/ cumin seed/ groundnut/ wheat/ barley (Nagaur). Furthermore, some FPOs are involved in sorting, grading, and marketing of produces grown by their members.



Source: JICA survey team

Figure A2.4.4 Number and Location of FPOs (District-wise)

NABARD Annual Report 2014-2015 mentions that Rajasthan is one of the states with good progress in the promotion of FPOs, probably from the viewpoint of funding process. On the other hand, SFAC Rajasthan points out that the progress of the state's SFAC programme is less advanced compared to the states of Kerala, Tamil Nadu, Maharashtra Pradesh, or Andhra Pradesh, where levels of producers' education are rather high⁶.

Table A2.4.1 summarizes status of the 36 FPOs in Rajasthan State. It could be said that there are still few FPOs which have already stepped into implementation of collective activities.

Table A2.4.1 Status of 36 FPOs in Rajasthan State

Status	Yes	No	Applied	N/A	Remarks
Possession of public market trading licence	2	7	2	23	-
Possession of fertilizer licence	3	6	2	25	-
Possession of pesticide licence	4	4	3	25	-
Possession of seed licence	4	4	3	25	-
Access to warehouse	2*	8	-	26	*Both warehouses are rented.
Possession of agri machinery and related infrastructure for renting	1*	9	-	26	*Grading machine, owned.
Access to credit	2*	8	-	26	*One is sourced from NABARD and another one is from Cooperative Bank
Involvement in sorting, grading and marketing of produces grown by members	5	5	-	26	-

Source: Prepared by JICA Study Team using the data of "List of Farmer Producer Organizations (FPOs) in the State of Rajasthan (from as of August 2015)"

An example of Kota Kisan Samrudhi Producer co Ltd. (Kota FPC) is described in the Box below.

⁵ FPOs are located at the districts of Jaipur (7), Sawai Madhopur (5), Ajmer (4), Pali (3), Nagaur (3), Alwar (2), Bikaner (2), Tonk (2), Bhilwara (1), Jalore (1), Jodhpur (1), Sikar (2), Dungarpur (1), Kota (1) and Bundi (1) as of August 2015, according to SFAC Website.

⁶ Project Management Agent of Rajasthan Agricultural Marketing Board (March 2016)

Box: Case of Kota Kisan Samrudhi Producer Co Ltd.

Kota Kisan Samrudhi Producer Co Ltd. (Kota FPC, Kota District) is a Farmer Producer Company registered in February 2015. Members are more or less satisfied with the situation of agro produce marketing such as prices, but they have sometimes no other options than selling vegetables at unreasonable prices, instead of bringing them back home. To increase bargaining power, they decided to formulate a FPC. Under the CEO, Director and Board of Director, around 1,000 members exist in 22 villages (67 FIGs), of which 75% are marginal and small-scale farmers while 25% are large-scale farmers. Any farmer can be accepted as a member once they pay member fee (INR. 10,000 = 100 shares).

Kota FPC recently started collective input procurement and is planning to start collective marketing in the near future. Although the FPC has not started selling their own agricultural produce yet, they sell tea leaves from Darjeeling to generate financial resources to strengthen self-reliance. After tea leaves are purchased in the production area at whole-sale prices, they are graded and packaged in Kota. Then, the FPC sells packets of tea in the members' villages at retail prices (16% lower for members), for which profit is used for input procurement while extra profit should be redistributed among members. The idea comes from the CEO of the FPC (non-farmer from Haryana State committed by SFAC), who focused on the fact that tea is popular among all people including both farmers and non-farmers.

Although they have not known about Kota Agro Food Park (for the detail, refer to Section 2.6) located within 20km but are now interested in using such opportunity for marketing by improving access to it. The difficulty in the FPC management is collection of member fees from marginal and small-scale farmers.

(based on an interview to Kota FPC CEO and Director)

2.4.3 Farmers' Club under National Bank for Agriculture and Rural Development

(1) Outline of the Programme

Under the Farm Sector Promotion Fund, NABARD supports Farmers' Club Programme aiming to organise farmers to facilitate access to credit, extension services, farm technology, and markets. It was launched as *Vikas Volunteer Vahini* (VVV) programme in 1982 to propagate the following five principles of "Development through Credit":

- i) Credit must be used in accordance with the most suitable methods of science and technology.
- ii) The terms and conditions of credit must be fully respected.
- iii) Work must be done with skill so as to increase production and productivity.
- iv) A part of the additional income created by credit must be saved.
- v) Loan installments must be repaid in time and regularly so as to recycle credit.

The VVV programme was renamed as Farmers' Club Programme (FCP) in 2005 by revisiting its earlier mission.

To reflect the improvement of agricultural technology of farmers' club (FC) members in their income, NABARD is promoting contract farming in line with the amendment in the Agricultural Produce Marketing Committee (APMC) Act and linking the clubs with FPOs.

The clubs are provided with information on the weather and market prices, and crop advisory services through short message service (SMS) on mobile phones involving Reuters' Market Light.

According to the Annual Report 2014-15 of NABARD, there are a total of 147,000 clubs in India and 7,690 in Rajasthan so far. FCs have been sanctioned by various agencies, viz.: district central cooperative banks, regional rural banks, commercial banks, primary agricultural credit societies, and NGOs in the state.

(2) Outline of the Farmers' Club

(a) System and Structure

The programme is implemented through NGOs, branch of local banks, *Krishi Vigan Kendra* (KVK) or *Panchayat Raj* institutes (local government). NABARD provides INR 10,000 per year to FCs for 3 years in terms of capacity building, e.g., INR 5,000 for base level training, INR 1,500 x 2 times for expert meet, and INR 2,000 for FC maintenance fee, and implementing organisation receives INR 2,000 per year for 3 years as management cost. FC can be formed with a minimum of 10 farmers including tenant

farmers but not more than one club per 1-3 villages. It is because NABARD promotes bulk purchase, contract farming, collective shipping of farm products, and value addition processing as a group.

(b) Implementing System

Implementing system differs from organisation to organisation. There should be two office bearers in the club, namely, chief coordinator and associate coordinator. They are rotated every two years.

Main purpose of the FC programme is providing financial literacy to rural farmers and basically, the following activities are supported by the implementing organisation:

- Transfer of technology: new technology on agriculture and animal husbandry.
- Credit counselling: how to use *Kisan* credit card (credit card for farmers provided by the government as financial inclusion policy), meeting with bank manager.
- Marketing advocacy: connect to FPOs.

(3) Good Practice and Lessons Learnt

Most useful point is to receive information on finance such as *Kisan* credit card loan. This loan is not known by farmers, but very convenient. It is a seasonal loan for one crop season (6 months) amounting up to INR 50,000 per *bigha* (0.16 ha) approximately, with an interest rate of 4% per year. In SHG, it is 2% per month.

Progressive farmers can use the services more effectively. NABARD also introduced a loan scheme for tenant farmers. Club members who do not own land can form a joint liability group (JLG) and can apply for a loan.

NABARD faces difficulties on the sustainability of FC; it depends on the implementing organisation.

It is difficult for an organisation to form and support FC through the program only; as additional activity to an ongoing project, it carries out complementary functions.

2.4.4 Farmer Interest Group under Agriculture Technology Management Agency (ATMA) Scheme

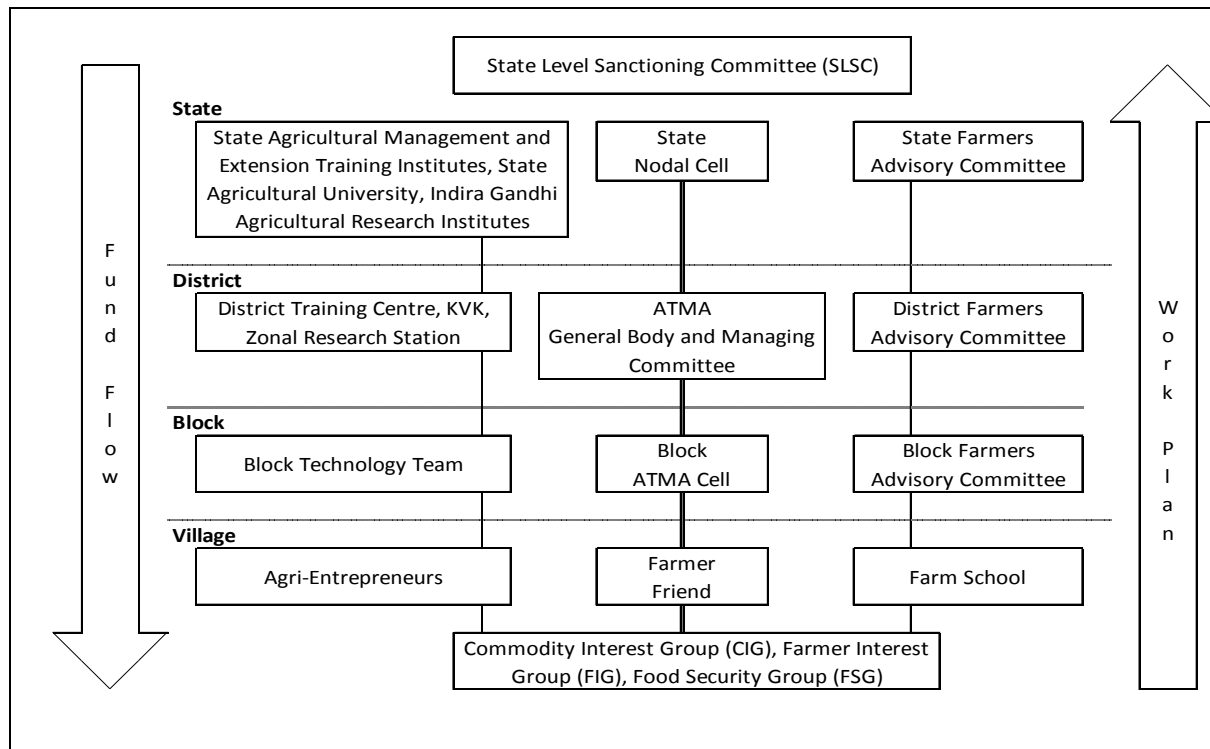
(1) Outline of the Programme

The scheme entitled “Support to State Extension Programmes for Extension Reforms” (ATMA scheme) is a national extension reform scheme launched by the Department of Agriculture and Cooperation, Ministry of Agriculture in 2005 based on the successful experiment of its pilot in 28 districts in 7 states from 1998 to 2005. According to the ATMA Guideline, 2014 under the National Mission on Agricultural Extension and Technology (NMAET)⁷, it aims at making the extension system farmer driven and farmer accountable by disseminating technology to farmers through a new institutional arrangement, i.e., ATMA, at the district level to operationalize the extension reforms on a participatory mode. The scheme focuses on the following key extension reforms:

- Encouraging multi-agency extension strategies involving public/ private extension service providers;
- Ensuring an integrated and broad-based extension delivery mechanism consistent with farming system approach with a focus on bottom-up planning process;
- Adopting group approach to extension in line with the identified needs and requirements of the farmers in the form of commodity interest groups (CIGs) and FIGs and consolidate them as FPOs;
- Facilitating convergence of farmer-centric programmes in planning, execution, and implementation; and
- Addressing gender concerns by mobilising women farmers into groups and providing training to them.

⁷ Guidelines for the Centrally Sponsored Scheme “National Mission on Agricultural Extension and Technology (NMAET)” to be implemented during the 12th Plan. <http://www.atma.ind.in/wp-content/uploads/2015/01/ATMA-Guidelines-2014.pdf>, downloaded on 14 March 2016

To implement the scheme, there is a four-tier institutional mechanism at the state, district, block, and village levels.



Source: JICA survey team based on ATMA Guideline, 2014 under NMAET

Figure A2.4.5 Implementation Mechanism of ATMA Scheme

At the village level, farmer friend (FF) serves as a vital link between extension system and farmers while CIGs, FIGs, and food security groups (FSGs) serve as a nodal point for information and technology dissemination amongst the members.

(2) Activity in Rajasthan

In Rajasthan, the ATMA scheme was introduced in 33 districts in 2005/06 to fulfil the identified gaps through demonstration, training, and exposure visit. The following are the main activities in the scheme reported in the Administrative Progressive Report 2014/15:

- i) Strategic Research and Extension Plan (SREP)
- ii) Farmers training/ exposure visit for FIGs
- iii) Demo plot: grant of INR 4,000 per demonstration is available to respond to gaps mentioned in the SREP
- iv) Farm school implementation: farm school has been conducted since 2007/08 under the ATMA scheme. Teacher of the school is one of the practical farmers and students are leaders of CIGs/FIGs.
- v) FIGs: There are three kinds of groups, namely: FIGs, CIGs, and FOs.
- vi) Training programme for extension workers and farmers: SIAM provides special training on ATMA scheme.
- vii) FF
- viii) Award for farmers: INR 50,000 at the state level, INR 25,000 at the district level, and INR 10,000 at the block level
- ix) District-wise farmer demonstration and agriculture fair
- x) Farmer seminars and field day
- xi) Innovation activities
- xii) Manpower (staffing)

Apart from the FIGs, there is a group for women named FSG, an agriculture-based SHG. It started in 2013 and has been doing kitchen gardening, poultry farming, and mushroom cultivation so far. A seed money of INR 10,000 is provided to a group when it is formed.

At the block level, there should be one block technical manager (BTM) and two assistant technical managers (ATMs); however, coverage ratio is 50-60% only and there is no female staff⁸. There are several district offices with active performance under the ATMA scheme, namely: Alwar, Bhilwara, Hanumangarh, Pratnarh, Sawai Madhopur, and Sikar.

2.5 Agriculture and Related Sector

2.5.1 Basic Information on Present Status of Agriculture in Rajasthan

(1) Farmer's Population

The population of Rajasthan is over 68.55 million according to the 2011 census. About 75% of the state population lives in rural areas. There are 13.62 million cultivators (about 45.6% of total workforce) and 4.94 million agricultural labourers (about 16.5% of total workforce).

Table A2.5.1 Composition of Population in Rajasthan 2011

S. No.	Total/Rural/Urban	Persons	%	Males	Females
No. of Cultivators					
1	Total	13,618,870	(100.0)	7,518,486	6,100,384
2	Rural	13,358,033	(98.1)	NA	NA
3	Urban	260,837	(1.9)	NA	NA
No. of Agricultural Labourers					
4	Total	4,939,664	(100.0)	2,132,669	2,806,995
5	Rural	4,733,917	(95.8)	NA	NA
6	Urban	205,747	(4.2)	NA	NA
No. of Household Industry Workers					
7	Total	720,573	(100.0)	435,561	285,012
8	Rural	446,948	(62.0)	NA	NA
9	Urban	273,625	(38.0)	NA	NA
No. of Other Workers					
10	Total	10,607,148	(100.0)	8,210,360	2,396,788
11	Rural	5,846,335	(55.1)	NA	NA
12	Urban	4,760,813	(44.9)	NA	NA
No. of Others					
13	Total	38,734,757	(100.0)	17,323,010	21,411,747
14	Rural	27,155,003	(70.1)	NA	NA
15	Urban	11,579,754	(29.9)	NA	NA
Total Population					
16	Total	68,621,012	(100.0)	35,620,086	33,000,926
17	Rural	51,540,236	(75.1)	26,680,882	24,859,354
18	Urban	17,080,776	(24.9)	8,939,204	8,141,572

Source: Government of India, Census 2011

(2) Land Use and Land Holdings

Total cropped area is 169.7 million ha (49.5% of total reported area) and gross irrigated area is 34.5% of total cropped area.

⁸ Interview with an officer of Deputy Director/Senior Faculty, ATMA on 15 March 2016

Table A2.5.2 Land Use Pattern in Rajasthan

(Area in million ha)

Year	1990-91		2000-01		2007-2008		2008-09		2009-10	
	Total Reported Area	342.5	(100)	342.6	(100.0)	342.7	(100.0)	342.7	(100.0)	342.7
Forest	23.5	(6.9)	26.1	(7.6)	27.3	(8.0)	27.3	(8.0)	27.4	(8.0)
Area under Non-Agricultural Uses	14.9	(4.4)	17.4	(5.1)	18.5	(5.4)	19.7	(5.7)	19.8	(5.8)
Barren and Unculturable Land	27.9	(8.1)	25.7	(7.5)	24.2	(7.1)	23.0	(6.7)	22.9	(6.7)
Permanent Pastures and Other Grazing Land	19.1	(5.6)	17.1	(5.0)	17.0	(5.0)	17.0	(5.0)	17.0	(5.0)
Land under Miscellaneous - Tree Crops and Grooves	0.2	(0.1)	0.1	(0.0)	0.2	(0.0)	0.2	(0.1)	0.2	(0.1)
Culturable Waste Land	55.7	(16.3)	49.1	(14.3)	45.7	(13.3)	43.4	(12.7)	44.7	(13.1)
Fallow Land Other than Current Fallows	19.3	(5.6)	24.4	(7.1)	21.7	(6.3)	21.1	(6.1)	20.5	(6.0)
Current Fallows	18.1	(5.3)	24.2	(7.0)	17.2	(49.9)	15.7	(4.6)	20.6	(6.0)
Net Sown Area (NSA)	163.8	(47.8)	158.6	(46.3)	171.0	(14.9)	175.5	(51.2)	169.7	(49.5)
Area Sown More than Once	30	(8.8)	33.7	(9.8)	51.1	(64.8)	52.2	(15.2)	47.7	(13.9)
Total Cropped Area (Gross Cropped Area or GCA)	193.8	(56.6)	192.3	(56.1)	222.1	(37.7)	227.7	(66.4)	217.4	(63.5)
Net Irrigated Area*	NA		NA		64.4	(36.4)	62.5	(35.6)	58.5	(34.5)
Gross Irrigated Area**	NA		NA		80.9		79.1	(34.7)	73.1	(33.6)
Cropping Intensity (%)	118.3		121.2		129.9		129.7		128.1	

Notes: Figures in parentheses are percentages of total reported area.

* Figures in parentheses are percentages of NSA and **Figures in parentheses are percentages of GCA.

Source: Government of Rajasthan (2011 Census Book)

Population of marginal and small landholders is 4 million (58% of all size group). However, they only occupy 16% of the total area.

Table A2.5.3 Land Holding Pattern in Rajasthan (2010-11)

No.	Item	Total Holding				Average Size of Holdings ha
		Number	(%)	Area	(%)	
1	Marginal (0-1 ha)	2,511,512	36.5%	1,237,578	5.9%	0.49
2	Small (1-2 ha)	1,511,068	21.9%	2,161,876	10.2%	1.43
3	Semi medium (2-4 ha)	1,335,144	19.4%	3,774,350	17.9%	2.83
4	Medium (4-10 ha)	1,127,122	16.4%	6,918,368	32.7%	6.14
5	Large (>10 ha)	403,590	5.9%	7,044,064	33.3%	17.45
6	All Size Group	6,888,436	100.0%	21,136,236	100.0%	3.07

Note: Figures in parentheses are percentages of total.

Source: Government of Rajasthan (2011 Census book)

(3) Cultivated Area and Yield

As shown in Table A2.5.4 below, in *kharif* season, 16.1 million ha of farmland is used for cultivation; and in *rabi* season, 9.6 million ha of farmland is used for cultivation. In *kharif* season, the farmers can depend on rainwater; but in *rabi* season, most of them depend on irrigation.

Table A2.5.4 State-level Summary of Principal Crops in Rajasthan

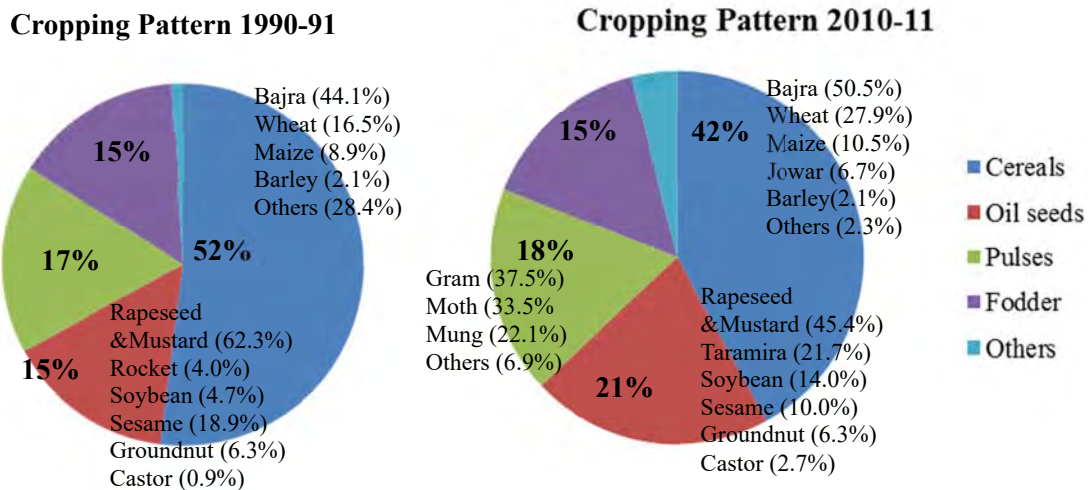
Season	Crops	Area (ha)	Area Irrigated (in ha)	Production (kg)	Productivity (kg/ha)
Kharif	Rice	167,752	115,140	366,676	2186
	<i>Jowar</i> (Sorghum)	660,969	837	504,500	763
	<i>Bajra</i> (Pearl millet)	4,076,909	121,381	4,456,123	1093
	Maize	891,457	5305	1,551,246	1740
	Millets	11,095	0	2650	239
	<i>Mung</i> bean	893,947	25,908	460,560	515
	Urad bean (Black lentil)	201,713	534	112,228	556
	Moth bean	868,914	3629	341,177	393
	<i>Chaula</i> (Cow pea)	59,587	589	38,648	649
	<i>Tur</i> (Pegion pea)	13,173	568	9685	735
	Cotton	486,552	463,094	1,527,300	534
	Sunn hemp (Green manure)	634	1	314	495
	Sugarcane	5571	5484	408,858	73,390
	Groundnut	500,824	441,966	1,011,120	2019
	Soybean	923,135	3954	956,552	1036
	Caster	226,336	193,770	335,111	1481
	Sesame	329,905	3362	112,203	340
	<i>Guar</i> beans (Cluster bean)	4,625,206	683,825	2,743,968	593
	Chilies	9671	8023	12,806	1324
	Others	414,900	-	-	-
Total		15,368,250	2,077,370	14,951,725	
Rabi	Wheat	3,318,248	3,303,856	9,823,876	2961
	Barley	343,302	338,437	962,391	2803
	Small Millets	2756	2756	2895	1050
	Gram (Chick pea)	1,256,323	599,695	911,085	725
	<i>Mater</i> (Green pea)	13,303	13,301	30,770	2313
	<i>Masur</i> (Pink lentil)	49,836	47,840	42,500	853
	Other pulses	4063	3864	4455	1096
	Coriander	249,310	248,180	198,764	797
	Cumin	434,783	434,515	120,828	278
	Fenugreek	81,699	81,669	84,186	1030
	Fennel	15,561	15,561	13,847	890
	Ajowan	636	342	436	686
	Turmeric	12	12	60	5000
	Ginger	120	118	230	1917
	Garlic	50,156	50,156	172,037	3430
	Potato	12,514	12,507	149,814	11,972
	Sweet potato	753	693	5744	7628
	Onion	61,363	61,268	960,784	15,657
	Rapeseed and Mustard	2,433,778	2,192,592	2,878,935	1183
	<i>Taramira</i> (Rocket)	40,604	2581	16,772	413
	Linseed	2561	2391	3290	1285
	<i>Isabgol</i>	355,595	355,536	117,587	331
	Tobacco	474	418	700	1477
Henna	41,809	5	30,847	738	

Season	Crops	Area (ha)	Area Irrigated (in ha)	Production (kg)	Productivity (kg/ha)
	Others	538,480	-	-	-
	Total	9,308,039	7,768,293	24,301,126	

Source: Department of Agriculture, Rajasthan, Agricultural Statistics 2014-2015

(4) Trend of Cropping Pattern

The major crops grown in different parts of Rajasthan are *bajra* (pearl millet), wheat, *jowar* (sorghum), maize, cotton, rapeseed and mustard, groundnut, and horticulture crops. In terms of the cropping pattern in the state, the crop groups of total cereals, oilseeds, pulses, and fodder crops respectively account for about 42%, 21%, 18% and 15% of the gross cropped area (GCA) during the 2010-11 period.



Source: Department of Agriculture, Agricultural Statistics, 2013

Figure A2.5.1 Cropping Pattern in 1990–91 and 2010–11

Among the cereals, *bajra* or pearl millet (50.5%), wheat (27.9%), maize (10.5%) and *jowar* or sorghum (6.7%) are the major crops; while rapeseed and mustard (45.4%), taramira or rocket (21.7%), soybean (14.0%), sesame (10.0%), and groundnut (6.3%) are the major oilseeds grown in the state. Among total pulses, ram, moth beans, and mung beans are the major crops which account for about 37.5%, 33.5%, and 22.1%, respectively in 2010-11.

It is evident from Figure A2.5.1 that the share of total cereals declined by 10% (from 52% in 1990-91 to 42.0% in 2010-11); while the share of oilseeds increased by 6% (from 15% in 1990-91 to 21% in 2010-11). Thus, it can be assumed that there is a shift from cereals to oilseeds.

The share of fodder crops remained at around 15% of GCA. The share of pulses increased slightly from 17% in 1990-91 to 18% in 2010-11. Among the cereals, the respective shares of bajra, wheat, maize, and barley increased from 44.1%, 16.5%, 8.9%, and 2.1% in 1990-91 to 50.5%, 27.9%, 10.5%, and 3.0% in 2010-11. On the other hand, the share of jowar and small millets decreased during the last two decades.

Among the oilseeds, the shares of taramira (rocket), soybean, and castor increased from 4.0%, 4.7%, and 0.9% in 1990-91 to 21.7%, 14.0%, and 2.7% in 2010-11, respectively. However, the share of rapeseed, mustard, sesame, and groundnut decreased sharply during the last two decades.

The share of rapeseed/mustard and sesame in terms of total area under oilseeds declined from 62.3% and 18.9% in 1990-91 to 45.4% and 10.0% in 2010-2011, respectively. The absolute area of total cotton has declined as well as its share in GCA. Cotton declined from 454,000 ha (2.12% of GCA) in 1990-91 to 336,000 ha (1.37% of GCA) in 2010-11.

(5) Animal Husbandry

Animal husbandry is not only a subsidiary source of livelihood in rural Rajasthan but also a major economic activity especially in the arid and semi-arid regions of the state. This sector plays a vital role

in the rural economy of the state and has a significant impact on employment generation for the marginal, sub-marginal, and landless farmers. The western districts of the state are famous for their indigenous cattle breed. The Eighteenth Livestock Census recorded a total livestock population in India of 529.7 million and total poultry population of 648.8 million (GoI, 2009). Out of the total, Rajasthan State accounts for 10.9% of livestock (57,900,000) and 0.4% of poultry (2,650,000). It may be noted that total livestock population in the state increased by 15.3% in 2007 compared to 2003 (increased from 49,140,000 in 2003 to 56,660,000 in 2007); while total poultry population is reduced by 19.3%, i.e., declined from 6,192,000 in 2003 to 4,994,000 in 2007 (GoI, 2005; 2009).

For the further development of the animal husbandry sector, the Government of Rajasthan formulated the “Livestock Development Policy” for the welfare of farmers. Some schemes and programmes have also been introduced to strengthen the sector in the state. Programmes such as Rajiv Gandhi Mission on Agriculture and Animal Husbandry, *Pashu Chikitsalaya Pashu Palak ke Dwar* Scheme, *Pashu Seva Kendra* Scheme, and National Protein Supplementation Programme have been introduced.

Animal treatment camps have also been organised regularly in *Gram Panchayats* where a government veterinary institution is not available (GoR, 2012c). Under the *Pashu Seva Kendra* Scheme, the state government has sanctioned 1,290 *Pashu Seva Kendra* across various districts.

The Dairy Development Programme in Rajasthan has been implemented through cooperative societies. Under this program, 12,478 primary dairy cooperative societies have been affiliated with 21 district milk producers cooperative unions spread over 33 districts of the state up to December 2011 (GoR, 2012c). It can be noted that about 432.2 million litres of milk have been marketed in 2011-12 (up to December).

Table A2.5.5 Performance of Dairy Development Sector in Rajasthan

Activity	Unit	Target 2011-12	Achievement 2011-12 (Up to Dec. 2011)
Milk Procurement	ton	779.0	411.8 (52.9%)
Milk Marketing	ton	616.8	432.2 (70.1%)
Cattle Feed Sale	ton	263	133 (50.6%)
Revived Societies	number	588	488 (83.0%)
New Societies	number	898	141 (15.7%)
Artificial and Natural Insemination	number	453	467 (103.1%)

Note: Figures in parentheses are percentages of the target achieved.
Source: Government of Rajasthan

(6) Farm Inputs and Management

In addition to harsh agro-climatic conditions, limited access to inputs (land, irrigation water, seeds and fertilisers), technology, farm credit, and markets have limited the growth of agriculture development in Rajasthan. It resulted in a predominance of low productivity, risk-minimizing, and subsistence-oriented farming systems (integrating crop and livestock production) capable of resilience (within limits) against droughts as well as able to produce a marketable surplus in years of good monsoon rainfalls (GoR, 2012). Thus, there is a need to strengthen the input delivery system in the state.

(a) Seeds

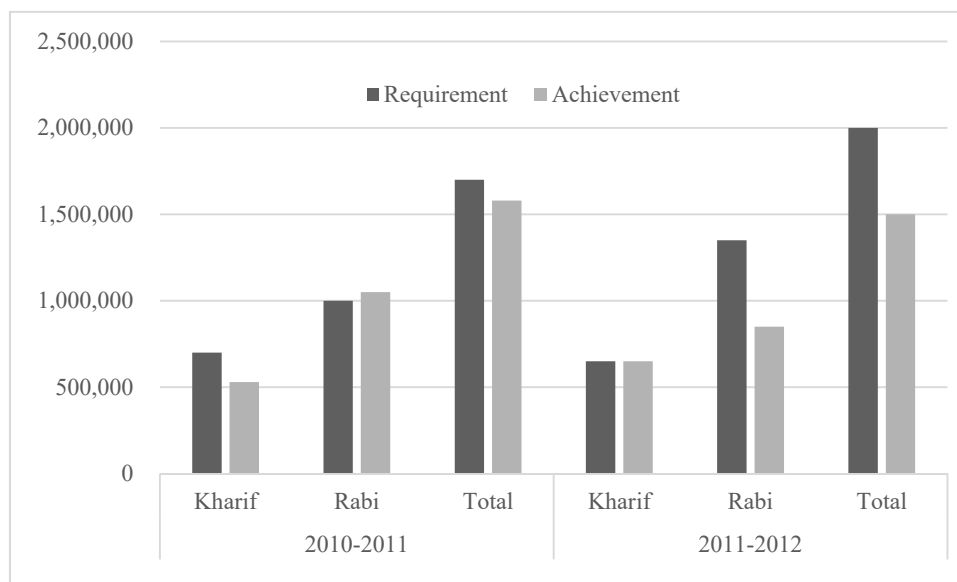
Seed brings big change to farmers in terms of quality and quantity. The Green Revolution in India during the late 1960s shows the evidence. In addition, lately, during the 2000s, Bt cotton seeds (GMO by Monsanto) and hybrid maize seeds have shown spectacular results (GoI, 2012). However, in the case of Bt cotton, it was not so successful since it was ineffective against many cotton pests.

Scientists and researchers develop new varieties every year. In particular, Rajasthan has colourful variations of climate and topography. Therefore, the Department of Agriculture (DoA) has provided the 20 Package of Practices (PoPs) for *kharif* and *rabi* seasons, and for 10 agro-climatic zones. It even provides the list of more than 5,000 recommended varieties.

However, the availability of quality/certified seeds has been limited in various parts of Rajasthan. Figure A2.5.2 shows that there had been a significant shortfall in the availability of quality/certified seeds in 2011-12. The shortfalls of seed to the total requirement during *kharif* and *rabi* seasons were 12.6% and

31.8%, respectively. Thus, the unavailability of seed in time and adequate quantity has potential negative impacts on agricultural output.

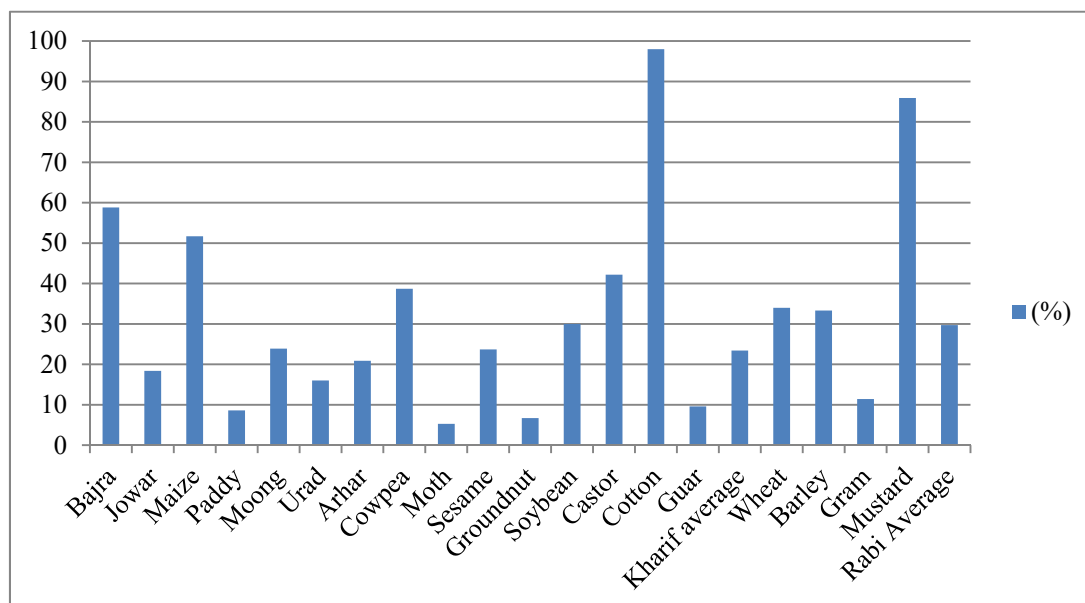
In some cases, the seed replacement rate (SRR) has improved recently. The SRR of *jowar*, *bajra*, groundnut, and soybean has increased by 104.7%, 27.3%, 46.0%, and 64.8%, respectively from 2008-09 to 2011-12. The SRR of some major crops in 2011-12 is presented in Figure A2.5.3.



Source: Commissionerate of Agriculture, Rajasthan, Agricultural Statistics, 2013-2014

Figure A2.5.2 Requirement and Distribution of Certified/Quality Seed

Usually, farmers harvest seeds by themselves and use the harvested seeds repeatedly. Sometimes, the self-harvested seeds have deteriorated quality. DoA recommends to replace the seeds at least within 2-3 years. However, certified/quality seeds are not always available. In the case of cotton, they use Bt cotton (terminator seeds) so that farmers need to replace all every year.



Source: Department of Agriculture, 2013

Figure A2.5.3 Seed Replacement Rate

(b) Fertilisers

Around 60% of the area in Rajasthan is covered by sandy soils. In terms of soil composition, there is no organic matter inside. Therefore, use of fertiliser is the only way to give nutrition to crops. Adequate

and timely application of fertilisers will maximize yield. Department of Fertilisers needs to provide proper quantity on time at affordable price to farmers.

Table A2.5.6 Consumption of Fertilisers in Rajasthan (Unit: ton)

N/P/K	2007-08	2008-09	2009-10	2010-11	2011-12 (Estimated)	% Change in 2010-11 over 2007- 08	% Change in 2011-12 over 2007- 08
N	705,335	709,533	721,962	870,392	924,730	23.40	31.11
P	260,464	319,022	316,184	413,303	409,226	58.68	57.11
K	20,912	23,470	34,748	34,950	44,832	67.13	114.38
Total	986,711	1,052,025	1,072,894	1,318,645	1,378,788	33.64	39.74
NPK Use in kg/ha of GCA	44.43	46.20	49.34	NA	56.77	NA	22.87

Notes: N-Nitrogenous, P- Phosphatic, K-Potassic; NA-Not available

Source: Department of Agriculture, Krishi Bhawan, Government of Rajasthan, 2013

(c) Mechanisation

There is a strong correlation between farm mechanisation and agricultural productivity. The states with greater availability of farm power show higher productivity as compared to the others (GoI, 2012). Among various types of farm machinery, tractors, power tillers, diesel engines, and electric motors are the major ones.

The sales of tractors and power tillers in India have increased significantly from 296,100 and 22,300 in 2005-06 to 545,100 and 55,000 in 2010-11, respectively. Out of the total sale of tractors, Madhya Pradesh and Rajasthan accounts for 21%. Electric power consumption is also one of the major aspects of farm mechanisation. Compared to the 20.98% of total power consumption used in agriculture at the all India level in 2009-10, Rajasthan consumes about 39.42% of its total electricity in agriculture alone (GoI, 2012).

Rental system of tractors and harvesters is popular in several states such as Haryana, Punjab, Madhya Pradesh. Large-scale farmers can purchase tractor by themselves. However, it is not affordable for small- and medium-scale farmers. Therefore, they pay rent fee to the agent.

As suggested in the State Agriculture Policy (GoR, 2012), seed-cum-fertiliser drill, zero till drill, laser levellers, and various farm implements and tools need to be popularised along with bullock drawn implements for small and marginal farmers.

Seed dressers, sprayers, weeding implements, fodder chaff cutters, and other drudgery reduction implements shall be popularised. Custom hiring system shall also be promoted.

(d) Credit and Insurance

Credit availability and agricultural insurances are important drivers of growth in agriculture. However, the formal credit is only readily available to elite class people, such as large and wealthy farmers who are trusted by the institutional lenders, because of their greater repayment capacity. On the other hand, the access of poor marginal and small farmers to institutional credit is quite limited (Swain, 2001; Swain and Swain, 2007). Looking at the disbursement of institutional credit in rural Rajasthan (Table A2.5.7), it is evident that only about 54.4% of the targeted amount of agricultural loans has been disbursed in 2011-12. The analysis on the composition of agricultural loans by sources reveals that about 49.1% of total agricultural loans and about 44.1% of total crop loans were disbursed by commercial banks. The cooperative banks disbursed about 30.3% of total loans as agricultural loans.

Table A2.5.7 Source-wise Agricultural Credit Disbursement in Rajasthan in 2011-2012

Type of Loan	Target/ Achievement	Commercial Bank	Regional Rural Bank	Cooperative Bank	Others	Total
Crop Loan	Target achievement	10,612	4,288	7,807	9	22,716
		5,785	2,871	4,450	0	13,106
		(54.5)	(67.0)	(57.0)	(0.0)	(57.7)
Term Loan	Target achievement	4,642	809	1,221	24	6,696
		2,071	429	406	0	2,906
		(44.6)	(53.0)	(33.3)	(0.0)	(43.4)
Total Agriculture Loan	Target achievement	15,254	5,097	9,028	33	29,412
		7856	3300	4856	0	16,012
		(51.5)	(64.7)	(53.8)	(0.0)	(54.4)

Note: Figures in parentheses are the percentages of targeted loan amount
Source: Department of Agriculture, Government of Rajasthan (2013)

As far as the status of agricultural insurance and weather-based crop insurance is concerned, it may be noted from Table A2.5.8 and Table A2.5.9 that performance of weather-based crop insurance is much better than that of the National Agricultural Insurance Scheme (NAIS). The number of farmers insured under the weather-based crop insurance has increased from 167,000 during *rabi* in 2007 to 2,733,000 during *rabi* in 2011.

Table A2.5.8 Performance of National Agricultural Insurance Scheme in Rajasthan

Season/Year	Farmers Insured (No.)	Farmers Benefitted (No.)	Area Insured (ha)	Sum Insured (INR in million)	Premium Paid (INR in million)	Claims (INR in million)	State Share (INR in million)
<i>Kharif</i> 2007	2,147,000	230,000	3,965,000	17,770	521.1	884.1	181.5
<i>Kharif</i> 2008	1,368,000	457,000	2,761,000	13,940	401.9	2,474.9	1,036.5
<i>Kharif</i> 2009	2,593,000	2,103,000	4,673,000	27,240	795.1	13,992.0	6,598.5
<i>Kharif</i> average	2,042,000 (75.6)	930,000 (82.8)	3,800,000 (77.3)	19,650 (64.4)	572.7 (64.9)	5,783.7 (89.5)	2,605.5 (92.6)
<i>Rabi</i> 2007	688,000	281,000	1,139,000	10,140	220.4	775.3	287.6
<i>Rabi</i> 2008	864,000	220,000	1,536,000	15,270	463.0	765.2	143.8
<i>Rabi</i> 2009	421,000	79,000	677,000	7,200	246.3	504.9	193.6
<i>Rabi</i> average	658,000 (24.4)	193,000 (17.2)	1,117,000 (22.7)	10,870 (35.6)	309.9 (35.1)	681.8 (10.5)	208.3 (7.4)
Gross total	2,700,000 (100.0)	1,123,000 (100.0)	4,917,000 (100.0)	30,520 (100.0)	882.6 (100.0)	6,465.5 (100.0)	2,813.8 (100.0)

Source: Department of Agriculture, Government of Rajasthan (2007-2009)

Similarly, the number of farmers insured under the same scheme has increased from 1,900,000 during *kharif* in 2008 to 4,738,000 during *kharif* in 2011. On the other hand, the growth in the number of farmers insured and area insured under NAIS has been almost stagnant over the last couple of years.

Table A2.5.9 Performance of Weather-based Crop Insurance Scheme in Rajasthan

Season/Year	Farmers Insured (No.)	Farmers Benefitted (No.)	Sum Insured (INR in million)	Premium Paid (INR in million)	State Share (INR in million)	Central Share (INR in million)	Claims (INR in million)
<i>Rabi</i> 2007	591,000	167,000	16,264.0	461.3	513.6	513.6	834.9
<i>Kharif</i> 2008	19,000	6,000	404.5	15.1	20.0	20.0	19.4
<i>Rabi</i> 2008	24,000	10,000	1,570.9	35.2	56.6	56.6	81.9
<i>Kharif</i> 2009	320,000	242,000	5,175.2	188.0	205.8	205.8	445.8
<i>Rabi</i> 2009	659,000	242,000	11,609.7	335.2	501.4	501.4	1,059.3
<i>Kharif</i> 2010	3,515,000	781,000	27,289.1	932.3	1,049.6	1,049.6	370.9
<i>Rabi</i> 2010	2,733,000	1,171,000	42,577.6	994.6	1,179.5	1,179.5	2,283.3
<i>Kharif</i> 2011	4,738,000	1,210,000	42,885.4	1,317.9	1,500.5	1,500.5	907.9

Source: Department of Agriculture, Government of Rajasthan

2.5.2 Soil Classification for Agricultural Production

Five distinct specifications of soils, viz.: aridisols, alfisols, entisols, inceptisols, and vertisols, are found in the state. The types of soil available in Rajasthan are mostly sandy, saline, alkaline, and chalky (calcareous). The characteristics of sandy soil are often dry, nutrient deficient, and fast-draining.

The districts of Nagaur, Jodhpur, Jalor, Barmer, Hanumangarh, Sri Ganganagar, Churu, Jhunjunu, and Sikar are covered by desert soils (sandy to sandy loam). They contain a high percentage of soluble salt and have high pH value. They have varying percentages of calcium carbonate and are generally poor in organic matter. These soils are deep and well drained. In most of the desert soils, nitrogen is low (0.02%-0.07%). They are not fertile but they can be made fertile for agricultural crops and plants where water supply is regular by putting phosphates with nitrates. Under normal rainfall, *kharif* (summer) crops are grown, but failure of crops due to low rainfall is common.

The soils in the districts of Barmer, Bikaner, Jaisalmer, Jaipur, Jodhpur, and Chure are classified into dunes and associated soils. Their texture is loamy fine sand to coarse sand and may or may not be calcareous. Cultivation is practised in the rainy season on the slopes of low to medium high dunes and usually rainfed bajra or *kharif* pulses are grown. They have been grouped separately from desert soils as they are only deposited sand and little profile development has taken place. Dunes are of varying heights, from low shifting dunes to high and very high stabilized dunes.

The soils in the districts of Tonk, Bundi, Sawai Madhopur, Bhilwara, Udaipur, and Chittorgarh are classified into brown soils. Their texture is sandy loam to clay loam. Major area of these soils is in the catchment area of Banas River. They are rich in calcium salts but are poor in organic matter. Use of fertilisers is essential to get good harvest. As the groundwater is saline, soils irrigated with groundwater have accumulated salts. Tank-irrigated soils have also developed problem of high water table. *Rabi* crops are grown under irrigation.

The soils in the districts of Pali, Nagaur, Ajmer, Jaipur, and Dausa are classified into sierozems. Their texture is sandy loam to sandy clay. These soils are suitable for cultivation. But for low rainfall and high evaporation, *kharif* crops are rainfed and *rabi* crops are grown through well irrigation. *Kharif* crops such as bajra, jowar, pulses and *rabi* crops such as wheat, mustard, and vegetables are grown.

The soils in the districts of Dungarpur, Bansawara, parts of Udaipur, and Chittorgarh are classified into red loams. Their texture is sandy loam to sandy. These soils are rich in iron oxide but devoid of calcium salts because calcium salts are soluble in water and are easily washed away. These soils are suitable for maize, chillies, wheat, barley, and rapeseed cultivation. Parent material of these soils is the red sandstone or yellow sandstone, which is found in Vindyan rocks.

The soils in the districts at the foothills of Aravalli in Sirohi, Pali, Nagaur, Udaipur, Rajsamand, Chittorgarh, Bhilwara, and Ajmer are classified into hill soils (lithosols). Their texture is sandy loam to clay and well drained. Cultivation of crops in these soils is very much restricting due to shallow nature of these soils and presence of stones on the surface. Soil erosion due to water is another problem of these soils.

The soils in districts in natural depressions like Pachpadra, Sambhar, Deedwana, Ranns of Jalor, and Barmer are classified into saline sodic soils (solonchaks). Saline sodic soils are seen in the far floodplains of Ghaggar River and Luni River basin. Water table is sometimes close to the surface. Cultivation is not possible due to impeded drainage and high degree of salinity. The only vegetation includes some salt-tolerant grasses and shrubs.

The soils in the districts of Sri Ganganagar, whose soil is deposited by Ghaggar River, Kota, Bundi, Baran, and Jaipur are classified into alluvial soils and black soils.

As a conclusion, to increase the area and production during both the *kharif* and *rabi* seasons, irrigation is indispensable; adequate use of water will then promote farming.

Table A2.5.10 Soil Classification in Rajasthan

No.	Type of Soil (Annual Rainfall)	Districts Covered	Crops Grown	Other Information
1	Brown Soils (500-750 mm)	Tonk, Bundi, Sawai Madhopur, Bhilwara, Udaipur, and Chittorgarh	<i>Rabi</i> crops mostly including cereals. Texture of soil is sufficient for <i>kharif</i> crops.	The groundwater is saline. Soils irrigated by groundwater have accumulated salts.
2	Sierozens Soils	Pali, Nagaur, Ajmer, and Jaipur on both sides and lying on both sides of Aravalli	<i>Rabi</i> crops under well irrigation and <i>kharif</i> crops are rainfed.	Soils are yellowish brown sandy to sandy loam and sandy clay loam soils with weak structure and are permeable.
3	Red Desert Soils (Less than 400 mm)	Nagaur, Jodhpur, Jalore, Pali, Barmer, Churu and Jhunjhunu	Failure of <i>kharif</i> crops due to no rainfall is common. Only salt-tolerant crops, mostly cereals, are grown.	Soils are pale brown to dark brown with weakly developed structure and well drained.
4	Solanchak (Saline Soils)	Jaisalmer, Bikaner, Nagaur, and Rann of Kutch area in Jalor and Barmer	The only vegetation consists of some salt-resistant grasses.	Soils are dark grey to dark brown heavy soils with water source very close to the surface.
5	Rend Zina	Mahi catchment area covering Dungarpur, Banswara, and parts of Chittorgarh districts	Paddy rice, cotton, and maize are the common crops of the area.	Soils are reddish in colour, medium textured, well drained, and calcareous.
6	Lithosols	At the foothills of the Aravalli in Sirohi, Pali, Nagaur, Udaipur, Chittorgarh, Bhilwara, and Ajmer districts and on the slopes of Vindhyan in Bundi and Jhalawar	Cultivation of crops is restricted due to root zone limitations and also due to stoniness on the surface.	Soils are reddish to yellowish red to yellowish brown in colour. They are sandy loam to clay loam in texture.
7	Regosols	Spread over almost the whole of the western half of the state	Usually rainfed bajra (pearl millet) or <i>kharif</i> pulses are grown on the slope of low to medium high dunes. Wherever groundwater is available, <i>rabi</i> cereals are grown.	Desert soils and sand dunes. Texture varies from loamy fine to coarse sand and may or may not be calcareous
8	Alluvial Soils	Vast area of northwestern, eastern, and southeastern plains of the state. Mainly in the floodplains of Sri Ganganagar, Alwar, Jaipur, Bharatpur, parts of Ajmer, Tonk, Sawai Madhopur, Bhilwara, Bundi, and Kota		Soils are brought down and deposited by the rivers like Ghaggar, Chamblee, etc.

Source: Department of Agriculture in "50 years of Agricultural Development in Rajasthan", 1999

2.5.3 Agro-climatic Zones and Classification

(1) Advantage and Disadvantage of Climatic Condition in Rajasthan

The arid zone of Rajasthan spreads over 12 districts occupying about 61% of the total geographical area of the state. The semi-arid and humid regions account for about 16% and 15% of the total area, respectively, while the sub-humid region constitutes about 8% of the total landmass. Rajasthan has varying topographic features although a major part of the state is dominated by parched and dry region. The extensive topography includes rocky terrain, rolling sand dunes, wetlands, barren tracts or land filled with thorny scrubs, river-drained plains, plateaus, ravines, and wooded regions. The distinctive features of ten agro-climatic zones are presented in Table A2.5.11.

The state has a tropical desert climate. The arid and semi-arid areas constitute about two-thirds of the total geographical area of the state. The analysis on two major climatic factors, viz., rainfall and temperature, has been made in this section. The analysis of the rainfall pattern in Rajasthan reveals that

the average rainfall in the state is 57.4 cm, compared to the all-India average of 110 cm. The period of monsoon is very short ranging from 60 to 75 days. On the average, its onset is late and withdrawal is early as compared to other states; one or two dry spells is a common phenomenon.

(2) Classification of Agro-climatic Zones

In determining agricultural regions, factors such as rainfall, temperature, altitude, latitude, natural vegetation, soils, crops, and livestock are taken into consideration. The agro-climatic classification is nothing but an extension of the climate classification keeping in view the suitability to agriculture.

Rajasthan is the largest state of India constituting 10.4% of the total geographical area and 5.67% of the total population of India (Census, 2011). The state is divided into 7 divisions and 33 districts, which are further sub-divided into 244 tehsils, 249 *panchayat* sammittees, and 9,168 *gram panchayats*. Physiographically, the state can be divided into four major regions, namely:

- i) The western desert with barren hills, rocky plains, and sandy plains;
- ii) The Aravalli hills running southwest to northeast starting from Gujarat and ending in Delhi;
- iii) The eastern plains with rich alluvial soils; and
- iv) The southeastern plateau.

Mahi, Chambal, and Banas are the three major rivers of the state. The state enjoys a strategic geographical position wherein it is situated between the northern and western growth hubs of the country, and 40% of the Delhi Mumbai Industrial Corridor (DMIC) runs through it.

Table A2.5.11 Agro-climatic Zones

Zone	Area (million ha)	District	Temperature (°C)		Major Crops		Soils
	Total	Covered	Max.	Min.	Kharif	Rabi	
Ia: Arid Western Plain	4.74	Barmer and part of Jodhpur	40.0	8.0	Pearl millet, Sorghum, Mung bean, Moth bean, Sesame	Wheat, Mustard, Cumin	Desert soils and sand dunes, aeolian soil, coarse sand in texture, some places calcareous
Ib: Irrigated Northwestern Plains	2.10	Sri Ganganagar, Hanumangarh	42.0	4.7	Cotton, Cluster bean	Wheat, Mustard, Gram	Alluvial deposits, calcareous, high soluble salts and exchangeable sodium
Ic: Hyper-Arid and Irrigated Western Plain Partially	7.70	Bikaner, Jaisalmer, Churu	48.0	3.0	Pearl millet, Moth bean, Cluster bean	Wheat, Mustard, Gram	Desert soils and sand dunes, aeolian soil, loamy coarse in texture, and calcareous
IIa: Transitional Plain of Inland Drainage	3.69	Nagaur, Sikar, Jhunjhunu, part of Churu	39.7	5.3	Pearl millet, Cluster bean, Pulses	Mustard, Gram	Sandy loam, shallow depth red soils in depressions
IIb: Transitional Plains of Luni Basin	3.00	Jalor, Pali of Sirohi, Jodhpur (part)	38.0	4.9	Pearl millet, Cluster bean, Sesame	Wheat, Mustard	Red desert soils in Jodhpur, Jalor, and Pali; sierozems in Pali and Sirohi
IIIa: Semi-arid Eastern Plain	2.96	Jaipur, Ajmer, Dausa, Tonk	40.6	8.3	Pearl millet, Cluster bean, Sorghum	Wheat, Mustard, Gram	Sierozems in eastern part; alluvial in west; lithosols in northwest; and brown soils in foothills,

Zone	Area (million ha)	District	Temperature (°C)		Major Crops		Soils
	Total	Covered	Max.	Min.	Kharif	Rabi	
IIIb: Flood-prone Eastern Plains	2.77	Alwar, Dholpur, Bharatpur, Sawai Madhopur, Karuli	40.0	8.2	Pearl millet, Cluster bean, Groundnut	Wheat, Barley, Mustard, Gram	Alluvial, prone to water logging, nature of recently alluvial; calcareous are observed
IVa: Sub-humid Southern Plains and the Aravalli Hills	3.36	Bhilwara, Sirohi, Udaipur, Chittorgarh, part of Rajsamand	38.6	8.1	Maize. Pulses Sorghum	Wheat. Gram	Soils are lithosols at foothills, and alluvials in plains
IVb: Humid Southern Plain	1.72	Dungarpur, Udaipur, Banswara, Pratapgarh	39.0	7.2	Maize, Paddy-Sorghum, Black gram	Wheat. Gram	Predominantly reddish medium texture, well drained, calcareous; shallow on hills, deep soil in valleys
V: Humid Southeastern Plain	2.70	Kota, Jhalawar Bundi, Baran	42.6	10.6	Sorghum, Soy bean, Sorghum	Wheat, Mustard, Gram	Black of alluvial origin, clay loam, groundwater with salinity

Source: Rajasthan Agricultural Statistics at a glance for the year 2013-14

2.5.4 Diversification and Target Agro-product

The change of cropping pattern in Rajasthan agriculture has brought about the setup of irrigation. Traditional cropping pattern is mix cropping of cereals for hedging risk against natural disasters. Some farmers converted from cereals to oilseeds, pulses, and horticultural crops.

Rajasthan State is India's largest producer of mustard, pearl millet (*bajra*), and three spices (coriander, cumin, and fenugreek), cluster beans (*guar*), and *isabgol* and second largest producer of maize. The dependence on livestock has also increased because of risky rainfed agriculture.

Rajasthan has the second largest herd of livestock amongst Indian states, contributing about 10% of the country's milk and 30% of mutton production (GoR, 2012). Agriculture and livestock production take place in major parts of Rajasthan, often in extreme agro-climatic conditions. In most parts of rainfed areas, only one crop can be grown in a year. Therefore, farmers need to make agriculture practices more resilient to harsher and changing agro-ecological conditions.

In consideration of such harsh conditions, farmers are challenged to convert from cereals to water-wise crops such as seed spices and medicinal plants.

If irrigation is available, farmers can even convert from cereals to vegetable under protected condition or to fruits with micro irrigation and mulching.

2.5.5 Minimum Use of Water Adapting to Agro-climatic Zones

Water-wise crops: "Water-wise" is a coined word from "water" and "wise". It means to use water efficiently and beneficially to conserve water. Water-wise crops can reduce the use of water. Therefore, they are suitable to arid and semi-arid areas, or almost all areas except agro-climatic zones Ib and V.

Table A2.5.12 Water-wise Crops

No.	Name of Crop	Total Area 2012-13 (ha)	Production (t)	State Average Yield (t/ha)	Price (INR/t)	Water Application in m ³ /ha
1	Barley	306,000	960,000	3.1	12,000-15,000	2,500-3,000
2	Gram	1,250,000	1,260,000	1.0	30,000-40,000	2,000-2,500
3	Lentil	27,587	30,356	1.1	30,000-35,000	2,000-2,500
4	Mustard	2,720,000	3,760,000	1.4	30,000-35,000	2,000-2,500
5	Linseed	1,061	1,023	1.0	25,000-30,000	2,500-3,000
6	<i>Taramira</i> (Rocket)	110,000	54,634	0.5	25,000-30,000	2,000-2,500
7	Cumin	495,691	176,350	0.4	110,000-130,000	1,500-2,000
8	Coriander	158,678	231,925	1.5	35,000-45,000	2,500-3,000
9	Ajowan	13,947	8,651	0.6	100,000-120,000	1,500-2,000
10	<i>Isabgol</i>	190,224	99,950	0.5	40,000-50,000	2,000-2,500

Source: JICA survey team compiled based on DoA information

2.5.6 Agriculture Extension Services

(1) Department of Agriculture

The main actor for agriculture extension is DoA. DoA provides services such as seed laboratory testing service, provision of information, extension services, and agricultural consultancy services. The organisational structure is shown in Figure B2.5.1. The total staff number is 8,628 as shown in Table B2.5.1.

The role of extension officers is mainly distribution of subsidies from central and state governments. Consequently, the agriculture supervisors, approximately 6,400 persons in total, play the role of extension workers at the village level. DoA provides cultivation manuals called “Package of Practice” (PoP). 20 PoPs are compiled for 10 agro-climatic zones and for *kharif* and *rabi* seasons. They cover some commercial crops such as tobacco, sugarcane, cotton, and *isabgol* (medicinal plant) as well as cereals, pulses, and oilseeds.

(2) Department of Horticulture

Another main actor for agriculture extension is the Department of Horticulture (DoH). DoH came into existence in 1989 under the DoA. The organisational structure and staff number of the DoH are shown in Figure B2.5.2. Having a total number of staff of 877, it comprises almost 10% of the DoA.

Higher agriculture officers are busy with the distribution of subsidies. The number of agriculture supervisors (extension worker at the field level) is only 349. It is only 5.5% of the DoA.

DoH covers fruits, vegetables, flowers, spices, and medicinal/aromatic plants. However, it is difficult to provide enough extension services to farmers since the number of staff is insufficient.

Through the collaboration between the Indian and Israeli governments, seven Centre of Excellence (COE) were set up in Rajasthan. They showcase advanced techniques and new crops of horticulture. They also provide nursery of exotic vegetables, fruits, and flowers to farmers on demand basis.

Table A2.5.13 Centres of Excellence

No.	Name of Centre	In charge	Location	Speciality
1	COE, Jhalawar, ROCL (Bassi)	Joint Director of Horticulture	Jaipur, Jhalawar	Hi-tech nursery of exotic vegetables and flower seedlings on demand; Olive cultivation
2	COE, Jhalawar	Deputy Director of Horticulture	Jhalawar	Automatic drip irrigation and fertigation system
3	COE, Jaisalmer	Deputy Director of Horticulture	Jaisalmer	Date palm
4	COE, Dhindol	Deputy Director of Horticulture	Jaipur	Drip irrigation system and pomegranate
5	COE, Kota	Deputy Director of Horticulture	Kota	Citrus
6	COE, Dholpur	Deputy Director of Horticulture	Dholpur	Semrina wheat
7	COE, Tonk	Deputy Director of Horticulture	Tonk	Guava

Source: Department of Horticulture

(3) *Krishi Vigyan Kendra (KVK)*

(a) **Mandate of KVK**

Mandate of KVK is to apply technology and products through assessment, refinement, and demonstration for adoption. To achieve the mandate effectively, the following activities are envisaged for each KVK:

- On-farm testing to identify the specific location of agricultural technologies under various farming systems.
- Frontline demonstrations to establish its production potentials on the farmers' fields.
- Training of farmers and extension personnel to update their knowledge and skills in modern agricultural technologies.
- Work as resource and knowledge centre of agricultural technologies for supporting initiatives of public, private, and voluntary sector for improving the agricultural economy of the district.
- Produce and make available technological products like seed, planting material, bio agents, and young ones of livestock to the farmers.
- Organise extension activities to create awareness about improved agricultural technologies to facilitate fast diffusion and adoption of technologies in agriculture and allied sectors.

(b) **KVKs in Rajasthan**

There are 42 KVKs in Rajasthan State. Out of the 42 KVKs, 33 KVKs are under five state agriculture universities (SAU); and 3 KVKs, 4 KVKs, and 2 KVKs are under the Indian Council of Agricultural Research (ICAR), NGOs, and other education institutes (OEI), respectively. The five SAUs include Swami Keshwanand Rajasthan Agricultural University (Bikaner), Maharana Pratap University of Agriculture and Technology (Udaipur), Shri Karan Narendra Agriculture University (Jobner), Kota Agriculture University (Kota), and Jodhpur Agriculture University (Jodhpur). Details of the KVKs are shown in Attachment 2.5.1.

(4) **Farm Input Agency**

Many private agro-input companies perform some extension functions. This may also be a significant function in the agriculture sector since the private marketing officers often provide several extension services regarding seeds, fertilisers, pesticides, and agro-machinery. In addition, a few of them also take up some demonstrations to publicise new products. Many of them sponsor farmer meetings or seminars organised by line departments such as DoA.

However, these companies generally do not always provide extension support to individual growers or farmer groups as they employ only limited manpower in their target area. In addition, since the private company officers are not fully trained, they sometimes mislead farmers. For example, some agro-chemical companies introduced banned insecticide to farmers. Commercialism is still prioritized over safety.

2.5.7 Technical Support Groups

Technical support group (TSG) was established in the project areas to promote interdepartmental coordination for delivery of agriculture extension services to farmers and for proper execution of new technologies of agriculture production and water management in minor and medium irrigation improvement projects. The GoR has constituted three-tier committees/groups on 5 February 2010. Keeping in view the utility of TSGs, the DOP (Sec. 3) has issued an order on 30 May 2014 that the following three tier TSGs will continue permanently:

- i) State Level Coordination Committee (SLCC),
- ii) District-level Technical Support Group (DTSG), and
- iii) Water User Association Technical Support Group (WUA-level TSG).

Two major resources, namely, land and water, are no more plentiful and have become critical in crop production. Rajasthan State is well known for its tight water situation. The TSG at the WUA level and TSG at the district level have important roles in increasing agriculture production and water use efficiency. In the original idea, TSG would serve for the WUA collectively. It was a multi-departmental approach. The TSG at the WUA level, by advocating for production technologies and efficient use of irrigation water, could have helped the farmers to achieve high productivity per unit area and per unit of water if it functioned fully. TSG at the WUA level might have been useful for increasing the income of farmers by following proper cropping systems and using water-wise crops in their area.

(5) TSG at WUA Level

The TSG at the WUA level consists of nine members in RAJAMIIP as shown in Table A2.5.14.

Table A2.5.14 Structure of TSG at WUA Level

No.	Position in Concerned Organisation	Post in TSG
1	Assistant agriculture officer of the area	Project Manager
2	JEN of Water Resource Department or their nominee	Member
3	Official of medical and health department or their nominee	Member
4	Secretary cooperative or their nominee	Member
5	Official nominated by district animal husbandry officer	Member
6	Three members nominated by WUA	Member
7	Nominee of NGO	Member
8	Private input supplier (nomination by collector)	Member
9	Agriculture supervisor of the area	Coordinator and member secretary

Source: JICA survey team

(6) Major Works for TSG at WUA Level

The major works of TSG at the WUA level are:

- To organize the campaign for awareness and activities of the project for members of the WUA;
- To know the constraints and problems faced by members and farmers for increasing production;
- To prepare benchmark status for current cropping pattern, productivity, use of fertiliser, method of irrigation, and economic and social status of farmers;
- Survey of samples of soil and water of the sub-project area;
- To prepare agriculture production programmes on the basis of the availability of water and soil and water analysis reports;
- Management and execution of demonstrations;
- Members and farmers of TSG should be trained and they should be informed about the details of INM and IPM;
- Extension of recommendations of TSG in the sub-project area;
- Execution and extension of the recommendation of the TSG in the area of demonstrations; and
- Assistant agriculture officer (AAO) should submit their working plan to DTSG for approval.

(7) TSG at District Level

TSG at the district level has been constituted in all 24 districts for the effective execution of the Project.

Table A2.5.15 Structure of TSG at the District Level

No.	Position in Concerned Organisation	Post in TSG
1	District collector (In special circumstance, district collector can nominate ADM or CO)	Chairman
2	Executive engineer of WRD	Member
3	Chief medical and health officer (CMHO)	Member
4	Deputy / Asst. registrar (posted in district) cooperative department	Member
5	Deputy director of animal husbandry	Member
6	One nominee of NGO	Member
7	One social worker nominated by government	Member
8	Private input supplier (To be nominated by district collector)	Member
9	Deputy director of agriculture extension	Coordinator and member secretary
10	Nominee of WRD	Member

Source: JICA survey team

(8) Major Works of D-TSG

The major works of D-TSG will be the following:

- D-TSG will issue directives to the TSG at the WUA level for execution of various components of agriculture extension service;
- To create awareness about the project and impart technical training as needed;
- To provide technical support and coordination to TSG at the WUA level for execution of the Project;
- To issue directives for collection of need-based technical information by priority;
- To participate as subject matter specialist in training programmes and train the farmers at the TSG at WUA level;
- To provide necessary materials and directives for training of technical members and farmers;
- Coordination among farmers, input supplier, credit supplier, NGO, and research organisation at the district level;
- To approve the action plan, and provide budget for the execution of the action plan; and
- To compile the information collected by AAO, and prepare the action plan for the area.

(9) State Level Coordination Committee

SLCC consists of the 12 members listed in Table A2.5.16.

Table A2.5.16 Structure of State Level Coordination Committee

No.	Position in Concerned Organisation	Post in SLCC
1	Principal secretary irrigation	Chairman
2	Director of agriculture	Member
3	Additional registrar of cooperative	Member
4	Chief engineer/Additional chief engineer of WRD	Member
5	Joint director of animal husbandry	Member
6	Joint director of medical & health	Member
7	Joint director of horticulture	Member
8	Nominee of NGO	Member
9	Social workers (2 members) nominated by GoR	Member
10	Director of research, agriculture university of Udaipur/Bikaner	Member
11	Private agriculture input supplier	Member
12	Joint director of agriculture nominated by WRD	Member secretary and nodal officer

Source: JICA survey team

2.5.8 Household Survey

To investigate the present status of farmers in the project area, brief household survey was conducted through interview based on questionnaire (see Attachment 2.5.8). Two sub-projects were chosen as target villages, namely, Hanumangarh Distributory in Hanumangarh and Dheel in Sawai Madhopur. Ten couples were selected as informants in each village. Three were from the head, other three were from the middle, and four were from the tail end of the irrigation system. The survey was conducted from 2 May 2016 to 9 May 2016.

Table A2.5.17 Target of Household Survey

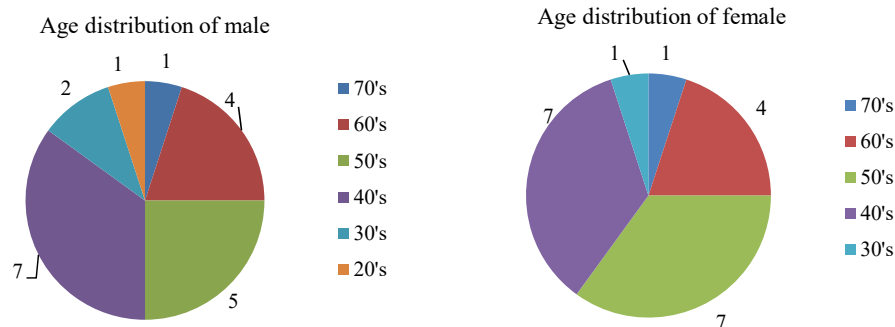
Item	Survey Target
Objective	To survey the present status of farming activities, marketing, and gender aspects
Period	From 2 May 2016 to 9 May 2016
Target village	Hanumangarh Distributory in Hanumangarh Dheel in Sawai Madhopur
Target people	20 families (20 couples of wife and husband)

Source: JICA survey team

The result of the household survey is shown in the following sections.

(a) Age Distribution

Average age is 48.1 years old for male group and 50.9 years old for female group. Male group has the largest number of those in their 40s. However, female group has two large groups of those in their 50s and 40s.



Source: JICA survey team

Figure A2.5.4 Age Distribution of Male and Female

(b) Membership of WUA and Membership Fee

There is no WUA in the Sawai Madhopur Sub-project area. Therefore, all farmers are not a member of WUA and they do not pay membership fee. On the contrary, the sub-project area of Hanumangarh Distributory has WUA. So they pay a membership fee of INR 2,500 per year.

(c) Land Size and Non-Agriculture Labourer

Hanumangarh farmers have bigger landholdings compared to Sawai Madhopur farmers (Table A2.5.18). The smallest land size is 0.5 ha (categorized into marginal farmer). The biggest landholder was in Hanumangarh. Some of the bigger landholders are not agricultural workers.

Table A2.5.18 Landholdings

District	Sample	Average Land Size (ha)	Median Land Size (ha)	Minimum Land Size (ha)	Maximum Land Size (ha)
Sawai Madhopur	10	3.025	3.25	0.5	7.5
Hanumangarh	10	5	5.125	1.25	9

Source: JICA survey team

(d) Water Source

Even if both sub-project sites have canals, they have supplementary wells or tube wells due to the lack of water in their canals.

Table A2.5.19 Water Source

District		1 st		2 nd		3 rd	
Sawai Madhopur	Canal	10	Well	6	Tube well	10	
			Channel	4			
Hanumangarh	Canal	10	Well	10			

Source: JICA survey team

(e) Water Rotation

They actually use water from irrigation, although there is an obvious difference between the two districts. Since the Hanumangarh group has WUA, it understands the rotation system. On the contrary, the Sawai Madhopur group does not have WUA. Consequently, they neither understand nor practice the rotation irrigation system.

Table A2.5.20 Water Rotation

District	Membership of WUA	Mode of Water Allocation	Frequency
Sawai Madhopur	0	Not clear (most of them answered “continuous”, but it seems to be rotation)	1~2 times
Hanumangarh	10	Two times a month	24 times/year

Source: JICA survey team

(f) Cropping Pattern

The most popular cropping pattern in Sawai Madhopur is the combination of wheat in *rabi* season and miner millets in *kharif* season. In Hanumangarh, the combination is wheat in *rabi* season and til (oilseed) in *kharif* season.

Table A2.5.21 Cropping Pattern

District	<i>Kharif</i>		<i>Rabi</i>		Remarks
Sawai Madhopur	<i>Bajara, Til</i>	9	Wheat, Mustard	9	
	<i>Bajara, Jawar, Mung, Til</i>	1	Wheat, Mustard, Gram	1	7.5 ha with canal irrigation
Hanumangarh	<i>Til, Cotton</i>	8	Wheat, Mustard	6	
			Wheat, Mustard, Gram	1	6.75 ha
			Wheat	1	
	<i>Til</i>	2	Wheat	2	

Source: JICA survey team

2.6 Agro-processing and Marketing

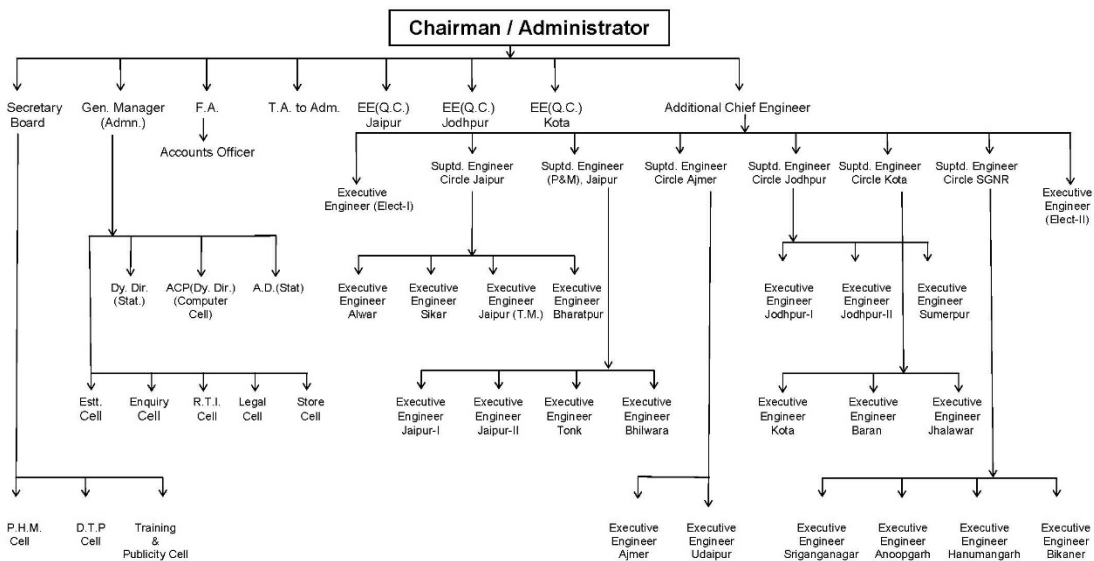
2.6.1 Rajasthan State Government

(1) Rajasthan State Agriculture Marketing Board (RSAMB)

Rajasthan State Agriculture Marketing Board (RSAMB), which was incepted in 1974 under Department of Agriculture, plays a leading role in the agro-processing and marketing sector. Activities of RSAMB includes construction and management of market yards and storages. The Board is also responsible for development of market yards by providing necessary amenities and facilities as well as issuing licenses to market traders⁹. Export of fruits and vegetables of the state is another important role for RSAMB. The Board also works on administration and management for Small Farmers’ Agri-business Consortium

⁹ For the detail of public markets, refer to Section 2.6.3.

(SFAC) under Ministry of Agriculture and Farmer Welfare, Govt. of India. Figure A2.6.1 shows the organizational setup of RSAMB.

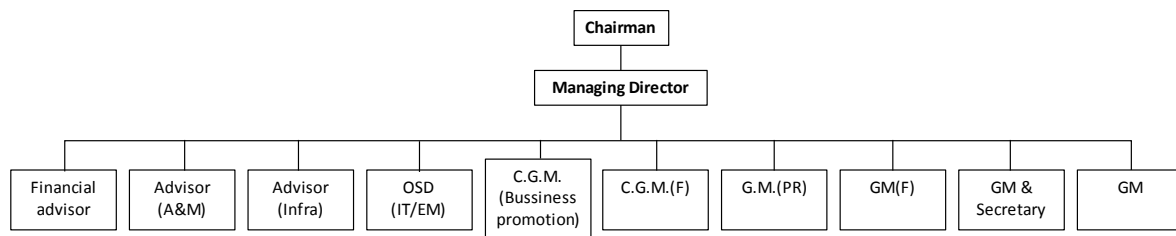


Source: Rajasthan State Agriculture Marketing Board Website

Figure A2.6.1 Organizational Setup of Rajasthan State Agriculture Marketing Board

(2) Rajasthan State Industrial Development & Investment Corporation Ltd. (RIICO)

Rajasthan State Industrial Development & Investment Corporation Ltd. (RIICO), under Department of Industrial Development, has taken major roles for industrialisation of the state by setting up of industrial areas. RIICO also acts as a financial institution for investors and entrepreneurs by providing loan to large, medium and small-scale projects. As explained in Section 2.6.2, RIICO's another important task is construction of Agro Food Parks under Agro Food Park Policy by Ministry of Food Processing Industry, GoI, 2002. Figure A2.6.2 shows the organizational setup of RIICO¹⁰.



Source: RIICO Website

Figure A2.6.2 Organizational Setup of Rajasthan State Industrial Development & Investment Corporation Ltd.

(3) Policy/Regulation related to Agro-processing and Marketing

(a) National level

National Mission on Food Processing (NMFP)

National Mission on Food Processing (NMFP) is a centrally sponsored scheme introduced by Ministry of Food Processing Industries, GOI in the 12th Five-Year-Plan (2012-13 to 2016-17). The NMFP has a three-tiered structure, namely, (i) National Mission on Food Processing, (ii) State Food Processing Mission (SFPM), and (iii) District Food Processing Mission. It is estimated that food processing contributes to over 28% of the share of the Agriculture GDP. The funding for NMFP scheme is in the ratio 75% from GOI and 25% from Govt. of Rajasthan. The incentive and subsidy are provided for

¹⁰ According to Chief General Manager (Business Promotion) of RIICO, Chairman of RIICO is also Chief Secretary of Department of Industrial Development whereas Managing Director of RIICO is also Principle Secretary (Industries) of the Department (as of May, 2016).

technology up-gradation/modernization/expansion of food processing industries, cold chain, value addition and preservation infrastructure for non-horticulture products as well as training and capacity building, promotional activities, setting up of primary processing centers/collection centers in rural areas, and for reefer vehicles. Commissioner of Industry, Government of Rajasthan is the nodal office that officiate the SFPM¹¹.

The Mega Food Parks Scheme (MFPS)

Ministry of Food Processing Industries launched The Mega Food Parks Scheme (MFPS) during the 11th Five-Year-Plan. The scheme aims to accelerate the growth of food processing industry in the country through facilitating establishment of strong food processing infrastructure backed by an efficient supply chain. The Mega Food Parks Scheme provides for a capital grant of 50 % of the project cost in difficult and ITDP notified areas (with a ceiling of INR 500 million). 42 Mega Food Parks are to be setup in the country. The estimated worth of packaged food industry is 30 billion USD in 2015 and the annual growth rate of this sunrise sector is almost 20 %. Mega Food Parks in Rajasthan are being established in Ajmer under the program¹².

India New Foreign Trade Policy 2001

India New Foreign Trade Policy 2001 (or Exim Policy 2001-02) was announced within the framework of the 5-year Exim Policy (1997-2002). It includes promotion of establishment of Agri Export Zones (AEZ), which are mentioned in 2.6.2., as well as an import monitoring system, an adequate safeguard system, and duty free exemption system, etc. Agri Export Zone (AEZ) has been promoted by GOI keeping APEDA as nodal agency. State governments are supposed to identify potential export products selected for development with a cluster approach. It dovetails facilities of central government agencies like APEDA, NHB, Dept. of Industries, Ministry of Agriculture provides assistance and state governments to promote agri-exports from the proposed Zones in a coordinated manner. Key aim is to strengthening of backward linkages with a market oriented approach and value addition to basic agricultural produce. GoI has sanctioned 60 AEZ comprising of 40 agriculture commodities. As per Economic Survey of India 2013, India's global ranking for agri-export improved to 10th. It adopts end-to-end approach in integrating the entire process right from production to consumption stage. Under AEZ, coriander and cumin crops are selected in Rajasthan¹³.

(b) State level

Rajasthan Agro-Processing and Agri-Marketing Promotion Policy-2015

The policy is compiled by RSAMB, mentioning Delhi-Mumbai Industrial Corridor, Agro Food Parks, Agriculture Market Reforms, subsidies for exporting, list of industries eligible for benefits under the policy.

Act: The Rajasthan Agricultural Produce Markets Act, 1961

Under this Act and Rules: The Rajasthan Agricultural Produce Markets Rule, 1963, as well as Bylaws: Model By – Laws as per RAPM, Act 1961 & Rules 1963, the marketing of agricultural produce is regulated and infrastructure is developed in Rajasthan. Some other Acts, Rules, Notification and Policies are available at RSAMB's website as listed up in the following box.

RSAMB (Service) by-Loz, 1977 / RSAMB Service (Pension) Rules, 1995 / RSAMB Gpf Rules, 1996 / Secret. Produces Agricultural Markets Act 1961 / Rajasthan Agriculture Produce Market Act, 1961 / Secret. Produces Agricultural Market Rules, 1963 / Rajasthan Agriculture Produce Market Rule 1963 / Secret. Mandi employee agreement of 1975 / Secret. Mandi Samiti Service (GPF) Regulations 1996

2.6.2 Government Strategies and Schemes

In the agro-processing and marketing sector, taking the State's locational advantage with access to the enormous market, Central/State Governments focus on development at the industrial level, mainly through infrastructure/facilities development and providing subsidies. Table A2.6.1 summarizes the recent industrial development projects mentioned in Rajasthan Agro-Processing and Agri-Marketing

¹¹ Background Material for Economic Editors' Conference, Oct 2011, Ministry of Food Processing Industries, GoI

¹² Mitcon India – Mega Food Park 2012, Mega Food Park Scheme by Ministry of Food Processing Industries, National Portal of India

¹³ Foreign Trade Policy 2009-2014 & 2015-2020, Ministry of Commerce and Industry Department of Commerce, GoI

Promotion Policy-2015 (except Agri Export Zones). In addition, development of export-oriented spices markets by Rajasthan State Agricultural Marketing Board (RSAMB) is an observable effort.

Table A2.6.1 Overview of the Recent Industrial Development Projects in Rajasthan for Food Processing and Export

Project/Scheme	Implementing agencies	Nodal/contact office in Rajasthan	Policy/Vision	Current status
(1) Delhi-Mumbai Industrial Corridor	GoI Dept. of Industrial Policy & Promotion (MoCI)	Dept. of Industries, Bureau of Investment Promotion, Jaipur	Joint Statement Vision for Japan-India Strategic and Global Partnership in the Next Decade (2010)	N/A (Planned to be completed in 2019)
(2) Agri Export Zones (AEZs)	GoI APEDA (MoCI)	RSAMB, Jaipur (no regional/virtual offices)	India New Foreign Trade Policy 2001	Completed in 2013 (RSAMB currently takes it over)
(3) Mega Food Park	GoI Min. of Food Processing Industries	Dept. of Industrial Development, Jaipur	Mega Food Park Scheme (10 th ~ 11 th Five Year Plan)	Under progress
(4) Spice Parks	GoI Spice Board (MoCI)	Spice Park, Jodhpur	XII Plan Export Development and Promotion Schemes	1 Park is operated 1 Park is under progress
(5) Agro Food Parks	State RIICO (Dept. of Industrial Development)	RIICO, Jaipur	Agro Food Park Policy by Min. of Food Processing Industry, GoI, 2002	4 Parks are operated

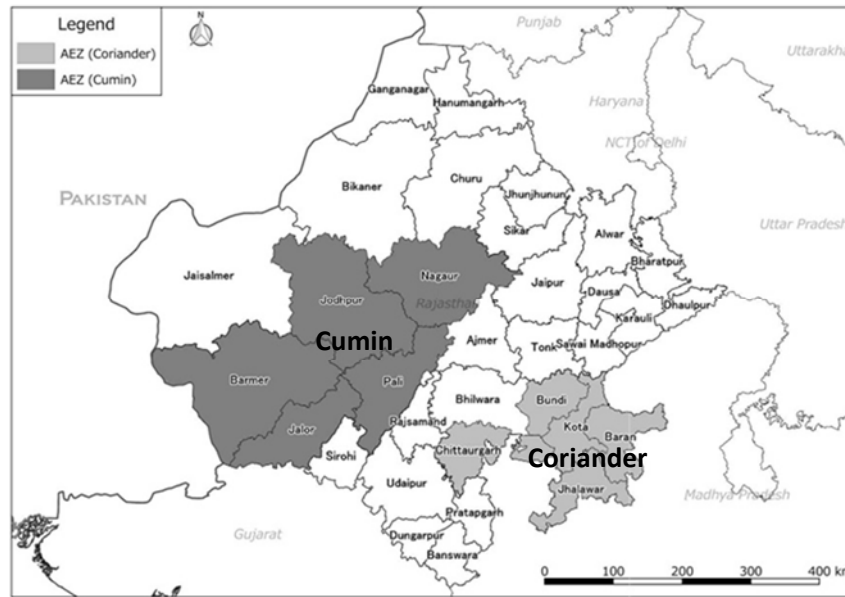
Source: JICA survey team

Detail of the projects related to the activities proposed for the Preparatory Survey on Rajasthan Water Sector Livelihood Improvement Project (RWSLIP) are explained below.

(1) Agri Export Zones

The concept of Agri Export Zone (AEZ) was announced by the Government of India, under India New Foreign Trade Policy 2001, with the aim of expansion of agricultural produce export. Under the coordination of Agriculture and Processed Food Export Development Authority (APEDA), Ministry of Commerce and Industry, 60 AEZs were set up in 20 states.

To achieve the goal, the Government of Rajasthan and APEDA signed a Minutes of Understandings (MOU) in 2005, targeting 10 districts for expansion of export of coriander (Kota, Bundi, Baran, Jhalawar and Chittoor) and cumin (Nagaur, Barmer, Jalor, Pali and Jodhpur, refer to Figure A2.6.3).



Source: JICA survey team

Figure A2.6.3 Agri Export Zones

This program started during 2006-2007 and once completed during 2012-2013, after which the State Government has continuously supported the AEZs through Rajasthan State Agricultural Marketing Board (RSAMB).

Budget allocated for AEZs, sourced from Central/State Governments as well as private partnership, were INR 12,057 million for coriander and INR 10,191 million for cumin.

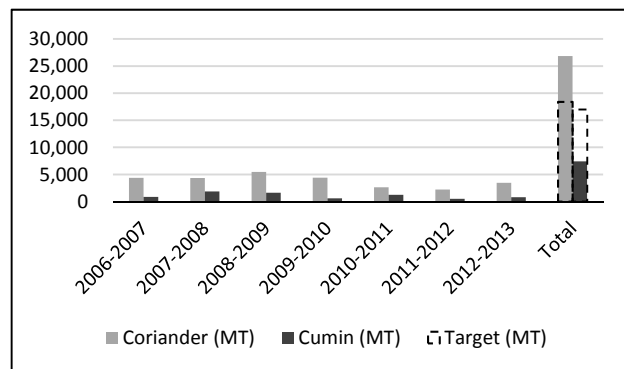
Rajasthan's activities for AEZs ranged from production to marketing, R&D and monitoring/evaluation by several agencies as follows.

- Productivity and quality enhancement programme (DoH)
- Post-harvest management and value addition (RSAMB)
- Marketing Promotion (RSAMB)
- Research and Development (State Agricultural University)
- Monitoring and evaluation (RSAMB)

For example, as for "Marketing Promotion", while RSAMB had provided subsidies for transport to exporters¹⁴, no financial assistance had been given from APEDA or Spices Board.

Rajasthan's export value through AEZs (INR 383 billion) accounts for 72% of the total states' export value, the highest share in the country, followed by Andhra Pradesh. Besides, the actual investments through Rajasthan's AEZs accounts for 31% of the country's total investments through AEZs, again positioned as the highest¹⁵.

The export amount of coriander and cumin, during 2006-2007 ~ 2012-2013, are 26,855 MT and 7,394 MT, respectively. Although coriander has achieved its target (18,700 MT), cumin's achievement is less than its target (17,000 MT)



Source: Prepared by JICA Study Team based on RSAMB's report: Status of AEZs (December, 2015)

Figure A2.6.4 Export Amounts from AEZs

¹⁴ 25% of transportation cost by road (public market ~ port) and INR. 5,000/container by sea (max. INR. 500/MT). Exporters are required to obtain IC Code (import/export license) from Department of Foreign Trade and Commerce. Spice exporter need to register at Spice board, too.

¹⁵ The Associated Chambers of Commerce & Industry of India (ASSOCHAM) <http://www.assochem.org/newsdetail.php?id=5442> (January, 2016)

(Figure A2.6.4). However, considering the possibility of unofficial exports by land, the actual figures could differ from the recorded (there is only estimated data but no accurate data is available).

Rajasthan's progress for the AEZ project was evaluated also based on supports for post-harvest improvement/value addition and quality enhancement, mostly having achieved the initial target figures. Supports were mainly through provision of infrastructure/facilities/materials. Few software supports, such as promotion of system adoption or training for awareness increases, were done, but support from the market-linkage aspect was weak (Table A2.6.2). There is no assessment related to market linkage but a study actually points out that producers can benefit from AEZs only if they are linked with players in AEZs as groups, directly or through contract farming¹⁶. Another study comments that, "villagers and field officers are unaware about the scheme and its conceptual framework"¹⁷.

Table A2.6.2 Progress of AEZs (Total of Coriander and Cumin Areas)

	Post-harvest improvement & value addition	Quality enhancement
Infrastructure facilities, materials	<ul style="list-style-type: none"> • Set-up of 130 new processing units under private sector • Construction/upgrade of 29 warehouses/godowns • Construction of 6 cold storages • Construction of 54 drying and curing yards on farmers field in AEZ • Distribution of 2,500 tarpaulins (plastic sheet for grain drying) to farmers • Establishment of two modern grinding/packaging units 	<ul style="list-style-type: none"> • Distribution of 751 MT of certified seeds • Distribution of irrigation system sprinklers/drips on 294,543ha of farmer' field • Establishment of 2 phyto sanitary labs • Set-up of 1,191 vermi compost units by farmers • Establishment of 2 plant health clinics in AEZ coriander
Software aspect	<ul style="list-style-type: none"> • Adoption of one quality system ISO 9001, ISO 14000 by exporters 	<ul style="list-style-type: none"> • Promotion of organic cultivation in 3,770ha • Set-up of 8 disease forecasting systems • Participation of 18 farmers and 12 traders in trade/fairs in other states/country • Training/awareness for 6,591 farmers

Source: Prepared by JICA survey team based on RSAMB's Report: Status of AEZs(December 2015)

Finally, it is remarkable that RSAMB is considering about proposing establishment of new AEZs for *isabgol* (psyllium seed) and guar, for which a DPR might be prepared. In the case of *isabgol*, on more district (Pratapgarh) would be added to the 5 districts for cumin whereas 5 more districts (Jaisalmer, Bikaner, Ganganagar, Churu, and Sikar) would be added to those for cumin, in the case of guar¹⁸.

(2) Mega Food Park

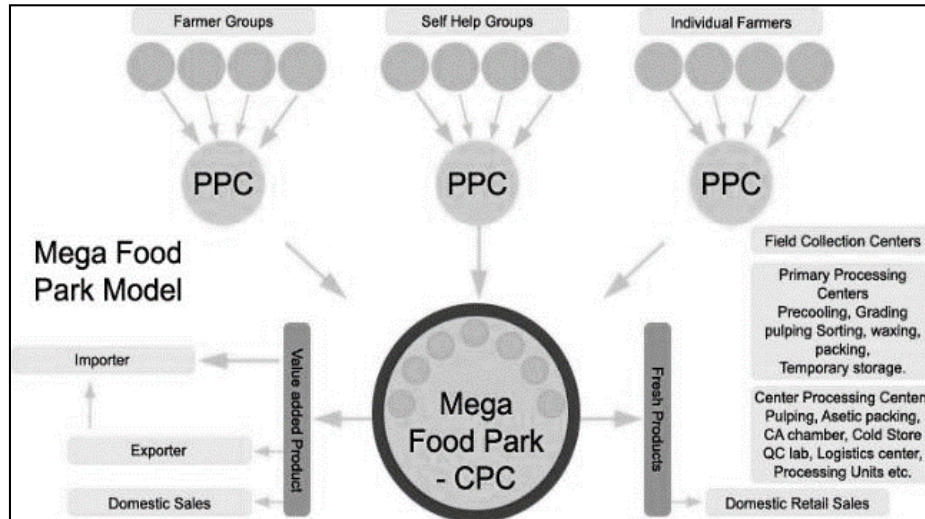
The Mega Food Park Scheme was announced in 11th Five Years Plan. Its primary objective was to facilitating the Vision 2015 of the Ministry of Food Processing Industries to raise the processing of perishables in the country from the existing 6% to 20%, value addition from 20% to 35% and the country's share in global food trade from 1.5% to 3% by the year 2015. To support the value chain from the farm to the market, a Mega Food Parks (MFP) will include infrastructure such as centralized processing centers, primary processing centers near the farm and transportation¹⁹, as shown in the MFP Model (Figure A2.6.5).

