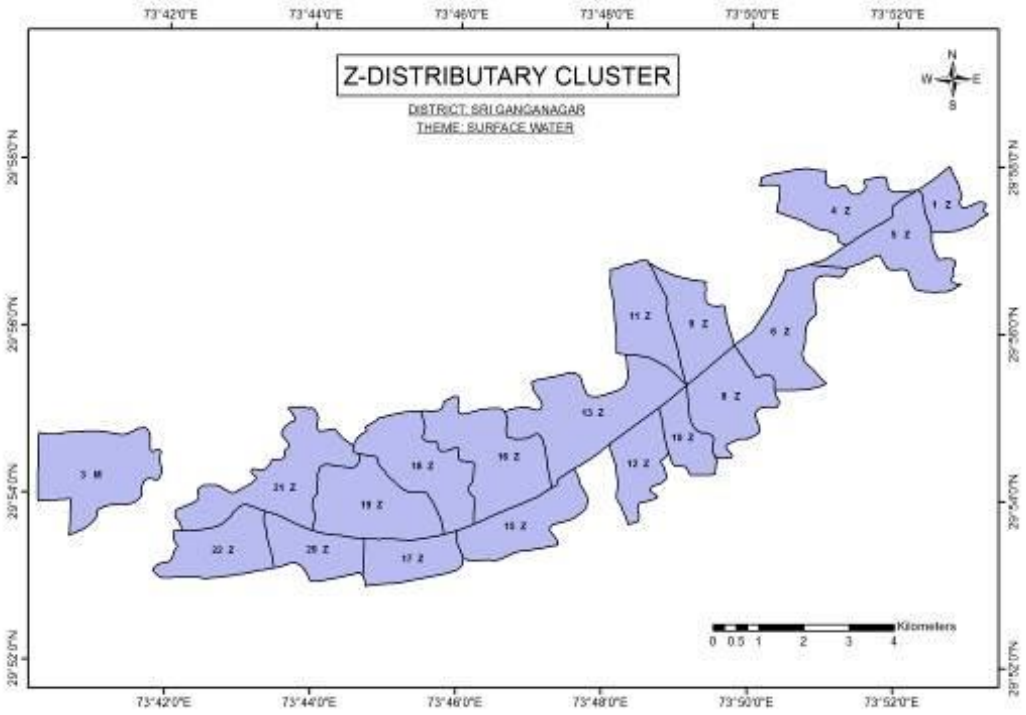
Cluster Agricultural Competitiveness Plan (CACP)

Surface Water Cluster Z-distributary, Sri Ganganagar
Rajasthan Agricultural Competitiveness Project (RACP)



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Preface

The World Bank has approved credit amounting to Rs.832.50 crores for development of 17 clusters, each having area ranging from about 10,000 ha to 31,500 ha in eight agro-climatic zones across Rajasthan to address end to end solutions to farmer's problems in three main water regimes. These include watershed/rain-fed, surface/canal water and ground water regimes with certain specified desired selection criteria's.

The Cluster Agricultural Competitiveness Plan (CACP) is the outcome of a planning process that aims to (a) identify opportunities as well as constraints towards developing one or two or more value chains in which the community deem themselves to have a potential competitive advantage and to (b) select from a list of eligible project investments and within the funding constraints of those public investments that will enable the community to address constraints and enhance opportunities towards establishing and strengthening identified value chains. The value chains proposed would envisage addressing broad sub-sectorial issues as well as help establish specific partnership arrangements between farmer groups or Producer Companies with agribusiness companies.

The Cluster Agricultural Competitiveness Plan (CACP) comprises investments to be made on improving water use efficiency, technology transfer and provision market led advisory services for agriculture & horticulture development, livestock strengthening and management especially for small ruminants, market and value chains in the cluster.

The CACP of z distributary Surface Water Cluster in Sri Ganganagar district has been prepared and an amount of Rs.3419.69 lakh will be invested during the project period to make the cluster and farmers competitive so that economic level of farmers in the cluster can be uplifted. Simultaneously, as well as agricultural productivity of the cluster can be optimized.