¹⁶ "Study of Effective Agro Marketing Strategies with Special Reference to Western Rajasthan" (Vyas, 2011)

¹⁷ Mrunal Website (<http://mrunal.org>)

¹⁸ Project Manager Agent of RSAMB (March 2016)

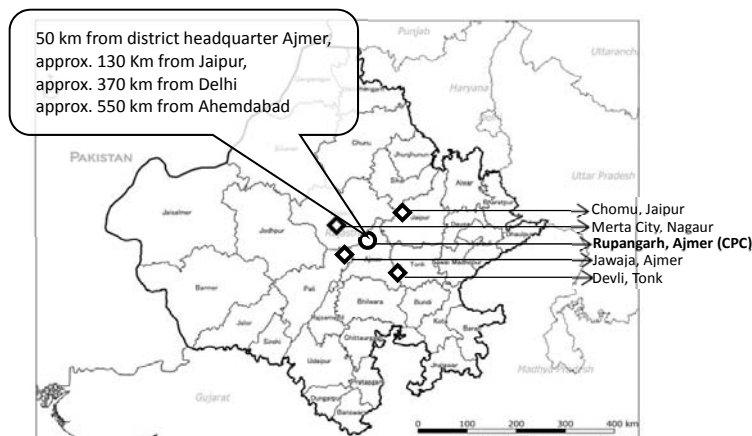
¹⁹ Mega Food Parks Scheme (MFPS) Guidelines (Ministry of Food Processing Industries, 2012)



Source: Corporation Presentation of Green Tech MFP

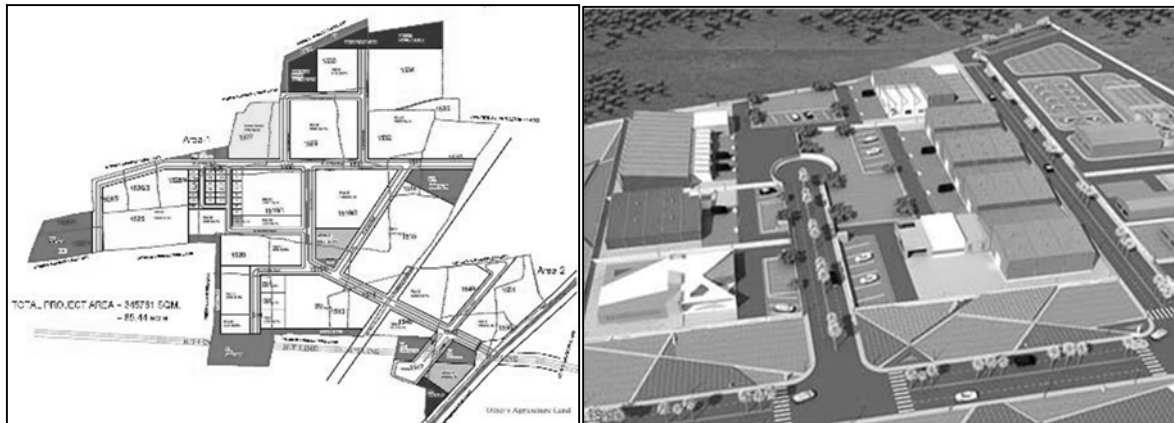
Figure A2.6.5 Mega Food Park Model

Approved in February 2012 for the 3rd phase of the scheme, Green Tech Mega Food Park Pvt. Ltd. Project launched in Ajmer District as the only Mega Food Park in Rajasthan. As of April 2016, construction of its infrastructure has been under progress. The locations of its Central Processing Center (CPC, 85.44acre, 30~35 processing units expected) in Ajmer, and Primary Processing Centers (PPC) in Tonk, Jaipur, Nagaur and Ajmer, are shown in Figure A2.6.6, as well as its master plan in Figure A 2.6.7. Moreover, examples of target agricultural produce and processed food are summarized in Table A2.6.3.



Source: Prepared by JICA survey team based on Corporation Presentation of Green Tech MFP

Figure A2.6.6 Location of CPC and PPCs



Source: Website and Corporation Presentation of Green Tech MFP

Figure A 2.6.7 Master Plan of Green Tech MFP

Table A2.6.3 Examples of Target Raw Materials Crops and Processed Food at Green Tech MFP

Target Raw Materials Crops	Target Processed Food
Anola	Noodles & Pasta
Guava	Biscuits & Bakery Products
Mango	Dairy Products
Sweet orange	Fruit Juice/Vegetable Juice/Herbal Juice
Mandarin	Oil milling
Onion/Potato/Tomato	Cattle/poultry feed
Bitter gourd	Pulses (cleaning)
Bottle gourd	Potato processing
Garlic	Frozen vegetables
Coriander	Candies, murabba & confectionery
Cumin	Ketchup & sauces (canning/bottling)
Fenugreek	Spice processing
Fennel	Jam, Jelly, pickles (canning/bottling)
Ajwain	
Grains (wheat, etc.)/Pulses (gram, etc.)	

Source: Prepared by JICA survey team based on Corporation Presentation of Green Tech MFP

As for implementation, Department of Industries is the chartering agency under National/State Food Processing Mission. As the Project Management Agency of the MFP project, Green Tech Mega Food Park Pvt. Ltd. was established to the MFP development, approved by the Ministry of Food Processing Industries. The company is responsible for constructing common facilities except processing plants. At the State level, the company receives subsidies from Bureau of Investment Promotion under Rajasthan Investment Promotion Scheme 2014 and Agro-Processing and Agri-Marketing Promotion Policy 2015. The Agency also includes private consultant as PPP operation adviser or food processing companies. Besides, some other private companies (food processing, electricity, infrastructure, and management) have sponsored the MFP project as promoters. As well, individual consultants have participated in it in the areas of real estate, export and agriculture²⁰.

Fund for CPC/PPCs construction is INR 11,356.62 Lakh²¹ and 18% of the fund has been executed as of February 2016. The construction is expected to complete by March 2017. Currently, 29% of the processing areas has been sold to private processors on an area basis. By the time of CPC completion, it is expected that the processing areas would partly start operation. Construction of PPCs has not started yet but a land has been just acquired in Jaipur. Around each PPC, 4~5 Collection Centers would be set up to collect raw materials crops from farmers.

²⁰ CEO of Green Tech Mega Food Park Pvt. Ltd./Corporate Presentation of Green Tech MFP (February 2015)

²¹ Sourced from promoters' contribution (INR. 3,356.62 Lakh), Grant of MoFPI (INR. 5,000 Lakh) and Term loan from Bank of Baroda (INR 3,000 Lakh).

(3) Agro Food Parks

(a) Overview

Agro Food Parks is one of the focus areas of Rajasthan Agro-Processing and Agri-Marketing Promotion Policy-2015. Rajasthan State Industrial Development and Investment Corporation Ltd. (RIICO) has developed and operated Agro Food Parks in four districts of Kota, Jodhpur, Sri Ganganagar, and Alwar, since 2000s²². RIICO is responsible for development and maintenance of infrastructure such as water supply facility, electricity, quality test lab, etc. whereas no activities for capacity building of Park users has been done. Currently, most plots are occupied by processors. Minimum area of a park is 30 acres and a minimum of 20 processing units should come up. For female, ST or SC unit owners, 25~30% of subsidies are provided²³.

Detail of the four Agro Food Parks are summarized in Table A2.6.4. Budgets had been mostly expensed as of 2014. Types of processing include primary processing such as cleaning and grading (for the original lists of the units, refer to Attachment 2.6.1 to 2.6.3).

Table A2.6.4 Overview of Agro Food Parks (as of March 2014)

	Kota	Jodhpur	Sri Ganganagar	Alwar
Area (acre)	139.8 (+99.5 expanded)	193.5 (+66.24 expanded)	81.1	185.9
Active plot.	178	282	53	40
Active unit	139	238	24	23
Project cost (% execution)	805.03 (174.5)	1,472.72 (84.9)	597.05 (100.2)	1,369.51 (100.0)
Processing /products (examples)	Coriander & other spices & wheat cleaning/grinding/grading, edible soybean oil, herbal products, dairy products	Guar gum powder, spices grinding, cattle feed, herbal products, confectionary, dehydrated vegetables/fruits, wheat (cleaning/grinding/grading)	Mustard oil/cake, kinnow grading/waxing, grain grading, seed processing, sugar candy, mineral water	Spices, anola, gram/chickpea/wheat (cleaning/grinding)
Distances from market	9 km	17 km	9 km	12 km
Detailed list of units (original)	Attachment 2.6.1	Attachment 2.6.2	Attachment 2.6.3	N/A

Note: Funding pattern = 30% of Total RIICO's contribution is provided from MoFPI, GoI as grant

Source: Prepared by JICA survey team based on RIICO's report: 10th Plan Scheme for Infrastructure Development ~Agro Food Park~

RIICO originally selected sites for setting up Agro Food Parks among the places with higher production of cash crops and higher needs from local service providers (processing, distribution) and market, after which lands were acquired from local producers or local governments. Once demand and supply are met, producers could supply to the Parks from any areas.

In addition to RIICO, Ministry of Food Processing Industries, GoI provides subsidies to processors (25% of an initial investment cost, under Agro-Product Industry Scheme). Funding from banks such as NABARD (Food Processing Fund) is also available. Processors are required to operate at least 20% of their units, which are leased for 99 years.

According to Chief General Manager of RIICO, no economic impact assessment has been done as of today but the number of Agro Food Parks could be increased anyway in the future once there are needs from local service providers and markets. One of the important issues of the food processing sector is unstable supply chains for raw materials, which is caused by the lack of overall production planning and transaction quantity adjustment. This makes it difficult for processors to procure a certain volume of raw materials constantly throughout year. Contract farming could enable effective procurement of raw materials but the level of "contract" is at present as simple as "agreement". As for Agro Food Parks, most processing plants have been already operated but higher-value products are still rare. Service providers should realize international market needs whereas producers are not aware of it.

(b) Situation of the Field

For example, in the case of Kota Agro Food Park, Director of Shiv Edibles Ltd., an edible oil processing company, mentions that raw materials are generally procured at nearby public markets, instead of being

²² RIICO has also developed Parks in the other industrial sectors including electricity, ceramic, and gems.

²³ Chief General Manager (Business Promotion) of RIICO

directly procured from producers. This is because quantity and quality are ensured at public markets where traders take care of grading and cleaning of produces. On the other hand, it is also remarkable that President of the Kota Agro Food Park Unit Owners Association points out that they are very interested in procuring raw materials from WUAs which are cultivating large areas and able to provide in large quantity. As a whole Kota Agro Food Park, it would be possible to double the procurement quantity of raw materials, through extension of operation hours, etc. The association conducts annual production survey at the beginning of a year by visiting producers within 600km to estimate production amount of the year also with DoA's data. Market surveys are not done.

In the case of a *kinnow* (a type of mandarin) waxing plant manager in the Sri Ganganagar Agro Food Park, he procures directly from “contract farmers” by visiting their field to confirm quality by himself. Those producers are located within 30km from the Park, being able to supply minimum of 50~100 ton, producing at least in 2.5 ha. Any producers could enter into contract under this condition. Prices are negotiated depending on his own standard (size, shining level and sickness of skin). 25% of producers prices is paid to producers in the field and 75% is paid after marketing waxed *kinnow*.

As for capacity building, President of Kota Agro Food Park Unit Owners Association also mentions that it would be necessary to strengthen capacities of unit owners or staff, for example for leadership, resources management, marketing, and corporate culture. While owners would need to increase abilities for assessing size or demand of international market, staff would need to acquire business communication skills. As for processing/packaging techniques, he mentions that they have been rather improved but use of older facilities might still require special training such as manual handling.

As for recognition of Agro Food Parks among producers, for example, the CEO of Kota FPO says that they have had no knowledge about Kota Agro Food Park located only within 20km from their place, and he is now interested in marketing through the Park.

Finally, from the gender view, Manager of Natureland Organic Foods Pvt. Ltd. tells that 50% of employees of the company are women who work during 10:00~17:00 for permanent employment. They are involved in post-harvest activities such as cleaning/grading of pulses, simply because “women are traditionally good at such preparation works”.

2.6.3 Public Markets and Marketing Rules

(1) Public Markets

Under the Rajasthan Agricultural Produce Market Act 1961, the number of public markets (regulated markets) in Rajasthan has gone up to 133 by now since 1964 with 312 sub yards under the principal market yards at present. A wide network of market regulation has been provided all over the state. The market committees known as Krishi Upaj Mandi Samities (KUMS) manage the market and regulate the trade (the secretary of KUMS is on deputation from the Agriculture Marketing Department).

Depending on the amount of annual income from market fee, public markets are categorized into five classes (Table A2.6.5). Out of the 133 public markets, 15 markets are under Super Class category, namely, Alwar, Khairthal, Bharatpur, Bikaner (Grain), Hanumangarh, Chomu, Jaipur (Fruits & Vegetables), Jaipur (Grain), Jodhpur (Grain), Baran, Bundi, Bhawanimandi, Kota (Grain), Ramganjmandi and Sri Ganganagar (Grain). As for the detailed list on the public markets with arrival of major crops, refer to Attachment 2.6.4 (only 131 markets are listed up here) and Attachment 2.6.5 for an example of general market information (case of Jaipur Market: Fruits & Vegetables).

Table A2.6.5 Category of Public Markets

Market Class	Annual Income from Market Fee	No. of Markets
Super	INR. 350 Lakh (= 35 million) and above	15
A	INR. 200 Lakh (= 20 million) and above but less than 350 Lacs	29
B	INR. 125 Lakh (= 12.5 million) and above but less than 200 Lacs	17
C	INR. 50 Lakh (= 5 million) and above less than 125 Lacs	45
D	Less than INR. 50 Lakh (=5 million)	27

Source: RASMB Website

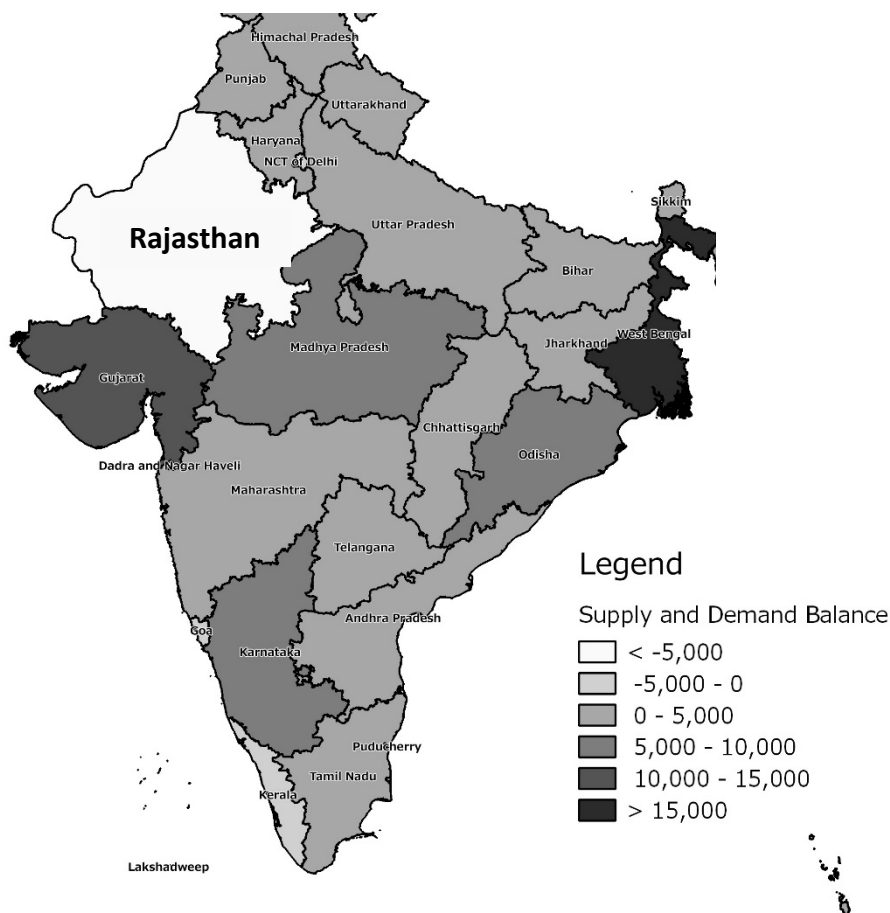
For providing all public market services, RSAMB collects commission from commission agents (food grain 2%, fruits/vegetables 6% on sales). Moreover, RSAMB collects market fee from buyers (INR. 0.01 for Fruits & Vegetables, INR. 1.00 for Mustard & Oilseeds, INR. 0.50 for cumin, *isabgol*, *jowar*, *bajra* & maize and INR. 1.60 for rest all commodities on every INR. 100 worth of produce sold). The market fee is collected at a single point in the state.

Examples of market prices of agricultural produce in Rajasthan are listed up in Attachment 2.6.6.

2.6.4 Supply and Demand of Agricultural Produce

(1) Production of Horticultural Produce

Majority of Rajasthan's horticulture produces come from vegetable (44.6%), spices (27.0%) and fruits (23.3%)²⁴. The state currently produces 736,000 MT of fruits and 1,433,000 MT of vegetables (0.85% of total fruits production and vegetable production of the country, respectively) while it produces 618,000 MT of spices, 10.1% of all India spices production²⁵. In addition, 152,000 MT of aromatic/medicinal plants, of which majority is *isabgol* (psyllium seed), an important Ayurvedic medicine, are produced (77.4% of the total aromatic/medicinal plants production in the State, and 67% of the total *isabgol* production in India, the world's largest producer of *isabgol*). In the view of the consumption demand estimated based on population, it could be said that Rajasthan is a state with the most serious fruits/vegetables shortages, having the negative balance of supply and demand (Table A2.6.6, Figure A2.6.8)²⁶.



Source: JICA survey team

Figure A2.6.8 Supply-Demand Balance of Fruits/Vegetables

²⁴ State-wise Horticulture Status (data for 2013-2014) by National Horticulture Mission

²⁵ Spices include coriander, cumin, garlic, fenugreek, chilly, etc.

²⁶ Statistics Division, Department of Horticulture

Table A2.6.6 Production and Estimated Consumption of Horticultural Produce (2014-2015)
(Unit 1000 MT)

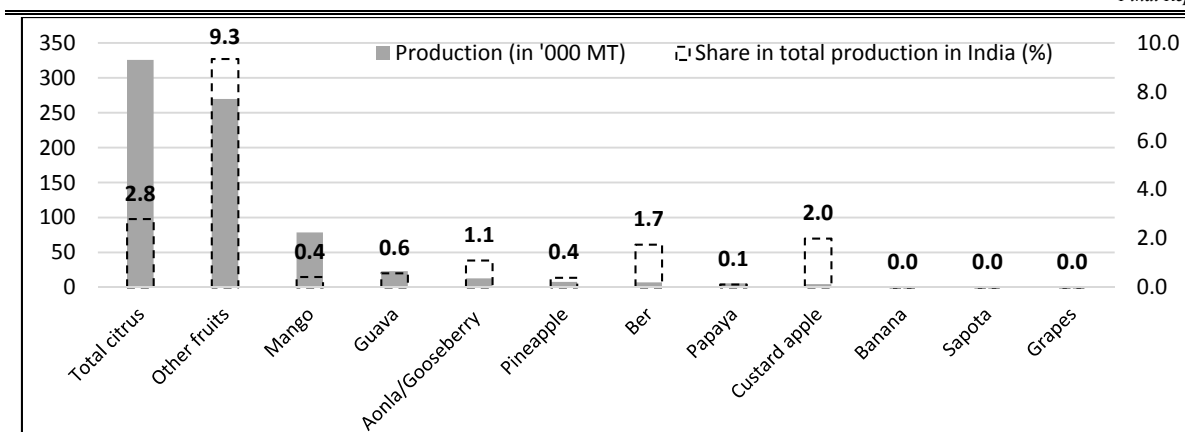
States/Uts	Population (2011)	Fruits			Vegetables			Spices			Aromatic/Medicinal plants
		Production	Consumption	Balance	Production	Consumption	Balance	Production	Consumption	Balance	Production
Andaman & Nicobar	379,944	32	21	10	51	34	17	3	1	2	
Andhra Pradesh	84,665,533	9,122	4,775	4,346	4,593	7,510	-2,917	918	227	691	1
Arunachal Pradesh	1,382,611	331	78	253	41	123	-82	64	4	61	109
Assam	31,169,272	2,030	1,758	272	4,470	2,765	1,705	321	84	237	0
Bihar	103,804,637	3,990	5,855	-1,865	14,467	9,207	5,260	13	278	-266	1
Chhattisgarh	25,540,196	2,071	1,440	631	5,812	2,265	3,547	12	68	-57	55
D & N Haveli	342,853	0	19	-19	6	30	-25		1	-1	
Daman & Diu	242,911	3	14	-11	4	22	-18		1	-1	
Delhi	16,753,235	1	945	-944	392	1,486	-1,094		45	-45	
Goa	1,457,723	83	82	1	82	129	-47	0	4	-4	
Gujarat	60,383,628	8,301	3,406	4,895	11,861	5,356	6,505	1,020	162	858	
Haryana	25,353,081	704	1,430	-726	5,306	2,249	3,057	83	68	15	0
Himachal Pradesh	6,856,509	752	387	365	1,585	608	977	22	18	4	1
Jammu & Kashmir	12,548,926	1,779	708	1,072	1,395	1,113	282	1	34	-33	
Jharkhand	32,966,238	898	1,859	-961	4,279	2,924	1,355	0	88	-88	
Karnataka	61,130,704	6,800	3,448	3,352	8,828	5,422	3,406	346	164	182	26
Kerala	33,387,677	2,554	1,883	671	1,645	2,961	-1,316	140	89	51	0
Lakshadweep	64,429	0	4	-3	1	6	-5		0	0	0
Madhya Pradesh	72,597,565	6,119	4,095	2,024	14,199	6,439	7,760	699	195	505	416
Maharashtra	112,372,972	11,090	6,338	4,752	8,783	9,967	-1,184	130	301	-171	0
Manipur	2,721,756	522	154	368	268	241	27	24	7	17	
Meghalaya	2,964,007	377	167	210	534	263	271	84	8	76	
Mizoram	1,091,014	351	62	289	274	97	177	66	3	63	1
Nagaland	1,980,602	411	112	299	492	176	317	39	5	34	
Odisha	41,947,358	2,156	2,366	-209	9,414	3,721	5,693	182	112	69	1
Puducherry	1,244,464	16	70	-54	44	110	-67	0	3	-3	
Punjab	27,704,236	1,645	1,563	82	4,168	2,457	1,710	92	74	17	3
Rajasthan	68,621,012	736	3,870	-3,135	1,433	6,087	-4,653	618	184	434	152
Sikkim	607,688	0	34	-34	130	54	76	61	2	60	
Tamil Nadu	72,138,958	5,964	4,069	1,895	7,521	6,399	1,122	188	193	-5	220
Telangana	35,286,757	5,288	1,990	3,298	3,005	3,130	-125	494	95	399	
Tripura	3,671,032	819	207	612	811	326	485	18	10	8	
Uttar Pradesh	199,581,477	7,559	11,256	-3,697	26,120	17,703	8,417	222	535	-313	13
Uttarakhand	10,116,752	786	571	215	1,110	897	212	41	27	14	
West Bengal	91,347,736	3,314	5,152	-1,838	26,355	8,103	18,252	208	245	-37	
TOTAL	1,244,425,493	86,602	70,186	16,416	169,478	110,381	59,098	6,108	3,335	2,773	1,000

Note: Fruit consumption is estimated using per capita consumption of 56.4kg /annum, vegetable consumption using per capita consumption of 88.7kg /annum, and spice consumption using per capita consumption of 2.86kg /annum (FAOSTAT, 2013)

Source: Prepared by JICA survey team based on the data from Census 2011 and National Horticulture Board

Figure A2.6.9 summarises the fruit production in Rajasthan. The State produces approximately 326,000 MT of citrus including *kinnow* (a type of mandarin), lemon and mosambi (sweet lime), accounting for 2.8% of total citrus production in India, as the 8th largest citrus producer in the country²⁷.

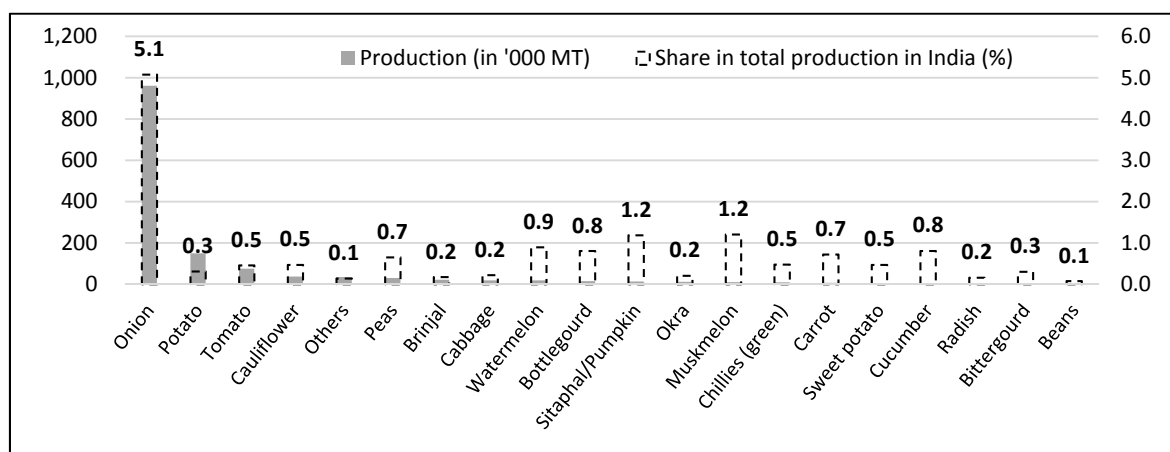
²⁷ As this data does not include Orange (a type of Mandarin as Kinnow), of which production in Rajasthan is approx.264,000 MT (Statics Division, DoH), actual figure of total citrus would be higher. According to State-wise Horticulture Status (data for 2013-2014) by National Horticulture Mission, Rajasthan's Orange production accounts for 7% of the total Orange production in India, making the State as the 4th largest Orange producer during 2013-2014.



Source: Prepared by JICA survey team based on the data from National Horticulture Board

Figure A2.6.9 Production of Fruits in Rajasthan (2014-2015)

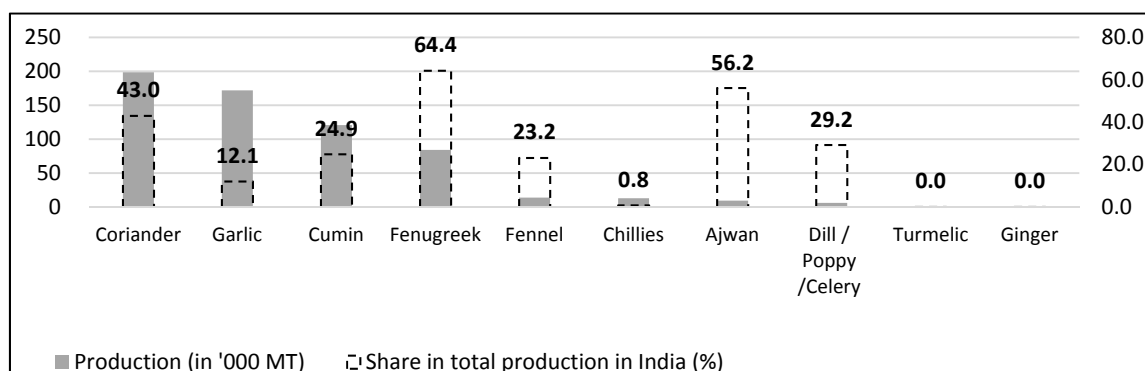
Figure A2.6.10 shows the vegetable production in Rajasthan. The State produces approximately 961,000 MT of onion, accounting for 67% of the State's horticultural production and 5.1% of the total onion production in India, as the 6th largest producer in the country. However, the production of the other vegetables are low, mostly staying at less than 1% of the country's total production as Rajasthan's dry environment hinders its vegetable production.



Source: Prepared by JICA survey team based on the data from National Horticulture Board

Figure A2.6.10 Production of Vegetables in Rajasthan (2014-2015)

Figure A2.6.11 shows the spice production in Rajasthan. As the 4th largest spices producers in the country, Rajasthan mainly produces coriander (1st), garlic (4th), cumin (2nd), fenugreek (1st), fennel (2nd), ajwan (1st), and dill/poppy/celery (2nd), mainly seed spices. Coriander and cumin are the target crops of Agri Export Zones.



Source: Prepared by JICA survey team based on the data from National Horticulture Board

Figure A2.6.11 Production of Spices in Rajasthan (2014-2015)

(2) Production of Food and Industrial Crops

India as a whole has increased its crop production in recent year. Rajasthan, as the 6th largest producers, abundantly produces food crops, exceeding its domestic demand (Table A2.6.7).

In addition to food crops such as wheat (4th in India), soybean (3rd) and barley (1st), the State also produces a large quantity of industrial crops such as rapeseed & mustard (1st), guar seed (1st), and castor seed (3rd) (Figure A2.6.12).

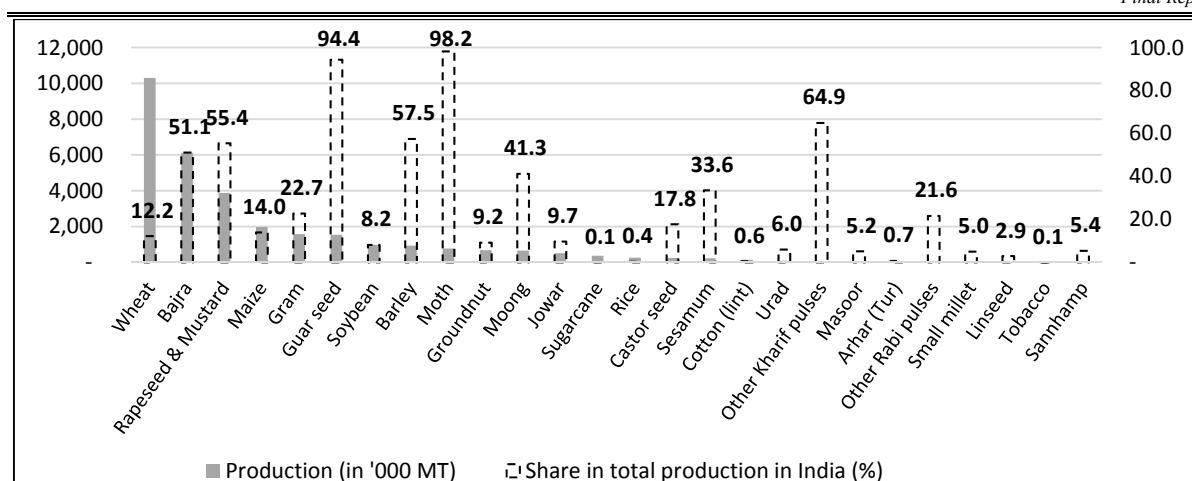
India accounts for 90% of the world's guar produce, of which 72% come from Rajasthan (APEDA website). Districts of Bikaner, Hanumangarh, Sri Ganganagar, Barmer, and Jaisalmer, the western/northern part of the State, contribute 68% of total guar production in Rajasthan during *kharif* season.

Table A2.6.7 Production and Estimated Consumption of Food Crops (2010)
(Unit 1,000 MT)

States/Uts	Population (2011)	Production	Consumption	Balance
Andaman & Nicobar	379,944	2,537	170	2,367
Andhra Pradesh	84,665,533	35,093	2,351	32,742
Arunachal Pradesh	1,382,611	270	18	252
Assam	31,169,272	6,230	417	5,813
Bihar	103,804,637	-	-	-
Chhattisgarh	25,540,196	7,134	478	6,656
D & N Haveli	342,853	61	4	57
Daman & Diu	242,911	3	0	3
Delhi	16,753,235	-	-	-
Goa	1,457,723	172	12	161
Gujarat	60,383,628	11,522	772	10,750
Haryana	25,353,081	17,169	1,150	16,019
Himachal Pradesh	6,856,509	49	3	46
Jammu & Kashmir	12,548,926	-	-	-
Jharkhand	32,966,238	86	6	81
Karnataka	61,130,704	-	-	-
Kerala	33,387,677	795	53	742
Lakshadweep	64,429	-	-	-
Madhya Pradesh	72,597,565	18,224	1,221	17,003
Maharashtra	112,372,972	99,785	6,686	93,099
Manipur	2,721,756	976	65	910
Meghalaya	2,964,007	239	16	223
Mizoram	1,091,014	-	-	-
Nagaland	1,980,602	603	40	562
Odisha	41,947,358	8,166	547	7,619
Puducherry	1,244,464	331	22	309
Punjab	27,704,236	25,089	1,681	23,408
Rajasthan	68,621,012	23,927	1,603	22,324
Sikkim	607,688	99	7	93
Tamil Nadu	72,138,958	41,281	2,766	38,515
Telangana	35,286,757	-	-	-
Tripura	3,671,032	-	-	-
Uttar Pradesh	199,581,477	167,163	11,200	155,963
Uttarakhand	10,116,752	8,166	547	7,619
West Bengal	91,347,736	8	1	8
TOTAL	1,244,425,493	475,178	31,837	443,341

Note: Consumption is estimated using per capita consumption of 67kg (rice, wheat, coarse grain, pulses) /2009-2010 (An Analysis of Changing Food Consumption Pattern in India by Nat. Council of Applied Economic Research)

Source: Prepared by JICA survey team based on the data of Population from Census 2011 and Production from Crop Production Statistics Information System (Directorate of Economics and Statistics, GOI)



Source: Prepared by JICA survey team based on data from Crop Production Statistics Information System (Directorate of Economics and Statistics, GOI)

Figure A2.6.12 Production of Food and Industrial Crops in Rajasthan (2010)

(3) Domestic Distribution and Import of Agricultural Produce

Table A2.6.8 summarizes the total transaction quantity (called “arrivals”) of agricultural produce at all the Public markets in Rajasthan.

Table A2.6.8 Arrivals of Agricultural Produce at Public Markets of Rajasthan (2014-2015)

		Horticultural produce			Food crops			Industrial crops	
		Fruits/ vegetables	Spices	Isabgol	Cereals	Maize/ rice	Pulses	Oil seeds	Guar
Total transaction through public markets ('000 MT)		2,537	311	21	4,444	661	860	3,745	935
Division	Largest share	Jaipur	Kota	Sikar	Kota	Udaipur (maize)/ Kota (rice)	Bikaner	Kota	Ganganagar
	Transaction QTY ('000 MT)	1,460	194	9.3	1,477	452	185	1,500	355
	% total Rajasthan	57.6	62.3	43.1	33.2	68.4	21.5	40.0	38.0
	Jaipur								
	Transaction QTY ('000 MT)	1,460	23	0.02	515	5	84	264	33
% total Rajasthan	57.6	7.7	0.1	8.3	0.8	8.4	8.8	3.5	

Note: Cereals, pulses and oilseeds are the data during 2013-2014. Cereals = wheat, barley, jowar, and bajra; Pulses = gram, urad, moong, masoor, moth, arhar, chola, pea, and others; Oilseeds = mustard, sesame, soybean, rucola seed, flax seed, castor seed, groundnut and others; Spices = coriander, cumin, fenugreek, ajwain, and chillies

Source: Prepared by JICA survey team based on “Arrivals of 10 years” from RSAMB Website (2013-2014, 2014-2015)

As shown in Table A2.6.8, an amount of 2,537,000 MT of fruits/vegetables were transacted during 2014-2015, of which 58% were through Jaipur Division. According to several traders in the Jaipur Market (fruits/vegetables), most fresh fruits/vegetables are transported to the market directly from production areas in other states/countries and supplied in Rajasthan, especially during Rabi season (interviewed in March 2016).

Kota Division, the largest crop producer in Rajasthan (17%)²⁸, is the major area of collecting and distribution for spices, cereals and oilseeds.

In Jaipur Division, one of the largest consumption divisions, less than 10% of crops arrive. According to the assistant secretary of Jaipur Market (cereals/pulses/other crops) and several traders there, most cereals/pulses/other crops transacted there are from other districts/nearby Jaipur. Except only bajra,

²⁸ Crop Production Statistics Information System (Directorate of Economics and Statistics, GOI)

groundnut, mustard and gram, those crops are consumed locally in/around Jaipur (interviewed in March 2016).

Moreover, Table A2.6.9 compares quantities of the State's production and transaction through public markets.

Table A2.6.9 Production and Transaction Quantities of Agricultural Produce (2014-2015)

	Horticultural produce			Food crops			Industrial crops	
	Fruits/ vegetables	Spices	<i>Isabgol</i>	Cereals	Maize/ rice	Pulses	Oil seeds	Guar
(a) Production in Rajasthan ('000 MT)	2,169	425	118	16,437	1,776	2,471	6,034	1,541
(b) QTY of transaction through public markets ('000 MT)	2,537	311	21	4,444	661	860	3,749	935
(c) Differences between (a) and (b) (% of production)	368 (20%)	-114 (27%)	-97 (82%)	-11,993 (73%)	-1,115 (62%)	-1,611 (65%)	-2,285 (38%)	-606 (40%)
Probable factors causing (c)	Import	Direct supply to industrial sector, unmonitored export by land, post-harvest loss		Procurement by government, local marketing, self-consumption by producers, post-harvest loss			Direct supply to industrial sector, unmonitored export by land, post-harvest loss	

Note: Cereals, pulses and oilseeds are the data during 2013-2014. Cereals = wheat, barley, jowar and bajra; Pulses = gram, urad, moong, masoor, moth, arhar, chola, pea, and others; Oilseeds = mustard, sesame, soybean, rucola seed, flax seed, castor seed, groundnut and others; Spices = coriander, cumin, fenugreek, ajwain, and chillies

Source: Prepared by JICA survey team based on "Arrivals of 10 years" from RSAMB Website (2013-2014, 2014-2015) and Agricultural Statistics at a Glance for the Year 2013-2014 for production of cereals, pulses and oilseeds, as well as the data from National Horticulture Board for production of fruits/vegetables and spices (2014-2015) and Crop Production Statistics Information System (Directorate of Economics and Statistics, GOI) for production of guar (2014-2015).

As for fruits/vegetables, the domestic transaction quantity exceeded the production, indicating that 368,000 MT of fruits/vegetables were presumably imported from other states/countries. However, even the imports are not sufficient to overcome the critical shortage of fruits/vegetables, 3,315,000 MT and 4,653,000 MT, respectively (Table A2.6.6).

As for spices, *isabgol*, oilseeds, and guar, the transaction quantities through public markets are less than the production. The differences are probably due to direct supply to the industrial sector, or export by land without official monitoring.

As for food crops, majority of the production is purchased by the government as buffer stock at minimum support prices, or probably locally sold and consumed.

Table A2.6.10 and Table A2.6.11 summarize examples of origins and supply destination of fruits and vegetables transacted at the Jaipur Market throughout the year, based on the interview to understand the general chains of distribution as explained above. According to the traders, fruits/vegetables come from the production sites without passing Delhi, sometimes directly from fields just after harvesting. As for vegetables, there was no indication about import from other countries. Most of fruits/vegetables are supplied in Rajasthan and some of them are for neighbouring states such as Hariyana, Punjab and Gujarat.

Fruits such as citrus, mango, papaya, guava, pineapple and pomegranate, and vegetables such as onion, potato, and tomato are already cultivated in Rajasthan although their production is still small (Figure A2.6.9 and Figure A2.6.10). Considering the state's potential to grow such fruits/vegetables and their market needs, increases in such fruits/vegetables production would be reasonable as a measure to reduce the shortage as well as for import substitution and export expansion.

Table A2.6.10 Origins and Supply Destination of Fruits at the Jaipur Market (Example)

Fruits	Origins (Production areas)			Supply destination	
	Within Rajasthan	Other states	Other countries	Within Rajasthan	Other states
Orange	Jhalawar, Bhawani, Bhilwara			Jaipur, Dausa, Bandikui, Bhartpur, Hindon, Karoli, Hanumangarh Alwar	
<i>Kinnow</i> (citrus)	Ganganagar	Panjab		All Rajasthan	Hariyana
<i>Mosambi</i> (citrus)		AP, Maharashtra			
<i>Malta</i> (citrus)	Ganganagar	Hariyana, Panjab			
Banana		Maharashtra, Gujarat and MP		All Rajasthan	
Mango		AP, TN, Gujarat, Karnataka, UP		All Rajasthan	Border districts of Hariyana (Hisar, Bhiwani etc.)
Papaya		Gujarat, AP, Maharashtra		Jaipur, Dausa, Alwar, Hindon, Karoli, Bhartpur, Sikar etc.	
Pineapple		Kerala, TN			
Guava	Sawaimadhopur, Bundi			Jaipur, Dausa, Bhartpur, Hindon, Karoli and Alwar	
Grape		Maharashtra		All Rajasthan	Hariyana
Pomegranate	Jaisalmer, Bhilwara	Maharashtra, Gujarat			
Sapota		Maharashtra, Gujarat		All Rajasthan	
Bael/Bel	Chomu, Bagru			Jaipur and other districts	
Apple		Himachal Pradesh, Kashmir,	China, USA, Australia, Chile	All Rajasthan	
Kiwi			Italy	All Rajasthan	
Soft pear			South Africa, USA, China	Jaipur	
Red globe (grape)			USA, Peru, Australia	Jaipur	

Source: JICA survey team

Table A2.6.11 Origins and Supply Destination of Vegetables at the Jaipur Market (Example)

Vegetables	Origins (Production areas)		Supply destination	
	Within Rajasthan	Other states	Within Rajasthan	Other states
Onion	<u>Mar. ~ Sept.</u> Jaipur, Sikar, Kuchaman, Jodhpur <u>Dec.~ Feb.</u> Ajmer, Kharthal, Alwar.	<u>Sep.~Nov.</u> Maharashtra, TN, Karnataka <u>Jan.~Apr.</u> Gujrat, Maharashtra.	All Rajasthan	UP, Hariyana
Garlic	<u>Jun.~Dec.</u> Jodhpur	<u>Feb.~Mar.</u> MP	Dausa, Jaipur, Sikar, Alwar, Bhartpur, Kota Sawaimadhopur	
Potato	<u>Jan.~Nov./Dec</u> Bhartpur	<u>Jan.~Nov./Dec</u> UP <u>Nov.~Dec.</u> Hariyana, Panjab	All Rajasthan	Border districts of Hariyana, Gujarat and MP

Vegetables	Origins (Production areas)		Supply destination	
	Within Rajasthan	Other states	Within Rajasthan	Other states
Tomato	<u>Apr.~Jun.</u> Chomu,Bassi (Jaipur)	<u>Dec.~Mar.</u> Gurajat <u>Jul.~Aug.</u> Karnataka <u>Aug.~Sep.</u> Maharashtra	Jaipur, Dausa, Bhartpur, Churu,Zunzunu, Sikar,	Delhi
Pea	<u>Jan.</u> Jaipur, Kota	<u>Oct.~Nov.</u> Himachal Pradesh <u>Jan.</u> Panjab, MP	Jaipur and nearby districts	Panjab, Hariyana.
Raw mango	Banswara	AP, Gujarat, UP	All Rajasthan	
Leafy vegetables (Coriander, fenugreek)	Jaipur, Bhankrota, Ramgarh, Ajmer,	<u>Dec.~Jun.</u> MP, UP	Jaipur, Tonk, Niwai, Caksu, Ajmer, Dausa, Bandikui, and Alwar	Agra, Delhi, Gujarat.
Pumpkin	Jaipur	Gurajat	Jaipur	Delhi, UP, Panjab
Beetroot		Gurajat, Bengal	All Rajasthan	
Cucumber	Sawaimadhopur, Choth ka barwara		Jaipur	UP, Panjab, Hariyana.
Okra	Bassi, Chomu (Jaipur)	Gujarat	All Rajasthan	
Bitter gourd	<u>April</u> Jaipur	<u>Other period</u> Maharashtra	Jaipur	
Apple gourd	Shapura, Chomu, Jaipur		Jaipur	Delhi
Pointed gourd		UP, Kolkata	Jaipur	
Guar	<u>April</u> Jaipur	<u>Other period</u> Maharashtra	Jaipur	
Colocasia		UP	Jaipur, Dausa Alwar, Sikar, Tonk	
Ginger		Assam, Bengal	All Rajasthan	
Green bell pepper		Gujarat	All Rajasthan	

Note: Garlic is categorized as spice in other parts of the report.

Source: JICA survey team

(4) Export of Agricultural Produce

The Rajasthan's single biggest agro export monitored is guar gum, of which value accounts for 97.2% (USD 764,550/278,000 MT) of total value of APEDA Products exports from the state during 2014-2015. There are also minor exports such as miscellaneous preparation, dairy products, wheat, pulses, and other fresh vegetables²⁹, follow after guar gum (0.6%, 0.4%, 0.16%, 0.15% and 0.12% of Rajasthan's total export value, respectively)³⁰.

As shown in Table A2.6.6, there is 434,000 MT of spices surplus, which is probably exported. As explained in Section 2.6.2(1), the export amount of coriander and cumin, the State's target spices in AEZs, during 2006-2007 ~ 2012-2013, are 26,855 MT and 7,394 MT, respectively.

According to DoH, *kinnow* is currently the single largest fruit for export (there is no estimates available). For example, National Horticulture Mission positions export potential of *kinnow* as "Medium" due to the good linkages to Food Parks (Sri Ganganagar) or markets, as well as its production advantage in India (Table A2.6.12). For example, the manager of the single (or one of two) *kinnow* plant in Sri Ganganagar Agro Food Park mentions that waxed *kinnow* are supplied to local markets or sold to export agencies in Mumbai to export to Malaysia, Russia, Bangladesh, and Gulf countries. There is a plan to establish one more plant in the Park to increase the current amount of *kinnow* to treat with (February 2016). As for spices, their export potential are more highly evaluated, probably due to the medium

²⁹ Exported other fresh vegetable include cabbage or peas in the case of Rajasthan (Statistics Division, Department of Horticulture).

³⁰ APEDA Website. APEDA products are not including spices, which are treated separately at Spice Board.

domestic demand. Establishment of AEZs and Spices Parks or RSAMB's effort for development of export-oriented spices market development tells the significant importance of spices as export commodities.

Table A2.6.12 Export Potential for Horticultural Produce

Horticultural produce	Market linkages					Production advantage (% of India production)	Export potential	Domestic demand
	Food park	AEZ	Markets	Process units	Cold storage			
Mandarin	o	x	o	o	x	5-6%	Low	High
Kinnow	o	x	o	o	x	30-35%	Medium	High
Santra orange	o	x	o	x	x	< 1%	Low	Medium
Pomegranate	o	x	o	x	x	< 1%	Low	High
Mango	x	x	o	x	x	< 1%	Low	High
Papaya	x	x	o	x	x	< 1%	Low	High
Bael	x	x	x	x	x	< 1%	Low	High
Ber	x	x	x	x	x	15-20%	Low	Medium
Aonla	o	x	o	o	x	High	Low	Medium
Guava	x	x	o	x	x	< 1%	Low	Medium
Lime	o	x	x	o	x	< 1%	Low	High
Coriander	o	o	o	o	o	50%	High	Medium
Cumin	o	o	o	o	x	40%	High	Medium
Fenugreek	o	x	x	o	x	80%	High	Medium
Fennel	o	x	x	o	x	12%	High	Medium
Henna paste	x	x	o	o	x	80%	High	Medium
Rose	x	x	o	o	x	Medium	Medium	High

Source: Action Plan for Rajasthan 2009 of National Horticulture Mission

(5) Potential Demand for High-Value Agricultural Produce

Rajasthan has a high comparative advantage in producing high-value agricultural produce. First, with its dry land and sandy soil, sugar contents of fruits/vegetables are expected to become higher. Presently, even without any special treatment, Rajasthan's fruits/vegetables have much higher sugar contents (TSS) than those in Japan, for example. With irrigation and proper agricultural techniques which enable intermittent of water, the current TSS could be higher along with nutrition. However, currently, TSS is not reflected on prices of fruits/vegetables. As for refractometers (TSS meter), a certain Japanese companies have already started manufacturing in India, import from Japan and domestic sales, but the equipment is used only for raw materials crops for which a certain level of TSS is required, for example, wine grapes³¹.

Second, Rajasthan, which has many tourist sites such as Jaipur, Udaipur, and Jodhpur, etc. (Figure A2.6.13), annually accepts more than a million of foreign tourists and more than 20 million including Indian tourists³². Hotels or restaurants in such areas could be regarded as niche markets to supply various exotic vegetables for tourists. Exotic vegetables, including cherry tomato, broccoli, Chinese cabbage, leek, red cabbage, yellow/red bell pepper, sweet corn, young corn, and mushroom, are transacted at the Jaipur Market. Exotic vegetables coming to the Jaipur Market are cultivated in/around Jaipur in protected environment (tunnel, net houses, etc.)³³, whereas some of them are also from other states. Most

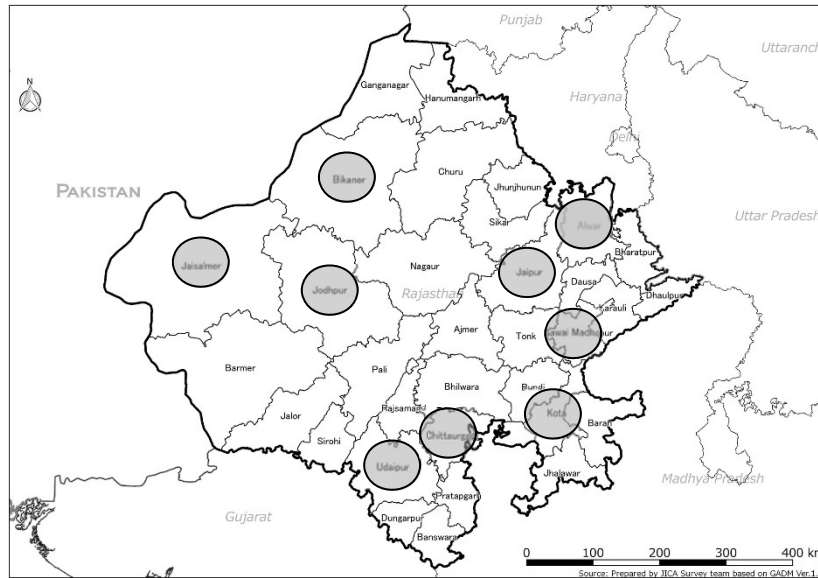
³¹ According to an informal tasting survey by JICA Survey Team, it seems that many Indian consumers prefer higher-TSS fruits (muskmelon) simply because they are "sweeter". As for vegetables (tomato, cucumber), on the other hand, high TSS does not necessarily indicate "sweet" and "tasty" for the consumers, of which opinions differ depending on other factors such as bitterness and skin hardness. This result has suggested us to aim at promoting high-TSS fruits as "sweeter fruits" and high-TSS vegetables as "more nutritious vegetables" instead of "sweeter vegetables".

³² Government of Rajasthan Tourist Offices Website (data for 2010)

³³ For the lists of districts producing exotic vegetables and villages producing exotic vegetables near Jaipur, refer to Supplemental information 1 and 2, at the end of Attachment 5.5.4 (Activity Plan: Brand building for high-value agricultural produce).

buyers in Jaipur such as purchasers from supermarkets and hotels, procure exotic vegetables at Jaipur Market³⁴.

However, supply chains for exotic vegetables do not exist yet in local regions while exotic vegetables are transacted at higher prices in Jaipur, and there are already a few stalls dealing with them in the Jaipur Market³⁵.



Note: Bikaner and Jaisalmer are not included in the project sites as of August 2016.
Source: JICA survey team

Figure A2.6.13 Location of Major Tourist Sites

Finally, to increase international competitiveness, quality improvement of *kinnow* (Citrus) or orange could be achieved by reducing their seeds or making them seedless. In the view of the present international market, about 61% of exported oranges/mandarins are seedless³⁶. However, Rajasthan's *kinnow* or orange still contain many seeds. According to the *kinnow* plant manager above or several orange traders in Jhalawar District, they would purchase seedless citrus at 10~13% higher prices than regular ones. In the view of production, seedlings of seedless Santra orange was newly released from the National Research Centre for Citrus, Nagpur in 2015, and distributed to progressive farmers, nursery operators, government departments and KVKs across the country. Distribution has just started only recently and will take some time to distribute sufficient number of seedlings for farmers. *Kinnow* with fewer seeds is also being developed by the Punjab Agriculture University.

2.6.5 Food Processing Industry and Distribution Industry

Refer to Attachment 2.6.7 for the details of food processing industry and distribution industry.

2.7 Gender-related Issues

2.7.1 National and State Policies and Strategies toward Gender Mainstreaming

In India, the Ministry of Women and Child Development was established in 1985 as an organization dealing with women and child development under the Ministry of Human Resources Development. It was at the turn of the 7th Five Year Plan (1985-1990) after the 6th Five Year Plan in which 'a multi-sectoral approach was adapted for women's development and, for the first time, a coordinated picture was presented in the plan'³⁷. As the National Perspective Plan for Women (1988-2000) was drafted in 1988, the approach of the central government of India on women development was gradually changed

³⁴ According to a few hotels in Jaipur, 90% of hotels in Jaipur City purchase exotic vegetables at Jaipur Market. Those interviewees answer that they are interested in other procurement options if available.

³⁵ RSAMB Sri Ganganagar

³⁶ "Kinnow Processing Plant", National Bank of Pakistan, R & D and Training Wing Agriculture Business Division, Lahore (incl. data for 2010)

³⁷ 8th Five Year Plan, Planning Commission, Government of India

from welfare for women to participation of women. The department was upgraded to the Ministry of Women and Child Development in 2006. The following are examples of government initiatives on gender mainstreaming:

- One third reservation for women in rural and urban local bodies, based on the 73rd and 74th constitutional amendments, 1992.
- Female property rights such as giving daughters of the deceased equal rights with sons, based on the Hindu Succession Act, amended in 2005.
- 33% participation by women and use of minimum wage rates for women and men, based on the Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS), 2005.
- Establishment of Gender Budgeting Cell in all ministries/ departments, based on the instructions issued by the Department of Economic Affairs, Ministry of Finance, 2004.
- Gender budgeting, based on the note issued as part of the Budget Circular every year by the Expenditure Division of the Ministry of Finance since 2005.

In Rajasthan, the Department of Women and Child Development (WCD) was established in 1985 to ensure the overall development of women and children in the state. In 2007, followed by the speech of the honourable chief minister of the department, the Directorate of Women Empowerment (WE) was formed separately from the Directorate of Integrated Child Development Services (ICDS) to improve the status of women in the mainstream of development equally and to facilitate integration. While ICDS implements programmes/schemes related to nutrition, pre-education, and women's health through *Anganwadi* centre, WE focuses more on economic empowerment, social development, and protection from any kind of violence against women. The following are initiatives of the state government on gender mainstreaming:

- Reservation of vacancies for woman candidates shall be 30%, category wise, under direct recruitment, based on the Rajasthan Administrative Services Rules, 1954, inserted in 2007;
- One half of the seats reserved for the SCs, STs, or backward classes shall be reserved for women belonging to such castes, tribes or, classes, based on the Rajasthan *Panchayati Raj* (Election) Rules, 1994, PART V, "one third" was replaced with "one half" in 2008;
- One half, including the number of seats reserved under sub-rule (1) (above), of the total number of seats shall be reserved for women, based on the Rajasthan *Panchayati Raj* (Election) Rules, 1994, PART V, "one third" was replaced with "one half" in 2008;
- Introduction of Gender Responsive Budget (GRB); auditing was started in six departments, namely: health, education, agriculture, women and child development, registration and stamps, and social welfare³⁸, which was an outcome of the chief minister's budget speech in 2005³⁹;
- Official adaptation of Gender Budget, based on the budget circular in 2011; and
- Set up of Gender Cell Desk in various departments.

Rajasthan adopted GRB following the central government at an early stage. WE introduced the categorization of the various schemes of the departments into A to D categories on the basis of budget allocation, i.e.: "A" category for programs/schemes having more than 70% allocation for women, "B" category for 30-70%, "C" category for 10-30%, and "D" category for less than 10%⁴⁰.

The decision of offering 50% reservation for women in *panchayats* is much earlier than in other states.

2.7.2 Programmes/Schemes under Related Organisations

(1) Gender Sensitising Activities in the Organisation

In Rajasthan, all the government organisations are asked to reserve 30% seats for women and set up Gender Cell Desk as mentioned above, but actual situation differs from department to department.

³⁸ Snapshots of Gender Responsive Budgeting in Rajasthan, Department of Planning Government of Rajasthan
<http://evaluation.rajasthan.gov.in/Utility/Documents/GenderBudgeting/English/snap.pdf>

³⁹ Gender Responsive Budgeting in Rajasthan, Sunil Thomas Jacob, State Programme Co-ordinator, UNFPA Rajasthan State Office, 2009

⁴⁰ Gender Budget Statement of the State, Department of Women and Child Development,
<http://wcd.rajasthan.gov.in/docs/gender-cell-new.pdf>

(a) WRD

Regarding staffing, 30% of women seats is not fulfilled because it is difficult to get capable and eligible women candidate, especially engineer, every time in WRD. Gender Cell Desk was once set up but there was no one at the time of the survey because the staff in charge of the Gender Cell Desk had long been transferred and WRD has not appointed a successor yet. Due to the absence of the Gender Cell Desk, WRD could not provide gender-disaggregated data to the JICA survey team. According to the brochure of IMTI, which is the training institute for WRD, there is no specific training on gender-related topics so far.

(b) DoA

DoA fulfilled the reservation for women only in specific posts, such as for village level extension officer, because there is shortage of eligible and suitable women candidates. There is a stipend program for female students studying in agriculture under centrally sponsored scheme and it helps produce future agriculture staff.

Comparatively speaking, DoA has been active in gender mainstreaming, e.g., it has a Gender Cell Desk with two permanent staffs, and 30% reservation for women, not only for staff but also for beneficiaries of activities. The following are examples of activities related to gender mainstreaming:

- Gender Responsive Budget: There are several “A” category programmes. The following are exclusive for women: one day women training programme at the *gram panchayat* level, exposure visit of women farmers at the district level, stipend for female student studying in agriculture at the state level, FIG programme under ATMA.
- Gender training: conducted by SIAM with Rajasthan State Institute of Public Administration (RIPA) and National Institute of Agricultural Marketing (NIAM) regularly.

(c) WCD

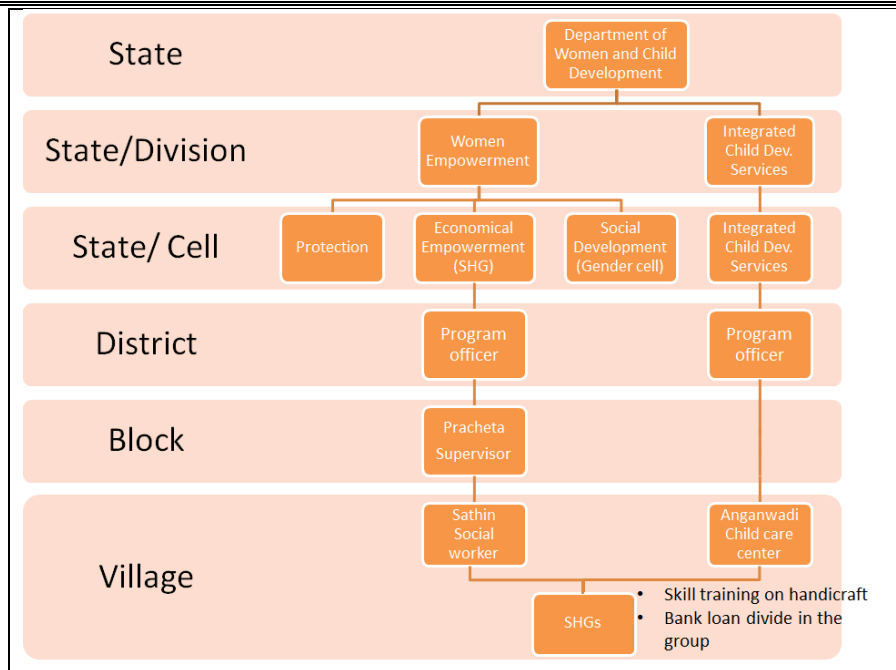
Since the nature of work in the department is suitable for women, 30% reservation for women in government services is fulfilled at the state level, district level, and field level. WCD has advantage since huge number of staffs at *Anganwadi* centres are all women, but there is shortage of field staff because of low pay. Gender Cell was constituted under the Directorate of Women Empowerment to function as secretariat to the committee as well as to help departments in institutionalizing GRB in their budgets⁴¹. Gender training has been conducted by RIPA for the state- and district-level staffs regularly.

(2) Programmes/Schemes for Rural Women

(a) SHG under WCD

The WCD promotes women’s participation in society through women development programmes. The department has two divisions in different offices. While WE works on the economic empowerment of women, social, development, and protection, ICDS provides nutritional guidance and foods to pregnant women, new mothers, adolescent girls, and babies and toddlers through an *Anganwadi* centre. Under the ICDS programme, there are several *Anganwadi* centres in a *gram panchayat* (village), and each centre has three staffs, namely: worker, helper, and assistant. Although SHG activity is under WE, *Anganwadi* staff also has the responsibility to form and monitor SHGs. According to interviews with *Anganwadi* staff and SHG members, in spite of the huge number of SHGs, there are not much success cases using bank loan. In most cases, they divided the money borrowed amongst the group members, and used it for household expenditure. Generally, the number of members per SHG is 10-15 and INR 100 is the savings per month. Stitching, jewelry making, and beautician job are mentioned by WE staff as examples of skills training for SHG members. There seems to be not much option for group activities and agriculture-related activities. Reflecting the current reality, WE has been reviewing the status of registered SHGs and will publish the report in March 2016.

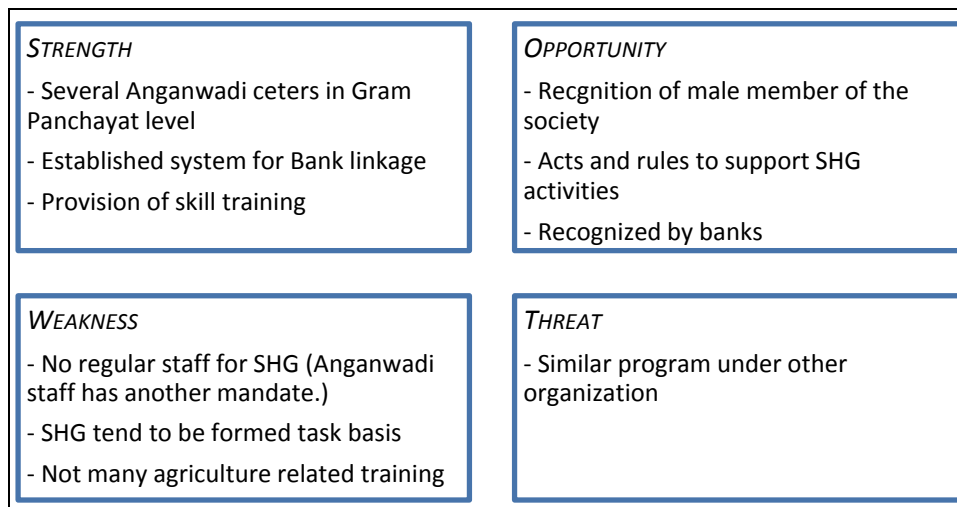
⁴¹ Interview with Ms. Kavita, Gender Advisor, Gender Cell, Directorate of Women Empowerment, 23 February 2016



Source: JICA survey team

Figure A2.7.1 Organisational Chart of WCD

The following Figure A2.7.2 shows the strengths, weaknesses, opportunities, and threats (SWOT) analysis of the programme.



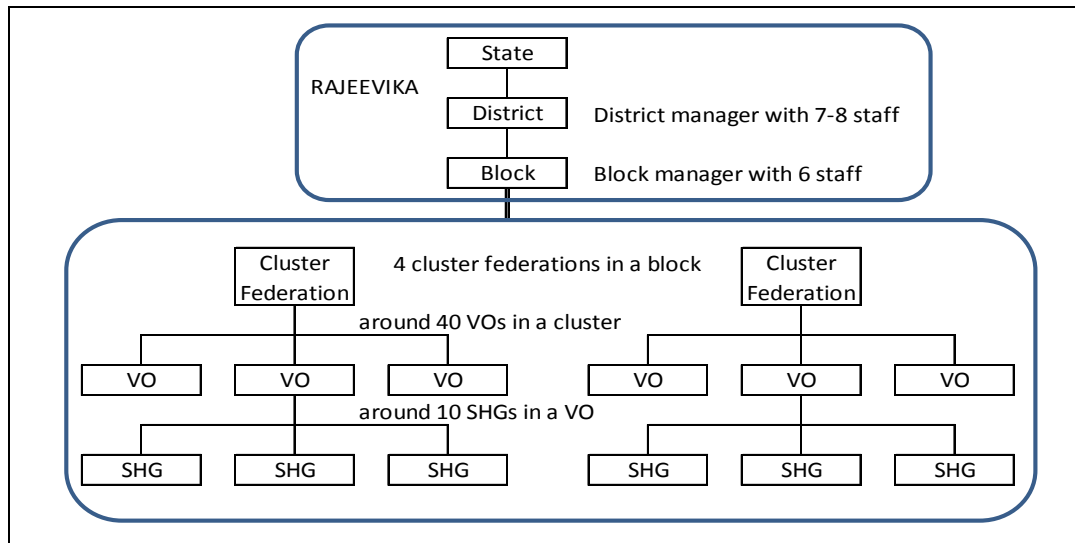
Source: JICA survey team

Figure A2.7.2 SWOT Analysis of SHGs under WE Programme

(b) SHG under National Rural Livelihood Mission

The Rural Development and Panchayat Raj Department (RDPRD) also implements SHG activities under the National Rural Livelihood Mission (NRLM), which is one of the programmes funded by the national government in cooperation with Rajasthan *Grameen Aajeevika Vikas Parishad* (RAJEEVIKA). RAJEEVIKA is an autonomous society registered under the Society Registration Act, 1958 in 2010 and mandated to implement all rural livelihoods programmes associated with SHG-based institutional architecture under RDPRD. NRLM focuses on the improvement of poor rural households through SHG activities. Before forming SHG, a survey team headed by a community resource person identifies the target group in the village in about two weeks. Although the government has already identified the Below Poverty Line (BPL) families, the team conducts survey and orients the target people without any

biases. The method of survey is adopted from the Society for Elimination of Rural Poverty (SERP), Andhra Pradesh. The implementation system is as shown in Figure A2.7.3.



Source: JICA survey team

Figure A2.7.3 Implementation System of SHG Activities under NRLM Programme

This structure has been introduced in all the states in India by the Ministry of Rural Development since 2011 and it was started in Rajasthan in 2013. As of March 2016, all the 33 districts in Rajasthan have already been covered by the programme. The target is to cover all the blocks and villages in the state by 2020 and the programme has already covered 111 blocks out of 295 and 5,253 villages out of 9,894 so far. As explained earlier, the programme starts with the formation of SHG and after the first six months, around 10 SHGs form village organisation (VO). Number of member per SHG is 10-15 and it saves money of INR 20 per week but conducts meeting twice a month. Based on the result of three months of monitoring, INR 15,000 is provided to the group by the programme and then after another three months, INR 110,000 is provided again to the group if the group is active enough. At that time, the programme also provides technical support to develop a micro credit plan so that SHG members can use their savings and bank loan effectively. There are two staffs, called Active Women, hired per VO from the nearby village for 12 months by the program with a salary of INR 2,250 per month. Cluster federation (CF) is formed after one year of establishment of VO. There are around 40 VOs per CF. For the running cost of offices at each level, the program provides INR 25,000,000 to CF as a loan; CF then lends it to VOs at 6% interest; VOs then give it to SHGs at 12% interest; and finally, most SHGs give the loan to members at 18-24% interest. The offices can use the interest differences as budget for running cost.

The following Figure A2.7.4 shows the SWOT analysis of the programme:

<p>STRENGTH</p> <ul style="list-style-type: none"> - Sufficient staff to take care of groups - Sufficient fund support - Established system for Bank linkage - More focus on investment - Provision of financial training 	<p>OPPORTUNITY</p> <ul style="list-style-type: none"> - Recognition of male member of the society - Acts and rules to support SHG activities - Recognized by banks - Network with outside of the state (National program)
<p>WEAKNESS/CONSTRAINT</p> <ul style="list-style-type: none"> - Only for poor household 	<p>THREAT</p> <ul style="list-style-type: none"> - Similar program under other organization - Envoke envy from villagers who are not target of the program

Source: JICA survey team

Figure A2.7.4 SWOT Analysis of SHGs under NRLM Programme

2.7.3 Women in Agriculture

(1) Regulation Regarding Women's Participation in WUA

Gender mainstreaming in PIM is a crucial issue of sustainable irrigation systems. Although women in farm households are actively involved in farm activities, as much as or more than men, as explained later, they are limited in terms of labour force but not in terms of the decision-making process on irrigation water management. There are several obstacles, as described below, for women's inclusion despite the water sector reforms and PIM acts.

(a) Political Aspect

Based on the field survey, there is no women representative in WUA since membership is limited only to landowners. It is a kind of a vested political interest, which often have an impact on the reservation for women in the management committee of WUA.

(b) Legal Framework

The Annual Report 2014-2015 of the Ministry of Water Resources mentioned that there are some states such as Madhya Pradesh which have attempted to ensure that all farm owners, be it men or women, are made rightful members of the outlet committees. Table A2.7.1 below shows provisions for women participation in some PIM acts and it says that only Madhya Pradesh (MP) is the exceptional case. Significant effort in the PIM act of MP is to ensure that where there are no women members, at least one woman from the area must be included in WUA even if she is not a landowner.

Table A2.7.1 Provision of Women Participation in the WUAs in Select State PIM Acts

State	Name of PIM / PIM Enabling Act	Provisions for Women Participation
AP	Andhra Pradesh Farmers Management of Irrigation Systems Act 1997	No reservation for women in management committees or at any other level.
Bihar	Bihar Irrigation, Flood Management and Drainage Rules 2003 (Section 3.6 regarding Irrigation Management Transfer (IMT) made under Section 115(1) and (2) of Bihar Irrigation Act 1997	No reservation for women at village level committee and system level committee (distributary and minor level)
Gujarat	Gujarat Water Users PIM Act 2007	No reservation for women in management committees or at any other level.
Karnataka	Irrigation and Certain Other Law (amendment) Act 2000	No reservation for women in management committees or at any other level.

State	Name of PIM / PIM Enabling Act	Provisions for Women Participation
MP	Madhya Pradesh Sinchai Prabandhan Me Krishkon Ki Bhagidari Adhiniyam 1999	The wives of valid landholders are members of WUA irrespective of landholding or not. (Amendment in Section 3, Subsection 4 of the Act vide MP's Extraordinary Gazette No. 55 dated 25 February 2005). Out of six subcommittees, one subcommittee is named as 'Women's Participation Sub - Committee' in order to involve women in the command area.
Maharashtra	Maharashtra Management of Irrigation Systems by the Farmers Act 2005	One third representation of women in management committee at all levels of WUAs has been provided in the act. But the membership is tied up with the landholding title. Therefore, there is a lack of availability of women members on the ground.
Orissa	Odisha Pani Panchayat Act 2002	Nearly but not less than one third of the total number of seats in the executive committee of any pani panchayat (minor level) shall be reserved for women. However, women should be landholders in the command area, which is a constraint.
Rajasthan	Rajasthan Farmers' Participation in Management of Irrigation System Act, 2000.	No reservation for women in management committees. Out of the five subcommittees, one woman may preferably be nominated in each Nirman Upsamiti and Sinchai Upsamiti.
Tamil Nadu	Tamil Nadu Farmers' Management of Irrigation Systems Act 2000	No reservation for women in management committees or at any other level.
UP	Uttar Pradesh PIM Act 2009	At every level, if a woman is not elected to the management committee, a woman from the command area shall be co-opted as a member in the management committee. However, women should be landholders in the command area, which is a constraint.

Source: Status of Participatory Irrigation Management (PIM) In India by Phanish Sinha

(c) Social Constraint

The following Table A2.7.2 shows gender related indicators in India and Rajasthan. Except 'Life expectancy at Birth', other indicators of female in Rajasthan are quite worse compared to indicators of India as well as male's in Rajasthan. It is seen as the result of tradition; family and society celebrate the birth of boy child than the birth of girl child and sons are given better food, medical treatment and education to than daughters. To improve the situation, Government of India has launched 'Save girl child, educate girl child' scheme in all the state.

Table A2.7.2 Gender Situation in Rajasthan

Item	Year	Rajasthan		India	
		Male	Female	Male	Female
Population ¹	2011	35,620,086	33,000,926	623,724,248	586,469,174
Sex ratio ¹	2011	926		940	
Literacy Rates ¹	2011	80.51	52.66	82.14	65.46
Life expectancy at Birth ²	2006-10	64.7	68.3	64.6	67.7
Maternal Mortality Ratio ³	2007-09	318		212	
Infant Mortality Rates ¹	2011	50	53	43	46

Source: 1: Provisional Population Totals Paper 1 of 2011. Ministry of Home Affairs, GoI,
2: Sample Registration System, Office of the Registrar General, India, Ministry of Home Affairs,
3: Maternal & Child Mortality and Total Fertility Rates Sample Registration System (2011)

In terms of WUA activities, it is focused on construction works related to system rehabilitation or desilting, maintenance, and repair works, participation in which is dominated by men. The membership and voting rights of women depend on the landholding title in their names. Traditionally, land titles are in the name of male members.

Table A2.7.3 Situation of Landholdings

	Male	Female	Total
Number	4,844,399	480,602	5,325,001
%	91	9	100
Area (ha)	13,649,349	1,142,310	14,791,659
%	92	8	100

Source: JICA survey team based on Agriculture Census 2010-11, <http://agcensus.dacnet.nic.in/SL/StateT1table2.aspx>, (last accessed on 17 June 2016)

(d) Capacity Building

Women's participation remains very low in training programs, which has been a major barrier for women not being able to come to decision making forums at par with men. There are no specific training modules and targets for women training.

(2) Situation of Women Farmers

In Rajasthan, coarse cereals and wheat are widely cultivated due to the scarcity of water. Although farm work is comparatively lighter than vegetable cultivation, it was found through interview with women farmers that most of the manual works are done by women. The findings found through the interview in the field are compiled below. The result of the household survey conducted on 20 households in Sawai Madhpur and Hanumangarh is attached to the report as Attachment 2.7.1.

(a) Activity Profile

Interviews were separately conducted with farmers cultivating wheat, garlic, and citrus. The result of the interview with four groups, i.e., 3 women groups and one men group, of wheat farmers in Bhilwara, Kota, and Jaipur districts is shown in the following Table A2.7.4:

Table A2.7.4 Activity Profile on Productive Activities (Wheat)

Productive activities	Women Group		Men Group	
	Men	Women	Men	Women
Land cleaning		✓	Not mentioned	
Land preparation, tilling	✓ (tractor)		✓ (tractor)	
Seed sowing	✓ (tractor)		✓ (tractor)	
Watering	✓ (using pump)	✓ (water course to the field)	✓✓ (using pump)	✓ (water course to the field)
Weeding and earthing up		✓ (by hand, once)	✓ (by spray, machine)	
Harvest (by hand)	✓	✓✓	✓	✓
Harvest (by machinery)	✓		✓	
Cleaning	✓ (threshing machine)	✓ (by hand)	Not mentioned	
Transportation (field to home)	✓ (tractor)	✓ (by foot)	✓	✓
Transportation (to market)	✓		✓	
Marketing (timing, place, price)	✓✓	✓	✓	✓

Source: JICA survey team based on interview

For garlic and citrus cultivation, interviews were conducted in Jhalawar District with two women groups. The result is similar to wheat farming in that women work manually and men use machineries.

Table A2.7.5 Activity Profile on Productive Activities

Productive Activities (Garlic)	Men	Women	Productive Activities (Citrus)	Men	Women
Soil preparation (oxen/tractor)	✓		Transplanting		✓
Seed sowing		✓	Watering	✓ (using pump)	✓ (sprinkler)
Transplanting		✓	Weeding	✓ (by machine)	✓ (by hand)
Watering		✓	Pruning and training	✓	
Weeding and earthing up (by hand)		✓	Harvest		✓
Harvest (by hand)		✓	Transportation (field to home)	✓	
Transportation (field to home)	✓		Transportation (to market)	✓	
Transportation (to market)	✓		Marketing (timing, place, price)	✓	
Marketing (timing, place, price)	✓✓	✓			

Source: JICA survey team based on interview

The above shows that women are responsible for labour work in the field whilst men work using machinery or are involved in more technical works. Some women mentioned that the hardest farm work is weeding/earthing up and they complained that it is troublesome for vegetable cultivation that needs weeding several times compared with wheat which requires weeding only once. Between production and marketing, there is a serious gap because transportation to market is purely dominated by men.

(b) Daily Activity Profile

Interviews were conducted with two women groups in Baran and Jaipur districts. Due to the limited interview time, the collected information are very general and rough, as shown in Table A2.7.6.

Table A2.7.6 Daily Activity Profile

Time	Wife/Mother (Answered by Women)
4:00	Wake up
5:00	Take care of cattle, milking
6:00	Cleaning house, making yogurt, prepare tea
7:00	Bathing, washing clothes, drink tea
8:00	Work on the farm
9:00	Work on the farm
10:00	Prepare food, caring of cattle
11:00	Take lunch
12:00	Take rest
13:00	Cleaning of house
14:00	Work on the farm/ take rest
15:00	Work on the farm/ take rest
16:00	Work on the farm, collection of firewood/ prepare dinner
17:00	Prepare dinner
18:00	Take dinner
19:00	Rest
20:00	Sleeping

Source: JICA survey team based on interview

Generally, women take care of livestock, especially cows, and that is why women's participation through dairy cooperative is popular in Rajasthan. It can be said that this is an example of a relatively good living condition since they have water connection to their houses, and most households use gas instead of cooking stove so that they can spare some time to rest. If there is no water or gas supplier, they need to

spend more time to fetch water and to collect firewood. Introduction of agricultural machineries also contributed to reduce working time on the farm compared before. Another women group in Jaipur also told that the reason for forming group is that they have 1-2 hours of free time every day. This is needed to collect information from men and also from both men and women living without water connection for comparison purposes.

(c) Access and Control Profile

The following Table A2.7.7 was compiled based on informally collected information:

Table A2.7.7 Access and Control Profile

Resources	Who has access or use?		Who owns and controls decision?	
	Men	Women	Men	Women
Land	✓✓	✓	✓✓	
Credit	✓✓	✓ (SHG members)	✓✓	✓ (SHG members)
Income	✓✓	✓	✓✓	✓
Labour	✓✓	✓	✓✓	✓
House	✓	✓✓	✓✓	
Tools/Machines	✓✓		✓✓	

Source: JICA survey team based on interview

Since women are also working on the farm, they have access to resources related to cultivation to some extent but they have control on credit, if they are SHG members, and limited amount of income. Traditionally, men decide on the cultivation plan and own properties.

(d) Value Chain Analysis

As shown in the activity profile and the access and control profile, women are used as labour on the farm without participation on the decision making of cultivation plan. Moreover, it is difficult for women to get the whole amount of sales of the production because of the gap between production and transportation. Since women give more time for cultivation than men, men bring the produces to the market and sell them. Table A2.7.8 shows information and ideas on the value chain of targeted farm produces. This will be analysed in line with the agriculture, food processing, and marketing components.

Table A2.7.8 Value Chain Analysis

Value Chain	Production ⇒	Processing ⇒	Distribution ⇒	Sale ⇒	Consumption
	Famers	Farmers/ Processors	Farmers/ Middleman/ Whole Seller/ Mandi	Local Markets/ Retail Shops	Restaurants/ Consumers
Roles of the Operator	Cultivation of crops	Post-harvest/ food processing	Distribution/ export and import/ wholesale	Marketing	Consumption/ seasonal events/ tourism
Men	Operation of machineries, agricultural inputs	- Operation of machineries, dry/store - Bulk production	- Shipment - Negotiation - Transportation (tractor, motorcycle, truck)	- Transportation (tractor, motorcycle, truck) - Management of market - Negotiation - Purchase	- Purchase in bulk - Cooking in restaurants - Development of goods and menu
Women	Manual work in farm	- Winnowing/cleaning - Household enterprise	Cleaning/ grading	- Seller in village/shop	- Purchase for house consumption - cook at home

Value Chain Basic Function	Production ⇒	Processing ⇒	Distribution ⇒	Sale ⇒	Consumption
	Famers	Farmers/ Processors	Farmers/ Middleman/ Whole Seller/ Mandi	Local Markets/ Retail Shops	Restaurants/ Consumers
Current Issues	Scarcity of water, lack of modern agricultural knowledge	Poor quality	Transportation cost, lack of pricing and negotiation skill	Lack of knowledge on pricing, lack of facilities (store, cold store)	Mix/unstable quality, shortage of goods in off-season, lack of attractive goods for tourist
Gender Issues	Heavy physical labour, no control on land and cultivation	Physical work, lack of idea on pricing, low profit, lack of knowledge on value addition	Lack of transportation, social constraint	Facility for women, social constraint	Social constraint on house work, lack of knowledge on nutritious food
Countermeasures and Activities Under the Project	Technical training on cultivation, gender sensitisation to men	Training on post-harvest and processing, organizing processing group	Group shipment, training on pricing and value addition skill	Training on pricing and value addition skill, promotion of farm stand	Gender sensitisation to men, training on nutrition, and cooking skill

Source: JICA survey team based on interview

CHAPTER 3 LESSONS LEARNT FROM RAJAMIIP

3.1 Outline of RAJAMIIP

The Rajasthan Minor Irrigation Improvement Project (RAJAMIIP) was designed based on the state's experiences in implementing World Bank-assisted projects viz. 'Dam Safety Project' and 'Rajasthan Water Sector Restructuring Project' (RWSRP). The developmental objectives of RAJAMIIP were to increase the agricultural productivity in the state of Rajasthan with low rainfall, and to enhance agriculture income and alleviate the poverty of farmer's community by rehabilitating existing minor irrigation infrastructure and adopting modern water management techniques and agriculture practices with active participation of the beneficiaries.

The salient features of RAJAMIIP are summarised in Table A3.1.1 and the details are given in Attachment 3.1.1.

Table A3.1.1 Outline of RAJAMIIP

Project Cost (Budget)	INR 6,122.9 million
(JICA Loan)	INR 4,814.5 million
(The State Government)	INR 1,308.4 million
Project Cost (Actual Expense)	INR 4,684.3 million (expenditure rate: 76.5%)
(JICA Loan)	INR 3,039.1 million (expenditure rate: 63.1%)
(The State Government)	INR 1,645.2 million (expenditure rate: 125.7%)
Project Period (Original Plan)	January 2005 – February 2012
Project Period (Addendum-I)	January 2013 – December 2014
Project Period (Addendum-II)	January - June 2015
Executive Agency	Water Resource Department (WRD)
Related Departments	Department of Agriculture (DoA) Department of Medical Health (DoMH) Irrigation Management Training Institute (IMTI)
Engineering & Management Consultant	<u>Main:</u> GITEC Consult GmbH <u>Associates:</u> HAQ Consultants Pvt. Ltd., Jaipur; KIRLOSKAR Consultants Ltd., Pune and ENV-DAS (India) Pvt. Ltd., Lucknow
NGO	Gram Vikas Trust (Lead NGO) and consortium
Monitoring & Evaluation Consultant	DHV-Haskoning India
Major Component	1. Civil Engineering 2. Institution Building 3. Capacity Building 4. Water Management 5. Agricultural Extension 6. Health Component
Number of Sub-projects	353 sub-projects
WUAs formulated	393 WUAs

Source: JICA survey team

3.2 Lessons Learnt in Irrigation Rehabilitation

The Minutes of Discussions (MOD) signed on 24 November 2004 with the Japan International Cooperation Agency (JICA) contemplated the completion of various activities involved under the civil works component by December 2012. However, there were several delays in the appointment of the Engineering & Management Consultant and non-government organisation (NGO); thus, all the activities

under the civil works component were delayed. Table A3.2.1 depicts the actual completion of various activities in comparison with the contemplated schedule.

Table A3.2.1 List of Actual Completion of Various Activities

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
1. Selection of Management & Engineering Consultant											
Period as per MOD	█										
Actual			█	█							
2. Data collection for second screening											
Period as per MOD		█									
Actual				█							
3. Second screening											
Period as per MOD		█									
Actual				█							
4. Establishment of SID standard											
Period as per MOD		█									
Actual				█							
5. Execution of SID											
Period as per MOD		█	█								
Actual			█	█	█	█	█	█			
6. Appraisal of sub-projects											
Period as per MOD			█								
Actual				█	█	█	█	█			
7. Tender & contract											
Period as per MOD			█	█							
Actual				█	█	█	█	█	█	█	
8. Main civil works											
Period as per MOD			█	█							
Actual					█	█	█	█	█	█	█

Source: JICA survey team

Table A3.2.2 provides a summary of challenges observed in RAJAMIIP and their reasons/causes.

Table A3.2.2 Challenges and Countermeasures

Challenges	Reasons / Countermeasures
1. Delay/cost cut of procurement of consultant 2. Delay of procurement of NGO	<u>Reasons:</u> ✧ Internal process of the Government of Rajasthan (GoR). <u>Countermeasures:</u> ➤ Guarantee of the GoR/WRD to keep the schedule agreed by the two parties. ➤ Guarantee of the GoR/WRD to keep the original conditions of the consultant's input agreed by the two parties.
3. Less WRD staff for site operation 4. No formulation of sub-project management units (sub-PMUs) (low performance of progress control and quality control of construction works)	<u>Countermeasures:</u> ➤ Guarantee of the GoR/WRD to have certain number of full-time assignment staff from WRD in PMU and sub-PMUs. ➤ Guarantee of the GoR/WRD to establish PMU, sub-PMU, and coordination committees.
5. Delay of survey, investigation, and design (SID) works 6. Delay of Civil works	<u>Reasons:</u> ✧ Concentration of work on one contractor ⇒ overloaded. ✧ Cost-based selection in tender introduced the dumping ⇒ poor contractor ⇒ termination ⇒ re-tender, or ✧ Dumping ⇒ poor workmanship ⇒ reworks.

Challenges	Reasons / Countermeasures
	<p><u>Countermeasures:</u></p> <ul style="list-style-type: none"> ➤ Introduction of a tender system in which overloading of work can be avoided (one contractor should have only one contract in the Project, or a confirmation system of the tenderer's present contract work volume should be introduced in the tender evaluation). ➤ Introduction of a tender system in which dumping can be avoided (setting appropriate range of bidding price for screening tenders). ➤ Introduction of the stage-wise implementation of the Project.
<p>7. Activities in agriculture sector were not performed well (poor coordination with related agencies)</p>	<p><u>Reasons:</u></p> <ul style="list-style-type: none"> ✧ No sub-PMU for coordination of site works. ✧ No full-time officers from DoA and Department of Horticulture (DoH). ✧ No special staff was provided from the PMU. ✧ Technical Support Group (TSG) was inactive. <p><u>Countermeasures:</u></p> <ul style="list-style-type: none"> ➤ Establishment of well-organised implementation structure with related agencies. ➤ Assignment of full-time officers from the related agencies (DoA, DoH, Department of Women and Child Development (WCD)). ➤ NGO staff for water users associations (WUA), agriculture, and gender mainstreaming should be hired. In addition, community motivators (one male and one female) should be employed in each sub-project for supporting activities. ➤ TSG sub-project should be established at site level.
<p>8. WUA empowerment was not performed well</p>	<p><u>Countermeasures:</u></p> <ul style="list-style-type: none"> ➤ Guarantee of the GoR/WRD to keep the schedule agreed by the two parties. ➤ NGO should be continuously engaged on WUA empowerment activities from the beginning to the end of the stage.
<p>9. Ownership by the project officers might be not so high</p>	<p><u>Reasons:</u></p> <ul style="list-style-type: none"> ✧ Responsibility is not clear. ✧ No incentive for good performance. <p><u>Countermeasures:</u></p> <ul style="list-style-type: none"> ➤ A responsibility system based on the sub-PMU should be introduced. ➤ A performance-based budget allocation should be introduced. ➤ Progress of each sub-PMU should be monitored regularly, and results should be shared among project officers

Source: JICA survey team

The detailed descriptions of the lessons learned from RAJAMIIP and the World Bank-assisted RWSRP, are given in Attachment 3.2.1 and Attachment 3.2.2, respectively.

CHAPTER 4 PRIORITISATION AND SELECTION OF IRRIGATION SUB-PROJECTS

4.1 Review of Sample DPRs and Preparation of Model DPR

4.1.1 Review of Sample DPRs

(1) General

In the original plan of the survey, all sample detailed project reports (DPRs) for 24 medium and 48 minor irrigation schemes were expected to be completed prior to the commencement of the survey works. Unfortunately, it shall be noted that the Japan International Cooperation Agency (JICA) survey team received only six sample DPRs upon arrival at the site on 9 February 2016 and eventually has received all sample DPRs on 3 March 2016.

The JICA survey team has received a total of 73 sample DPRs consisting of 36 medium and 37 minor irrigation schemes as shown in Table B4.1.1.

(2) Preparation of Database based on Sample DPRs

The JICA survey team compiled the data and information in the sample DPRs into a database (see Attachment 4.1). As shown in Attachment 4.1, there are a lot of data and information marked as “not clear”, “blank”, and “no item”, and it is recommended to review and revise all sample DPRs before proceeding to the next steps such as preparation of technical estimate and tender documents.

(3) Issues on Preparation of Sample DPRs

Although sample DPRs were planned to be prepared by local consultants employed by the Water Resource Department (WRD), all sample DPRs were actually prepared by a junior engineer or assistant engineer and approved by the executive engineer at the field level of WRD. According to an interview survey with government officers, the following are the issues and findings related to the preparation of DPR by field-level officers:

- Guidelines and samples for preparation of DPRs were provided by WRD to field-level officers for their reference to prepare sample DPRs.
- No special training for preparation of DPRs was ever given to field-level officers.
- The Department of Agriculture (DoA) was not involved in the preparation of sample DPRs.
- Water users association (WUA) was not involved in the preparation of sample DPRs.
- Standard unit price at district level and design criteria at state level were used for the cost estimate and design works, respectively.

(4) Preliminary Review of Sample DPRs

According to the preliminary review of sample DPRs, the following issues are found in the present DPRs prepared by the field officers:

- It seems most DPRs were hardly acceptable technically even for detailed review works due to lack of data and information and unclear description.
- Most DPRs were not prepared in conformity with the guidelines or samples provided by WRD due to the lack of understanding of the field-level officers.
- There is less or no descriptions of essential information, especially for environmental/social issues, soft component activities, and economic/financial evaluation.

It is, therefore, strongly recommended to review all sample DPRs based on the model DPRs to be prepared by the JICA survey team and such DPRs should be checked and technically approved by the consultant for the implementation stage before proceeding to the next step.

Considering the quality of sample DPRs and the limited numbers and capacity of WRD field officers, it is recommended to employ survey, investigation, and design (SID) consultants for such review works

as well as for the preparation of the remaining DPRs. It is noted that the whole responsibility for revision and preparation of DPRs should be fully borne by each sub-project management unit (PMU) even though such DPRs would be prepared by the SID consultants.

The summary of the results of the preliminary review of sample DPRs is shown in Attachment 4.2. All comments and suggestions were informed to the WRD field officers for their reference to revise the sample DPRs, although there has been no response from most of the field officers except for a few divisions.

4.1.2 Preparation of Model DPR

(1) Objective of Preparation of Model DPR and Training to Government Staff

The model DPR will be prepared for the following purposes:

- Acceleration of preparation of the remaining DPRs,
- Revision of sample DPRs to be suitable for the Rajasthan Water Sector Livelihood Improvement Project (RWSLIP) (hereinafter referred to as “the Project”),
- Improvement of quality and uniformity of DPRs, and
- Smooth and proper review of the remaining and revised DPRs by WRD officers.

Considering the above purposes, it is recommended to provide the training programs shown in Table A4.1.1 to district-level officers during the implementation of the Project since contents and check points of the model DPR should be well understood by the WRD officers including field-level officers and PMU staff.

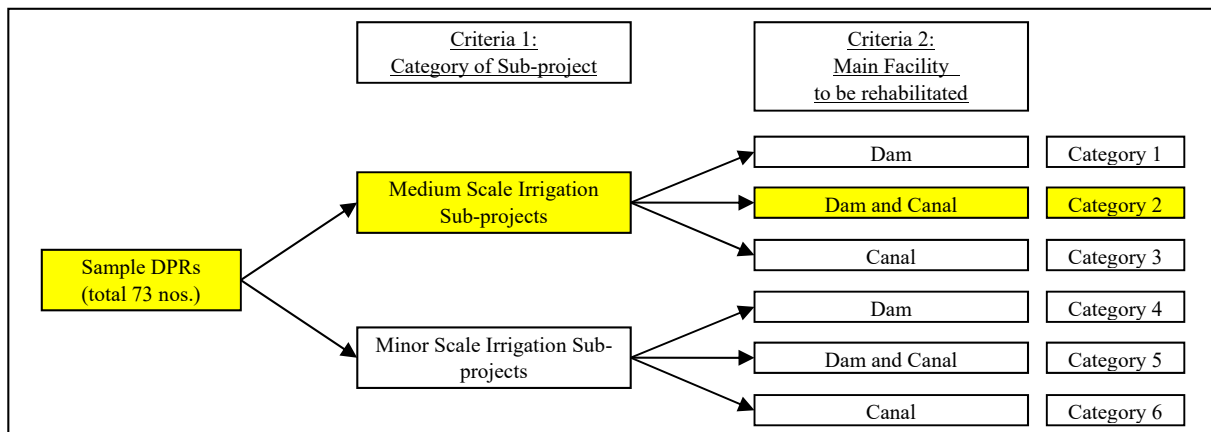
Table A4.1.1 Training on Preparation and Review of DPRs to Field Officers

Timing	Target Officer	Trainer	Contents
Before and during the Project	Junior Engineers, Assistant Engineers and Executive Engineers	PMU staff / Consultant	Preparation, check, and review of DPRs

Source: JICA survey team

(2) Categorisation of Irrigation Sub-projects and Selection of Sub-project for Model DPR

The JICA survey team categorised the irrigation sub-projects with sample DPRs into six categories using the database, and from these categories, selected the irrigation sub-projects for the preparation of the model DPR as shown in Figure A4.1.1.



Source: JICA survey team

Figure A4.1.1 Flow Chart of Categorisation of Irrigation Sub-projects

The JICA survey team will prepare the model DPR for Category 2 irrigation sub-project (i.e., medium-scale irrigation sub-project including rehabilitation of dam and canal works) taking into consideration the following:

- i) Medium-scale irrigation sub-projects are newly included in RWSLIP.
- ii) Model DPR for Category 2 irrigation sub-project (dam and canal) includes the necessary contents for preparation of DPRs for Category 1 (dam) and Category 3 (canal) irrigation sub-projects.

- iii) The consultant for RAJAMIIP prepared the following manuals for preparation of DPRs for minor-scale irrigation sub-projects:
 - TN-6: Economic internal rate of return (EIRR) manual (for calculation of EIRR)
 - TN-10: SID manual (including guidelines and format for preparation of DPRs)
- iv) There are many DPRs already approved and implemented during RAJAMIIP for minor-scale irrigation sub-projects including good examples.

(3) Collection of Additional Data and Information for Preparation of Model DPR

As shown in the above section 4.1.1, there are a lot of lacking data and information in sample DPRs, which are essential in preparing the completed model DPR. Based on the result of the preliminary review of sample DPRs, the JICA survey team selected four irrigation sub-projects and officially requested WRD to provide additional data and information for those irrigation sub-projects. However, the JICA survey team hardly received a positive response from WRD field officers mainly due to financial constraints and lack of capability. Mainly based on the availability of data and information and activeness of field officers, the JICA survey team finally selected the West Banas Irrigation Sub-project as a candidate irrigation sub-project for the preparation of model DPR; and made a field reconnaissance to check the actual site condition and directly discuss with field officers about some important issues. Salient features of the West Banas Irrigation Sub-project from the sample DPRs are shown in Table A4.1.2.

Table A4.1.2 Salient Features of West Banas Irrigation Sub-project (in Sample DPR)



Non-disclosure information

(4) Preparation of Model DPR including Simple Guidelines and Checklist

The model DPR for the rehabilitation of the West Banas Irrigation Sub-project prepared by the JICA survey team is shown in Attachment 4.3. Simple guidelines for the preparation of DPR for RWSLIP and checklist for review of DPR are shown in Attachment 4.4 and Attachment 4.5, respectively.

4.2 Preparation of Tentative Implementation Schedule for Project Formulation

4.2.1 Basic Concept for Implementation Plan of the Project

(1) Lessons Learnt from RAJAMIIP (One-stage Implementation)

In RAJAMIIP, one-stage implementation was applied and the process for the implementation of civil works such as SID works for the preparation of DPRs, tender (bidding) process, and construction works was commenced at the same time for all candidate irrigation sub-projects. As a result, it might cause a significant delay of the works, poor quality of the works, and a negative effect for monitoring and evaluation due to the following constraints:

- Limited number and capacity of PMU staff to review, process, and approve the required documents such as DPRs, tender and contract documents, and contractor's claims;
- Limited number of capable consultants for SID works for preparation of DPRs;
- Limited number of capable contractors for construction works;
- Limited number of capable contractors and WRD staff at field level for proper construction management and supervision;
- Difficulties to reflect lessons learnt from each irrigation sub-project during implementation; and
- Difficulties to set up the systematic monitoring and evaluation frameworks especially for soft component activities.

Figure A4.2.1 shows the lessons learnt from RAJAMIIP (one-stage implementation).



Figure A4.2.1 Lessons Learnt from RAJAMIIP (One-stage Implementation)

(2) Proposed Implementation Plan of RWSLIP (Stage-wise Implementation)

Taking into consideration the lessons learnt from RAJAMIIP, the JICA survey team proposes “stage-wise implementation” for the Project that aims the following:

- i) Early and smooth commencement of construction works through smooth pre-construction works (review of DPRs, preparation of technical estimate, and tender process); and
- ii) Improvement of quality and progress of the works through proper construction management and supervision.

In case of stage-wise implementation, the number of sub-projects for each stage can be limited and equal workload throughout the implementation period can be expected in comparison with one-stage implementation.

- i) Lessons learnt from the previous stages can be reflected to the next stage even during the project period, and
- ii) Long-term monitoring period after completion of the construction works especially for Stage 1 works can contribute to a variety of soft component activities.

Especially due to items iii) and iv) above, it is proposed to formulate the Project at least with three stages as shown in Figure A4.2.2.

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Figure A4.2.2 Merits of Stage-wise Implementation Recommended for RWSLIP

(3) Proposed Duration of Each Stage

According to the construction record of RAJAMIIP as of May 2015 and sample DPRs for RWSLIP, the construction period of each sub-project can be roughly estimated as shown in Table A4.2.1.

Table A4.2.1 Construction Period of Irrigation Sub-projects (RAJAMIIP and Sample DPRs)

Description	Average (years)	Maximum (years)	Minimum (years)
Sub-projects in RAJAMIIP	1.48	More than 4.50 (not yet completed)	0.25
Sub-projects with sample DPRs	2.63	5.00	1.00

Note The figures are just based on rough estimate due to the following reasons:

RAJAMIIP: Many projects were not yet completed or suspended and difficult to be summarised.

Sample DPRs: Many data are unclear or technically unacceptable and corrected by the JICA survey team based on its experience.

Source: RAJAMIIP Final Completion Report and JICA survey team

It is construed that the construction periods described in the sample DPRs are longer than those of the sub-projects in RAJAMIIP because of the inclusion of medium-scale irrigation sub-projects.

Considering the above data, the target completion year (eight years) set by Rajasthan WRD, and the proposed stage-wise implementation, the proposed total duration for one stage is 3.5 years consisting of 1.5 years for preparatory works and 2 years for construction works with the following conditions:

- Construction works of one sub-project shall preferably be completed within 1.5 years and should be completed within 2 years.
- In case of a sub-project with construction period of more than 2 years, packaging of the work components should be considered to avoid unrealistic construction plan.

4.2.2 Estimated Maximum Annual Expenditure for Construction Works

(1) Peak Annual Expenditure for Construction Works in Past Projects

As a reference for estimation of expected maximum peak annual expenditure for construction works under the Project, the JICA survey team examined the records of annual expenditure for the following projects which were recently implemented by Rajasthan WRD with foreign assistance and similar type projects to RWSLIP:

- Rajasthan Minor Irrigation Improvement Programme (RAJAMIIP) funded by JICA
- Rajasthan Water Sector Restructuring Project (RWSRP) funded by the World Bank

Records of total annual expenditure from loan of RAJAMIIP and RWSRP are summarised in Table A4.2.2.

Table A4.2.2 Record of Annual Expenditure from Loan (RAJAMIIP and RWSRP)

Non-disclosure information

As shown in Table A4.2.2, the major construction works were recorded in 2011-2015 for RAJAMIIP and in 2004-2010 for RWSRP; and the peak of major construction works was recorded in 2012-2014 for RAJAMIIP and in 2004-2007 for RWSRP. The JICA survey team estimated the “peak annual expenditure from loan” for construction works in RAJAMIIP and RWSRP with some assumptions as shown in Table A4.2.3.

Table A4.2.3 Estimated Peak Annual Expenditure (from Loan) for Construction Works

Non-disclosure information

(2) Expected Improvements in RWSLIP

As described in Chapter 3, significant delay caused by several constraints was observed especially in RAJAMIIP. In RWSLIP, it is expected to improve such constraints through the following countermeasures (see other related chapters for details):

- i) Establishment of sub-PMUs with sufficient number of full-time staff for RWSLIP;
- ii) By inclusion of medium irrigation schemes and exclusion of small-scale minor irrigation schemes (less than 300 ha), the contract packages can be simplified and a number of scattered small-scale sub-projects can be avoided;
- iii) Establishment of proper monitoring system through coordination committees from state to district levels and regular and special construction meetings at each sub-project;
- iv) Stage-wise implementation and performance-based budget allocation; and
- v) Employment of the consultant pursuant to the assignment schedule and the contract agreed among the three parties (Rajasthan WRD, JICA, and the consultant).

(3) Expected Maximum Annual Expenditure for Construction Works under RWSLIP

(a) Confirmation of Financial Capability of the Rajasthan WRD

Table A4.2.4 shows the comparison between average annual expenditure for water resources sector and expected maximum annual disbursement in other irrigation projects in India.

Table A4.2.4 Comparison of Annual Expenditures and Maximum Annual Disbursement

Non-disclosure information

(b) Expected Maximum Annual Expenditure for Construction Works under RWSLIP

Non-disclosure information

4.2.3 Proposed Implementation Plan and Ceiling Amount for Construction Works (Tentative Plan to be Used for Screening of Irrigation Sub-projects)

Based on the above considerations, the proposed implementation plan for construction works under RWSLIP with annual disbursement plan (maximum amount case) is prepared as shown in Figure A4.2.3. It is noted that this implementation plan is just a tentative one to be used for the determination of the ceiling amount of construction works for screening of the candidate irrigation sub-project.



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Figure A4.2.3 Proposed Implementation Plan for Participatory Irrigation Rehabilitation Works Component under RWSLIP (Tentative)

It should be noted that the above recommendable ceiling amount was estimated based on the expected maximum annual disbursement with the strict conditions that:

- i) All countermeasures and expected improvements in RWSLIP shown in Section 4.2.2 (2) and other relevant chapters shall be strictly secured at the proper timing and manner by Rajasthan WRD.
- ii) Sample DPRs for Stage 1 works shall be properly revised based on the model DPR before the commencement of the Project.

4.3 Review of Selection Criteria and Preliminary Screening of the Irrigation Sub-projects

4.3.1 General

Selection and screening criteria and the processes described in the project report for RWSLIP are basically the same as those for RAJAMIIP.

Meanwhile, the activities and improvements in RWSLIP that are planned or proposed to enhance and expand the achievement of RAJAMIIP and also add further value based on the lessons learnt from RAJAMIIP are the following:

- i) Inclusion of medium-scale irrigation sub-projects (2,000 ha – 10,000 ha of CCA);
- ii) Strengthening of organisation structure by establishment of sub-PMUs and collaboration with other related agencies such as DoA, DoH, and WCD;
- iii) Stage-wise implementation of the Project;
- iv) Introduction of element of competition among sub-PMUs to improve the sense of ownership of field-level officers of WRD;
- v) Introduction and promotion of micro irrigation system;
- vi) Gender mainstreaming activities;
- vii) Value-chain activities including farming, food processing, and marketing support; and
- viii) Involvement of WUA starting from the planning and design of the irrigation sub-projects.

Taking into consideration the activities and improvements proposed for RWSLIP, the JICA survey team reviewed the selection process in the project report and prepared the proposed flow charts for the following:

- i) Selection of the candidate irrigation sub-projects for Stage 1 and formulation of the Project scope, and
- ii) Screening and selection of the candidate irrigation sub-projects for Stage 2 and Stage 3 during the implementation of the Project.

4.3.2 Selection Criteria and Screening Results for Selection of the Candidate Irrigation Sub-projects for Stage 1 and Formulation of the Project Scope

The PMU submitted the revised long list of the candidate irrigation sub-projects to the JICA survey team on 15 March 2016 and the additional list on 19 April 2016 (see Attachment 4.6 for details).

The JICA survey team made preliminary selection and screening of the candidate irrigation sub-projects for the formulation of the project scope of RWSLIP using the database and the long list. Selection criteria and summary of screening results are shown in Figure B4.3.1 and the details are described as follows:

(1) Basic Concept

Selection of Candidate Irrigation Sub-projects for Stage 1

WRD has prepared sample DPRs for 73 irrigation sub-projects and these irrigation sub-projects have an advantage in terms of the short period for pre-construction works especially for the preparation of DPRs because of availability of certain level of data and information. For the smooth commencement of the construction works of the Project, it is recommended to select the candidate irrigation sub-projects for Stage 1 from the 73 irrigation sub-projects.

(2) 1st Screening (Pass or Fail Stage) for All Irrigation Sub-projects

Screening Criteria

- The works shall be the rehabilitation works of existing irrigation system and shall exclude new development/extension works considering the environmental and social impact.
- The CCA of the sub-project cannot be more than 10,000 ha (source: Project Report for RWSLIP 4.1.4.1, p.57) and less than 300 ha.
- The yield from the catchment area should be in conformity with effective storage to check the availability of water resources (source: Project Report for RWSLIP 4.1.4.1, p.56).
- Sufficient storage is available in comparison with the benefitted area to check the availability of water resources (source: Project Report for RWSLIP 4.1.4.1, p.56).

Screening Result

Non-disclosure information

Non-disclosure information

(4) Selection of 1st Priority Sub-projects for Stage 1 - 1st Screening (Pass or Fail Stage)

Screening Criteria

- Estimated cost of irrigation sub-project for Stage 1 shall be less than INR 250 million, considering the required time for revision of DPR, preparation of technical estimate, and tender and approval process.
- Designed at 50% dependability (Source: Project Report for RWSLIP 4.1.4.1, p.56).
- EIRR may not be less than 5% (Source: Project Report for RWSLIP 4.1.4.1, p.56).

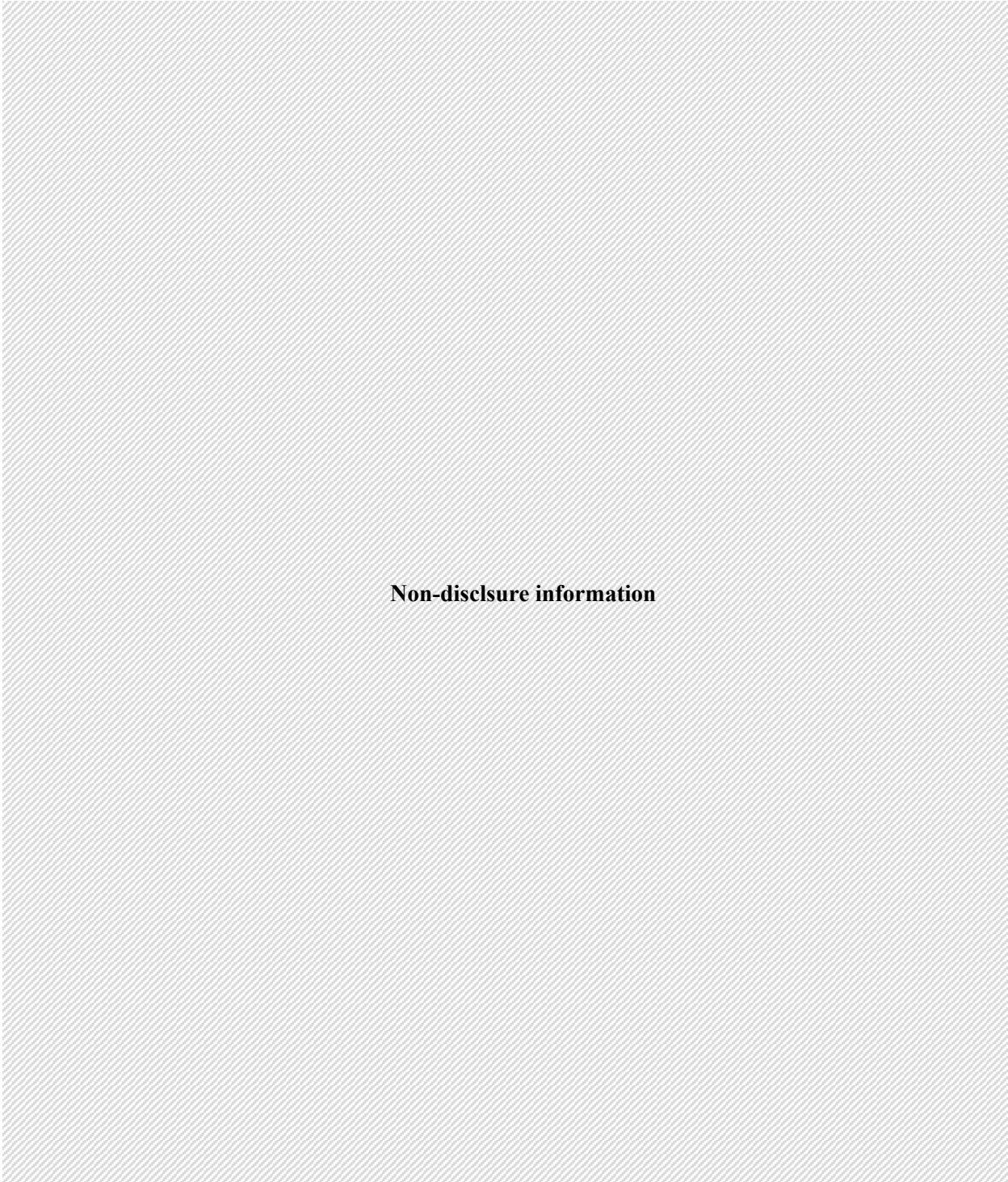
Screening Result

Non-disclosure information

Screening Criteria

- Sub-projects with score of 50 and above => 1st priority sub-projects (recommended to be implemented in Stage 1)
- Sub-projects with score of less than 50 => to scoring stage for 2nd – 9th priority sub-projects

Screening Result



Overall Result

Table B4.3.1 shows the summary of the overall tentative screening results and all the details are shown in Attachment 4.8.

Candidate Irrigation Sub-projects for Stage 2 and Stage 3 (for Project Formulation)

Taking into consideration the recommendable ceiling amount for construction works described in Section 4.2.3, it is proposed to select the irrigation sub-projects in 2nd, 3rd, 4th and 5th priorities as the candidate irrigation sub-projects for Stage 2 and Stage 3 for the purpose of the Project formulation in this survey. Table A4.3.10 and Table A4.3.11 show the results of the screening for candidate irrigation sub-projects for Stage 2 and Stage 3 based on scheme and zone, respectively.

Non-disclosure information

(b) Recommendation on the implementation structure

As shown in Table B4.3.2, the total amount and number of irrigation sub-projects for Stage 1 in the North Zone is relatively large. Considering the smooth operation of the works, it is recommended to divide this zone into two sub-PMUs, namely, sub-PMU of North Zone 1 (Sri Ganganagar and Hanumangarh 1) and sub-PMU of North Zone 2 (Hanumangarh 2). Meanwhile, as shown in Table

B4.3.2, the total amount and number of irrigation sub-projects in Jodhpur Zone is relatively small. It is recommended to merge this zone with Udaipur Zone considering the location of each zone.

Based on the above consideration and discussions with WRD, it is recommended to reorganise the sub-PMUs as follows:

- i) Sub-PMU 1: Jaipur Zone
- ii) Sub-PMU 2: Kota Zone
- iii) Sub-PMU 3: Udaipur and Jodhpur Zones
- iv) Sub-PMU 4: North Zone 1 (Sri Ganganagar and Hanumangarh 1)
- v) Sub-PMU 5: North Zone 2 (Hanumangarh 2)

The summary of the candidate irrigation sub-projects for RWSLIP based on the reorganised sub-PMUs is shown in Table B4.3.3. It is noted that demarcation of irrigation sub-projects between sub-PMU 4 and sub-PMU 5 in Table B4.3.3 is just tentative one and shall be reviewed and finalized based on the final short listed irrigation sub-projects considering those location and size.

As shown in Table B4.3.3, the total amount and number of irrigation sub-projects in each sub-PMU might be still unbalanced. It is recommended to remedy such imbalance through the adjustment of the number of allocated staff to each sub-PMU. The detailed proposed organisational structure for the Project is described in Section 6.2.

(c) Recommendation on the final screening of the candidate sub-projects for Stage 1

As shown in item (1) above, for the smooth commencement of the construction works of the Project, the candidate irrigation sub-projects for Stage 1 were selected from the 73 irrigation sub-projects with sample DPRs.

However, it is noted that the sample DPRs of all the irrigation sub-projects recommended for Stage 1 should be reviewed and revised based on the model DPRs prepared by the JICA survey team before the commencement of the Project. Based on the revised DPRs, the final screening should be made for the final confirmation of the critical factors of the sub-project such as EIRR, dependability, environmental and social issues, and farmers' commitment.

The detailed procedures of the final screening are shown in Section 4.3.3.

(d) Recommendation on the re-screening and re-selection of candidate irrigation sub-projects for Stage 2 and Stage 3 during implementation stage

Meanwhile, for the candidate irrigation sub-projects for Stage 2 and Stage 3, it is recommended to completely reselect and rescreen based on the updated long list and DPRs to be prepared during the implementation stage because of the following reasons:

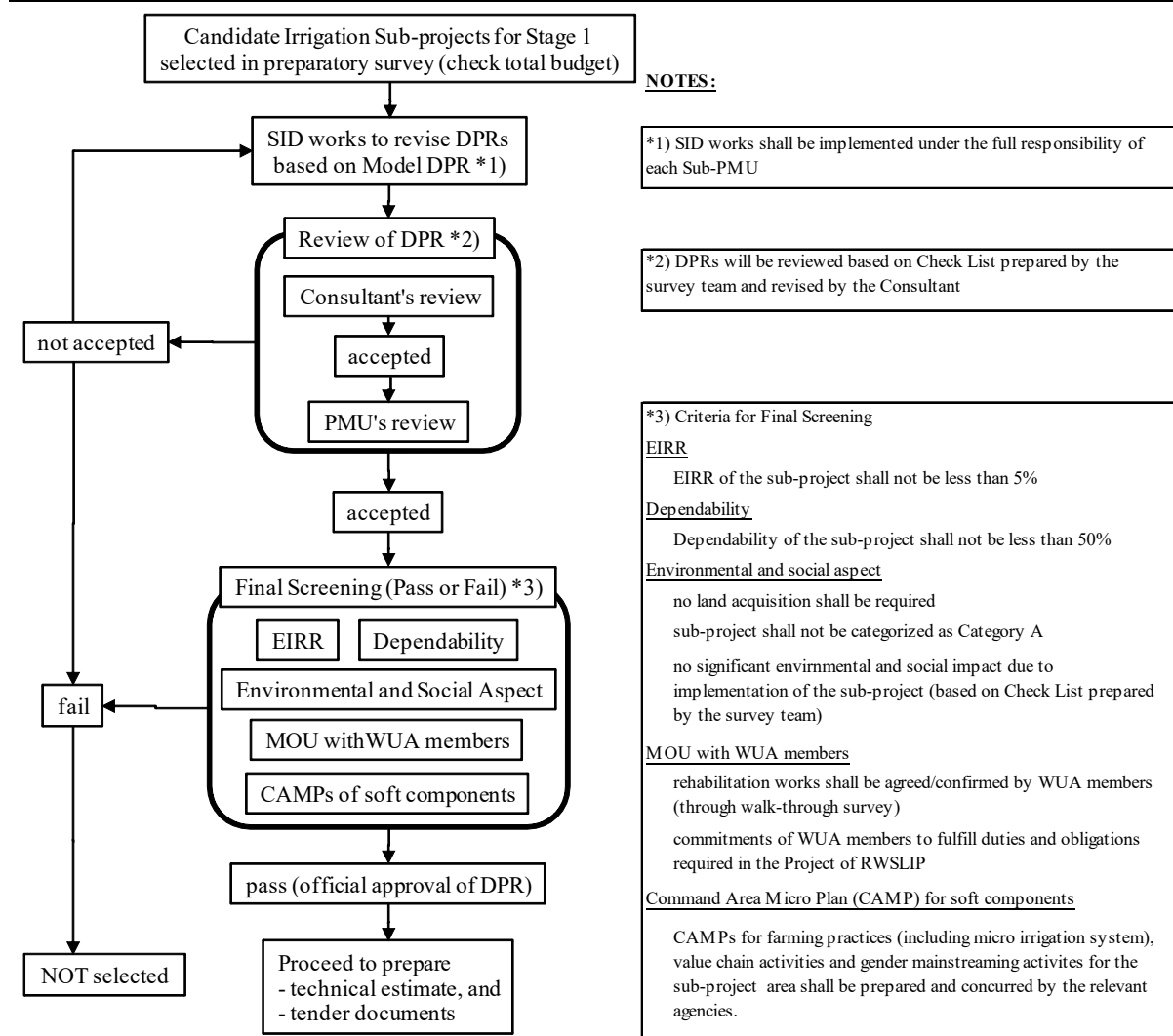
- The preliminary screening in this survey was made based on very limited and uncertain data and information,
- Selection of candidate irrigation sub-projects will be made taking into consideration the performance of each sub-PMU during previous stages, and
- The site condition may be changed especially at the time of the selection of the irrigation sub-projects for Stage 3.

The detailed procedures for the selection of the candidate irrigation sub-projects for Stage 2 and Stage 3 are shown in Section 4.3.3.

4.3.3 Flow Chart and Criteria for Selection and Screening of Irrigation Sub-projects During the Implementation of the Project

(1) Flow Chart and Criteria for the Final Screening of Candidate Irrigation Sub-projects to be Implemented Under Stage 1

The flow chart and criteria for the final screening of the candidate irrigation sub-projects to be implemented under Stage 1 are shown in Figure A4.3.1.



Source: JICA survey team

Figure A4.3.1 Flow Chart for Final Screening of Candidate Irrigation Sub-projects for Stage 1

(2) Flow Chart and Criteria for the Selection and Screening of Candidate Irrigation Sub-projects to be Implemented Under Stage 2 and Stage 3

For the selection of irrigation sub-projects to be implemented under Stage 2 and Stage 3, it is proposed to include the criteria of “evaluation of performance of each sub-PMU in previous stages” aiming to introduce the element of competition among sub-PMUs and the improvement of the sense of ownership of field-level officers of WRD.

Figure B4.3.2 shows the flow chart for the selection and screening of candidate irrigation sub-projects to be implemented under Stage 2 and Stage 3.

CHAPTER 5 OUTLINE OF PROPOSED PROJECT SCOPE

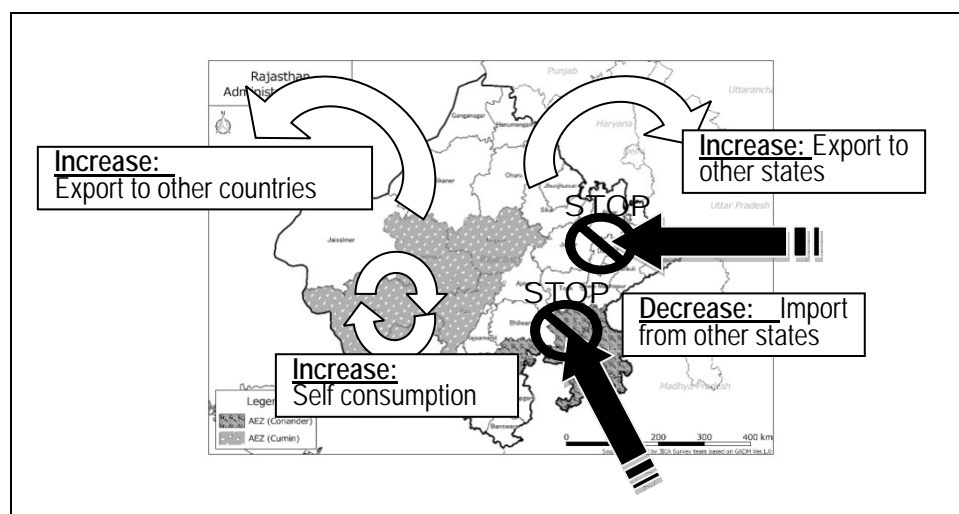
5.1 General

5.1.1 General Approach in the Project

(1) Well-balanced Approach in Export and Domestic Consumption

After the analysis of agriculture sector in Rajasthan, it was found that the sector has both potential in export and domestic consumption.

Export and domestic consumption are pair of wheels for agriculture development in the state. Both of these, therefore, should be strengthened simultaneously for the prosperity of the state. The schematic image of approach for export and domestic consumption is shown in Figure A5.1.1 below.



Source: JICA survey team

Figure A5.1.1 Schematic Image of Approach for Export and Domestic Consumption

In formulating a business strategy, it is important to analyse all the situations carefully before taking any decision. That way, there will be fewer chances of making mistakes and designing strategies that would not work. To help with this analysis, several analytical tools are available and one of them is the Strength, Weaknesses, Opportunities, Threats (SWOT) analysis. In the project survey, after the collection and evaluation of the current condition in agriculture sector in Rajasthan State, the JICA survey team analysed the Rajasthan Water Sector Livelihood Improvement Project (RWSLIP) SWOT analysis as shown in Figure A5.1.2 in terms of export of agro-produce and domestic consumption of agro-produce within the state.

(a) Export

As explained in Section 2.6, the Government of Rajasthan is trying to promote the export of agriculture product, such as introduction of the Agro Food Parks, the Agri Export Zones, and the Mega Food Park. In addition, the Delhi-Mumbai Industrial Corridor (DMIC) may accelerate the state's economic growth with incremental export goods, including agro-produce.

The result of the SWOT analysis is summarised in Figure A5.1.2 for export without the project condition.

<p><u>Strength</u></p> <ul style="list-style-type: none"> • "Kinnow" and other export products in Rajasthan 	<p><u>Opportunity</u></p> <ul style="list-style-type: none"> • Demand at export markets • State's support for export (Agri Export Zone etc.) • Acceleration of exports by Delhi-Mumbai Industrial Corridor
<p><u>Weakness</u></p> <ul style="list-style-type: none"> • Low-level agriculture practice • No access to exporters • Dry area (Less water) • Sandy soil = high percolation = need more water 	<p><u>Threat</u></p> <ul style="list-style-type: none"> • Competition with producers in other states • Climate change (rainfed agriculture is not stable)

Source: JICA survey team

Figure A5.1.2 SWOT Analysis for Export of Agro-produce Without the Project

(b) Domestic Consumption

Since the Rajasthan State has vital agricultural activities, it is known that the domestic consumption rates for vegetables and other crops are so low and most of them are less than 22% (see Section 2.6 for details). To alleviate such condition, the Project will support in promoting exotic vegetable cultivation, which has high demand and high market prices in the state, particularly in tourist hotels located around its major tourist towns.

The result of the SWOT analysis is summarised in Figure A5.1.3 for domestic consumption without the project condition.

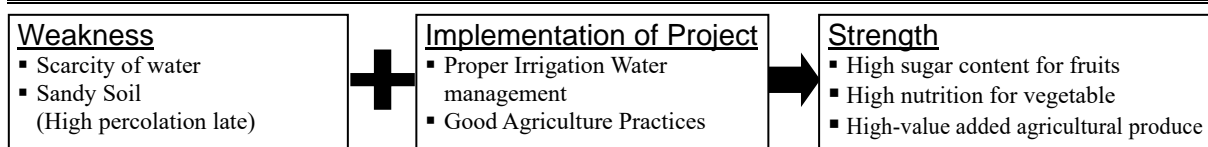
<p><u>Strength</u></p> <ul style="list-style-type: none"> • Close to consumers' places 	<p><u>Opportunity</u></p> <ul style="list-style-type: none"> • High demand for exotic vegetable for tourists in Hotels • High demand of normal vegetable at domestic market (deficit in supply within the state)
<p><u>Weakness</u></p> <ul style="list-style-type: none"> • Low-level agriculture practice • No access to direct-contract farming • Dry area (Less water) • Sandy soil = high percolation = need more water 	<p><u>Threat</u></p> <ul style="list-style-type: none"> • Competition with producers in other states • Climate change (rainfed agriculture is not stable)

Source: JICA survey team

Figure A5.1.3 SWOT Analysis for Domestic Consumption of Agro-produce Without the Project

(2) Changing Weakness to Strength in Project Implementation

The results of present SWOT analysis are shown in the previous section. There are several weaknesses in the export and domestic consumption matters. However, with (a) proper irrigation management and (b) application of appropriate agricultural practices introduced by RWSLIP, the dry area (less water) and sandy soil (high percolation) in the "Weakness" can be changed to "Strength" as shown in Figure A5.1.4 in terms of quality of produce, i.e., TSS and nutrition (refer to Section 2.5).



Source: JICA survey team

Figure A5.1.4 Changing from Weakness to Strength in the Quality of Agro-produce

The result of the SWOT analysis is summarised in Figure A5.1.5 for export with project condition.

<p><u>Strength</u></p> <ul style="list-style-type: none"> • "Kinnow" and other export products in Rajasthan • Sandy soil => • Intermittent of water => high-value products (in sugar-contents, and nutrition) 	<p><u>Opportunity</u></p> <ul style="list-style-type: none"> • Demand at export markets • State's support for export (Agri Export Zone etc.) • Acceleration of exports by Delhi-Mumbai Industrial Corridor
<p><u>Weakness</u></p> <ul style="list-style-type: none"> • Low-level agriculture practice • No access to exporters 	<p><u>Threat</u></p> <ul style="list-style-type: none"> • Competition with producers in other states • Climate change (rainfed agriculture is not stable)

Source: JICA survey team

Figure A5.1.5 SWOT Analysis for Export of Agro-produce with the Project

In the SWOT analysis for domestic consumption of agro-produce within the state, same points can be applied. The result of the SWOT analysis is summarized in Figure A5.1.6 for domestic consumption with the project condition.

<p><u>Strength</u></p> <ul style="list-style-type: none"> • Close to consumers' places • Sandy soil => • Intermittent of water => high-value products (in sugar contents, nutrition) 	<p><u>Opportunity</u></p> <ul style="list-style-type: none"> • High demand for exotic vegetable for tourists in Hotels • High demand of normal vegetable at domestic market (deficit in supply within the state)
<p><u>Weakness</u></p> <ul style="list-style-type: none"> • Low-level agriculture practice • No access to direct-contract farming 	<p><u>Threat</u></p> <ul style="list-style-type: none"> • Competition with producers in other states • Climate change (rainfed agriculture is not stable)

Source: JICA survey team

Figure A5.1.6 SWOT Analysis for Domestic Consumption of Agro-produce with the Project

(3) Promotion of High-value added Fruits/Vegetables

As explained in Sections 5.1.2 and 5.5.1 (3), there is high potential for promoting high-value added agricultural produce, which is worth tackling as a challenge in the Project aiming at the establishment of a brand of good quality of fruits and vegetables, in particular total soluble solids (TSS) and nutrition, in the Rajasthan State in the future.

The conceptual plan and estimated interventions proposed by the JICA survey team are explained as follows, however, it should be scrutinised by an expert for food value chain in consultation with its project management unit (PMU) and other relevant agencies prior to its implementation.

(a) Target Customer Group

A Rich-Niche Market: Since the high-value added agro-produce should be sold at higher prices than those of ordinary fruits and vegetables. The target customer of those agro-produce should not be ordinary customers but the wealthy who stay in big towns, such as Delhi and Mumbai. It is considered that only 2%-5% of all the customers in India, in maximum, could fall into the target group at the initial stage.

(b) Approaches

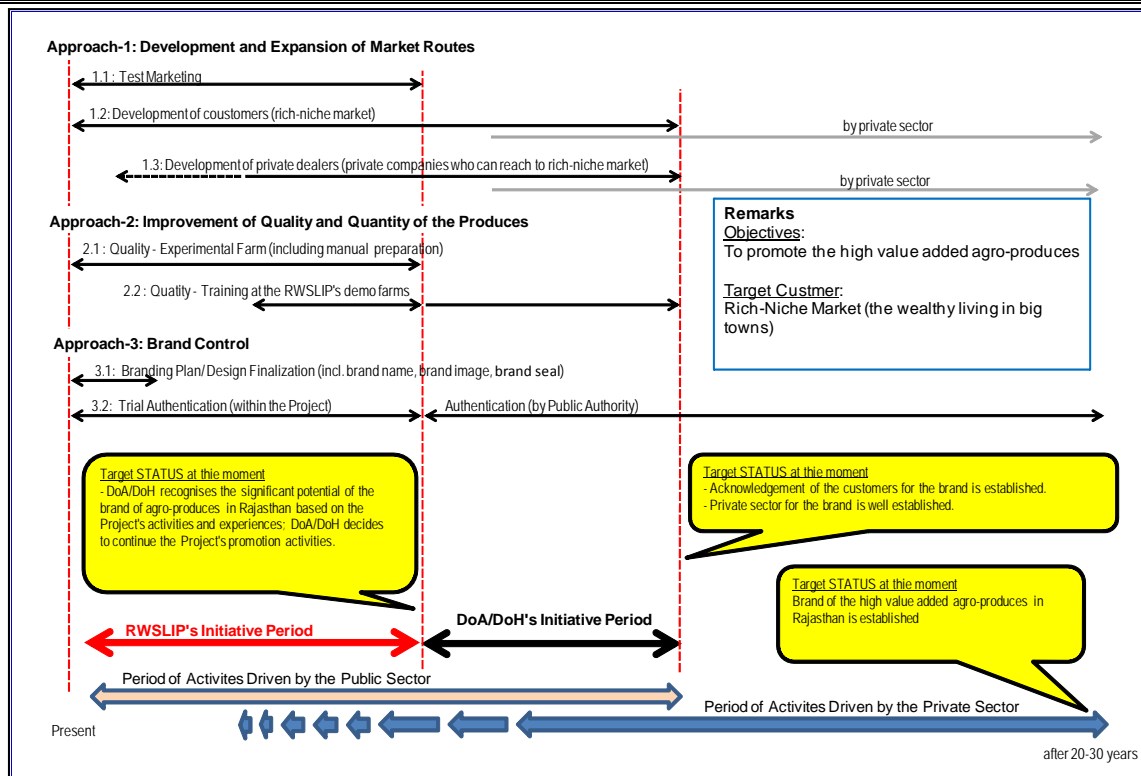
The JICA survey team considers the following approaches and interventions inevitable:

- i) Approach-1 Development and Expansion of Market Routes
 - Testing marketing;
 - Development of customers;
 - Development of private dealers of the agro-produce;
 - Advertisement of the produce to public through demonstration of activities such as tasting in antenna shop, tasting events in farmer's fair; and
 - Advertisement of the produce to public through broadcasting media and internet such as television (TV) commercial, newspaper, magazines, website of the Department of Agriculture (DoA)/Department of Horticulture (DoH), and Department of Tourism (DoT).
- ii) Approach-2 Improvement of Quality and Quantity of the Produce
 - Technical knowledge accumulation through experimental farms,
 - Compilation of technical manual and distribution, and
 - Farmers training in terms of high quality produce.
- iii) Approach-3 Brand Control
 - Establishment of brand strategy,
 - Establishment of authentication system for the brand, and
 - Establishment of an authentication agency, including providing facilities and training staff.

(c) Main Executing Body/Actor

(d) Overall Implementation Plan for Promoting and Branding the Agro-produce in Rajasthan

Considering its long time span to its achievement, the limited implementation period of the Project, present condition/tendencies of agro-markets in India, and several possible interventions for promoting high-value added produce by DoA and DoH, the JICA survey team depicts an image in Figure A5.1.7 for its overall promotion works including the role of the Project in the long way of its success.



Source: JICA survey team

Figure A5.1.7 Schematic Image of Overall Promotion of High-value Added Agro-Produce

The process should be transferred gradually from (a) period of activities driven by the public sector to (b) period of activities driven by the private sector. Furthermore, the period of activities driven by the public sector is divided into (i) RWSLIP's initiative period and (ii) DoA/DoH 's initiative period. As described in Figure A5.1.7 above, the project activities by RWSLIP fall into the first part of the period supported by the public sector with its initial implementation. Then it is planned that DoA/DoH will succeed some parts of the RWSLIP's activities.

Activity period and its initiatives are summarised in Table A5.1.1.

Table A5.1.1 Activity Period and Its Initiatives

Period	Execution Body	Targets/Condition to be Realised
1. RWSLIP's initiative period	PMU, the consultant, and NGOs	<p>Target: DoA/DoH recognises the significant potential of the brand of agro-produce in Rajasthan based on the project's activities and experiences; and decides to continue the project's promotional activities.</p> <ul style="list-style-type: none"> - Test marketing activities can be successfully terminated with several experiences and certain positive results. - Know how high the TSS cultivation is accumulated in the projects and compiled in a manual/guideline. - The brand begins to win recognition for its high quality and high-value added produce, making it worth the money.
2. DoA/DoH's initiative period	DoA/DoH or the market board	<ul style="list-style-type: none"> - Without the support of the public sector, the movement of the branding begins to accelerate further by the private sector. - Acknowledgement of customers for the brand is successfully established. - The brand is well established by the private sector.
3. Period of activities driven by the private sector	The private sector is the private dealer and distributors of agro-produce.	<ul style="list-style-type: none"> - The brand of the high-value added agro-produce in Rajasthan is well established

Source: JICA survey team

As shown in Figure 5.1.7, there is a long way to go, as well as huge efforts are needed to achieve the establishment of a brand of high quality Rajasthan's agricultural produce. It takes around 20-30 years or more, according to general experiences in Japan. Consequently, it is inevitable to involve the following major executing bodies/actors in the process for its success as well as the Project even during the RWSLIP's initiative period:

- i) Government office such as DoA/DoH and
- ii) Actors in the private sector in the agricultural produce market.

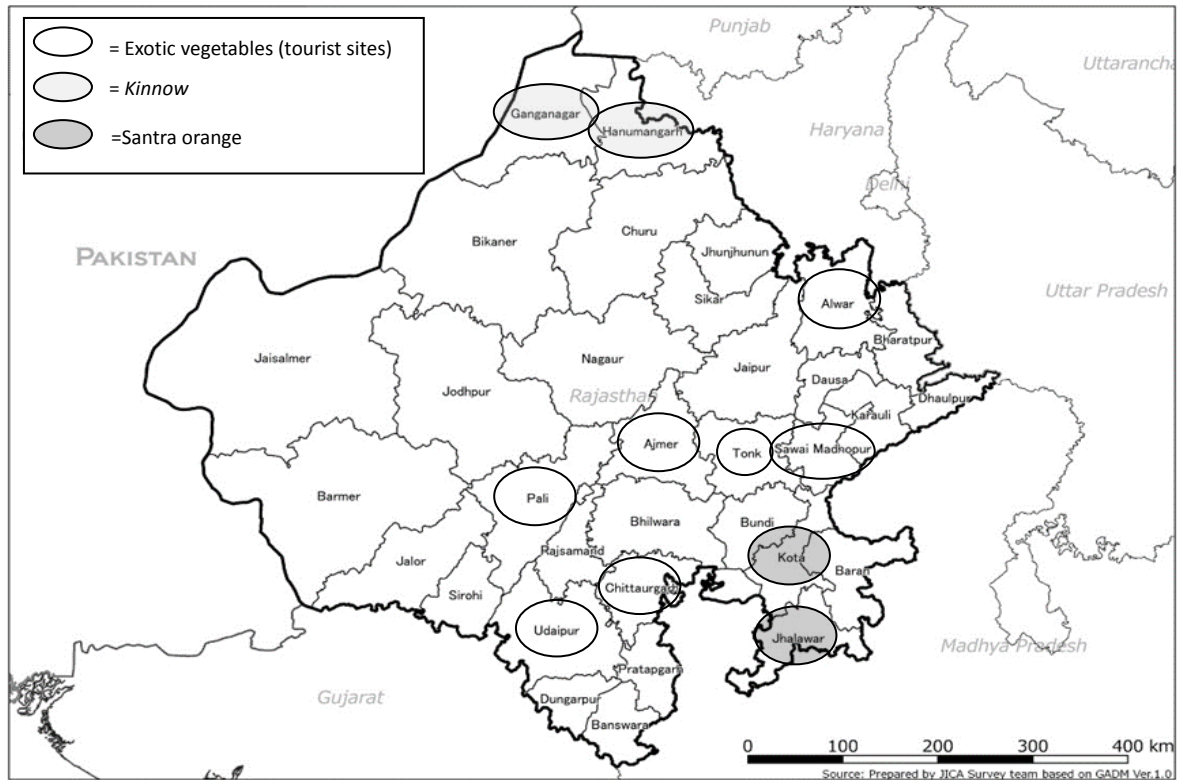
(e) Target Crops

The following crops as shown in Table A5.1.2 and Figure A5.1.8 were selected as target crops of the high-value added agricultural produce in the Project after scrutinising its potential conditions based from its agricultural aspect and marketability.

Table A5.1.2 Target Crops for Promotion and Branding

Crops	Areas	Reasons
1. Vegetables/Fruits	Irrigated areas have good access to big towns.	<ul style="list-style-type: none"> ▪ It is observed that current TSS in exotic vegetables in Rajasthan is relatively higher than that in other areas ▪ Since the selling prices of ordinary vegetable is high, only the rich-niche customers used to buy those crops. Consequently, those high-value crops could attract interests of the rich-niche customers easier than other crops.
2. <i>Kinnow</i> Mandarin	Northern area such as Sri Ganganagar and Hanumangarh areas	<ul style="list-style-type: none"> ▪ At this moment, there is a certain kind of brand status for those crops. It is, therefore, easier to establish the brand with those crops than the others.
3. Santra Orange	Southern area such as Jhalawar and Kota areas	<ul style="list-style-type: none"> ▪ There are many good farmers who have obtained advanced agricultural practices and technique at the export level as well as financial ability.

Source: JICA survey team



Source: JICA survey team

Figure A5.1.8 Location of Potential Sites to Produce High-value Added Agro-Produce

(f) Activities in the Project

Based on the approach mentioned in Section (b), the project activities for the promotion and branding of high-value added agro-produce are formulated. Table A5.1.3 shows the relation between the approach mentioned in the previous section and the project activities.

The detailed description of the project activities is given in Section 5.5.3.

Table A5.1.3 Project Activities and Related Approaches

	Development and Expansion of Market Routes					Improvement of Quality and Quantity of the Produces			Brand Control.		
	Testing Marketing:	Development of individual customers	Development of private dealers of agro-produces	Advertisement to public by demonstration activities	Advertisement to public by the broadcasting medias and through internet	Technical knowledge accumulation through experimental farms.	Compilation of technical manual and distribution	Farmers training in terms of high quality produces.	Establishment of brand strategy	Establishment of authentication system for the brand	Establishment of an authentication agency
Coordination & Preparation	Formulation of Brand building working group								○		
	VC actor evaluation forum								○		
	Online questionnaire survey								○		
	Preparation of leaflet								○		
	Preparation of logo sticker								○	○	○
Experiment for quality improvement (TSS, marketing and quality standards)	Establishment and operation of experimental plots					○	○				
	Direct sales to individual customers (Jaipur, Delhi, etc.)	○	○	○							
Application of experimental results to farmers	Sales to individual customers in Delhi through vegetables delivery services (Jaipur, Delhi, etc.)	○	○	○							
	TSS improvement and quality standards							○			
Antenna shops	Advanced packaging/sales and quality standards							○	○		
	Quality control							○		○	○
Tasting events	Establishment and operation of shops				○						
	Tasting events in large cities (Delhi, Jaipur, etc.)		○	○	○						
	Tasting events for high-grade groceries at large cities in Rajasthan		○	○	○						
Multimedia advertising	Farmers' fair (State & National level)			○							
	Through TV commercial, newspaper, gourmet magazine, etc				○						
Extension to outside the Project	Workshop for government officials outside the Project			○							

Source: JICA survey team

(4) Proper Combination of Soft Components and Hard Components

Since the rehabilitation work of irrigation system would increase the available volume of water at farmland level, it does not always connect effectively to the improvement of livelihood of farmers. Farmer needs appropriate technique in which they can increase their farm income in using increased supply of irrigation water.

In order to maximise the Project's positive impact on beneficiaries, support on soft components such as improvement of agriculture practices, post-harvest technique training, and market linkage should be provided to farmers through the Project with a certain amount of financial help.

5.1.2 Project Outline

Brief summary of the project outline is given below and the detailed explanations of the project component and activities will be mentioned from Section 5.2 afterwards.

(1) Background

The Government of Rajasthan takes cognisance of the fact that the irrigation system in the state is deteriorating and needs immediate attention to improve the condition of the water delivery system for optimising its water usage. It also recognises that a holistic approach for agriculture sector such as development of agricultural technique, food value chain improvement, promotion of high-value added agriculture produce, as well as gender mainstreaming in agriculture and water sector aspect should be taken in the project activities in order to foster a better livelihood of people dwelling in the project target area.

(2) Project Objectives

The development objectives of the proposed RWSLIP are to improve the livelihood of beneficiaries in the project target area through the following:

- i) Rehabilitation and modernisation of the existing medium and small irrigation schemes by repairing and upgrading works, including introduction;
- ii) Establishment of a sustainable operation and management system of irrigation facilities by implementing the participatory irrigation management through capacity building of WUAs;
- iii) Increase of the productivities and improvement of quality of agriculture produce through diversification to appropriate varieties and introduction of water saving technology;
- iv) Improvement and diversification of food value chain in agriculture produce market by strengthening farmers' groups and promotion of high-value added produce; and
- v) Gender mainstreaming of women in agriculture and water sector.

(3) Executing Agency

The executing agency of the Project is the Department of Water Resource (WRD) of the Government of Rajasthan State, which is the responsible agency of the development of irrigation facilities. In addition, DoA, DoH, WCD, and the Department of Finance will be the line departments for the project implementation.

Then it is agreed that the project steering committee (PSC), project monitoring committee (PMC), and PMU will be set up for coordinating and monitoring the project activities at the three levels.

(4) Project Location

The Project covers 27 districts in the Rajasthan State as shown in a location map of the project area.

(5) Project Component

In order to meet the project objectives and in pursuance of government policies the major components of the Project are envisaged as shown in Table A5.1.4.

Table A5.1.4 Project Components

Component No	Component Items
Component-1	Participatory irrigation rehabilitation works
Component-2	Fostering and capacity enhancement of water users organisations
Component-3	Irrigated agriculture intensification and diversification
Component-4	Agro-processing, marketing, and promotion of high-value added agricultural produce
Component-5	Gender mainstreaming in agriculture and water sector
Component-6	Project management and monitoring
Component-7	Consultancy services
GoR Share	Project administration, taxes and duties, interest during construction, and front end fee

Source: JICA survey team

(6) Project Scope

The scope of work of each component is explained briefly and in detail in Table A5.1.5.

Table A5.1.5 Project Scope

Component No	Scope of Work	
Component-1	Participatory Irrigation Rehabilitation Works	
1.1	Rehabilitation of Irrigation Facilities	<ol style="list-style-type: none"> 1) To execute detailed design works through survey, investigation, and design (SID) subletting works 2) To rehabilitate irrigation facilities as planned
1.2	Promotion of Micro Irrigation System	<ol style="list-style-type: none"> 1) To provide orientation to farmers for their participation to this scheme 2) To select beneficiary group/individuals and make memorandum of understanding (MOU) among them 3) To provide micro irrigation system and capacity building for using the facilities and water saving

Component No	Scope of Work	
1.3	Introduction of Water Users Association (WUA) Constructive Facilities	<ol style="list-style-type: none"> 1) To plan and design the WUA constructive facilities 2) To construct the WUA constructive facilities
1.4	Support to Women Friendly Activities	<ol style="list-style-type: none"> 1) To plan and design women friendly facilities and the trees 2) To construct the women friendly facilities and to plant the trees
Component-2	Fostering and Capacity Enhancement of Water Users Organisations	
2.1	Establishment of WUA Support Mechanism	<ol style="list-style-type: none"> 1) To develop project materials for WUA establishment 2) To provide orientation and training of trainers (ToT) trainings in different levels for WUA establishment 3) To establish monitoring system through project management activities
2.2	Capacity Building of WUA Management	<ol style="list-style-type: none"> 1) To formulate WUA 2) To provide capacity development activities such as on-the-job (OJT) trainings 3) To support WUA regular activities such as regular meetings.
2.3	Improvement of Agriculture Linkage	<ol style="list-style-type: none"> 1) To strengthen linkage between farmers and agriculture organisation 2) To conduct agriculture demonstration
2.4	Corpus Fund for WUAs	<ol style="list-style-type: none"> 1) Providing corpus fund to WUAs 2) Monitoring corpus fund management
Component-3	Irrigated Agriculture Intensification and Diversification	
3.1	Training of Trainers for Agriculture	<ol style="list-style-type: none"> 1) To provide workshops for high-ranking officers (state level) and field level officers (sub-PMU level) 2) To provide ToT training on cultivation and quality improvement techniques for cereals, pulses, oilseeds, spices, medicinal plants, citrus (<i>kinnow</i> mandarin and santra orange), and exotic vegetables
3.2	Exposure Visit for Agriculture Trainers	<ol style="list-style-type: none"> 1) To provide opportunity to visit advanced state (e.g., Punjab agriculture university) for orange cultivation and exotic vegetable cultivation
3.3	Improvement of Agriculture Support System	<ol style="list-style-type: none"> 1) To compile farmer friendly manuals with visual aide 2) To strengthen agriculture information centre
3.4	Agriculture Farmers' training	<ol style="list-style-type: none"> 1) To provide farmers' training on cultivation and quality improvement techniques for cereals, pulses, oilseeds, spices, medicinal plants, citrus (<i>kinnow</i> mandarin and santra orange), and exotic vegetables 2) To provide marketing survey
3.5	Agriculture Demonstration Farm	<ol style="list-style-type: none"> 1) To establish and maintain orange demonstration farm (four farmers) 1 ha 2) To establish and maintain exotic vegetable demonstration farm (seven farmers in focal area) 0.2ha
Component-4	Agro-processing, Marketing, and Promotion of High-value Added Agricultural Produce	
4.1	Farmer Interest Groups (FIG) Formulation for Cooperative Activities	<ol style="list-style-type: none"> 1) To formulate FIGs and facilitate cooperative activities (collective marketing) to increase profit of individual farmers
4.2	Connecting with Large-size Consumers (matching meeting)	<ol style="list-style-type: none"> 1) To hold matching meetings between FIGs and processors to give options of direct marketing for higher profit for both value-chain players
4.3	Connecting with Small-size Consumers (exotic vegetables)	<ol style="list-style-type: none"> 1) To support exotic vegetables farmers for sales to public markets and hotels/restaurants
4.4	Brand Building for High-value Added Agricultural Produce	<ol style="list-style-type: none"> 1) To promote high-value fruits/vegetables produce production and marketing toward future brand building after the Project
Component-5	Gender Mainstreaming in Agriculture and Water Sector	
5.1	Supporting the Institutionalisation of Gender Mainstreaming in Water Management	<ol style="list-style-type: none"> 1) To develop and adopt gender-responsive rules and guidelines of the Participatory Irrigation Management Act 2) To incorporate gender perspectives into existing capacity building activities in water management 3) To establish gender disaggregated data collection system

Component No	Scope of Work	
5.2	Enhancement of Women's Capability and Participation in WUA	<ol style="list-style-type: none"> 1) To formulate WUA women wing 2) To facilitate in the introduction of women friendly activities, such as women friendly facilities and women-planted trees 3) To encourage women's participation in WUA activities 4) To provide trainings and exposure activities on water management and organisational management
5.3	Capacity Building on Agricultural Technologies through SHGs	<ol style="list-style-type: none"> 1) To conduct orientation to women farmers in the target areas 2) To select the target groups 3) To provide training for group management 4) To provide training for agricultural technique 5) To monitor and mentor the groups for sustainable activities
Component-6	Project Management and Monitoring	
6.1	Procurement of Office Equipment	<ol style="list-style-type: none"> 1) To procure vehicles for daily operation 2) To procure office furniture 3) To procure office equipment, e.g., personal computers, copiers, and UPS. 4) Survey equipment
6.2	NGO Services	<ol style="list-style-type: none"> 1) To engage five NGOs for supporting the following: (a) WUA establishment, (b) agriculture and marketing, and (c) gender mainstreaming activities
6.3	Monitoring and Training for Environmental and Social Aspect	<ol style="list-style-type: none"> 1) To provide trainings to project staff at the sub-PMU level 2) To monitor the soil and water qualities, pollution testing during construction 3) To execute annual environmental assessments (in-house) for ten sub-projects for five years 4) To conduct third party environmental assessment
6.4	Monitoring and Evaluation	<ol style="list-style-type: none"> 1) Carrying out a review of the project preparation documents with regard to project monitoring and evaluation (M&E) and drawing attention to changes which may have necessary since their preparation; 2) Set up M&E frameworks for overall project activities; 3) Prepare selection and appraisal manual and plans; 4) Prepare evaluation criteria for each activity, and role and tasks of the agencies.
6.5	Transportation for the Consultant	<ol style="list-style-type: none"> 1) Car rental fees

Source: JICA survey team

5.2 Component-1: Participatory Irrigation Rehabilitation Works

5.2.1 Constraints and Issues in Irrigation and Rural Infrastructure Sector

(1) Constraints and Issues on Rehabilitation Works of Irrigation Facilities

(a) Delay of preparation of Detailed Project Reports (DPRs)

As described in Section 4.1.1, the quality of sample DPRs did not reach at an acceptable level mainly due to the limited preparation period, number, and capacity of field officers of WRD. In addition, the views and opinions of farmers were hardly reflected in the formulation of rehabilitation plan.

Regarding the preparation of DPR, as described in Section 3.2.1, significant delay on SID works was observed in RAJAMIIP mainly due to excess concentrated workload on SID consultants and limited number of capable consultants. This significant delay on SID works was one of the main causes of overall delay of the RAJAMIIP project and smooth preparatory works especially of preparation of DPR is one of the main issues for overall success of the Project.

In addition, the capability and ownership of WRD field officers to check and review of DPRs should be also improved to secure the quality of the works and smooth implementation of the Project.

(b) Contract management

As described in Section 3.2.1, unrealistic tender prices and poor contract management caused low quality, delay, and non-completion of the works in RAJAMIIP. Especially, unrealistic bidding price (too low bidding price) and excess workload to particular contractors (too many contract works was awarded to one contractor) caused serious negative effects to the quality and progress of the project activities. Improvement of contract management including bidding process is essential for the success of the Project.

(c) Construction supervision

In RAJAMIIP, low quality works and improper construction manners were observed in several irrigation sub-projects (refer to Section 3.2.1 for details) mainly due to lack of number of capable WRD field officers and contractor’s staff. In addition, in RAJAMIIP, no regular and/or special construction meetings were organised at the site to discuss the problems and issues on the construction works in a timely manner.

In RWSLIP, it is essential to establish sub-PMUs at zone level and assign sufficient number of “fulltime” and “qualified” field officers for proper construction supervision. In addition, regular and special construction meeting at the site should be timely and constantly organised at each level to improve the quality and construction manner of the construction works.

(d) Rehabilitation of water courses

Although the rehabilitation of water courses was one of the main sub-components of civil engineering component in RAJAMIIP, only 49.9% of the planned works was completed at the end of the project according to the financial progress described in RAJAMIIP Final Completion Report, Vol-C, Annex-7. Detailed status as of the end of May 2015 is summarised in Table A5.2.1.

Table A5.2.1 Status of Water Courses Rehabilitation Works (RAJAMIIP, as of May 2015)

Status	Number of WUA
Earthworks and some of structures were completed	100
Only earthworks were completed but structures were not constructed	122
Contract was signed but the works did not commence, it was terminated without any actions	52
Totally no actions and the contract was not signed	62
Total	336

Source: Final Completion Report, RAJAMIIP

According to the final completion report of RAJAMIIP and interview with the consultant of RAJAMIIP, the main causes are as follows:

- i) Misconceptions, political strife, and rivalry in the rural community;
- ii) Lack of ownership of WUA members and WRD field officers;
- iii) Delay and early termination of employment of NGOs;
- iv) Inflationary material cost; and
- v) Delay of payment from WRD to WUA.

In principle, the rehabilitation of water courses should be implemented under the full responsibility of WUA. In RWSLIP, it is recommended to reconsider this sub-component of rehabilitation of water courses considering the ownership of WUA members.

(2) Constraints and Issues on Water Saving through Promotion of Micro Irrigation System

(a) Constraints and issues on promotion of micro irrigation system especially in the existing irrigation system

As shown in the project report of RWSLIP, the main objectives for the promotion of micro irrigation system are the following:

- Saving water with increasing water efficiency, and
- Increase farmer’s income by high-tech agriculture.

However, micro irrigation system has not been widespread or well functioned especially in the existing irrigation system mainly due to the following reasons:

- i) Lack of sense of water saving among farmers and WRD field officers.

According to the field survey and interview, few farmers intended to contribute in water saving by the introduction of micro irrigation system and change in the existing water rotation system even after the introduction of micro irrigation system.

- ii) Lack of awareness of merits of micro irrigation system among farmers and WRD field officers (one of the causes of i)).

According to the field survey and interview, few farmers and WRD field officers understood the applicable condition and main merits of introduction of micro irrigation, e.g., water saving effect by micro irrigation system, improvement of quality and yield through saving water, application of high-tech agriculture, and introduction of intensive agriculture.

- iii) Lack of flexibility for water management in existing irrigation system due to fixed proportional diversion method commonly applied in the Project area.

Water gates to control the discharge to each canal are provided generally only up to the distributary canal level and no gates are provided at the diversion structures, which divert the water from minor canal to field canals. Due to this irrigation system, the saved water at upstream field canal through introduction of micro irrigation system cannot be allocated to downstream field canal because discharge to each field canal is fixed by diversion structure and cannot be changed without installation of water gate at diversion structure to field canal.

- iv) No involvement of WRD field officers to install micro irrigation system.

Especially for individual farmers based drip irrigation system, WRD field officers were not involved, thus they have difficulty to request the farmers to save water.

- v) Reduction of government subsidy for the introduction of micro irrigation system.

Due to the reduction of subsidy especially for the installation of solar pump, 86% => 70% and drip irrigation kit, 90% => 70%, currently, farmers are hesitant to introduce the micro irrigation system in the Project area.

For promotion of micro irrigation system under RWSLIP, the above constraints and issues should be fully considered in preparing the appropriate project approach and activities.

(b) Issues on water management in the existing irrigation system

According to site inspections, it was found that constant proportional diversion structures were commonly applied at each diversion point on irrigation canals in the Project area. Although the constant proportional diversion structure has a merit of easy and fair operation as well as low construction cost, this structure is generally applied to paddy field and has a demerit for upland farming due to lack of flexibility for fluctuation of water demand.



In RWSLIP, the JICA survey team proposes several activities that require a change of water demand such as promotion of micro irrigation system, exotic vegetables, and citrus cultivation. The constant proportional diversion structure, hence, may cause the adverse effect to maximise the project outcomes from such activities.

In addition, it may cause large amount of water loss due to difficulties for implementing optimum water management.

(3) Construction of WUA Office Building

According to the site inspections and interview surveys, status of utilisation of WUA office buildings constructed in RAJAMIIP is clearly depending on the activeness of WUA. In other words, in case WUA is actively functioning, WUA office building is also effectively utilised. In case WUA is not

actively functioning; the WUA office building is also not effectively utilised as well. For construction of WUA office building, capacity building of WUA is essential. In addition, the measures to motivate WUA members to utilise such facilities should be considered to formulate the Project approach.

In RAJAMIIP, 22 WUA office buildings were not constructed due to land acquisition problems and this issue should be also considered for the preparation of the Project approach.

(4) Gender Issues Regarding Irrigation Facilities

According to the site inspections and interview surveys, it was found that the canal maintenance and cleaning works were made mainly by women and caused a large workload on them.

In addition, it was also found that some of the facilities deeply related to women’s activities such as washing steps and foot bridges were constructed without any involvement of women living in the area in the past projects.

In order to reduce the workload of women and for gender mainstreaming in irrigation activities, countermeasures against the above issues should be considered in the Project formulation.



5.2.2 Approaches and Countermeasures in Irrigation and Rural Infrastructure Sector

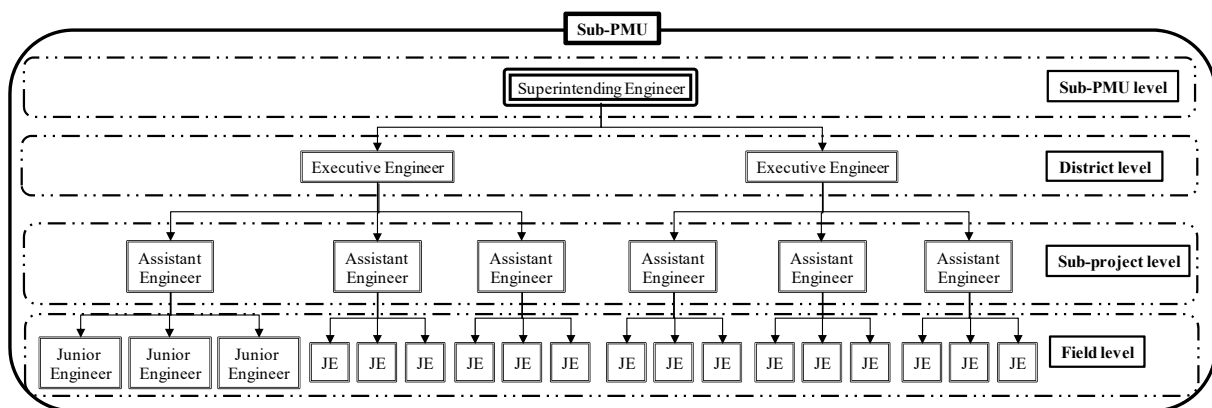
(1) Realistic Implementation Plan and Adequate Structure for Rehabilitation of Irrigation System (Dam and Canal)

(a) Stage-wise implementation plan

As shown in Section 4.2.1, one-stage implementation applied in RAJAMIIP is one of the main causes of the delay in works and the JICA survey team proposes to apply “stage-wise implementation” in RWSLIP. Detailed concept of application of stage-wise implementation is shown in Section 4.2.1.

(b) Proposed organizational structure for rehabilitation of irrigation system

The JICA survey team proposes to establish sub-PMUs at zone level and assign sufficient number of “fulltime” field officers for smooth and proper pre-construction works, contract management, and construction supervision works. The proposed organisational structure for the rehabilitation of irrigation system and general responsibility and required number of each engineer are shown in Figure A5.2.1 and Table A5.2.2 below.



Note: all the staff shall be “fulltime” staff,
Source: JICA survey team

Figure A5.2.1 Typical Organisational Structure of Sub-PMU for Rehabilitation of Irrigation Facilities (Implementation and Construction Unit)

Table A5.2.2 General Responsibility and Required Number of WRD Staff in Sub-PMU (Implementation and Construction Unit)

Position	Responsibility					
Superintending Engineer	Overall responsible for the implementation, coordination, and management of the Project activities in sub-PMU					
Executive Engineer	Overall responsible for the implementation, coordination, and management of the Project activities at the district level (3 ~ 5 sub-projects with a total contract amount of INR 300 ~ 400 million)					
Assistant Engineer	Overall responsible for the implementation, coordination, and management of the Project activities at the sub-project level (1 ~ 2 sub-projects with a total contract amount of INR 100 ~ 150 million)					
Junior Engineer	Responsible for daily supervision of the construction works (1 ~ 2 contract packages with a total contract amount of INR 40 ~ 50 million)					
Position	Required Number of "Fulltime" Staff					
	Sub-PMU 1	Sub-PMU 2	Sub-PMU 3	Sub-PMU 4	Sub-PMU 5	Total
Superintending Engineer	1	1	1	1	1	<u>5</u>
Executive Engineer	3	3	4	3	3	<u>16</u>
Assistant Engineer	9	9	12	9	9	<u>48</u>
Junior Engineer	27	27	32	27	27	<u>140</u>
Total	<u>40</u>	<u>40</u>	<u>49</u>	<u>40</u>	<u>40</u>	<u>209</u>

Source: JICA survey team

(c) Rehabilitation of water courses

The JICA survey team proposes to exclude the rehabilitation works for water courses from the Project scope considering the following:

- Operation and maintenance including rehabilitation works for water courses is WUA's obligation and duty, and
- The Project concept of RWSLIP puts relatively high priority to medium-scale irrigation scheme, i.e., large-scale works,
- In most sub-projects, WUA will be newly established and it may be preferable to focus the Project attention on the proper formulation of WUA and continuous training to WUA members at initial stage, and
- Considering the lessons learnt from RAJAMIIP, it may be preferable to concentrate to complete the rehabilitation works with sufficient reflection of WUA's views and opinions through walk-through survey and attendance to weekly meeting.

In order to facilitate WUAs to improve their ownership for the rehabilitation of their own water courses, the Project will provide WUAs with capacity enhancement program as shown in Section 5.3.

(2) New Type Project Support System to Motivate Farmers for Water Saving through Micro Irrigation System

(a) Proposed micro irrigation system under RWSLIP

In RWSLIP, the JICA survey team proposes to promote the following types of micro irrigation system, namely: community-based sprinkler irrigation and individual farmer-based drip irrigation as shown in Table A5.2.3:

Table A5.2.3 Proposed Micro Irrigation System under RWSLIP

Irrigation System	Community-based Sprinkler Irrigation	Individual Farmer-based Drip Irrigation
Type of System	Sprinkler Irrigation	Drip Irrigation
Target	Farmers group (<i>chak</i> ¹ level)	Individual farmer
Target Crop	Cereals, pluses, and oil seed	Citrus and vegetable
Target Area	All irrigation sub-projects	Focal area for citrus and vegetable

Source: JICA survey team

¹ *Chak* means the area covered by one outlet and water course and its covering area is around 50 – 100 ha generally.

(b) Expected water saving effect through introduction of micro irrigation system

According to preliminary and rough estimate by the JICA survey team using CROPWAT 8.0, the expected water saving effect through the introduction of the above micro irrigation system is summarised as shown in Table A5.2.4:

Table A5.2.4 Estimated Water Saving Effect with Micro Irrigation System

Irrigation System	Crop Type	Gross Water Requirement	Water Saving Ratio to Current Irrigation System	Remarks
Current irrigation system (surface irrigation)	Wheat and cotton	3,798 mm	-	14 days rotation
Community-based sprinkler irrigation system	Wheat and cotton	2,445 mm	36%	-
Individual farmer-based drip irrigation system	Citrus	1,068 mm	72%	With other water saving techniques such as mulching

Note: calculated by CROPWAT 8.0 (in case of Jaipur)
Source: JICA survey team

(c) Proposed project support system

Although remarkable water saving effect can be expected through the introduction of the proposed micro irrigation system as shown in Table A5.2.4, it may not be realised due to lack of sense of water saving of farmers and government field officers. In order to realise the above expected water saving effect and motivate the farmers and government field officers for water saving, the JICA survey team proposes the following supporting system for the promotion of micro irrigation system under RWSLIP:

1) Proposed project support system for community based sprinkler irrigation system

Considering the present water management system broadly implemented in the Project area, it is proposed that the target farmers group under RWSLIP should be basically “*chak*” basis, and two types of support system should be prepared. The first one is for farmers group in water shortage *chak* and another one is for farmers group in water sufficient *chak*. Hereinafter, “*chak*” where the target farmer group for introduction of community-based sprinkler system is located, is referred to as “target *chak*”.

Proposed Support System for Farmers Group at Chak Suffering from Water Shortage

Goals of Project Support

- i) Expansion of irrigation area and increase of irrigation efficiency “within the target *chak*” through effective use of water saved through the introduction of sprinkler irrigation system
- ii) Increase farmers’ income through i)

Proposed Project Support System

Considering the good practices and experiences in Narmada Major Irrigation Project shown in the project report, the Project support for the construction of the following facilities is recommended in RWSLIP:

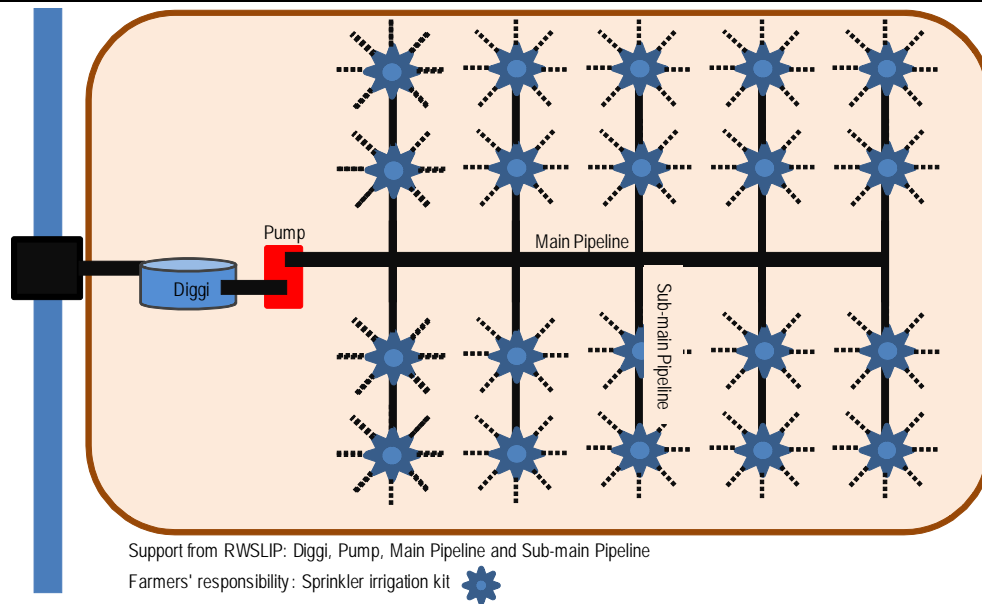
- Diggi (regulation pond)
- Solar pump (including solar panel and pump house)
- Distribution pipeline system (main pipelines and sub-main pipelines)

Conditions for Application of Project Support

The farmers group shall satisfy the following conditions for application of the above Project support:

- Water management system within *chak* shall be well functioned under present situation (*Warabandi* shall be implemented)
- Commitment for installation of sprinkler kit at his own responsibility
- Provision of land required for construction works without any compensation
- Commitment for operation and maintenance works of farmers group at his own responsibility including collection of water fee and water management

The conceptual figure for the above support system is shown in Figure A5.2.2.



Source: JICA survey team

Figure A5.2.2 Conceptual Figure of the Support System for Community-based Sprinkler Irrigation System under RWSLIP

Proposed Support System for Farmers Group at Chak with Sufficient Water

Goals of Project Support

- i) Increase of farmers' income through effective use of a part of saved water through the introduction of sprinkler irrigation system within the target *chak*.
- ii) Expansion of irrigation area and increase of irrigation efficiency “at the downstream water shortage *chak*” through additional irrigation water supply from the target *chak* using a part of saved water.

Proposed Project Support System

- i) In order to allocate a part of the saved water to downstream water shortage *chak*, the Project will provide a water gate at the head of water course of the target *chak* to control discharge to the target *chak*.
- ii) In order to realise the above goals and motivate the farmers for water saving, the JICA survey team proposes the following supporting system for construction of other facilities as shown in Table A5.2.5:

Table A5.2.5 Proposed Support System for Farmers Groups at Water Sufficient *Chak*

Estimated Water Saving Effect	Allocation to Downstream <i>Chak</i> *1)	Benefit in the Target <i>Chak</i>	Project Support	Farmers' Responsibility (with Government Subsidy)
36%	20%	16%	Full support (<i>diggi</i> , pipeline system and pump with solar panels)	Sprinkler irrigation kit
	10%	26%	Partial support (<i>diggi</i> , pipeline system and pump without solar panels)	Solar panels and sprinkler irrigation kit
	0%	36%	No support from RWSLIP	Full responsibility

Note *1): allocation to downstream *chak* means deduction of current irrigation water rotation time for the target *chak*, e.g., in case of 20%, irrigation water rotation time of the target *chak* will be deducted to 80% of the current irrigation water rotation time

Source: JICA survey team

As shown in the Table A5.2.5, if farmers' groups agree to allocate more water to downstream *chak*, they can receive more support from the Project.

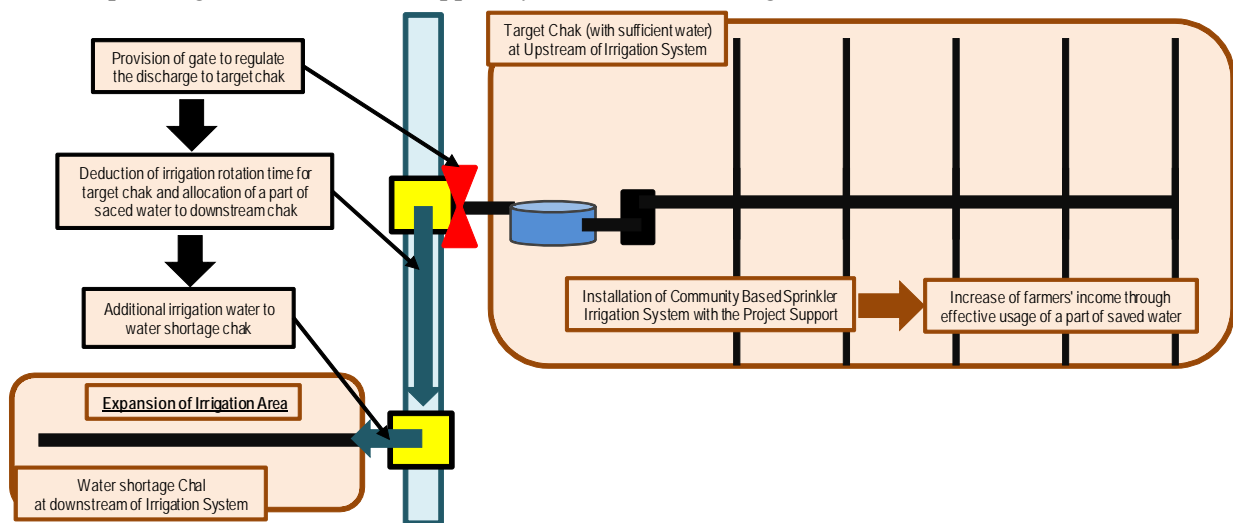
It is noted that the figures in Table A5.2.5 should be reviewed and revised in timely manner based on the result of demonstration farm, updated figures, and actual site conditions.

Conditions for Application of Project Support

The farmers' group shall satisfy the following conditions for application of the above Project support:

- Water management system within *chak* shall be well functioned under present situation (*Warabandi* shall be implemented),
- Commitment for allocation of a part of saved water to downstream based on Table A5.2.5,
- Commitment for installation of facilities as his own responsibility based on Table A5.2.5,
- Provision of land required for construction works without any compensation, and
- Commitment for operation and maintenance works as a farmers group as their own responsibility including collection of water fee and water management.

The conceptual figure for the above support system is shown in Figure A5.2.3.



Source: JICA survey team

Figure A5.2.3 Conceptual Figure for the Goals of Project Support

2) Proposed project support system for individual farmer-based drip irrigation system

Goals of Project Support

- Increase of the target farmer's income through introduction of high-value added crops with high-tech agriculture and effective use of a part of saved water through drip irrigation system.
- Expansion of irrigation area and increase of irrigation efficiency for "downstream farmers" within same chak through additional irrigation water supply from the target farmer using a part of saved water.

Proposed Project Support System

In order to realise the above goals and motivate the target farmers for water saving, the JICA survey team proposes the following supporting system for individual farmer-based drip irrigation system as shown in Table A5.2.6.

Table A5.2.6 Proposed Support System for Individual Farmer-based Drip Irrigation

Estimated Water Saving Effect	Allocation to Downstream Farmers *	Benefit of the Target Farmer	Project Support	Farmers' Responsibility (with Government Subsidy)
72 %	40%	32%	Construction of <i>diggi</i> , pump house, and pipe line	Solar pump (with solar panel) and drip irrigation kit
	30%	42%	Solar pump (with solar panel and pump house)	Construction of <i>diggi</i> and pipeline, installation of drip irrigation kit
	20%	52%	Drip irrigation kit	Construction of <i>diggi</i> and pipeline, installation of solar pump (with solar panel and pump house)
	0%	72%	No support from RWSLIP	Full responsibility

Note *: allocation to downstream farmers means deduction of current irrigation water rotation time for the target farmer, e.g., in case of 20%, irrigation water rotation time for the target farmer will be deducted to 80% of the current irrigation water rotation time

Source: JICA survey team

As shown in Table A5.2.6, if the target farmer agrees to allocate more water to downstream farmer, he can receive more support from the Project.

It is noted that the figures in Table A5.2.6 should be reviewed and revised in timely manner based on the results of demonstration farm, updated figures, and actual site conditions.

Conditions for Application of Project Support

The target farmer shall satisfy the following conditions for the application of the above Project support:

- Water management system within *chak* shall be well functioned under present situation (*Warabandi* shall be implemented),
- All the farmers within *chak* shall acknowledge his application,
- Commitment for allocation of a part of saved water to downstream farmers and installation of facilities as his own responsibility based on Table A5.2.6,
- Provision of land required for construction works without any compensation, and
- Commitment for operation and maintenance works as his own responsibility.

(3) Introduction of WUA Constructive Facilities

In order to improve WUA members' ownership for facilities, motivate them in WUA activities and facilitate their farming practice and income generation activities, the JICA survey team proposes to introduce the WUA constructive facilities such as the following:

- WUA office building,
- Community hall,
- Dry yard,
- Direct sales store, and
- Warehouse.

In case WUA office building has not been constructed yet, in principle, WUA office building shall be the first priority facility considering the importance of securement of meeting space. If WUA members intends to construct the other facilities despite no WUA office building, meeting space for the required regular and special meetings should be secured by WUA representatives and acknowledged by all WUA members as well as NGO and WRD staff concerned.

Type of facilities shall be decided and agreed by all WUA members and the following conditions will be applied for the introduction of WUA constructive facilities:

- i) No compensation shall be made for the required land for construction of facilities, and
- ii) All operation and maintenance shall be made under WUA's full responsibility.

For irrigation sub-projects rehabilitated under RAJAMIIP or RWSRP, WUA office building has been already constructed and no WUA constructive facilities will be provided by the Project unless otherwise approved by PMU.

(4) Gender Mainstreaming in Irrigation and Rural Infrastructure Sector

(a) High priority on canal rehabilitation works

With newly provided canal lining facility, the workload related to canal maintenance and cleaning works such as weed removal and slope repair works can be drastically reduced. Considering gender sensitivity, the JICA survey team recommends to put high priority on canal rehabilitation (canal lining) works to reduce the workloads on women for canal maintenance and cleaning works.

(b) Promotion of women friendly facilities and women friendly trees in canal system

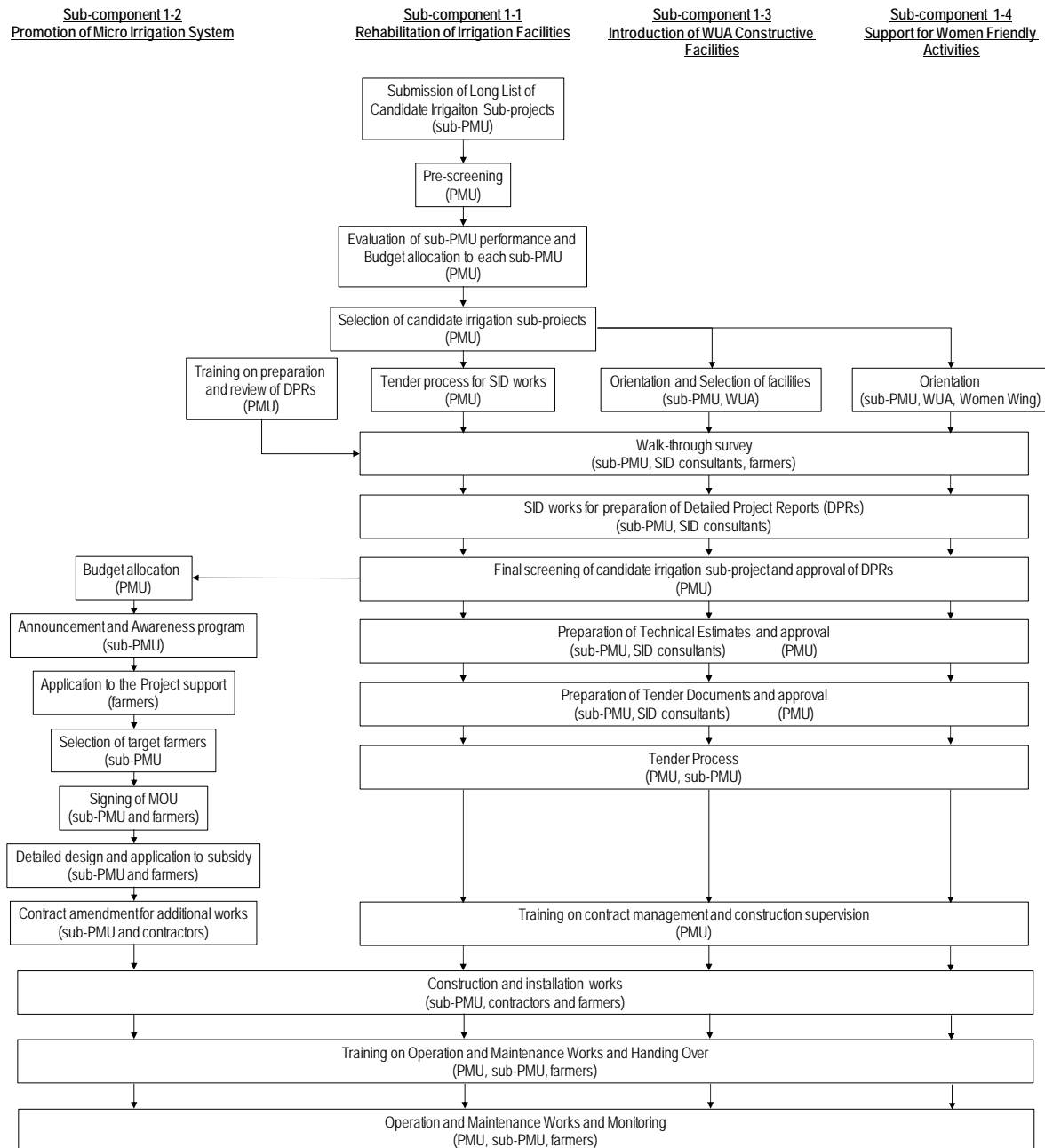
For gender mainstreaming in canal system, it is recommended to promote to provide women friendly facilities such as washing step, foot path and so on and women friendly trees such as cash trees in the irrigation system. For planning, design, construction, and maintenance works, women-wing to be established in RWSLIP should be fully involved to reflect their idea and voice to planning and design. Detailed procedure and method for planning, design, construction and maintenance works for promotion of women friendly facilities and women friendly trees is described in Section 5.6.

5.2.3 Proposed Sub-components and General Work Flow of Component-1: Participatory Irrigation Rehabilitation Works

In Component-1: participatory irrigation rehabilitation works, the JICA survey team proposes the following sub-components:

- i) Sub-component 1-1: Rehabilitation of irrigation facilities
- ii) Sub-component 1-2: Promotion of micro irrigation system
- iii) Sub-component 1-3: Introduction of WUA constructive facilities
- iv) Sub-component 1-4: Support for women friendly activities

General work flow of Component-1: Participatory irrigation rehabilitation works consisting of the four sub-components is shown in Figure A5.2.4 and the detailed activities and procedure of each sub-component are described in the following sections.



Source: JICA survey team

Figure A5.2.4 General Work Flow of Component 1: Participatory Irrigation Rehabilitation Works

5.2.4 Sub-component 1-1: Rehabilitation of Irrigation Facilities

(1) Selection of Candidate Irrigation Sub-projects

Flow chart for selecting and screening of irrigation sub-projects during their implementation is shown in Figure B4.3.1 and summarised as follows:

(a) Submission of long list by sub-PMUs

Sub-PMUs will prepare the long list of candidate irrigation sub-projects for each stage and submit it to PMU with concept paper including the sufficient information for pre-screening.

- Name and location of the irrigation sub-project
- Cultivable Command Area (CCA)
- Year of construction and rehabilitation record

- Estimated cost (with dam, canal and other works, separately)
- Major rehabilitation work items
- Sub-PMU's priority

(b) Pre-screening of candidate irrigation sub-projects by PMU

Based on the long lists submitted by sub-PMUs, PMU will make a pre-screening of candidate irrigation sub-projects using the following screening criteria:

- CCA of the irrigation sub-project shall be 300–10,000 ha,
- Age of irrigation facilities shall not be less than 20 years, and
- Proposed works shall be the rehabilitation works.

(c) Evaluation of performance of sub-PMUs and allocation of budget for new stage

Based on the records and information from the consultant and NGOs, PMU will evaluate the performance of sub-PMUs during previous stages and allocate the budget for new stage to each sub-PMU based on the evaluation results of each sub-PMU. Basically, evaluation will be made based on the following aspects:

- Progress and achievement of pre-construction works;
- Progress and achievement of construction works; and
- Achievement of soft components such as farming support program, gender mainstreaming activities, and strengthening of WUA.

(d) Prioritisation and selection of candidate irrigation sub-projects

Based on the allocated budget and prioritisation of irrigation sub-projects for each sub-PMU, the candidate irrigation sub-projects will be selected by PMU. Prioritisation will be made using the following scoring criteria:

- Priority in state policy and sub-PMU's plan,
- Years after construction and rehabilitation records, and
- Potential for collaboration with value chain and gender mainstreaming activities.

It is noted that for Stage 1 works, the above procedure of the selection of candidate irrigation sub-projects has been already completed during this survey period and the works will be started from tender process for SID works shown in the following sections.

(2) SID Works for the Preparation of DPRs

After the selection of candidate irrigation sub-projects, each sub-PMU will commence the preparatory works starting from the preparation of DPR.

(a) Tender process and employment of SID consultants

Considering the limited number of field officers of WRD in comparison with the voluminous work of SID works, the JICA survey team proposes to employ SID consultants for preparation of DPRs, technical estimate, and tender documents aiming at smooth commencement of the construction works.

Regarding the possibility of excessive concentrated workloads on SID consultants, stage-wise implementation proposed in RWSLIP can contribute to reduce the concentrated workloads. In addition, for employment of the SID consultants, the capacity of each consultant should be carefully checked to avoid excess workloads on particular consultants.

(b) Training on preparation and review of DPRs

The JICA survey team proposes the following training program to improve the quality of DPRs and for smooth and proper review and approval of DPRs to be prepared by SID consultants, in parallel with tender process for employment of SID consultants as shown in Table A5.2.7.

Table A5.2.7 Training on Preparation and Review of DPRs

Timing	Target Officer	Trainer	Contents
Before and during the Project	Junior engineers and assistant engineers (and executive engineers)	PMU staff / consultant	Preparation and checking of DPRs for RWSLIP

Source: JICA survey team

(c) Walk-through survey with WUA members

Walk-through survey to confirm the current condition of the irrigation facilities and possible countermeasures should be conducted among the sub-PMU officers, WUA members including women-wing, SID consultant, consultant, and NGOs.

(d) SID works for preparation of DPR

Based on the results of the walk-through survey, the SID consultants will prepare DPR and submit it to sub-PMU for review and approval. The checked and approved DPR by the sub-PMU will be sent to the consultant for further review and technical approval. After the technical approval of the consultant, DPR will be submitted to PMU for final check and final screening of the candidate irrigation sub-projects.

(3) Final Screening of Candidate Irrigation Sub-projects

Based on DPRs technically approved by the consultant, PMU will make final screening of candidate irrigation sub-projects using the following screening criteria:

- Economic internal rate of return (EIRR) shall not be less than 5%,
- Dependability shall not be less than 50%,
- No significant environmental and social impact,
- MOU with WUA to confirm the agreement of rehabilitation works and commitment of WUA members to satisfy their duties and obligations, and
- CAMPs for soft components shall be completed.

After the final screening, DPRs will be officially approved by PMU or sub-PMU based on the following power of sanction stipulated in the public works financial and accounts rules as shown in Table A5.2.8.