I personally appreciate the commendable efforts by ARAVALI, Jaipur, Mr. V. S. Singh, Consultant, ARAVALI and especially Dr. V. P. Singh, Jt. Director Agriculture (Agronomy), Project Coordinators, Specialists, ABPF Consultant and line departments who contributed much towards making this comprehensive document. I also appreciate all other people who supported in many ways to prepare the CACP in a short period.

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List of Abbreviations

ABPF	Agri-Business Promotional Facility
AEZ	Agro-Ecological Zones
ARAVALI	Association for Rural Advancement through Voluntary Action and Local Involvement
ARS	Agriculture Research Station
ARSS	Agriculture Research Sub Station
ATC	Adaptive Trial Centre
BPL	Below Poverty Line
CACP	Cluster Agricultural Competitive Plan
CBO	Community Based Organizations
CFC	Common Facility Centres
CIG	Common Interest Group
DLIC	District-Level Implementation Committee
EMP	Environment Management Plan
e-NAM	e-National Agriculture Market
FAQ	Fair Average Quality
FCI	Food Corporation of India
FCSC	Farmer's Common Service Centre
FIG	Farmers Interest Group
FPO/FPC	Farmer Producer Organizations/ Farmer Producer Company
GIS	Geographical Information System
GoI	Government of India
GoR	Government of Rajasthan
GSS	Gram Seva Sahkari Samiti
ICM	Integrated Crop Management
ICT	Information, Communication and Technology
IMD	Indian Metrological Department
INM	Integrated Nutrient Management
IPM	Integrated Pest Management
JV	Joint Venture
KSK	Kisan Sewa Kendra
KVSS	Kriay Vikrya Sahkari Samiti
LLW	Lady Link Worker
LSCD	Loose Stone Check Dam
MI	Micro-Irrigation
MMS	Minor Masonry Structure
MPT	Mini Percolation Tank
MSP	Minimum Support Price

MTA	Multi Task Association
MTG	Multi Task Group
NAM	National Agriculture Market
NCR	National Capital Region
NeML	NCDEX e-Markets Limited
NRSA	National Remote Sensing Agency
NSPOT	NCDEX Spot Exchange
OBC	Other Backward Cast
PC	Producers' Companies
PAD	Project Appraisal Document
PDO	Project Development Objectives
PG	Producer Group
PHM	Post-Harvest Management
PIU	Project Implementation Unit
PMU	Project Management Unit
PRA	Participatory Rural Appraisal
RACP	Rajasthan Agricultural Competitive Project
RAJHANS	Rajasthan Horticulture Nursery Society
RAJUVAS	Rajasthan University of Veterinary and Animal Sciences
RKVY	Rashtriya Krishi Vikas Yojana
RS	Remote Sensing
RSSC	Rajasthan State Seed Corporation
RTC	Rural Technology Centers
SC	Schedule Caste
SCPI	Sustainable Crop Production Intensification
SFAC	Small Farmers Agri Business Consortium
SHG	Self Help Group
SR	Small Ruminants
SRR	Seed Replacement Rate
ST	Schedule Tribe
TCS	Tata Consultancy Services
TGM	Technical Grade Material
TRA	Technical Resource Agency
UMP	Unified Market Platform
VCD	Vegetative Check Dam
WUE	Water Use Efficiency

Executive summary

The World Bank is supporting the Rajasthan agricultural Competitiveness Project (RACP) with Rs.832.50 Cr. (166.5 USD) offered to Government of Rajasthan. It is envisaged to make structured interventions in 17 clusters as selected on water themes viz. watershed, surface water and ground water are spread over eight (8) agro climatic zones across the State. The Project Development Objective (PDO) is to establish the feasibility of sustainably increasing the agricultural productivity and the farmer incomes through a distinct agricultural development approach by integrating agriculture water management and agricultural technology, farmer organizations and the market innovations in selected locations across the ten agro-ecological zones of Rajasthan. The Project Development Objectives aim to help farmers realise more rupees per unit of water in compensation for farmers using fewer units of water.