Table A5.2.8 Power of Sanction for Approval of DPRs

Position	Power of Sanction
Chief Engineer	Full Power
Additional Chief Engineer	Full Power
Superintending Engineer	Up to INR 15,000,000
Executive Engineer	Up to INR 5,000,000

Source: Public Works Financial and Accounts Rules

(4) Preparation and Approval of Technical Estimates

Based on the approved DPRs, the SID consultants will prepare the technical estimates and submit it to sub-PMU for review and approval. Technical estimates checked and approved by sub-PMU will be sent to the consultant for review and technical approval. After the technical approval of the consultant, technical estimates will be officially approved by the PMU or sub-PMU based on the following power of sanction stipulated in the public works financial and accounts rules as shown in Table A5.2.9.

Table A5.2.9 Power of Sanction for Approval of Technical Estimates

Position	Power of Sanction
Chief engineer	Full Power
Additional chief engineer	Full Power
Superintending engineer	Up to INR 15,000,000
Executive engineer	Up to INR 5,000,000

Source: Public Works Financial and Accounts Rules

(5) Preparation and Approval of Tender (Bidding) Documents

As details are shown in Section 6.5 Procurement Plan, the JICA survey team proposes the following for the preparation of tender documents for RWSLIP:

(a) Format of tender documents and contract documents

Format of tender documents and contract documents will be prepared by the consultant based on the Standard Bidding Documents for W-2 (National Competitive Bidding) of World Bank project. Considering the lessons learnt from RAJAMIIP regarding price dumping and unrealistic tender prices, the JICA survey team proposes to add the following criteria for the evaluation of bidding documents to be submitted by the Bidders:

- In case the Bid price is less than 80% of the estimated cost of Engineer's estimate, clarification to the Bidder will be made by the Employer, and if the reply of the Bidder is not acceptable to the Employer, such Bid may be rejected by the Employer, and
- In case the unit price of any work item is less than 70% of that of Engineer's estimate, clarification to the Bidder will be made by the Employer, and if the reply of the Bidder is not acceptable to the Employer, such Bid may be rejected by the Employer.

In addition, the list of the contractors awarded for contract packages should be timely and properly monitored and controlled by PMU and shared among all sub-PMUs to avoid unnecessary confusion caused by an events of "one contractor submits his bids to many contract packages" and "one contractor is awarded with too many contract packages beyond his capacity".

(b) Packaging of the contract for construction works

Classification of the contractors for civil works is shown in Table A5.2.10:

Table A5.2.10 Classification of the Contractors (Civil Works)

Class	Qualification for Application of Tender
AA class contractors	No limitation
A class contractors	Up to INR 30,000,000
B class contractors	Up to INR 15,000,000
C class contractors	Up to INR 5,000,000
D class contractors	Up to INR 1,500,000

Source: Public Works Financial and Accounts Rules

In RWSLIP, the size of one irrigation sub-project may be sufficiently attractive for capable contractors and, therefore, the JICA survey team proposes not to apply the packaging method in RAJAMIIP, i.e., merging of several irrigation sub-projects as one contract package.

Meanwhile, considering the construction period for one stage in two years, the allowable maximum contract amount of one contract package should be limited to avoid unrealistic construction plan and schedule.

Taking account of the above consideration and past experiences, the JICA survey team proposes to apply the following packaging plan for RWSLIP:

- Minimum amount for one contract package: INR 30 million
(Contractor: A or AA class, power of sanction: chief engineer)
- Basic amount for one contract package: INR 50 million ~ 100 million
(Contractor: AA class, power of sanction: chief engineer or empowered committee)
- Maximum amount of one contract package: INR 200 million
(Contractor: AA class, power of sanction: empowered committee)

In case the size of one irrigation sub-project is smaller than the above minimum amount, the merging of sub-project with another sub-project is recommended to attract the maximum participation of capable contractors and reduction of administrative burden of contract management. Meanwhile, in

case the size of one irrigation sub-project is larger than the above maximum amount, the division of such sub-project into several contract packages is recommended to avoid unrealistic construction plan.

(c) Preparation and approval of tender (bidding) documents

Based on the format prepared by the consultant, the SID consultants will prepare tender documents including draft contract documents and submit to sub-PMU for review and approval. Tender documents checked and approved by sub-PMU will be sent to the consultant for further review and technical approval. After the technical approval of the consultant, tender documents will be officially approved by empowered committee, PMU or sub-PMU based on the following power of sanction stipulated in the public works financial and accounts rules as shown in Table A5.2.11:

Table A5.2.11 Power of Sanction for Approval of Tender Documents

Position	Power of Sanction
Empowered committee *	Full power
Chief engineer	Up to INR 50,000,000
Additional chief engineer	Up to INR 25,000,000
Superintending engineer	Up to INR 12,000,000
Executive engineer	Up to INR 3,000,000

Note *: members of empowered committee are the secretary, chief engineer general, chief engineer, staff from financial department, and financial advisor.

Source: Public Works Financial and Accounts Rules

(6) Tender Process and Signing of the Contract

After the approval of tender documents, the tender process will be executed. Tender documents will be evaluated by sub-PMU and the evaluation results will be submitted to the consultant for review and technical approval. After the technical approval of the consultant, the results of tender, i.e., contract award, will be officially approved by empowered committee, PMU or sub-PMU based on the following power of sanction stipulated in the public works financial and accounts rules as shown in Table A5.2.12:

Table A5.2.12 Power of Sanction for Approval for Contract Award

Position	Power of Sanction	Period for Evaluation
Empowered committee *	Full power	20 days
Chief engineer	Up to INR 50,000,000	30 days
Additional chief engineer	Up to INR 25,000,000	40 days
Superintending engineer	Up to INR 12,000,000	50 days
Executive engineer	Up to INR 3,000,000	70 days

Note: in case the amount of contract award is higher than owner's estimate by more than 20%, power of sanction for approval will be transferred to higher level position.

Note *: members of empowered committee are the secretary, chief engineer general, chief engineer, staff from financial department, and financial advisor.

Source: Public Works Financial and Accounts Rules

Following the approval by the above competent authority, contract document will be signed between the executive engineer of WRD and the contractor.

(7) Construction Plan for Construction Works

(a) General

According to the review of sample DPRs and the proposed activities by the JICA survey team, the rehabilitation of irrigation facilities works for candidate irrigation sub-projects will broadly include the following rehabilitation and construction works:

- i) Rehabilitation of Dam
 - Rehabilitation of dam body
 - Rehabilitation of spillway
 - Rehabilitation of intake structure

- ii) Rehabilitation of Canal System
 - Rehabilitation of canal bank
 - Rehabilitation of lining and related structures
 - Construction of new canal lining
 - Installation of micro irrigation system
- iii) Construction of WUA constructive facilities such as office building

The above rehabilitation works will broadly require the following work items:

- i) Earth works,
- ii) Concrete works,
- iii) Stone works,
- iv) Grouting works,
- v) Gate works,
- vi) Hydro-mechanical works,
- vii) Building works, and
- viii) Miscellaneous works.

Generally, those works and work items were also included in the rehabilitation works implemented under RAJAMIIP and the consultant for RAJAMIIP prepared several guidelines and manuals for the smooth implementation of those works. In RWSLIP, it is recommended to utilise those available guidelines and manuals effectively. Meanwhile, in RAJAMIIP, most of those guidelines and manuals were not utilised especially at the site and field level due to the following constraints and issues:

- Lack of understanding or interest of field level officers and contractors,
- Lack of communication between the consultant and the government, and
- No systematic project implementation system, i.e., no sub-PMUs, no fulltime staff, and lack of ownership of field level officers.

Lists of the technical notes and comments from the consultant for RAJAMIIP are shown in Attachment 5.2.1.

Considering the above lessons learnt from RAJAMIIP, it is recommended not only to totally review and update those guidelines and manuals to be suitable for RWSLIP by the consultant for RWSLIP, but also to set up the systematic mechanism and training program for effective use of such guidelines and manuals especially by the field officers in sub-PMUs. In addition, it is also recommended to monitor the status of usage of those guidelines and manuals in project monitoring committee and review and revise, whenever necessary in a timely manner.

Using those guidelines and manuals reviewed and updated by the consultant, the JICA survey team proposes the following training program just after signing of the contract and before commencement of the construction works as shown in Table A5.2.13.

Table A5.2.13 Training on Construction Supervision and Contract Management

Timing	Target Officers	Trainer	Contents
Before commencement of the construction works	PMU and sub-PMU staff, contractor staff	Consultant	Construction supervision and contract management based on the guidelines and manuals to be prepared by the consultant

Source: JICA survey team

(b) Construction Management and Supervision

In RAJAMIIP, the following guidelines and manuals were prepared by the consultant although those guidelines and manuals were not effectively utilised and should be revised as shown in (a):

- TN-13: Guidelines for construction supervision and QC and monitoring, and
- TN-17: Monitoring manual

During construction works under RAJAMIIP, no regular and/or special construction meetings were organised by WRD in a timely manner and several important contractor's submittals such as construction schedule and action plan, construction drawings, and weekly and monthly reports were

not even submitted by the contractors. Such improper construction management resulted in poor quality of the works as well as a significant delay of the works. The JICA survey team strongly recommends to include the clear descriptions of those activities including the approval procedure for contractor's submittals in the revised guidelines and manuals.

The JICA survey team recommends having at least the following regular and/or special construction meetings under full responsibility of sub-PMUs as shown in Table A5.2.14:

Table A5.2.14 Proposed Construction Meetings

Name	Frequency	Chairman	Member	Main Agenda
Sub-PMU coordination committee	Monthly	Superintending engineer	- Executive engineers - Consultant - Contractor (with delay or problem)	- Report to sub-PMU about progress, quality, and safety issues - Discussion and decision for important issues especially for delay of the works
Monthly construction meeting	Monthly	Executive engineer	- Assistant engineers - Consultant - Contractor (project manager level)	- Progress, quality, and safety of the works - Decisions for required actions such as show cause meeting, warning letter, variation order, extension of time, and contract amendment
Weekly construction meeting	Weekly	Assistant engineer	- Junior engineers - Contractor (site manager level)	- Progress, quality, and safety of the works - Discussion for required actions such as show cause meeting, warning letter, variation order, extension of time, and contract amendment
Special meeting	As required	Superintending engineer	- Executive engineers - Consultant - Contractor (project manager level)	- Specific issues for discussion (delay and low quality of the works)

Source: JICA survey team

All the construction management activities including the above meetings and contractor's submittals should be regularly monitored and evaluated by PMU for evaluation of sub-PMUs' performance.

(c) Construction Method

Basically, the required construction skills and methods for RWSLIP will be the same as those in RAJAMIIP although the scale of the works will be large because of inclusion of medium-scale irrigation sub-projects. The consultant for RAJAMIIP prepared several guidelines and manuals regarding the construction methods such as the following although those guidelines and manuals were not effectively utilised and should be revised as shown in (a):

- TN-20 "Concise Construction/Rehabilitation Manual"
- TN-21 "Rehabilitation of Water Courses"
- Guidelines for Shot-Crete
- Guidelines for Repair of Cracks by Epoxy Mortar and Concrete
- Guidelines for Execution of Earthworks on Dam (key construction procedure for addition of earthen lamina to existing earthen dams)
- Guidelines for Surface Concrete at Spillway (key construction procedure for providing cement concrete lamina on the existing masonry overflow/non-overflow portion of the masonry dams)

During the construction works under RAJAMIIP, the contractors commenced and WRD field officers allowed the commencement of the construction works without any "work method statement" for each construction work item. In order to avoid improper construction manner and improve the quality of the works, it is recommended to instruct the contractors to submit the "work method statement" for the Engineer's approval before commencement of any permanent and temporary works. Especially, in RWSLIP, rehabilitation of relatively large-scale dam will be included in the Project scope and large-scale diversion works or temporary coffer dam may be required to rehabilitate dam facilities. In order to avoid serious accident, the checking and approval of work method for those important works will be essential for the successful completion of the Project.

(d) Quality Control

In RAJAMIIP, the following guidelines and manuals were prepared by the consultant although those guidelines and manuals were not effectively utilised and should be revised as shown in (a):

- TN-16: Quality Control Manual

Considering the organisational structure for RWSLIP, the consultant will not be able to control the quality of the works due to shortage of field staff and quality control should be the sole responsibility of the contractors and WRD field officers in each sub-PMU. Monitoring and evaluation system should be well functioned through construction meeting as well as coordination committee at each level. Based on monitoring and evaluation, the warning and penalty to the contractors should be strictly applied in accordance with relevant clauses of the specifications of the contract and payment for the low quality works should not be made to the contractors until the remedial works will be officially accepted by the Engineer.

For the proper monitoring of the quality control activities, it is recommended to instruct the contractor to submit “Quality Assurance of the Works” at the beginning of the works and “Monthly Quality Report” in a timely manner.

All the quality control activities should be regularly monitored and evaluated by PMU for evaluation of sub-PMUs’ performance.

(e) Safety Control

According to the final completion report for RAJAMIIP, no specific activities or actions for safety control were taken in the construction works under RAJAMIIP. The JICA survey team strongly recommends implementing the following safety control activities as minimum requirement to avoid serious accident:

- Submission of “working safety plan” by the Contractor and approval by the Engineer,
- Weekly and monthly safety patrol by safety manager of the contractor and sub-PMU field officer,
- Reporting of results of weekly and monthly safety patrol and discussions for proper safety manners to be taken by the contractors in weekly and monthly meeting (record as minutes of meeting), and
- Description of the above activities in weekly and monthly reports submitted by the contractors.

All the safety control activities should be regularly monitored and evaluated by PMU for evaluation of sub-PMUs’ performance.

(8) Training on Operation and Maintenance and Handing Over

In principle, operation and maintenance works on irrigation facilities should be made based on the Rajasthan Farmers’ Participation in Management of Irrigation Systems, Act 2000 (Act No. 21 of 2000) and Notification of the Rajasthan Farmers’ Participation in Management of Irrigation Systems, Rules. The details are described in Section 6.4.

In RAJAMIIP, the following guidelines and manuals were prepared by the consultant although those guidelines and manuals were not effectively utilised and should be revised as shown in (7) (a):

- TN-16: Draft Manual for O&M,
- TN-24: Irrigation Water Demand,
- TN-26: Training Manual for Village Water Masters,
- TN-27: Policy Issues, Completion Certificates and Handing Over Documents, and
- TN-31: Handing Over Training Module.

Those guidelines and manuals will be reviewed and revised to be suitable for RWSLIP by the consultant and such guidelines and manuals should be handy and farmer friendly. It is recommended to prepare handy simple guidebook for each section and position of WUA staff and WRD field officers separately for easy understanding of their own roles and responsibilities. It is also suggested that at least the following shall be clarified/included in those guidelines and manuals:

Operation and Maintenance Plan:

- Responsible personnel and body for check and repair works,
- Frequency and time schedule for check and repair works, and
- Method of check and repair works.

Water Management Plan:

- Responsible personnel and body for gate control and water management,
- Frequency and time schedule for water management,
- Method of water management, and
- Record keeping of water management activities.

Based on such revised guidelines and manuals, the JICA survey team proposes to have the following training program for handing over the facilities to WUA:

Table A5.2.15 Training on Operation and Maintenance

Timing	Target Officer	Trainer	Contents
Completion of each irrigation sub-project	Sub-PMU staff WUA members	PMU staff/ consultant	O&M including water management based on guidelines and manuals to be prepared by the Consultant

Source: JICA survey team

The result of training on operation and maintenance will be compiled as MOU for handing over which shall include clear demarcation of responsibility between WUA and WRD, the commitment of operation and maintenance activities by WUA and the commitment of continuous support from WRD.

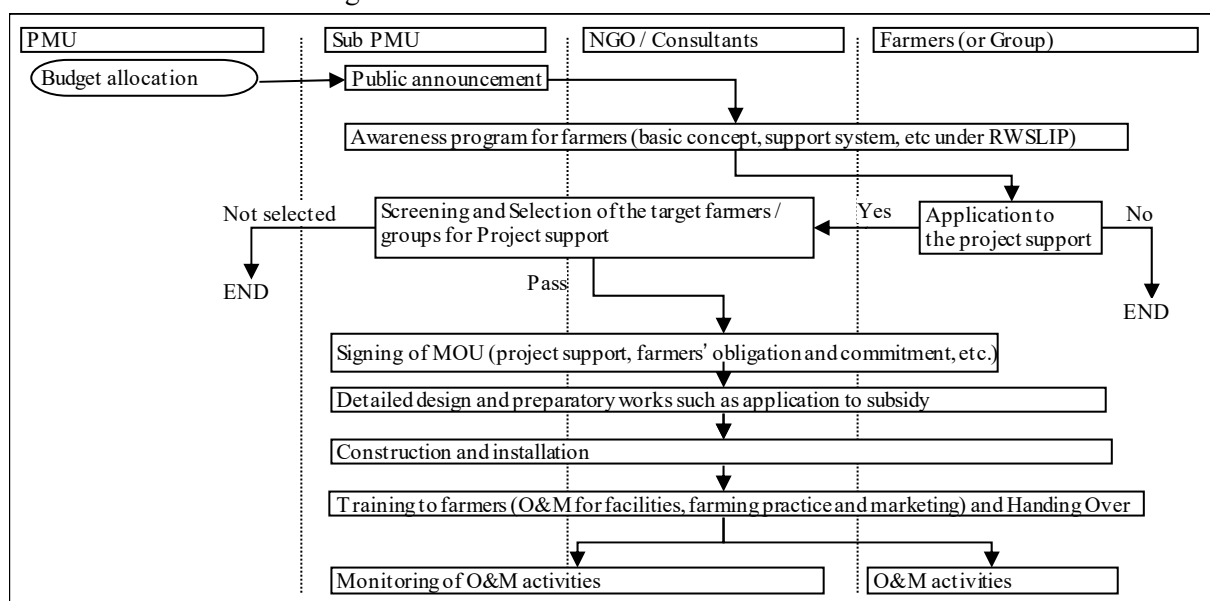
(9) Monitoring of Operation and Maintenance Activities

In RAJAMIIP, the operation and maintenance activities by WUA as well as WRD field officers were not monitored after training of operation and maintenance and handing over the facilities to WUA.

Since stage-wise implementation will be applied in RWSLIP, monitoring and evaluation period for operation and maintenance activities will be sufficiently secured. All operation and maintenance activities by WUA and WRD field officers should be regularly monitored by sub-PMU officers with support from NGOs and the consultant, and reported to and evaluated in sub-PMU coordination committee at sub-PMU level and project coordination committee at the state level.

5.2.5 Sub-component 1-2: Promotion of Micro Irrigation System

The general work flow for promotion of micro irrigation system is shown in Figure A5.2.5 and details are described in the following sections.



Source: JICA survey team

Figure A5.2.5 General Work Flow of Promotion Micro Irrigation System under RWSLIP

(1) Budget Allocation by Project Management Unit

At the beginning of each stage and just after final screening of candidate irrigation sub-projects, PMU will allocate the budget to each sub-PMU based on total CCA (ha) of candidate irrigation sub-projects to be implemented under each sub-PMU. Basically, the budget will be allocated to the promotion of community-based sprinkler irrigation system and individual farmer-based drip irrigation system, separately.

(2) Public Announcement by Sub-PMU

Sub-PMU will announce the public subscription to the Project support for all the farmers in the command area of candidate irrigation sub-project. Public announcement by sub-PMU will include at least the following information:

- Format of application form,
- Deadline of application (date and time),
- Place for submission of application form,
- Type of the works and conditions for application,
- Type of Project support and conditions for application, and
- Responsibility of the works including O&M.

(3) Awareness Programme for Farmers

Just after the public announcement and before the closing of application, awareness programme for farmers will be organised by sub-PMU with support from the consultant and NGOs. The proposed contents of awareness programme are shown in Table A5.2.16:

Table A5.2.16 Awareness Programme for Farmers

Trainer	Trainee	Contents
Consultant	Sub-PMU staff (field level) NGO staff (field level) Farmers (or group)	<ul style="list-style-type: none"> - Basic concept of promotion of micro irrigation system under RWSLIP (water saving and increasing water efficiency) - Water saving by micro irrigation system - Recommended crops for cultivation (agriculture component) - Type of the works and conditions for application - Type of Project support and conditions for application - Farmers' benefit expected from micro irrigation system - Farmers' obligation for application of micro irrigation system

Source: JICA survey team

In the above awareness programme, it is proposed to point out that the micro irrigation system to be promoted under RWSLIP may have a potential to solve the problem of inequality of water distribution between upstream and downstream farmers without any adverse impact to upstream farmers. Through the introduction of micro irrigation system, upstream farmers can save a considerable amount of water without any yield and income decrease and even with yield and income increase. In this sense, demonstration farm described in the following section (8) will play an important role to make aware and motivate the farmers to introduce the micro irrigation system under RWSLIP.

(4) Application by Farmers / Farmers Groups and Preparation of Long List of Applicants

Based on public announcement by sub-PMU and awareness program, the farmers/farmers' groups with support from NGO staff especially of community motivators will prepare application forms including the following information and submit to sub-PMU:

- Name of applicants, WUA information, and location of farm land;
- Documents related to WUA and water management system;
- Type of the works for application (community-based sprinkler irrigation or individual farmer-based drip irrigation) with cultivation crops;
- Project support and conditions applied for the Project;
- Agreement and acknowledgement of all farmers in the *chak* and WUA; and
- Commitment for farmers' obligation.

Based on application by farmers/farmers' groups, the sub-PMU will prepare the long list of applicants to be used for screening and selection of target farmers/groups.

Sample application form is shown in Attachment 5.2.2.

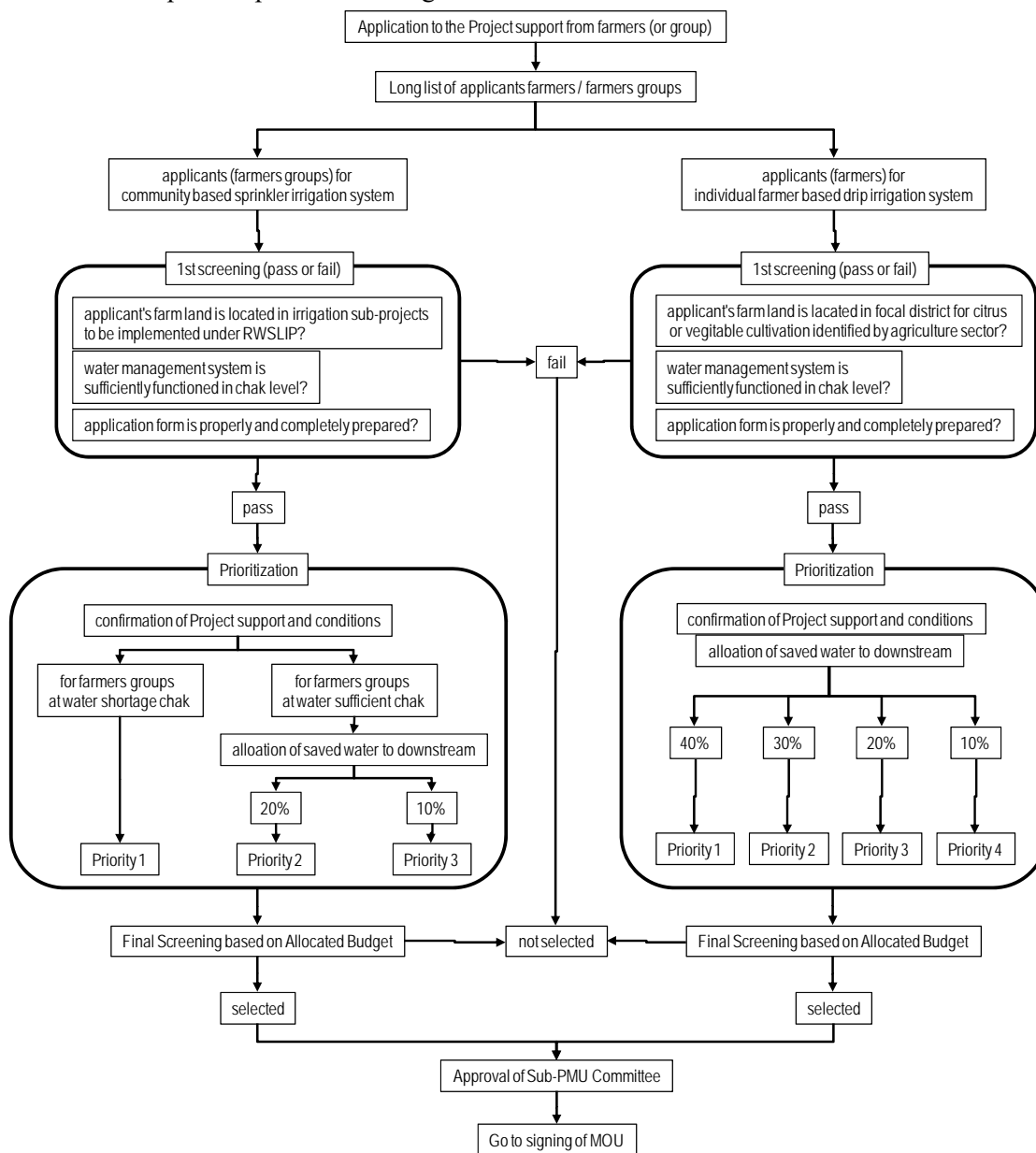
(5) Screening and Selection of Target Farmers/Farmers Groups

Based on the long list of applicant farmers/farmers' groups, the sub-PMU with support from the consultant and NGOs will make a screening and selection of target farmers/farmers groups.

General flow of screening and selection of target farmers/farmers' groups are shown in Figure A5.2.6.

As shown in Figure A5.2.6, the screening and selection of target farmers/farmers groups will be made separately for the applicants for community-based sprinkler irrigation system and for applicants for individual farmer-based drip irrigation system in consideration of the separate budget allocation described in the above (1). Screening and selection process for both irrigation system is shown in Figure A5.2.6.

For gender mainstreaming of irrigation sector, it is proposed to put high priority on women land owner in case of comparable priorities among several farmers.



Source: JICA survey team

Figure A5.2.6 Flow Chart of Screening and Selection of Target Farmers/Farmers Groups

(a) Screening and selection of target farmers groups for community-based sprinkler irrigation system

1) 1st screening (pass or fail)

Applicants (farmers' groups) will be screened based on the following screening criteria:

- Farm land shall be located in the command area of irrigation sub-projects to be implemented under RWSLIP,
- Water management system shall be sufficiently functioned in *chak* level, and
- Application form shall be properly and completely prepared and submitted to sub-PMU.

2) Prioritisation for final screening

Based on the application forms submitted by the applicants and discussions among sub-PMU, the consultant and NGO staff including site reconnaissance and interview surveys, applicants will be classified into the following prioritised farmers' groups:

- i) 1st Priority Farmers Group: Farmers groups at water shortage *chak*.
- ii) 2nd Priority Farmers Group: Farmers groups at water sufficient *chak* with condition of allocation of 20% of current irrigation water to downstream *chak* (deduction of irrigation water rotation time to 80% of current time).
- iii) 3rd Priority Farmers Group: Farmers groups at water sufficient *chak* with condition of allocation of 10% of current irrigation water to downstream *chak* (deduction of irrigation water rotation time to 90% of current time).

It is noted that the percentage of allocation of water should be reviewed and revised in timely manner based on the result of demonstration farm, updated figures, and actual site conditions.

3) Final screening based on allocated budget

Considering the allocated budget from PMU described in (1), sub-PMU will make final screening of applicants based on the prioritisation made in the above 2). The result of final screening shall be subject to approval of the sub-PMU committee.

In case a considerable number of farmers groups are classified into same priority, it is recommended to select the farmers group at downstream, who may have more possibility to suffer from water shortage at present condition as well as in the future.

(b) Screening and selection of target farmers for individual farmer based drip irrigation system

1) 1st screening (pass or fail)

Applicants (farmers) will be screened based on the following screening criteria:

- Farm land shall be located in the focal area of citrus or vegetable cultivation identified by agriculture and value chain sectors,
- Water management system shall be sufficiently functioned in *chak* level, and
- Application form shall be properly and completely prepared and submitted to sub-PMU.

2) Prioritisation for final screening

Based on the application forms submitted by applicants and discussions among sub-PMU, the consultant and NGO staff including site reconnaissance and interview surveys, applicants will be classified into the following prioritised farmers:

- i) 1st Priority Farmers: Farmers with condition of 40% allocation of current irrigation water to downstream farmers (deduction of irrigation water rotation time to 60% of current time)

- | | | |
|------|-----------------------------------|---|
| ii) | 2 nd Priority Farmers: | Farmers with condition of 30% allocation of current irrigation water to downstream farmers (deduction of irrigation water rotation time to 70% of current time) |
| iii) | 3 rd Priority Farmers: | Farmers with condition of 20% allocation of current irrigation water to downstream farmers (deduction of irrigation water rotation time to 80% of current time) |

It is noted that the percentage of allocation of water should be reviewed and revised in timely manner based on the result of demonstration farm, updated figures, and actual site conditions.

In case a considerable number of farmers are classified into same priority, it is recommended to select the farmer at downstream, who may have more possibility for suffering from water shortage at present conditions as well as in the future.

3) Final screening based on allocated budget

Considering the allocated budget from PMU described in (1), the sub-PMU will make final screening of applicants based on the prioritisation made in the above 2). The result of final screening shall be the subject to approval of the sub-PMU committee.

(6) Signing of MOU between Sub-PMU and Target Farmer/Farmers Group

Before commencement of the Project support, Minutes of Understanding (MOU) shall be signed between sub-PMU and target farmer/farmers' group mainly to confirm the following matters:

- Type of the works (community-based sprinkler irrigation or individual farmer-based drip irrigation) with cultivation crops,
- Project support and farmers' obligations,
- Agreement and acknowledgment of all farmers in the *chak* and WUA,
- Training programs and government support to be provided to the farmers, and
- Implementation schedule and structure (including O&M).

(7) Detailed Design and Preparatory Works

(a) Detailed design and cost estimate

Sub-PMU with support from the consultant will make a detailed design of the micro irrigation system to be constructed/installed taking into consideration farmers' view and opinion especially for location of *diggi* and pump house, alignment of pipe lines, and updated cropping pattern. Accordingly, sub-PMU with the consultant will estimate the cost and decide the amount of the Project support and farmers' contribution.

It is recommendable to include the above works in SID works for rehabilitation of irrigation facilities unless it does not cause any delay of such SID works.

(b) Application to government subsidy

Based on the detailed design and cost estimate made by sub-PMU, target farmers/farmers' groups will prepare an application to government subsidy, which is available other than the Project support as shown in Table A5.2.17.

Table A5.2.17 Government Subsidy for Micro Irrigation System

Item	Source of Subsidy
Construction of <i>Diggi</i>	Department of Agriculture
Installation of distribution pipelines	Department of Agriculture
Installation of solar panel and solar pump	Department of Horticulture
Installation of sprinkler irrigation system (kit)	Department of Horticulture
Installation of drip irrigation system (kit)	Department of Horticulture

Source: JICA survey team

(8) Construction and Installation Works

Construction and installation works of micro irrigation system will be implemented by the Project and the target farmers/farmers' groups based on demarcation agreed in MOU described in (6) generally based on the following procedure:

- i) Application to government subsidy for the works to be implemented under farmer/farmers' groups responsibility (in charge: farmer/farmers group);
- ii) After the above application is accepted by DoA and/or DoH, sub-PMU will commence the tender process for the construction/installation works to be implemented under the Project support; and
- iii) Implementation of construction/installation works by the Project and the target farmers/farmers' groups based on demarcation agreed in MOU.

It is recommendable to include the works to be implemented under the Project support in the Contract for construction works for rehabilitation of irrigation facilities unless it does not cause any delay of such Contract works.

(9) Training of Farmers and Handing Over of the Facilities

(a) General

Operation and maintenance activities including collection and management of water tariff will be fully done under farmers/farmers groups responsibility with support from the government officers such as WRD, DoA and DoH, and suppliers. Since suppliers will play important roles in operation and maintenance activities generally, it is recommendable to include clauses/provisions describing such responsibilities for operation and maintenance activities in the Contract with suppliers. Other trainings such as farming practice and marketing activities will also be provided by the Project and details are described in Sections 5.4 and 5.5.

(b) Operation and maintenance manual and training

During the construction and installation works, the sub-PMU with support from the consultant, the contractor, and the supplier will prepare the operation and maintenance manual for community-based sprinkler irrigation system and individual farmer-based drip irrigation system, respectively. Such manual should be farmer friendly, handy type, and illustrated one.

Using this operation and maintenance manual, the following training program will be organised as shown in Table A5.2.18.

Table A5.2.18 Training on Operation and Maintenance

Timing	Target Trainee	Trainer	Contents
Completion of construction and installation works	Target farmers group/ farmers and NGO staff	Sub-PMU staff / Consultant	O&M including water management based on guidelines and manuals

Source: JICA survey team

(c) Handing over the facilities

After the training for operation and maintenance, MOU for handing over will be signed between sub-PMU and target farmer/farmers' group. The MOU should include the commitment of farmer/farmers' group in the responsibility of operation and maintenance including water management and penalty provisions for improper operation and maintenance activities.

(10) Monitoring of O&M Activities

The sub-PMU with support from NGOs and the consultant will monitor the operation and maintenance activities by farmers/farmers' groups. Monitoring results will be reported to the monthly sub-PMU coordination committee meeting and evaluated by relevant officers.

If improper operation and maintenance activities are observed, warning to such farmers/farmers' groups will be made by sub-PMU, and if not improved even after the 2nd warning, penalties described in the MOU such as uninstillation of facilities supported by the Project should be applied based on the decision made by sub-PMU coordination committee.

(11) Necessity of Demonstration Farm

Under agriculture and marketing sectors, demonstration farm especially for citrus and vegetable cultivation using drip irrigation system will be established. In order to motivate the farmers/farmers' groups to save more water through the introduction of micro irrigation system, the effect of "water saving activities can contribute to increase the of farmers' income through expansion of irrigation area and improvement of quality of agro-produces" should be clearly demonstrated at demonstration farms.

Details of demonstration farms are described in Sections 5.4 and 5.5.

(12) Responsible Staff for Promotion of Micro Irrigation System

The following staff will be responsible for the above activities in the promotion of micro irrigation system:

- | | | |
|------|--|--------------------------------|
| i) | Final approval and monitoring of the activity: | Sub-PMU coordination committee |
| ii) | Overall responsibility: | Executive engineer in charge |
| iii) | In charge: | Assistant engineer in charge |
| iv) | Supporting: | Junior engineers in charge |

(13) Recommendation

(a) Motivation of farmers and WRD field officers in water saving and change of water management system

Considering the present sense of water saving and water management system of farmers and WRD field officers described in Section 5.2.1 (2), the introduction of micro irrigation system to "water sufficient *chak* with condition of water saving and allocation of excess water to downstream" may be the challenging approach in the Project.

Especially in stage 1, therefore, JICA survey team recommends to intensively motivate the farmers and WRD field officers in water saving and change of water management through awareness program shown in (3) and demonstration farm shown in (11). In addition, lessons learnt from stage 1 activities shall be verified and evaluated by PMU, sub-PMU, NGO and the consultant and the results shall be reflected in the stage 2 and stage 3 activities.

(b) Collaboration with other components

In order to maximise the merits of introduction of micro irrigation system, it is essential to improve the soft component aspects such as farming practice, marketing, and capacity building of WUA. Proposed project activities for those aspects are described in Section 5.4 for farming practice, Section 5.5 for marketing, and Section 5.3 for capacity building.

(c) Introduction of modernized water management system

In order to maximise the Project outcomes expected from Project activities, flexibility of water management against change of water demand is essential because the following activities will cause the change of water demand at farm level:

- Water saving by promotion of micro irrigation;
- Water saving by improvement of water management; and
- Promotion of exotic vegetables, orange, and spices.

The JICA survey team proposes to introduce the modernised water management system consisting of discharge control diversion structure such as gated type diversion structure with Supervisory Control and Data Acquisition (SCADA) system aiming at the flexible and optimum water management in irrigation system without increase of manpower for its operation.

Meanwhile, drastic change of water management custom may cause confusion in farmers, water master as well as WRD field level officers. In order to avoid unnecessary confusion at the field level, it is proposed to introduce the above discharge control diversion structure with SCADA system through step by step as future plan of WRD and not to include the scope of works of RWSLIP.

5.2.6 Sub-component 1-3: Introduction of WUA Constructive Facilities

(1) Orientation and Selection of Facilities by WUA

After the selection of candidate irrigation sub-projects by PMU and before the walk-through survey, the sub-PMU will organise orientation for WUA members regarding Sub-component 1-3: Introduction of WUA Constructive Facilities. Main agenda of orientation is shown in Table A5.2.19:

Table A5.2.19 Orientation for Introduction of WUA Constructive Facilities

Trainer	Trainee	Contents
Sub-PMU (district level)/ Consultant	Sub-PMU staff (field level) NGO staff (field level) WUA members	<ul style="list-style-type: none"> - Basic concept of introduction of WUA constructive facilities under RWSLIP (improvement of ownership and income generating activities) - Project support and conditions for application (no compensation for required land and O&M activities) - Sample of facilities and benefit expected from each facility - Discussions for selection of type of the facilities, required function and basic design of the selected facility.

Source: JICA survey team

The WRD field officers, NGO staffs and the consultant should facilitate WUA members to discuss the required functions and basic design for the selected facility to improve their sense of ownership.

For gender mainstreaming in WUA activities, views and opinions from members of women-wing should be fully considered and reflected for the above selection of type of facilities.

It is noted that for the irrigation sub-projects rehabilitated under RAJAMIIP or RWSRP, WUA office building has been already constructed, and no WUA constructive facilities will be provided unless otherwise approved by PMU.

(2) Walk-through Survey for the Determination of Location and Details of Facilities

To confirm and determine the location and details such as size and specifications of the proposed facility selected in the orientation, a walk-through survey should be conducted among sub-PMU officers, WUA members including women-wing, SID consultant, the consultant, and NGOs. It is preferable to conduct this walk-through survey at the same time with Sub-component 1: Rehabilitation of Irrigation Facilities.

After the walk-through survey, the works for this sub-component will be generally incorporated to the works under Sub-component 1-1: Rehabilitation of Irrigation Facilities.

(3) Collaboration with Other Components

In order to maximise the merits from this sub-component, collaboration with other components especially of Component 2: Fostering and Capacity Enhancement of Water Users Organizations is essential. Detailed proposed activities under Component 2 are described in Section 5.3.

5.2.7 Sub-component 1-4: Support for Women Friendly Activities

(1) Orientation for Women-wing and Representatives of WUA

After the selection of candidate irrigation sub-projects by PMU and before the walk-through survey, sub-PMU will organise an orientation for members of women-wing and representatives of WUA regarding Sub-component 1-4: Support for Women Friendly Activities. Main agenda of orientation is shown in Table A5.2.20.

Table A5.2.20 Orientation for Support for Women Friendly Activities

Trainer	Trainee	Contents
Sub-PMU (district level) / Consultant	Sub-PMU staff (field level) NGO staff (field level) WUA members	<ul style="list-style-type: none"> - Objective and target goal of women friendly activities (trigger by the active movement of women-wing in WUA, reduction of workload, and increase of income generation). - Project support and conditions for application (no compensation for required land, acknowledgment of representative of WUA, and responsible for O&M activities). - Sample facilities and trees; and benefits expected from each facility and tree. - Discussions for selection of type of facilities and trees.

Source: JICA survey team

(2) Walk-through Survey for Determination of Location and Details of Facilities

To confirm and determine the location and details such as size and specifications of the proposed facility selected in the orientation, a walk-through survey should be conducted among sub-PMU officers, members of women-wing, representatives of WUA, SID consultant, the consultant and NGOs. It is preferable to conduct this walk-through survey at the same time with Sub-component 1-1: Rehabilitation of Irrigation Facilities.

After the walk-through survey, the works for this sub-component will be generally incorporated into the works under Sub-component 1-1: Rehabilitation of Irrigation Facilities.

(3) Collaboration with Other Components

In order to maximise the merits from this sub-component, collaboration with other components especially of Component 5: Gender Mainstreaming in Agriculture and Water Sector is essential. Detailed proposed activities under Component 5 are described in Section 5.6.

(4) Recommendation

Especially for construction of women friendly facilities and trees, it is recommended to encourage the contractors to employ the members of women-wing as labourers for construction works considering ownership for facilities and gender mainstreaming in construction works.

5.3 Component-2: Fostering and Capacity Enhancement of Water Users Organisations

5.3.1 Constraints and Issues in WUA Sector

The constraints found through the review of existing data, documents, and field survey are listed as follows:

(1) Lack of Coordination and Support for WUA by WRD

After PIM is introduced in the existing irrigation system, it is sometimes observed in the previous project that WRD has been handing over irrigation schemes to WUAs without enough consideration on WUAs capacity on water management. It seemed that WUA members were provided several but not systematically arranged series of training during the project. It should be planned in the original project plan that weekly meetings of the project committee (umbrella organisation of WUAs) members with WRD engineers in circuit office was conducted continuously if it is major scheme. However, there seems that there are no regular meetings, and WUA members visit WRD divisional or sub-divisional office when needs arise eventually. In RAJAMIIP, it is regrettably noted that WRD focused more on construction works but does not have enough human resources and budget for management of irrigation scheme.

(2) Technical Support Group

The technical support group (TSG) is the most beneficial system to WUAs in getting continuous guidance in improving agriculture's productivity and efficiently utilising their water resources. However, in most places, TSGs are not functioning effectively due to lack of adequate support from government officials since the expected role of DoA staff was not clear, and the involvement of WRD in soft component was so limited at the district level. Although WUA-TSG was managed well rather

than the district-TSG with active facilitation of NGO field staff, it was not fully utilised. It seems that the activities of TSG were additional tasks for TSG members, in particular for government staff because they have been fully occupied with their own task/duty and planned activities.

(3) Financial Resources of WUAs

Financial status is not stable in WUAs because revenue is so limited due to (i) less profitable water tariff setting (INR 150/ha basically), (ii) less collection rate of water charges due to less ownership, and (iii) limited scope for resource mobilisation for financial sustainability. Those financial constraints cause lack of support of water masters in management and maintenance of record. Regarding the water tariff setting, it is difficult to improve the situation by WUA without WRD's involvement. In some WUAs of RAJAMIIP, annual membership fee collection was introduced to cover running cost of WUA activities, but the collection of fees or charges often depend on availability of water and credibility of WUA. Since WUAs were formed in a short period, and support of the project was also terminated shortly after completion of construction work, WUAs do not have enough knowledge and experience to plan for resource mobilisation.

(4) Gender Issue

The females are much involved in farming activities but their participation in the function of WUAs is limited due to social customs in their communities. WUA membership is recognised as property for family's male member of the household and tends to think that he just represents his family including female members. It appears to be a general idea, but practically the information is not shared within the household in most cases. On the other hand, there are few women WUA members. Although there is no restriction for women WUA membership in any policies, acts, or rules, it is difficult for women to be WUA member because the membership is limited to landowners where there is a few women owned land in their name. Detailed information is given in Sections 2.7 and 5.6.

(5) Training and Capacity Building of WUAs

For sustainable management of WUA, substantial long-term effort on training and capacity building of WUA is required, much more than the limited training that was provided under the project. Under the RFPMS Act, officials of WUAs are elected for five years so that education required or necessary in their positions is available when new untrained officials are elected. In RAJAMIIP, however, new WUAs have been elected at the time of closure of the project, in case most of the WUAs such as the office bearers of these WUAs, are untrained and not aware of their roles and responsibilities.

5.3.2 Approaches and Countermeasures in WUA Sector

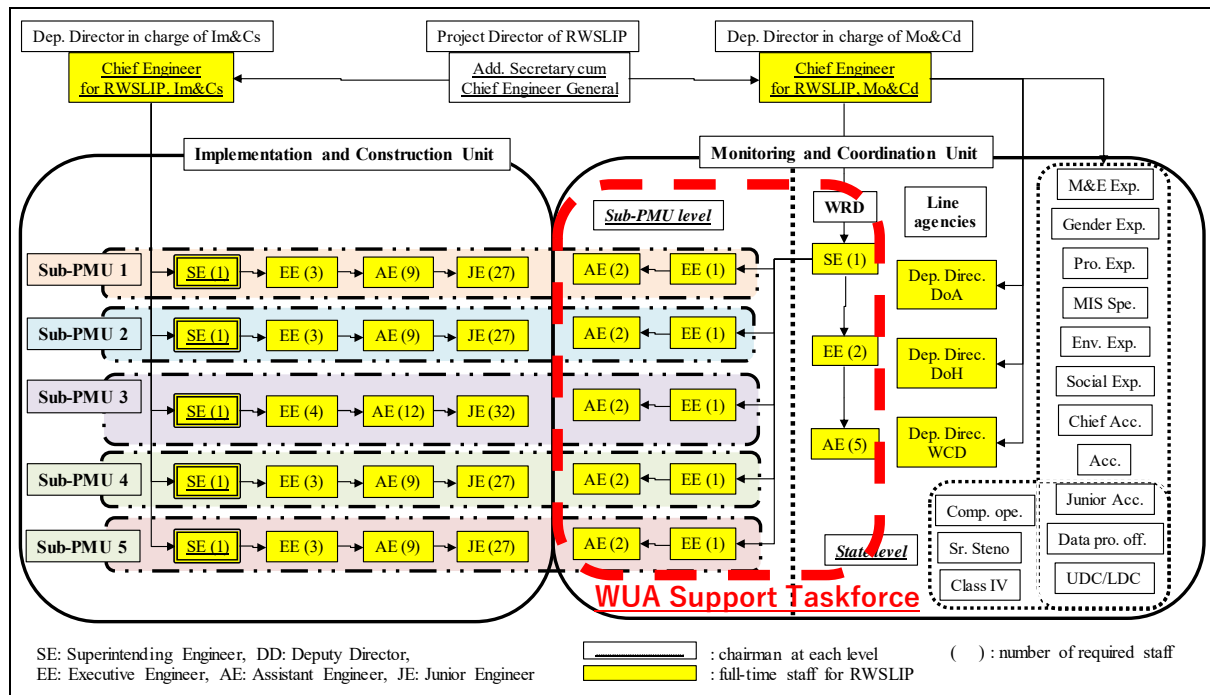
(1) Establish WUA Support Mechanism for Sustainable and Effective Management of WUA

It was found that limited government support, in particular, the involvement of WRD to WUA affects the ability of WUA on its management and sustainability. Since originally, the *raison d'etre* of WUA is the management of water, it is important to provide practical feedback by WRD and DoA based on the availability of water after completion of the work. To address the issues, the JICA survey team proposes to establish WUA support mechanism as follows:

- Strong involvement of PMU on monitoring of WUA;
- Utilisation of NGO for quality implementation of soft component activities;
- Mobilisation of TSG through regular interaction; and
- Capacity development of WRD, DoA, and NGO staff on water management including irrigated agriculture and WUA management.

Through this mechanism, related organisations are expected to monitor WUA management and progress of activities closely and to provide timely advice not only to WUAs but also to project management. Through the practices, WRD is expected to assign staff in charge to monitor WUA activities including roles of gender desk permanently by the end of the Project. For that purpose, establishment of official support division in WRD is required, but allocation of budget and assignment of full-time staff is not realistic at this moment. Therefore, JICA survey team proposes to organize "WUA Support Taskforce" within PMU as shown in the following Figure A5.3.1 and the engineers

assigned to the position will be future WUA support officers. This taskforce will be institutionalized as WUA support division under Quality Control Department of WRD after the Project.



Source: JICA survey team

Figure A5.3.1 WUA Support Taskforce

(2) Enhance Ability of WUA on Water Management and Organisational Management by Well-organized Training Package of OJT

As mentioned earlier, the capacity building on water management is essential for WUA since WUA’s most important role is the management of irrigation water. Capacity building on water management includes not only the management of irrigation scheme but also the irrigated agriculture so that WUA and water users can develop appropriate cultivation plan to available water. And it is expected that efficient management of WUA will improve collection ratio of water charges. At the same time, formation process and quality of WUA members also affect organisational management fundamentally. Therefore, the JICA survey team proposes to ensure quality and sustainable WUA management through the following steps:

- i) Formation of WUA in transparent and participatory way,
- ii) Introduction training on water management and organisational management,
- iii) Follow-up training on water management and organisational management after one year of completion of construction work, and
- iv) Regular OJT on water and WUA management through monitoring of WRD and TSG.

(3) Improvement of Agricultural Technology and Linkage

Without increase in agriculture production, the irrigation scheme cannot be successful in livelihood improvement. More enhancements should be given to input advanced agricultural practices on efficient use of irrigation water. It also ensures the sustainability of WUA and utilisation of irrigation scheme. Although DoA has their field level agency such as the Farmer Services Centre (FSC) known as Kisan Sewa Kendra in the village, there is not much coordination between WUA and Famer Services Centre. It results to lack of opportunity to participate to programs such as training, workshop, and subsidies provided by DoA. To get timely and appropriate information on agriculture technology and inputs, involving FSC with water management and cultivation plan is essential. For further application of modern technology, WUA can also form/contact the Farmers’ Club, a program of the

National Bank for Agriculture and Rural Development (NABARD) and/or Farmer Producer Organisation so that the function of WUA is enriched.

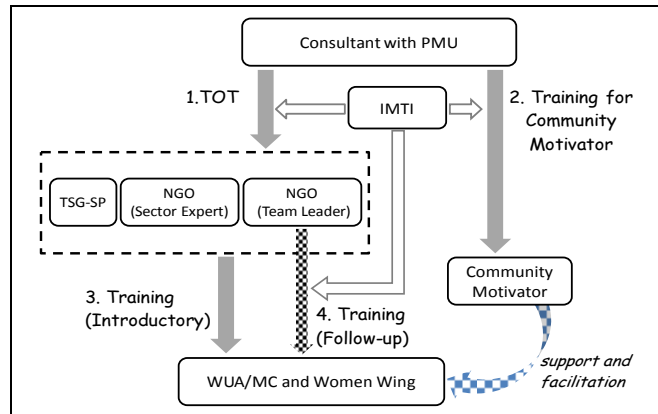
5.3.3 Proposed Activities in WUA Sector

(1) General Activity Plan for this Sector

This component consists of four sub-components: (i) Establishment of WUA support mechanism, (ii) Capacity building of WUA management, (iii) Improving of agricultural linkage, and (iv) Corpus fund for WUAs. The following are the highlight points on the objectives of activities and practical consideration:

WUA Support Mechanism

- This sub-component aims to establish support mechanism for WUA to implement the project activities as well as their regular activities.
- The consultants are responsible for the overall training activities under this sub-component while WRD field staff is responsible for meeting and monitoring in the field level.
- TOT on water management and WUA management is provided to TSG-SP members, district or *Gram Panchayat* level officers of each organisation, and NGO staff (team leader/sector expert). TSG-SP members and NGO staff are expected to be the resource person in training for WUA managing committee (MC) members.
- Community motivator is also trained on water management and WUA management, in which they assist TSG-SP and to conduct WUA level activities supporting WUA and women-wing.



Source: JICA survey team

Figure A5.3.2 Training Mechanism

Capacity Building of WUA Management

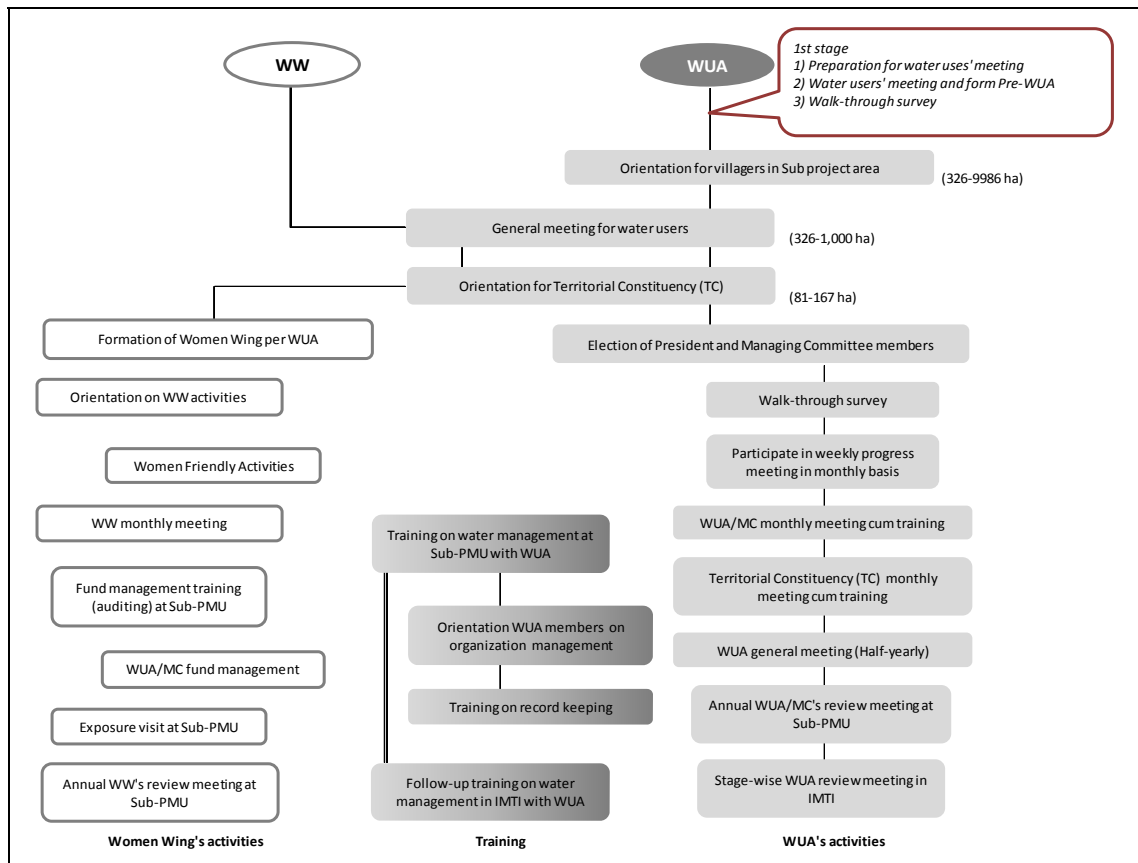
- This sub-component aims at building capacity of WUA not only through training but also the opportunity of peer learning such as annual WUA review meeting and stage-wise WUA review meeting. In those meetings, good WUAs are awarded to promote their practices to other WUAs. Sample selection criteria on awarding WUA is given in Attachment 5.3.2.
- To make WUA active and sustainable, its emphasis is to form WUA democratically by providing information in each layer such as sub-project area, WUA area, and territorial constituency (TC)² area. Monthly TC meeting is expected to unite the water users toward WUA and water management.
- In the monthly meeting of the managing committee (MC) and TC, short lecture on seasonal topics is given to the participants by TSG-SP members and/or NGO staff. Topics are related to water management as well as agriculture, gender, and environment, which are selected in

² Every WUA area has been divided into territorial constituencies (TCs) on the basis of following norms: Area up to 500 ha=4 TCs, Area from 501 ha to 1000 ha=6 TCs. In this report, number of WUA is calculated by dividing CCA by 1000 (ha). Example for sub-project of 6,500 CCA, number of WUA is estimated as 7 (=6500/1000). Area of each WUA is estimated 928.57 ha (=6500/7). Thus, number of TCs is supposed to be 6.

the monthly TSG-SP meeting. Necessary instruction and information is also given to community motivator in the meetings.

- Because there may be no time for the preparation in the 1st stage, it is suggested to form pre-WUA as temporary organisation until official WUA MC members are elected. It is formed by mutual consent of water users when they conduct the walk-through survey. Official processes for forming WUA and electing MC members are proceeded at the same time.

The following Figure A5.3.3 shows the flow of WUA formation process and activities:



Source: JICA survey team

Figure A5.3.3 Flow Chart of WUA Formation and Activities

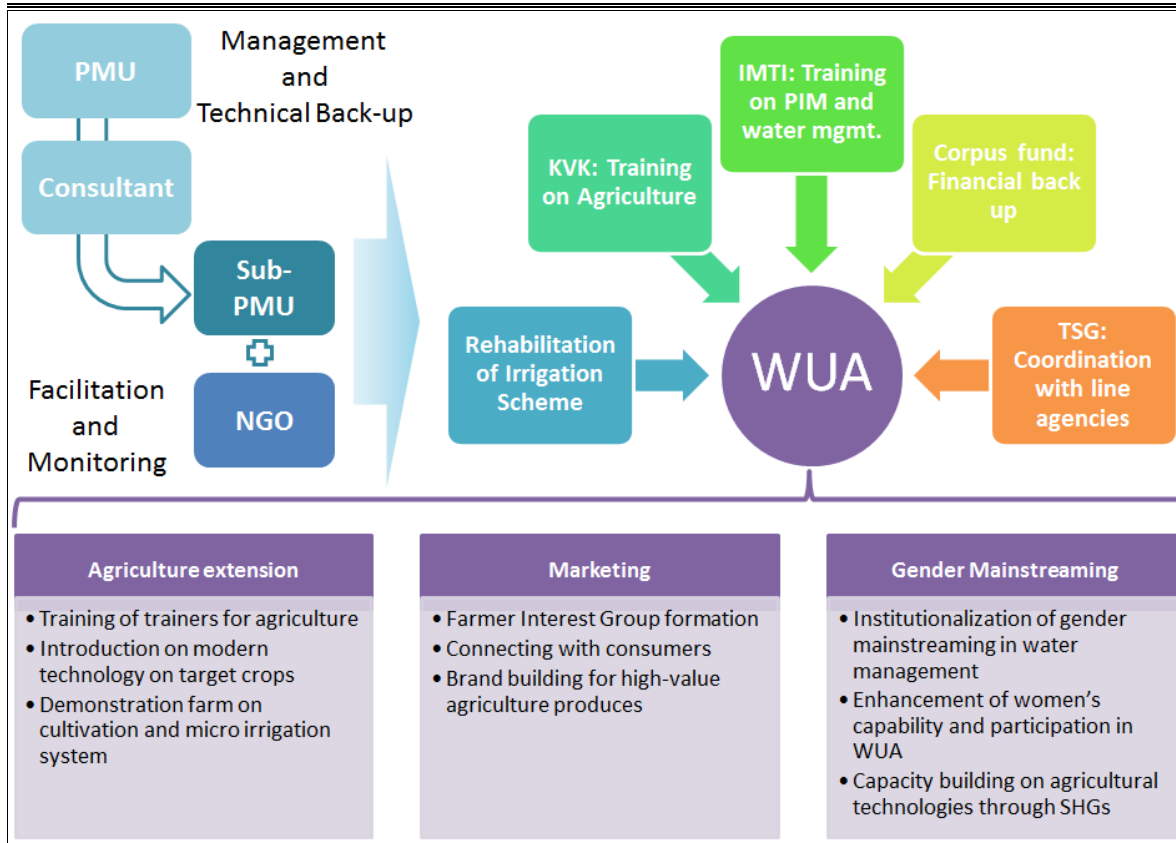
Improving of Agricultural Linkage

- This sub-component aims at utilising existing agricultural organisations and schemes in the village level. No additional input is provided but activities are conducted using existing schemes in coordination with DoA and other agricultural organisations.

Corpus Fund for WUAs

- After completion of rehabilitation work, a certain amount of fund shall be provided to WUA's account for fund of sustainable management of irrigation scheme. WUA can utilise interest of the fund after one year. The Project supports the smooth transfer of fund to WUA as well as WUA to utilise the interest.
- The Project should evaluate the actual management of the existing corpus fund in RAJAMIIP, then revise the system of the fund, if necessary.

Activities other than those above, WUA are supported through various activities of different components such as agriculture and marketing as shown in the following Figure A5.3.4.



Source: JICA survey team

Figure A5.3.4 Support for WUA

(2) Activities in this Sector

To obtain fruitful result with the abovementioned approaches in this sector, the following project activities are tentatively proposed, and the details are given in Attachment 5.3.1:

- i) Establishment of WUA support mechanism,
- ii) Capacity building of WUA management,
- iii) Improvement of agriculture linkage, and
- iv) Corpus fund for WUAs.

Table A5.3.1 Activities for WUA Establishment

Items	Activities
1. Establishment of WUA Support Mechanism	1) Development of project materials (a) Develop training materials (b) Leaflet on the project concept and activities 2) Orientation and training in different level (a) TOT for TSG-SP members and NGO staff (b) Training for community motivator 3) Project management activities (a) Planning workshop in sub-project (b) Monthly sub-PMU meeting (c) Monthly TSG-SP meeting (d) Monitoring of the activity progress
2. Capacity Building of WUA Management	1) Formation of WUA (a) 1st stage 1) Preparation for water users' meeting

Items	Activities
	<ul style="list-style-type: none"> 2) Water users' meeting for pre-WUA formation and to form pre-WUA 3) Support to participate in walk-through survey (same as 3) - (a) 4) Conduct same activities under (b) (b) 2nd and 3rd stage <ul style="list-style-type: none"> 1) Orientation for villagers in sub-project area 2) General meeting of water users in WUA area 3) Orientation for territorial constituency 4) Election of president and managing committee members of WUA 2) Capacity building activities <ul style="list-style-type: none"> (a) Training for MC members on water management in sub-PMU (b) Orientation for WUA members organisation management (c) Training for accountant of WUA for record keeping (d) MC monthly meeting cum training (e) Territorial constituency monthly meeting cum training (f) Annual MCs' meeting in sub-PMU (g) Stage-wise WUA review meeting in IMTI (h) Follow-up training for MC members on water management in IMTI 3) WUA management <ul style="list-style-type: none"> (a) Support MC members to participate in the walk-through survey (b) Support MC members to attend weekly progress meeting in the site on monthly basis (c) Support to conduct general meeting of WUA
3. Improvement of Agricultural Linkage	<ul style="list-style-type: none"> 1) Strengthen linkage between farmers and agricultural organisation <ul style="list-style-type: none"> (a) Conduct monthly coordination meeting (b) Invite agriculture supervisor to MC/TC monthly meeting (c) Coordinate with existing farmers organisation 2) Conduct agricultural demonstration <ul style="list-style-type: none"> (a) Establish demonstration plot to promote seasonal technology (b) Conduct farmers field day in demonstration plot
4. Corpus Fund for WUAs	<ul style="list-style-type: none"> 3) Providing corpus fund to WUAs 4) Monitoring corpus fund management

Source: JICA survey team

5.4 Component-3: Irrigated Agriculture Intensification and Diversification

5.4.1 Constraints and Issues in Agriculture Sector

(1) Harsh Natural Conditions

Rajasthan is the largest state of India area-wise. The arid and semi-arid areas constitute about two-third of total geographical area of the state. In recent time, Rajasthan has experienced severe and frequent spells of droughts than any other region in India. There have been 48 drought years of varied intensity during last century (i.e. from 1901 to 2002). The number of severe and very severe drought years is larger in the western and southern part of Rajasthan, even though the southern region receives high average rainfall (GoR, 2011). Many places in Rajasthan have witnessed flash floods due to heavy rainfall events (GoI, 2012).

A gradual decreasing trend in the mean annual temperature for the region of northwest India including Rajasthan has been observed. After Jammu and Kashmir, Rajasthan is the second state where maximum number of cold waves has occurred.

On the contrary, the year of 2016, Rajasthan was hit by severe heat wave in May and June. The temperature rose up to the highest record of 51°C. Along with high temperature, several thunder

storms and hail stones damaged field crops, fruits trees, animals (sheep and goats) and even caused loss of human lives.

(2) Insufficient Extension Services

The situation assessment survey of farmers conducted during the 59th round of the National Sample Survey (NSSO, 2005) provided valuable insights into reach of extension services across India. The data collected from 51,770 households in 6,638 villages showed that 60% of farmer households did not access any information on modern technology that year. For the farmers who accessed information, progressive farmers and the input dealers were the main source of information. Broadcast media was also used a great deal to obtain information, which included radio, television and newspapers. The public sector extension worker was a source of information for only 5.7% of farmer households interviewed and the *Krishi Vigyan Kendra* (KVK) accounted as an extension source for only 0.7% of the sample farmers. Private and NGO services were accessed by only 0.6%.

Even though “the Packages of Practices” (cultivation guideline for cereals, pulses, oilseeds and several commercial crops) of DoA were revised every 2-3 years, “the Packages of Practices”(cultivation guideline for fruits, vegetables, flowers, spices and medicinal plants) of DoH were not revised for more than 10 years. They only published several leaflets for limited crops.

(a) Insufficient Number of Extension Officers

Extension in today’s Rajasthan, includes all those organizations in the public, private, NGO and community based organizations that provide a range of agricultural advisory services and facilitate technology application, transfer and management. While public sector line departments, the Department of Agriculture was the main agricultural extension service provider in the 60’s and 70s. However the last two decades have witnessed the increasing involvement of private sector, NGOs, community based organizations and media. With the external support drying up with the end of the T&V (Training and Visit) system of extension in the early 1990s, states have been left to fund their extension machinery and this has led to considerable weakening of public sector extension.

In terms of number of staff and organizational reach, the public sector extension staff of the Department of Agriculture (DoA) of the states dominate extension provision in India. Most of the extension personnel that are present perform multiple roles. Their visits to the field are irregular as the service is pre-occupied with the implementation of government schemes linked to subsidies and subsidized inputs. “Although farmers require information for the whole food and agriculture value chain, the public extension system largely concentrates on on-farm activities.

Actual number of assistant director of agriculture extension in Department of Agriculture (DoA), Rajasthan, it is 103 and vacant posts are 48. This statistics means that more than 31% posts of higher extension staffs are vacant in DoA. The number of Agriculture Supervisors (village level extension workers) in DoA, Rajasthan is 6,472 and vacant posts count 3,134. This shows that more than 32% posts of field level extension worker are vacant in DoA (2014-2015, DoA).

Moreover, the number of Agriculture Supervisors in Department of Horticulture (DoH) is only 349.

(b) Insufficient Budget for Public Extension Services

Low operational budgets, with 85–97 percent of expenditures going to salaries, limit the ability of DoA staff to visit farmer fields (Sulaiman and van den Ban 2003). Lack of adequate resources also constrained the DoA in continued education of their field staff on ways of dealing with new and evolving challenges. Compared with the DoA, the other line departments, such as animal husbandry, fisheries, horticulture, sericulture do not have adequate field personnel. For instance, the state Departments of Animal Husbandry (SDAH) -the major stakeholders for the livestock development in India is mostly dominated by animal health concerns with negligible attention to production related advice to farmers. Moreover, their spending on livestock extension activities is only around 1–3% of their total budget (Chander et al 2010). Research and Extension in some of the select commodities such as Rubber, Spices, Coffee, Tea and Medicinal plants are handled by the respective Commodity Boards functioning under the Central Ministry of Commerce.

(c) Insufficient Information to Farmers

Farmers are waiting for the visit of extension staff to their field to get customized information fit to their needs. However, public sector extension sources are very limited in size and frequency. DoA has provided Agriculture Supervisors who could work in village level. However, there are many vacant posts. Insufficient information may leave farmers exposed to inappropriate products and can limit firms' ability to respond to farmers' needs. For instance, if they are not able to quality seed on time and appropriate volume, they will fail to harvest expected amount (Robert Tripp and Suresh Pal, 2000). Advanced, rich farmers may get sufficient information from public and private extension providers on cultivation techniques and subsidies from many schemes. On the other hand, marginal and small, poor farmers are out of their scope. Even they cannot reach the information of trainings from lined departments.

(3) Water Stagnation and Salinization

In the wake of irrigation development, the problems of rising water table and salinity development have emerged in the Indira Gandhi Nahar Priyonjna (IGNP) area. The delta of irrigation has come down in recent years to around one meter that is much higher than the stipulated value of 0.51 m in Stage-1. In Stage-1, heavy water logging was observed at many places. It is estimated that about 49.6% of the command area monitored will be sensitive to water logging by the turn waterlogged areas.

(a) Excessive Water Use

In IGNP area, water table was mostly between 15 to 40m before the start of the project. With introduction of irrigation, the water table has built up progressively. As per GWD (Ground Water Department) norms, the water table between 6- to 1.5 m from the soil surface is considered sensitive and that within 1.5 m from the surface is considered critical.

The cause of water logging is evident. There was a no provision for drainage of excess water. Moreover, direct outlets from main canals to the farm holdings continue to draw unlimitedly supply of water. The situation of over irrigation, which initially arose out of concern to make use of the allotted share of water from the Harike Barrage, is perpetuating as the farmers were attuned to using more water than optimally required by the crops (ICAR, 1992).

The land in this area does not have much capacity of water absorption. In many areas, the upper layer of the soil has a rocky layer of calcium carbonate and the Kankar pan is only 4 – 10 feet below. Because of this, surplus water cannot go inside and water gets collected on the surface giving rises to the problem of water logging in the area.

(b) Transpiration from Sandy Soil

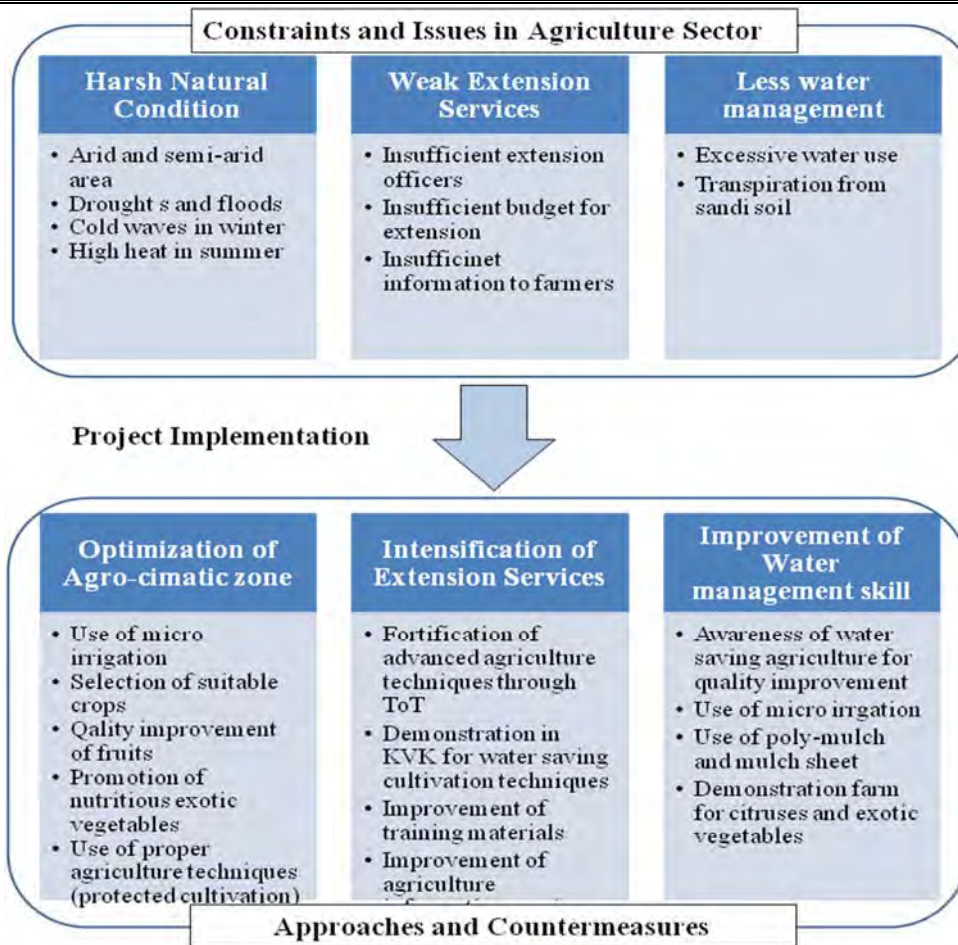
Salinity has become serious problem. The continuous loss of arable land due to irrigation in arid and semi-arid regions is derived from over-exploitation and mismanagement of water.

Agricultural losses caused by salinity are difficult to assess but estimated to be substantial and expected to increase with time. Secondary salinization of agricultural lands is particularly widespread in arid and semi-arid environment where crop production requires irrigation schemes.

Salinity is one of the most severe environmental factors limiting the productivity of agricultural crops. Since most crops are sensitive to salinity caused by high concentration of salts in the soil.

Salinization commonly occurs as an outcome of agricultural practices, either associated with irrigation or due to long – term changes in water flow in the landscape that can follow land clearance or changed water management.

Salinity is a major threat to irrigated agriculture because many of the soils and irrigation waters contain significant amount of dissolved salts. Due to excessive evapotranspiration in arid and semi-arid regions, the secondary salinization is becoming important factor for salinity. (Kumar, A, 2012).



Source: JICA Survey Team

Figure A5.4.1 Expected Project Effects

5.4.2 Approaches and Countermeasures in Agriculture Sector

(1) Optimization of Agro-climatic Zones based on Water Requirement

The biggest issue concerned optimization of the advantage of agro-climatic zones is no awareness of saving water. Upstream farmers/rich farmers dominate water and even apply excessive irrigation. Even they have caused water logging in some area. Optimum use of irrigation is a key to solve this issue.

Farmers shall understand that adequate irrigation brings about high quality crops and they would fetch good rate.

BOX: Three Reasons for High Sweetness of Rajasthan Products

Based on our survey, interesting result was found in terms of quality of vegetables and fruits in Rajasthan. Even though the number of sample is small, the tendency of high TSS (Total Soluble Solids) is observed. TSS usually means TSS in juice from vegetables or fruits. It is thus a good assessment of sweetness.

Name of Vegetables / Fruits	TSS (%) in Rajasthan	TSS (%) in Japan
Kinnow orange (Sri Ganganagar)	14-16	12-14 (Unshu-mikan)
Santra orange (Jhalawar)	14-17	10-14 (Ponkan)
Cucumber (Jaipur, poli-house)	8	2-3
Tomato (Jaipur, poli-house)	8	4-5

Supposedly, there are 3 reasons of high sweetness of agricultural products in Rajasthan.

- Temperature gap between day and night becomes a stress and it improve sweetness

Usually, cloudless nights are colder than cloudy nights. This is because cloud cover in the night prevents the heat (near the surface) from escaping into space; on the other hand, cloudless night allows the heat to escape reducing the night temperature.

This is true in the case of deserts as there is no cloud cover over the desert due to absence of enough moisture in the air. Rajasthan is a semi-desert area as it lies in the rain-shadow area of the Aravalli Mountain Range. Naturally, the difference between day and night temperature will be more.

ii) Sandy soil: intermittent of fertilizer becomes a stress and it can improve sweetness

Compared with application of granule chemical fertilizer, application of liquid fertilizer is easy to use since it will be diluted with water. Quick response from crops will be expected. By combination with mulching, fertilizer absorbing minute roots will be developed just underside of mulching. Therefore, amount of fertilizer should be reduced. Based on the growth of plant, it is possible to apply fertilizer on time. Overuse of fertilizer hinders growth of plant.

iii) Scarcity of water: intermittent of water becomes a stress and it bring about sweetness

Report of NARO (Mitsunori Iwasaki, 2012) proved that water stress by dryness (intermittent of water) promoted effective production of sweet oranges. In case of tomato, TSS is 6 degree and water content is 94% in control group (ordinary water application). Compared to the control group, TSS is 7, 10 and water content is 93% and 89% in less water applied tomato group (Sakamoto, et al., 1999)

It is well known that the Brix values of tomatoes increase under water-stressed conditions. In this study, the water stressed condition is caused by irrigation of NaCl solution. Concentration of 400,800, 1,200, and 1,600 ppm were used. At the blocks of 1,600ppm, tomatoes withered. As the concentrations increased, the Brix values of tomato became higher, but the weight of the tomatoes decreased. The water potential of the leaves decreased and the osmotic potential increased as the concentration increased. The concentration of Na and Cl ions in the tomatoes increased under the saline irrigation.

This theory is also applicable to spice crops and medicinal plants to improve aroma and medicinal property.

(a) Use of Micro Irrigation

To optimize use of water, micro irrigation (sprinkler and drip irrigation) is recommendable. Sprinkler is applicable to cereals, pulses and oilseeds. Drip irrigation is applicable to vegetable and fruit cultivation. In particular, drip irrigation with mulching is most effective to save water.

(b) Selection of Suitable Crops to Each Agro-climatic Zone

To optimize the criteria of “Agro-climatic Zone”, suitable crop to each climatic zone is selected mainly based on water requirement. Department of agriculture of Rajasthan recommends to cultivate water-wise crops like barley, gram, mustard, linseed, coriander, cumin and *isabgol*. These water-wise crops are categorized to three types based on the use of water as below shown.

1) Promotion of Cereals, Pulses and Oilseeds

Since cereals, pulses and oilseeds have numerous types and varieties which have its own characteristics in terms of water consumptions and resistance to water shortage, crop types and varieties should be carefully selected based on the agro-climatic conditions and other actual conditions at sites. In the Project the following varieties and crops are recommended to introduce widely as being suitable to cultivate with sprinkler for saving water more.

Table A5.4.1 Cereals, Pulses and Oilseeds as Water-wise Crops

No.	Name of Crop	Total Area 2012-13 (ha)	Production (t)	Water Application in m ³ /ha
1	Barley	306,000	960,000	2,500-3,000
2	Gram	1,250,000	1,260,000	2,000-2,500
3	Lentil	27,587	30,356	2,000-2,500
4	Mustard	2,720,000	3,760,000	2,000-2,500
5	Linseed	1,061	1,023	2,500-3,000
6	<i>Taramira</i> (Rocket)	110,000	54,634	2,000-2,500

Source: JICA survey team

2) Promotion of Spices

Indian government planned Agri-export Zones. In case of coriander, Kota, Bundi, Baran, Jhalawar and Chittoragarh are set up. As of Cumin, Nagaur, Barmer, Jalore, Pali and Jodhpur are set up as Agri-export Zone. Although fenugreek is not chosen as a crop for Agri Export Zone, it is promising spice in Rajasthan since it is the largest fenugreek production (57.99%) state in India.

Compared to vegetables, most of cereals, pulses and oilseeds, spices are less water requirement. For example, water requirement for cumin is 335m³/ha and for coriander 300-350m³/ha. Less water

application makes seed spices more aromatic since water stress improves the quality. However if water application is too less, quantity will be less. Adequate water application is necessary.

National Research Centre on Seed Spices (NRCSS), Ajmer stated that application of pressurised irrigation like drip irrigation or micro-sprinkler systems at 50-60% of water can be saved. And it stated that drip irrigation system resulted maximum seed yield, which was 43% higher over traditional surface irrigation system.

Table A5.4.2 Spices as Water-wise Crops

No.	Name of Crops	Total Area 2012-13(ha)	Production (t)	Water Application in m ³ /ha
1	Cumin	32,080	165,030	335
2	Coriander	182,725	117,084	300-350
3	Fenugreek	55,375	64,101	1,250
4	Fennel	15,161	14,277	3,000
5	Ajwain	12,694	9,220	(usually non-irrigated crop)

Source: Compiled by JICA survey team based on the data available for the year 2013-14 from Spice Board, Gol

3) Promotion of Medicinal Plants

Rajasthan has 1911 species of medicinal plants. About 30 species of medicinal plants are found in abundance in the State. Rajasthan is divided in 6 agro-climatic areas. About 31 species of medicinal plants are suitable for cultivation in the State. 6 species such as *Isabgol*, Mehendi, Ashwagandha, Dhatura, Senna and Safed musali are being exported.

Water requirement of medicinal plants are categorized 2 types. One is large size and shape plant. Water requirement of them is 35,000 pl/ha in irrigated area and 15,000 pl/ha in dry land. The other is small size and shape plant and their water requirement is 50,000 pl/ha in irrigated area and 25,000 pl/ha in dry land. Therefore production of medicinal plants is suitable to downstream farmers and marginal farmers who are only reachable to lower water of a canal or rain fed farmers. "pl" means pico litre. A pico litre is a trillionth of a litre, which can be represented numerically as 0.000000000001/litre (10^{-12} L).

Table A5.4.3 Medicinal Plants as Water-wise Crops

No.	Type of Plant	Water Requirement in Dry Land (pl/ha)	Water Application by Irrigation (pl/ha)
1	Large size and shape plant	15,000	25,000
2	Small size and shape plant	35,000	50,000

Source: Compiled by JICA survey team based on the data available for the year 2013-14 from Spice Board, Gol

Considering the medicinal properties in the plant, less water application is better since water stress condenses the ingredients. On the contrary, yield will be declined.

The scheme of the National Medicinal Plant Board (NMPB) provides training, certification of quality seed and planting materials.

Table A5.4.4 Suitable Medicinal Plants to Each District

Division	Districts	Species
1. Eastern region	Alwar, Bharatpur, Dholpur, Dausa, Karoli	Gwarpatha (Aloe vera), Shatavari (Indian Asparagus), Anola (Amla: Indian gooseberry), etc.
2. Western region	Bikaner, Jaisalmer, Jodhpur, Barmer	<i>Isabgol</i> , Senna, guggal etc.
3. Northern region	Sri Ganganagar, Hanumangarh, Churu, Jhunjhunu,	Gwarpatha, Shatavari, Ashwagandha, Senna, Guggal etc.
4. Southern region	Rajsamand, Chittoregarh, Bhilwara, Banswara, Udaipur, Jalore, Sirohi, Dungarpur	Safed musli, Kalihari (Glory lily), Guggal etc.
5. South-eastern region	Kota, Bundi, Bara, Jhalawar, Tonk, Sawai Madhopur	Ashwagandha, Anwala, Safed musli, Kalmegh etc.
6. Middle region	Jaipur, Ajmer, Sikar, Nagaur, Pali	Tulsi, Giloy (heart-leaved moonseed), Bhoomi anwla etc

Source: Medicinal plants board

4) Quality Improvement of Fruits (*Kinnow* mandarin and *Santra* orange)

High quality orange production is potential in the area of IB-Irrigated North Zone (Sri Ganganagar, Hanumangarh) and V humid Zone (Kota and Jhalawar) under mulching with drip irrigation. By the help of these, TSS will increase more.

As a second step, low seed *Kinnow* and seedless *Santra* orange are recommendable to improve international competitiveness. The seedling of seedless *Santra* orange is newly released from the National Research Centre for Citrus, Nagpur in 2015 and distributed 4,000 nurseries to progressive farmers, nursery men, government departments and KVKs across the country. Still it is in the beginning stage, therefore, it will take time to distribute sufficient number of plants for farmers. Low seed *Kinnow* was also developed by the Punjab agriculture university.

As future consideration, quality improvement of fruits should go further to other fruits such as mango, papaya, guava, banana, *aonla* (Indian gooseberry), pomegranate, *mosanbi* (sweet lime), lemon, Malta, *sapota* (sapodilla) and lychee.

5) Promotion of Exotic Vegetables

Rajasthan has plenty of tourist spots such as Jaipur, Udaipur, Jodhpur, Jaisalmer, Bikaner, Pushkar, Sawai Madhpur, Chittorgarh, Mount Abu, Alwar and so on. Its peak season is from October to March. Not only Indian but also foreign tourists visit Rajasthan more than 30,000,000 persons including 1,450,000 foreigners per year (as of 2012). Even though the number of tourists is increasing year by year, production of exotic vegetables is still very limited. Most of exotic vegetables are imported from other states and even other countries. For the replacement of these imported ones, production of exotic vegetables under protected condition (Poly-house, net house, low tunnel, mulching with drip or sprinkler irrigation) is recommendable. According to producer group in Basedi village, it is quite profitable. Planned crop schedule is indispensable to supply exotic vegetables constantly from October to March (*Rabi* season). In *Kharif* season, they can cultivate tomato, cucumber as off-season vegetable. Seed of exotic vegetables are available in the market or mail order from private sectors.

(2) Use of Protected Cultivation (Poly-house, shade-net house, low tunnel, mulch)

It is very efficient to utilize protected cultivation method in harsh climatic condition. Poly-house is a protection from insects, birds and heat/coldness. Farmer can control inside environment of poly-house. Most of poly-house and protected cultivation method is from Israeli. Demonstration of their techniques and materials are seen in centre of excellence. They have similar weather condition in Israeli. Therefore, it is easy to apply those techniques and materials to Rajasthan. UV poly-film can protect crops from strong sunshine.

Shade-net house is effective to cultivate vegetables and fruits in *kharif* season. The net can protect crops from insects and birds attack. What is more, it provides good aeration. Too much moisture cause fungus problem. Good aeration through shade-net can reduce incidence of fungus problem. In addition, temperature inside house will not increase compare to poly-house.

Low tunnel is cheaper and easily manageable and affordable even for marginal farmers. It is usually use for early production of nursery and low height vegetables cultivation.

Mulch is very useful to save water, control weeds, keep soil temperature, and promote early germination and early maturity. Mulch with micro irrigation is the best combination to save water.

Low tunnel, shade net, mulch and drip irrigation shall be seen in demonstration farm for exotic vegetables. Mulch is shown in on-farm trial too .

(3) Production of High-value Added Fruits/Vegetables

From small survey on TSS of fruits/vegetables in Rajasthan, several farmers have already produce high TSS produces. However, they did not realise the value. If they try to improve quality as a whole, Rajasthan state will become a famous state producing high-value added crop.

To optimise the natural resources including the weather, agro-climatic zone is one of the criteria to choose suitable crops to each district.

The plan and implementation should be revised and modified after starting the project since they are not fully qualified based on the experiment in Rajasthan.

(a) Target farmers group and their attributes

Farmers who produce *kinnow* mandarin and *santra* orange: Already they produce export-quality of *kinnow* and *santra* orange. The quality has reached in international market level. If they adopt water stress method, they will be able to higher-level produces constantly.

Even this method will be applicable to other fruits such as mango, papaya, guava, pomegranate and dragon fruit.

Farmers who produce vegetables: The TSS of vegetables is higher than that of Japanese and other states. Normally the higher TSS is in vegetable, the more nutritious is in it. Farmers need to be aware of the fact. Then, they can concentrate on production of high-value vegetables.

(b) Approaches to the Target Production

To achieve the target production, the JICA survey team considers following 3 approaches;

- i) Approach-1 Awareness campaign for high value added crops
 - Testing of produces by refractometer to check TSS before project activities starting;
 - Visit demonstration farm/demonstration plot in KVKs and on-farm trials in the sub-project
 - Practices in the field for understanding of techniques
 - Testing of produces by refractometer to check TSS after project activities started.
 - Review on the results; and
 - If there is the points to be improved, modify the cultivation techniques

ii) Approach-2 On-farm trials and Demonstrations

To show practical cultivation techniques and materials, a concept of trial plots, including demonstration farms, is very effective tool. In the Project, 3 types of trial plots will be included, i.e. (i) 21 demonstration/exhibition plots in KVKs for fruits and vegetables, (ii) 11 demonstration farms for *kinnow* mandarin, *santra* orange and exotic vegetables, and (iii) on-farm trial plots for exotic vegetables and citrus at the focal sites.

iii) Approach-3 Quality improvement and marketability training

To produce high value added agro produces, it is necessary to confirm present status of the quality. Therefore it is better to check the quality at before and after conditions of implementation of project. TSS should be measured for the comparisons. Such kind of comparison would be a part of the marketing activities.

- Monitoring of the result of cultivation,
- Improvement of the quality after review, and
- Reflect the result to next season.

(c) Main Executing Body/Actor

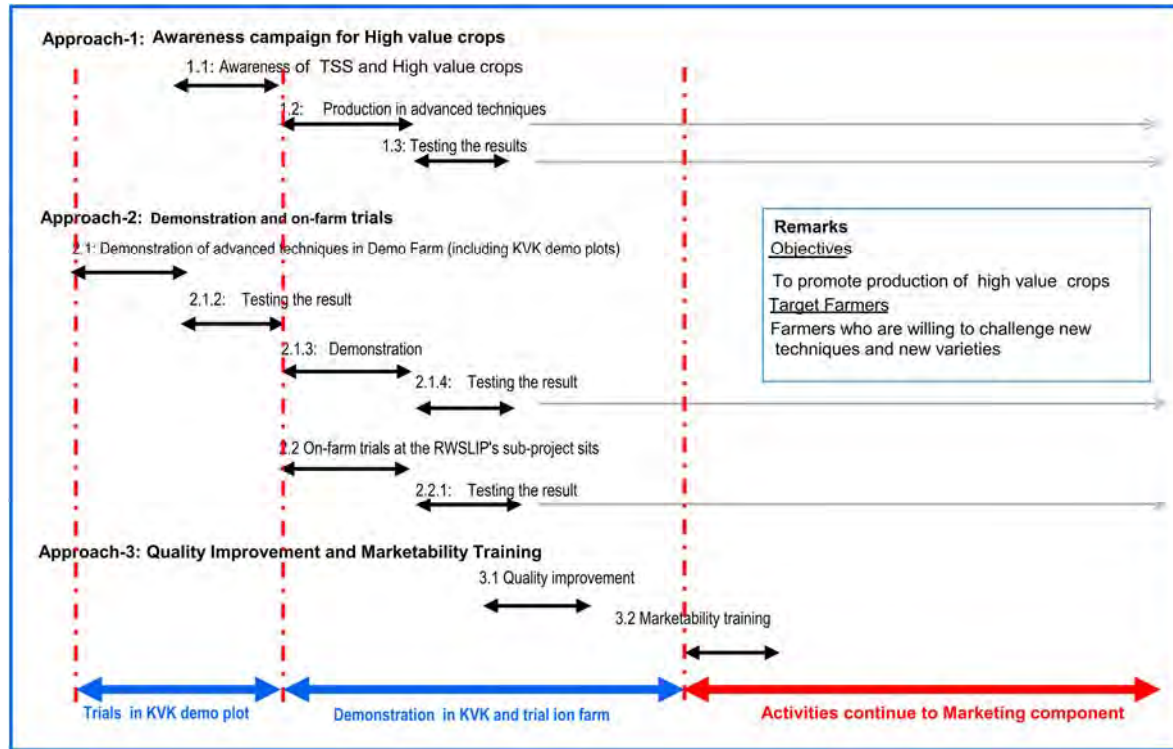
First, line departments should realise the value of farmers' produces in Rajasthan. For successful production of such high value added produces, it will take more than 3-5 years according to general experiences in Japan. Consequently, it is essential for concerned departments and KVKs to collaborate with the Project. Second, for effective dissemination of improved techniques to farmers, it is indispensable the collaboration of advanced farmers.

- i) Department of Agriculture and Horticulture,
- ii) KVKs as a venue for demonstration, and
- iii) Farmers who have already produce high value added crops for dissemination of advanced techniques

(d) Implementation Plan for High-value crop production

Farmers are normally very conventional so that it is difficult to persuade them to introduce high value crops. The most effective way is to let them understand through "Seeing is believing" process. One is

experiment and demonstration in KVK demonstration plot. However most of farmers listen to the opinion of advanced farmers in vicinity. Therefore it is important to provide demonstration plots within the sub-project sites. After checking the result, they will follow the different and new techniques or varieties. The exit of production is marketing. Without marketing, they cannot sell their produces. In final stage of production, quality improvement and marketability training (marketing survey) is planned to connect to marketing component.



Source: JICA survey team

Figure A5.4.2 Image of Production of High Value Added Agro Produces

(e) Target crops

There are various crops to suitable to each agro-climatic zone. From the marketing point of view, following crops are chosen in the Project.