To achieve the PDO of the RACP, activities related to four components are to be implemented in the clusters viz. Component 1: Climate Resilient Agriculture; Component 2: Markets and Value Chains; Component 3: Farmer Organization and Capacity Building; and Component 4: Project Management, Monitoring and Learning. The Key Performance Indicators (KPIs) to assess the impact of the project are (a) reduction in water used in agriculture; (b) increase in water use efficiency in agriculture; (c) increase in agricultural productivity; (d) increase in gross margins from crops and livestock products; (e) increase in the share of producer's price in wholesale price; and (e) farmer satisfaction with project deliverables

The z distributary cluster (Surface Water) in Sri Ganganagar district has been selected under the project after several visits by the PMU coordinators; consultations with officials of the Water Resources Department Jaipur; interactions with the local community, Water User's Associations and various value-chain actors. The area is predominantly rich in agriculture and horticulture. Surplus production is generally available in the area as dominant crops in the cluster include Guar Sugarcane Cotton in Kharif crops and major Rabi crops are Wheat, Mustard and Barley. The fodder of these crops is also predominantly used as cattle feed in the region. Area under the horticultural crops is only 1.43% of the total agriculture land (12,128 ha) but there is a scope to increase the area under these crops i.e. (vegetables: Carrot, Potato, Onion, Brinjal and fruits crops Kinnow, Date) by diversification of area from food grain crops to the horticultural crops.

Z distributary cluster is in I-B Agro Climatic Zone (Integrated North Western Plains) in Northern Rajasthan has been selected as one of the canal water based project cluster belonging to the command area and most of the area is dependent on canal water, monsoon rains and ground water for agriculture cultivation. The canal cluster of the RACP is located in the district of Sri Ganganagar, and the market is 10 km from the cluster. Hanumangarh Mandi is situated 63 Kms from the cluster. Road & Rail is connectivity is there. Nearest Airport is Bikaner Airport which is around 312 Kms. The Z-Distributary is facilitated to 49 nos Chaks and main city. The area of the cluster is spread over in 49 Chaks/Abadi of 10 Gram Panchayats.

The soil of the project area is shallow to moderately deep, dominantly sandy loam soils, imperfectly drained and moderately to severely eroded and the cluster area is almost flat with 0-1% slope of the area. The average rainfall of the area is 347 mm and temperature goes to 48^0C in the summer. About 12128 ha area is irrigated in the cluster. Total population of the cluster is 28,885 and total farming households are 5830 in number. Total cultivated area in the cluster is 12128 ha. Out of the total

population female population is 46.98% and scheduled caste (SC) population is 36.76% and 0.07% is scheduled tribe (ST) population. Only 55.40% farmers are having land in the area. 51.63% farmers are large, 1.66% small, 2.11% marginal, 16.16% landless and 16.16% are BPL households.

Total average cropped area is about 15650 ha, out of which 4801 ha is in Kharif and 10849 ha is in Rabi season. Guar crop is sown in about 2282 ha, Sugarcane in 284 ha, & Cotton in 2235 ha. In Rabi season Wheat is being grown in 4159 ha, Mustard in 4719 ha and Barley is sown in 1970 ha. 173 ha is being covered under horticultural crop Kinnow. Area under the above crops makes a total cropping intensity of 130.52%. The cluster has 10 Gram Panchayats covering 39 villages with 49 Chaks with 12128 Ha of area. There are 323 MTGs for Agriculture & Horticulture related farmers and 6 Water Users Associations.

It is also significant to mention here that total 156 diggies and 46 solar pumps already were constructed / installed in the cluster before launching of activities of RACP. Since there is great requirement of diggies and the solar pumps in the command of this canal system so that the canal water can be used through drip & sprinkler irrigation system and power can be available through solar panel.

The scope of value addition was derived from the consultation of the various stakeholders, crop water requirement, industrial value etc. Guar in Kharif, Barley in Rabi and Kinnow in horticulture has been selected for the value chain development in the cluster. Accordingly, activities enhancing the above potentials are proposed to be implemented in the cluster. It is presumed that success of the technologies would be replicated in the similar areas. The value chain development would be done through Farmer Producer Company (FPC), to be formed for specific purpose in the cluster. There are 13 APMCs near the cluster, 2 private market yards and State and Central Warehouses.

The total water requirement is 59.50 MCM and 34.026 MCM may be saved through adopting of MIS to be adopted in course of time, in-situ moisture conservation, cultivation on conserved moisture etc. and net water requirement likely to be 25.475 MCM, whereas 49.96 MCM canal water and 1.72 MCM ground water is available for irrigation in the cluster.