Table A5.4.5 Target Crops for High-value Added Production

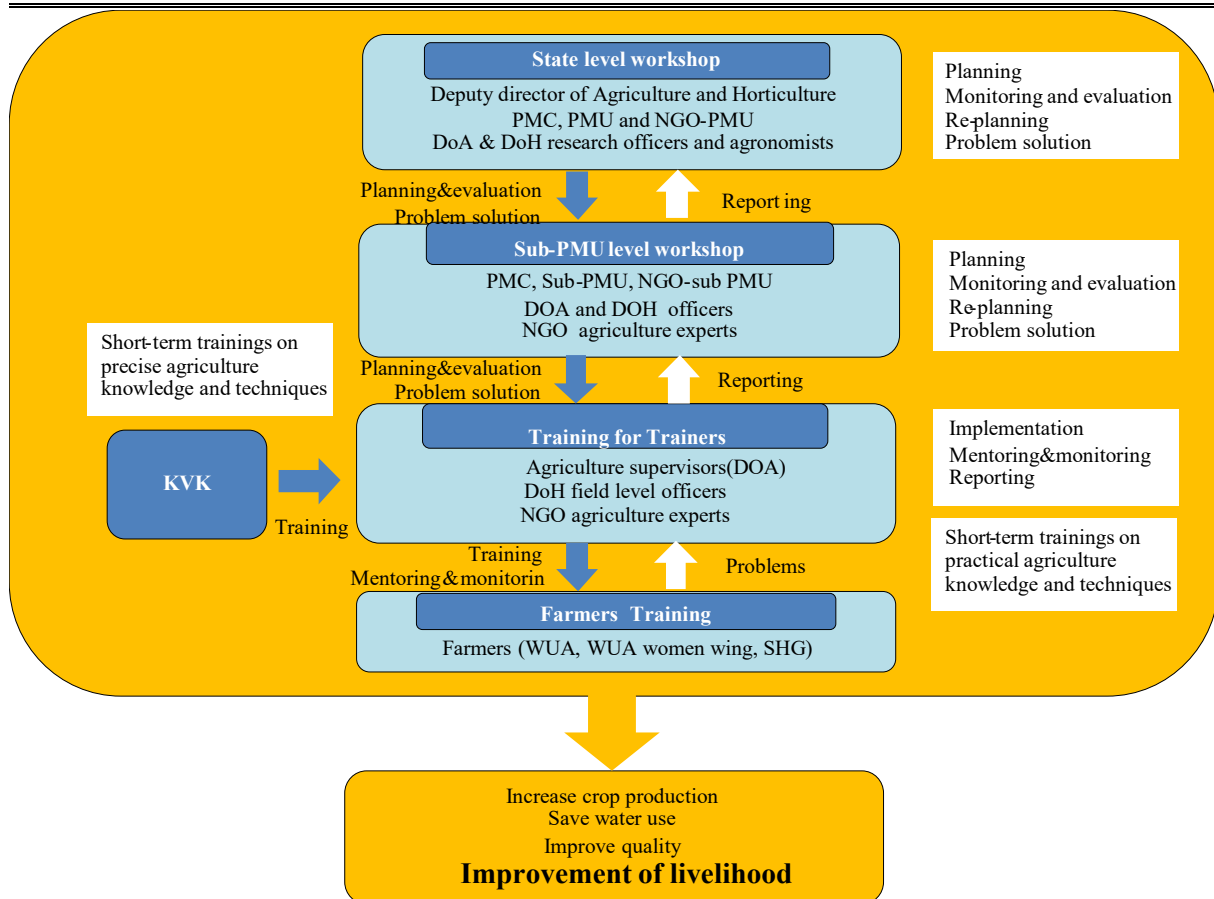
Crops	Areas	Reasons
1. Vegetables/ Fruits	Irrigated areas where have good access to the big towns.	<ul style="list-style-type: none"> - Existent farmers have already produce higher TSS vegetables and fruits in Rajasthan. - There are much potential to produce high value added vegetables and fruits since they have good natural condition. If they could understand the water stress method, they can produce high value added crops easily.
2. Kinnow mandarin	Northern area, such as Sri Ganganagar and Hanumangarh area.	<ul style="list-style-type: none"> - Existent farmers have already export their produces to other states and even other counties. If they can produce better one, they can sell their produces in higher price. - Some of them have drip irrigation system in their farm. It is easy to apply mulch to their farms.

Source: JICA survey team

5.4.3 Proposed Activities in Agriculture Sector

(1) General Activity Plan

To optimise the natural and social condition in agriculture for improvement of livelihood, following activities are proposed. Detailed activities are in Attachment.5.4.1.



Source: JICA survey team

Figure A5.4.3 Role and Responsibility of Each Player in Agriculture Component

(a) Training of trainers for agriculture

1) State level workshop (once a year)

In this workshop, PMC will chair the meeting. PMC, PMU, Deputy Director of Agriculture and Horticulture, NGO-PMU and DoA and DoH research officers and agronomists are the member of this workshop. They will make an implementation plan and review the results of activities, then make a new plan for next year. They will also discuss the issues related to agriculture such as problems raised from farmers through Sub-PMU and find the solution to them.

The most important issue to be discussed first is on high value added agro produces. They themselves need to realise the present status of the produces in Rajasthan. Refractometer will be provided to understand how the produces are higher TSS and what it does mean.

2) Sub-PMU level workshop (once a year in each Sub-PMU)

In this workshop, PMC will chair the meeting. PMC, PMU, NGO-PMU, NGO-sub-PMU, DoA agriculture supervisors, DoH field level officers and NGO-agriculture experts are the member of this workshop. They will make an implementation plan in field level. Then, DoA agriculture supervisors, DoH field level officers and NGO agriculture experts implement the plan. NGO agriculture experts and community motivators need to mentor and monitor farmers' activities in the field at least once a month. If some farmers raise a question/problem, give appropriate advice. If there is no solution, report it to Sub-PMU and get the exact answer. NGO-Sub-PMU needs to collect the *kharif* and *rabi* reports from NGO agriculture expert and review the results of activities. Then Sub-PMU needs to report them to PMU before state level meeting.

The most important issue to be discussed is on high value added produces in Rajasthan. If they realized the higher quality by using refractometer, they can guide farmer properly. Therefore, they need to understand how to use refractometer and what high TSS does mean.

3) Training of trainers for agriculture techniques

All trainings for trainers will be conducted in KVK. In these trainings, trainers (agriculture supervisors of DoA, field level officers of DoH, NGO-agriculture experts and sometimes NGO-community motivators) are trained by resource persons of KVK. If there is no suitable resource person, KVK needs to find out such resource persons.

For extension purpose, KVK needs to demonstrate the use of drip irrigation with mulch for vegetables and fruits in 0.2ha demonstration plot each. The Project will support to establish the demonstration plot in KVKs. They need to show specific crops (fruits and vegetables) suitable to the area. The list of KVKs in the project area is attached in Table B 5.4.1.

(b) Exposure visit for agriculture trainer

The agricultural method of use of drip irrigation with mulch for fruit and vegetable cultivation is not so common even though it is effective to save water. To intimate this technique, DoA, DoH and NGO need to make a plan to visit appropriate place (ex. Punjab agriculture university) and resource persons. Then they need to select 30 persons from DoA agriculture supervisors, DoH field level officers and NGO agriculture experts in focal area of citrus and exotic vegetable cultivation. Chosen participants need to learn through the field visit and lectures. After return back to their Sub-PMU, they need to disseminate the effectiveness of use of this method to improve quantity and quality of fruits and vegetables.

(c) Improvement of agriculture support system

As mentioned in Section 5.4.1 “Constraints and Issues in Agriculture Sector”, farmers eager to get agricultural information such as countermeasure for insects and diseases, market rate, subsidies application. Farmers complained lack of information even cultivation techniques.

1) Farmers friendly manuals

Department of Agriculture published and revised 20 packages of practice based on 10 agro-climatic zones, *kharif* and *rabi* seasons on cereals, pulses, oilseeds, spices and other commercial crops such as cotton, sugarcane, tobacco and *isabgol* every year. On the contrary, Department of Horticulture did not revised their package of practices on vegetables and fruits for 15 years. Department of Horticulture published leaflets for each crop instead. Though those manuals are very informative, it is not so kind to farmers, especially illiterate farmers since those manuals are not included pictorial aide. Therefore, there is a demand to provide “farmers friendly manuals” with visual aide.

First of all, PMU, PMC, DoA, and DoH needs to organize task team by 1 team leader and working group of 10 persons (composed by DoA agriculture supervisors, DoH field level officers and NGO agriculture supervisors). Detailed their works and procedure is shown in Attachment 5.4.2.

2) Strengthening of agriculture information centre

Farmers eager to get agricultural information on crops, cultivation techniques, availability of subsidy and so on. However, they cannot access such information easily. Some farmers can access to Kisan Call Centre. Others only grieve over lack of information. If Kisan Call Centre can diffuse information through Short Message Service (SMS), more farmers can access to such information. Therefore, RWSLIP has a plan to strengthen the function of Kisan Call Centre to Agriculture Information Centre. See detailed works and procedure in Attachment 5.4.3.

(d) Agriculture farmers’ training

Most of farmers’ training will be conducted in the sub-project sites. The training shall be done by cascade method. Trained trainers, agriculture supervisors of DoA, field level extension staffs of DoH and NGO-agriculture experts will train farmers. Not all farmers will be trained but selected core farmers from WUA, WUA women wing and SHG members will be trained.

The trained farmers need to duplicate the learnt techniques in their farm. Then, their farm will be the venue for demonstration of introduced techniques. Other farmers can learn from seeing. This method is called comprehensive hands-on farmer to farmer training.

Trained trainer (Agriculture supervisor/DoH field level officers and NGO-agriculture expert) need to visit every sub-project site at least once two weeks for monitoring. In such occasion, farmers can ask questions to agriculture supervisor and NGO agriculture extension staff. Community motivators will also support farmers.

(e) Agriculture demonstration farm

To verify the effectiveness of drip irrigation with mulch for cultivation of fruits and vegetables, two types of demonstration farm will be established in farmer's field.

Role of demonstration farm is primarily to demonstrate various agricultural techniques and materials. Demonstration farm is secondly the place for extension for such techniques and materials.

On-farm demonstrations of new techniques and new materials serve as one of the most effective extension education tools. Farmers can compare those techniques and materials with traditional way side by side. It is also the venue to test new methods and transfer new techniques by hands-on training. In general, farmers are very conservative and tend to hesitate to introduce new things to their farms. However if they see the result of demonstration farm, they will perceive that it is effective and appropriate to apply those techniques and materials into their own farm.

For selection and preparation of demonstration farm, there are several points to be considered.

- The demonstration farm should be prepared well before layout of demonstration
- Preferably, the demonstration plots should be near to roads or paths, so that more number of farmers and officials can visit the demonstrations
- The demonstration farm should be in middle section of the irrigation area having conjunctive irrigation from well and tube well
- The site of the demonstration should be well protected from animals and cattle
- A board should be fixed at the site of demonstration with the information such as name of the farmer, name of the crop variety, type of demonstration, date of sowing.
- Innovative farmers who can follow the required improved technologies should be selected
- The size of demonstration farm for kinnow mandarin and santra orange should be 1 ha. The size of demonstration farm for exotic vegetable should be 0.2 ha or 0.4 ha.
- The control plot should be in side of demonstration plot

1) Demonstration farms for citrus (kinnow mandarin and santra orange)

Out of demonstration farms for kinnow mandarin, santra orange and exotic vegetables in 11 sites, two demonstration farms for kinnow will be established one in Ganganagar district and another in Hanumangarh district. Two other demonstration farms for santra orange will be established one in Kota district and another in Jhlawar district. Drip irrigation system and mulch will be introduced to existing orchard. The size of demonstration farm is 1 ha and another 1 ha for control area.

In this farm, water saving method should be experimented to confirm effectiveness of improvement of sweetness and size equalization. To compare with existing method at present, control area should be set nearby area. Every year, TSS and size of fruits should be monitored.

First, drip irrigation needs to be set to root of each plant. Then, the soil surface should be covered with double mulch (white and black mulch). The white side should be surfaced. Detailed application schedule and volumes are given in Table A 5.4.6.

Detailed water application and fertigation is in below table and information for water requirement is given in Attachment 5.4.4.

Table A5.4.6 Irrigation Amount and Timing for Kinnow Cultivation

Month	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Irrigation timing	Early Mid Late	Mid	Early Mid Late	Early Mid			Late	Late	Early			Early Mid Late
Times	3	2	9	6			2	2	2			6
L/tree/time	30	15	30	30			30	30	60			30
L/month	90	30	270	180			60	60	120			180
Fertigation timing				Mid Late	Early Mid Late	Early Mid Late	Early Mid			Early Mid Late	Early Mid Late	
Times				6	19	30	20			12	13	
L/tree/time				30	15	15	15			15	15	
L/month				180	285	450	300			180	195	
(Nitrogen g)				(27)	(43.5)	(67.5)	(45)			(27)	(28.5)	

Note: Planting density: 650 trees/ha, Rate of dilution: 150 ppmN, 240 g/tree/year. Irrigation: 2,600 L/tree/year
Source: Kinki Chugoku Shikoku Agriculture Research Center, Japan

2) Demonstration farms for exotic vegetables

The role of demonstration farm for exotic vegetables is to promote cultivation of exotic vegetables in main tourist areas. They include Ajmer, Alwar, Sawai Madhopur, Tonk, Jodhpur (Pali), Chittorgarh and Udaipur. In each area, 0.2 ha of demonstration farm of exotic vegetables will be established along with 0.2 ha of control area. Drip irrigation with mulch, low poly-tunnel and net-tunnel will be introduced as new materials. Recommendable varieties are cherry tomato, broccoli, leaf lettuce, colour cauliflower, snap peas, red cabbage, Chinese cabbage, capsicum (bell pepper) and parsley.

Table A5.4.7 Recommendable Exotic Vegetables

	Name of vegetables
<i>Kharif</i>	Cherry tomato, tomato (for salad), capsicum, cucumber (not local variety), Swiss chard
<i>Zayed</i>	Musk melon, melon, water melon
<i>Rabi</i>	Colour cauliflower, broccoli, red cabbage, leaf lettuce, kale, Chinese cabbage, Pak choy, snap peas, leek, winter tomato (for salad), winter cucumber (not local variety), capsicum

Source: JICA survey team

Table A5.4.8 Recommendable Herbs

	Name of herbs
<i>Kharif</i>	Basil, lemon grass, oregano, thyme, sage, lemon balm, Rosemary
<i>Rabi</i>	Florence fennel, dill, chives

Source: JICA survey team

In this farm, water saving method should be experimented to confirm effectiveness of drip irrigation and mulch for improvement of sweetness and nutrition. To compare with existing method at present, control area should be set nearby area. Every year, TSS and nutrition should be monitored and compared with control.

First, drip irrigation needs to be set to root of each plant. Then, the soil surface should be covered with double mulch (white and black mulch). The white side should be surfaced.

In case of vegetables with mulch, water application amount and timing differs from variety to variety. Ideal interval shall be once every two weeks. However, soft, leafy vegetables need to be taken more care than other vegetables. Since once the soft leaves are withered, they could not recover. In case of herbs, they need less water alike medicinal plants. Too much water application makes herbs less aromatic. To increase TSS and nutrition, reduce water application just before harvesting.

Difference among Demonstration firm, KVK demo-plot and On-farm trial are summarised in Table B5.4.2.

(2) Activities

To obtain fruitful result with the above mentioned approaches in this sector, the following project activities are proposed, and the summary is given below Table A5.4.9. Detailed activities are show in Attachment 5.4.1, Attachment 5.4.2, and Attachment 5.4.3.

- i) Training of Trainers for Agriculture,
- ii) Exposure Visit for Agriculture Trainers,
- iii) Improvement of Agriculture Support System,
- iv) Agriculture Farmers' Training, and
- v) Agriculture Demonstration Farm.

Table A5.4.9 Activities for Agriculture Sector

Component No	Activities	
Component-3	Irrigated Agriculture Intensification and Diversification	
3.1	Training of Trainers for Agriculture	<ol style="list-style-type: none"> 1) To provide workshop for high-rank officers 2) To provide ToT training on general agriculture techniques, 3) To provide ToT training on specific cultivation techniques on cereals, pulses and oilseeds, 4) To provide ToT training on specific cultivation techniques on spices and medicinal plants, 5) To provide ToT training on exotic vegetables, 6) To provide ToT training on oranges/citrus, and 7) To provide ToT training on quality improvement for TSS
3.2	Exposure Visit for Agriculture Trainers	<ol style="list-style-type: none"> 1) Assess needs for exposure visit and plan 2) Implement exposure visit to advanced state (ex. Punjab agriculture university) for orange cultivation and exotic vegetable cultivation
3.3	Improvement of Agriculture Support System	<ol style="list-style-type: none"> 1) To formulate a task team for farmer friendly manuals and prepare sample materials (compilation of 10 visual manuals for farmers) 2) To strengthen agriculture information centre
3.4	Agriculture Farmers' training	<ol style="list-style-type: none"> 1) To provide farmers training on general agriculture techniques, 2) To provide farmers training on specific cultivation techniques on cereals, pulses and oilseeds, 3) To provide farmers training on specific cultivation techniques on spices and medicinal plants, 4) To provide farmers training on exotic vegetables, 5) To provide farmers training on oranges/citrus, and 6) To provide farmers training on quality improvement for TSS 7) To provide marketing survey
3.5	Agriculture Demonstration farm	<ol style="list-style-type: none"> 1) To Establish orange demonstration farm (4 farmers) 1ha 2) To establish exotic vegetable demonstration farm (7 farmers in focal area) 0.4ha 3) To mentor demonstration farm (oranges and exotic vegetables) (11 farmers) 4) To monitor demonstration farms

Source: JICA survey team

(3) Location of Activities

Location of activities are categorized as Table A5.4.10 and summarised in Table B 5.4.3. Promotion of exotic vegetables will be implemented in 7 tourist places, Ajmer, Alwar, Sawai Madhopur, Jaipur, Jodhpur, Chittorgarh and Udaipur. One sub-project in concerned districts should be chosen as a demonstration farm. If not available in concerned district, the district nearby tourist place should be selected instead. In case of Agro Food Park, the districts near each Agro Food Park are also chosen. Agri Export Zones were demarked for setting up agriculture based processing industries, mainly for export.

Table A5.4.10 Districts Targeted to Activities in Agriculture and Marketing

Area	Produces	No.	Location / variety	Targeted Districts
Tourist places	Exotic vegetables	1	Ajmer	Ajmer
		2	Alwar	Alwar
		3	Sawai Madhopur	Sawai Madhopur
		4	Jaipur	Jaipur, Tonk
		5	Jodhpur	Jodhpur, Pali
		6	Chittorgarh	Chittorgarh
		7	Udaipur	Udaipur
Citruses production Area	Kinnow mandarine	1	Hanumangar	Hanumangar
		2	Sri Ganganagar	Sri Ganganagar
	Santra orange	1	Jhalawar	Jhalawar
		2	Kota	Kota
Agro Food Park	Cereals, pulses, oilseeds	1	Ganganagar	Ganganagar, Hanumangar
		2	Jodhpur	Jodhpur, Pali
		3	Kota	Kota, Bundi, Baran, Jhalawar
Mega Food Park	Cereals, pulses, oilseeds	1	Ajmer	Ajmer, Sawai Madhopur
Agro Export Zone	Spice seeds	1	Corinader	Kota, Bundi, Baran, Jhalawar, Chittorgarh
		2	Cumin	Nagaur, Barmer, Jalore, Pali and Jodhpur

Source: JICA survey team

5.5 Component-4: Agro-processing, Marketing, and Promotion of High-value Added Agricultural Produce

5.5.1 Constraints and Issues in Agro-Processing and Marketing Sector

(1) Extreme Shortage of Fruits/Vegetables

The state currently produces 2,169,000 MT of fruits/vegetables, which is only 0.85% of total fruits/vegetables production of the country due to its natural environment unsuitable for fruits/vegetables cultivation. Shortage of fruits/vegetables is most serious in Rajasthan among all states in the country, with the negative balance of supply and demand (-3,135,000 MT for fruits and -4,653,000 MT for vegetables).

Even the imports (4.7% of the total shortage on a weight basis) from other states/countries are not sufficient to overcome the shortage. Some exotic vegetables are also imported from other states/countries. Transaction of fruits/vegetables is concentrated in Jaipur (58% on a weight basis), which are locally distributed in Jaipur and surrounding consumption areas, indicating that rural areas consume very small quantity of fruits/vegetables. Although rural residents might traditionally consume rather fewer amount of fruits/vegetables and prefer to take more meat or dairy products, increase in fruits/vegetables consumption would help them in terms of nutrition improvement as well as income generation.

(2) Weak Support for Supply Chain of the Processing and Export Sectors

Agro Food Parks and Agri Export Zones (AEZs) were introduced in Rajasthan in the 2000s to promote food processing and expand export. There are many types of infrastructure constructed by the state/central government as well as financial/materials support to farmers/processors/exporters but few supports have been provided for the enhancement of supply chain.

The major issue for the industrial food processing sector is its unstable supply chain caused by the lack of overall production planning and transaction quantity adjustment. This makes it difficult for processors to procure a certain quantity of raw materials constantly throughout the year. Contract

farming could enable effective procurement of raw materials but the level of “contract” at present is as simple as an “agreement”.

Currently, only few number of farmers in the field recognise the existence of facilities/schemes such as Food Parks and AEZs or advantages of supplying there. Raw materials are generally procured at nearby public markets; rather than being procured directly from farmers. This is because the quantity and quality are ensured at public markets where traders take care of grading and cleaning of produces. Then, only farmers who have direct access to such buyers and who are able to supply in large quantity with high quality can enjoy more the advantages of Food Parks and AEZs through private supply chain.

Processing capacities of the existing parks could be increased and more parks could be established in the future. The sector seems ready for accepting more raw materials at that time. Then, for farmers who are missing such marketing opportunities, more places should be provided to exchange opinions and information with processors/exporters, and consequently for business matching.

(3) Underestimation of Value of Agricultural Produce

In general, prices only slightly differ depending on quality of produce (moisture content, oil content, cleanness, varieties, etc., in the case of grains/pulses). Furthermore, no agro produce are seen at public markets with quality high enough for higher prices. As for organic produce, even certified ones are transacted without significant price difference when they go through regular supply chain.

Although exotic vegetables are transacted at higher prices in Jaipur, and there are already a few stalls dealing with them in the Jaipur Market; supply chains for exotic vegetables in local regions do not exist.

Besides, Rajasthan is already producing fruits/vegetables with higher sugar content (TSS) without special agricultural management. The high sugar content is due to its natural conditions, specifically limited water availability. Despite the advantage, there is no quality standard or price differentiation yet related to sugar content (although it is easy to measure sugar content using a hand-held refractometer (or BRIX meter).

Finally, currently produced *kinnow* contains plenty of seeds. It is notable that dissemination of seedless/fewer-seeds *kinnow* has just started in Rajasthan. These kinds of *kinnow* can be sold at 10% 13% higher than regular ones.

More marketing options should be provided to farmers for such high-value added agricultural produce and promotion of the produce is necessary to get the attention of value chain players.

Furthermore, even in the case that suppliers promote taste or safety of their produce, consumers' evaluation can stay within sensuous impression (refer to Attachment 2.7.6 for the details). To promote high-value added agricultural produce and increase sales steadily, its quality should be surely conveyed to consumers.

(4) Supply Chains Unfavourable for Farmers

Supply chains through public markets could generally weaken the communication between farmers and buyers; and farmers hardly access information on the demand of buyers/consumers for quality/quantity/varieties. Moreover, commission for traders, charges for market facilities, and labour cost for loading/unloading; could also reduce the share of farmers in total consumer prices. Finally, higher percentage of post-harvest loss is caused during the long distribution process from farm gate to consumers.

Another issue is the weak negotiation power of farmers. For those who can sell large quantities of vegetables at once and have access to markets, it is reasonable and possible to transport produce by themselves. On the other hand, small/marginal farmers who can sell only small quantities at once and have no access to markets, have only options to sell to middlemen who charge unreasonable commission.

Since 2011, Rajasthan has promoted farmers for formulation of Farmer Producer Organization (FPO) to strengthen to enhance linkages between farmers and agro value chain. Although the program has some progress so far under the formulation of 36 FPOs, there are still few groups which started collective activities on marketing.

(5) Issues for Fruits/Vegetables Processing

Fruits/vegetables processing seems to have lower potential as compared to cereals/spices processing. In Rajasthan, 90~95% of fruits/vegetables are habitually consumed fresh. There is only 5~10% of fruits/vegetables surplus due to low production. As a result, only 1~2% of fruits/vegetables are currently processed at the industrial level.

Furthermore, market demand for small-scale fruits/vegetables processing is not high as seen in an example of *aonla*. Rajasthan produces large quantities of *aonla* but the domestic demand for processed *aonla* is low. The fruit is thus processed and exported to other states by large-scale processors.

As well, small-scale fruits/vegetables processing and marketing are not very common in Rajasthan. KVKs offer training courses on primary fruits/vegetables processing to rural women only for home consumption or village-level marketing. Selling prices are rather unreasonable and processors can hardly recover the profit. This is because equipment/facilities are not accessible to them, techniques for processing/packaging/branding are not sufficient for higher level marketing, and women are not involved in higher level marketing traditionally.

(6) Economical Risks of Starting Cultivation of New Crops

Considering the comparative advantages of market linkages and production, *kinnow* and spices have high export potentials, especially in/around food parks and AEZs. The economic advantages derived from subsidies, too, contribute to promoting introduction or increase in production of such new crops. Growth of market demand is also observable as the mega food park and another spice park will soon operate. Furthermore, establishment of new AEZs might be approved for *isabgol* and *guar* in the near future.

However, there are also economical risks of shifting from conventional crops to such new crops, without overall production planning or awareness of international market trend. For instance, *guar* demand recently dropped due to overproduction, causing consequent price drop after most farmers in Sri Ganganagar shifted to *guar*. Years of transition period, especially for tree crops, is another concern. To avoid such cases and obtain high profits as much as possible, risk control should be taken. For example, this can be addressed through gradual shift to new crops under intercropping or keeping original crops in the field with new trees during transition stage.

5.5.2 Approaches and Countermeasures for Agro-processing and Marketing Sector

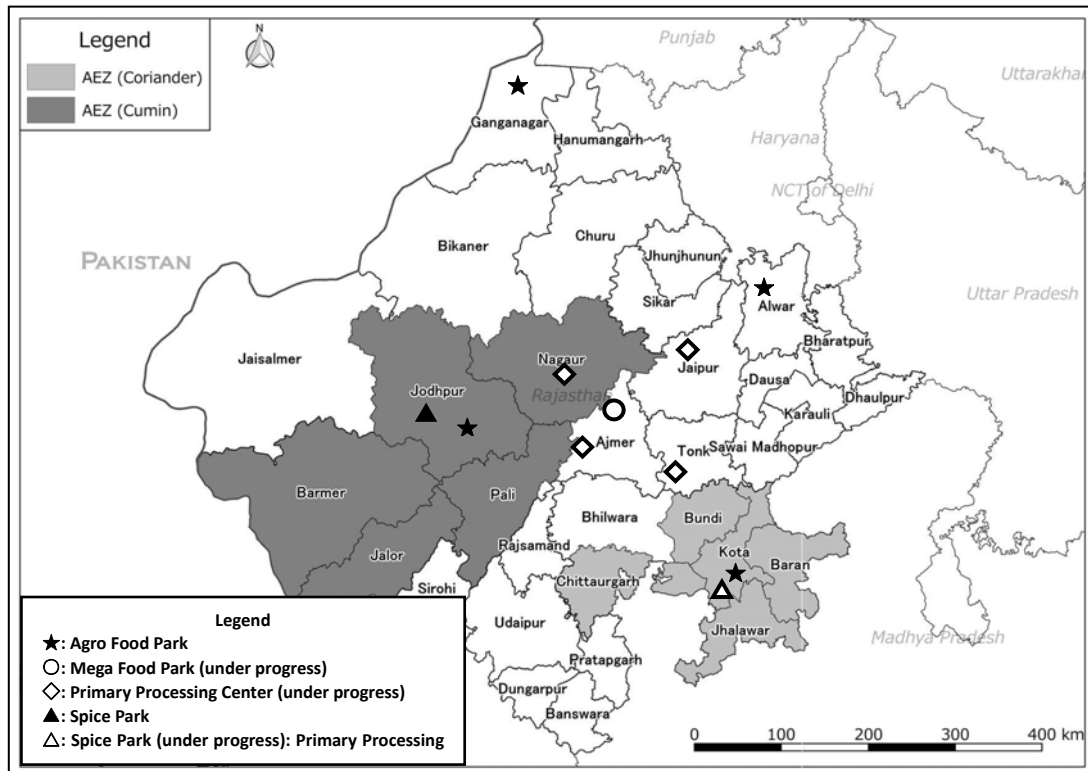
(1) Strengthening of Farmers' Negotiation Power through Formulation of FIGs

Above all, to increase individual farmers' marketing capacity, the Project would promote the formulation of Farmer Interest Groups (FIGs) by WUA members for cooperative activities. First, the Project would formulate Cooperative Demonstration Group (CDG) in selected sites to apply results of their cooperative activities to FIGs in all other sites, and target to develop into FPOs as a final goal.

From the viewpoint of gender mainstreaming, a certain number of female members would be included in FIGs, considering their traditional roles in postharvest/marketing activities. Female members are requested to join every event/training with male members.

(2) Selection of Strategic Areas to Improve Supply Chains for the Processing/Export Sectors

To improve the supply chains for the industrial processing sector and export sector, the Project would focus on the facilitation of marketing of raw material crops by FIGs around the food parks/AEZs. Raw material crops with export potential include *kinnow*, spices (coriander, cumin, and fenugreek), medicinal plants (mainly *isabgol*), and guar. Food crops such as soybean could be focused on too, as it is processed partly at higher levels for export to international market.



Note: Barmer is not included in the project sites as of April 2016.

Source: JICA survey team

Figure A5.5.1 Location of Food Parks, Primary Processing Centres, and Agri Export Zones

(3) Increase in Domestic Production of Vegetables

To reduce the extreme shortage and promote consumption in the state, increase in domestic production of vegetables is essential. The Project would locally initiate activities in expectation of future expansion of vegetable production at the state level. For this reason, exotic vegetable production could be intensified in/around the tourist sites such as Jaipur, Udaipur, and Ajmer and sales support could be provided to farmers.

(4) Enhancement of Linkages Between FIGs/Farmers and Buyers

(a) Processors at Food Parks

WUAs have actually given a rather positive impression to the industrial sector that their wider cultivation areas can supply raw materials in large quantities. As the case of exotic vegetables above, to improve the current supply chain of raw materials for the industrial processing sector and consequently, contribute to expansion of export, the Project could link FIGs with actively operated food parks.

By supporting the linkages and improving the communication among value-chain players, farmers could have more marketing opportunities and processors/exporters could improve the current procurement of raw materials crops in terms of quantity/quality/timing.

(b) Exotic Vegetables Buyers

To facilitate domestic distribution of exotic vegetables, the Project would enhance linkages between farmers and buyers (public markets/hotels/restaurants) in tourist sites by supporting sales activities.

(5) Promotion of High-value Added Fruits/Vegetables

To increase awareness of high-value added fruits/vegetables with high TSS/nutrients and to attract more consumers in/outside the state, the Project could make efforts on brand building in the future under possible cooperation of DoA/DoH. By including TSS in existing indicators for quality, it is expected to be able to convey quality of the produce clearly to consumers (see Section 5.1 and 5.5.3 for the details).

5.5.3 Proposed Activities for Component 4: Agro-processing, Marketing, and Promotion of High-value Added Agricultural Produce

(1) General Activity Plan

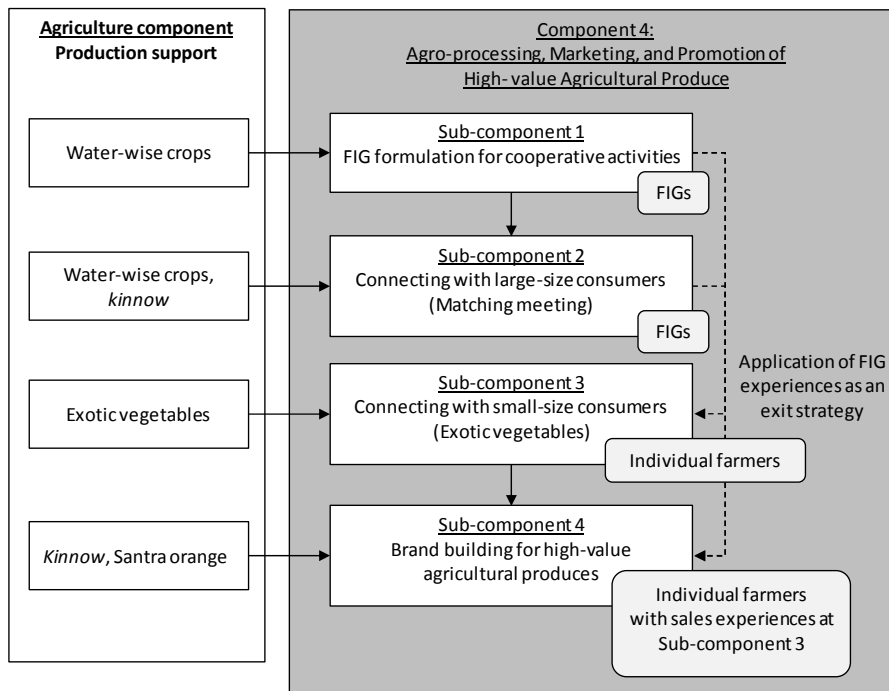
In this section, general activity plan for Component 4: Agro-processing, Marketing, and Promotion of High-value Added Agricultural Produce is briefly explained. For every sub-component, details of the activity plans are given in Attachment 5.5.1, Attachment 5.5.2, Attachment 5.5.3, and Attachment 5.5.4.

(a) Overall Approach

For Component 4, activities are planned under the four sub-components aiming to achieve the goals as follows:

<u>Sub-components and Goals</u>
<p><i><u>Sub-component 1: FIG formulation for cooperative activities</u></i></p> <ul style="list-style-type: none">➤ Profit of WUA members is increased through formulation and operation of cooperative groups (Farmer Interest Groups: FIGs), also toward development of FIGs into FPOs under Small Farmers' Agri-business Consortium (SFAC)
<p><i><u>Sub-component 2: Connecting with large-size consumers (Matching meeting)</u></i></p> <ul style="list-style-type: none">➤ Marketing options of Farmer Interest Groups (FIGs) are increased for higher profit➤ Successful results of the activities contribute to future development of the processing/export sector
<p><i><u>Sub-component 3: Connecting with small-size consumers (Exotic vegetables)</u></i></p> <ul style="list-style-type: none">➤ Increase in distribution of domestically grown exotic vegetables contributes to reduction of the current shortage of vegetables in Rajasthan
<p><i><u>Sub-component 4: Brand building for high-value added agricultural produce</u></i></p> <ul style="list-style-type: none">➤ A basis is established for future branding of high-TSS fruits/vegetables grown in Rajasthan

Basically, Component 4 targets farmers who already received training under the agriculture sector for production activities. Sub-components 1 and 2 will be conducted for FIGs for collective marketing for larger lots of produce such as cereals, while sub-components 3 and 4 train individual farmers considering that target buyers are consumers who will buy smaller lots of fruits and vegetables. However, accumulated experiences of FIG activities could be eventually applied for sub-components 3 and 4 as an exit strategy based on collective marketing for larger lots of fruits and vegetables. Figure A5.5.2 summarises the overall view of the activity plan for Component 4.



Source: JICA survey team

Figure A5.5.2 Overall View of Activity Plan for Component 4: Agro-processing, Marketing, and Promotion of High-value Added Agricultural Produce

(b) Target for Every Sub-component

Target sites, produce, and markets/buyers vary in accordance with sub-components. Table A5.5.1 summarises the target sites for every sub-component, while Table A5.5.2 shows the targets of agricultural produce and markets/buyers for every sub-component.

Table A5.5.1 Target Sites for Every Sub-component (Summary)

	Focal sites						All other sites	Whole state
	Food Parks	Medicinal plants cultivation sites	Tourist sites (district)		Citrus cultivation sites			
			Jaipur	Ajmer, Alwar, Swai Madhpur, Tonk, Pali, Jodhpur, Chitorgarh, Udaipur	Ganganagar, Hanumangarh	Kota, Jhalawar		
1 FIG formulation for cooperative activities								
TOT	○	○	○	○	○	○	○	-
Support for Cooperative demonstration groups	-	-	-	-	-	-	-	○
FIG formulation and activities in other sites/Guidance for FPO formulation	○	○	○	○	○	○	○	-
2 Connecting with large-size consumers (Matching meeting)								
TOT	○	-	-	-	-	-	-	-
Information exchange, Information analysis, Matching meetings, Review&improvement, Gap-filling training, etc.	○	-	-	-	-	-	-	-
3 Connecting with small-size consumers (Exotic vegetables)								
TOT	-	-	○	○	-	-	-	-
Demonstration / Extension to farmers	-	-	○	○	-	-	-	-
4 Brand building for high-value agricultural produce								
Coordination	-	-	-	-	-	-	-	○
Experiment for quality improvement (TSS and quality control)	-	-	○	-	○	○	-	-
Sales promotion	-	-	-	-	-	-	-	-
Tasting events, Sales visit	-	-	-	-	-	-	-	○
Delivery to customers	-	-	○	-	○	○	-	-
Application of experimental result to farmers	-	-	-	-	-	-	-	-
Training at market-oriented experimental plots	-	-	○	○	○	○	-	-
Antenna shops/corners, Farmers' fairs, Multimedia advertising, Extension to outside the Project	-	-	-	-	-	-	-	○

Remarks: See CAMP for the details.

Source: JICA survey team

Sub-component		Agricultural Produce	Markets/Buyers
1	FIG formulation for cooperative activities	Water-wise crops: cereals/pulses/oilseeds, spices, and medicinal plants	Public markets, public spices markets (Agro Export Zones, etc.), public medicinal plants markets
2	Connecting with large-size consumers (Matching meeting)	Raw materials crops to be processed at the food parks	- Kota Agro Food Park - Sri Ganganagar Agro Food Park - Jodhpur Agro Food Park - Mega Food Park (Ajmer)
3	Connecting with small-size consumers (Exotic vegetables)	Exotic vegetables: Cherry tomato, broccoli, leaf lettuce, etc.	- Public markets (exotic vegetables traders) - Hotels and restaurants
4	Brand building for agricultural produce	Crops to increase TSS/nutrients: - Vegetables (tomato, melon, etc.) - <i>Kinnow</i> - Santra orange	- Upper-income and Middle-upper-income consumers in large cities (Delhi, Jaipur, etc.) - Private services (vegetable delivery services, high-grade groceries, etc.)

Source: JICA survey team

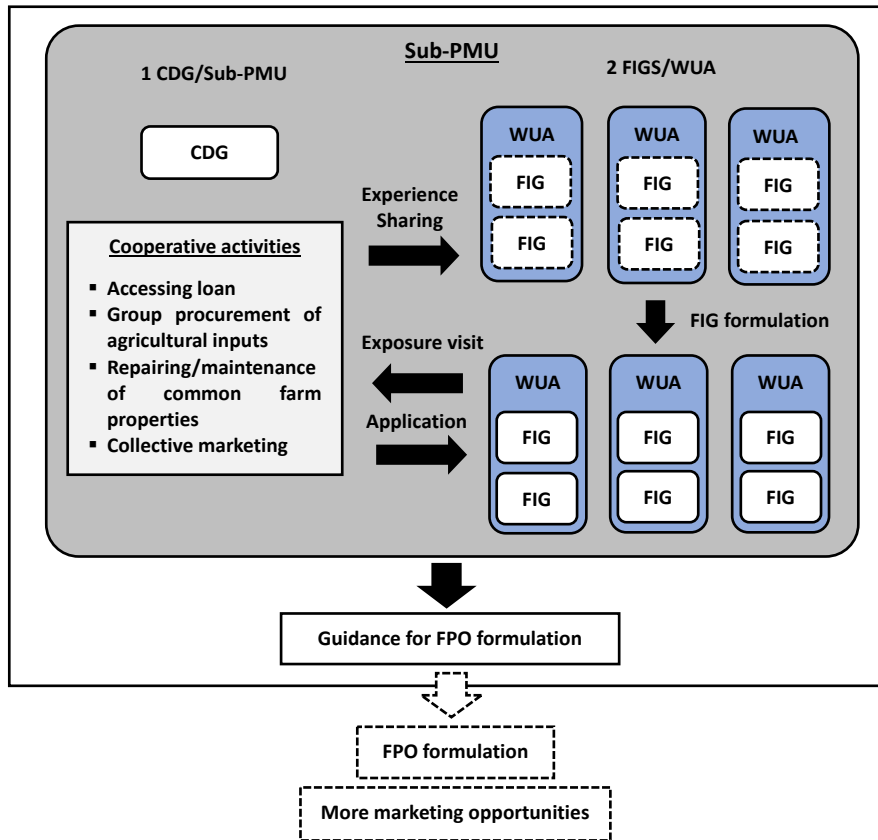
(c) Key Concepts for Every Sub-component

Every sub-component has core strategies developed from the issues in the field as explained below.

Sub-component 1: FIG formulation for cooperative activities

“Support for Cooperative Demonstration Groups and Application to Farmer Interest Groups”

For effective promotion of formulation of FIGs among farmers rather conserve for group activities, the Project would first formulate cooperative demonstration groups (CDGs) at every sub-PMU by selected WUA members, to accumulate good results on cooperative activities. It is expected that sharing their experiences would encourage many other WUA members to work on cooperative activities by formulating FIGs (Figure A5.5.3).

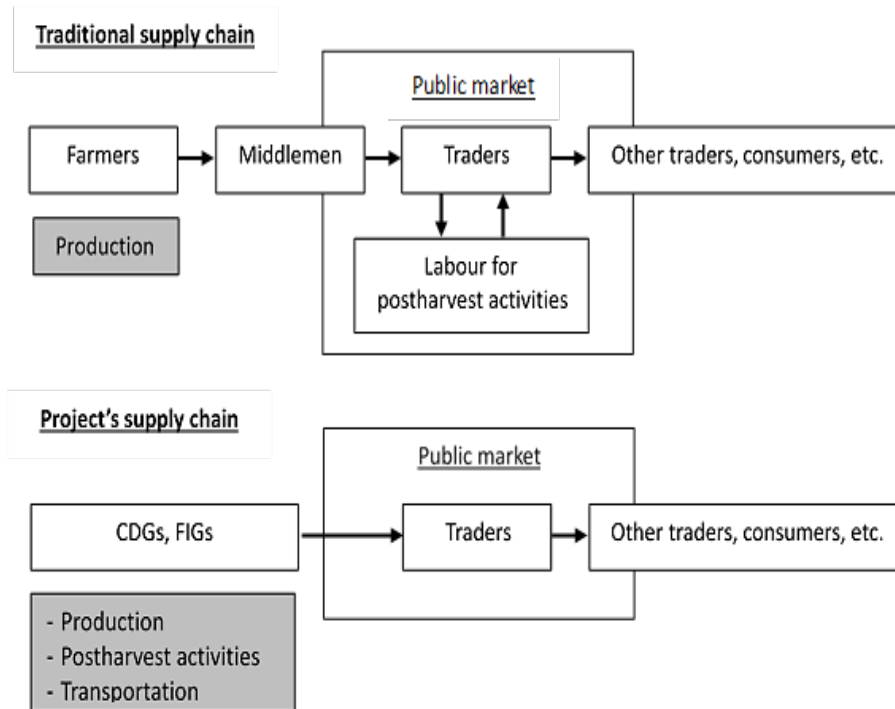


Source: JICA survey team

Figure A5.5.3 Flow of Cooperative Activities by CDGs and FIGs

“Support Through Training and Promotion for Implementation”

Formulation of CDGs and FIGs eventually aims at “collective marketing” for higher profit, which are preceded by “accessing loan”, “group procurement of agricultural inputs” and “repairing/maintenance of common farm properties”. In addition to training, which is conventionally done, the Project would promote actual implementation of activities by farmers through training. As for collective marketing, CDGs and FIGs are supposed to actually implement the activity by taking roles of market labour for postharvest duties to ensure quality standardization among group members. They will be also requested to transport the produce by themselves without intervention of middlemen. It is then expected to increase the negotiation power of the groups and increase the groups’ selling prices. Figure A5.5.4 summarises the concept of collective marketing activity in the Project.



Source: JICA survey team

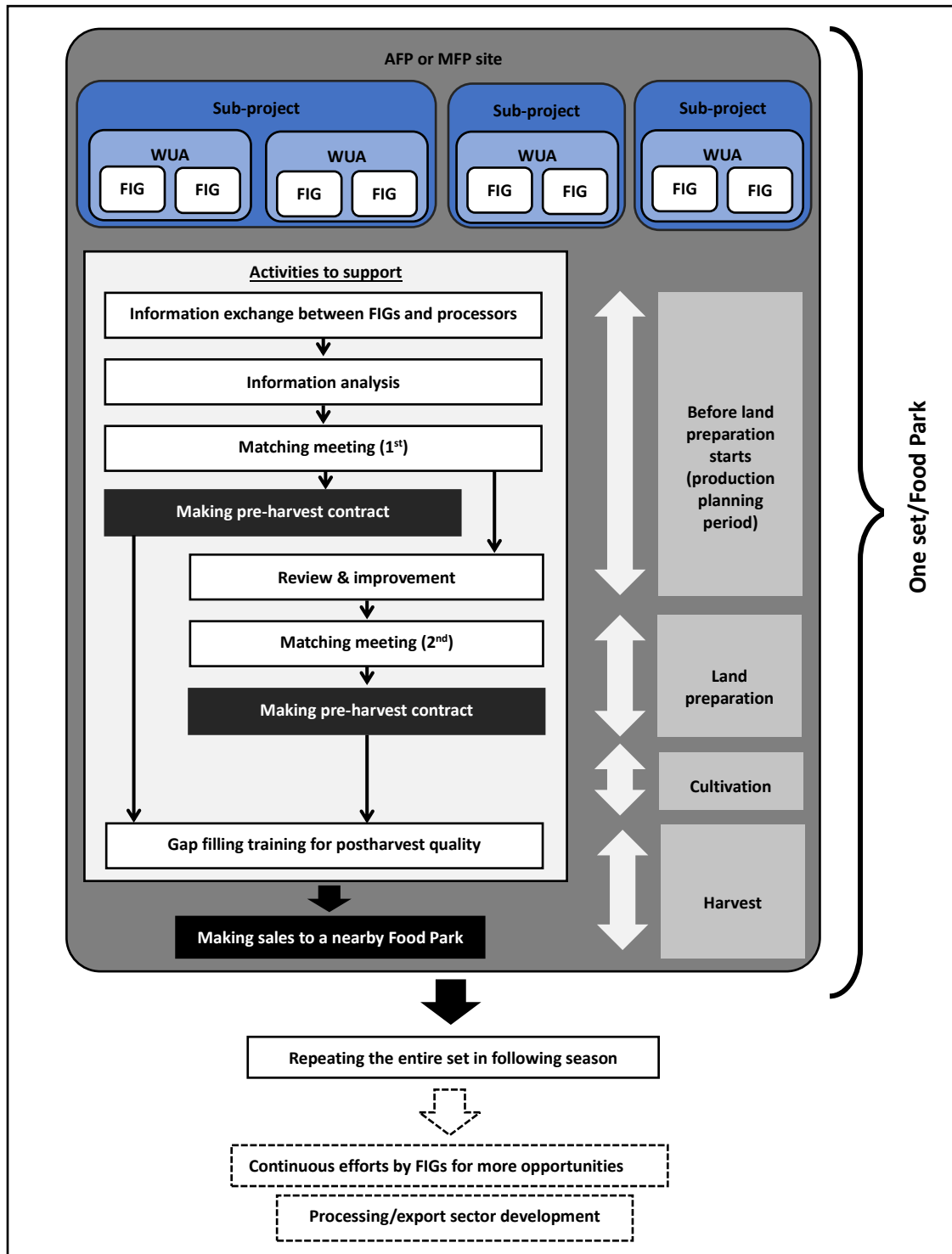
Figure A5.5.4 Collective Marketing in the Project's Supply Chain

For Sub-component 1, details of the activity plans are given in Attachment 5.5.1.

Sub-component 2: Connecting with large-size consumers (Matching meeting)

“Adequate Preparation, Reviewing, and Repeating for Higher Possibilities of Matching”

To provide more marketing opportunities for higher profit on both demand and supply side, and to promote direct sales from FIGs to food parks, a series of activities is planned for matching. As shown in Figure A5.5.5, a series of the activities are planned based on cropping calendar, starting before land preparation period (production planning period) and continuing till harvest period. After the information exchange between food parks and FIGs, and information analysis by FIGs, matching meeting (1st) will be conducted. For those FIGs who reached successful deals, they could directly step into gap filling training for postharvest quality at the time of harvest period. However, for those FIGs who failed to make successful contract at the matching meeting (1st), places would be provided for them to examine a successful matching and try another deal for matching (matching meeting (2nd)). During the two seasons of every stage, two sets of the matching activities would be repeated for the same FIGs to increase their opportunities in making contracts with processors successfully.



Source: JICA survey team

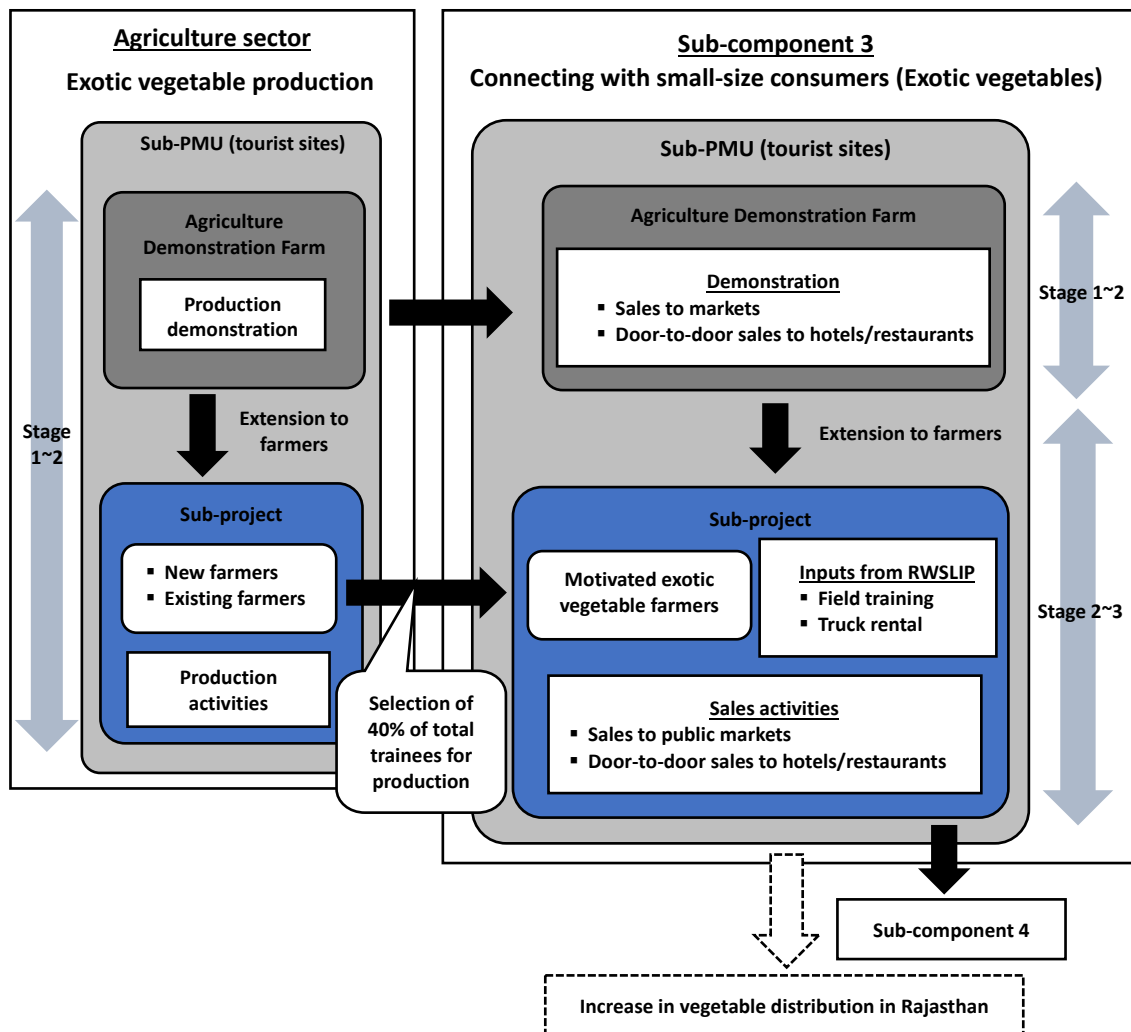
Figure A5.5.5 Flow of the Matching Activities

For Sub-component 2, details of the activity plans are given in Attachment 5.5.2.

Sub-component 3: Connecting with small-size consumers (exotic vegetables)

“Demonstration Preceded by Implementation by Farmers”

To increase the quantity of Rajasthan-origin exotic vegetables distributed in the state, the Project would assist farmers’ sales of exotic vegetables after a few harvest seasons by sharing marketing experiences of agriculture demonstration farms. Main activities of the farms would be sales to public markets in Jaipur and other large cities in/nearby tourist sites in the state as well as door-to-door sales to hotels/restaurants. Prior to extension to farmers, potential farmers would be selected from those who have been trained for exotic vegetables production in the agriculture sector, based on their performances (productivity, marketability, and motivation). Through sales training in the farms, selected farmers could learn successful cases and receive support for actual implementation such as information on buyers and truck rental services to transport vegetables. After the sales support, farmers are expected to move on to Sub-component 4: brand building for high-value added agricultural produce. Flow of activities of Sub-component 3 is explained in Figure A5.5.6.



Source: JICA survey team

Figure A5.5.6 Flow of Demonstration and Extension to Farmers for Exotic Vegetables Sales

For Sub-component 3, details of the activity plans are given in Attachment 5.5.3.

Sub-component 4: Brand building for high-value added agricultural produce

“Integrated Approaches for Longer-Span Efforts on Brand Building”

Brand building of high-value added agricultural produce could not be achieved through shorter period but would require planning in longer term for a few decades, as explained in Section 5.1. Considering such condition, the Project would play a role during the first five years to establish a basis of brand building for the future sustainable efforts even after the Project, also expected are the outcomes below.

Expected Outcomes from Sub-component 4

1. Market-oriented approaches have been clarified to achieve the following objectives:
 - (a) To increase TSS of fruits/vegetables through improvement of cultivation techniques in the field also aiming at stable production.
 - (b) To control quality of high-TSS fruits/vegetables under standards defined by the Project
 - (c) To develop marketing channels for high-TSS fruits/vegetables
2. Manual is compiled to explain the market-oriented approaches
3. Sales results have been achieved as indicated by following points:
 - (a) Single-time sales to individual customers
 - (b) Contract with individual customers
 - (c) Contract with private services (vegetables delivery services, high-grade groceries/restaurants, etc.)
4. Size of production and marketing has started to enlarge through:
 - (a) Extension of the market-oriented approaches to farmers
 - (b) Increase in consumers’ recognition for high-TSS fruits/vegetables

Integrated approaches would be therefore essential to carefully work throughout the entire implementation period on the activity plan of some length and some inputs. Sub-component 4 would take the following approaches to achieve the goal:

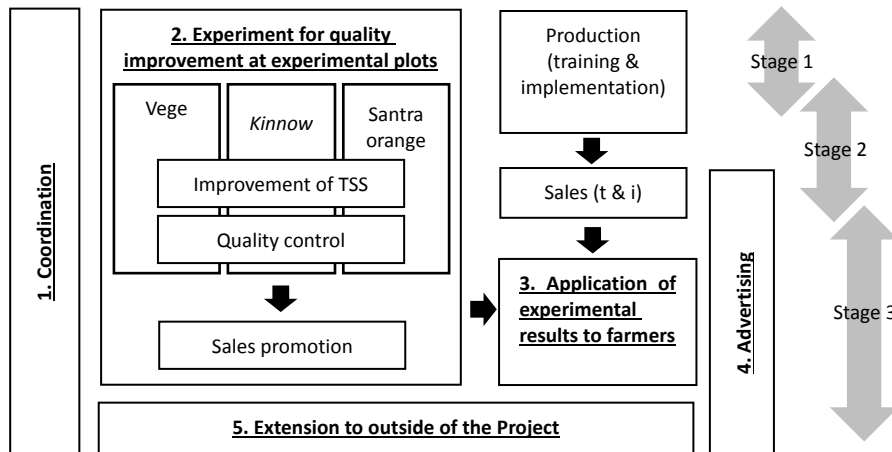
Approaches for Sub-component 4

1. Coordination of overall activities by brand building working group.
2. Experiment for quality improvement at market-oriented experimental plots for production and sales.
3. Application of experimental results to farmers.
4. Advertising for high-TSS fruits/vegetables.
5. Extension to outside of the Project.

Table B.5.5.1 summarises a comparison table between “the agriculture demonstration farms” in Component-3 of agriculture and “market-oriented experimental plots (MOE plot)” in Component-4 of agricultural marketing.

Figure A5.5.7 summarises the flow of the approaches for brand building for high-value added agricultural produce. Activities would start at the beginning of Stage 1 and continue till the end of

Stage 3, for five years in total, becoming more intensive during Stage 3 when application to farmers starts after several series of experiments for quality improvement and production and sales experiences.



Source: JICA survey team

Figure A5.5.7 Flow of the Approaches for Branding High-value Added Agricultural Produce

“ TSS Improvement, Quality Control and Sales Promotion through Market-Oriented Experimental Plots and Application to Farmers”

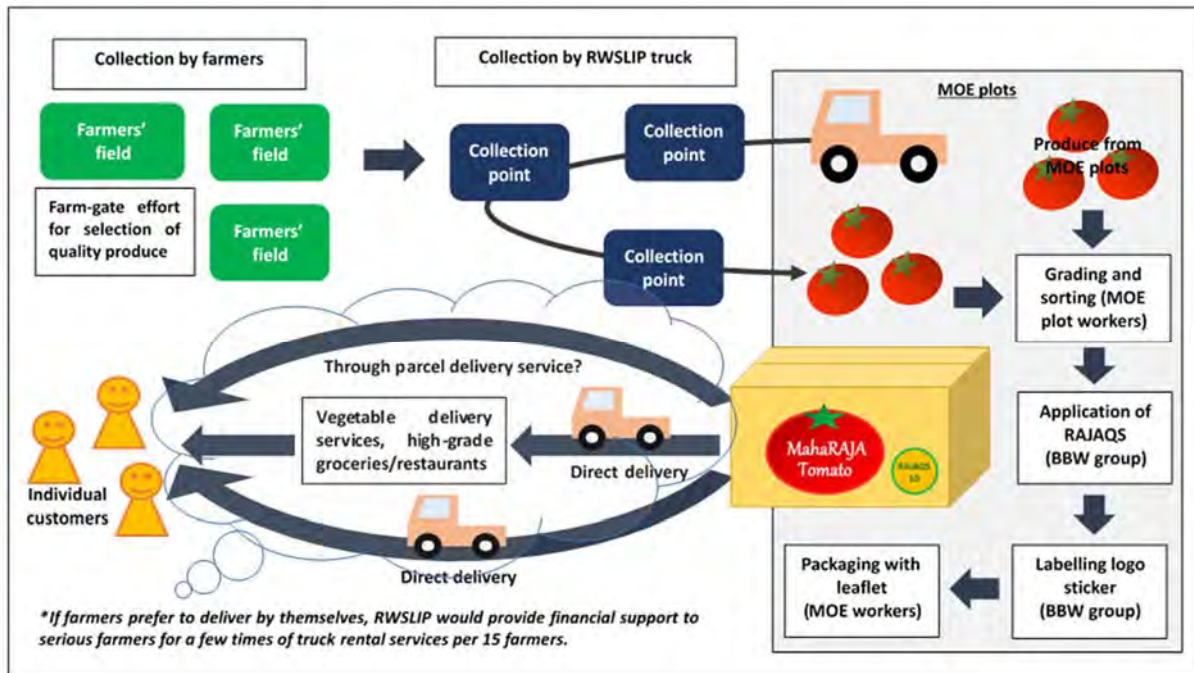
The Project would be engaged in improvement of TSS/nutrients, quality control and sales promotion for high-TSS fruits/vegetables in MOE plots (Stage 1~2), and results would be applied to farmers (Stage 2~3).

<u>Approaches at MOE plots</u>	
➤	<u>Improvement of TSS/nutrients and stable production:</u>
a.	Intermittent irrigation and fertilizer application: use of drip irrigation system and black-and-white mulching sheets
b.	Awareness for timing of harvest (awareness for maturity and sweetness using refractometer)
c.	Lab test to assess richness of nutrient content
➤	<u>Quality control:</u>
a.	Addition of TSS to ordinary quality standards (size, appearance, freshness and maturity, etc.)
b.	Sample inspection by the third party (Brand building working group)
c.	Use of logo for agricultural produce which meet required quality standards
➤	<u>Sales promotion:</u>
a.	Targeted consumers: Upper-income class and upper-middle-income class consumers as well as private services targeting those consumers (vegetable delivery services, high-grade groceries/restaurants, etc.).
b.	Sales promotion: Tasting events (catering type and invitation type) and/or sales visit with tasting samples → (provision of samples) → making contract/agreement
c.	Delivery: Directly to customers by the Project using trucks (during the Project period) → shift of customers to vegetable delivery services (till the end of the Project)
d.	Packaging to maintain quality: Wrapping fruits/vegetables individually using materials appropriate for every different fruit/vegetable, use of buffer materials to protect fruits/vegetables during transportation, use of recycle bags for longer-term contract

Following steps summarizes a process to include farmers in the brand building activities after the experiment period also as illustrated in Figure A5.5.8.

- i) The Project conducts training on TSS/nutrient improvement and quality control to farmers.
- ii) Farmers work on production and harvest as well as quality control by their own effort using refractometers.
- iii) Farmers bring their produce to collection points or MOE plots.
- iv) The Project collects the farmers’ produce at collection points or MOE plots.

- v) The Project works on grading both farmers' produces and MOE plots' produce following its own quality standards (e.g. RAJAQS).
- vi) The Project delivers selected high-TSS fruits/vegetables to customers from MOE plots.



Source: JICA survey team

Figure A5.5.8 Process to Include Project Farmers in Brand Building Activities

For Sub-component 4, details of the activity plans are given in Attachment 5.5.4.

(d) Target Trainees and Flow of Training/Implementation

Activities of Sub-components 1~3 would be implemented through Training of Trainers (ToT), followed by farmers training/implementation. Sub-component 4 starts from the on-the-job training at market-oriented experimental farms followed by farmers training/implementation.

Table A5.5.3 summarises flow of training/implementation and the target trainees for every sub-component (coloured players in every flow diagrams).

Table A5.5.3 Target Trainees and Flow of Training/Implementation

Sub-compo nent	Target trainees and flow of training/implementation
1 FIG formulation for cooperative activities	
2 Connecting with large-size consumers (Matching meetings)	
3 Connecting with small-size consumers (Exotic vegetables)	
4 Brand building for high-value added agricultural produce	

Source: JICA survey team

For every sub-component, the details of the activity plans are given in Attachment 5.5.1, Attachment 5.5.2, Attachment 5.5.3, and Attachment 5.5.4.

(2) Activities

To obtain fruitful result with the abovementioned approaches in this sector, the following project activities are tentatively proposed (Table A5.5.4), and further details are given in Attachment 5.5.5.

Table A5.5.4 Activities for Agro-processing, Marketing, and Promotion of High-value Added Agricultural Produce

Items	Activities
1. FIG formulation for cooperative activities	1-1. Training-of-trainers (ToT) for FIG activities 1-2. Support for Cooperative demonstration groups 1-3. FIG formulation and activities in other sites 1-4. Guidance for FPO formulation
2. Connecting with large-size consumers (Matching meeting)	2-1. Training-of-trainers (ToT) for Matching meetings 2-2. Information exchange between FIGs and processors 2-3. Information analysis by FIGs 2-4. Matching meeting (1st) 2-5. Review and improvement 2-6. Matching meeting (2nd) 2-7. Gap filling training for postharvest quality
3. Connecting with small-size consumers (exotic vegetables)	3-1. Training-of-trainers (ToT) for supporting exotic vegetables sales 3-2. Demonstration 3-3. Extension to farmers
4. Brand building for high-value added agricultural produce	4-1. Coordination (Monitoring & evaluation, setting quality standards, etc.) by Brand building working group 4-2. Experiment for quality improvement (TSS improvement and quality standards) 4-3. Sales promotion (tasting events, sales visit, delivery, packaging to maintain quality) 4-4. Application of experimental results to farmers 4-5. Antenna shops/corners 4-6. Farmers' fairs 4-7. Multimedia advertising 4-8. Extension to outside the Project

Source: JICA survey team

5.6 Component-5: Gender Mainstreaming in Agriculture and Water Sector

5.6.1 Constraints and Issues in Gender Mainstreaming

Findings of the review of existing data and survey conducted are listed up as follows:

(1) Limited Participation of Women in WUA

Women farmers are working in their fields on irrigation and cleaning of watercourses but not much in the decision-making process because there are less women members in WUA. Main reason of it is the condition of WUA membership. It is clearly mentioned in the Rajasthan Farmers' Participation in Management of Irrigation Systems Rules (2002) that water users are the landowners and in the State Water Policy 2010 it stated that executive members of WUGs will be chosen by democratic means, with fair representation by large and small-scale stakeholders, including women. Although there is no restriction for women to be WUA members, actually there are few women WUA members as the total number of women landowner is very limited. At the same time, there is tendency that only male household members attend the program related to water management while female members are asked to take care of house chores. Therefore, it is not realistic to introduce a reservation of posts for women in WUA since there are not enough women landowners who could become WUA members as well as they do have no enough experience to act as WUA member.

(2) Limited Involvement of Women Farmers in Agricultural Value Chain

Similar to involvement in water management, most of the women in farm households participated actively in agricultural activities but are limited only in farm work and production work but not in decision-making process or marketing in her family. Participation in decision-making process is related to land ownership, too. Landowners get more agricultural information through both formal and informal network because usually landowners are recognised as farmers and other household members are categorised as helpers by others and even by themselves. The reason for less participation in marketing is the means of transportation to bring their farm products to market. Since group marketing is not common in this area, farmers bring their products to a local market (mandi) individually by using their own means of transportation or by public transportation. In both ways, it is difficult for women to bring the produce to a local market.

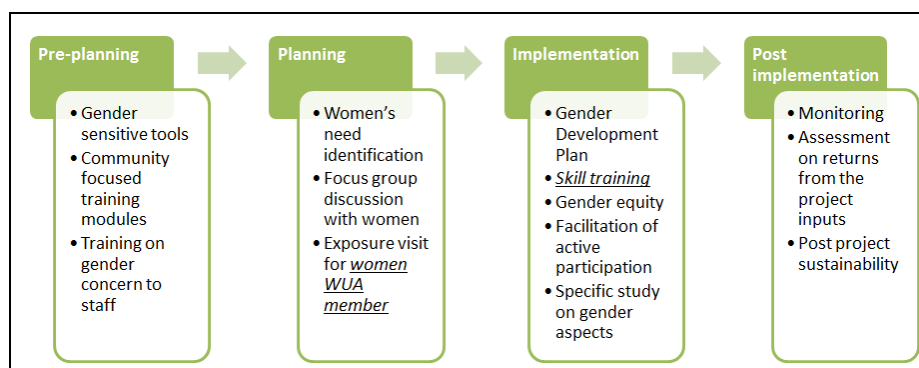
(3) Male-dominated Society in Most Areas

In Rajasthan, society is traditionally male-dominated as shown in landownership and in *pardah* system, which controls women's behaviour. Although the situation is changing gradually by the variety of programs for women empowerment such as SHGs and reservation of post for women, understanding of gender issues is very limited both in male and female. Presently, gender mainstreaming means the number or percentage of women's presence. The reason is that government approaches are giving focus more on progress in quantity and in the welfare so far. For example, evaluation of Gender Responsive Budget is evaluated in four categories from A to D based on the number of women beneficiaries. In case of Satin, a field worker under the Directorate of Women Empowerment provides information on women's rights to rural women and helps rural women who are faced with difficulties on health or domestic issues but does not involve much in the promotion of women's participation in decision-making process in the society or in the household. The JICA survey team could not find any programs targeting men to understand gender issues.

5.6.2 Approaches and Countermeasures in Gender Mainstreaming

(1) Review and Organizing of Suggested Activities

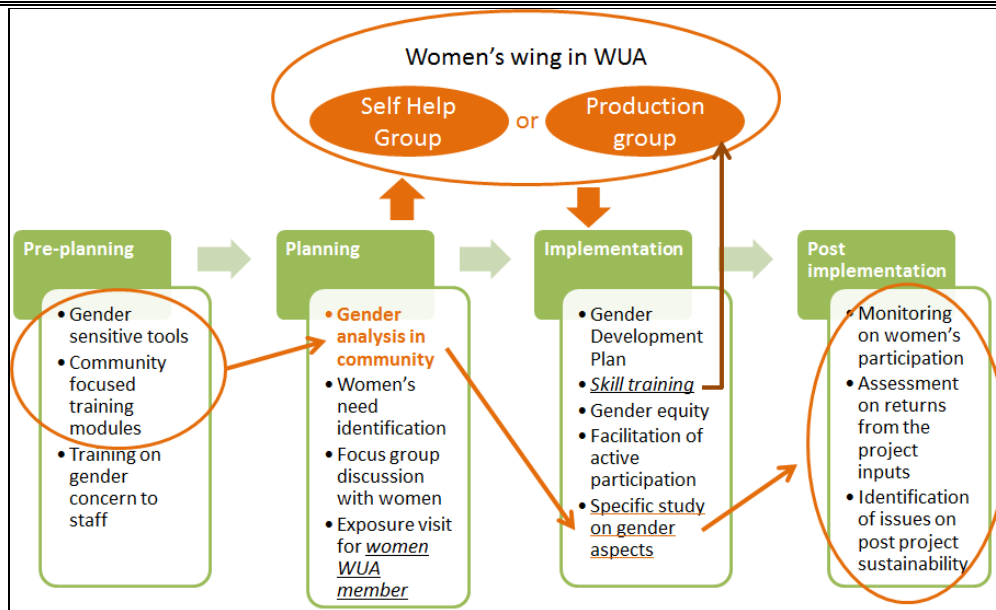
Learning from RAJAMIIP experience, RWSLIP suggests the following activities in environment and social management component as gender development in the project report (PR).



Source: Project Report of RWSLIP

Figure A5.6.1 Flow of Gender Activities

It covers the stages from the pre-planning to post implementation aiming to bring a paradigm shift in the present scenario and focusing on increasing women's involvement, but suggested activities need to be specified considering the present situation surrounding rural women. To take into account the countermeasures to the constraints mentioned above, the JICA survey team proposes to organise the activities as described in Figure A5.6.2.



Source: JICA survey team based on the data in the project report of RWSLIP

Figure A5.6.2 Revised Flow of Gender Activities

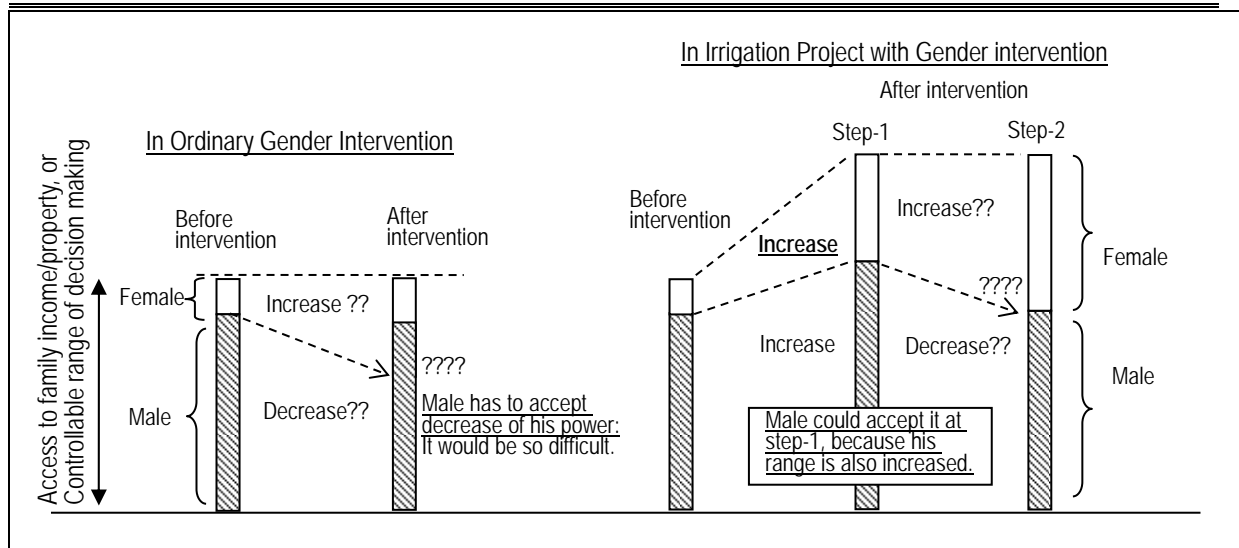
(2) Making Full Use of the Capability of Women in WUA

(a) Basic Understandings of Women in Agriculture

Since women have significant roles in agricultural activities (see in Section 2.7), their contribution and capabilities are always underestimated in their society. In the Project, therefore, the JICA survey team focuses on the roles of females and their responsibility in agriculture, then tried to accelerate the participation of women in irrigation development. Because the JICA survey team believes that participation of women in irrigation development could establish more sustainable and stronger organisation in the operation and maintenance of the irrigation system.

Generally speaking, it is known in India that gender issues could not be solved easily, particularly, in widening women's access to family income as well as giving women controllable range in the decision making in their rural lives.

However, the JICA survey team considers that gender interventions in irrigation development could have more advantages than other ordinary intervention, where only training on awareness for women's right is provided. As shown in Figure A5.6.3 below, irrigation development could actually increase family income by itself, which might let the male accepts women's empowerment in decision making and women's income generation for the overall increase in family income.



Source: JICA survey team

Figure A5.6.3 Gender Intervention in Irrigation Development

(b) “Women-wing” in WUA

As mentioned above, there are few women landowners therefore, it is not practically rational to expect empowerment of women WUA members. To reflect the opinions of women to the WUA’s decision making process, women-wing is proposed to be formed in the Project under WUA. The representative of the wing is guaranteed a place in the WUA meeting in order to raise her concerns on the agenda.

Functions of women-wing in WUA in the Project are tentatively suggested as follows:

- Planning and management of gender related facilities, as described in Chapter 4;
- Participation in the decision making of WUA as representative of women user group of irrigation facilities from women’s aspect;
- Assistance (or in charge, if possible) of financial audit on WUA bookkeeping;
- Assistance (or in charge, if possible) of collaborative activities, e.g., grass cutting on canal slope, and desilting in canal; and
- Assistance (or in charge, if possible) of water fee collection, and so on.

(3) Increase Control and Access on Income through Processing and Marketing

It is expected to increase the control and access of women on income when the gaps of women participation in agricultural value chain are fulfilled. According to the field survey, the following opportunities are found to improve women participation in agriculture:

- Production: basic vegetable production in small area
- Processing: value added activities such as post-harvest including packaging, food processing
- Marketing: group shipping/marketing, arrangement of transportation in a group

For this purpose, the project facilitates women-wing members to form small groups with 10 to 15 members in certain condition and provide support with technical and management training based on their needs. It is also essential to assign female field staff, e.g., female animator to provide close support to the groups.

5.6.3 Proposed Activities in Gender Mainstreaming

To obtain fruitful results with the abovementioned approaches in this sector, the following project activities are tentatively proposed, and the details are given in Attachment 5.6.1.:

- i) Institutionalization of Gender Mainstreaming in Water Management
- ii) Enhancement of Women’s Capability and Participation in WUA
- iii) Capacity Building on Agricultural Technologies through SHGs

(1) General Activity Plan for this Sector

This component consists of three sub-components: Supporting the Institutionalization of Gender Mainstreaming in Water Management; Enhancement of Women's Capability and Participation in WUA; and Capacity Building on Agricultural Technologies through SHGs. The following highlight some points on objectives of activities and practical consideration.

(a) Institutionalization of Gender Mainstreaming in Water Management

This sub-component aims at institutionalizing the participation of women in WUA and water management by adding clauses to PIM Act and at systemising collection of gender disaggregated data. Those are the very foundations to promote gender mainstreaming in water management. Prior to the Project, WRD proceeds suggested clauses to ordain; WRD, WCD, and gender consultant are expected to continue to follow-up on the progress of procedure and make additional clauses of PIM Act take into effect seamlessly from the ordinance.

Another point to emphasise is the absence of separate training for gender issues in promoting gender as crosscutting issues; it is included in the trainings under WUA component: water management training and monthly meeting cum training of WUA/Managing Committee (MC) and Territorial Constituency (TC). Before starting the activities, the gender consultant and WCD need to prepare the plan of lecture and supporting materials on gender issues in water management and WUA activities. It is also aimed to incorporate gender perspectives into the existing capacity building activities in water management continuously. At the same time, training institutions such as IMTI and KVK need to improve their training facilities to meet female participants' needs and training organizers also need to establish approach to facilitate women farmers to participate in trainings. Ideas on gender friendly training practices are given in Attachment 5.6.2.

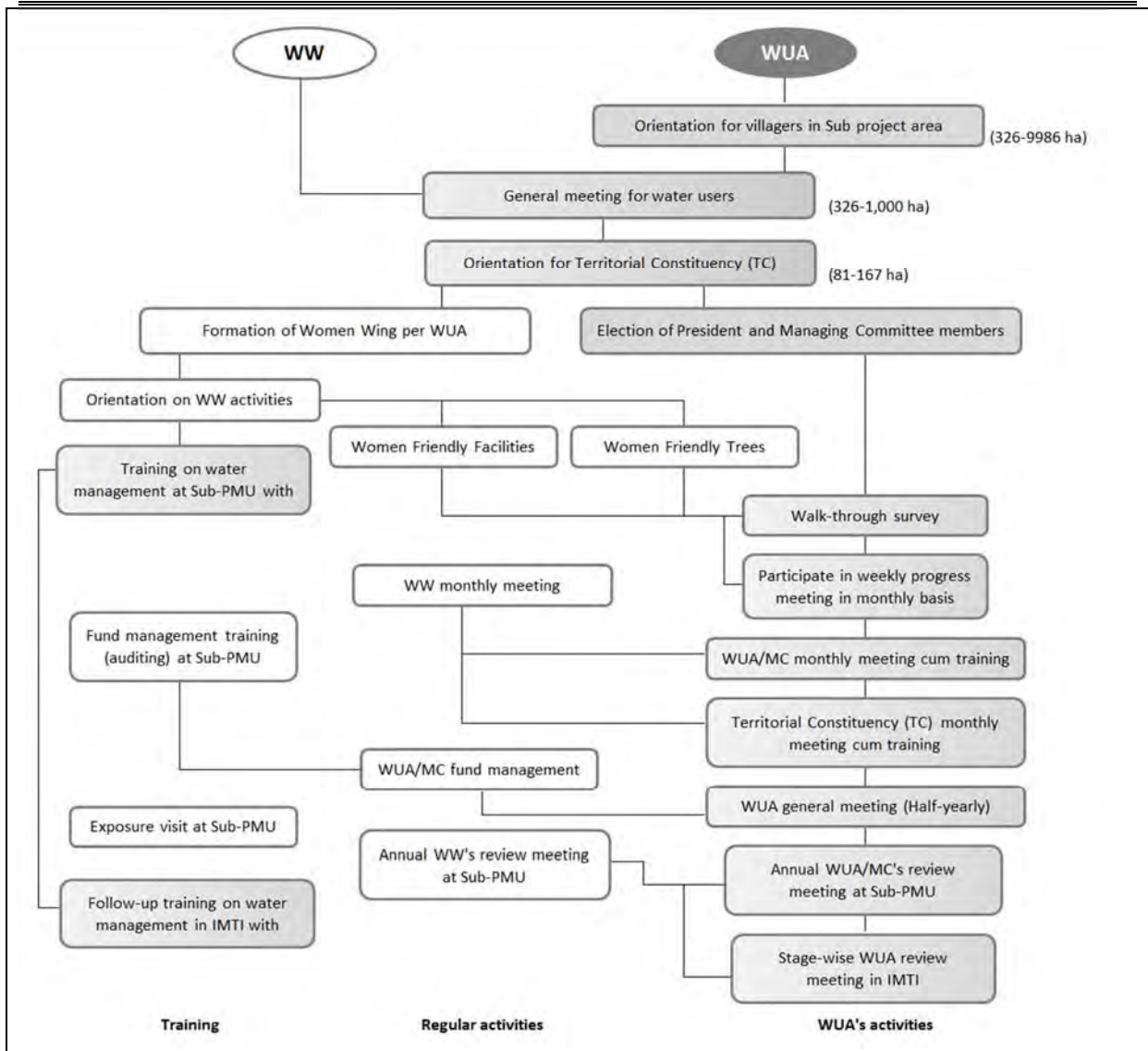
Collection of gender-disaggregated data is not new in the government organisations since there are gender desks in each department. WCD gender cell and gender consultant need to give clear instructions to the gender desks in the departments on the how's and what data to collect. WRD is expected to lead in data collection physically while WCD provides technical advices. For this purpose, WRD need to restore their gender desk or create a new post immediately, being a lead agency of the Project as well as by promoting gender mainstreaming in WUA and water management.

To determine the effectiveness of the project approach, periodical surveys, e.g., baseline, annually, stage-wise, and end of the Project, should be conducted. Based on the result of the periodical survey, further suggestion on the concept to be included in PIM Act will be compiled and be proceeded for legalisation. Sample questionnaire for baseline survey on gender aspects are given in Attachment 5.6.3.

(b) Enhancement of Women's Capability and Participation in WUA

To encourage women to participate in WUA activities as well as in water management, the Project forms the "women-wing" in each WUA, which will play various roles in WUA's activities. Women-wing is formed through the same steps with WUA formation except for the election. Meetings in different layers such as sub-project, WUA area, and TC, should be utilise to facilitate women in the participation to the project activities.

Figure A5.6.4 shows the flow of women-wing activities.



Source: JICA survey team

Figure A5.6.4 Flow of Women-wing Activities

The Project introduced a new concept called “Women Friendly Activities” as women-wing’s activities: women friendly facility (WFF) and women friendly trees (WFT). The women-wing can plan and implement works for women friendly activities. Women will plan the *what, where, how many, what shape, how to operate, etc.*

The aims are as follows:

- i) A process in which women think/ discuss about WFF to improve their lives,
- ii) A fact that they realise WFF at the sites, and
- iii) A sharing of experiences among women-wings.

Women friendly facility is an infrastructure in or near the irrigation scheme to fulfill the needs of women. It can be steps/stairs in watercourses, footbridges to cross canals or watercourses, bathing, or washing places. The activity aims not only to provide facility to women, but also to provide learning

process on "how to plan", and implement the project. It is important to facilitate women-wing members in fully expressing their ideas freely.

WFTs are planted as part of environmental protection in construction work of irrigation scheme rehabilitation. The Project utilises this opportunity to make women choose trees based on their needs. The plan of facility and tree plantation is shared and discussed with WUA. The sites are confirmed through the walk-through survey. Table A5.6.1 summarises the information on women friendly activities.



Source: JICA survey team

Figure A5.6.5 Example of WFF

Table A5.6.1 Summary of Women-wing Activity

	Women Friendly Facilities	Women Friendly Trees
Expected Budget	1% of estimated cost for the rehabilitation of canal system	Number of trees/WUA: 1,667 INR 120 / tree, 1 tree / 3 m and 5 km / WUA
Possible Activity	<ul style="list-style-type: none"> Steps/stairs Foot bridges Bathing and washing place (need to be environmental friendly) Other ideas to be developed by women themselves 	<ul style="list-style-type: none"> Selection of trees based on women's needs <ul style="list-style-type: none"> - Fodder trees - Fruit tree - For fire wood - For any other income generating purpose Management of trees: collection and auction (on discussion with WUA)
Responsible Organisation	Construction and management: WRD Facilitation: WCD	Preparation: WRD Facilitation and management: WCD
Possible Criteria	<ol style="list-style-type: none"> 1) Public purpose: more beneficiaries 2) Cost-effectiveness 3) Necessity/urgency for women 4) Sustainability 	<ol style="list-style-type: none"> 1) Easy to manage (suitableness, size of trees, insect/disease, water, etc.) 2) Cost-effectiveness 3) Diversity
Needs to be Considered	<ul style="list-style-type: none"> Be considered to cover all the TCs as much as possible Facilitate members to reach mutual consent 	<ul style="list-style-type: none"> Need to confirm land demarcation with vested interests Need to confirm with WUA on management of trees, especially auction

Source: JICA survey team

At the same time, women-wings are actively involved in WUA activities. Besides the monthly meeting, members participate in the WUA's monthly meeting and territorial constituency's monthly meeting to learn how to conduct and organise activities and how to reflect their opinions in the activities. The Project also support women-wing to involve in WUA's fund management. In coordination with WUA, women-wing will plan their activities related to WUA's fund management, such as: involvement of Corpus Fund (management, and/or audit), involvement of water fee collection, auditing WUA fund, and fund raising in WFF construction. In water fee collection and in fund raising for WFF and WFT activities, there should be a discussion on saving a part of payment for women-wing activities.

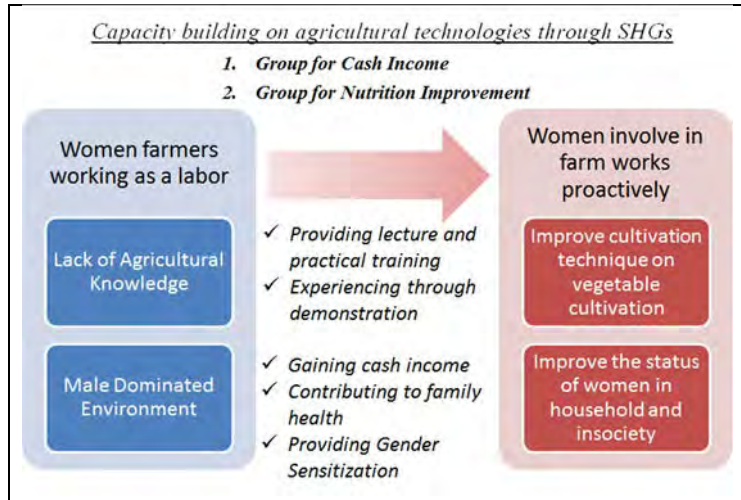
The Project emphasises that women-wing activities should not be separated from WUA activities. Just empowerment of women is not enough for the Project; women's participation in WUA activities and in water management should be increased through women-wing activities as active water users. That is why the Project plans to conduct training and meeting for women-wing with WUA.

Attachment 5.6.4 shows the detailed process to implement the activities of women-wing.

(c) Capacity Building on Agricultural Technologies through SHG Activities

Although women in farm household spend substantial amount of time on farming work, there are gaps in the involvement of men and women in farming activities; farming plan is mainly made by male member of their household and women have less opportunities to update their agricultural knowledge. The following Figure A5.6.6 shows the present constraints, proposed attempts of the Project, and expected outcome to fulfill those gaps. The Project proposes vegetable cultivation activities for women group by using SHG program under WCD, as well as agricultural extension system under DoA/DoH.

This sub-component is conducted in sub-project wise. There are two kinds of activity, i.e., vegetable cultivation for cash and vegetable cultivation for nutrition. Two groups per sub-project are targeted for each activity. It is different from WUA-based activities, so TSG-SP members need to develop activity plans as a team before starting the selection process of the group. Unlike in the case of WUA membership, landownership is not necessarily required but the group member should be a water user.

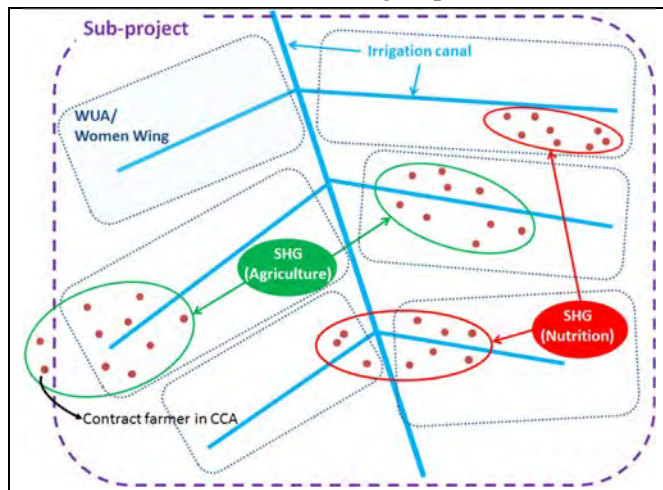


Source: JICA survey team

Figure A5.6.6 Concept of the Activity

While the group for cash improves cultivation techniques on basic vegetables such as tomato, chili, and onion; the group for nutrition learns how to cultivate and cook newly introduced vegetables such as Swiss chard, kale, and amaranth.

Each group consists of up to 20 members. The Project provides trainings and necessary materials for vegetable cultivation on all members. In cooperation with one member of the group, a demonstration plot (demo plot) is established per group for nursery production and providing on-the-job training to show the other group members the know-how on nursery raising and cultivation of vegetables using modern technologies. Produced seedlings in the demo nursery are distributed to the group members to be used in for demonstration in their field. Members are expected to cultivate the vegetables in their own field using the same method as explained in the training. While basic vegetable cultivation group focused more on cultivation techniques, nutritious vegetable cultivation group on the other hand learnt not only the cultivation method but also how to cook nutritious food. Developed recipe is disseminate through distribution of recipe book and lecture on nutrition and recipe. Members are received complete blood count (CBC) regularly in order to follow up their nutritious status, especially on anemia. For the activity of the group for cash, the Project requests DoA to involve agriculture supervisors not only for technical advices, but also for improving extension techniques so that DoA can continue and sustain similar program. The group can be formed as FIG or any other suitable group under Agriculture Technology Management Agency (ATMA) program as suggested by DoA. The Project provides agricultural material (mulch sheet) to two progressive women farmers to support DoA staff disseminating the activity to out of the group. And for the activity of the group for nutrition, *Anganwadi*, WCD/ICDS needs to play an important role instead of DoA.



Source: JICA survey team

Figure A5.6.7 Selection of SHG

Table A5.6.2 summarises the information of the groups and Attachment 5.6.3 shows the detailed process to implement.

Table A5.6.2 Summary of Agriculture Group Activity

	Basic Vegetable Cultivation Group	Nutritious Vegetable Cultivation Group
Objectives	To acquire the knowledge and skills necessary to cultivate vegetables for commercial purpose. To expand in order to adopt the learnt technologies in their family field.	To learn how to cultivate newly introduced nutritious vegetables in limited land areas. To improve nutritional status by ingestion of nutritious vegetables.
Number of Target groups	Two groups per sub-project. Each group consists of up to 20 members (one demonstrator and 19 followers).	Two groups per sub-project. Each group consists of up to 20 members (one demonstrator and 19 followers).
Responsible Organisation	DoA: Agriculture supervisor	WCD: <i>Anganwadi</i> for technical support. <i>Satin</i> for group management.
Requirements to be a Member	- Has experience to cultivate vegetable - Family members agree to use the land for the activity. - Has enough land to cultivate vegetable for commercial purpose in the future: Family members are positive to cultivate vegetables for commercial purpose in the future. - Able to share the gained experience with other members of the society.	- Able to use a part of land for this activity wherein family members agree on it. - Has nutrition problem and a desire to improve it on their own as well as their family. - Comparatively has less land than others. - Able to share gained experience with other members of the society.
Method of Extension	Demonstration is conducted in <i>Rabi</i> and in <i>Kharif</i> 1. TOT for agriculture supervisor (DoA) and NGO staff. 2. Theoretical training to group members by agriculture supervisor in cooperation with NGO staff. 3. Preparation of nursery and demo plot (Hands-on training to all members). 4. Post-harvest technology: bundling, packaging (Hands-on training to all members). 5. Promote record keeping on vegetable sales.	Demonstration is conducted in <i>Rabi</i> and in <i>Kharif</i> 1. TOT for agriculture supervisor (DoA), <i>Anganwadi</i> staff (WCD/ICDS), and NGO staff. 2. Practical training in demo plot on how to sow the seed and how to apply water and fertiliser. 3. Training on how to harvest and how to cook the vegetable in <i>Anganwadi</i> . 4. Seed collection and hand it to <i>Anganwadi</i> to establish seed bank to continue the activity with other group.
Way Forward	- DoA is expected to incorporate the extension method and technology in existing extension system. - Farmers interest group or commodity interest group under ATMA program is formed (including male members) after adopting and promoting the cultivation technique in the area - The group can develop linkage with farmers producer organisation in the future.	- <i>Anganwadi</i> is expected to maintain the seed bank and continue the activity with other groups. - Other recipes to cook the vegetable in local way are developed by the group and/or <i>Anganwadi</i> and disseminated through the recipe book and lecture in order to increase intake of vegetable in the area.
Remarks		If there is no <i>Satin</i> , <i>Anganwadi</i> staff will support the group formation and management instead.

Source: JICA survey team

(2) Activities in this Sector

To obtain fruitful results with the abovementioned approaches in this sector, the following project activities are tentatively proposed and the details are given in Attachment 5.6.1:

- i) Supporting the Institutionalisation of Gender Mainstreaming in Water Management,
- ii) Enhancement of Women's Capability and Participation in WUA, and
- iii) Capacity Building on Agricultural Technologies through SHGs.