The cluster is classified as canal water cluster, and activities related to the rehabilitation and modernization of the canal & structures is being implemented by Water Resource department, while activities related to production are looked after by the department of Agriculture, Horticulture and Animal Husbandry GOR. The activities related to market and value chains will be addressed and implemented by Farmer Producer Company with the support of Agri-Business Promotion facility. Community mobilization, data collection and technical support to stakeholders will be given by the field level NGO operating in the cluster.

Although, the ground water is saline, but due to repeated canal irrigation, the quality of the ground water is improving and is being used for irrigation using tube wells. As per the ground water assessment, the cluster is in safe zone. In-situ moisture conservation would be ensured so that the Kharif crops can be grown from in-situ moisture. The harvested rain water can be used as lifesaving irrigation in Kharif season, if there is a dry spell during the monsoon. Likewise, demand side irrigation methods like drip and sprinkler irrigation system would be promoted in the cluster which will lead to saving of about 50% of the ground water. This means only 50% ground water extraction will be done by the farmers for Rabi and Horticultural crops.

A scoring intervention-matrix consisting of parameters along with weights has been deployed for prioritisation and selection of commodities/crops for value chain intervention in the cluster. The four important parameters considered include : (A) Existing size of the crop considering cropped area, production and productivity of each crop (B) Potential for value addition (implying scope for increased value addition for local producers and processors) considering price spread until mandi as well as retail level, net profit in production, scope for processing in the state, scope in terms of extent of processing (primary, secondary & tertiary), growth in market demand (C) Risk assessment considering price volatility in the commodity (D) Others considering water requirement. On this basis Barley, Guar and Kinnow have been selected for value chain study and intervention. Horticulture development through various activities like introducing water saving techniques, promoting horticulture crops etc. has also been considered. There is a range of constraints apparently in the value chains leading to lower producers' incomes. These include multiple intermediaries, limited access to

market information, limited value added processing units, inadequate capacity building initiatives for members, limited primary and secondary processing facilities, lower productivity and net yield in some crops like barley vis-à-vis wheat, poor awareness in good package of practices, limited storage and primary processing facilities etc.

To address the issues of improvement of water use of efficiency, production constraints, poor access to market management etc. following appropriate investments would be done in the project area:

1. Investment activities/heads in Climate Resilient Agriculture

A. Improvement of water use efficiency:

This being the canal water cluster, rehabilitation and modernization of the canal network and structures would be done to improve the water use efficiency by reducing the conveyance losses during the operation. In addition to the above some expenditure on farmer's organizations and project management costs would also be done. The total tentative investment on these activities would be around Rs.247.17 Lakh. The Water Resources department is responsible to implement these activities with the support of field staff, community groups and field NGO.

B. Technology transfer and Market led advisory services in:

(I) Agriculture production activities will include (i) Promotion of efficient techniques of irrigation viz. drip and mini sprinklers, sprinklers, pipelines, to increase the irrigation efficiency, improve productivity and reduce cost of production. Construction of water storage structures viz. Diggis to support the micro irrigation techniques and utilization of canal rotation water in most efficient way during the crop critical stages(ii) Diversify the present area towards value chain crops i.e. Barley and Guar and horticultural crops like Kinnow with the aim to improve the irrigation water use efficiency and to develop a new value chain crop through demonstrations and capacity building for the cluster (iii) Promotion of farm mechanization to reduce the cost of production (iv) Promotion of seed production and adaption support to improve the SRR and the farmer income (v) Promotion of fodder production to reduce the gap of demand and availability of the fodder for the animals (vi) Introduction of ICT based extension system for the quick reach of the solutions to the beneficiaries (vii) Establishment of FCSC to encourage the farmer organization of cluster for their own input arrangement and facilitate the value addition and marketing of agro-produce and (viii) Capacity building of the beneficiaries to achieve the PDO. An investment of Rs.1509.53 Lakh would be incurred for these activities.