Table A5.6.3 Activities for Gender Mainstreaming in Agriculture and Water Sector

Items	Activities
<p>1. Supporting the Institutionalization of Gender Mainstreaming in Water Management</p>	<p>1) Developing and adopting gender-responsive rules and guidelines of Participatory Irrigation Management Act.</p> <p>(a) Follow-up of approval process of additional clauses on PIM Act.</p> <p>(b) Promoting and monitoring of adaptation of additional clauses.</p> <p>(c) Compiling and submitting further suggestions on concepts to be included in PIM Act based on the project's result.</p> <p>2) Incorporating gender perspectives into existing capacity building activities in water management.</p> <p>(a) Preparation of gender session for training on water management and WUA management.</p> <p>(b) Providing necessary information in orientation and ToT for developing gender action plans in WUA.</p> <p>(c) Developing topics for regular awareness program in WUA/MC meeting, TC meeting, and general meeting.</p> <p>(d) Support in the coordination between WUA and women-wing.</p> <p>3) Establishment of gender disaggregated data collection system.</p> <p>(a) Preparing and finalising the list of sector-wise gender disaggregated data.</p> <p>(b) Establishment of monitoring system on gender concerned activities.</p> <p>(c) Monitoring the activities through field visit and collecting gender disaggregated data.</p> <p>(d) Analysing collected data and compiling it for annual report.</p> <p>(e) Conduct stage-wise assessment.</p> <p>(f) Evaluation of the impact and result of RWSLIP.</p>
<p>2. Enhancement of Women's Capability and Participation in WUA</p>	<p>1) Formulation of WUA women-wing.</p> <p>(a) General meeting for water users at the same time of WUA formation.</p> <p>(b) Orientation for territorial constituency at the same time of WUA formation.</p> <p>(c) Formulation of women-wing per WUA.</p> <p>(d) Orientation on women-wing activities.</p> <p>2) Facilitate the introduction of women friendly activities.</p> <p>(a) Facilitating to discuss and finalise women friendly activities.</p> <p>(b) Support women-wing to plan and implement women friendly facilities.</p> <p>(c) Support women-wing to plan and implement women friendly trees.</p> <p>3) Encouraging women to participate in WUA activities</p> <p>(a) Support women-wing members to conduct WW monthly meeting.</p> <p>(b) Support women-wing members to participate and report in WUA/MC monthly meeting.</p> <p>(c) Support to women-wing members to participate in WUA fund management.</p> <p>(d) Support women-wing members to participate territorial constituency monthly meeting cum training.</p> <p>(e) Support women-wing members to participate in weekly progress meeting in monthly basis.</p> <p>(f) Support women-wing members to participate in WUA general meeting.</p> <p>4) Providing trainings, exposure activities on water management, and organisational management.</p> <p>(a) Training main members on water management at the sub-PMU level with WUA.</p> <p>(b) Fund management training (auditing) at the district level.</p> <p>(c) Exposure visit (sub-PMU wise).</p>

Items	Activities
	<ul style="list-style-type: none"> (d) Annual women-wing review meeting at the sub-PMU level. (e) Annual WUA/MCs review meeting at the sub-PMU level. (f) Stage-wise WUA review meeting at the state level in IMTI with WUA. (g) Follow-up training for main members on water management with WUA.
<p>3. Capacity Building on Agricultural Technologies through SHGs</p>	<ul style="list-style-type: none"> 1) Selection of the group. <ul style="list-style-type: none"> (a) Developing work plan on activities in SP level. (b) Providing information to women members of the sub-projects on agriculture program under women-wing. (c) Collecting proposal from groups. (d) Selection of group. (e) Conducting orientation to selected groups. 2) Strengthening capacity on group management. <ul style="list-style-type: none"> (a) Providing training on group management. (b) Support to conduct monthly group meeting. 3) Strengthening capacity on agricultural techniques. <ul style="list-style-type: none"> (a) ToT on basic vegetable cultivation techniques on tomato, onion, and chili for DoA, DoH, NGO, and community motivators. (b) ToT on nutritious vegetable cultivation techniques on Swiss chard, kale and amaranth for DoA, DoH, NGO, and Anganwadi workers. (c) Training for SHGs on basic vegetable cultivation techniques on tomato, onion, and chili. (d) Training for SHGs on nutritious vegetable cultivation techniques on Swiss chard, kale, and amaranth. (e) Establishing demonstration plot for basic vegetable cultivation. (f) Establishing demonstration plot for nutritious vegetable cultivation. 4) Monitoring and mentoring the groups for sustainable activities. <ul style="list-style-type: none"> (a) Regular monitoring and providing necessary support to groups.

Source: JICA survey team

CHAPTER 6 ORGANISATIONAL STRUCTURE, PLAN, AND SCHEDULE FOR IMPLEMENTATION, PROCUREMENT, OPERATION, AND MAINTENANCE

6.1 General

6.1.1 Constraints and Issues in Implementation Plan

(1) Convergence of Other Related Agencies

Since agricultural supports including agriculture practices, marketing, and processing are essential for the success of the Project, having a good implementation-related organisation is a crucial issue. According to the analysis of the irrigation projects that were implemented by the Water Resource Department (WRD) in the past, the following constraints were identified:

- Coordination among WRD, Department of Horticulture (DoH), Department of Agriculture (DoA), Market Board, and other related agencies was not established well.
- The project management unit (PMU) at Jaipur could not manage and supervise all the sub-projects scattered all over the state.

(2) Risk of Delay Due to Preparatory Issues

Delay or cancelation of the following focal matters have caused serious negative impacts on the project implementation in the past projects:

- Sub-PMU was planned to be established, but actual establishment of the sub-PMU was cancelled due to WRD's internal problem.
- Procurements of (1) engineering and management consultants, (2) monitoring and evaluation consultant, and (3) non-governmental organisations (NGOs) were significantly delayed for no less than two years, which caused serious delay in the progress of construction schedule and formulation of water users' associations (WUAs).
- Mentoring services to WUAs by NGOs after transferring the irrigation facilities were terminated and were not completed.
- The quality of survey, investigation, and design (SID) works which were done by local consultants was poor. This caused delay of construction works due to re-design works.

(3) WUA's Ownership of the Irrigation Facility

One of the objectives of the project is the introduction of the participatory irrigation management (PIM) by the water users' association (WUA). However, it is said that establishment of good and active WUAs is not easy, particularly on how to let WUAs have the sense of ownership on their irrigation system.

(4) Sub-PMU Officers' Ownership and Responsibility of the Sub-project

It is a fact that the progress of construction works and other project activities will be widely affected by the sub-PMU officers which can be formed by having a sense of ownership and responsibility on the sub-project. To generate sense of ownership and responsibility on the sub-PMU officers' mind may be one way for the success of the Project.

6.1.2 Approaches and Countermeasures in Implementation Plan

(1) Stage-wise Implementation

As explained in Section 4.2.1 (2), the survey team proposes "Stage-wise Implementation Program" aiming at the following:

- Early and smooth commencement of construction works through smooth pre-construction works such as review of DPRs, preparation of technical estimate (hereinafter referred to as TE), and tender process; and

- Improvement of quality and progress of works through proper construction management and supervision.

(2) Introduction of Organisational Aspect of Evaluation and Prioritisation of the Sub-projects

Screening and prioritisation of the sub-projects is normally made with technical aspects such as dependability of water resource and appropriateness of size of irrigation facilities. However, the team proposes to evaluate farmers' competence acting as WUA in the sub-project in parallel with the evaluation of technical potential.

(3) Introduction of Performance based Budget Allocation

In order to give the sub-PMU officers tangible benefits with responsibility on the progress of the sub-projects, the survey team suggests to introduce "a performance-based budget allocation system" in which sub-PMU's budget for the sub-projects in the next stage will be allocated based on the results of each sub-PMU's performance in the previous stage. Accordingly, sub-PMUs that have good performance can implement more sub-projects than the original plan with increased budget. Assessment will be made by the consultant at the proper timing of stage-1 and stage-2 and compiled in stage-wise review reports at the end of stage-1 and stage-2.

6.2 Implementation Structure

6.2.1 Committees for Project Coordination, and Monitoring

There are three committees for arranging the project activities inter-department matters such as the project steering committee at the state level, the project monitoring committee at the project management unit (PMU) level, and the sub-PMU coordination committee at the sub-PMU level. The implementation structure of the project is shown in Figure A6.2.1

The chairmen, members, responsibilities, and remarks of each coordination committee are summarised in Table A6.2.1.

Table A6.2.1 Roles and Responsibility of Each Coordination Committee

Committees	Members	Responsibilities	Remarks
The Project Steering Committee	<ul style="list-style-type: none"> Chief Secretary of Government of Rajasthan (GoR) (Chairman) Secretary/Chief Engineer General of Water Resource Department Secretary of Department of Agriculture Secretary of Department of Horticulture Secretary of Department of Women and Child Development Secretary of Rural Development Department Secretary of Marketing Board Principal Secretary of Department of Finance 	<ul style="list-style-type: none"> Coordination between departments and other related agencies at high-level Monitoring and supervising the overall progress of the project Acceptance and concurrence for major changes of the project works, if any 	<ul style="list-style-type: none"> Frequency of meeting: every six months Location: Jaipur
The Project Monitoring Committee	<ul style="list-style-type: none"> Chief Engineer General of Water Resource Department (Chairman) Chief Engineer for Implementation and Construction Unit of Water Resource Department Chief Engineer for Monitoring and Coordination Unit of Water Resource Department Superintending Engineer for Monitoring and Coordination Unit of Water Resource Department Additional Commissioner of Department of Agriculture Additional Director of Department of Horticulture Additional Director of Department of Women and Child Development Additional Director of Rural Development Department Joint Director of Marketing Board 	<ul style="list-style-type: none"> Coordination between departments and other related agencies at PMU-level Monitoring and supervising the overall progress and sector-wise progress of the project Acceptance and concurrence for any change of the minor project works, if any 	<ul style="list-style-type: none"> Frequency of meeting: every two months Location: Jaipur

Committees	Members	Responsibilities	Remarks
<u>The Sub-PMU Coordination Committee</u>	<ul style="list-style-type: none"> ▪ Superintending Engineer for Implementation and Construction Unit in each sub-PMU of Water Resource Department (Chairman) ▪ Executive Engineer for Implementation and Construction Unit in each sub-PMU of Water Resource Department (Chairman) ▪ Deputy Director of Department of Agriculture in each regional/district office ▪ Deputy Director off Department of Horticulture in each regional/district office ▪ Deputy Director of Department of Women and Child Development in each regional/district office ▪ Deputy Director of Rural Development Department in each regional/district office ▪ Deputy Director of Marketing Board in each regional/district office 	<ul style="list-style-type: none"> ▪ Coordination between departments and other related agencies at sub-PMU/regional/district level ▪ Monitoring and supervising the progress of the project works ▪ Instruction of the project works to contractors, NGOs, and other related agencies ▪ Discussing and solving all the problems ▪ Implementing the entire project activities 	<ul style="list-style-type: none"> ▪ Frequency of meeting: every month ▪ Location: each sub-PMU site

Source: JICA survey team

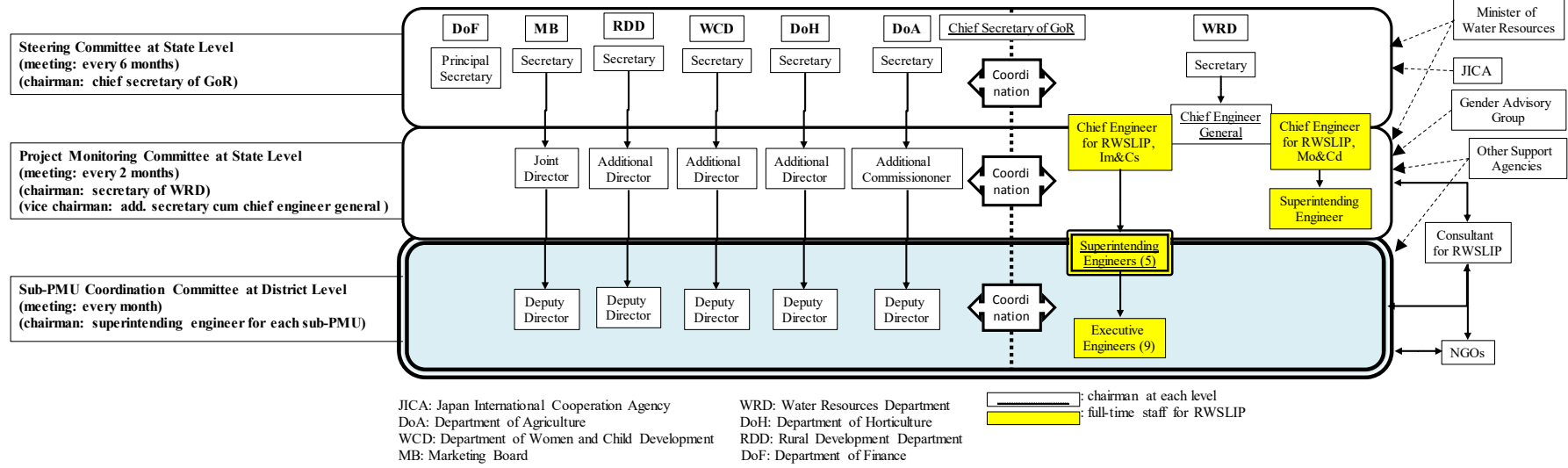
6.2.2 Project Management Unit (PMU)

As shown in Figure A6.2.1, the Project Management Unit (PMU) is the execution body which comprises two sub-units namely (i) Monitoring and Coordination Unit, and (ii) Implementation and Construction Unit as shown in Figure A6.2.1. The monitoring and coordination unit has an office in Jaipur, so-called the PMU main office, and it plays a role in monitoring entire progress and quality of the works and activities. In contrary, the implementation and construction unit has five sub-PMU offices which are located at and cover the following zones/areas:

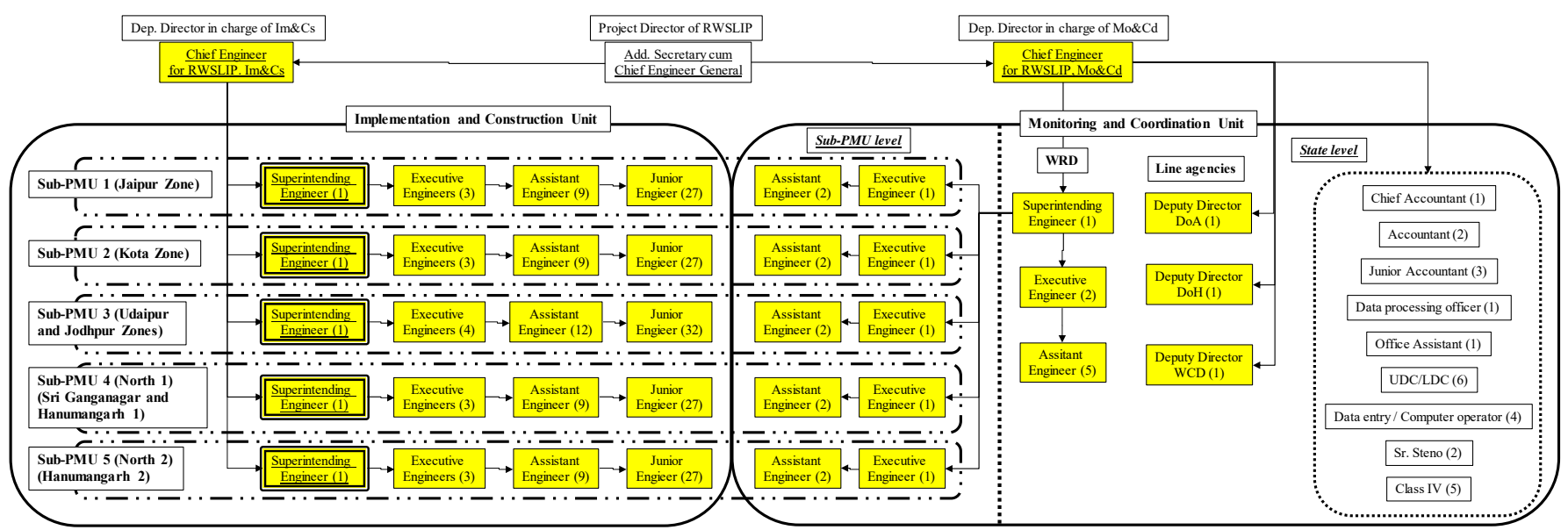
- (i) Jaipur Zone (Jaipur sub-PMU region),
- (ii) Kota Zone (Kota sub-PMU region),
- (iii) Udaipur and Jodhpur zones (Udaipur/Jodhpur sub-PMU region),
- (iv) Ganganagar and Hanumangarh 1 area in North Zone (Ganganagar/Hanumangarh sub-PMU region), and
- (v) Hanumangarh 2 area in North Zone (Hanumangarh sub-PMU region).

Those five sub-PMU offices play significant roles in supervising construction works and controlling all the other project works on the ground. Each Superintending Engineer of WRD will be fully responsible for all the project works including activities for soft components as well as construction works.

Project Management and Coordination Committee



Implementation Structure of Project Management Unit (PMU)



Source: JICA survey team

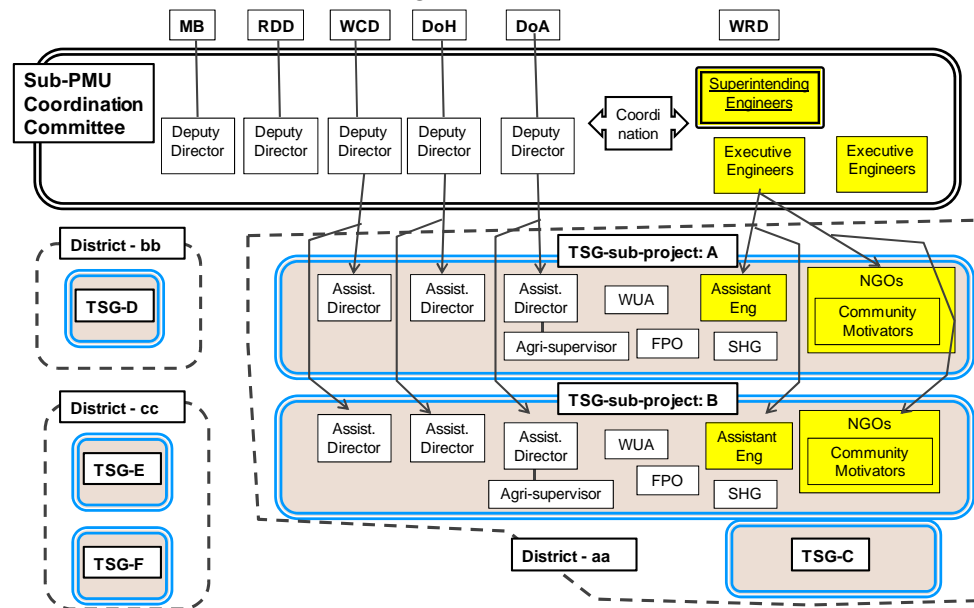
Figure A6.2.1 Implementation Structure of the Project Management Unit (PMU)

6.2.3 Technical Support Group at Sub-project level

The technical support group at sub-project (TSG-SP) should be formulated in each sub-project, which comprises officers and members from the following:

- i) Department of Agriculture,
- ii) Department of Horticulture,
- iii) Women and Child Development Department,
- iv) Water Resource Department,
- v) Regional NGO,
- vi) WUAs,
- vii) Farmer interests group (FIG)/Farmer producer organisations (FPO), and
- viii) Self-help groups (SHG).

The implementation structure is shown in Figure A6.2.2.



Source: JICA survey team

Figure A6.2.2 Implementation Structure of Technical Support Group at Sub-project Level

At the district level, the executing engineer should be responsible for the implementation of the project works. The additional engineers should control all the project works at sites under the supervision of executing engineers/superintending engineer of WRD.

6.2.4 Implementation Supporting by Major Line Departments

(1) Agriculture

(a) Department of Agriculture

The roles of the Department of Agriculture (DoA) for the Project are described below.

- DoA needs to participate in the state level and sub-PMU level workshops to make implementation plan, to monitor implementation schedule, and to evaluate (review) the result of activities; then re-plan the schedule for next year. In addition, DoA needs to give advice and solution to reported problems from farmers.
- DoA needs to dispatch participants for exposure visit in order to learn the advanced techniques from advanced state; then, the participants need to transfer the techniques to farmers.
- DoA needs to organise a task team for compilation of farmer friendly manuals in collaboration with the DoH and NGOs.
- DoA needs to lead a task team for strengthening of agriculture information centre by construction of short message service (SMS) system in *Kisan* call centre. In addition, DoA needs to compile the queries from farmers and response from the agriculture information centre to

Q&A data book. It would be a preparation for interactive communication.

- DoA needs to play an active role for farmers' training as resource persons and mentors.
- DoA needs to guide farmers in establishing demonstration farm in farmer's field.
- DoA needs to provide improved seeds for cereals, pulses, and oilseeds for the sake of improvement of farmers' livelihood.

(b) Department of Horticulture

The roles of the Department of Horticulture (DoH) for the Project are described below.

- DoH needs to participate in state level and sub-PMU level workshops to make implementation plan, to monitor implementation schedule, and to evaluate (review) the result of activities; then, to re-plan the implementation schedule for next year. In addition, DoH needs to give advice and solutions to reported questions and problems from farmers.
- DoH needs to dispatch participants to exposure visit in order to learn the advanced techniques from advanced state; then, the participants need to teach the techniques to farmers.
- DoH needs to organise a task team together with DoA for compilation of farmer friendly manuals in collaboration with NGOs.
- DoH participates in a task team for strengthening of agriculture information centre by construction of SMS service system in Kisan call centre. In addition, DoH needs to collaborate with DoA for preparation of Q&A data book and future interactive communication.
- DoH needs to play an active role for farmers' training as resource persons and mentors.
- DoH needs to guide farmers in establishing demonstration farm in farmer's field.
- DoH needs to provide seedlings of seedless *kinnow*, seedless santra oranges, and exotic vegetables for the sake of improvement of farmers' livelihood.

(c) State Institute of Agriculture Management

The roles of the State Institute of Agriculture Management for the Project are described below.

- The State Institute of Agriculture Management needs to provide the venue (including lodging and food) for the state level and sub-PMU level workshops.
- The State Institute of Agriculture Management needs to provide appropriate resource persons for the agriculture-related issues on an on-demand basis.

(d) Krishi Vigyan Kendra (KVK)

The roles of the *Krishi Vigyan Kendra* (KVK) for the Project are described below.

- KVK needs to provide the venue (including lodging and food) for the training of trainers.
- KVK needs to provide resource persons who have precise and practical knowledge to make participants a good trainer for farmers.
- If KVK does not have proper resource persons in the vicinity, KVK needs to outsource resource persons.
- KVK needs to show how to guide farmers. Therefore, the resource person needs to provide not only lecture type trainings but also hands-on type trainings.
- KVK needs to experiment water saving cultivation with mulch in the demonstration plots for fruits (0.2 ha) and for vegetables (0.2 ha).
- KVK needs to show how demonstration farm works to change the attitude of conservative farmers.

The tasks and obligations of concerned departments and institutes are summarised in Table A6.2.2.

**Table A6.2.2 Tasks and Obligations of Concerned Departments and Institutes
for Agriculture Sector**

	Item	PMU	Consultant	NGO	DoA	DoH	SIAM	KVK
Workshop	State level workshop	○	○	○	○	○	○	
	Sub-PMU level workshop	○	○	○	○	○	○	
Cultivation techniques	General agriculture techniques	○	○	○	○	○		○
	Cultivation techniques on cereals, pulses, and oilseeds	○	○	○	○	○		○
	Cultivation techniques on spices and medicinal plants	○	○	○	○	○		○
	Cultivation techniques on <i>kinnow</i> and santra orange	○	○	○	○	○		○
	Cultivation techniques on exotic vegetables	○	○	○	○	○		○
	Quality improvement of crops	○	○	○	○	○		○
Exposure visit	Exposure visit to advanced state	○	○	○	○	○		
Improvement of agriculture support system	Farmer friendly manuals	○	○	○	○	○		
	Strengthening of information centre	○	○	○	○	○		
Agriculture farmers' training	General agriculture techniques			○	○	○		
	Cultivation techniques on cereals, pulses, and oilseeds			○	○	○		
	Cultivation techniques on spices and medicinal plants			○	○	○		
	Cultivation techniques on <i>kinnow</i> and santra orange			○	○	○		
	Cultivation techniques on exotic vegetables			○	○	○		
	Quality improvement of crops			○	○	○		
	Marketing survey			○	○	○		
Agriculture demonstration farm	Establishment of citrus demonstration farm			○	○	○		
	Establishment of exotic vegetables			○	○	○		
	Mentoring of demonstration farm			○	○	○		
	Monitoring of demonstration farm			○	○	○		
	Establishment of demonstration plot							○

○ Main obligation, ○ Sub obligation

Source: JICA survey team

(2) Agencies Relating Agro-processing and Market

There is a cloth linkage with DoA, DoH, the Marketing Board/Small Farmers Agri-business Consortium (SFAC), and State Agriculture University in the project activities for agro-processing, marketing, and brand building component.

As explained in Section 5.1.2 (3), DoA and DoH should play major roles in the brand building for high-value added agricultural produces. The SFAC which is an organisation under the Marketing Board can provide trainings for formulation of FPO.

The relations of those departments and organisation in the proposed activities for this component are summarised in Table A6.2.3.

Table A6.2.3 Tasks and Obligations of Concerned Departments and Institutes for Agro-processing and Marketing

		DOA	DOH	The Marketing Board / SFAC	State Agricultural University
1. FIG formulation for cooperative activities					
	ToT training	-	-	○	-
	Guidance for FPO formulation	-	-	○	-
2. Connecting with large-size consumers (matching meeting)					
3. Connecting with small-size consumers (exotic vegetables)					
4. Brand Building for High-value added Agricultural Produces					
Coordination & Preparation	Formulation of Brand building working group	○	○	-	-
	VC actor evaluation forum	○	○	-	-
	Online questionnaire survey	○	○	-	-
	Preparation of leaflet	○	○	-	-
	Preparation of logo sticker	○	○	-	-
Experiment for quality improvement (TSS, marketing and quality standards)	Establishment and operation of experimental plots	○	○	-	○
	Direct sales to individual customers (Jaipur, Delhi, etc.)	-	-	-	-
	Sales to individual customers in Delhi through vegetables delivery services (Jaipur, Delhi, etc.)	-	-	-	-
Application of experimental results to farmers	TSS improvement and quality standards	○	○	-	-
	Advanced packaging/sales and quality standards	-	-	-	-
	Quality control	○	○	-	-
Antenna shops	Establishment and operation of shops	○	○	-	-
Tasting events	Tasting events in large cities (Delhi, Jaipur, etc.)	-	-	-	-
	Tasting events for high-grade groceries at large cities in Rajasthan	-	-	-	-
	Farmers' fair (State & National level)	○	○	-	-
Multimedia advertising	through TV commercial, newspaper, gourmet magazine, etc	○	○	-	-
Extension to outside the Project	Workshop for government officials outside the Project	○	○	-	-

Source: JICA survey team

(3) Agencies Relating Gender Mainstreaming

Unlike many other irrigation projects, Women and Child Development Department (WCD) plays a key role in this Project since gender mainstreaming in water management is centred on the soft component activities of the Project.

Major gender-related activities and expected involvement of WCD are shown in Table A6.2.4.

Table A6.2.4 Major Gender-Related Activities and Expected Involvement of WCD

Activities	PMU		Sub-PMU		TSG-SP		Other Responsible Organization
	WE	ICDS	WE, Dy. Director/ PO	ICDS, Dy. Director/ PO	Sathin	Anganwadi	
1. Supporting the Institutionalization of Gender Mainstreaming in Water Management							
1-1. Developing and Adopting Gender-Responsive Rules and Guidelines of Participatory Irrigation Management Act							
Follow-up of Approval Process of Additional Clauses on PIM Act	○						WRD
Promoting and Monitoring of Adaptation of the Additional Clauses	⊙						WRD
1-2. Incorporating Gender Perspectives into Existing Capacity Building Activities in Water Management							
Preparing Gender Session for the Training and Provide Information of Gender Action Plan	○						Consultant
Developing Topics for Regular Awareness Program in WUA and TC Level	○						Consultant
Support to Coordinate between WUA and Women Wing			○		○		WRD
1-3. Establishment of Gender Disaggregated Data Collection System							
Preparing List of Gender Disaggregated Data, Establishing Monitoring System and Monitoring Activities	⊙						Consultant
Monitoring the Activities through Field Visit and Collect Gender Disaggregated Data	○		⊙		○		NGO, WRD
Analyzing Collected Data and Compile in Annual Report	○						Consultant
Stage-wise Baseline Survey	○						Consultant
Stage-wise Gender Assessment	○						Consultant
Impact Survey at the end of the Project	○						Consultant
2. Enhancement of Women's Capability and Participation in WUA							
2-1. Formulation of WUA Women Wing			⊙		○		WRD
2-2. Facilitating to Introduce the Women Friendly Activities					○		NGO
2-3. Encouraging Women to Participate in WUA Activities					○		NGO
2-4. Providing Trainings and Exposure Activities on Water Management and Organizational Management							
Training on Water Management and on Financial Management (Auditing) and Exposure Visit					○		NGO
Annual Review Meeting of WW and WUA in Sub-PMU Level	○		○		○		NGO
Stage wise WUA Review Meeting	○		○		○		NGO
3. Capacity Building on Agricultural Technologies through SHGs							
3-1. Selection of the Group					○		NGO
3-2. Strengthening Capacity on Group Management					○		NGO
3-3. Strengthening Capacity on Agricultural Technique						○	NGO
3-4. Monitoring and Mentoring the Groups for Sustainable Activities					○	○	NGO

Source: JICA survey team

As indicated by this table, WCD, especially the Directorate of Women Empowerment (WE), is expected to promote gender mainstreaming in different levels: central (PMU), regional/district (sub-PMU), and *gram panchayat/village* (TSG-SP).

For collection of gender disaggregated data, WCD/WE Gender Cell is expected to activate gender desks in related organisations (WRD, DoA and DoH), and to provide necessary technical advice to them. Gender desks are administrative units in charge of gender mainstreaming in several line departments. In the project, it is not only for collecting data of all the gender concerned activities (especially trainings and participation), but also for monitoring, evaluating, and analysing the impacts and results of the Rajasthan Water Sector Livelihood Improvement Project (RWSLIP) as useful lessons learnt. Collected data are analysed and compiled annually by the project consultant (gender) and Gender Cell.

In the field level, the Project plans to formulate “WUA Women Wing” in each WUA which will play various roles in WUA’s activities and water management. *Sathin* is expected to facilitate Women Wing in cooperation with other field staff of governmental organisations and NGO staff to plan and implement activities as well as participate in WUA activities and water management.

For capacity building on agricultural technology for women, the Project proposes to use framework of SHGs structure. There are two groups: basic vegetable cultivation group for increasing cash income and nutritious vegetable cultivation group for improving nutrition. While *Sathin* supports formation and management of both group, *Anganwadi* staff is expected to be involved in technical activities of the nutritious vegetable cultivation group such as demo plot management and training on how to cook newly introduced vegetables for improvement of nutrition, in cooperation with DoA/DoH staff and NGO agriculture expert. The nutritious vegetable cultivation group is asked to produce seeds and hand it to *Anganwadi*, so that *Anganwadi* can continue the activities with other SHGs. WCD and *Anganwadi* have responsibility to disseminate output of the activity through publication of recipe book and lecture on nutrition and recipe in cooperation with KVK.

The deputy director or program officer takes major roles in monitoring activities in the field and providing necessary advice in time as mediator of directorate, field, and sub-PMU level staff. It is also

important to coordinate with line agencies to create an enabling environment in the field for efficient implementation of activities.

6.2.5 Implementation Supporting Services by Consultant, NGOs and Others

(1) Consulting Services

An engineering and management consultant shall be procured in compliance with the ‘Guidelines for the Employment of Consultants under Japanese ODA Loans’, April 2012 for smooth and effective implementation of its various components as stated below.

- Participatory Irrigation Rehabilitation Works
- Fostering and Capacity Enhancement of Water Users Organisations
- Irrigated Agriculture Intensification and Diversification
- Agro-processing, Marketing, and Promotion of High Value Agriculture Produces
- Gender Mainstreaming in Agriculture and Water Sector
- Project Management and Monitoring

The objective of this consulting service is to assist the GoR under the Rajasthan Water Sector Improvement Project in terms of technical and project management aspects.

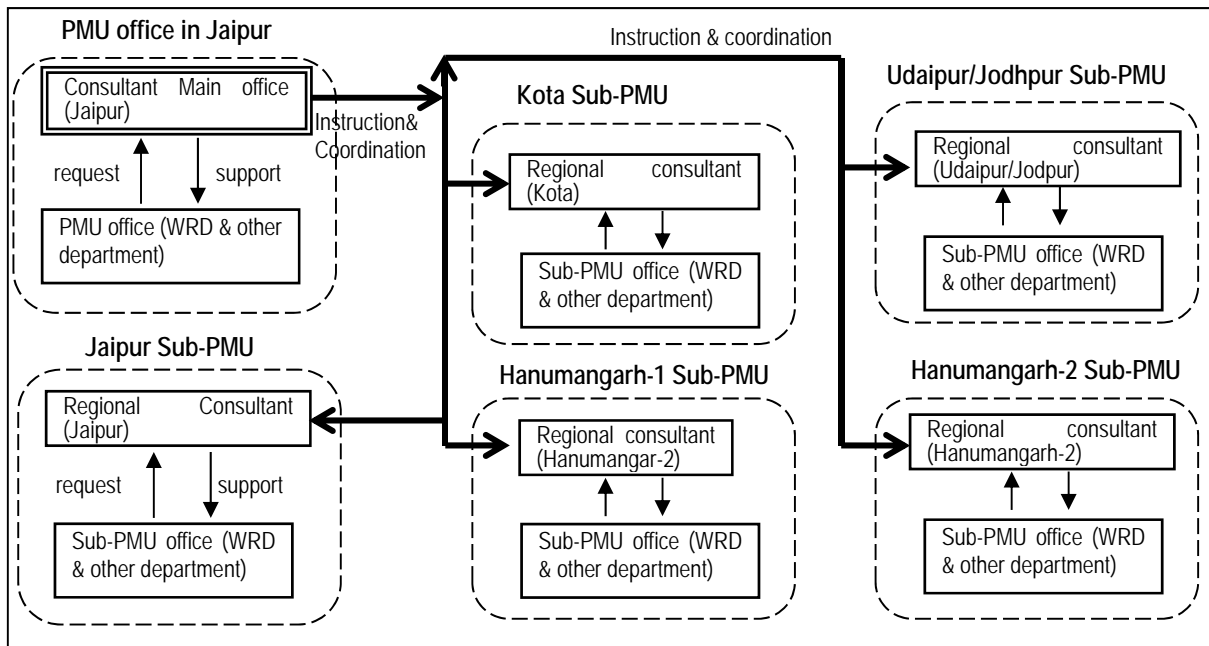
The required experts for the RWSLIP’s consultancy services in order to support the PMU for overall project management and for sub-PMU at field level are listed in Table A6.2.5.

Table A6.2.5 Required Experts for Consultancy Services of RWSLIP

International Consultants	Local Consultants
- Team Leader/Engineering and Management Consultant	- Co-Team Leader/ Engineering and Management Expert
- Sr. Planning and Design Expert	- Regional Management Expert-1
- Sr. Construction Quality Expert	- Regional Management Expert-2
- Sr. Irrigated Agriculture Development Expert	- Regional Management Expert-3
- Sr. Gender Mainstreaming Expert	- Regional Management Expert-4
- Sr. Food Value Chain Expert	- Regional Management Expert-5
- Sr. Procurement Engineer	- Agriculture and FVC Expert-1
- Sr. Water Management and Institutional Expert	- Agriculture and FVC Expert-2
	- Gender Mainstreaming Expert
	- Procurement Expert
	- Water Management and Institutional Expert
	- Environmental Expert

Source: JICA survey team

The implementation structure of the consultant is described in Figure A6.2.3, and the terms of references and other detailed explanations about consultancy services are given in Attachment 6.2.1.



Source: JICA survey team

Figure A6.2.3 Implementation Structure of Consultant's Support

The proposed assignment schedule of the consultant is shown in Attachment 6.2.2.

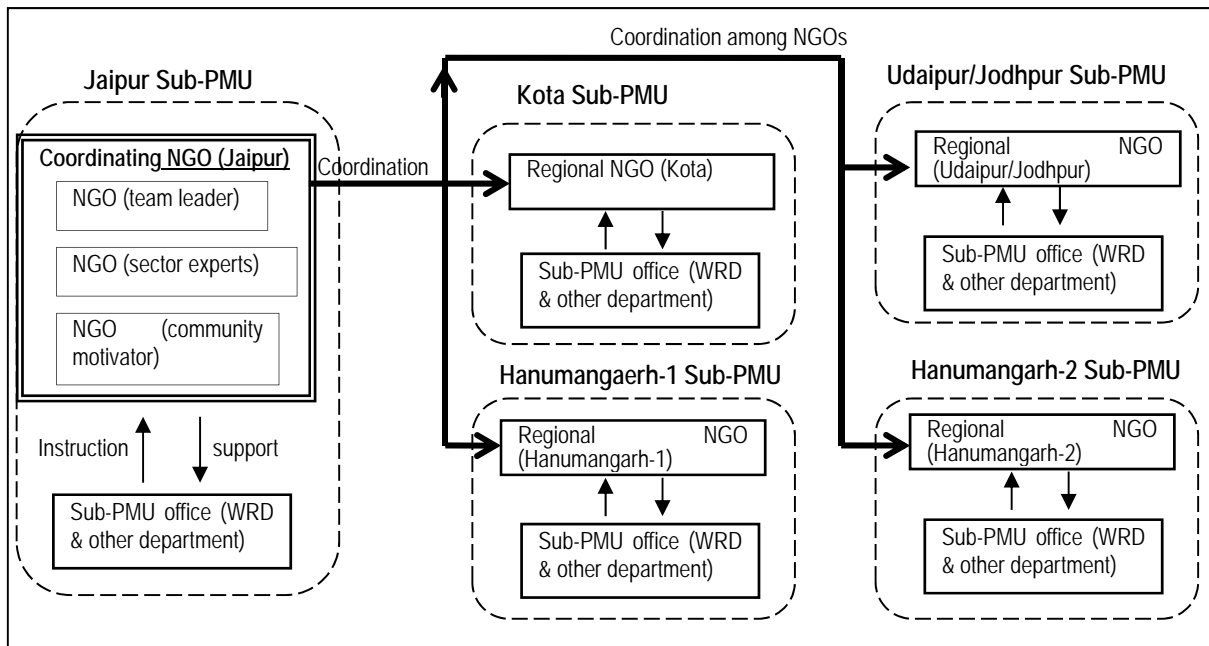
(2) Supporting Services by NGOs

Based on lesson learnt from Rajasthan Minor Irrigation Improvement Project (RAJAMIIP), full-time engagement of NGOs for implementing soft components activities (WUA, agriculture extension, and gender mainstreaming) from the beginning and up to the end of the project period is strongly recommended. Since each sub-PMU shall have a different regional NGO, a total of five NGOs should be assigned in the Project as regional NGOs.

In terms of coordination among NGOs, the survey team proposed not to adopt consortium-structure (partner NGOs under the control of the lead NGO) as RAJAMIIP but to engage regional NGOs under each respective sub-PMU so as to facilitate the sub-PMU for controlling the NGOs. In order to realise effective supports to farmers with effective internal linkage among NGOs, it is also suggested that a regional NGO under Jaipur sub-PMU should be given the mandate of coordinating NGOs such as coordination and supporting function among NGOs as described in Figure A6.2.4.

There are three kinds of posts in a regional NGO team, namely: team leader, sector experts, and community motivator. The major roles of those officers are given below.

- i) Team leader is the person in-charge of all the activities executed by the NGO. In addition, he should act as an expert for WUA establishment and strengthening of the team.
- ii) Sector experts will be assigned as officers-in-charge of agriculture and gender sector. They should be responsible for all the agriculture activities such as cultivation training, marketability training, and market linkage training; and gender activities.
- iii) Community motivators play as local facilitators who support target groups to implement their activity on the ground. Those officers should be selected from villagers who dwell in target areas so as to establish easy access from villagers to those officers.



Source: JICA survey team

Figure A6.2.4 Implementation Structure of NGOs Support

The terms of references and other detailed explanations of the coordinating NGO and regional NGOs are given in Attachment 6.2.3 and Attachment 6.2.4.

(3) Supports by Gender Advisory Group

To support PMU in pursuing gender mainstreaming in the Project as well as in their organizations, the survey team proposes to form the gender advisory group, consisting of gender experts and researchers from WCD and research institutes such as Institute of Development Study and National Institute of Agricultural Marketing, gender desk of WRD and gender consultant.

The group is responsible for developing Gender Action Plan (GAP) and for monitoring and advising on activities related to gender mainstreaming as well as analyzing impact of the activities based on the GAP. (See Attachment 6.2.6) The group members monitor the activities by visiting the Project sites regularly and attending Women Wing's annual review meeting and findings are reported in the Project Monitoring Committee meeting conducting every two months. The group need to suggest an improvement or revision for the activities if the need arises. To determine the impact of the activities, the group conducts periodical review such as annual, stage-wise and the Project period, and compile the result in the report to share widely.

WCD is expected to play a key role of the group to utilize the impact of the activities not only in the Project but also to link with national and state policies on gender mainstreaming since WCD is mandated to promote gender mainstreaming in governmental organizations. The researcher will be invited as an outside expert and PMU need to select person of vast experience on gender mainstreaming who is available thirty to forty days per year including field trip.

As soon as forming the group, it is important for members to understand the whole picture of the Project and to discuss what can be done and how in the Project. Based on the discussion, the group develops an action plan as a group in detail with implementing structure and responsibility of each member, and it is obtained PMU's agreement. The plan will be revised based on progress of the activities and changes of situation, but it should be a reasonable and effective plan in the first place to have the understanding and cooperation of line agencies.

6.3 Implementation Schedule

6.3.1 Implementation Schedule for Overall Management

(1) Overall Implementation Schedule for All the Components

The total project period for implementation of RWSLIP is eight years and actual construction of rehabilitation works, agriculture training, marketing, and most of other activities will be started at the third year. As explained in the previous sections, construction works and other activities are split into three stages: stage-1, stage-2, and stage-3.

Most of the activities for soft components such as (i) fostering and capacity enhancement of water users organisations, (ii) irrigated agriculture intensification and diversification, (iii) agro-processing, marketing, and promotion of high value agriculture produces, and (iv) gender mainstreaming in agriculture and water sector will be simultaneously implemented at the same period of the construction works of irrigation facilities in each stage. However, the activity period for (i) fostering and capacity enhancement of water users organisations is slightly longer, particularly in regarding the timing of termination of the services. The beneficiaries of stage-3 need several supports on WUA strengthening six months after transferring the irrigation facilities to WUA at the end of the construction period.

Overall implementation schedule is shown in Figure A6.3.1 and the detailed implementation schedule for each component is given in the following sections.

In order to expedite prompt project commencement at the beginning stage of the Project, it is strongly recommended that a specific input of man-power for supporting the procurement process of the consultant and the SID consultant should be provided by the WRD or JICA, if possible, on an appropriate timing and quantity. Because it is preferable that tender documents for bidding of the consultant and survey, investigation, and design (SID) consultant should be prepared prior to conclusion of the loan agreement between the two governments.

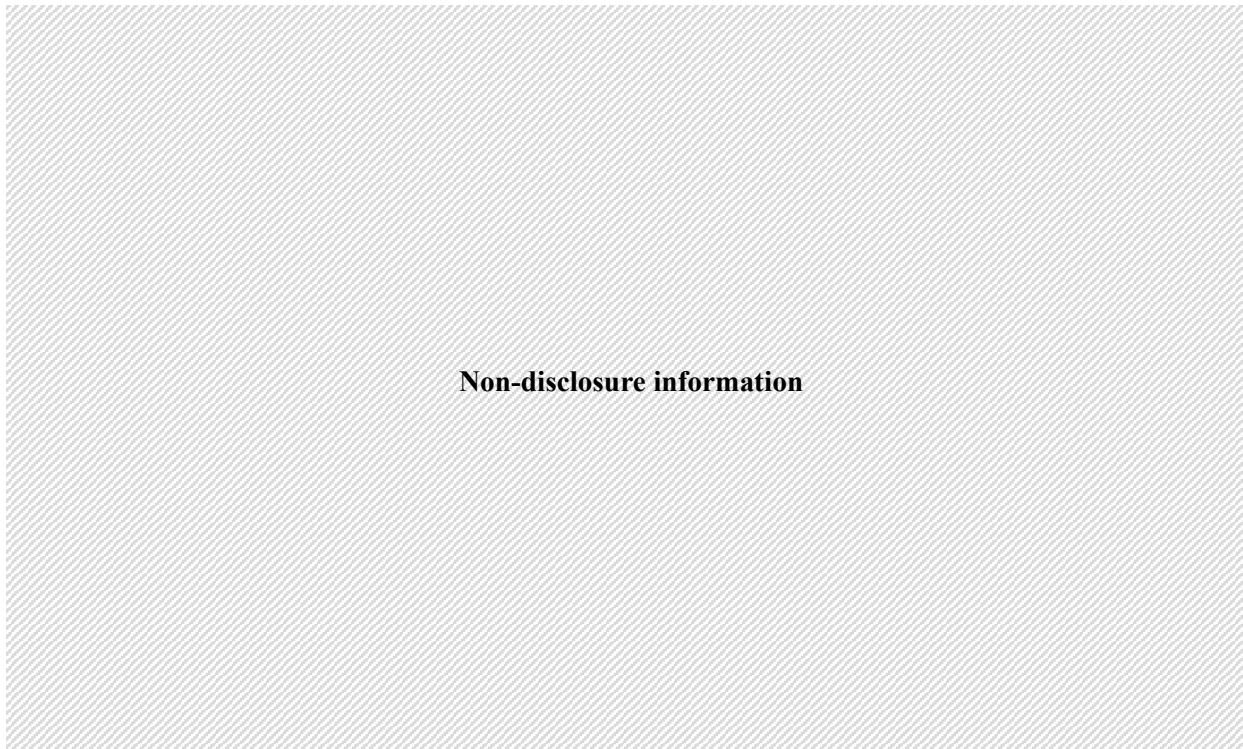


Figure A6.3.1 Overall Implementation Schedule

(2) Overall Project Management Activities

In order to implement project activities efficiently and smoothly, the Project plans to execute several activities as overall project management facilitation as mentioned below.

- i) Pre-arrangement Works
- ii) Procurement of the Consultant
- iii) Procurement of the NGOs
- iv) Procurement of the SID Consultants
- v) Screening and Selection of Sub-projects
- vi) Procurement of the Civil Contractors and Construction Periods
- vii) Monitoring and Evaluation Survey

A tentative implementation schedule of those overall project management activities is shown in Figure A6.3.2.

Several consideration and explanation about the overall project management activities are given in Attachment 6.3.1.

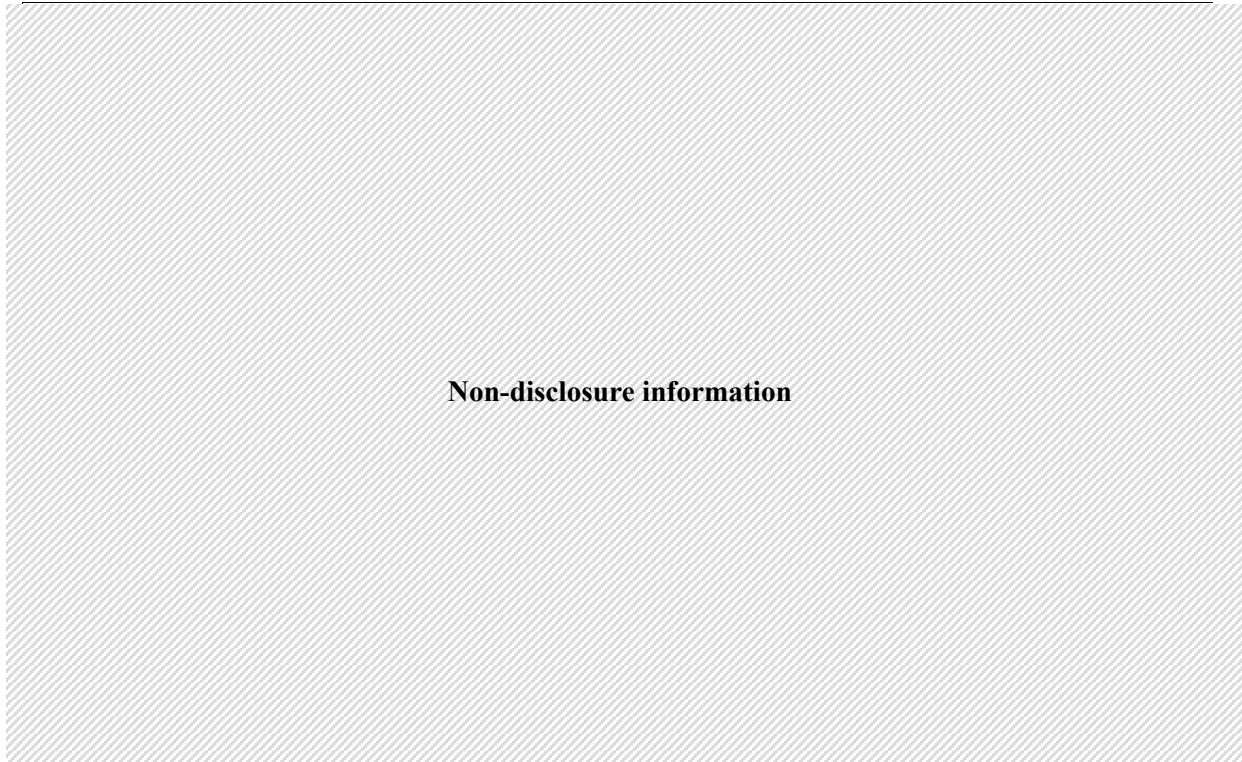
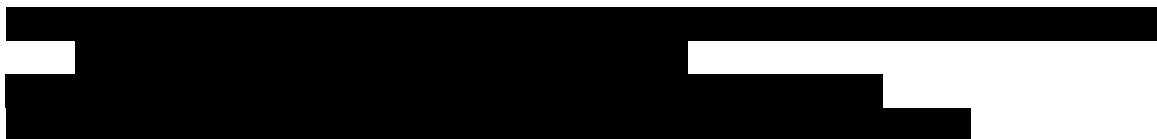


Figure A6.3.2 Implementation Schedule of Overall Management

The detailed explanation of implementation schedule for each component will be given in the following sections.

6.3.2 Implementation Schedule for Component 1: Participatory Irrigation Rehabilitation Works

An implementation schedule for Component 1: Participatory Irrigation Rehabilitation Works is prepared as summarised in Figure A6.3.3 and detailed implementation schedule is shown in Figure B 6.3.1 based on the general work flow described in Section 5.2.3 and the following assumptions:



Non-disclosure information

Figure A6.3.3 Implementation Schedule for Component 1: Participatory Irrigation Rehabilitation Works

6.3.3 Implementation Schedule for Component 2: Water Users Association Empowerment

This component consists of three sub-components: establishment of WUA support mechanism, capacity building of WUA management, and improving of agricultural linkage. First of all, the implementation schedule for each sub-component is set based on the construction schedule. Then, the following points are considered for forming the schedule since some of the activities are related to each other.

WUA Support Mechanism

- Each project material needs to be ready by starting related orientation and training.
- Orientation for PMU, sub-PMU, and TSG-SP consist of officers of WRD, DoA, DoH, and WCD is conducted in the very beginning of each stages for efficient management through generating common understanding on the Project.
- After the orientation and selection of NGO, training of trainers (ToT) on water management and WUA management is conducted in the Irrigation Management and Training Institute (IMTI) for TSG-SP consists of district level officers of each organisation and NGO staff. The TSG-SP members are expected to be resource persons in training of WUA managing committee (MC) members.
- A community motivator (NGO WUA level staff) is also trained on water management and WUA management to conduct and assist TSG-SP in conducting field activities.
- For monitoring purpose, the community motivator will remain for six months to one year after completion of the construction works; it varies by stages.

Capacity Building of WUA Management

- Except the first stage, awareness activities on WUA formation starts at least three months before the construction works start. It is important to form the WUA and MC democratically for effective WUA management and sustainable irrigation scheme management.
- In the first stage, preparation-WUA (pre-WUA) will be formed to handle necessary procedure to start construction works and to connect the users and the Project until regular WUA/MC is formed/elected formally.
- Training on water management will be conducted at the start and the end of the stage.
- The TSG-SP and the community organiser need to support the WUA/MC in conducting WUA general meeting twice a year before *Rabi/Kharif* season.

WUA Management

- In coordination with the agricultural organisation, TSG-SP as well as the community motivator need to organise demonstration and farmers field day seasonally; once in *Rabi* and once in *Kharif* and at least one site in each sub-project area.

The implementation plan for this component is mentioned in Figure A6.3.4, and the detailed plan is given in Figure B 6.3.2.

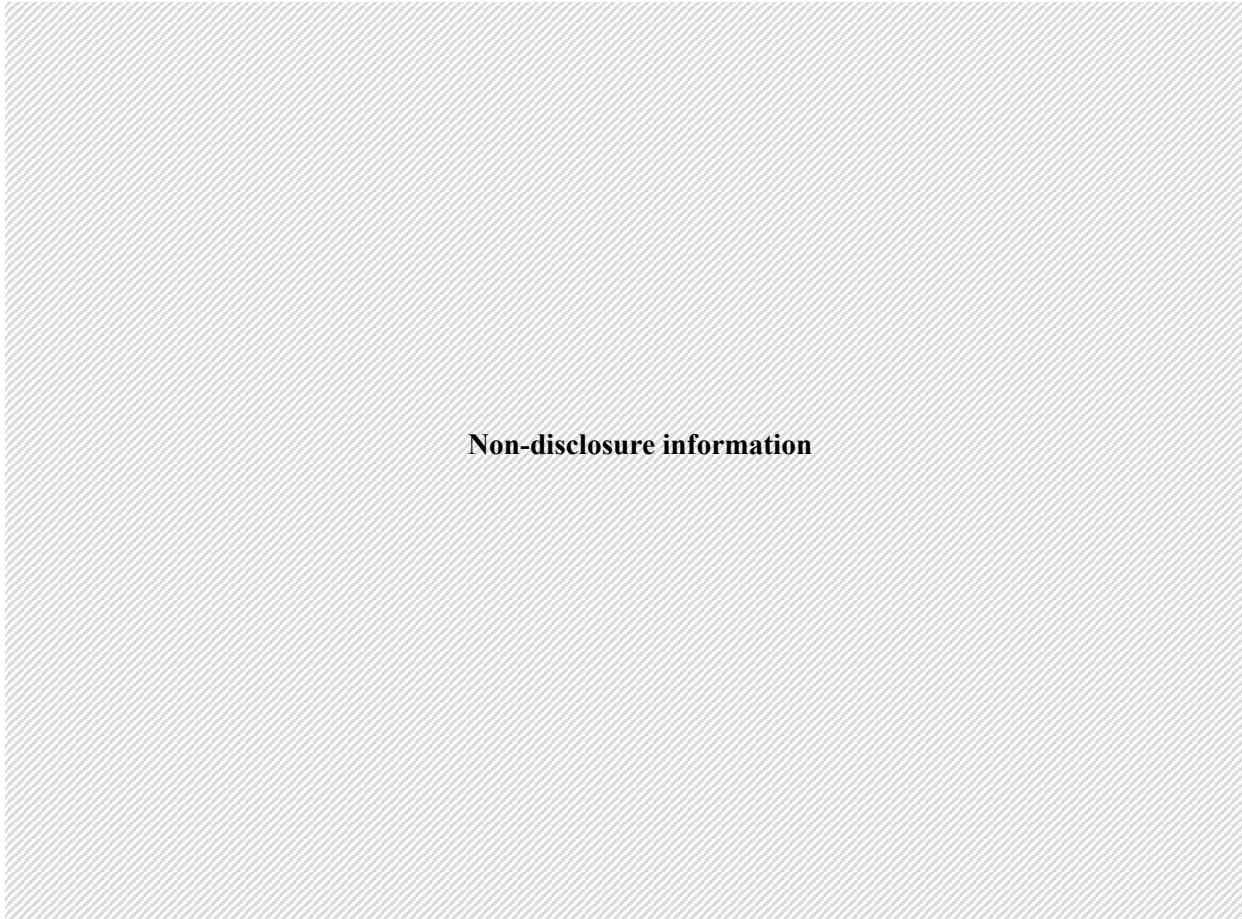


Figure A6.3.4 Implementation Schedule for Component 2: WUA Strengthening

6.3.4 Implementation Schedule for Component 3: Irrigated Agriculture for Intensification and Diversification

In the development of implementation schedule, the timing and duration was decided considering the following points:

- The state level workshop is designed for planning, monitoring, and evaluation. The implementation schedule needs to be reviewed and revised every year according to the progress of project. The sub-PMU level workshop also needs to review the progress of project and modify actual implementation schedule in the field level.
- To implement planned activities related to cultivation, on-time training is necessary since agriculture is defined by season. Agriculture farmers' training should be conducted in advance of actual cultivation season. Likewise, training of trainers should be done prior to the farmers' training.
- To implement the improvement of agriculture support system, both activities shall be started before implementation of farmers' training to optimise their effectiveness.
- Demonstration farms are not only for demonstration of new techniques and new materials, but also the venue for extension. For farmers, seeing is believing. The success of demonstration farm is a key to persuade conservative farmers. Therefore, the cost for mentoring and monitoring is provided.

The implementation plan for this sector is mentioned in Figure A6.3.5, and the detailed plan is given in Figure B 6.3.3.

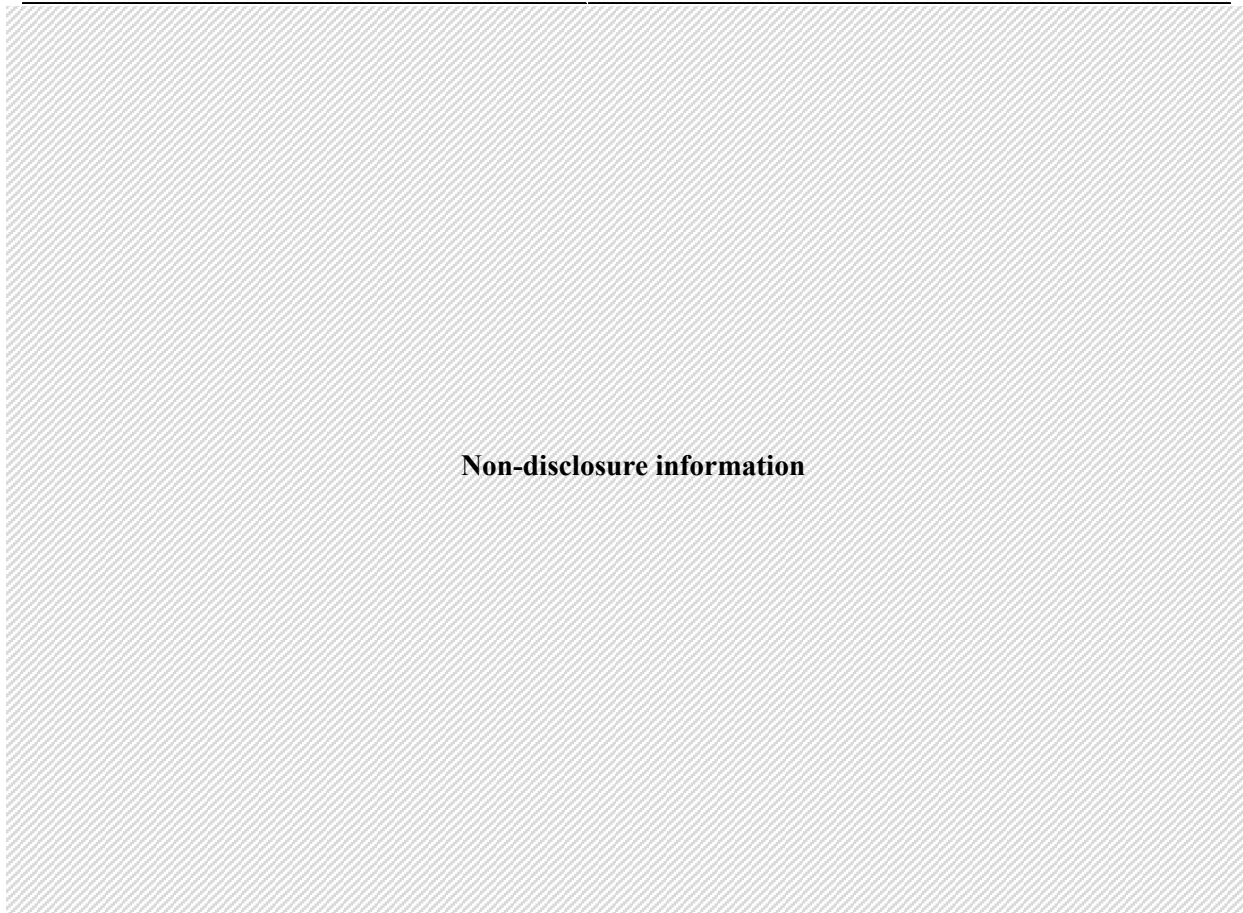


Figure A6.3.5 Implementation Schedule for Component 3: Irrigated Agriculture for Intensification and Diversification

6.3.5 Implementation Schedule for Component 4: Agro-processing, Marketing, and Promotion of High-value Added Agricultural Produce

Based on the Activity Plan proposed in Section 5.6.5 and the following preconditions, the implementation plan for Component 4 is summarised in Figure A6.3.6. The detailed plan is given in Figure B 6.3.4.

Planning Based on Agricultural Activities

Most activities of Component 4 are scheduled during every stage of the construction works. They are expected to start at earliest in the second year of each stage since farmers are supposed to concentrate on agricultural production for the first year. Timing to start the activities is also set backward (from harvest period of the target crops) considering that sale of farm harvest is the main objectives of the activities.

Earlier Start of Demonstration Activities

Demonstration activities (cooperative demonstration groups to promote FIGs and agriculture demonstration farms to promote exotic vegetable sales) are to start in Stage 1 ahead of the implementation by farmers and continue throughout the construction works. After intensive trial in the first few years, outcomes will be extended to farmers.

Longer Span Efforts on Brand Building for High-value Added Agricultural Produce

As for brand building for high-value added agricultural produce, efforts will be done through all stages of the construction works. Sales through market-oriented experimental plots are expected to start in the first harvest period of the Project so that outcomes could be applied to farmers after repeating trial of advanced quality improvement and marketing methods for several times. Other activities such as

antenna shops operation and multimedia advertising would start rather later after confirming actual sales are increasing, also implemented only during the Rabi harvest seasons.

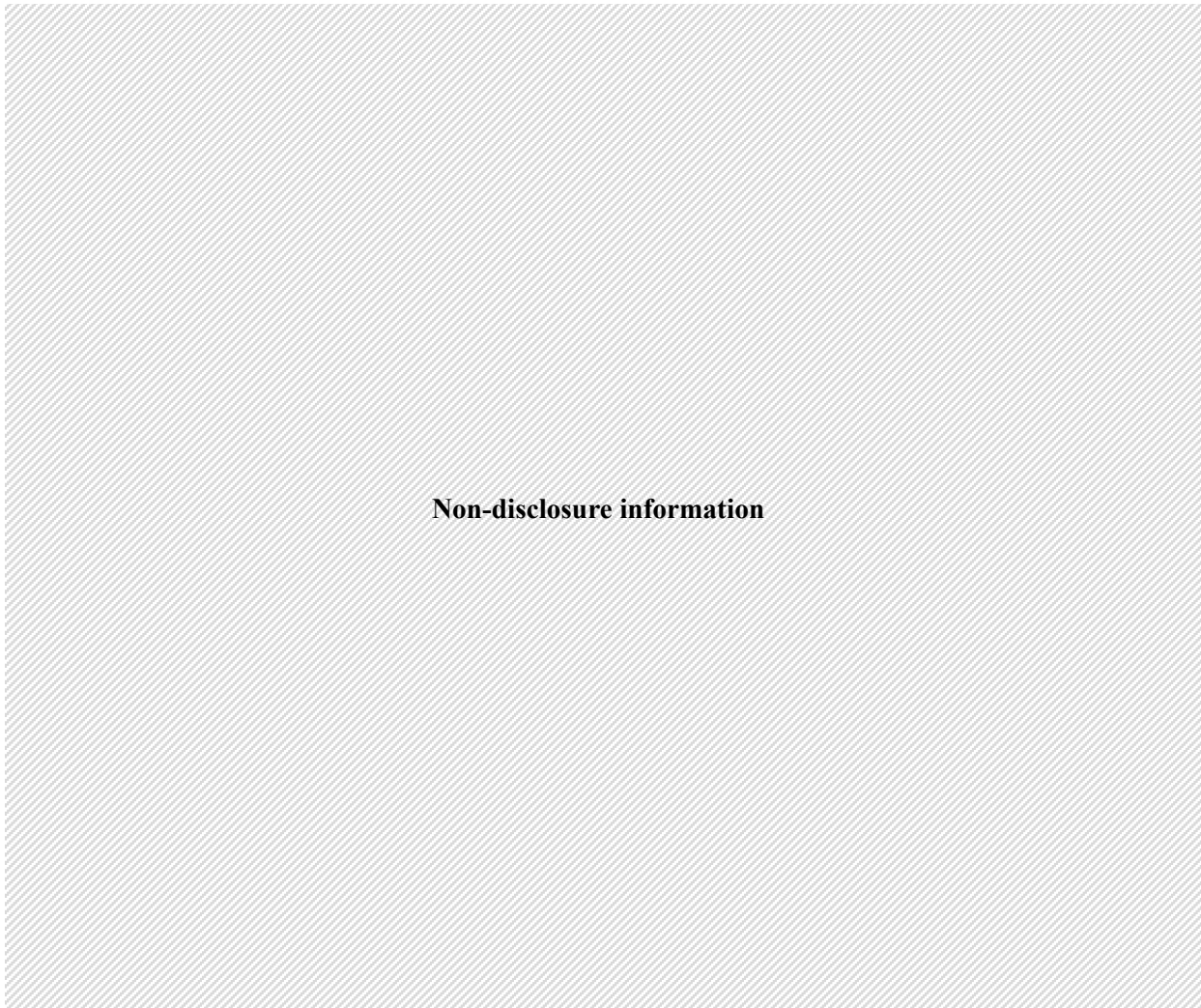


Figure A6.3.6 Implementation Schedule for Component 4:

Agro-processing, Marketing, and Promotion of High-value Added Agricultural Produce

6.3.6 Implementation Schedule for Component 5: Gender Mainstreaming

This component consists of three sub-components: supporting the institutionalisation of gender mainstreaming in water management, enhancement of women's capability and participation in WUA, and capacity building on agricultural technologies through SHGs. The implementation schedule for each sub-component is set based on construction schedule. In forming the schedule, the following points are considered since some of the activities are related to each other.

Institutionalisation of Gender Mainstreaming in Water Management

- Additional clauses to PIM Act need to take effect before expiration of the ordinance established in advance.
- It is also important to prepare training session on gender issues and activities before starting each stage as well as to obtain consensus with organisation concerned on list of gender disaggregated data to be collected and its collecting system.
- The Project aims not only at conducting gender related activities during the Project but at incorporating gender perspectives into existing capacity building activities in water management.
- Collected gender disaggregated data is used for monitoring as well as analysing annual basis to compile an annual report.

-
- To see the effectiveness of the Project approach, stage wise gender assessment will be conducted for compiling further suggestion on concept to be included in the PIM Act by the end of the Project.

Enhancement of Women's Capability and Participation in WUA

- Women wing (WW) is formed at the same time of forming WUA. WW needs to finalise plan for women friendly activities before starting construction stage.
- The most important point of women friendly activities is the planning process. The WW members need to be carefully facilitated to express their idea and opinion freely so that members can learn how to discuss and to decide things on their needs by themselves and learn from its result.
- The WW activities should not be separated from WUA activities. Empowerment of women is not enough for the Project; women's participation in WUA activities and in water management should be increased through WW activities as active water users. That is why the Project plans to conduct training and meeting with WUA.

Capacity Building on Agricultural Technologies through SHGs

- This sub-component is conducted in sub-project wise. The TSG-SP members need to develop activity plan as a team.
- ToT on vegetable cultivation for related TSG-SP members (DoA/DoH, *Anganwadi* staff, and NGO staff) is conducted one month before sowing of *Kharif* and *Rabi* season, but target groups for the activity need to be selected before participating the ToT.
- ToT is conducted separately twice each for nutrition purpose and for cash income: one for *Kharif* and one for *Rabi*. After the ToT, the participants are expected to start preparing demonstration plot in the field of one group member who can take responsibility to display the technology in the field throughout the season and can share experiences to other members.
- Related TSG-SP members who participated in ToT need to conduct training for the group through establishing demonstration plot timely and to monitor not only demonstration plot but also other members plot after the training.
- The Project considers to adopt seed bank system for the nutrition group. The owner of the demonstration plot will be asked to produce certain amount of seed and hand it over to *Anganwadi* so that *Anganwadi* can expand the activities to other SHGs by using the seed.

The implementation plan for this component is mentioned in Figure A6.3.7, and the detailed plan is given in Figure B 6.3.5.

Non-disclosure information

**Figure A6.3.7 Implementation Schedule for Component 5: Gender Mainstreaming in
Agriculture and Water Sector**

6.4 Operation and Maintenance Plan

6.4.1 Operation and Management Structure and Schedule for Irrigation Facilities

After transferring the rehabilitated facilities to WUA from WRD, all those facilities should be maintained by WUA with their own fund and initiatives.

Proposed operation and maintenance activities in the project areas are listed below.

- i) Operation Activities for Irrigation Facilities
 - Gate operation at division structures for water distribution
 - Allocation of water in irrigation planning
 - Pump and other irrigation facilities operation on micro irrigation system
 - Storage tank (*diggi*) operation for storage and distribution
- ii) Maintenance Activities
 - Maintenance of gates and lifting devices
 - Canal clearing including grass cutting and sediment removal
 - Canal repair and reshaping on earth canal
 - Canal repair and relining works on concrete-lined canal
 - Structure repair on canal related facilities
 - Repair of WUA offices
 - Repair and replacement of micro irrigation facilities such as sprinklers, emitters, flexible tubes, and others

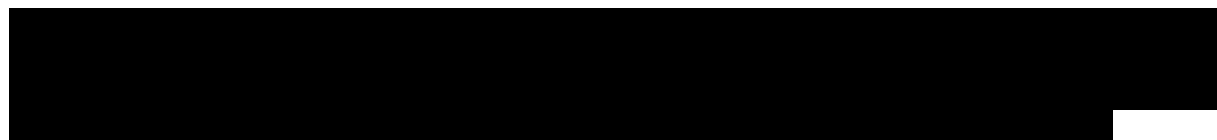
All the required knowledge and practical training should be provided by the Project in the activities for Water Users Association Empowerment as described in Section 5.3.

6.4.2 Fund for Operation and Maintenance

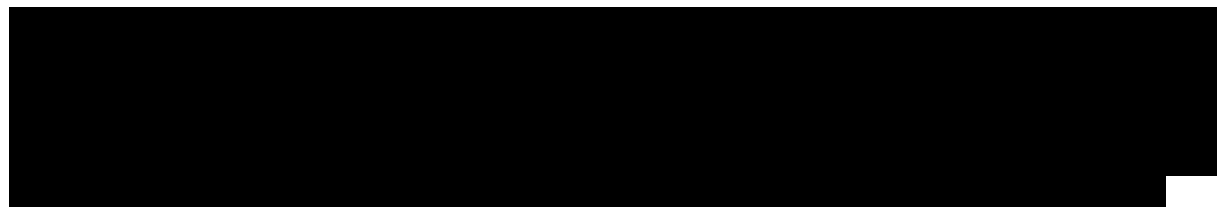
(1) Water Fee

Water fee tariff is variable per ha depending on crops, and almost half of the water fee collected by the WUA can be utilised for WUA activities on their own initiatives. This is one of the main financial source of WUA management for sustainable activities. Thus, water fee collection directly affect to WUA's sustainability as one of focus issues regarding the participatory irrigation management.

Its usage and financial movement should be monitored and checked by the WUA's financial sub-committee.



(2) Corpus Fund



6.5 Procurement Plan and Schedule

6.5.1 General

There are for kinds of procurement in the Project listed as follows:

- i) Procurement of the contractor of civil works,
- ii) Procurement of the consultant,
- iii) Procurement of the NGOs, and

iv) Procurement of the SID consultants.

The procurement works for number i), iii) and iv) should be executed in compliance with the procurement process and procedures in the Rajasthan State while the procurement works for number ii) should be executed in compliance with guidelines for the employment of consultants/contractor under Japanese ODA loans. The details of those procurement works shall be given in the following sections.

6.5.2 Procurement Plan for Civil Works

(1) Procurement Method and Tender (Bidding) Documents

Format of bidding contract documents will be prepared by the consultant based on Standard Bidding Documents for W-2 (National Competitive Bidding) of World Bank project. Considering the lessons learnt from RAJAMIIP regarding price dumping and unrealistic tender prices, the survey team proposes to add the following criteria for evaluation of bidding documents to be submitted by the Bidders:

- In case the Bid price is less than 80% of the estimated cost of Engineer's estimate, clarification to the Bidder will be made by the Employer, and if the reply of the Bidder is not acceptable to the Employer, such Bid may be rejected by the Employer, and
- In case the unit price of any work item is less than 70% of that of Engineer's estimate, clarification to the Bidder will be made by the Employer, and if the reply of the Bidder is not acceptable to the Employer, such Bid may be rejected by the Employer.

In addition, the list of the contractors awarded with contract packages should be timely and properly monitored and controlled by PMU, and shared among all sub-PMUs to avoid the unnecessary confusion caused by the events of "one contractor submits his bids to many contract packages" and "one contractor awarded with too many contract packages beyond his capacity".

(2) Power of Sanction for Procurement Process

The current power of sanction related to procurement process is shown in Table A6.5.1 and Table A6.5.2.

Table A6.5.1 Power of Sanction for Approval of Tender Documents

Position	Power of Sanction
Empowered Committee *	Full Power
Chief Engineer	Up to INR 50,000,000
Additional Chief Engineer	Up to INR 25,000,000
Superintending Engineer	Up to INR 12,000,000
Executive Engineer	UP to INR 3,000,000

Note *: The members of empowered committee are secretary, chief engineer general, chief engineer, staff from DoF, and financial advisor.
Source: Public Works Financial and Accounts Rules

Table A6.5.2 Power of Sanction for Approval for Contract Award

Position	Power of Sanction	Period for Evaluation
Empowered Committee	Full Power	20 days
Chief Engineer	Up to INR 50,000,000	30 days
Additional Chief Engineer	Up to INR 25,000,000	40 days
Superintending Engineer	Up to INR 12,000,000	50 days
Executive Engineer	UP to INR 3,000,000	70 days

Note: In case the amount of contract awarded is higher than the owner's estimate by more than 20%, the power of sanction for approval will be transferred to a higher level position.
Source: Public Works Financial and Accounts Rules

(3) Packaging of the Contract for Construction Works

The classification of the contractors for civil works is shown in Table A6.5.3.

Table A6.5.3 Classification of the Contractors (Civil Works)

Class	Qualification for Application of Tender
AA class contractors	No Limitation
A class contractors	Up to INR 30,000,000
B class contractors	Up to INR 15,000,000
C class contractors	UP to INR 5,000,000
D class contractors	UP to INR 1,500,000

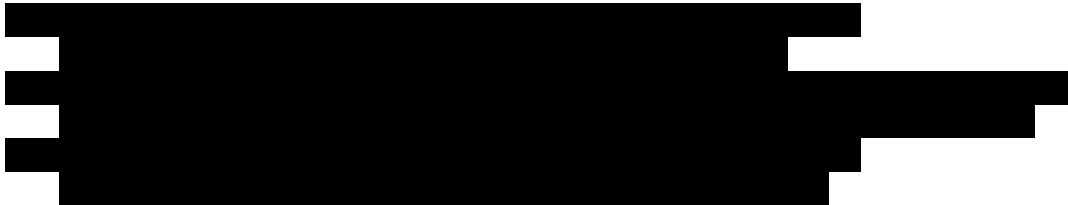
Source: Public Works Financial and Accounts Rules

In RAJAMIIP, packaging of the contract was made based on the principles that irrigation sub-projects in each sub-division (two to seven irrigation sub-projects) should be incorporated into one package taking account of optimal package size (as large as possible) to attract the maximum participation from capable contractors and reduction of administrative burden of contract management. However, this packaging method resulted in one of the main causes of delay of the construction works because the whole tender process for one contract package could not commence due to delay on SID works even with only one irrigation sub-project incorporated into such contract package.

In RWSLIP, Rajasthan WRD put rather high priority on relatively large scale works by inclusion of medium scale irrigation sub-project and exclusion of irrigation sub-projects with cultivable command area (CCA) less than 300 ha. Accordingly, the size of one irrigation sub-project may be sufficiently attractive for capable contractors; and therefore, the survey team proposes not to apply the packaging method in RAJAMIIP i.e., merging of several irrigation sub-projects in one contract package.

Meanwhile, considering the construction period for one stage (two years), the allowable maximum contract amount of one contract package should be limited to avoid unrealistic construction plan and schedule.

Taking account of the above consideration and past experiences of the survey team, the survey team proposes to apply the following packaging plan for RWSLIP:



In case the size of one irrigation sub-project is smaller than the above minimum amount, merging of sub-projects is recommended to attract maximum participation from capable contractors and reduction of administrative burden of contract management. Meanwhile, in case the size of one irrigation sub-project is larger than the above maximum amount, dividing of such sub-project into several contract packages is recommended to avoid unrealistic construction plan.

6.5.3 Procurement Plan for Consultant, the NGOs, and SID Consultants

(1) Schedule

The procurement schedule for i) the consultant, ii) the NGO consultants, and iii) the SID consultants is given in Figure A6.5.1.

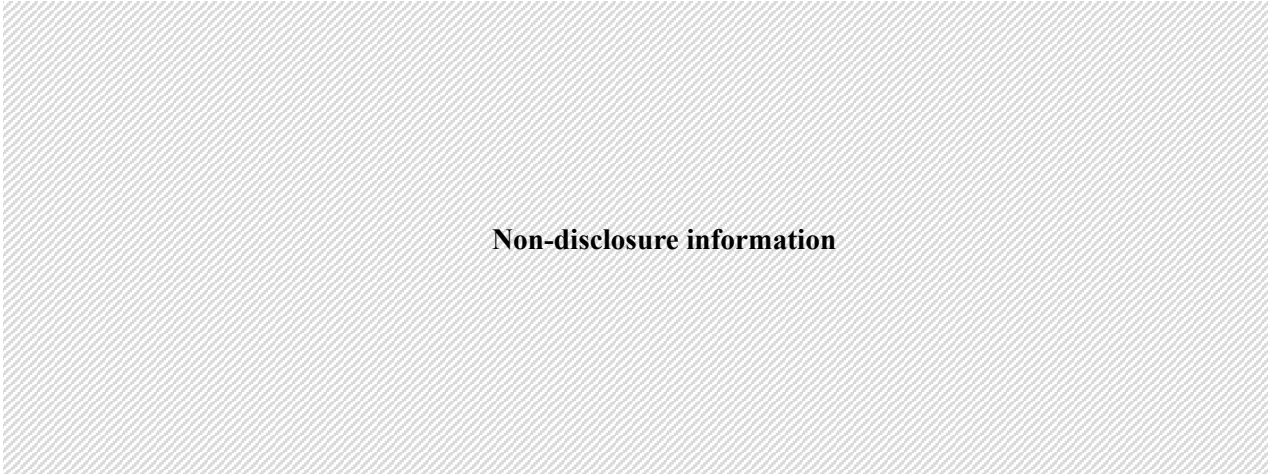
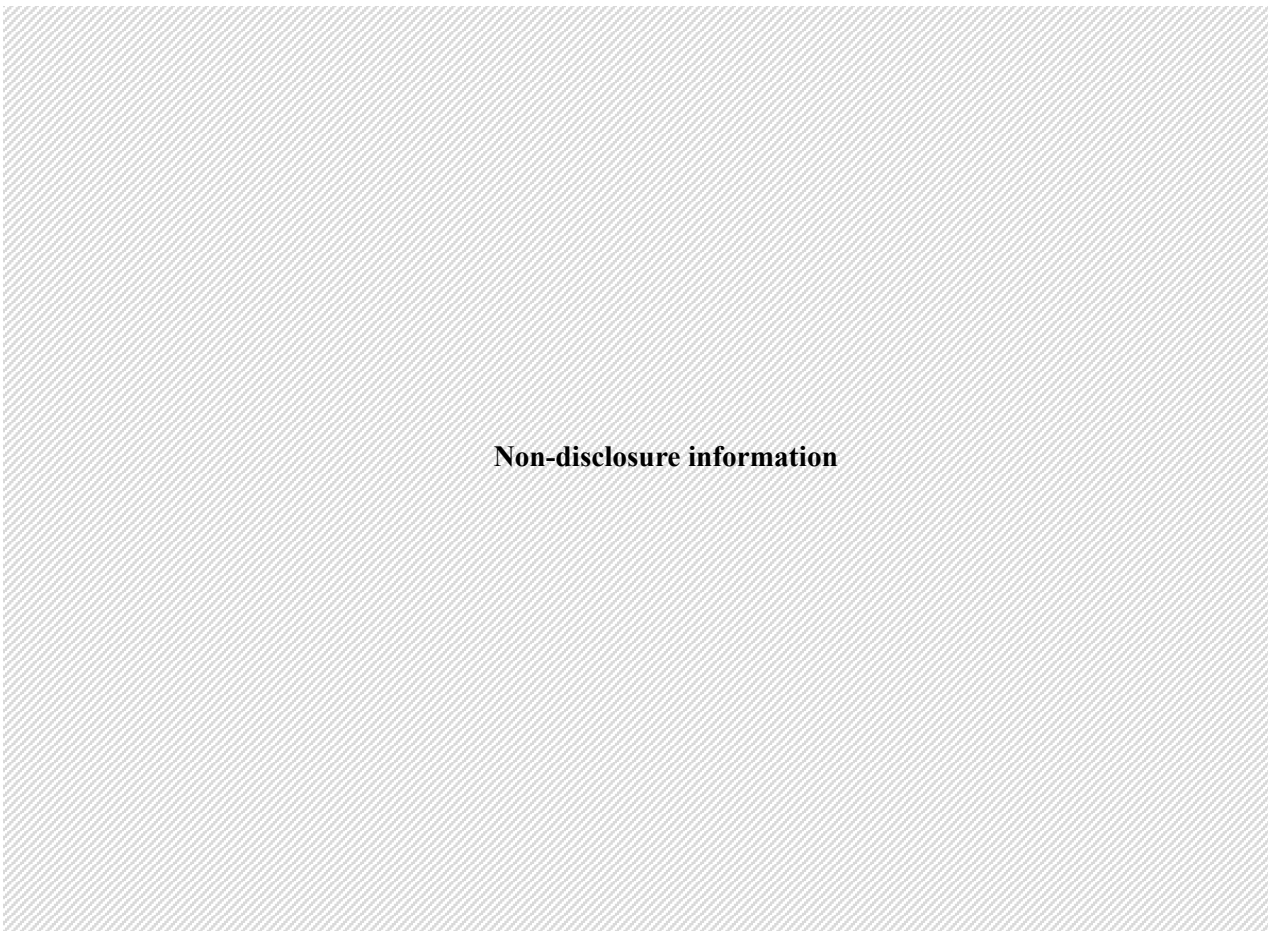


Figure A6.5.1 Procurement Schedule of the Consultant, the NGO, and the SID Consultant

(2) Procurement Works

Salient feature and significant remarks on the procurement works of the consultant are given in Table A6.5.4.

Table A6.5.4 Salient Feature of Procurement of the Consultant



The following are special consideration to be required or recommended for efficient implementation of the Project:


- i) It is strongly recommended that a specific input of man-power for supporting the procurement process of the consultant and the SID consultant should be provided by WRD or JICA, if possible, on an appropriate timing and quantity in order to expedite immediate project commencement at the beginning stage of the Project. It is because it is preferable that tender documents for bidding of the consultant and SID consultant should be duly prepared prior to conclusion of the loan agreement between the Government of Rajasthan and the Government of Japan.
- ii) If possible, it is preferable that the SID works of stage-1 be commenced prior to the conclusion of the loan agreement by a special arrangement between WRD and JICA under which WRD can employ the SID consultant without waiting for the conclusion of the loan agreement and its cost will be refunded by JICA after the loan agreement is duly valid.
- iii) The work volume of the SID works should be precisely reviewed after the selection works of the sub-projects is completed.
- iv) There are two kinds of NGO in the Project: the coordinating NGO and the regional NGO. The coordinating NGO has the following additional tasks as well as the task for the regional NGOs:
 - To plan, arrange, and implement the initial standardisation trainings to the five selected NGOs prior to project implementation;
 - To plan, arrange, and implement annual coordinating meetings with the five selected NGOs;
 - To prepare several NGO activities reports for overall project as compiling all the regional NGO activity reports from the other four regional NGOs;
 - To arrange, coordinate, and hold regular meetings among the five NGOs;
 - To share necessary information among all the five NGOs; and
 - To assist the PMU for facilitating smooth implementation of the project works.

6.6 Demarcation of the Project Works for Detailed Planning and Budgetary Arrangements

6.6.1 Demarcation of Activities and Preparation of Activity Plans

The overall activities explained in Chapter 5 should be defined and categorised into three categories to demarcate the responsibility of the project works between (i) overall project management system by the monitoring and coordinating unit in PMU (PMU-Mo and Co) located in the project main office in Jaipur and (ii) sub-PMU management system under each sub-PMU offices, as shown in Table A6.6.1.

Table A6.6.1 Demarcation of the Project Activities



Non-disclosure information

While the project-level activities in Table A6.6.1 as well as budget request should be planned and controlled by the PMU-Mo and Co, the activities in the sub-PMU level, and sub-project level should be planned by the sub-PMU offices. In order to facilitate budget formulation for sub-PMU, the following kinds of assistances are planned through the SID and NGO works in the Project:

- i) Preparation of Detailed Project Report (DPR) for the hard component (by SID works)
The SID consultant shall prepare DPR through site reconnaissance, geographical survey, detailed design work, and cost estimation for all the rehabilitation and improvement works in the irrigation systems. The DPR shall be prepared for each sub-project. It means that the DPR covers only the activities at the sub-Project-Level as mentioned in Table A6.6.1.
- ii) Preparation of Command Area Micro Plan (CAMP) report for the soft components (by NGO works)
This is a new concept and new work for the Project. NGOs hired by the sub-PMU shall formulate a CAMP report for his sub-PMU.
The CAMP shall cover the project activities at the sub-PMU level and the sub-project level. The CAMP report should include the following:
 - List of specific activities and its cost at the sub-project level,
 - List of specific activities and its cost at the sub-PMU level,
 - Implementation schedule, and
 - Implementation structure.

Detailed explanations are given in Attachment 6.6.1, including a guideline for preparing CAMP and a sample CAMP.

To facilitate understanding, the schematic image of those demarcation, category, and the plans which should be prepared by SID consultants (DPR and CAMP) is depicted in Figure A6.6.1.

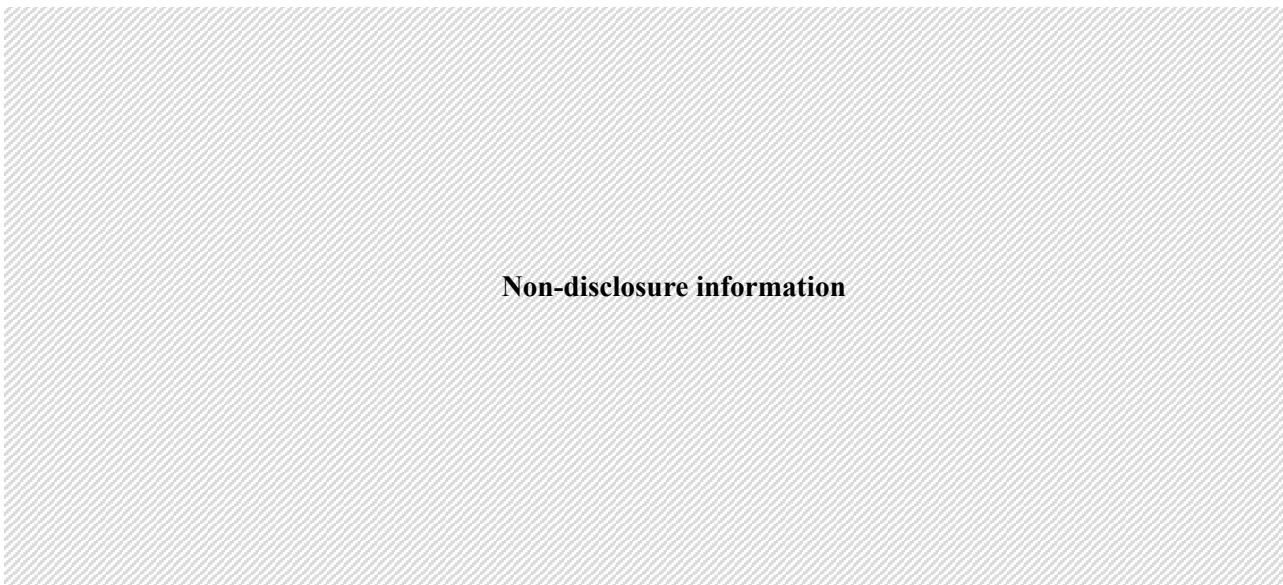


Figure A6.6.1 Demarcation of Activities

The construction cost for a single sub-project for component-1 (participatory irrigation rehabilitation works) should be estimated and obtained in DPR through SID works. In the same manner, the activity cost for the soft components (Component-2, 3, 4, and 5) should be estimated in CAMP through NGO's works.

It is noted, as explained in the Figure A6.6.1, CAMP does not cover the cost for the activities at the project level. Thus, activity cost for the project level should be estimated separately by the PMU-Mo and Co office.

6.6.2 Budgetary Arrangement and Flow of Fund

As described in Figure A6.6.2, executive engineers in sub-PMUs have a significant role on fund management in the Project.

Project activity budget should be prepared by the executive engineer based on the data estimated in DPR for hard component and in CAMP for soft components. A budget request shall be sent through the superintending engineer of the sub-PMU and the chief engineer of the implementation and construction unit of the PMU to the chief engineer of the PMU-Mo and Co.

The project fund released by the Department of Finance goes to WRD quarterly, then directly transferred to the monitoring and coordinating unit of the PMU controlled by the chief engineer (Mo and Co). Then the fund will be allocated to each executive engineer in the sub-PMUs.

Once the project budget is allocated to executive engineers, they can use the fund as scheduled upon their own decision.

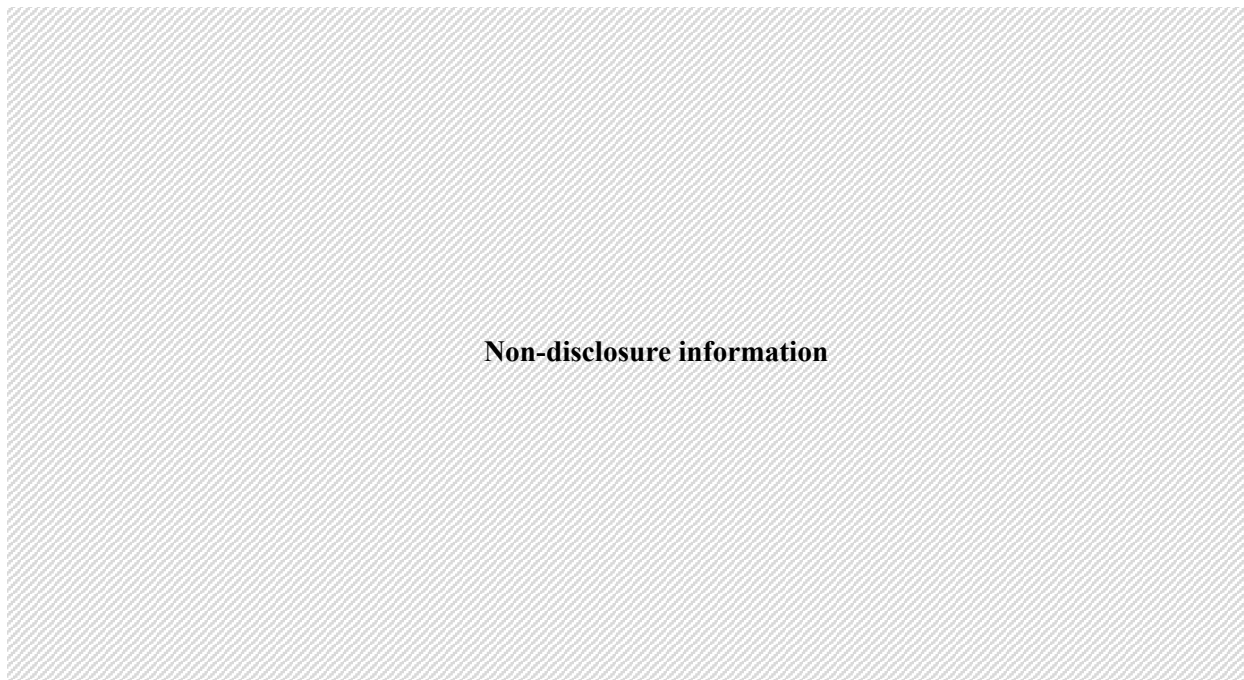


Figure A6.6.2 Flow of Funds in the Project

CHAPTER 7 COST ESTIMATION

7.1 Basic Conditions of the Project Cost Estimation

The basic conditions and assumptions employed for the cost estimates are as follows:

- i) Prices as of 2016 are used.
- ii) The following exchange rate as of March 2016 is applied for the cost estimate:
USD 1.0 = INR 67.0 = JPY 113.1
- iii) Project period is from January 2017 to December 2024.
- iv) Financial year is from April to March.
- v) Price escalation rates are assumed to be 1.6%/annum for F/C and 3.7%/annum for L/C.
- vi) Physical contingency is 5.0% for direct costs and 5.0% for consulting services.
- vii) Project administration cost is 7.0% of the direct cost.
- viii) Service tax is 15.0% of consulting services.
- ix) Labour welfare is 1.0% of consulting services, civil works, and non-government organisations (NGOs).
- x) Income tax is 10.0% for consulting services and NGOs, and 2.0% for civil works.
- xi) Royalty is 1.5% of civil works.
- xii) Interest during construction is 1.4% for works of the accumulated loan portion, and 0.01% for the consulting services.
- xiii) Front-end fee is 0.2% of the accumulated loan portion.
- xiv) The project costs are categorised into F/C portion and L/C portion, as follows:
 - F/C portion
 - Foreign currency portion of the consultancy services.
 - L/C portion
 - Participatory Irrigation Rehabilitation Works,
 - Fostering and Capacity Enhancement of Water Users Organisations,
 - Irrigated Agriculture Intensification and Diversification,
 - Agro-processing, Marketing, and Promotion of High-value Added Agriculture Produce,
 - Gender Mainstreaming in Agriculture and Water Sector,
 - Project Management and Monitoring, and
 - Taxes, duties, and front-end fee.

7.2 Project Cost

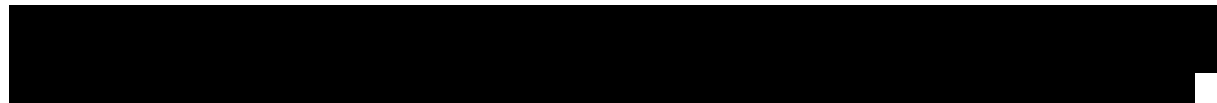


Table A7.2.1 Summary of Project Cost

Non-disclosure information

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7.2.1 Cost for Participatory Irrigation Rehabilitation Works

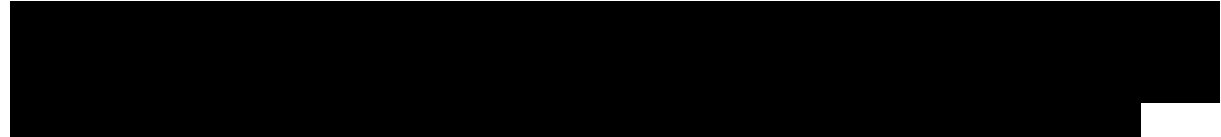


Table A7.2.2 Summary of Cost for Participatory Irrigation Rehabilitation Works

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7.2.2 Cost for Fostering and Capacity Enhancement of Water Users Organisations

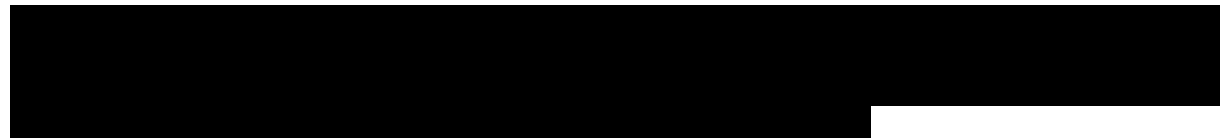


Table A7.2.3 Summary of Cost for Fostering and Capacity Enhancement of Water Users Organisations

Non-disclosure information

7.2.3 Cost for Irrigated Agriculture Intensification and Diversification



Table A7.2.4 Summary of Cost for Irrigated Agriculture Intensification and Diversification

Non-disclosure information

7.2.4 Cost for Agro-processing, Marketing, and Promotion of High-value Added Agricultural Produce



Table A7.2.5 Summary of Cost for Agro-processing, Marketing, and Promotion of High-value Added Agricultural Produce

Non-disclosure information

7.2.5 Cost for Gender Mainstreaming in Agriculture and Water Sector



Table A7.2.6 Summary of Cost for Gender Mainstreaming in Agriculture and Water Sector



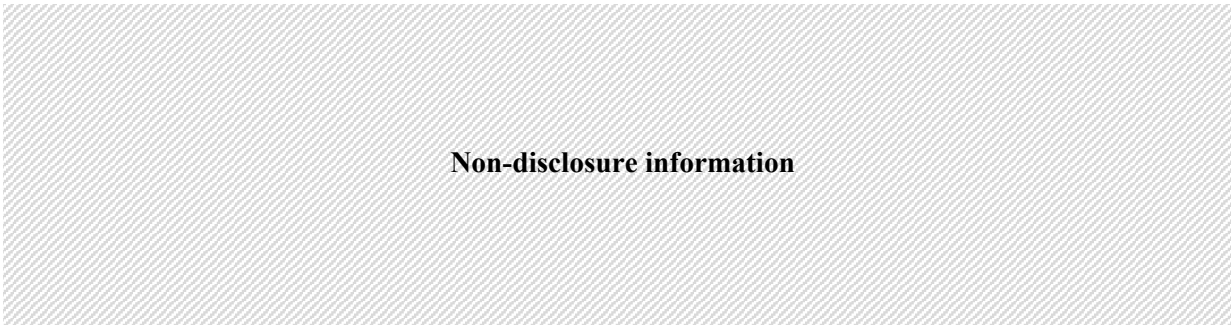
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7.2.6 Cost for Overall Implementation

(1) Cost for Project Management and Monitoring



Table A7.2.7 Summary of Cost for Management and Monitoring



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(2) Consultancy Service

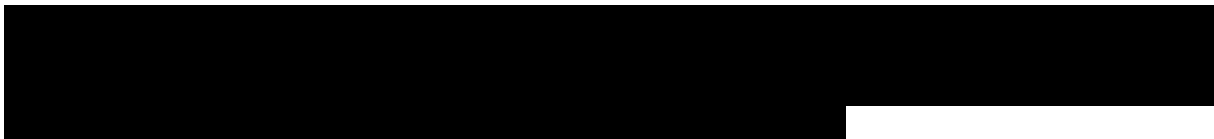
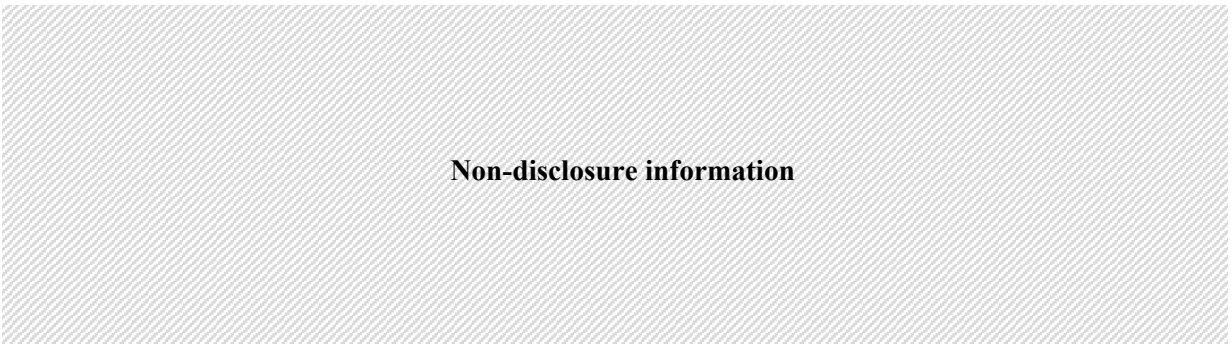


Table A7.2.8 Summary of Cost for Consultancy Services



Non-disclosure information

(3) Administration and Other Costs

The non-eligible portion of the yen loan shall be funded by the Government of India. This portion includes administration cost, taxes and duties, interest during construction, etc. The non-eligible cost is summarised in Table A7.2.9.

Table A7.2.9 Summary of Administration and Other Costs

Non-disclosure information

7.3 Cost Reduction Measures

Since the Project will be funded by the Japan International Cooperation Agency (JICA) as a project-type sector loan project, the sub-projects including the type of construction works to be implemented under the Project have not been specified at this preparatory survey time. Considering these constraints, the JICA survey team examined the possibility of cost reduction through measures of early commencement and completion of the construction works, i.e., reduction of the cost caused by price escalation and early realisation of the project benefits.

For the project implementation, the JICA survey team proposes the following improvements and measures (details are described in the previous chapters):

- i) Stage-wise implementation plan for equal workloads during the implementation of the Project will be applied to avoid unnecessary delay of the works due to overcapacity of contractors, Survey, Investigation and Design (SID) consultants, government officers, and financial capacity of Rajasthan Water Resource Department (WRD) caused by concentrated workload for each work,
- ii) Procurement of SID works and completion of review of DPRs for Stage 1 works in the 1st year is proposed, and
- iii) Commencement of a part of construction works at the end of 2nd year and completion of most of the construction works for Stage 1 by the end of 4th year can be realised by i) and ii).

Through the above i) ~ iii), the early commencement and completion of the construction works as well as early realisation of the project benefits can be expected and will result in cost reduction especially of the cost for price escalation. For reference, in the Rajasthan Minor Irrigation Improvement Project (RAJAMIIP), the bulk of the construction works has commenced three years after the employment of the consultant, i.e., at the end of the 4th year in the case of this plan, and one of the main causes of such delay might be the one-stage implementation plan.

In addition, sufficient monitoring and evaluation period especially for Stage 1 works can be assured through the application of stage-wise implementation plan and continuous capacity building for operation and maintenance works to WUA; and WRD field officers can contribute to reduce the life cycle cost of the irrigation facilities through proper operation and maintenance works.

7.4 Annual Disbursement Schedule

Annual disbursement schedule is prepared using JICA's calculation tool. The disbursement schedule is summarised in Table A7.4.1.

Table A7.4.1 Summary of Annual Disbursement Schedule

Non-disclosure information

CHAPTER 8 PROJECT EVALUATION

8.1 Confirmation of Financial Capability of the State Government

8.1.1 State Budget of Rajasthan

(1) State Budget

Total annual expenditure of the Government of Rajasthan (GoR) in 2016-17 (Budget Estimated: BE) is approximately INR 1,712.6 billion (INR 25,000 per population), which accounts for 25% of gross state domestic product (GSDP) of Rajasthan in 2015-16. The breakdown of the annual receipts and expenditures are shown in Table A8.1.1.

Receipts	INR in Millions	Share in Total
Revenue Receipts	1,232,505	71.9%
State's Tax Revenue	533,000	31.1%
Share in Central Taxes	314,779	18.4%
Non-Tax Revenue	140,841	8.2%
Grants-in-aid for Central Government	243,886	14.2%
Capital Receipts	480,895	28.1%
Recoveries of Loans	1,327	0.1%
Borrowings and Other Liabilities	479,467	28.0%
Contingency Fund	0	0.0%
Other Capital Receipts	100	0.0%
Total Receipts	1,713,400	100.0%
Expenditure	INR in Millions	Share in Total
Revenue Expenditure	1,320,525	77.1%
Non-plan Expenditure	790,543	46.2%
(of which Interest Payment)	(175,266)	(10.2%)
Plan Expenditure	529,982	30.9%
Capital Expenditure	234,208	13.7%
Non-plan Expenditure	128	0.0%
Plan Expenditure	234,080	13.7%
Public Debt	47,205	2.8%
Loan and Advances	110,672	6.5%
Appropriation to Contingency Fund	0	0.0%
Total Expenditure	1,712,610	100.0%
Balance	790	
Fiscal Deficit 1/	-431,472	
Primary Deficit 2/	-256,206	

Note: 1/ (Total Receipt - Borrowings) - (Total Revenue - Public Debt), 2/ Fiscal Deficit - Interest Payment
Source: Source: Budget at Glance/Budget Study, Finance Department, Government of Rajasthan

Fiscal deficit of GoR is INR 431 billion, which accounts for 25% of the total expenditure and 6% of GSDP. Primary deficit, which is defined as the difference between current government spending on goods and services and total current revenue from all types of taxes net of transfer payments, is INR 256 billion (4% of GSDP).

Definition/explanation of terms of budget is shown in the following box.

Box: Definition/Explanation of Terms of Budget		
BE:	Budget estimated, budget prepared before the beginning of the financial year (April to March)	
RE:	Revised estimated, budget revised during the financial year (April to March)	
Outlay:	Amount allocated for each sector at the budgeting stage	
(Actual) Expenditure:	Result of actual expenditure at the end of financial year based on the budget	
Revenue receipts:	The receipts that neither create any liability nor cause any reduction in the assets of the government, which includes tax revenue and non-tax revenue	
Capital receipts:	The receipts that either create a liability or cause a reduction in the assets of the government, which include loans	
Expenditures:	Definition of expenditures in the budget is shown below.	
	Revenue Account	Capital Account
	Neither deduct any liability nor cause any increase of the assets	Either deduct any liability or cause any increase of the assets
Plan	Expenditure utilised for public services by government without increase of the assets	Expenditure with increase of the assets such as acquisition of land, construction of building, etc.
Non-plan	Interest payments, wage and salary payments to government employees, economic services in various sectors, other general services such as tax collection, social services, etc.	Loans to public enterprises, etc.

Source: JICA survey team

(2) State Public Debt

Table A8.1.2 shows the state-wise comparison of fiscal deficit, GSDP, and ratio of deficit/GSDP. In Budget 2014-15, the average ratio of fiscal deficit/GSDP of non-special category states is 3.0%. The ratio of Rajasthan is 3.5% in 2014-15, which is relatively higher compared with the national average.

Table A8.1.2 State-wise Fiscal Deficit/Surplus and GSDP

Unit: INR in billions

	2014-15 BE		Current Price 2013-14		
	Receipts Without Borrowings	Expenditure Without Public Debt	Surplus (-)/ Deficit (+)	GSDP	Ratio of Deficit / GSDP
Non-special Category					
Andhra Pradesh	920.8	1,041.4	120.6	4,641.8	2.6%
Bihar	1,019.4	1,133.1	113.7	3,436.6	3.3%
Chhattisgarh	486.5	544.2	57.7	2,101.9	2.7%
Goa	80.9	99.3	18.4	290.8	6.3%
Gujarat	1,040.5	1,257.7	217.2	7,656.4	2.8%
Haryana	477.2	591.1	113.9	3,889.2	2.9%
Jharkand	434.4	483.6	49.2	1,727.7	2.8%
Karnataka	1,111.1	1,311.5	200.4	6,146.1	3.3%
Kerala	648.7	792.7	144.0	3,962.8	3.6%
Madhya Pradesh	1,034.9	1,169.2	134.3	4,347.3	3.1%
Maharashtra	1,803.2	2,112.8	309.6	15,101.3	2.1%
Odisha	671.5	768.4	96.9	2,729.8	3.5%
Punjab	448.9	552.7	103.8	3,175.6	3.3%

	2014-15 BE			Current Price 2013-14	
	Receipts Without Borrowings	Expenditure Without Public Debt	Surplus (-)/ Deficit (+)	GSDP	Ratio of Deficit / GSDP
Rajasthan	1,061.3	1,263.2	201.9	5,745.5	3.5%
Tamil Nadu	1,273.9	1,531.0	257.1	8,542.4	3.0%
Telangana	800.9	974.9	174.0	3,917.5	4.4%
Uttar Pradesh	2,264.2	2,548.3	284.1	8,627.5	3.3%
West Bengal	1,059.8	1,212.7	152.9	7,065.6	2.2%
Total Non-special Category	16,638.1	19,387.8	2,749.7	93,105.8	3.0%
Special Category					
Arunachal Pradesh	87.8	93.3	5.5	135.5	4.1%
Assam	527.0	566.8	39.8	1,594.6	2.5%
Himachal Pradesh	167.2	220.8	53.6	825.8	6.5%
Jammu and Kashmir	392.2	415.5	23.3	875.7	2.7%
Manipur	88.3	93.8	5.5	143.2	3.8%
Meghalaya	111.3	116.6	5.3	219.2	2.4%
Mizoram	58.8	64.7	5.9	103.0	5.7%
Nagaland	95.4	101.3	5.9	177.5	3.3%
Sikkim	61.1	64.8	3.7	123.8	3.0%
Tripura	107.9	119.9	12.0	268.1	4.5%
Uttarakhand	244.7	285.5	40.8	1,229.0	3.3%
Total Special Category	1,941.7	2,143.0	201.3	5,695.4	3.5%

Source: State Finances A Study of Budgets of 2015-16, Reserve Bank of India/Ministry of Statistics and Programme Implementation

Table A8.1.3 shows the amount of public debt of GoR. Borrowings and other liabilities account for 28% of receipts of the budget in 2016-17, which is 8.3% of the GSDP. Repayment of debt accounts for 2.8% of the expenditure. The amount of annual repayment in the recent five years is around INR 40 to 50 billion.

Table A8.1.3 Public Debt of the Government of Rajasthan in the Last Five Years

Unit: INR in millions

	2012-13	2013-14	2014-15	2015-16	2016-17
Permanent Debt					
Raised	80,411	88,000	123,000	159,283	159,749
Repaid	23,834	16,249	22,979	19,933	17,290
Net Receipts	56,576	71,751	100,021	139,351	142,459
Floating Debt					
Raised	0	0	0	0	0
Repaid	0	0	0	0	0
Net Receipts	0	0	0	0	0
Other Loans					
Raised	17,140	54,327	50,465	450,941	224,545
Repaid	18,552	19,999	21,531	21,294	24,513
Net Receipts	-1,411	34,329	28,934	429,646	200,032
Loan from Central Government					
Raised	1,999	2,587	7,943	43,788	55,825
Repaid	4,681	4,909	5,091	5,319	5,402
Net Receipts	-2,682	-2,322	2,853	38,469	50,423
Total Public Debt					
Raised	99,550	144,914	181,408	654,012	440,120
Repaid	47,067	41,156	49,600	46,546	47,205
Net Public Debt	52,483	103,758	131,808	607,466	392,915

Source: Budget Study 2016-17, Finance Department, Government of Rajasthan

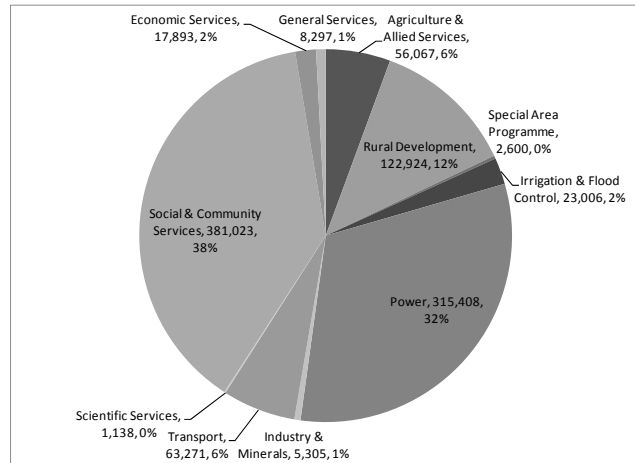
(3) Sector-wise Outlay

Proportion of sector-wise outlay allocation is shown in Table A8.1.4. According to the Budget Estimated (BE) in 2016-17, GoR allocated 5.6% of the total outlay in the budget for agriculture and allied sector and 2.3% for irrigation and flood control sector including command area development in 2016-17.

Table A8.1.4 Sector-wise Outlay of Government of Rajasthan 2016-17

Unit: INR in millions

	Sector	2016-17
1	Agriculture and Allied Services	56,067
2	Rural Development	122,924
3	Special Area Programme	2,600
4	Irrigation and Flood Control	23,006
5	Power	315,408
6	Industry and Minerals	5,305
7	Transport	63,271
8	Scientific Services	1,138
9	Social and Community Services	381,023
10	Economic Services	17,893
11	General Services	8,297
Total Plan Outlay		996,933



Source: Budget Study 2016-17, Finance Department, Government of Rajasthan

Table A8.1.5 shows the sector-wise outlay of GoR in the last five years. Ratio of allocated budget for agriculture and irrigation sector is almost stable in recent years. Outlay includes gross budgetary support from the government and Internal and Extra Budgetary Resources (IEBR) such as fund resources from commission of marketing board through marketing activities.

Table A8.1.5 Sector-wise Outlay of the Government of Rajasthan in the Last Five Years

Unit: INR in millions

	2012-13		2013-14		2014-15		2015-16		2016-17	
	Outlay	% of Total	Outlay	% of Total	Outlay	% of Total	Outlay	% of Total	Outlay	% of Total
1 Agriculture and Allied Services	23,242	6.4%	23,629	5.9%	42,347	6.1%	39,758	5.6%	56,067	5.6%
4 Irrigation and Flood Control	9,905	2.7%	15,409	3.8%	17,061	2.4%	17,191	2.4%	23,006	2.3%
Other Sector	330,491	90.9%	362,353	90.3%	638,792	91.5%	657,109	92.0%	917,860	92.1%
Total Plan Outlay	363,638	100.0%	401,390	100.0%	698,201	100.0%	714,058	100.0%	996,933	100.0%

Source: Budget Study 2016-17, Finance Department, Government of Rajasthan

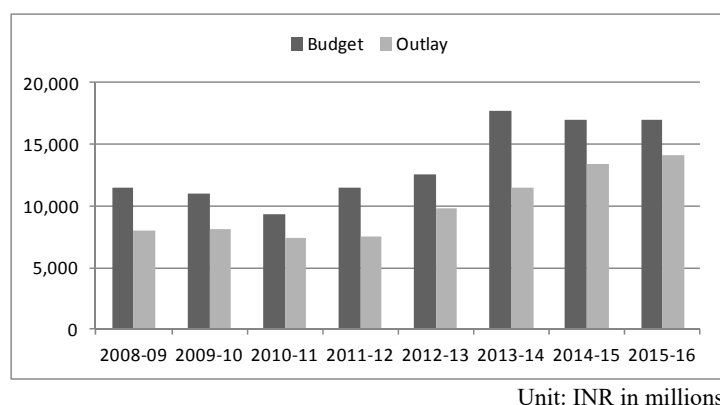
8.1.2 Budget and Outlay of Related Agencies

(1) Budget and Outlay of Irrigation Sector

Budget for irrigation and flood control sector is allocated to two departments, namely: Water Resource Department (WRD) and Command Area Development (CAD) Department. Budget and expenditure under the irrigation and flood control sector in 2008-09 to 2015-16 are shown in Figure A8.1.1.

A total amount of INR 17,051 million was allocated for irrigation and flood control sector in 2015-16 and of which INR 14,127 million was expended.

Table A8.1.6 shows the subsector-wise outlay for irrigation and flood control sector.



Source: WRD, Rajasthan

Figure A8.1.1 Budget and Expenditure for Irrigation and Flood Control Sector

Table A8.1.6 Outlay for Water Resource Sector in Four Years

	Unit: INR in millions			
	2015-16	2014-15	2013-14	2012-13
Water Resources	11,551	11,177	12,418	10,968
Multi-purpose Project	-	212	100	0
Major Project	-	3,331	4,054	3,945
Medium Project	-	1,063	1,104	931
Modernisation of Gang Canal	-	591	600	400
Minor Project	-	5,216	5,625	5,522
Water Management Services	-	734	856	130
Flood Control	-	30	80	40
Ground Water	-	15	17	2
Command Area Development	-	3,113	2,170	888
<i>Indhira Gandhi Nahar Project (IGNP)</i>	2,566	2,756	3,004	1,279
Total Water Resource with IGNP	14,117	13,933	15,422	12,246
Total Irrigation and Flood Control	-	17,061	17,609	13,136

Note: Due to the difference of reporting format of the annual plan, breakdown of each project is not available.

Source: Annual Plan 2014-15, Planning Department, Government of Rajasthan and WRD

Out of the total outlay for water resource development sector (with IGNP) in 2014-15, an amount of INR 13,933 million, around 82%, is allocated for irrigation development, water management, and flood control by WRD. Average annual outlay in recent three years from 2013-14 to 2015-16 for water resource development sector (with IGNP) is INR 14,491 million.

(2) Budget and Outlay of Agriculture and Allied Sector

Budget for agriculture and allied sector is allocated to the Department of Agriculture (DoA), Department of Horticulture (DoH), Department of Livestock, and agriculture universities. Table A8.1.7 shows the budget of DoA, DoH, and the Department of Animal Husbandry.

Table A8.1.7 Budget for Agriculture and Allied Sector

Unit: INR in millions/percentage of shares in total budget

	2014-15 RE	2015-16 BE
Department of Agriculture		
Central Share	11,678 (38%)	6,562 (22%)
State Share	19,230 (62%)	23,127 (78%)
Total	30,909	29,689
Department of Horticulture		
Central Share	1,495 (40%)	934 (21%)
State Share	2,202 (60%)	3,507 (79%)
Total	3,697	4,441
Department of Animal Husbandry		
Central Share	629 (9%)	187 (3%)
State Share	6,281 (91%)	5,764 (97%)
Total	6,910	5,951

Source: DoA, DoH, Government of Rajasthan

Budget of these three departments includes outlay for crop/animal husbandry such as demonstration, crop and water insurance, and subsidies by state fund. In addition to the state share of budget, as central supported schemes, such as the National Agriculture Development Program (*Rashtriya Krish Vikas Yojna*: RKVY), National Food Security Mission (NFSM), National Mission on Agriculture Extension and Technology (NMAET), and National Horticulture Mission (NFM) are also managed by the departments.

(3) Budget and Outlay for Gender Related Issues

Budget of DoA includes gender budgeting, which consists of INR 40 million as incentives for girls who will take agriculture as a subject, INR 35 million for one-day gram panchayat level training, and INR 200 million for seed minikit distribution.

The budget of empowerment of women and development of children sector, amounting to INR 933 million per annum for women development and INR 18,642 million per annum for Integrated Child Development Services (ICDS) with 60% of the central government funding support.

A 50% interest subvention scheme on bank loans to self-help groups (SHGs) is ongoing for women development. SHGs are allowed by the state government with a bank loan up to INR 50,000 per SHG. The remaining 50% of interest is to be borne by the SHG.

ICDS is an Indian government welfare program that provides food, preschool education, and primary healthcare to children under six years of age and their mothers. These services are provided by *Anganwadi* centres established mainly in rural areas and staffed with frontline workers. In addition to fighting malnutrition and ill health, the programme is also intended to combat gender inequality by providing girls with the same resources as boys.

A summary of budget for gender related issue is shown in Table A8.1.8.

Table A8.1.8 Budget for Gender Related Issue

Unit: INR in millions

	2014-15 BE	Description
Department of Agriculture/Gender Budgeting		
Incentives to Girls	40	- Incentives for girls to take agriculture as subject
One Day Gram Panchayat Level Training	35	- Agriculture training for women
Minikit Distribution for Women	200	- Distribution of seed minikit for women
Department of Women and Children Development		
SHG Development	933	- 50% interest subvention scheme on bank loans to SHGs
Nutrition/ICDS	18,642	- Welfare program that provides food, preschool education, and primary healthcare to children under six years of age and their mothers with 60% central support

Source: Annual Plan 2014-15, Planning Department, Government of Rajasthan

8.1.3 Financial Capability of the State Government

Non-disclosure information

8.2 Economic Evaluation Methodology and Assumption

8.2.1 Evaluation Methodology

Economic evaluation is carried out to assess the economic viability of the Project from a viewpoint of the national economy. In order to evaluate the Project, indicators such as the economic internal rate of return (EIRR), cost-benefit ratio (B/C), and net present value (B-C) are calculated by estimating the cash outflow (costs) and inflow (benefits) on an annual basis over the project life with a certain discount rate. EIRR is a discount rate at which the present value of the in and out cash flows become equal. This rate shows the return expected from the Project as expressed in the following equation:

$$\sum_{t=0}^n C_t / (1+r)^t - \sum_{t=0}^n B_t / (1+r)^t = 0$$

Where,

C_t	:	Cost
B_t	:	Benefit
t	:	Year
n	:	Project Life (year)
r	:	Discount Rate (EIRR)

Sensitivity analysis is also carried out to evaluate the viability of the Project against possible adverse changes in the future.

Financial internal rate of return (FIRR) is not calculated because FIRR is an indicator to assess the financial sustainability of the implementation agency with direct return from project activities such as water supply scheme.

8.2.2 Basic Assumptions

The abovementioned economic evaluation indicators are estimated with the following conditions and assumptions:

- i) **Project life:** Project life is assumed to be 30 years beginning from the fiscal year 2016;
- ii) **Exchange rate:** All prices and costs are expressed in economic prices of Indian rupee. Other currencies are converted to Indian rupee using the exchange rate, as of April 2016, for the estimation:

$$\text{USD } 1.00 = \text{JPY } 113.1, \quad \text{INR } 1.0 = \text{JPY } 1.69, \quad \text{USD } 1.00 = \text{INR } 67.0$$
- iii) **Discount rate:** Discount rate of 12% is applied for calculation of B/C and B-C in view of the rate used generally for other irrigation projects (Rajasthan Water Sector Restructuring Project (RWSRP) of the World Bank, Rengali Irrigation Project, Orissa, etc.) in India;
- iv) **Traded outputs:** Maize, wheat, and barley are treated as traded outputs (export goods). Economic prices of these products are estimated based on free on board (f.o.b.) price calculated from trade statistics (excluding taxes and duties) derived from the "Export Import Data Bank, Department of Commerce" and expressed in 2016 prices;
- v) **Non-tradable commodities:** Standard conversion factor (SCF) of 0.96 is applied for converting from financial prices of non-tradable commodities to economic prices which is calculated based on trade statistics of India. Calculation table of SCF is shown in Table B8.2.1;
- vi) **Labour:** Shadow wage rate (SWR) for unskilled labour of 0.9 is applied for converting market wage rate to its economic price, which is applied for RWSRP of the World Bank;
- vii) **Economic Price:** All financial prices are converted to economic prices by using the abovementioned prices and factors. Transfer payment (taxes and subsidies), land acquisition, compensation, price escalation and interest during construction are excluded for the calculation of economic project cost/benefit;
- viii) **Economic Cost:** For calculation of the project economic cost, only incremental cost is counted.

Sunk cost is not included in the economic cost; and

- ix) **Economic Benefit:** For calculation of the project benefit, only the tangible direct benefits of irrigation are counted and no indirect and intangible benefits are taken into account. Intangible benefits of the Project are described in Section 8.8.

8.3 Project Cost



Table A8.3.1 Summary of the Project Cost

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Non-disclosure information

Annual disbursement schedule is shown in Table A8.3.2.

Table A8.3.2 Annual Disbursement Schedule (Economic Price)

Non-disclosure information

8.4 Operation and Maintenance Cost

Non-disclosure information

8.5 Project Benefit

8.5.1 Methodology and Basic Assumptions for Estimation of Project Benefit

The benefit from irrigation and water supply of the Project is the increment of net production value of crops derived from increasing cropping intensity and unit yield of cereals, pulses, oil seed, and other crops compared between without and with project condition.

Cropping intensity of 134% without project condition can be increased to 157%, which equates to an increase of about 83,000 ha of cultivated land in the project area with project condition as shown in Table A8.5.1.

Table A8.5.1 Estimated Cropping Intensity

	With Condition		Without Condition	
	Percentage	Cultivated Area (ha)	Percentage	Cultivated Area (ha)
Kharif Crops				
Maize	32%	115,605	28%	101,154
Jowar (Sorghum)	12%	43,352	12%	43,352
Bajra (Pearl Millet)	12%	43,352	11%	39,739
Kharif Pulses/Moong	13%	46,965	13%	46,965
Kharif Oilseed/Other Kharif Crops	4%	14,451	6%	21,676
Kharif Total	73%	263,724	70%	252,886
Rabi Crops				
Wheat	10%	36,127	16%	57,803
Barley	5%	18,063	11%	39,739
Gram	25%	90,317	37%	133,668
Rabi Oilseed	19%	68,641	15%	54,190
Other Rabi Crops	2%	7,225	8%	28,901
Rabi Total	61%	220,372	87%	314,301
Total	134%	484,096	157%	567,188
Increment by the Project			23%	83,091

Source: JICA survey team

8.5.2 Crop Budget

Economic crop budget of ten major crops with and without project conditions was prepared for estimation of irrigation benefit considering the current situation of agriculture in the project area and the following conditions:

- i) Crop budget is prepared for *Kharif* cereals (maize, sorghum, and pearl millet), *Kharif* beans (Moong), *Kharif* oilseed (Sesame), *Rabi* cereals (wheat and barley), *Rabi* beans (gram), *Rabi* oilseed (Mustard), refer to Table B8.5.1;
- ii) Crop budget of onion, which has the largest cultivation area among the vegetables in Rajasthan typified other high value crops due to lack of reliable data on cost of cultivation;
- iii) Back data of crop budget provided by the Government of Rajasthan does not separate crop budget under irrigated condition and un-irrigated condition (Average figure includes both irrigated and un-irrigated condition). Thus, the crop budget of the Project also does not separate irrigated and un-irrigated condition;
- iv) Crop budget is prepared based on the following sources:

Price: Average price of 2009-14, five-year data at 2016 price, Rajasthan Agricultural Statistics at a Glance 2013-14, published in November 2015, DoA, Rajasthan
Yield: Average five years data up to 2012-13, Rajasthan Agricultural Statistics at a Glance 2013-14, published in November 2015, DoA, Rajasthan
Cost of cultivation: 2012-13 data, Estimates of Cost of Cultivation/Production and Related Data, Directorate of Economics and Statistics

- v) Prices of agro commodities are converted from wholesale price to farm gate price by deducting the marketing cost, refer to Tables B8.5.2 and B8.5.3;
- vi) Gross receipts include 1) receipts from crop production, 2) by-product value as fodder, and 3) dung receipts (based on the Central Water Commission, CWC Standard for Calculation of Benefit Cost Ratio, refer to Annex-17, Guideline for Preparation of Detailed Project Report of Irrigation and Multipurpose Project);
- vii) All prices are expressed in 2016 prices by converting with the consumer price index;
- viii) Material costs are estimated to have 20% of subsidy for seeds and/or fertilisers based on subsidy rate for seeds in Rajasthan. Material costs are also estimated to include 5.5% of the value-added tax (VAT), which are deducted from material cost;
- ix) As to the other costs for cultivation, the following items are included in the cost based on the Central Water Commission, CWC Standard for Calculation of Benefit Cost Ratio. Expenses for the items are calculated by a certain factor on gross receipts from crop production, as follows:

	Without Condition	With Condition
• Fodder expense	15%	10%
• Depreciation on implementation	2.7%	2.7%
• Share and cash rent	5%	3%
• Land revenue	2%	2%

- x) Figures of crop budget are converted to economic prices based on the abovementioned assumptions and procedures;
- xi) Irrigation charge of cultivation cost is included in the O&M cost and not included in the production cost;
- xii) Crop budget with abovementioned conversion is assumed as crop budget without project condition, refer to Table B8.5.4; and
- xiii) Increase in production of 10% for wheat, barley, and gram; and 5% of maize, mustard, and other crops are anticipated for the crop budget with condition due to availability of stable water supply by the rehabilitation of irrigation facilities and agricultural extension activities of the Project. Increase of 5% in labour cost and material inputs is anticipated with condition due to more intensive use of irrigation water, introduction of recommended variety, and increase of fertiliser inputs, refer to Table B8.5.4. These conditions were estimated based on the package of practice, Department of Agriculture, GoR.

A summary of crop budget for major crops is shown in Table A8.5.2. Detailed table of the crop budget is shown in Table B8.5.5.

Table A8.5.2 Summary of Economic Crop Budget

Crops	Gross Receipts			Cost of Cultivation					Net Receipts (INR/ha)	
	Unit Price (INR/ton)	Unit Yield (ton/ha)	Gross Receipts (INR/ha)	Other Receipts (INR/ha)	Total Receipts (INR/ha)	Labour (INR/ha)	Materials (INR/ha)	Others (INR/ha)		Total Cost (INR/ha)
Without Project Condition										
Khariif Crops										
Maize	11,892	1.60	19,062	6,467	25,529	28,847	6,448	6,520	41,814	-16,285
Jowar	17,894	0.55	9,770	5,325	15,095	13,107	3,228	2,413	18,748	-3,653
Bajra	13,879	0.91	12,588	6,860	19,448	13,879	2,342	3,109	19,330	119
Kh. Pulses	59,702	0.40	23,642	3,428	27,070	12,839	3,570	5,840	22,249	4,822
Til	93,535	0.29	27,406	1,233	28,639	10,608	1,264	6,769	18,641	9,998
Rabi Crops										
Wheat	13,939	3.36	46,863	14,368	61,231	22,112	9,899	14,485	46,496	14,735
Barley	12,880	2.94	37,803	9,982	47,785	24,537	6,865	10,064	41,466	6,319
Gram	36,400	0.81	29,630	4,296	33,926	13,127	6,563	7,319	27,008	6,918

Crops	Gross Receipts					Cost of Cultivation				Net Receipts (INR/ha)
	Unit Price (INR/ton)	Unit Yield (ton/ha)	Gross Receipts (INR/ha)	Other Receipts (INR/ha)	Total Receipts (INR/ha)	Labour (INR/ha)	Materials (INR/ha)	Others (INR/ha)	Total Cost (INR/ha)	
Mustard	37,824	1.35	50,911	2,291	53,202	16,106	4,792	12,575	33,473	19,729
Other Crops	12,024	9.45	113,598	5,112	118,710	32,886	29,900	28,059	90,845	27,865
With Project Condition										
Kharif Crops										
Maize	11,892	1.68	20,015	6,375	26,390	28,847	6,770	4,906	40,522	-14,132
Jowar	17,894	0.55	9,770	5,178	14,948	13,107	3,228	1,729	18,064	-3,116
Bajra	13,879	0.91	12,588	6,672	19,260	13,879	2,342	2,228	18,449	811
Kh. Pulses	59,702	0.40	23,642	3,073	26,716	12,839	3,570	4,185	20,594	6,122
Til	93,535	0.29	27,406	822	28,228	10,608	1,264	4,851	16,723	11,505
Rabi Crops										
Wheat	13,939	3.70	51,549	14,837	66,386	22,764	10,394	11,418	44,576	21,810
Barley	12,880	3.23	41,583	10,308	51,891	25,390	7,209	7,933	40,531	11,360
Gram	36,400	0.90	32,593	4,237	36,830	13,623	6,891	5,769	26,283	10,547
Mustard	37,824	1.41	53,457	1,604	55,060	16,616	5,032	9,462	31,109	23,951
Other Crops	12,024	9.92	119,278	3,578	122,856	33,361	31,395	21,112	85,869	36,988

Source: JICA survey team

8.5.3 Irrigation Benefit

In accordance with “without” and “with” cropping pattern in the project area and crop budget, annual project benefit is estimated. Economic benefit from irrigation development is estimated at INR 3,331 million per annum as summarised in Table A8.5.3. Detailed calculation of the economic irrigation benefit is shown in Table B8.5.5.

Table A8.5.3 Economic Benefit from the Project

Unit: INR million

Annual Total Benefit	
Without	1,162
With	4,493
Incremental Benefit	3,331

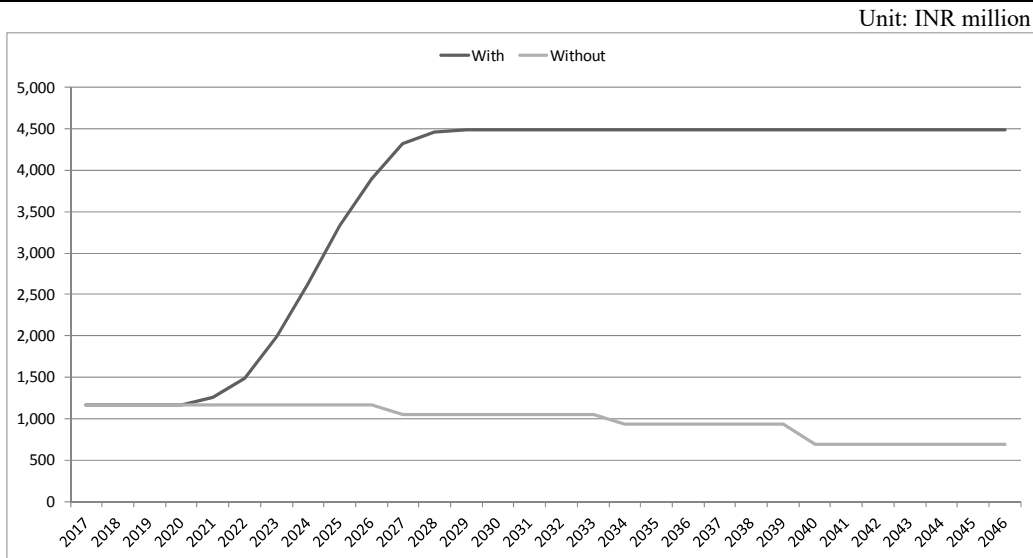
Source: JICA survey team

Increase of annual benefit was estimated to be at 10%, 30%, 70%, and 100% in each year from year one after completion of the construction works. Calculation of the total increase of annual benefit is shown in Table A8.5.4.

Table A8.5.4 Increase of Annual Benefit

Non-disclosure information

Decrease in benefit due to aging and degradation of canal without the project condition is anticipated. The decrease of benefit is calculated based on aging and degradation estimation curve of concrete lining canal applied for irrigation development project in Japan. Annual benefits of with and without project condition are graphed in Figure A8.5.1.



Source: JICA survey team

Figure A8.5.1 Comparison of Annual Benefit With and Without Project Condition

8.6 Evaluation Results

EIRR is calculated at 13.4% with B-C at INR 1,124 million and B/C at 1.11, as summarised in Table A8.6.1.

Table A8.6.1 Economic Evaluation Results

Non-disclosure information

A sensitivity analysis is made to evaluate the soundness of the Project against unexpected adverse changes in the future. The detailed result of analysis is shown in Table B8.6.1.

Table A8.6.2 Sensitive Analysis of the Project

Non-disclosure information

The economic indicators calculated are feasible. The Project is also robust against unexpected adverse changes in the future as shown in the result of sensitivity analysis. Therefore, the JICA survey team concluded that the proposed Project is economically feasible.

8.7 Farm Economic Analysis

In order to evaluate the financial viability of individual farmers in the project area, annual farm income of typical farm household is estimated based on the abovementioned crop budgets. Net farm income estimation is shown in Table A8.7.1 and detailed table is shown in Table B8.7.1.

Table A8.7.1 Annual Farm Income in the Project Area

	Net Receipts (ha)	Net Receipts of Median Land Holding Household (1.9 ha)	Unit: INR
Without	22,800		43,321
With	35,752		67,928
Balance	+12,952		+24,607

Source: JICA survey team

Cultivation area of typical farm household is considered at 1.9 ha, which nearly equals to median of landholding size in Rajasthan. The results showed that the net farm income will increase to approximately INR 68,000 per year after the implementation of the Project as compared with the current condition, at INR 43,000 per year. This result showed that the Project has positive impact in increasing the net farm income of individual farmers.

8.8 Intangible Benefit

The following positive effects as intangible benefits shall be envisaged through the project activities.

(1) Women empowerment through gender related activities

Aiming gender mainstreaming in water management, the Project will implement the following activities: legal and organisational institutionalisation, promoting women participation in water management, and improving agricultural activities. It is expected to observe a certain number of women members in the water users association (WUA) management committee (MC) by adding clauses to the Participatory Irrigation Management (PIM) Act on reservation for women members as well as new establishment of Women Wing, thus, this will create a venue to reflect their voices and needs on water management and will increase number of almost non-existent women WUA MC member. At the same time, women will acquire the capacity to express their opinions and needs not only in WUA but also in community activities of other sector, such as agriculture and forestry, health and nutrition through regular participation in the meetings. In the household level, it is expected to gain knowledge on crops and cultivation techniques through agriculture program for men and women so that it will be reflected in cultivation plan. Women's control on household income will be increased and their opinion on

cultivation plan will be respected through their participation on agricultural technical activity for women group and gender awareness program for men and women.

(2) Revitalisation of water users association (WUA) and farmers’ organisation

It is essential to revitalise WUA and farmers’ organisation to generate sustainable management of restructured irrigation scheme by the Project. For that purpose, procedures of WUA formation will be carefully monitored and territorial constituency-wise meeting will be conducted by the Project to make users aware of WUA and water management. It makes management of WUA and its activities more democratically leading to a practical and equitable water management plan and implementation.

(3) Improvement of agricultural techniques and nutritional improvement of women and children

The Project will introduce the following new agriculture techniques to farmers:

- Introduction of suitable and high yield varieties for cereals, pulses, and oil crops;
- Introduction of mulch for vegetable cultivation; and
- Introduction of mulch and drip irrigation for fruit cultivation.

Improvement of agricultural techniques of farmers is expected through the project activities.

Through the SHG activity, women can understand healthy intake of nutritious vegetables (Swiss chard, kale, and amaranth) for their health. Improvement in nutrient condition of women and children is expected.

(4) Increase in value of Rajasthan agro-produce through marketing promotional activities

Support for farmer interest groups’ (FIGs) cooperative activities including collective marketing would enhance FIGs marketing capacities (quality control, negotiation power, etc.) to sell agricultural produce to public markets, medicinal plants markets, spice markets in agri export zones (AEZs), and/or processors of food parks in and around the production areas. It is also expected that market-oriented experimental farms would provide quality produce as well as improvement in sales of farmers, consequently, contributing to future increase in value of high-total soluble solids (TSS) fruits/vegetables grown in Rajasthan.

(5) Adaptation measures for climate change

As described in Section 8.10, as adaptation measures, part of the project activities has positive effect to reduce the vulnerability of farmers to climate change.

8.9 Operation and Effect Indicators

8.9.1 Operation Indicators

At this moment, the following baseline and operation indicators are provisionally set based on the “Reference of Operation/Effect Indicators for ODA Loan Project, JICA, 2014”.

Table A8.9.1 Operation Indicators

No.	Indicators	Current (2017)	Target (2026)
1.	Area benefited by the Project (ha) (CCA)	-	360,000 ha
2.	Cultivated area by crops (ha)	As shown in the cropping pattern	
3.	Collection rate of irrigation water charge (%) 1/	50%	70%

Source: JICA survey team

Remarks:

1/ The indicator was set based on the Draft Implementation Completion Report, RWSRP, World Bank, 2013. Current and target figures shall be revised based on the actual data collected by NGOs as support to WUA.

Baseline data of operation indicators shall be surveyed by the Survey, Investigation, and Design (SID) consultant and mentioned in the detailed project reports (DPRs). After commencement of the Project, operation indicators will be monitored in the following manner:

Table A8.9.2 Monitoring of Operation Indicators

No.	Indicators	Target of Survey	Responsible Organisation	Frequency of Survey	Reports for Reference
1.	Area benefited by the Project (ha) (CCA)	All sub-projects	PMU, WRD and the consultant	Every quarter during the project period	Quarterly report of the project consultant
2.	Cultivated area by crops (ha)	All sub-projects	NGO	Every year during the project period	Annual report prepared by NGO
3.	Collection rate of water tariff (%)	All sub-projects	NGO	Every year during the project period	Annual report prepared by NGO

Source: JICA survey team

8.9.2 Effect Indicators

The following baseline and effect indicators are provisionally set at this moment. Baseline and target indicators will be set based on the baseline surveys in sample WUAs.

Table A8.9.3 Effective Indicators

No.	Indicators	Current (2017)	Target (20xx)
1.	Production volume of major crops (t/year) Maize Wheat Barley Gram Mustard Other crops	Set by survey in each sample WUA	Estimates based on increase of cultivation area and unit yield
2.	Yield of major crops per unit area (t/ha) 1/ Maize Wheat Barley Gram Mustard Other crops	Set by survey in each sample WUA	5% Increase 10% Increase 10% Increase 10% Increase 5% Increase 5% Increase
3.	Gross annual average farm income (INR/year/ household)	Set by survey in each sample WUA	Estimates based on increase of crop production
4.	Male/female ratio in WUA committee 2/	Set by survey in each sample WUA	33%

Source: JICA survey team

Remarks:

1/ Target figure of the indicator was set based on the actual increment of unit yield of RWSRP from the Draft Implementation Completion Report, RWSRP, World Bank, 2013.

2/ Target figure of the indicator was set based on Regulation Law of WUA.

Effect indicators will be monitored in the following manner:

Table A8.9.4 Monitoring of Operation Indicators

No.	Indicators	Target of Survey	Responsible Organisation	Frequency of Survey	Reports for Reference
1.	Production volume of major crops (t/year)	Sample WUAs in the sub-projects	The consultant /NGOs	Before the sub-project implementation and two years after the sub-project completion	Monitoring report of the consultant
2.	Yield of major crops per unit area (t/ha)	ditto	ditto	ditto	ditto

No.	Indicators	Target of Survey	Responsible Organisation	Frequency of Survey	Reports for Reference
3.	Gross annual average farm income (INR/year/ household)	ditto	ditto	ditto	ditto
4.	Male/female ratio in WUA committee	All sub-projects	NGO	Every year during the project period	Annual report prepared by NGO

Source: JICA survey team

At the moment, sub-projects under RWSLIP have not yet been selected. Thus, sample WUAs for monitoring and evaluation will be selected after commencement of RWSLIP. The Engineering and Management Consultant in-charge of project monitoring and evaluation shall prepare the monitoring plan of RWSLIP and based on this, he/she will implement the project monitoring activities.

Two WUAs in the canal irrigation projects, two for the dam and canal irrigation project (medium), and one in dam and canal irrigation project (minor) will be sampled and selected based on the criteria such as agro-climatic conditions among stage 1 sub-projects. Sampled WUAs will be selected on the same way for stage 2 sub-project. Around 50 farm households in each sampled WUA will be the target of baseline and monitoring survey. NGOs of the Project will implement the baseline and monitoring survey according to the monitoring and evaluation plan. Based on the result of the survey, the project consultant will analyse the data. Tentative items of the survey include basic information, cropping pattern, production, yield, farm income, other income, participation rate with the project activities, adaptation of new techniques introduced by the project, etc.

Tentative schedule of the implementation of baseline and monitoring survey is shown in Figure A8.9.1.



Figure A8.9.1 Tentative Schedule of Monitoring and Evaluation Survey

Monitoring procedure and method proposed in this report is tentative and will be modified based on the actual situation.

8.9.3 Indicators for Intangible Benefits

In order to monitor the positive effects of RWSLIP as intangible benefit, the following indicators are proposed to be set and monitored in addition to the operation and effect indicators:

No.	Indicators	Current (2017)	Target (20xx)
1.	Increase women's voice in WUA MC meeting* ¹	Set by the baseline survey	Women's voice is recorded in more than 50% of WUA meetings
2.	Increase in number of women participating in meetings* ² other than WUA meeting	Set by the baseline survey	30% of women participated in more than one meeting last year
3.	Increase in women's control over household income	Set by the baseline survey	30% of vegetable cultivation group members had controlled over the income
4.	Number of farmers participating gender session (gender disaggregated data)	Set by the baseline survey	30% of farmers received gender session (number of female and male farmer separately)

No.	Indicators	Current (2017)	Target (20xx)
5.	Number of farmers participating agricultural technical session (gender disaggregated data)	Set by the baseline survey	30% of farmers received agricultural technical session (number of female and male farmer separately)
6.	WUA participation in the implementation of water management according to the plan	Set by the baseline survey	More than 50% of WUA implement water management according to the plan
7.	Improvement of agriculture techniques (evaluated by the adaptation rate of new techniques)	Set by the baseline survey in each sample WUA	Set based on the baseline
8.	Nutritional (anemia) improvement of women and children (Gender disaggregated data)	-	More than 4 SHGs other than the target SHGs started to cultivate vegetable for nutritional improvement (Number of women and boy and girl child)
9.	Number of FIGs formulated through the Project and their sales activities (number of female member and its ratio)	0 group	2 groups per each WUA
10.	Sales results of high-TSS fruits/vegetables from market-oriented experimental plots (number of women farmers and its ratio)	0 case (INR 0)	To be set for every plot in consideration of the increase in production amount and sales contracts

*1 Need to check whether their voices are accepted or not based on WUA's activities

*2 Meetings other than WUA means meetings conducted by gram panchayat and DoA.

Source: JICA survey team

These indicators will be monitored in the following manner:

Table A8.9.6 Monitoring of Indicators for Intangible Benefits

No.	Indicators	Target of Survey	Responsible Organisation	Frequency of Survey	Reports for Reference
1.	Increase women's voice in WUA MC meeting*1	WUA (Minutes of the Meeting)	NGO (Community Motivator)	Once at the end of the year	NGO annual report
2.	Increase in number of women participating in meetings other than WUA meeting*1	1 TC from each WUA	NGO (Community Motivator)	Interview at the end of the stage	Stage-wise evaluation report
3.	Increase in women's control over household income	All members of vegetable cultivation group	ditto	ditto	ditto
4.	Number of farmers participating gender session (gender disaggregated data)	1 TC from each WUA	ditto	ditto	ditto
5.	Number of farmers receiving agricultural technical session (gender disaggregated data)	ditto	ditto	ditto	ditto
6.	WUA participation in the implementation of water management according to their plan	All WUAs	NGO (Community Motivator)	Each cultivation season	NGO annual report
7.	Improvement of agriculture techniques	Sample WUAs in sub-projects	The consultant /NGOs	Before the sub-project implementation and two-year after the sub-project completion	Monitoring report of the consultant
8.	Nutritional (anemia) improvement of women and children (Gender disaggregated data)	Sample survey among SHGs	NGO	Every year during the project period	Annual report prepared by NGO

9.	Number of FIGs formulated through the Project and their sales activities (number of female member and its ratio)	All WUAs	NGO staff (Community motivators)	Once per year	NGO's annual report
10.	Sales results of high-TSS fruits/vegetables from market-oriented experimental plots (number of women farmers and its ratio)	All market-oriented experimental plots for high-TSS fruits/vegetables	ditto	ditto	ditto

Source: JICA survey team

*1 Need to check whether their voices are accepted or not based on WUA's activities

*2 Meetings other than WUA means meetings conducted by *gram panchayat* and DoA.

8.10 Adaptation Measures for Climate Change

Rajasthan has been experiencing the effect of climate change such as shifting rain pattern and increase in temperature in the past decades. According to the “State Level Climate Change Trends in India, Ministry of Earth Sciences, India, 2013”, the annual mean temperature in Rajasthan has a statistically-significant increasing trend in the last 50 years, especially that the increase of temperature in pre-monsoon season is relatively high compared with other season.

Rajasthan is also known as dry and high-temperature state among other states in India. Annual precipitation is around 700 mm in average even in the eastern district, and that of western district across Alavari Mountains is less than 350 mm. In the western part, in the pre-monsoon summer season, temperature in daytime increases more than 40 °C. Risk for severe and long drought is high in Rajasthan, especially in the western part of the state. Under such circumstances, farmers depend upon limited water resources for cultivation. Thus, irrigation and agriculture sector of the state of Rajasthan shall be vulnerable on the effect of climate change.

Several activities proposed under the Project is considered as “adaptation measures for climate change” to decrease the degree of vulnerability. Therefore, the Project could contribute to reduce vulnerability of farmers to climate change. Vulnerability to climate change, effect on agriculture and irrigation sector and project activities as “adaptation measures” are summarised in Table A8.10.1.

Table A8.10.1 Vulnerability and Adaptation Measures for Climate Change under the Project

Vulnerability	Effect on Agriculture and Irrigation Sector	Project Activities as “Adaptation Measures” for Climate Change
Shifting rainfall pattern	<ul style="list-style-type: none"> ● Increase of crop water requirement in irrigated area ● Damages on the agricultural crops due to lack of water ● Lack of irrigation water due to decrease of water resources 	<ul style="list-style-type: none"> ● Introduction of water saving crops and micro irrigation ● Proper cultivation management by agricultural extension activities ● Capacity development of WUA
Increase in air temperature	<ul style="list-style-type: none"> ● Increase of crop water requirement in irrigated area ● Change of suitable crop variety 	<ul style="list-style-type: none"> ● Introduction of water saving crops and micro irrigation ● Introduction of drought-resistant crop variety ● Proper cultivation management by agricultural extension activities
Intensity and duration of drought	<ul style="list-style-type: none"> ● Severe damages on rainfed agriculture ● Lack of irrigation water due to decrease of water resources 	<ul style="list-style-type: none"> ● Development and rehabilitation of irrigation facilities ● Introduction of water saving crops and micro irrigation ● Capacity development of WUA

Source: Prepared by the JICA survey team based on the JICA Climate Finance Impact Tool for Adaptation Ver 1.0

8.11 Possibility of Application of Japanese Technology

The JICA survey team studied the possibility of application of Japanese technology. The result is shown in Table A8.11.1

Table A8.11.1 Possibility of Application of Japanese Technology

<p>Non-disclosure information</p>
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Non-disclosure information

CHAPTER 9 ENVIRONMENTAL AND SOCIAL CONSIDERATION

9.1 Environment Related Laws, Regulations, and Policies

India has a strong policy, legal, and operative framework for protection of environment and conservation of ecological resources. The policies of the nation are in conformity to management of natural resources for sustainable development. In the recently concluded Conference of the Parties (COP) 21 of the United Nations Framework Convention on Climate Change (UNFCCC) in Paris, France, the country made an ambitious submission of its commitment to nature conservation and reduction of greenhouse gas (GHG) emission intensity. The Constitution of India provides the mandates for the protection of forest, wildlife, and environment. Article 48A dwells on protection and improvement of environment and protection of forest and wildlife. Article 51A emphasises the duty of every citizen to protect and improve the natural environment. Relevant provisions for environment protection has been incorporated in Part IV (Directive Principles) and Part IV A (Fundamental Duties).

All projects/activities are liable for scrutiny under the relevant laws and rules for safeguarding the environment and safeguarding the rights of Scheduled Tribe (ST), Scheduled Caste, Steering Committee (SC), women, and other vulnerable communities. Attachment 9.1 presents some of the relevant environment policies, laws, and rules of the national and state governments. The most important ones are the Environment (Protection) Act, 1986, EIA Notifications issued by the Ministry of Environment, Forest, and Climate Change (MOEF&CC), September 2006 and subsequent modifications in the Wildlife (Protection) Act, 1972, Forest (Conservation) Act, 1980, the Scheduled Tribes and Other Traditional Forest Dwellers Act, 2006, Air Pollution (Control of Pollution) Act, 1981, Water Pollution (Control of Pollution) Act, 1974, and the Land Acquisition Act, 1894 (amended in 2013).

9.2 Procedure for Environmental Clearance

India has a quite elaborate procedure for giving environmental clearances to different projects or activities, which can adversely impact the environment. For the first time, an Environment Impact Assessment Notification was brought out by the then Ministry of Environment and Forest on 27 January 1994 under the Environment (Protection) Act 1986, which was superseded by the EIA Notification 14 September 2006. The notification provides a schedule of eight types of projects and activities that will require environmental clearance. All projects and activities are broadly categorised into two groups based on the spatial extent of potential impacts on human health as well as on natural and man-made resources. The project or activity expected to have high potential impacts is classified as Category A. The project proponent has to obtain environmental clearance from the MOEF&CC of the Government of India (GOI) on the recommendations of the Expert Appraisal Committee (EAC) constituted by GOI. The project or activity expected to have lesser potential impacts than Category A projects will be classified as Category B. For Category B project or activity, the project proponent shall require getting environmental clearance from the State Level Environment Impact Assessment Authority on the recommendations of a State-level Expert Appraisal Committee (SEAC). Attachment 9.2 presents the procedures of environmental clearance in India.

Table A9.2.1 Categorisation of River Valley and Irrigation Projects Requiring Prior Environmental Clearance (as per the EIA Notification-14-09-2006)

Project or Activity		Category with Threshold Limit		Conditions, if any
		A	B	
1(c)	(i) River Valley Projects (ii) Irrigation Project	(i) ≥ 50 MW hydroelectric power generation; (ii) $\geq 10,000$ ha. of culturable command area	(i) < 50 MW ≥ 25 MW hydroelectric power generation; (ii) $< 10,000$ ha.- $> 2,000$ ha of culturable command area	General condition shall apply Note: Category B river valley projects falling in more than one state shall be appraised at the central government level.

Note on General Condition (GC) in the context of River Valley Projects: Any project or activity specified in Category 'B' will be treated as Category A, if located in whole or in part within 10 km from the boundary of: (i) Protected areas notified under the Wild Life (Protection) Act, 1972, (ii) Critically polluted areas as notified by the Central Pollution Control Board from time to time, (iii) Eco-sensitive areas declared under the Environment (Protection) Act, 1986, (iv) Inter-state boundaries and international boundaries.

Source: EIA Notification of 14 September 2006, EIA Notification of 25 June 2014, MOEF&CC, Government of India

Existing projects, if changed in project mix during expansion or modernisation (expand in space or create new facility other than the existing one), will also require prior environmental clearance. For mere repair and maintenance work, no environmental clearance is required. In case of the Rajasthan Water Sector Livelihood Improvement Project (RWSLIP), environmental clearance is not required as the Project will undertake repair and maintenance of existing irrigation projects.

9.3 Procedures for Forest Clearance

When there is forestland involved in any project or activity, clearance is required from the GOI under the Forest (Conservation) Act. This was enacted in 1980 to ensure conservation of forest and biodiversity. No forestland can be used for non-forestry purpose without the prior approval of the central government. Proposals are to be submitted to the MOEF&CC, GOI for any diversion of forestland for non-forestry purposes by the state government or the user agency. The proposal shall be agreed to in-principle by the central government with stipulated conditions relating to transfer, mutation, and declaration as reserve forest or protected forest under the Indian Forest Act, 1972, of equivalent non-forest land for compensatory afforestation and funds for raising compensatory afforestation. The state government has to prepare the compliance report with respect to the stipulated conditions and submit it to the MOEF&CC, and thereafter based on the compliance report formal approval under the said act shall be issued by GOI.

In case of RWSLIP, forest clearance is not required as existing sub-projects will be rehabilitated and no activities will be undertaken on the forestland.

9.4 Method, Procedure of Environmental and Social Consideration (ESC)

The Japan International Cooperation Agency (JICA), as the responsible agency for official development assistance (ODA) of Japan, has developed the Guidelines for Environmental and Social Consideration. The guidelines re-affirm JICA's policy to respect human rights and environment in its investments, projects, and programmes; and JICA gives utmost priority to ensure transparency, predictability, and accountability in supporting environmental and social consideration. The principles of JICA for environmental and social consideration (ESC) are presented below.

- ESC should cover a wide range of environment and social impacts.
- Environmental and social issues must be considered at an early stage in design and throughout the project cycle.
- JICA confirms its responsibility for accountability and transparency.
- JICA recognises the need for stakeholders' consultation and participation in ESC.
- JICA promotes information disclosure.
- Emphasis is given on the enhancement of organisational capacity to ensure appropriate ESC and monitoring of environmental and social issues.
- JICA emphasises prompt and timely action to address ESCs.

The JICA survey team carried out the reviews for environmental and social consideration as per the Guidelines for Environmental and Social Consideration of JICA, April 2010. The project has been categorised as F1. Table B 9.4.1 presents the policy of JICA as well as the methods adopted during the survey. The JICA survey team prepared the JICA Environment and Social Management System Checklist (Refer to Attachment 9.3) and Environment Checklist on Agriculture and Irrigation (Refer to Attachment 9.4).

9.5 Environmental and Social Condition

Rajasthan is one of the six fastest growing states of India and the pace of development has its own repercussions on the exploitation of natural resources/natural capital of the state. Rajasthan, the land of kings, has remained an important place for both domestic and international tourists and the thriving tourism industry contributes to about 15% of the state economy.

The state is faced with a number of environmental and social challenges. Most important of them is the rising water demand for irrigation, drinking and other domestic use, industries, mines, etc. The surface water is limited and groundwater is depleting in an alarming rate. Nearly 60% of the blocks of Rajasthan have reported an over exploitation of groundwater. Because of overexploitation of groundwater, geochemistry of water resources has been adversely affected. Rajasthan accounts for 51% of fluoride and 42% of salinity-affected areas of the country. As per the World Health Organisation (WHO) Guidelines on quality standards of drinking water, 56% of water resources of the state are unpotable (21,190 villages have salinity problem; 23,297 villages have fluoride problem, and 20,659 villages have nitrate problem). Pollution of water and air has also increased significantly especially in areas specific to mines and industries (Pali and Jodhpur districts and industrial areas of Balotra and Bhiwadi are declared as critically polluted areas in the state by the Central Pollution Control Board). Some other environmental challenges are: increasing soil salinity, forest degradation because of biotic pressure (85% of rural population still depend on the forest for cooking fuel), low water use efficiency, increasing urbanisation with inadequate facilities for sewage, and solid waste management.

While the state has enormous challenges in water resources conservation and management, it presents plethora of traditional systems and practices for water conservation and management. One can find several examples of traditional water harvesting and storage systems (*Kuins* – deep narrow wells, *Kunds* – ponds, *Tankas* – tanks, *Johads* – earthen check dams, *Baories* – community wells) perfectly operating in the state. There were *Khadeens* in the desert areas – oases created through the retention of water in the beds of seasonal rivers to enable crop farming. Rajasthan presents a good example of traditional water security management influenced by a combination of natural, social, and cultural factors.

Some of the social challenges faced by the state are low literacy levels amongst women, access to safe drinking water, quality health services in selected areas, caste and gender based discrimination, etc.

Overview of some of the natural capitals of the state is presented in Attachment 9.5.

9.6 Environmental and Social Management System (ESMS)

9.6.1 Purpose and Objectives

The JICA survey team made an attempt to understand the existing systems within the Water Resource Department (WRD) to look into environmental and social consideration aspects. Documents of other departments were also consulted to review the existing efforts in addressing environmental and social issues. Discussions were held with officers of the Environment Department, Forest Department, and State Pollution Control Board, to understand various issues and challenges in environmental management and monitoring.

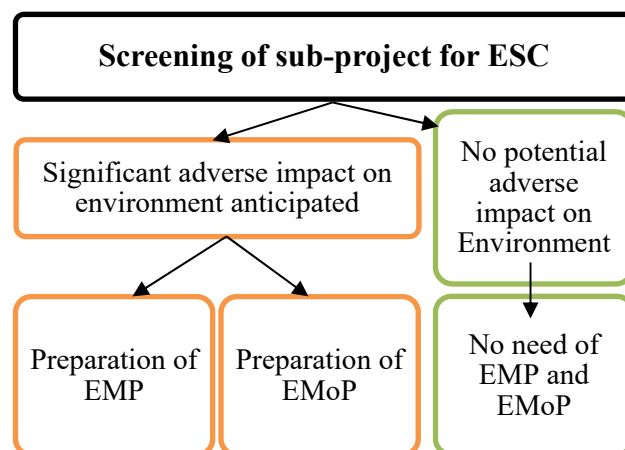
While the Rajasthan Water Sector Restructuring Project was implemented by WRD, Environment Management Guidelines were developed in 2009. These guidelines were finalised in February 2013. The department came up with a Field Operation Manual for Environment Management of Water Resources Project in February 2013. Both these documents were prepared under the guidance of the World Bank. Both the documents provided detailed guidelines for environmental screening of water sector projects, processes for environmental clearance, carrying out environment impact assessments, and preparation of an environment management plan to address environmental concerns during the pre-project, during the project, and post-project periods.

Efforts were made for setting up special units for environment management within the State Water Resources Planning Department, Irrigation Department, and a water cell in the Environment Department to coordinate environment management actions for the water resources projects. The Environment Management Guidelines, 2013 also specified the roles of different departments such as Agriculture, Forest, Environment, Groundwater, Public Health Engineering, and State Pollution Control Board to assist WRD in monitoring different environmental parameters and provide information to WRD on a regular basis. It was decided that based on the information provided, WRD will prepare an annual report with special focus on environmental aspects. WRD faced a lot of difficulties getting information from other departments despite repeated requests and it could make only one annual report for 2012-13. There is one superintendent engineer in the State Water Resource Planning Department of WRD assigned to look into the environmental matter but nothing much is happening now for environmental management. Environmental audits have never been done by WRD for different projects including the Rajasthan Minor Irrigation Improvement Project (RAJAMIIP).

As per JICA's mandate, all projects assisted by JICA will have to address the environmental and social concerns during planning and implementation of the projects. WRD shall set up an Environmental and Social Management System as part of its Project Monitoring System to have comprehensive assessment of environmental and social issues and adequate response mechanisms to address these issues. The already prepared Environment Management Guidelines and Field Operational Manual will form the basis for further interventions. The JICA survey team has prepared an environmental management plan (EMP) and environmental monitoring plan (EMoP), which will help WRD to address the environmental and social concerns during the implementation of the Project.

The basic objective of ESMS is to ensure that the environmental and social considerations are adequately addressed during the planning and implementation of sub-projects and other project interventions. Some of the key functions of WRD for ESC are as follows:

- Preparation of overall strategies for ESC and improvements in the strategy during the course of project implementation.



Source: JICA Survey Team

Figure A9.6.1 Screening of sub-projects

- Mobilisation of adequate human and financial resources for preparation and implementation of EMP, EMoP, and Tribal Development Plan (TDP).
- Building capacity of project staff, non-governmental organisations (NGOs), and water utility organisations (WUOs) to work on ESC.
- Screening of sub-projects and project activities for ESC.
- Preparation of EMP and EMoP of sub-projects, wherever necessary.
- Preparation of TDP for sub-projects, wherever necessary.
- Periodical monitoring of ESC aspects and implementation of corrective measures, if needed.
- Preparation of necessary reports and documents, and their wider circulation.
- Facilitation of environmental audit with the help of specialised agencies.

9.6.2 Potential Environmental Concerns and Mitigation Measures

Some of the potential environmental impacts of the project interventions are listed below.

Table A9.6.1 Anticipated Environmental Impact

Sl.	Project Components	Environmental Concerns	Mitigation Measures
1.	Irrigation		
1.1	Rehabilitation of Existing Irrigation System (both construction/ rehabilitation and post-rehabilitation phases)	<ul style="list-style-type: none"> • Possibilities of air/dust, noise, and water pollution because of the rehabilitation of dams, canals, and minors. • Problems arising due to waste disposal and reclamation of borrow areas. • Extraction of groundwater for construction of activities. • Disturbances to the wildlife especially in the areas close to wildlife sanctuaries and national park. • After the rehabilitation of the irrigation systems, there will be the increase in irrigation area and increase in cropping intensity which may enhance the consumption of chemical fertilisers and pesticides leading to soil degradation, environment pollution, increase in diseases, etc. 	<ul style="list-style-type: none"> • Effectiveness of the mitigation measures undertaken – use of pollution reduction devices in machines and equipment, certification of vehicles with compliances to the Air Act, covering of transportation vehicles, water spraying, proper stockpiling of materials and wastes, etc. • Proper maintenance of the machines and equipment. • Use of sound barriers, when needed. • Allowing the operations of machines only during the day hours. • Workers operating near the machines to wear noise protective equipment – earmuffs and earplugs. • Adoption of standard norms for blasting • Proper management of borrow areas and restoration/reclamation of borrow areas after completion of construction works • Proper disposal of construction wastes/debris • Work in areas near to wildlife sanctuaries to be undertaken as per the advice of the local forest officials. • Promotion of Integrated Nutrition Management (INM), Integrated Pest Management (IPM), and other environment friendly farming practices. • Regular site inspections and corrective measures, in case of any problem. • Monitoring of extraction of groundwater. • Promotion of conjunctive use of groundwater and surface water for irrigation, wherever feasible. • Undertake tree planting along the canals and green belt development, wherever possible. • Training and capacity building of WUAs for proper maintenance of irrigation systems (dams, canals, minors). • Timely testing of soil and water quality and interventions as needed. • Sensitising the local people to prevent waste disposal to the dams and canals.

1.2	Promotion of Micro Irrigation	<ul style="list-style-type: none"> No negative impact on the environment. Rather, this will reduce a) the consumption of water and fertiliser, b) loss of soil nutrients, c) occurrence of diseases in crops, and d) increase the productivity. Inappropriate use of fertilisers and poor adherence to fertigation schedule may create adverse environmental impact. 	<ul style="list-style-type: none"> Adequate training and capacity building programmes for WUA including farm demonstration activities. Promotion of INM, IPM, and other environment friendly farming practices. Periodical assessment of environmental aspects and proper feedback to the farmers.
2	WUA Strengthening		
2.1	Training, Mentoring, and Follow-up	<ul style="list-style-type: none"> This will strengthen the institutional and technical capacity of WUAs. No negative impact on environment is anticipated; rather, WUAs, after capacity building, will adopt environment friendly farming practices and monitor environment pollution. 	<ul style="list-style-type: none"> No mitigation measures are required.
3	Agriculture		
3.1	Training and Provision of Materials	<ul style="list-style-type: none"> No significant environmental impact is anticipated 	<ul style="list-style-type: none"> Agriculture extension activities will include promotion of INM, IPM, and other environment friendly farming practices.
3.2	Demonstration Farm and Exposure Tour	<ul style="list-style-type: none"> No significant environmental impact is anticipated 	<ul style="list-style-type: none"> Agriculture extension activities will include promotion of INM, IPM and other environment friendly farming practices.
4	Food Processing and Marketing		
4.1	Formulation and Empowerment of Farmer Producer Organisations (FPOs)	<ul style="list-style-type: none"> No significant environmental impact is anticipated 	<ul style="list-style-type: none"> Promotion of environment friendly technologies for food processing.
4.2	Linkage between Farmers and Buyers	<ul style="list-style-type: none"> No significant environmental impact is anticipated. 	<ul style="list-style-type: none"> No mitigation measures are required.
5	Gender Mainstreaming		
5.1	Women's Participation in Water Management and Agriculture	<ul style="list-style-type: none"> No significant environmental impact is anticipated. 	<ul style="list-style-type: none"> No mitigation measures are required.

Source: JICA survey team

9.6.3 Potential Social Concerns and Mitigation Measures

Table A9.6.2 presents the potential social impacts because of project interventions.

Table A9.6.2 Anticipated Social Impact

Sl.	Project Components	Social Concerns	Mitigation Measures
1.	Irrigation		
1.1	Rehabilitation of Existing Irrigation System (both construction/ rehabilitation and post-rehabilitation phases)	<ul style="list-style-type: none"> ▪ Poor management of labour camps may lead to pollution, diseases, etc. ▪ Safe work environment - safety of workers and less incidence of accident. ▪ Less employment opportunity for local labourers as the contractors may bring labour from outside. ▪ Possibility of water use conflicts in the post-rehabilitation phase. 	<ul style="list-style-type: none"> ▪ Registration of labourers. ▪ Training of labourers on safety standards. ▪ Ensure that the contractor provides necessary safety gears to the workers. ▪ Contractual obligation for the contractor to engage local labour and providing necessary facilities to them. ▪ Regular monitoring of work sites and labour camps. ▪ Building capacity of WUOs to manage the irrigation systems, water distribution, and conflict management.
1.2	Promotion of Micro Irrigation	<ul style="list-style-type: none"> ▪ Chances of exclusion of marginal farmers especially farmers belonging to ST and SC communities from availing this benefit from the Project 	<ul style="list-style-type: none"> ▪ Sensitisation of marginal farmers and SC and ST farmers on the provisions of the project. ▪ Efforts for promotion of micro irrigation packages for marginal farmers and linkage with other schemes and opportunities.
2	WUA Strengthening		
2.1	Training, Mentoring, and Follow-up	<ul style="list-style-type: none"> ▪ Inadequate participation of ST and SC farmers in WUA activities. 	<ul style="list-style-type: none"> ▪ Advocacy with WRD for necessary changes in PIM Act and Rules for creating adequate space for ST, SC, and women in WUA. ▪ Consistent efforts to build the capacity of ST, SC, and women to participate in different activities of WUA/ Project.
3	Agriculture		
3.1	Training and Provision of Materials	<ul style="list-style-type: none"> ▪ Chances of exclusion of marginal farmers especially farmers belonging to ST and SC communities from availing these benefits from the Project. 	<ul style="list-style-type: none"> ▪ Sensitisation of marginal farmers and SC and ST farmers on the provisions of the Project. ▪ Efforts for creating space for these farmers in agriculture extension activities.
3.2	Demonstration Farm and Exposure Tour	<ul style="list-style-type: none"> ▪ Inadequate participation of marginal farmers, ST and SC farmers in these activities 	<ul style="list-style-type: none"> ▪ Efforts for creating space for these farmers in agriculture extension activities.
4	Food Processing and Marketing		
4.1	Formulation and Empowerment of FPOs	<ul style="list-style-type: none"> ▪ Poor participation of marginal farmers/small producers especially from ST and SC in farmers interest groups (FIGs) and farm producer organisation (FPOs). 	<ul style="list-style-type: none"> ▪ Awareness building amongst the marginal farmers and small producers on the benefits of FIG/FPO and creating adequate space for them in the Project to participate in these activities.
4.2	Linkage between Farmers and Buyers		
5	Gender Mainstreaming		
5.1	Women's Participation in Water Management and Agriculture	<ul style="list-style-type: none"> ▪ Inadequate legal space for women to participate in different WUA related activities. 	<ul style="list-style-type: none"> ▪ Advocacy with WRD for necessary changes in the Participatory Irrigation Management (PIM) Act and Rules.

Source: JICA survey team

9.6.4 Preparation of Environmental Management Plan (EMP)

After the screening of sub-project, it will be determined whether EMP is necessary or not. If EMP is necessary, then a detailed assessment has to be carried out engaging technical experts (environmental and social experts). The environment expert and social expert of the project management unit (PMU) as well as the concerned experts of the Engineering and Management (E&M) Consultants will provide necessary support in environmental assessment and preparation of EMP. The process of EMP preparation will include: a) creation of an environmental baseline through surveys, interviews, review of secondary data, etc.; b) review of project activities to be undertaken; c) anticipated environmental impact during rehabilitation of dams and/or canals, and post-rehabilitation phases; d) possible mitigation measures; and e) cost required for mitigation measures. The anticipated environmental impacts and mitigation measures shall be discussed with the water users and local residents before finalisation. An overall EMP for the Project is provided in Attachment 9.6. EMP for a sample sub-project (West Banas Irrigation Project) is provided in Attachment 9.7. EMP shall provide the following information:

- Potential impact to be managed by the Project;
- Sources of potential impact;
- Standard of impact/standard for reference/permissible limits;
- Objectives of EMP;
- Management efforts/mitigation measures;
- Location of the management efforts/mitigation measures;
- Period/time frame of mitigation measures;
- Institution/persons responsible for implementation of mitigation measures; and
- Cost for mitigation measures.

9.6.5 Preparation of Environmental Monitoring Plan (EMoP)

Since the Project includes existing irrigation sub-projects for rehabilitation, the monitoring of environmental aspects would be limited to selected number of sub-projects. All the prioritised sub-projects are screened for environmental monitoring based on the following criteria and four sub-projects were identified:

1. Location of sub-projects near the environmental sensitive areas such as national parks, sanctuaries, and forest areas;
2. Location of sub-projects in the fifth schedule areas (homeland of tribal communities);
3. Volume of work and cost involved in the rehabilitation of dams; and
4. Volume of work and cost involved in the rehabilitation of canals.

Table A9.6.3 Sub-projects Selected for Regular Environmental Monitoring

Sl. No.	Name of Sub-Project	Zone	District /Division	Category of Scheme	CCA in ha	Remark
1	Gambhiri Irrigation Project	Udaipur	Chittorgarh	Medium	7,575.00	On the basis of volume of work and cost on the renovation of the dam
2	Rehabilitation of Mansarovar Irrigation Project	Jaipur	Alwar	Minor	843.00	Location of sub-project near environmental sensitive areas (within 10 km)
3	Rehabilitation of West Banas Irrigation Project	Jodhpur	Sirohi	Medium	7,952.00	Location of sub-project near environmental sensitive area (within 10 km) as well as Schedule V area
4	Rehabilitation of Phulad Minor Irrigation Project	Jodhpur	Pali	Minor	787.79	Location of sub-project near environmental sensitive areas (within 10 km)

Source: JICA survey team

An overall EMoP for the Project is presented in Attachment 9.8 along with the monitoring forms (Attachment 9.9) to be used for environmental monitoring.

9.6.6 Indigenous People's Plan/Tribal Development Plan

The GOI and the Constitution of India do not provide any legal definition of the indigenous people. In Indian context, scheduled tribes are commonly referred to as *Adivasi* – meaning the original inhabitants of the land or the indigenous people. Communities based on their primitive traits, geographical isolation, economic backwardness, shyness of contact with community-at-large, and cultural distinctiveness are categorised and notified as scheduled tribes by the President of India under Article 342 of the Constitution of India. The Constitution of India provides social, economic, and political guarantees to the STs.

The State of Rajasthan has 12 different scheduled tribe communities and one of them i.e., Seharia/Sahariya is notified as particularly vulnerable tribal group. The total tribal population of the state is 9.238 million which is 13.5% of the total population of the state. It has also areas notified as scheduled areas under Schedule V of the Constitution, where the tribal communities have special rights and privileges, and the governor of the state has special powers to govern these areas.

The JICA survey team reviewed the detailed project reports (DPRs) of sub-projects submitted by WRD and also visited some of the sub-projects located in the scheduled areas as well as tribal dominated areas. From the existing DPRs as well as consultation with WRD, it was confirmed that the Project will not have any negative impact on the tribal communities because of the nature of project activities i.e., repair and maintenance of existing irrigation systems. There will not be any land acquisition and involuntary resettlement. DPRs of other sub-projects are yet to be prepared and reviewed by the JICA survey team. The JICA survey team suggests that WRD would undertake screening of sub-projects, for which DPRs are to be prepared using the screening form provided in Attachment 9.10. If any sub-project will have potential adverse impact on the local tribal communities, then the Tribal Development Plan has to be prepared and implemented. The Tribal Development Plan will be prepared based on the JICA's Guidelines for Environmental and Social Consideration with reference to the World Bank's Operational Manual – OP 4.10 for the Indigenous Peoples (the World Bank Safeguards Policy). A note on the preparation of the Tribal Development Plan is provided in Attachment 9.11.

9.6.7 ESMS Structure

Both the PMU and sub-PMUs will be responsible for planning and implementation of environmental and social consideration activities. NGOs will play supporting role in the implementation of ESC activities. The following table clarifies the responsibilities and functions of PMU, sub-PMUs, and NGOs:

Table A9.6.4 Project Implementation Structure for ESC

Sl.	Project Implementation Structure/Agency	Responsibility	Detailed Functions/Activities
1	PMU, Jaipur (Key officers to look into ESC matters – Project Director, Environment Expert, and Social Expert) (These officers will get technical assistance from E&M Consultants)	Policy and strategy formulation and mainstreaming ESC in project planning and execution. Oversee implementation of EMP, EMoP, and TDP, wherever necessary. Deploy adequate staff and financial resources for ESC.	<ul style="list-style-type: none"> ▪ Prepare the overall strategy for addressing the environmental and social consideration aspects in project planning and execution. ▪ Establishment of ESMS as part of the Project Monitoring System. ▪ Prepare and circulate guidelines on screening of sub-projects for ESC, preparation of EMP, EMoP, and TDP. ▪ Facilitate organisation of training and capacity building programmes for project staff, NGOs, and WUOs on ESC. ▪ Facilitate the smooth fund flow for ESC activities. ▪ Monitor the preparation and implementation of EMP, EMoP, and TDP. ▪ Direct monitoring of the environmental and social consideration aspects during rehabilitation of sub-projects as well as during post-rehabilitation phase. ▪ Ensure the periodical progress reporting on environmental and social aspects. ▪ Facilitate organisation of periodical environmental assessment (in-house) and third party environmental assessments/audits with the help of specialised agencies.
2	Sub-PMU, Zones (Executive engineer, implementation and construction unit will be responsible for monitoring of ESC aspects during construction/rehabilitation phase). (Executive engineer, monitoring and coordination unit will be responsible for monitoring of ESC aspects during post construction/rehabilitation phase).	Preparation and implementation of EMP, EMoP, and TDP Regular monitoring to ensure ESC activities are properly executed	<ul style="list-style-type: none"> ▪ Training of project staff, NGO, and WUOs on ESC aspects. ▪ Screening of sub-projects for ESC. ▪ Preparation of EMP, EMoP, and TDP, wherever necessary, with the help of NGO and other technical staff. ▪ Implementation of EMP, EMoP, and TDP. ▪ Monitoring of ESC as per EMoP. ▪ Preparation of necessary reports.
3	NGO	Community mobilisation, strengthening of WUOs, farmers organisation for implementation of ESC activities	<ul style="list-style-type: none"> ▪ Assist sub-PMU in the preparation and implementation of EMP, EMoP, and TDP. ▪ Assist sub-PMU, environment expert, and social expert in the monitoring of ESC aspects and preparation of necessary reports on ESC.

Source: JICA survey team

9.6.8 Time Plan for ESC Activities

The project period is eight years and most of the preparatory activities will be carried out during the first year. Major efforts for capacity building, preparation of EMP, and EMoP will be made during the first two years. Table A9.6.5 presents the time plan for key ESC activities.

Table A9.6.5 Time Plan for ESC Activities

Sl.	Activities	Yr1	Yr2	Yr3	Yr4	Yr5	Yr6	Yr7	Yr8
1	Finalisation of guidelines, formats, and directives on ESC aspects								
2	Training of project staff on ESC, screening of sub-projects, preparation of EMP, EMoP, and TDP at the sub-PMU level								
3	Training of trainers from NGOs								
4	Orientation/sensitisation of WUOs on ESC								
5	Screening of sub-projects and preparation of EMP, EMoP, TDP, wherever necessary								
6	Monitoring of environmental and social concerns and reporting								
7	Tree planting/green belt development								
8	Annual environmental assessment of prioritised sub-projects (10 nos.)								
9	Environmental auditing by specialised agencies								

Source: JICA survey team

9.6.9 Capacity Development of WRD and Other Stakeholders for Implementation of ESC

The WRD has developed the Environment Management Guidelines in 2009 while the World Bank-assisted the Water Sector Restructuring Project, which was implemented in the state and thereafter, the guidelines were revised in 2013. A field operation manual was prepared to guide the field functionaries to carry out environment and social impact assessments accordingly, in response to the situation. The environment management guidelines could not be fully executed owing to several issues and challenges including inadequacy of the staff in the field. It was envisaged too that the field staff need adequate orientation on the environment and social consideration. Some areas of orientation and capacity building of project staff, NGOs, and WUOs are identified and presented below.

- JICA Guidelines on Environmental and Social Consideration.
- The World Bank Operational Policy 4.10 on Indigenous Communities and Social Assessment.
- Recent developments in legal and operative frameworks concerning Environmental and Social Safeguards.
- Environment Management Guidelines, SWRPD 2013
- Field Operational Manual for Environment Management of Water Resources Project, SWRPD 2013.
- Methods of Screening of Sub-projects for ESC and Preparation of EMP, EMoP, and TDP.
- Methods for Social Assessment including Free, Prior and Informed Consultation with Tribal Communities.
- Gender issues and mainstreaming gender and development concerns in the project planning and implementation stages.
- Monitoring of environmental and social consideration and carrying out environmental assessments.

9.7 Evaluation of Sample Detailed Project Reports

WRD provided DPRs of 73 sub-projects for review by the JICA survey team. Out of which, 32 sub-projects are having cultivable command areas (CCAs) less than 1,000 ha; 13 sub-projects have CCA between 1,000 ha to 5,000 ha; and 28 sub-projects have CCA more than 5,000 ha but less than 10,000

ha. From the cost estimate point of view, 34 sub-projects will be spending less than INR 50 million each. For five sub-projects, the cost estimate is more than INR 500 million each.

9.7.1 Environmental Consideration

While reviewing some DPRs it was found that the sub-projects would not have significant negative impact on the environment as the activities focus only on repair and maintenance work. But the information available in many other DPRs are inadequate to draw conclusions whether there would be any negative impact on the environment or not.

Most of the DPRs do not provide information on the location of sub-projects within 10 km of protected areas or within the eco sensitive zones and whether rehabilitation work would have any adverse impact on the wildlife and/or their habitat. The current status of the catchment area and efforts for catchment area treatments have not been mentioned in some of these DPRs. Inadequate efforts have been suggested for green belt development and promotion of tree planting by the water users. The DPRs do not also provide site-specific information on the current exploitation of groundwater. The current use of chemical fertilisers and pesticides, the impact on the environment, and contamination of water and soil are not adequately studied and analysed. The Project plans to have interventions for agriculture and the DPRs do not provide information on what would be its impact on the environment and what mitigation measures could be taken up.

In some of the sub-projects, investment would be more than INR 100 million and in some cases, it would be more than INR 500 million; however, the impact of rehabilitation works on the local environment (air, water, soil, trees, human habitations, wildlife, domestic animals, etc.) has not been explained adequately. The kind of measures that would be taken to avoid adverse impacts and how the executing agency will monitor the environment management aspects have not been adequately dealt with in the DPRs.

9.7.2 Social Consideration

Some of the DPRs reviewed do not provide adequate information on the socioeconomic aspects of the target area, villages, and target households. No information is available on the landholding pattern of the water users, water use conflicts, access of SC, ST, and other vulnerable communities to irrigation water and other project benefits.

No information is available in the DPRs on the impact of the Project on ST, SC, women, and other vulnerable communities and how these communities can be involved in different project activities.

9.8 Recommendation of Inclusion of Environmental and Social Consideration in the Model DPR

It was understood from the project report and confirmed from WRD that there will not be any clearance of forest, land acquisition, and involuntary resettlement. The primary activity of the Project is to renovate/rehabilitate the existing minor and medium irrigation infrastructure; hence, no environment clearance is required under EPA, 1986. Since there are not much negative environmental impacts predicted, the DPRs prepared by WRD have limited information on the ESC aspects. Analysis of social environment has to be given adequate attention in preparation or revision of DPRs. The JICA survey team has prepared guidelines for a model DPR, which will guide WRD in preparing the report.

Prior to DPR preparation on each sub-project, evaluation and categorisation should be made to the screening form provided in Attachment 9.10 based on the JICA Guidelines on Environmental and Social Consideration. In particular, some selected DPRs should be scrutinised and confirmed whether DPRs are duly prepared based on the JICA Guidelines on ESC or not. When some DPRs are selected for sample checking, the following criteria should be applied:

- i) Location of sub-projects near the environmental sensitive areas such as national parks, sanctuaries, and forest areas;
- ii) Location of sub-projects in fifth schedule areas (homeland of tribal communities);
- iii) Large volume of work and cost involved in the rehabilitation of dams; and
- iv) Large volume of work and cost involved in the rehabilitation of canals.

CHAPTER 10 CONCLUSION

10.1 General

The development objective of the Project is to improve the livelihood of beneficiaries in the project target area through the following:

- i) Rehabilitation and modernisation of the existing medium and small irrigation schemes,
- ii) Establishment of sustainable operation and management system of irrigation facilities by implementing the participatory irrigation management on water utility associations (WUAs),
- iii) Increase the productivities and improvement of quality of agriculture produce,
- iv) Improvement and diversification of food value chain in agriculture produce market by strengthening farmers' groups and promotion of high value-added produce, and
- v) Gender mainstreaming of women in agriculture sector.

As explained in the following sections, it is concluded that the Project has pressing necessity and sound rationality for implementation in terms of the following aspects:

- i) Relevance,
- ii) Effectiveness,
- iii) Efficiency,
- iv) Impact, and
- v) Sustainability.