(II) Horticulture production activities will include (i) Demonstrations on the production technologies for Fruit Cultivation (ii) Demonstrations on the production technologies for vegetable cultivation including assistance on green house, assistance on shade net house (iii) Solar Pump Program (iv) Post-Harvest Management (v) Horticulture Mechanization (vi) Farmer's training, Seminars, Exhibition Kisan mela etc. The investment of Rs.1428.86 Lakh is estimated to be incurred on the activities.

2. Market and value chains activities:

The value chain and marketing infrastructure will be developed in the cluster with the support local community for three crops which are Guar, Barley and Kinnow. Farmer's Common Service Centre will be developed in the cluster with the support of local community. Accordingly, the Farmer Producer Company would be supported through (i) Cleaning and grading unit of Guar and Barley along with storage facility and (ii) Grading and waxing unit for Kinnow. Total 4 units under FPC and 4 units for individual agri-preneurs can be supported under the project. A working capital would also be provided to Farmer's Producer Company. A tentative investment of Rs.232 Lakh would be incurred during the project period on these. The Project Management Unit (PMU), Agriculture & Horticulture department are responsible to implement these activities with the support of field staff, community groups, ABPF Consultants and field NGO.

Total Rs.2.13 Lakh would be incurred on various trainings to be conducted in the cluster on Environment Management Plan through Agriculture Department. The cost has been included in Agriculture sub component.

The intervention plan in the selected commodities in the light of critical constraints may be viewed as follows:

Barley:

Sr.no	Constraints	Action	Action By
1.	**Production**		
1.1	Productivity is less and variety is not suitable for processing (Malt)	Introduction of new Malt Variety	Agriculture Department, Processors like Soufflet (ABPF)
1.2	Traditional package of practices	Farmers training on best package of practices	Agriculture Department, Processors like Soufflet (ABPF)
1.3	Limited identification efforts for farmer leaders (entrepreneurs)and BODS at field level in Barley Value Chain for capacity building	PIA and Soufflet to identify farmers' leaders and these farmers' leaders will be trained by ABPF to be evolved. ABPF to prepare DPR and link these entrepreneurs with bank to get credit facilities. Incubation support to entrepreneurs.	PIA and Processors like Soufflet and ABPF
1.4	Banks do not support individual farmers for crop loans etc. in some cases.	Organise bankers meet with Soufflet & project team with farmers to facilitate crop loans;	PMU, SLBC, ABPF and Soufflet
2.	**Post-Harvest**		
2.1	High dirt content in harvested barley.	Ensure availability of the Cleaning & Grading facility to farmers; ensure 10% lower income accruals to farmer, Capacity building and awareness	PMU, PIA, ABPF, NGO
2.2	Mostly rain fed crop usually resulting in harvesting of immature grain without water/critical irrigation at time of pod filling. Resulting in small-sized grain	Farmer training, water management /sprinkler irrigation, pond + drip option etc. led to be considered.	RACP, SPs with input from ABPF
2.3	During good harvest prices Collapse and hence storage option could help avoid distress sale.	Storage facility with electronic weigh bridge for farmers as part of FCSC/individual unit	RACP, ABPF
3.	**Processing**		
3.1	Not aware of special license option to source directly from farmers /FPCs.	Awareness seminars for processors.	ABPF
3.2	No alternate marketing channel developed for Barley to facilitate crop diversification.	Soufflet to secure Single Purchase License. ABPF to link FPCs/farmers with Soufflet for Barley marketing.	Processors like Soufflet and ABPF
3.3	Inadequate links with farmers for direct procurement.	ABPF to organise BS meet with players like Soufflet, Cargill etc.	ABPF, RACP
3.4	High cost of procurement due to taxes like mandi tax and VAT	ABPF to work on policies for ease of procurement. Policy Support for value chain players like Soufflet	ABPF
3.5	Inadequate capacity building programs on Market led extension services	ABPF to organize capacity building program for farmers with market leaders like Soufflet	ABPF

Kinnow:

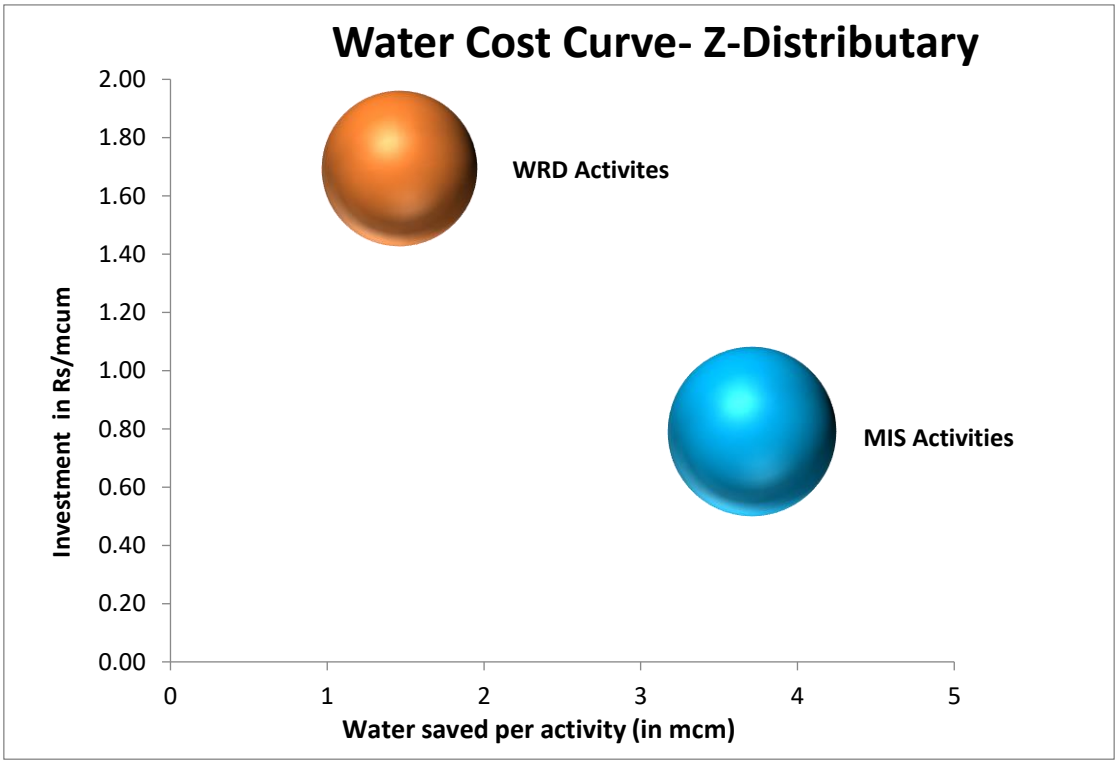
Sr. No	Constraints	Action	Action By
1.	**Production**		
1.1	High cost of pesticides, unavailability or spurious pesticides	Aggregated input facilitation through FCSC/s ensuring good quality and reasonable price	FPC with support from RACP and SPs
1.2	Lack of appropriate information on availability of good quality versus scrummed planting material	FPC to undertake joint input sowing activities for seed fertilizer, pesticides, etc under umbrella of FCSC	FCSC with support from RACP
1.3	Lack of adequate water management result in poor quality fruit	Farmer training on water management, means of irrigation drip/ sprinklers, Diggies etc.	RACP with input of SPs
2.	**Post-Harvest**		
2.1	Lack of knowledge of standard package of post-harvest practices	Farmers training on standards package of post- harvest practises	RACP and ABPF
3.	**Processing**		
3.1	Inadequate sorting and grading facility	Technical services, establishment of common facility services are imperative	PC with support from RACP and SPs with inputs from ABPF
3.2	Lack of post-harvest farm level washing fungicidal treatment & waxing facility	Provision of packing, waxing, washing facility of FCSC	FCSC with support from RACP and SPs with inputs from ABPF
3.3	Very limited Kinnow development: pulping, juice manufacturing units, etc.	Facilitate start-ups in secondary processing from amongst FPOs / individual entrepreneurs	ABPF

Guar:

S.no	Constraints	Action	Action By
1	**Production**		
1.1	Unavailability of high yielding varieties of guar for farmers	Seed production programme using sources of Raj seeds through PC	PCs & PIAs
2	**Post-harvest**		
2.1	Dearth of adequate storage facility	Storage facility for farmers as part of FCSC	RACP, PC, SP with inputs from ABPF
3	**Processing**		
3.1	Limited number of processing units such as guar gum processing unit in the region	Facilitate start up in secondary processing from among PC members or individual entrepreneurs; ties with large players such as Agro gum	ABPF
3.2	Lack of cleaning and packaging facilities which result in losses as well as contamination	Provision of cleaning and packaging facilities as part of FCSC.	RACP, PC with inputs from ABPF

The comparison of investment (in Rs crore per mcm) is a useful tool for assessing data to understand the relative effectiveness and cost of the full spectrum of approaches to improving water security. When coupled with realistic assessments of operational risk, such comparisons can also help policy makers and investors to improve water-sector productivity.

In the case of Z-distributary cluster, there are majorly two water saving activities taking place viz activities of Water resource department and the micro-irrigation system (MIS) activities of Agriculture and Horticulture department. Both these activities save water up to the extent of 1.46 mcm and 3.71 mcm per year. When the investment per unit of water saved is calculated, it is found that MIS activities are able to conserve more water at lower investment of Rs.0.79 crore per mcm of water saved for an area of 1784 ha impacted. Thus, it could be said that MIS activities like installation of drips and sprinklers for the agricultural and horticultural crops has far reaching impact in the span of a year.



Activities undertaken to save water	Water saved- per year in mcm	Investment- Rs. crore/mcm	Total investment- Rs crore
Rehabilitation (R) & Modernization (M) Activities on Canals	1.46	1.69	2.47
Micro Irrigation System (MIS) Activities	3.71	0.79	2.94

The procurement of agricultural inputs /materials would be done as per the procurement manual of the RACP. However, procurement of seed would be done from Rajasthan State Seed Corporation (RSCC) / National Seed Corporation or any other States Seed Corporations and Agricultural Universities of Rajasthan. Other inputs including fertilizer, pesticides, weedicides etc. would be procured from Kray Vikray Sahkari Samiti (KVSS) / Gram Sahkari Samiti (GSS) or other local institutions from where Agriculture & Horticulture Departments procure them for their programmes.

After all these investments in the cluster, it is expected that water availability in the area would be increased significantly and productivity of water is also expected to increase. The farmers of the cluster will be in a position to increase productivity of the crops at least by 5% per year and expected to reach to a desired level subsequently. The Farmer Producer Company will be empowered to do business and will setup required infrastructure to get the benefits from the crop production.

Interventions proposed at the initial level are primary in nature and to build up the Agri business activities in the cluster. The process will lead to increase in business acumen of the farmers along with

social and environmental development. At primary level, farmers can realize 15% - 20% more income at their farm.

With the model of FPC, there will be an advantage of aggregation which leads in cutting of cost hence increasing the income by 5%-10%. Members will also receive dividend on the profit earned by FPC through business hence, indicatively, farmer will get 35%-40% increased income once a full model of FPC and FCSC along with market linkages gets established.

Total Investments in the z distributary Cluster

S. No.	Department	Components (Rs. Lakh)				
		Climate Resilient Agriculture	Market & Value Chains	Farmer's Organization and Capacity Building	Project Management and M&E	Total
1	Water Resource management	195.77	0.00	43.90	7.50	**247.17**
2	Agriculture	1338.65	232.00	163.97	9.04	**1743.66**
3	Horticulture	1381.86	0.00	36.00	11.00	**1428.86**
	Total	**2916.28**	**232.00**	**243.87**	**27.54**	**3419.69**

The total tentative investments amounting to **Rs.3419.63 Lakh** would be incurred during the project period by March 2019 against the activities under the project. This investment is subjected to the implementation activities listed under the project. Any deviation in the same by farmers will lead to change in the presented figures.

Out of the total investments, 85.28% investments would be incurred on first component i.e. Climate Resilient Agriculture including, 6.78% on Market and Value Chains, 7.13% on Farmers Organization & Capacity Building and 0.81% investments would be incurred on 4th Component i.e. Project Management.

Chapter – 1: Context and Background

The World Bank has approved credit amounting to Rs.832.50 crore for development of 17 clusters, each having area ranging from about 10,000 ha to 31500 ha in eight agro-climatic zones across the Rajasthan to provide end to end solution to farmer's problems in three main water regimes namely Canal Water/rain-fed, surface/canal water and ground water, having some specified desired selection criterion.