10.2 Necessity and Rationality of the Project

10.2.1 Relevance

Project implementation is relevant based on the following points:

(1) Consistency with the Twelfth Five-Year Plan of India

The National Twelfth Five-Year Plan emphasises that the growth must not only be rapid but also more inclusive and environmentally sustainable. The inclusiveness is a multidimensional concept, i.e., (i) to reduce poverty; (ii) to improve regional equality across and within states; (iii) to improve the conditions of the scheduled castes, scheduled tribes, and other backward classes and minorities; (iv) to close the gender gap; and (v) to generate attractive employment opportunities for the youth. Meanwhile, the plan must also focus on other priorities such as resource use efficiency and technology to ensure sustainability of natural resources, adaptation to climate change, and improvements in total factor productivity. The Project promotes (i) poverty reduction and (ii) regional equity by means of rehabilitation of irrigation system and other agricultural support as holistic approach in the Project. In addition, with activities for gender mainstreaming, (iii) improvement of condition of minority could be realised. The project target is aligned with the national policy.

(2) Consistency with the State Policy and Plans of Rajasthan

Irrigation: The State Water Policy of the Rajasthan State recognises the objectives of *development of all utilisable water resources to the maximum possible extent, including surface water - local and imported, groundwater, and waste water for optimal economic development and social well-being*. To maximise effective usage of available water, the Project envisages improving conveyance efficiency by facility rehabilitation and introduction of micro irrigation in physical improvement as well as by participatory irrigation management in institutional aspect.

The policy also takes an approach for assuring an integrated and multi-disciplinary approach to planning, evaluation, approval, and implementation of irrigation and drainage projects, including river basin management of surface water and groundwater. In this context, the Project plans to approach livelihood improvement by performing (i) facility rehabilitation, (ii) participatory irrigation management, (iii) agriculture technique capacity building, (iv) food value chain improvement, and (v) gender mainstreaming.

Gender Mainstreaming: In Rajasthan, the Department of Women and Child Development (WCD) was established in 1985 to ensure the overall development of women and children in the state. Then, in 2007, followed by the speech of the honorable chief minister of the department, the Directorate of Women Empowerment (WE) was spun off from the Directorate of Integrated Child Development Services (ICDS) to improve the status of women in the mainstreaming of development equality and to facilitate integration of women to the society. The Project consists of several gender mainstreaming activities such as formulation of WUA women wing in water management and revision of the Participation Irrigation Management (PIM) Act, which follow current tendency of gender consideration in rural development.

(3) Necessity

Rehabilitation of the Existing Facilities: Presently in the Rajasthan State, the irrigation system performance is poor on account of physical disabilities of the systems affecting it. Also, a large number of unauthorised outlets as well as over-sized outlets are adversely affecting equitable distribution of water. The cumulative effect of these deficiencies, together with lack of proper water management, has resulted in poor system performance, inequitable and unreliable water delivery service, and ultimately low agricultural productivity.

The rehabilitation component proposed under the Project envisages addressing the identified system deficiencies in the selected irrigation schemes through execution of civil works which would rehabilitate and modernise the head works and canal systems of these schemes, duly restoring the head works to acceptable design standards, and channels to their designed capacity. This shall involve active participation of WUA's as well.

Agriculture and Marketing Sectors: Reinforcement of marketing activities is one of the current focal challenges which needs more support from the government. Since there are huge investment in market facilities such as food parks, software supports are not so much in quality and quantity for agro market reinforcement.

Gender Mainstreaming: In the agriculture sector, it is said that while women play significant roles in all agricultural activities, they are nevertheless, treated as auxiliary workers in rural society. Thus, the Project focuses on "women in agriculture sector" and empowers them in their existing activities in terms of decision-making or participation on meeting for several important discussions.

(4) Consistency with JICA's Assistant Policy to India

According to the country analysis paper of the Japan International Cooperation Agency (JICA) for India, poverty alleviation and food security are the main issues of the agriculture sector in India, which are to be overcome by means of the following:

- i) Countermeasures for water shortage,
- ii) Development of rural infrastructure, and
- iii) Investment on research and development of agriculture technology.

The Project tackles item i) and item ii) by rehabilitation of irrigation facilities and introduction of micro irrigation system. Thus, the Project is justifiable to apply for a Japanese official development assistance (ODA).

In addition, JICA has emphasised on acceleration of gender mainstreaming and obtained several experiences in gender mainstreaming project. In this context, the Government of Japan can contribute effectively to achieve the project objectives.

10.2.2 Effectiveness

The Project can be implemented effectively through the following method and approaches:

Holistic Approach to the Project Objective: Since the rehabilitation work of irrigation system would increase available volume of water at the farmland level, it does not always connect effectively to improve the livelihood of farmers, particularly, increase in their income. Farmer needs, therefore, should make use of appropriate techniques and other support in which they can increase farm income by using increased irrigation water as described in Figure A 10.2.1.

In addition, the Project includes (a) WUA strengthening and (b) gender mainstreaming as the project components. To secure sustainability of the irrigation facility, the Project emphasises that WUA

strengthening is an essential component of the Project. Participatory irrigation management is expected to accelerate equal distribution which alleviates complaints of downstream farmers and leads to increased collection rate of water fee.

Gender mainstreaming could accelerate utilisation of human resources of women which usually not being able to contribute in decision making and in other aspects in the agriculture sector. Figure A10.2.1 describes the relation between the project objective and each project component.

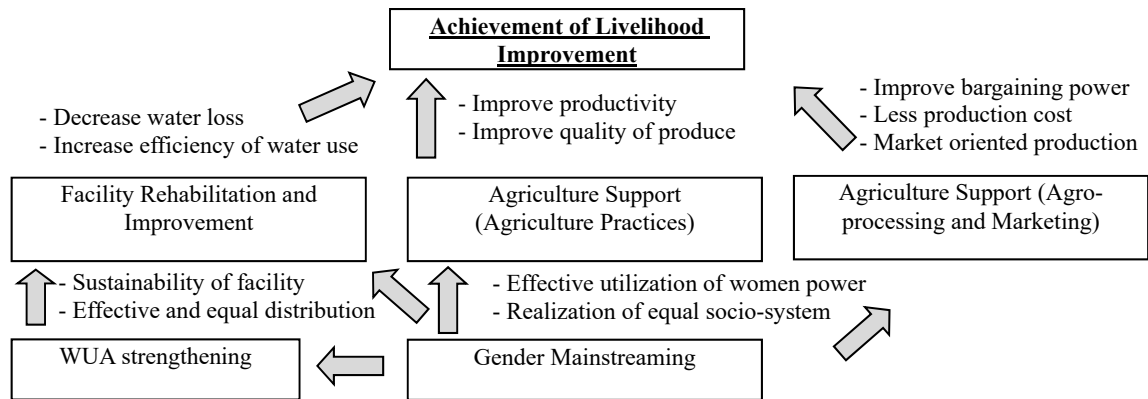


Figure A10.2.1 Model for Achievement of the Project Target

Source: JICA Survey Team

10.2.3 Efficiency

Due to the following reasons, the efficiency of the project implementation could be assured

(1) Lessons Learnt from the Previous Project

The Project was planned and designed based on the experiences and lessons learnt from the previous project, the Rajasthan Minor Irrigation Improvement Project (RAJAMIIP), to implement project activities effectively. It is believed that the Project could avoid having difficulties and constraints which RAJAMIIP had on the course of implementation.

(2) Project Monitoring System on a Sub-PMU basis

The Project sets-up the five sub-PMUs as the main responsible parties in the Project while PMU shall act as the monitoring body for progress and quality of the project activities. It expects to realise the following effects in the project operation effectively:

- The sub-PMU offices are located at site which facilitates easy regular monitoring of project activities and detailed assistance and mentoring with easy access to the project sites. It contributes high efficiency of project management quality and quantity.
- Each sub-PMU controls a regional non-governmental organisation (NGO) directly at each zone level. This management system contributes in developing close monitoring and instruction system between sub-PMUs and regional NGOs.

(3) Introduction of ToT Method

The Project introduces the training of trainers (ToT) method as a cascade system of knowledge transfer in training to beneficial farmers in terms of WUA strengthening, agricultural technique, market supporting, and gender mainstreaming. Due to such methodology, it is expected that the provision of the training to farmers could be effectively conducted with minimum input of man-power.

(4) Stage-wise Project Implementation

The construction works in the Project shall be split into three stages so as to have quick commencement of construction work for stage-1 just after 1/3 of all the detailed design works are completed. Then the other 2/3 of the detailed design works for stages-2 and 3 can be executed in parallel with the construction works of stage-1. Due to such arrangement, the total project period of the rehabilitation work could be shortened which depressed the total project cost due to price escalation cost.

10.2.4 Impact

(1) Methodology Developed by Project

The Project will not only rehabilitate irrigation facilities but also develop innovative challenges and invent methodology for agriculture development and other sectors in the following aspects:

- Micro irrigation with water saving concepts (see Section 5.2 in details),
- Market linkage system with large-size and with small-size consumers through matching meeting (see Section 5.5 in details),
- Brand building for high-value agro produce (see Section 5.5 in details),
- Nutritious vegetable cultivation through empowerment of self-help group (SHG) activities (see Section 5.6 in details),
- Gender mainstreaming with PIM Act modification (see Section 5.6 in details), and
- Establishment of WUA women wing (see Section 5.6 in details).

These methodologies, results, and lessons learnt can surely be utilised and diffused in future development project on the agriculture sector and gender mainstreaming sectors in the state.

(2) Environmental and Social Impacts

Since the Project rehabilitates the existing irrigation facilities without any increasing irrigation areas, there are little negative impacts on environment and social aspects.

10.2.5 Sustainability

(1) Participatory Irrigation Management

Introduction of participatory irrigation management could establish more reliable and sustainable operation and management system in each irrigation scheme through WUA strengthening activities in the Project. These WUAs can autonomously plan and implement water management by themselves.

(2) NGO as Partner of Development Assistance

The Project plans to employ local NGOs as assistant partners for project implementation. They are expected to support beneficiaries continuously even after the Project terminates its activities.

Furthermore, since the NGO will be given several ToT by the experts in the Project in terms of (a) WUA strengthening activities, (b) agricultural technical activities, (c) agro-marketing activities, and (d) gender mainstreaming activities, those NGOs could become good partners in similar development projects in the future through these trainings and experiences in project implementation. Those NGOs may duplicate the same activities in other areas and diffuse the project impacts and effects.

(3) Gender Mainstreaming Activities

Sustainability of the gender mainstreaming, in particular, the WUA women wing, can be secured due to the following:

- i) Enactment of revision of the PIM Act for facilitating participation of women members to WUA activities,
- ii) Financial reinforcement for the women wing with the women friendly trees which can generate regular income of the women wing, and
- iii) Active involvement of the *Anganwadi* officers in the project activities who can continuously play significant roles in nutrition improvement even after the Project.

10.3 Recommendations

The following recommendations shall be considered on the condition that the proposed RWSLIP will be implemented with financial and technical support of JICA:

(1) WRD's Actions to be Taken before Loan Agreement

- Presently, 73 DPRs for medium and minor sub-projects have been prepared and submitted to the Central Water Commission (CWC) for their check and approval. These DPRs are to be modified based on the model DPR prior to the start of the survey, investigation, and design (SID) work.
- An ordinance of the PIM Act should be prepared and enacted for modification with gender mainstreaming concept.

(2) WRD's Actions to be Taken Right after Loan Agreement

For quick implementation of RWSLIP, WRD and GoR shall initiate the following actions immediately after the loan agreement be made effective:

- Setting-up of PMU and sub-PMU including recruitment of new officers,
- Selection of the consultant, and
- Selection of the SID contractor.

Table B

Table B 2.5.1 Number of Officials of Department of Agriculture

No.	District	Dy Dir.	Asstt. Dir.	Agri. Off.	Agri. Res.O.	Statistics Officer	Asstt.Agri. Off.	Agri. Super.	Agri. Inves.	Acct.	J.acct	U.D.C.	L.D.C.	Driver	Ass.emp.	Total
1.	Jaipur	1	3	10	1	0	62	344	3	1	0	7	8	1	7	448
2.	Dausa	1	1	4	1	1	29	157	1	1	1	3	5	1	5	211
3.	Ajmer	1	4	9	1	1	40	216	3	1	2	5	8	1	8	300
4.	Sikar	1	2	6	1	0	40	220	2	1	2	4	6	1	6	292
5.	Jhunjhunu	1	3	6	1	0	36	191	1	1	2	3	7	1	5	258
6.	Bharatpur	1	2	8	1	0	45	243	2	1	2	5	6	1	5	322
7.	Dholpur	1	2	4	1	0	19	109	2	1	1	2	5	1	5	153
8.	S.madhampur	1	2	8	1	1	26	151	2	1	2	4	7	2	6	214
9.	Kaurali	1	2	5	1	0	26	149	2	1	1	2	4	1	4	199
10.	Alwar	1	5	13	1	1	68	376	4	1	4	6	10	1	8	499
11.	Kota	1	1	5	1	0	13	61	1	1	1	3	4	2	6	100
12.	Bundi	1	1	3	0	1	12	65	1	1	1	2	4	1	4	97
13.	Baran	1	3	7	1	0	24	131	2	1	1	4	5	1	6	187
14.	Jhalawar	1	3	6	1	0	31	172	2	1	1	3	6	1	6	234
15.	Tonk	1	3	7	1	1	34	193	3	1	2	4	6	2	8	266
16.	Bhilwara	1	3	9	1	1	56	306	3	1	3	5	9	2	7	407
17.	Rajsamand	1	4	7	1	0	27	156	3	1	3	5	8	3	7	226
18.	Chittorgarh	1	3	8	1	0	39	216	3	1	2	5	7	1	8	295
19.	Pratapgarh	1	1	4	0	1	20	105	1	1	2	2	3	0	4	145
20.	Udaipur	1	3	10	1	0	59	331	3	1	3	6	6	4	9	437
21.	Dungarpur	1	3	5	1	0	34	198	2	1	2	3	7	1	5	263
22.	Banswara	1	3	6	1	1	37	202	1	1	2	3	7	2	6	273
23.	S.Ganganagar	1	3	12	1	0	48	271	4	1	5	5	9	2	8	370
24.	Hanuman Garh	1	5	8	1	0	35	201	3	1	3	4	6	2	5	275
25.	Churu	1	1	3	0	0	20	116	1	1	1	2	3	1	3	153
26.	Bikaner	1	2	5	1	0	32	181	2	1	1	3	5	1	6	241
27.	Jodhpur	1	1	4	1	0	46	251	1	1	1	3	4	2	5	321
28.	Nagaur	1	3	6	1	1	58	320	2	1	1	3	4	1	5	407
29.	Jalor	1	3	6	0	0	36	198	2	1	2	4	5	1	5	264
30.	Pali	1	3	9	1	0	38	215	3	1	2	5	6	2	6	292
31.	Sirohi	1	1	4	1	0	19	97	1	1	1	2	4	1	5	138
32.	Barmer	1	2	3	0	0	31	182	1	1	1	2	4	1	4	233
33.	Jaisalmer	1	1	3	1	0	12	76	1	1	1	2	4	1	4	108
	Total	33	82	213	28	10	1152	6,400	68	33	59	121	192	46	191	8,628

Table B 2.5.2 Number of Officials of Department of Horticulture

No.	Post	Allotted Post
1.	Director, Horticulture	1
2.	Additional Director, Horticulture	1
3.	Joint Director, Horticulture	11
4.	Chief Accounting Officer	1
5.	Dy. Dir. Horticulture	21
6.	Dy. Dir. Horticulture (Statistics)	1
7.	Assistant Dir. Horticulture	42
8.	Assistant Dir. Horticulture (statistics)	1
9.	Agriculture Officer	79
10.	Subject Matter Specialist	1
11.	Agriculture Research Officer (Entomology/Horticulture/Plant pathology/Agronomy	15
12.	Assistant Agri. Research Officer	4
13.	Accounts Officer	1
14.	A.A.O. Grade-I	1
15.	Assistant Agriculture Officer	130
16.	Assistant Statistics Officer	5
17.	Senior Personnel Assistant	1
18.	Personnel Assistant	4
19.	Office Superintendent	1
20.	Assistant Office Superintendent	13
21.	Senior Clerk	2
22.	Clerk Grade-I	22
23.	Clerk Grade-II	37
24.	Assistant Acc. Officer Grade-II	33
25.	Junior Accountant	14
26.	Agriculture Supervisor	349
27.	Driver	14
28.	Peon	51
29.	Gardener	20
30.	Lab Assistant	1
	Total	877

Table B 4.1.1 List of Sample Detailed Project Reports (DPRs)

Non-disclosure information

Non-disclosure information

Non-disclosure information

Non-disclosure information

Non-disclosure information

Table B 4.3.2 Overall Results of Preliminary Screening of Candidate Irrigation Sub-projects for RWSLIP (Zone Basis)

Non-disclosure information

Table B 4.3.3 Overall Results of Preliminary Screening of Candidate Irrigation Sub-projects for RWSLIP (Sub-PMU Basis)

Non-disclosure information

Table B5.4.1. Distribution of Krishi Vigyan Kendras (KVK) in the Project area

No.	District	Name of KVK	Host Organization	Sub-project sites	Citrus	Exotic vege
1	Ajmer	KVK, Ajmer	SAU: Rajasthan Agricultural University, Bikaner	○		○
2	Alwar-	KVK, Navgaon, Alwar	SAU: Rajasthan Agricultural University, Bikaner	○		○
3	Alwar	KVK, Vill. -Gunta	ICAR: Directorate of Rapeseed-Mustard Research, Sear, Bharatpur	○		○
4	Bharatpur	KVK, Kumher	SAU: Rajasthan Agricultural University, Bikaner	○		
5	Dousa	KVK, Khedla Khurd, Lalsot Road,	SAU: Rajasthan Agricultural University, Bikaner			
6	Dhoulpur	KVK, RIICO Industrial Area,	SAU: Rajasthan Agricultural University, Bikaner			
7	Jaipur	KVK, Vill. Kotputli,	SAU: Swami Keshwanand Rajasthan Agricultural University, Bikaner			(○)
8	Jaipur	KVK, V.P. Tankadra, Chomu,	NGO: Pragati Trust, Chomu, Jaipur			(○)
9	Jhunjhunu	KVK, Abusar, P.Box No.4,	SAU: Rajasthan Agricultural University, Bikaner			
10	Karauli	KVK, Karauli	SAU: Rajasthan Agricultural University, Bikaner-	○		
11	Sawai Madhopur	KVK, Sawai Madhopur	SAU: Rajasthan Agricultural University, Bikaner	○		○
12	Sikar	KVK, Fatehpur Shekhawati	SAU: Rajasthan Agricultural University, Bikaner	○		
13	Tonk	KVK, Tonk	OEI: Banasthali Vidyapith, Banasthali, Tonk	○		(○)
14	Baran	KVK, Baran	SAU: Maharana Pratap University of Agriculture and Technology, Udaipur	○		
15	Bundi	KVK, Bundi	SAU: Maharana Pratap University of Agriculture and Technology, Udaipur	○		
16	Jhalawar-	KVK, Jhalawar-	SAU: Maharana Pratap University of Agriculture and Technology, Udaipur	○	○	
17	Kota-	KVK, Kota	SAU: Maharana Pratap	○	○	

No.	District	Name of KVK	Host Organization	Sub-project sites	Citrus	Exotic vege
			University of Agriculture and Technology, Udaipur			
18	Banswara	KVK, Borwat Farm	SAU: Maharana Pratap University of Agriculture and Technology, Udaipur	○		
19	Bhilwara	KVK, Bhilwara	SAU: Maharana Pratap University of Agriculture and Technology, Udaipur	○		
20	Chittorgarh	KVK, Chittorgarh	SAU: Maharana Pratap University of Agriculture and Technology, Udaipur	○		○
21	Dunganpur	KVK, Badal Mahal, Shastri Colony,	Maharana Pratap University of Agriculture and Technology, Udaipur			
22	Pratapgarh	KVK, Village Basad,	SAU: Maharana Pratap University of Agriculture & Technology, Udaipur			
23	Rajasamand	KVK, Dhoinda,	SAU: Maharana Pratap University of Agriculture and Technology, Udaipur			
24	Udaipur	KVK, Badgaon	NGO: Vidya Bhawan Society, Badgaon, Udaipur	○		○
25	Jarole	KVK, Keshwana,	SAU: Rajasthan Agricultural University, Bikaner			
26	Jodhpur	KVK, Village - Phaldi,	SAU: Swami Keshwanand Rajasthan Agricultural University, Bikaner			(○)
27	Jodhpur	KVK, CAZRI (ICAR) Campus	ICAR: CAZRI (ICAR), Jodhpur			(○)
28	Pali	KVK, CAZRI (ICAR),	ICAR: CAZRI (ICAR), Jodhpur	○		○
29	Sirohi-	KVK, Sirohi	SAU: Maharana Pratap University of Agriculture and Technology, Udaipur	○		
30	Srigangangnagar	KVK, Srigangangnagar	SAU: Rajasthan Agricultural University, Bikaner	○	○	
31	Hanumangarh	KVK, Sangaria	NGO: Gramothan Vidya Peeth Sangaria, Hanumangarh	○	○	
32	Hanumangarh	KVK, Village-Chak-27-NTR, LRS, Nohar	SAU: Rajasthan University of Veterinary & Animal Sciences, Bikaner	○	○	

Table B 5.4.2 Difference among Demo-farm, Demo-plot and On-farm Trial

	Agriculture Demonstration Farm	KVK Demonstration plots	On-farm trial
Objectives	Demonstration for <ul style="list-style-type: none"> Techniques and materials for production 	Experiment and extension for <ul style="list-style-type: none"> Use of mulch Water saving Quality improvement 	Trial for <ul style="list-style-type: none"> Use of mulch Water saving Quality improvement
Establishment	To be newly established	To be established in KVK	To be established in farmer's field
Number of farms/plots	<ul style="list-style-type: none"> Exotic vegetables (0.2ha x 7) <i>Kinnow</i> mandarin (1ha x 2) Santra orange (1ha x 2) 	<ul style="list-style-type: none"> Vegetables (0.2ha x 21) Fruits (0.2ha x 21) 	<ul style="list-style-type: none"> Exotic vegetables <i>Kinnow</i> mandarin Santra orange
Equipment to install	<ul style="list-style-type: none"> Drip irrigation Mulching sheets (for the places without using the equipment)	<ul style="list-style-type: none"> Mulch 	<ul style="list-style-type: none"> Mulch
Operation	The Project will <ul style="list-style-type: none"> Use part of farmers' land Provide the above equipment to farm owners Hire labor specifically working for the Project 	The Project will <ul style="list-style-type: none"> Use part of KVK's land Provide the above equipment to concerned KVK 	The Project will <ul style="list-style-type: none"> Use part of farmers' land Provide the above equipment to farm owners
Target crops	<u>Exotic vegetables</u> <ul style="list-style-type: none"> Cherry tomato Broccoli Leaf lettuce For other vegetables possibly recommended, refer to Table A 5.4.6 and Table A 5.4.7	<u>Some of vegetables</u> below <ul style="list-style-type: none"> Cherry tomato Broccoli Leaf lettuce Capsicum (bell pepper) Carrot Onion Cucumber Sweet corn Muskmelon Watermelon <u>Fruit crop</u> suitable to the area	<ul style="list-style-type: none"> <u>Exotic vegetables</u> <u><i>Kinnow</i> mandarin</u> <u>Santra orange</u>
Target trainees	<ul style="list-style-type: none"> Farmers who will newly start exotic vegetables cultivation Farmers who already cultivate exotic vegetables Farmers who already cultivate <i>kinnow</i> Farmers who already cultivate Santra orange 	KVKs where the Project covered districts <ul style="list-style-type: none"> Where production training will be conducted (Exotic vegetables, <i>kinnow</i>, santra orange) 	Farmers who received <ul style="list-style-type: none"> Production training (Exotic vegetables, <i>kinnow</i>, santra orange)

Source: JICA Survey Team

Table B5.4.3 Training on Agriculture (1/2)

			Training of trainers										
Target			PMU, sub-PMU, lead NGO, dy director of DoA and DoH, research officers/agronomy from 27 districts	DoA, DoH officers, agriculture supervisors, DoH field level officers, NGO staffs in 27 districts	DoA, DoH, NGO, Community Motivators	DoA, DoH, NGO				DoH, NGO, Community motivator	NGO, Anganwadi worker, Community motivator	DoH, DoH, NGO	
Facilitator			PMU	PMU and lead NGO									
Trainer or resource person			SIAM	SIAM	KVK	KVK	KVK	Punjab Agri-Universit	Punjab Agri-University	KVK	KVK	KVK	PMU
Venue			SIAM	SIAM	KVK	KVK	KVK	KVK	KVK	KVK	KVK	PMU	
Contents			State level workshop	District level workshop	Agricultural technical training	on Near AFP sites		Agricultural technical training			on SHG		Exposure visit
			Crops		on Planning, Monitoring, Evaluation, specific tpics on agriculture	on Planning, Monitoring, Evaluation, specific tpics on	General agri-technique	Specific cereals, pulses and oilseeds	Specific spices and medicinal plants	Specific Kinnow	Specific Exotic vege	Marke tabilit y	
Water-wise crop	Cereals	Other area	○	○	○	×	×	×	×	×	×	×	×
		Near AFP	○	○	○	○	×	×	×	×	×	×	×
	Pulses, Oil seeds&othe	Other area	○	○	○	×	×	×	×	×	×	×	×
		Near AFP	○	○	○	○	×	×	×	×	×	×	×
	Spices	Other area	○	○	○	×	×	×	×	×	×	×	×
		Near AFP & AEZ	○	○	○	×	○	×	×	×	×	×	×
Medicinal plants	Other area	○	○	○	×	×	×	×	×	×	×	×	
	Near public	○	○	○	×	○	×	×	×	×	×	×	
Kinnows /Oranges			○	○	○	×	×	○	×	○	×	×	○
Exotic vegetables			○	○	○	×	×	×	○	○	×	×	○
Basic vegetables (SHG)			○	○	○	×	×	×	×	×	○	×	×
Nutritious vegetables (SHG)			○	○	○	×	×	×	×	×	×	○	×

○: Implement

×: Not implement

IMTI: Irrigation Management & Training Institute

PIM: Participatory Irrigation Management

Table B5.4.3 Training on Agriculture (2/2)

Target			Farmers' training							Demo-farm training						
			Farmers							SHG		Demo farm farmers				
Facilitator					NGO	NGO	NGO	NGO	NGO	NGO, CM	NGO, WCD	PMU, NGO, DoH, DoA	NGO, DoH	NGO/DoH		
Trainer or resource person			NGO, community motivator	DoA, DoH, NGO	DoA, DoH, NGO	DoA, DoH, NGO	DoA, DoH, NGO	DoA, DoH, NGO	DoA, DoH, NGO	NGO, community motivator	NGO, WCD	PMU, NGO, DoH, DoA	NGO, DoH	NGO/DoH		
Venue			Project site	Project site	Project site	KVK	KVK	Project site	Advanced area	Project site	Project site	Project site	Project site	Project site		
Contents			on Near AFP sites		Agricultural technical training					Marketing Survey	Agricultural technique	Agricultural, nutritional techniques	Technical support	Technical support	Monitoring	
			General agri-technique	Specific cereals, pulses, oilseeds	Specific spices, medicinal plants	Specific Kinnow	Specific Exotic vege	Marketability	Basic vegetables		Nutritious vegetables	Establishment	Mentoring	Monitoring		
Water-wise crop	Cereals	Other area	○	×	×	×	×	×	×	×	×	×	×	×	×	
		Near AFP	×	○	×	×	×	×	×	○	×	×	×	×	×	×
	Pulses, Oil seeds&othe	Other area	○	×	×	×	×	×	×	×	×	×	×	×	×	×
		Near AFP	×	○	×	×	×	×	×	○	×	×	×	×	×	×
	Spices	Other area	○	×	×	×	×	×	×	×	×	×	×	×	×	×
		Near AFP	×	×	○	×	×	×	×	○	×	×	×	×	×	×
Medicinal plants	Other area	○	×	×	×	×	×	×	×	×	×	×	×	×	×	
	Near AFP	×	×	○	×	×	×	×	○	×	×	×	×	×	×	
Kinnows /Oranges			×	×	×	○	×	○	○	×	×	○	○	○	○	
Exotic vegetables			×	×	×	×	○	○	○	×	×	○	○	○	○	
Basic vegetables (SHG)			×	×	×	×	×	×	×	○	×	×	×	×	×	
Nutritious vegetables (SHG)			×	×	×	×	×	×	×	×	○	×	×	×	×	

○: Implement

×: Not implement

IMTI: Irrigation Management & Training Institute

PIM: Participatory Irrigation Management

Table B5.5.1: Overall View of Agriculture Demonstration Farm and Market-oriented Experimental Plots

	Agriculture Demonstration Farm	Market-oriented experimental plots
Sector	Agriculture sector	Agro-processing and Marketing sector
Objectives	Demonstration for <ul style="list-style-type: none"> Techniques for production 	Experiment and extension for <ul style="list-style-type: none"> TSS/nutrients improvement Quality control Advanced sales
Establishment	To be newly established	To be established in part of existing farm land
Number of farms/plots	<ul style="list-style-type: none"> Exotic vegetables (0.4ha x 7) <i>Kinnow</i> mandarin (1ha x 2) Santra orange (1ha x 2) 	<ul style="list-style-type: none"> Vegetables (0.4ha x 3) <i>Kinnow</i> mandarin (1ha x 3) Santra orange (1ha x 3)
Equipment to install	<ul style="list-style-type: none"> Drip irrigation Mulching sheets (for the places without using the equipment)	
Operation	The Project will <ul style="list-style-type: none"> Use part of farmers' land Provide the above equipment to farm owners Hire labor specifically working for the Project Purchase produces from owners for the Project's sales activities (or return of sales to owners) 	
Target crops	Exotic vegetables <ul style="list-style-type: none"> Cherry tomato Broccoli Leaf lettuce 	Vegetables to increase TSS <ul style="list-style-type: none"> Cherry tomato Broccoli Leaf lettuce Bell pepper Carrot Onion Cucumber Sweet corn Muskmelon Watermelon
Target buyers	Exotic vegetables <ul style="list-style-type: none"> Traders of public markets Hotels and restaurants <i>Kinnow</i> /Santra orange <ul style="list-style-type: none"> Exporters, processors, etc. 	Individual consumers <ul style="list-style-type: none"> Through direct sales Through vegetable delivery services Through sales at high-grade groceries Through sales at antenna shops, etc.
Target trainees	<ul style="list-style-type: none"> Farmers who will newly start exotic vegetables cultivation Farmers who already cultivate exotic vegetables Farmers who already cultivate <i>kinnow</i> Farmers who already cultivate Santra orange 	Farmers who received <ul style="list-style-type: none"> Production training at Agriculture sector (Exotic vegetables, <i>kinnow</i>, santra orange), and Sales training at Agro-processing and Marketing sector (Exotic vegetables)

Source: JICA survey team

Table B8.2.1 Calculation of Standard Conversion Factor (SCF)

Non-disclosure information

Non-disclosure information

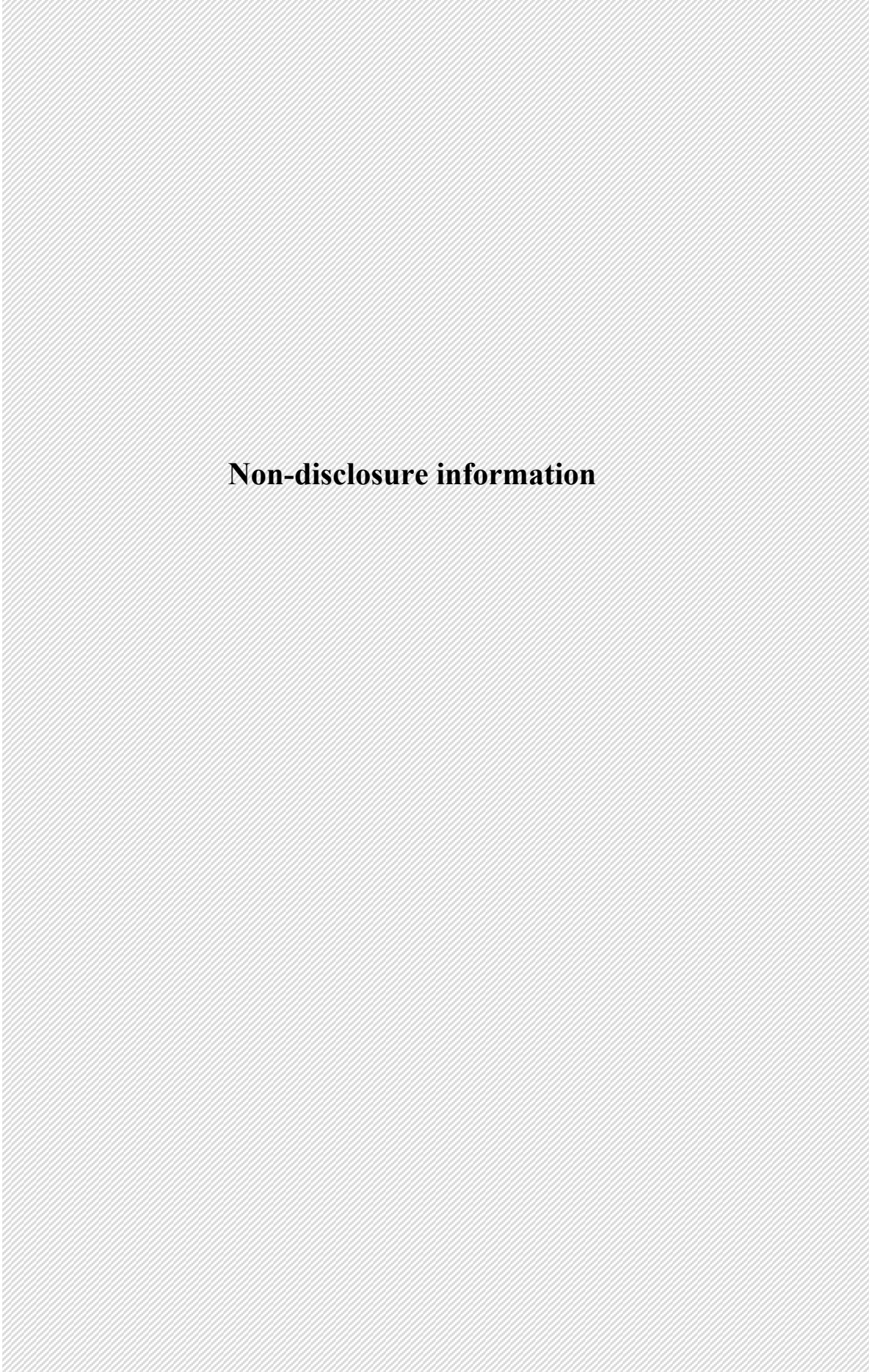
Table B8.5.1 Original Data for Estimation of Crop Budget

Non-disclosure information

Table B8.5.2 Economic Price of Internationally Traded Goods

Non-disclosure information

Table B8.5.3 Economic Price of Non-Tradable Goods



Non-disclosure information

Non-disclosure information

Non-disclosure information

Table B8.5.5 Project Economic Benefit

Non-disclosure information

Table B8.6.1 Cash Flow of the Project Cost and Benefit

Non-disclosure information

Non-disclosure information

Table B 9.4.1 JICA Policy on ESC and Methods of Survey

Sl.	Policy	Methods of the Survey
JICA ESC Guidelines April 2010		
1	JICA examines the related financial intermediary or executing agency to see whether appropriate environmental and social Consideration as stated in the guidelines are ensured for projects in this category. JICA also examines institutional capacity in order to confirm environmental and social Consideration of the financial intermediary or executing agency, and, if necessary, requires that adequate measures be taken to strengthen capacity.	<p>The Survey Team had discussions with WRD on the JICA ESC Guideline 2010 and procedures to be followed for this project, which is categorized as FI by JICA from the preliminary assessment. The WRD confirmed that the environmental and social consideration shall be looked in to at every stage of project planning and implementation. The project monitoring system will include systems and procedures for implementation of environmental and social consideration.</p> <p>The Survey Team reviewed policies, laws, rules, operative guidelines and reports of the National and State Government concerning environmental and social consideration.</p> <p>The Survey Team reviewed the Environment Management Guidelines and Manual of WRD and confirmed with the Department of its commitment to implement these guidelines.</p> <p>The Survey Team discussed with WRD and prepared the JICA Environment and Social Management System Checklist and Environment Checklist on Agriculture and Irrigation.</p>
2	The financial intermediary or executing agency examines the potential positive and negative environmental impacts of sub-projects and takes the necessary measures to avoid, minimize, mitigate, or compensate for potential negative impacts, as well as measures to promote positive impacts if any such measures are available.	<p>The Survey Team had meetings with Water Resources Department, State Water Resources Planning Department, Irrigation Department, and Environment Department etc. on existing systems and procedures concerning Environment and Social Consideration, issues and challenges in addressing environmental and social Consideration.</p> <p>The Survey Team undertook a screening of sample DPRs of sub-projects to assess possible impacts on the Environment and Social aspects and identifying mitigation measures and discussed with the WRD on the screening of sub-projects as per the JICA Guidelines on Environmental and Social Consideration.</p>
3	In principle, JICA undertakes environmental reviews and information disclosure for the sub-projects prior to their implementation in a same manner as specified for Category A projects, if those sub-projects are likely to be under the cooperation projects.	<p>The WRD confirmed that the sub-projects will be screened as per JICA Guidelines and it will share screening and selected sub-projects with JICA from time to time during the process of project implementation.</p> <p>The WRD confirmed that no sub-projects of Category A will be adopted for implementation under the Project.</p>
4	JICA discloses the results of environmental reviews on its website after concluding agreement documents.	The WRD will share necessary information with JICA for environmental review as well as for public disclosure.
Indigenous People's Plan/Tribal Development Plan		
1	Any adverse impacts that a project may have on Scheduled Tribes are to be avoided when feasible by exploring all viable alternatives. When, after such an examination, avoidance is proved unfeasible, effective measures must be taken to minimize impacts and to compensate indigenous peoples for their losses.	<p>The Survey Team reviewed various documents to understand the status of Scheduled Tribes (ST) and Women in the State. Discussions were held with WRD and Civil Society Organizations working with ST & Women to understand various issues and challenges in development of ST and Women.</p> <p>The WRD confirmed that there won't be any adverse impact on tribal communities as no land will be acquired for the Project and no involuntary resettlement case will be there. The Project will only</p>

Sl.	Policy	Methods of the Survey
		<p>include existing sub-projects for rehabilitation. No sub-project, after rehabilitation, will enhance its approved Culturable Command Area.</p> <p>The Preparatory Survey Team screened DPRs of 73 sub-projects and found that there will be no land acquisition and no involuntary resettlement. These sub-projects will not have any adverse impact on tribal people. The tribal communities having land in the command area will get benefit of irrigation, agriculture extension services under the Project.</p> <p>WRD confirmed that for other sub-projects, whose DPRs have not been prepared/ submitted to the Survey Team, WRD will undertake screening to find out whether any adverse impact will be there on the tribal communities or not. WRD confirmed that if any sub-project would have adverse impact on tribal communities then it would not be included in the Project or a Tribal Development Plan would be prepared to mitigate the adverse impact. But WRD is of the opinion is that no adverse impact would be there on the tribal people in the sub-projects area as the proposed Project would carry out repair and maintenance of existing dams, canals and minors.</p> <p>WRD confirmed that efforts shall be made to proactively engage Tribal communities in the activities of the Project such as micro irrigation, agriculture extension, WUA strengthening etc.</p>
2	<p>When projects may have adverse impacts on Scheduled Tribes, all of their rights in relation to land and resources must be respected in accordance with the spirit of relevant international declarations and treaties, including the UN Declaration on the Rights of Indigenous Communities. Efforts must be made to obtain the consent of Scheduled Tribes in a process of free, prior, and informed consultation.</p>	<p>WRD confirmed that while preparation of sub-projects adequate efforts shall be made for screening of project impact on the Tribal Communities. In case of significant adverse impact, the sub-project will not be included in the Project. In case of less significant impacts on the Tribal Communities, Social Assessment shall be carried out and free, prior and informed consultations shall be organised with the Tribal Communities. Help of NGOs will be sought for organizing social assessments and consultations.</p>
3	<p>Measures for the affected Scheduled Tribes must be prepared as a Development Plan for Scheduled Tribes and must be made public in compliance with the relevant laws and ordinances of the host country. In preparing the Development Plan for Scheduled Tribes, consultations must be made with the affected Scheduled Tribes based on sufficient information made available to them in advance. When consultations are held, it is desirable that explanations be given in a form, manner, and language that are understandable to the people concerned. It is desirable that the Development Plan for Scheduled Tribes include the elements laid out in the World Bank Safeguard Policy, OP4.10, Annex B.</p>	<p>The Survey Team has prepared a guideline for preparation of Tribal Development Plan wherever tribal communities would be affected by the sub-projects</p>

Source: JICA ESC Guidelines April 2010. JICA Survey Team

Figure B

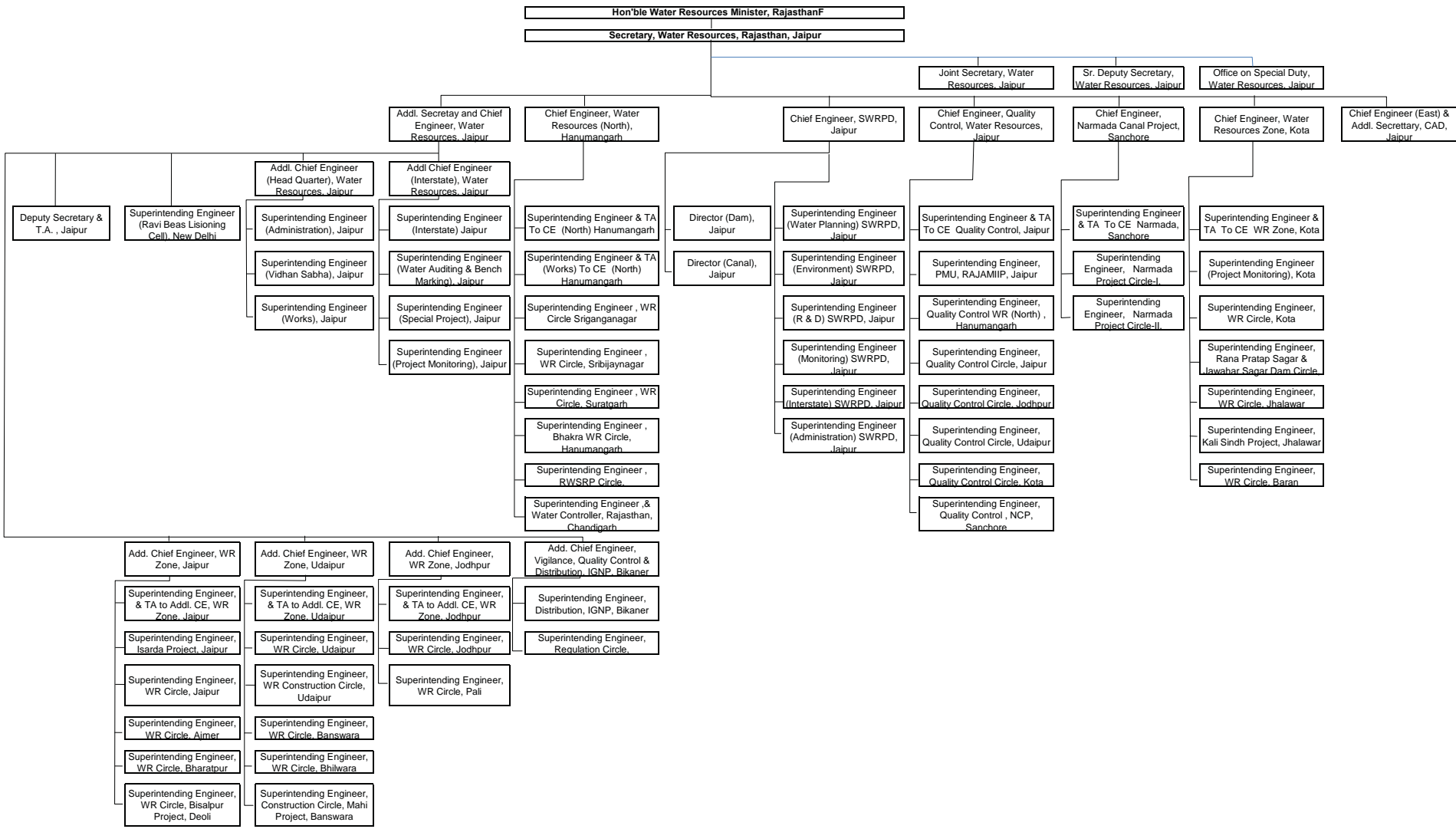


Figure B2.3.1 Organisation Chart of Rajasthan Water Resources Department

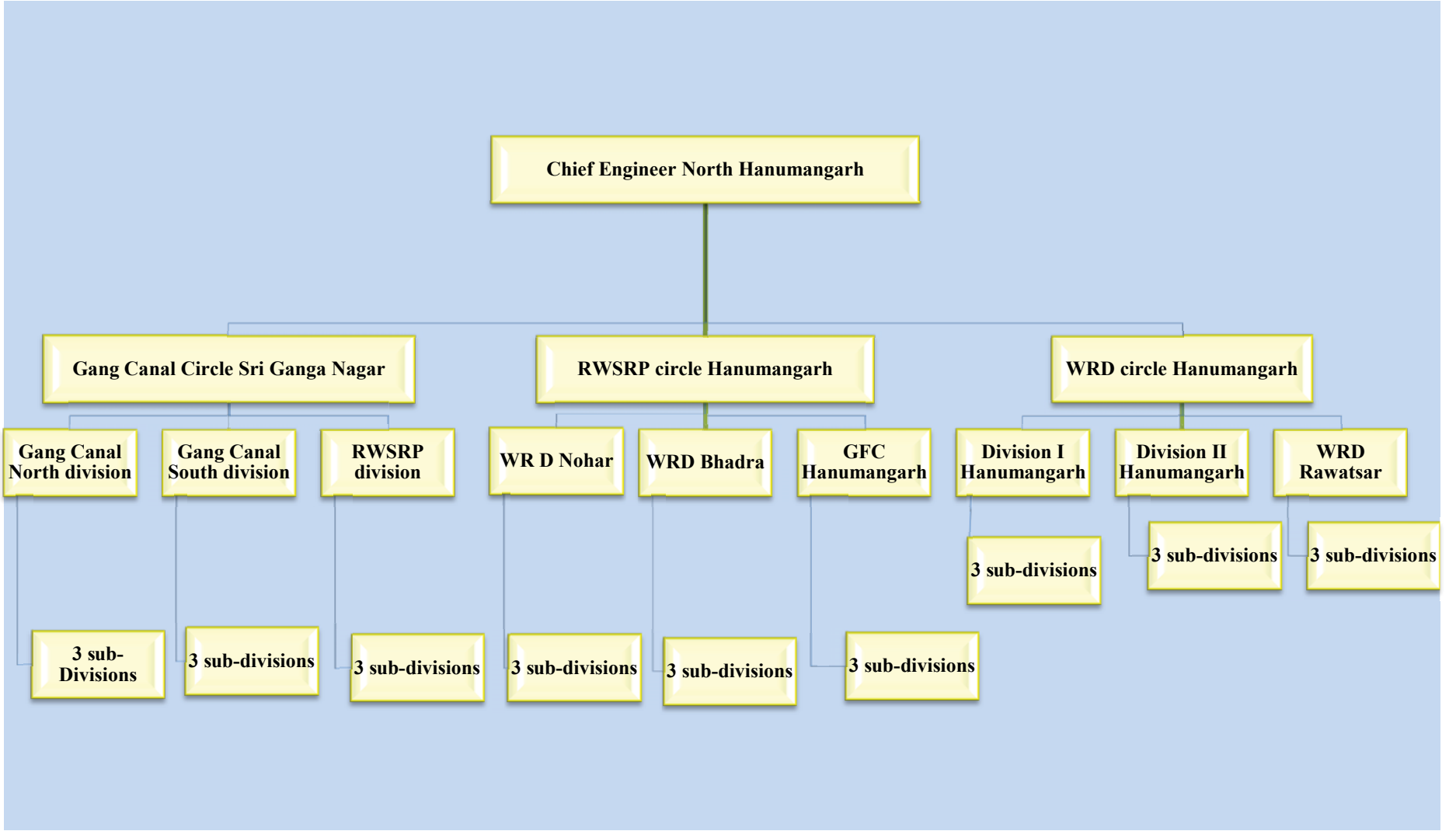


Figure B2.3.2 Organisation Chart of North Zone

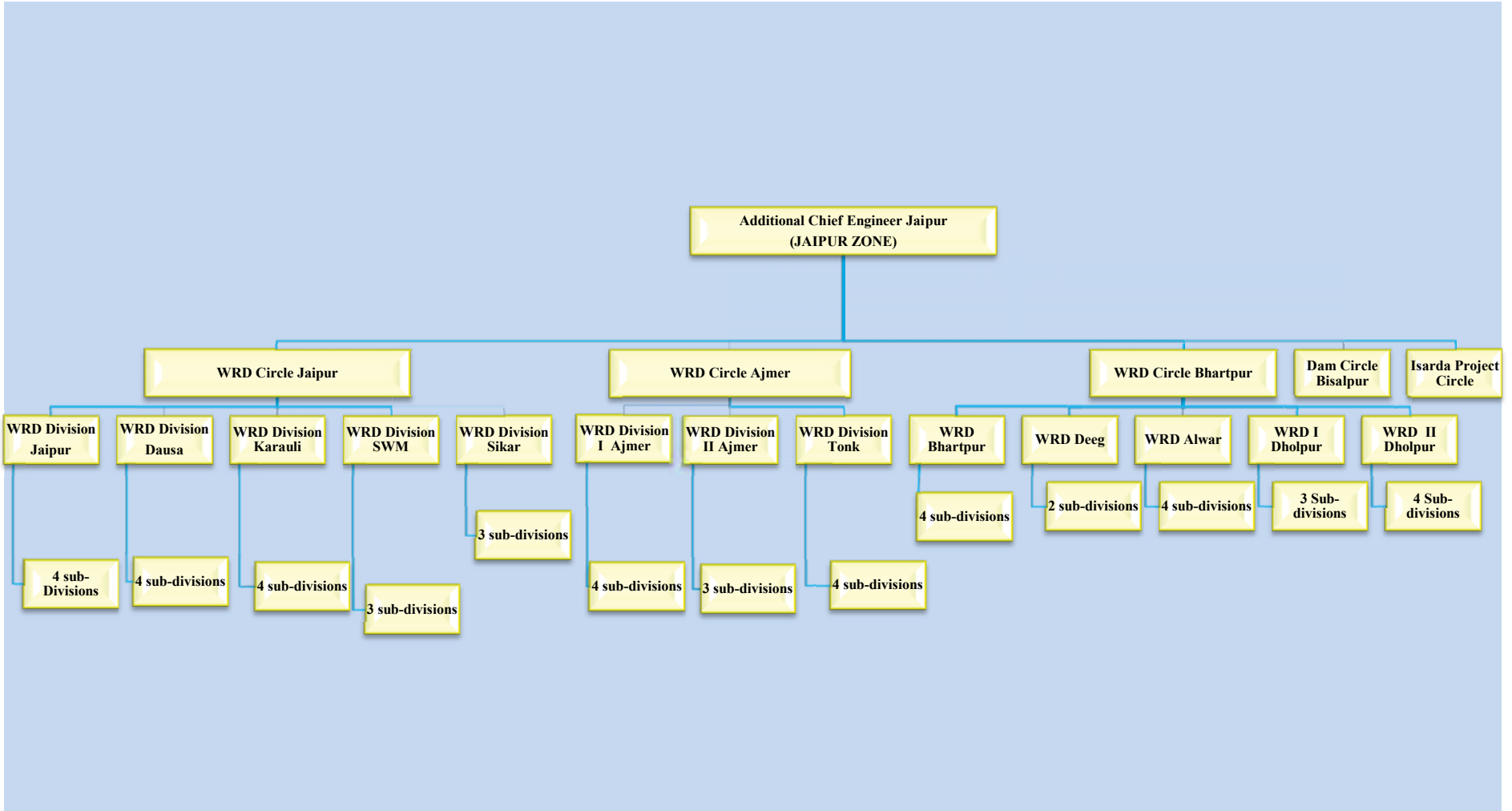


Figure B2.3.3 Organisation Chart of Jaipur Zone

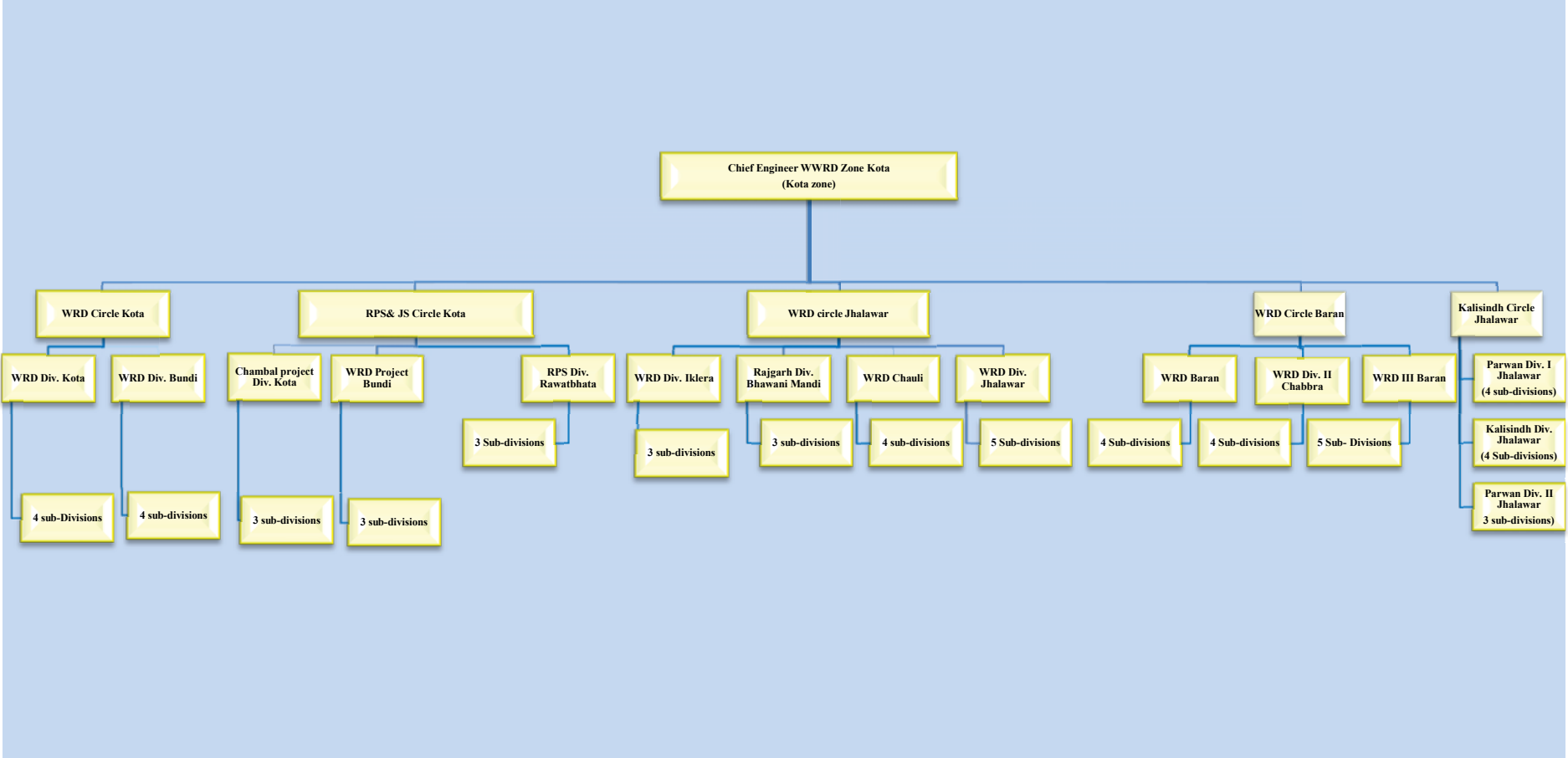


Figure B2.3.4 Organisation Chart of Kota Zone

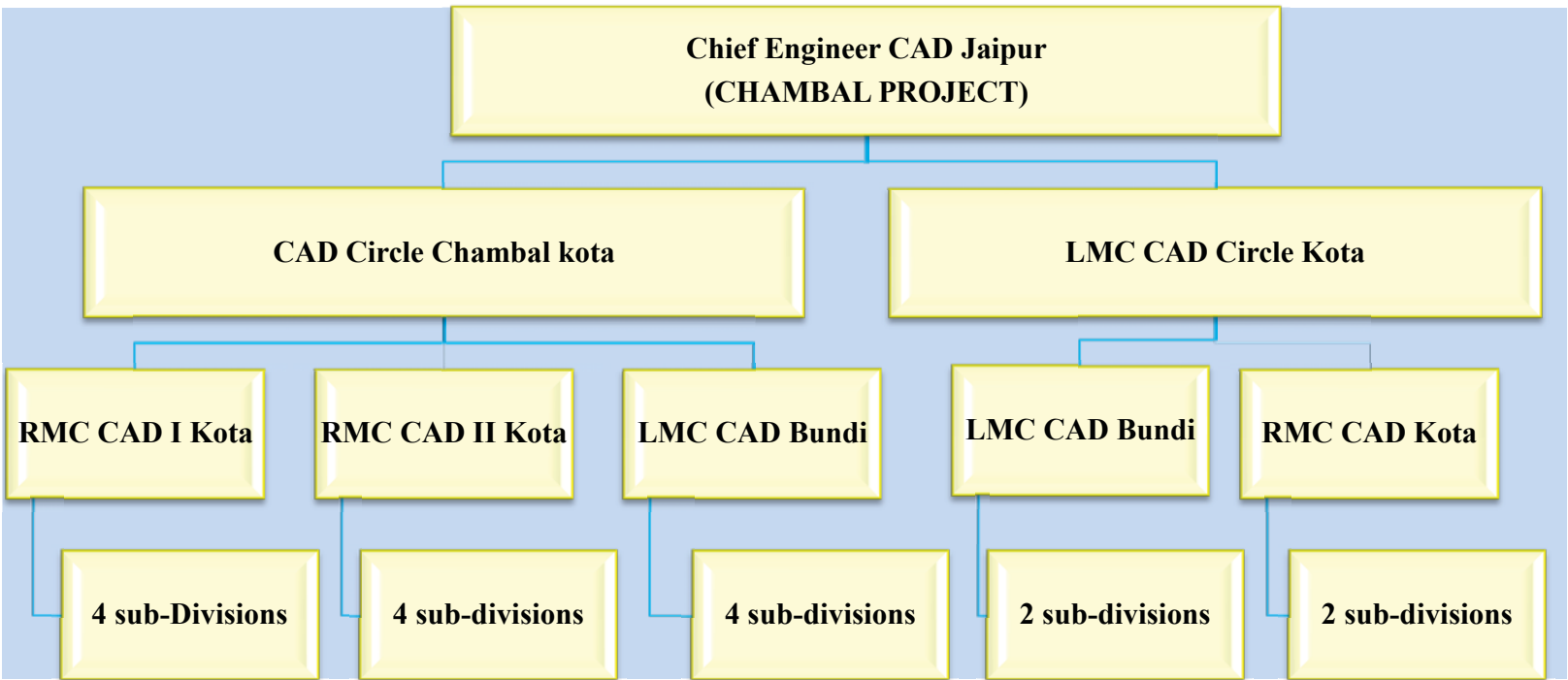


Figure B2.3.5 Organisation Chart of Kota Zone (CAD Kota)

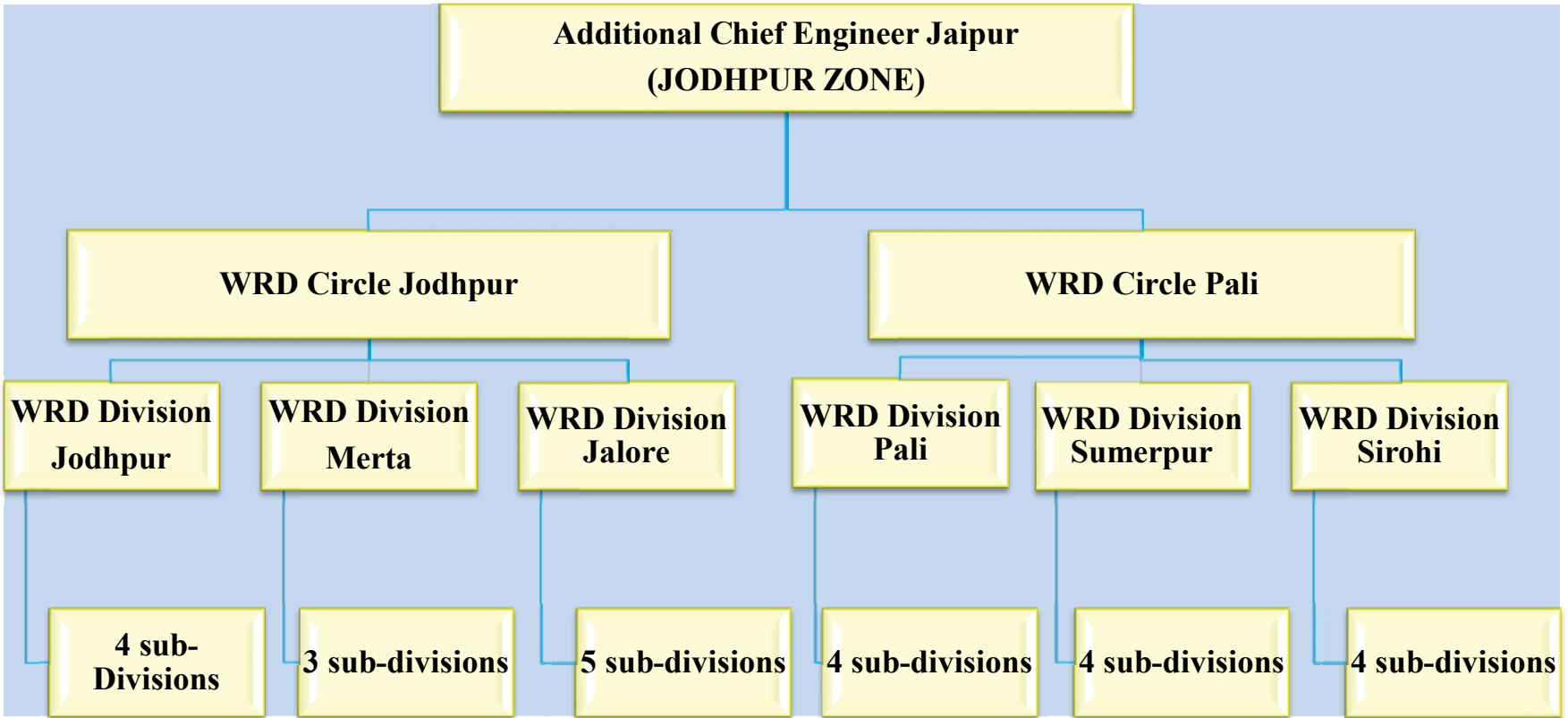


Figure B2.3.6 Organisation Chart of Jodhpur Zone

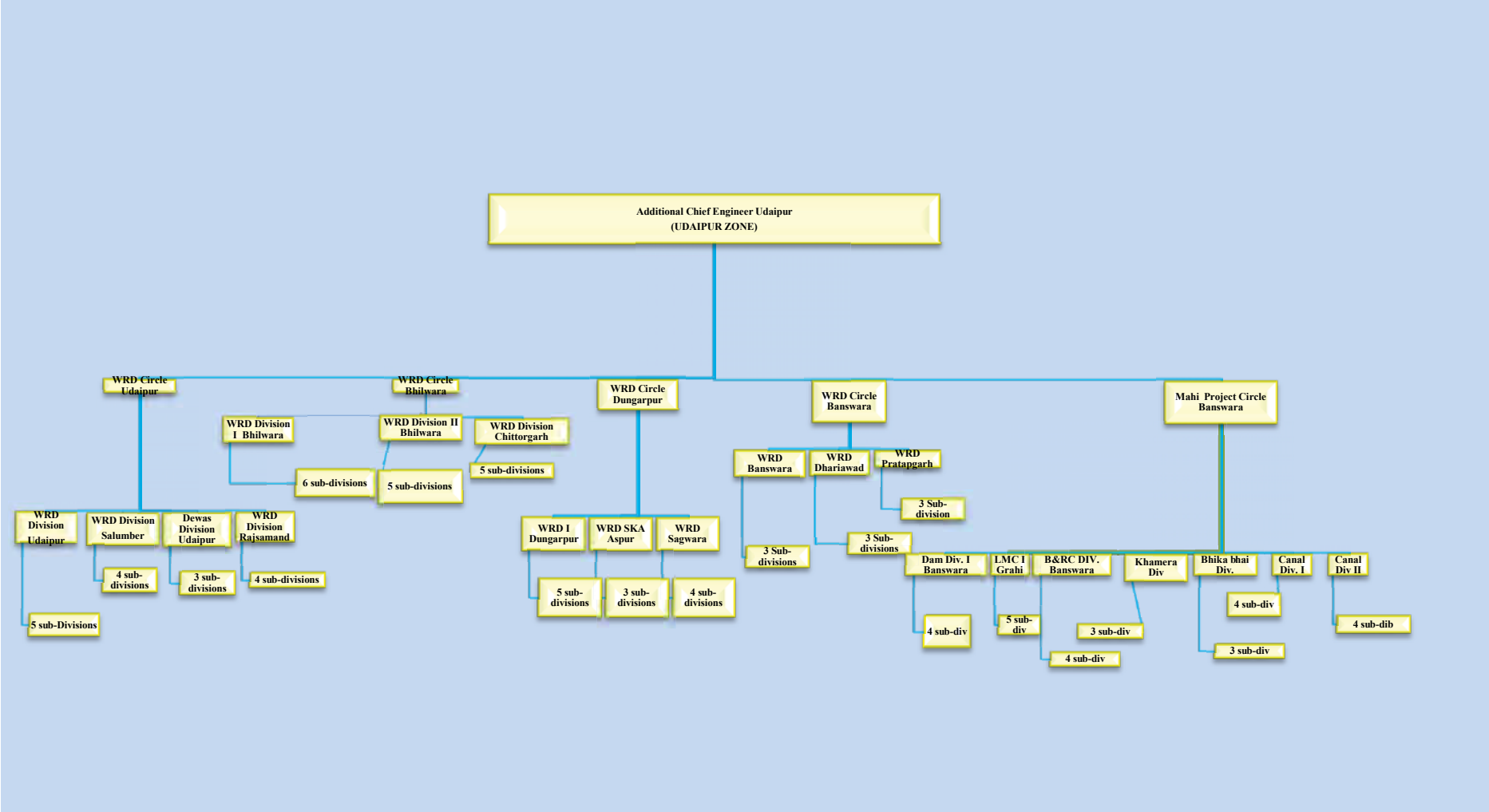


Figure B2.3.7 Organisation Chart of Udaipur Zone

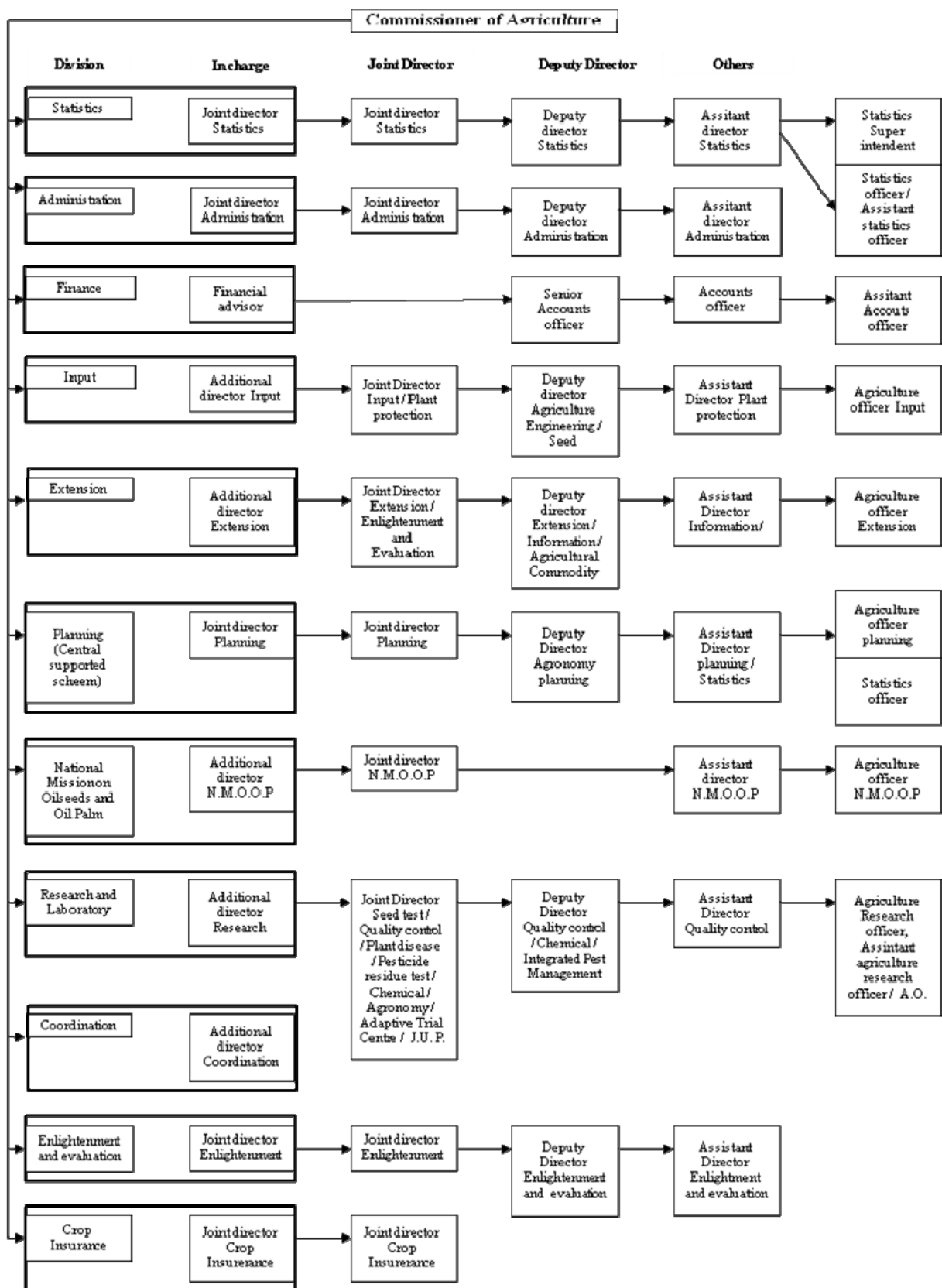


Figure B2.5.1 Present Organisational Chart of Department of Agriculture

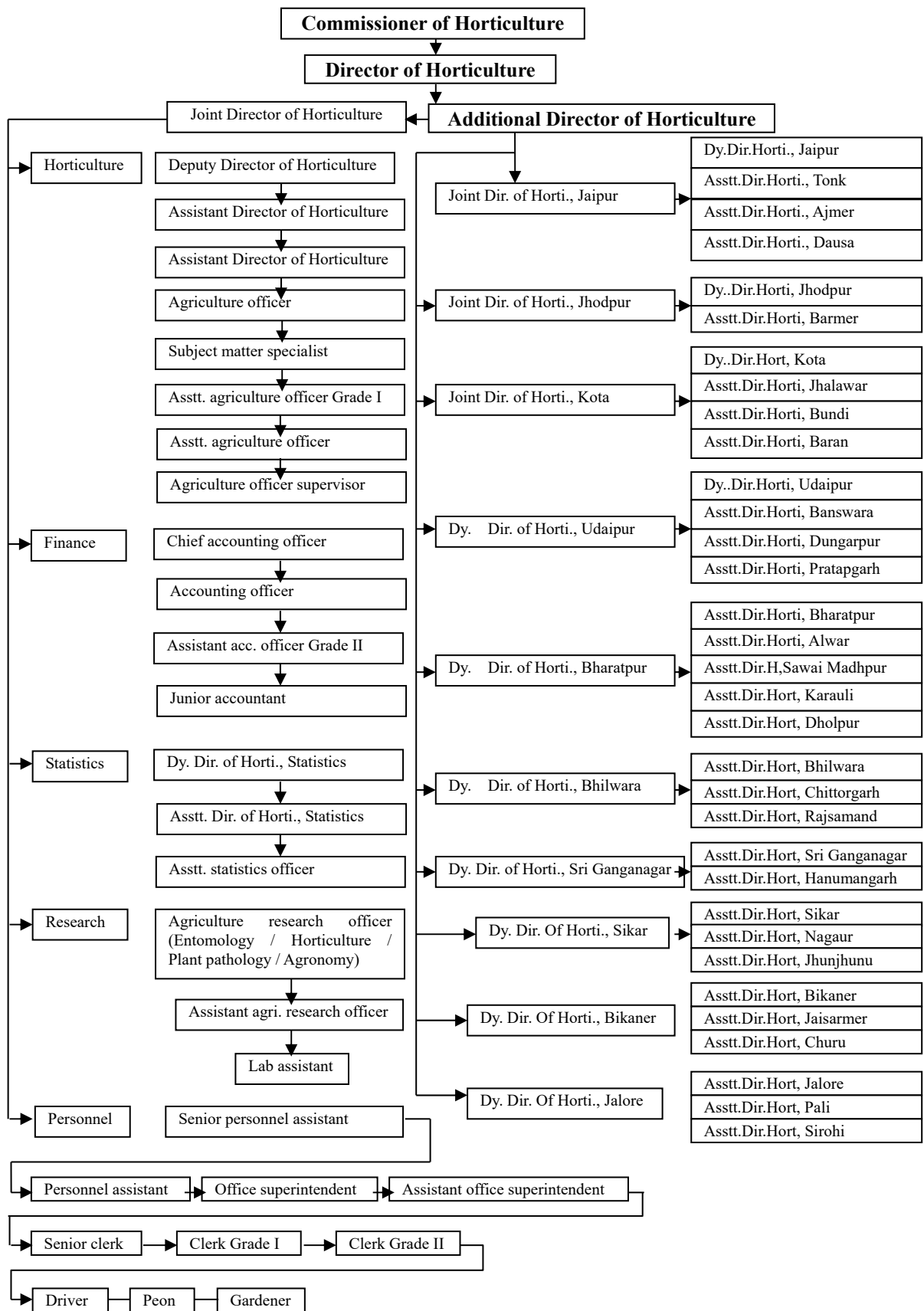


Figure B2.5.2. Present Organisational Chart of Department of Horticulture

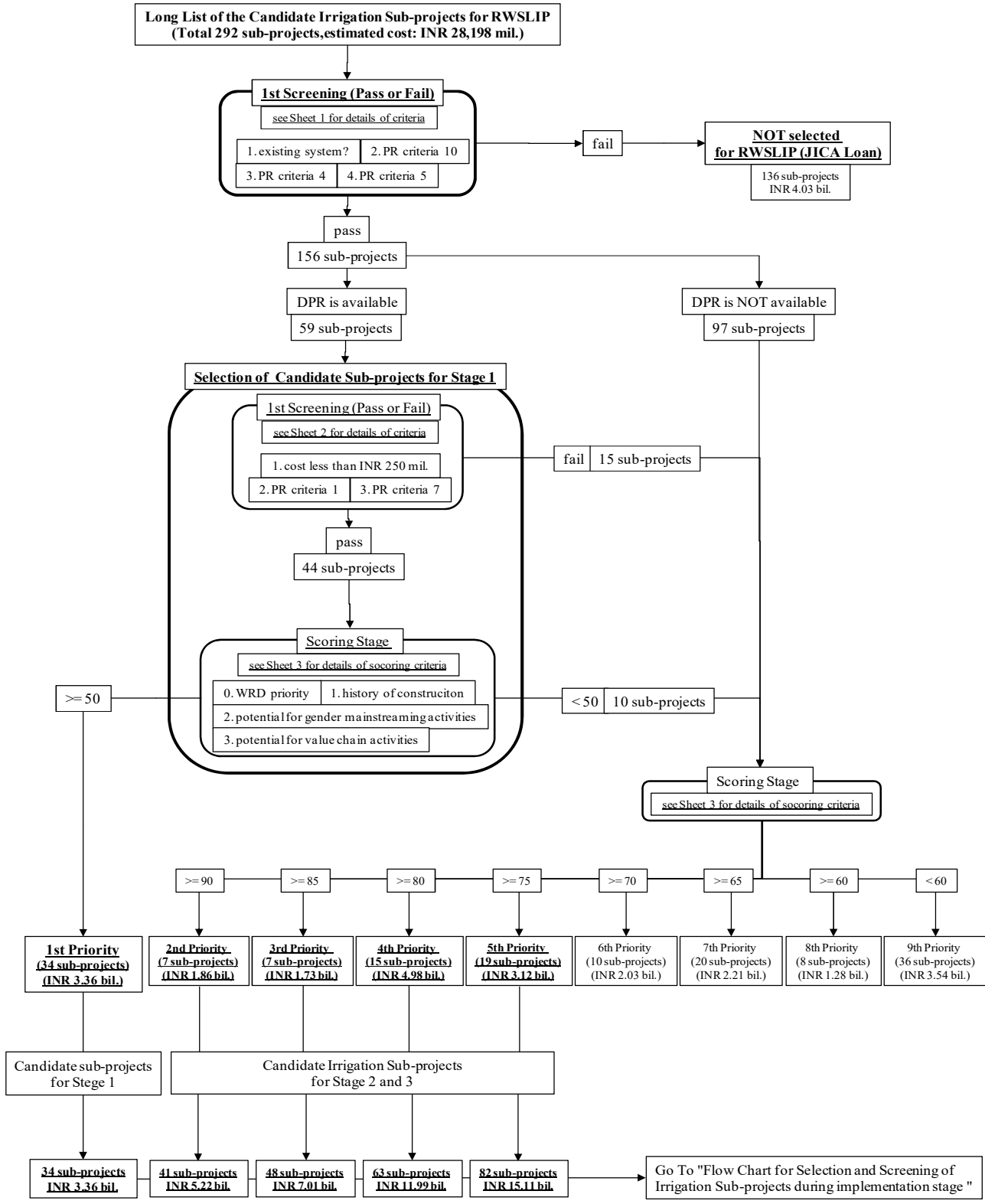


Figure B 4.3.1 Flow Chart for Preliminary Selection and Screening of Irrigation Sub-projects to be implemented under RWSLIP (for formulation of the Project scope under the preparatory survey) (1/3)

Sheet 1: Selection Criteria for 1st Screening for All Irrigation Sub-projects (Pass or Fail Stage)

Criteria 1: Existing System?

The works shall be rehabilitation works of existing irrigation system and shall not include new development / extension works considering the environmental and social impact

Criteria 2: PR criteria 10 (source: Project Report for RWSLIP 4.1.4.1, p.57)

CCA of sub-project may not be more than 10,000 ha and less than 300 ha

Criteria 3: PR criteria 4 (source: Project Report for RWSLIP 4.1.4.1, p.56)

Yield from the catchment area should be in conformity with effective storage of the sub-project (inflow from the catchment area) / (effective storage capacity of dam) ≥ 1
0.5 (for Jhunjhunu, Sikar, Barmer, Jalore, Jodhpur, Nagaur, Pali and Rajasamand districts)

Criteria 4: PR criteria 5 (source: Project Report for RWSLIP 4.1.4.1, p.56)

Sufficient storage is available in comparison with the benefitted area
(effective storage capacity - evaporation loss) / CCA ≥ 0.0032
0.0016 (for Jhunjhunu, Sikar, Barmer, Jalore, Jodhpur, Nagaur, Pali and Rajasamand districts)

Sheet 2: Selection Criteria for 1st Screening of Candidate Sub-projects for Stage 1 (Pass or Fail Stage)

Criteria 1: Cost less than INR 250 mil.

Estimated cost of irrigation sub-project for Stage 1 shall be less than INR 250 mil. considering the required time for revision of DPR, preparation of Technical estimate, Tender and approval process.
Irrigation sub-projects with cost more than INR 250 mil. are recommended to be implemented in Stage 2 and 3

Criteria 2: PR criteria 1 (source: Project Report for RWSLIP 4.1.4.1, p.56)

It should be designed at 50% dependability

Criteria 3: PR criteria 7 (source: Project Report for RWSLIP 4.1.4.1, p.56)

EIRR may not be less than 5%

Figure B 4.3.1 Flow Chart for Preliminary Selection and Screening of Irrigation Sub-projects to be implemented under RWSLIP (for formulation of the Project scope under the preparatory survey) (2/3)

Sheet 3: Scoring Criteria for Prioritization and Selection of Irrigation Sub-projects for RWSLIP

E - 12

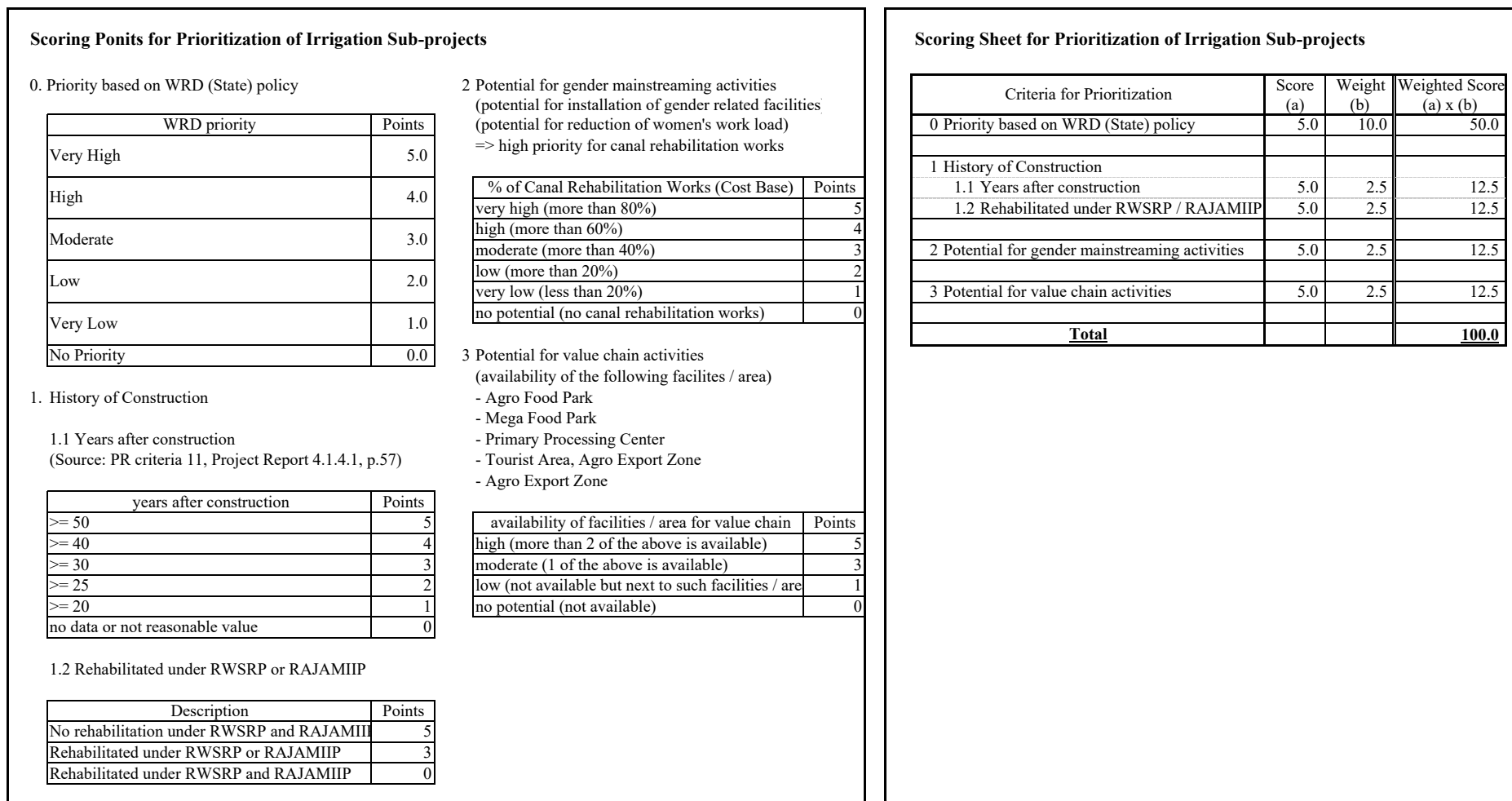
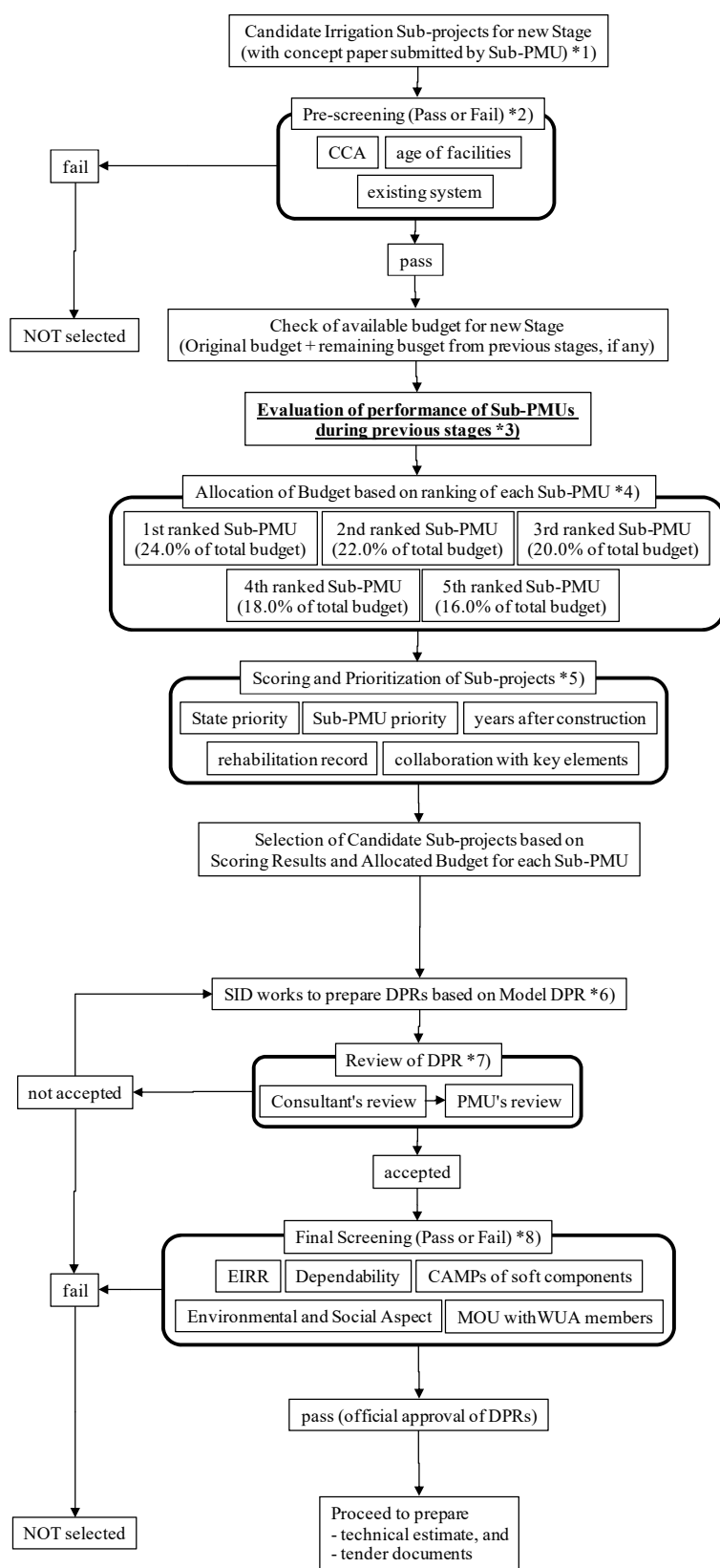


Figure B 4.3.1 Flow Chart for Preliminary Selection and Screening of Irrigation Sub-projects to be implemented under RWSLIP (for formulation of the Project scope under the preparatory survey) (3/3)



NOTES:

*1) Concept paper shall include the following "minimum" information name, location, CCA, year of construction, rehabilitation record, estimated cost (dam and canal), major work items for rehabilitation, Sub-PMU's priority

***2) Criteria for Pre-screening**

CCA
CCA of the sub-project shall not be less than 300 ha and more than 10,000 ha
Age of facilities
age of irrigation facilities shall not be less than 20 years
Existing system
proposed works shall be rehabilitation of existing facilities and shall not include new development and extension works including rising of dam height

***3) Items to be evaluated for performance evaluation**

(details shall be determined and agreed before evaluation of each stage)
- progress of pre-construction works (plan v.s. actual)
- progress of construction works (plan v.s. actual)
- achievement of farming support program (plan v.s. actual)
- achievement of gender mainstreaming activity (plan v.s. actual)
- achievement of strengthening of WUA (plan v.s. actual)

*4) percentage of total budget for each rank is just tentative and shall be discussed and determined before evaluation of performance of each stage

***5) Criteria for scoring of sub-projects (total score: 200)**

Priority in State Policy
(score: 1 (low) - 10 (high), weight: x 5, total weighted score: 50)
Priority in Sub-PMU's plan
(score: 1 (low) - 10 (high), weight: x 5, total weighted score: 50)
Years after construction (20, 25, 30, 35, 40, 45, 50, 55, 60, 70 years)
(score: 1 (>20 years) - 10 (>70 years), weight: x 2, total weighted score: 20)
Rehabilitation record with RWSRP / RAJAMIIP (both of two, either, none)
(score: 1 (both), 5 (either), 10 (no), weight: x 2, total weighted score: 20)
Potential for collaboration with value chain activities
(based on detailed implementation program for overall activities)
(score: 1 (low) - 10 (high), weight: x 3, total weighted score: 30)
Potential for collaboration with gender mainstreaming activities
(based on detailed implementation program for overall activities)
(score: 1 (low) - 10 (high), weight: x 3, total weighted score: 30)

*6) SID works shall be implemented under the full responsibility of each Sub-PMU

*7) DPRs will be reviewed based on Check List prepared by the survey team and revised by the Consultant

***8) Criteria for Final Screening**

EIRR
EIRR of the sub-project shall not be less than 5%
Dependability
Dependability of the sub-project shall not be less than 50%
Environmental and social aspect
no land acquisition shall be required
sub-project shall not be categorized as Category A
no significant environmental and social impact due to implementation of the sub-project (based on Check List prepared by the survey team)
MOU with WUA members
rehabilitation works shall be agreed/confirmed by WUA members (through walk-through survey)
commitments of WUA members to fulfill duties and obligations required in the Project of RWSLIP
Command Area Micro Plan (CAMP) for soft components
CAMPs for farming practices (including micro irrigation system), value chain activities and gender mainstreaming activities for the sub-project area shall be prepared and concurred by the relevant agencies.

Figure B 4.3.2 Flow Chart for Selection and Screening of Candidate Irrigation Sub-projects to be implemented under Stage 2 and Stage 3

Non-disclosure information

Figure B 6.3.1 Implementation Schedule for Component 1: Participatory Irrigation Rehabilitation Works

Figure B 6.3.2 Implementation Schedule for Component 2: Fostering and Capacity Enhancement of Water Users Organizations

Non-disclosure information

Figure B 6.3.2 Implementation Schedule for Component 2: Fostering and Capacity Enhancement of Water Users Organizations

Non-disclosure information

Figure B 6.3.2 Implementation Schedule for Component 2: Fostering and Capacity Enhancement of Water Users Organizations

Non-disclosure information

Figure B 6.3.3 Implementation Schedule for Component 3: Irrigated Agriculture Intensification and Diversification

Non-disclosure information

Figure B 6.3.3 Implementation Schedule for Component 3: Irrigated Agriculture Intensification and Diversification

Non-disclosure information

Non-disclosure information

Non-disclosure information

Non-disclosure information

Non-disclosure information

Figure B 6.3.5 Implementation Schedule for Component 5: Gender Mainstreaming in Agriculture and Water Component

Non-disclosure information

Figure B 6.3.5 Implementation Schedule for Component 5: Gender Mainstreaming in Agriculture and Water Component

Non-disclosure information

Figure B 6.3.5 Implementation Schedule for Component 5: Gender Mainstreaming in Agriculture and Water Component

Non-disclosure information