The Project Development Objective (PDO) is to establish the feasibility of sustainably increasing agricultural productivity and farmer incomes through a distinct agricultural development approach by integrating agriculture water management and agricultural technology, farmer organizations and market innovations in selected locations across the ten agro-ecological zones of Rajasthan. The aim is for the state to help farmers get more rupees per unit of water in compensation for farmers using fewer units of water.

The guiding principles i.e. (a) sustainable and efficient use of water resources, including improved on-farm water use efficiency, reduced water-intensive cropping patterns, and using the resultant savings of water from agriculture sector for economic purposes outside of agriculture in support the state's water policy objectives; (b) increased private sector participation in the development of value chains in processing and marketing in support of the state's agro-processing and agri-business policy; and (c) improved public sector capacity in delivering agriculture support services are to be ensured through the investments.

The Key performance indicators (KPIs) (a) reduction in water used in agriculture; (b) increase in water use efficiency in agriculture; (c) increase in agricultural productivity; (d) increase in gross margins from crops and livestock products; (e) increase in the share of producer price in wholesale price; and (e) farmer satisfaction with project deliverables will also be measured under the project.

There are four components under the project: Component 1: Climate Resilient Agriculture; Component 2: Markets and Value Chains; Component 3: Farmer Organization and Capacity Building; and Component 4: Project Management, Monitoring and Learning. Implementation of the four components will take place over the project period and across selected clusters in the state. The project will be taken up in seventeen (17) clusters across the eight agro-ecological zones (AEZ) and would implement a location-specific menu of approaches and interventions would be discussed in the CACP. Each cluster will have a defined theme and demonstration objectives and accordingly cluster specific menu of investments are to be proposed for implementation in the cluster during the project period.

After restructuring the project, it was decided that planning and implementation of the project would be done by line departments in place of Service Providers (SP) as decided at the time of signing of the agreement and community mobilization at cluster level would be done with the support of Field NGOs. Dy. Director Agriculture, Jila Parishad, at district level has been designated as District Project Manager and his office has been designated as office of the District Project Management Unit (DPMU). All concerned offices of the line departments at district level would be Project Implementation Agencies for planning and implementation of project activities in the cluster. There is District Level Implementing Committee (DLIC) will be responsible for coordination and implementation at district as well as at cluster level. District Collector is chairperson of the committee,

DPM, DPMU is member secretary and other district level officers / PIAs of the line departments are the members of the committee.

1.1. Brief Description of the CACP

The Cluster Agricultural Competitive Plan (CACP) is primary requirement of the cluster to be developed keeping in mind Project Development Objective (PDO). The CACP is divided in to eight chapters and whatever discussed in the chapter is being summarized as under:

First chapter includes context and the background, brief description of the CACP, objective of the RACP and rationale for selection of the cluster.

Second chapter consists of description of the cluster in terms of spatial characteristics, agro ecological characteristics, demography of the cluster, agriculture characteristics that includes agronomy, horticulture, Micro Irrigation Systems and Seed Replacement Rate. Further there is a description on livestock scenario in the cluster and market infrastructure that can have impact on the cluster.

Third chapter discusses the strategic contexts of choosing the Value chain crops for the cluster. The scoring matrix designed to select the value chain crop has been detailed out along with the parameters for the same. Thereafter, the inference is drawn from the scoring model in order to finally select the major value chain crops. Then the current marketing channels of the selected VC crops have been described.

Forth chapter includes opportunities and challenges in selected value chain/s along with summary of selected value chain crops that includes the constraints for the crops and the possible interventions.

Fifth chapter is related to the value chain investments to be done in the cluster under production and market and value chain sub component which includes rationale for these investments, non-water-use interventions in value chain, investments related to technology transfer and market led advisory services (agriculture & horticulture), livestock strengthening & management, interventions in market & value chains, value chain studies of identified commodities in the cluster of selected crops in the cluster, scouting of technologies and business ideas for such identified commodities, incubation services to agri-entrepreneurs, management and business training to FCSC and producer companies personnel, facilitating agri policies, linking producers groups to market, market infrastructure and reference business models of selected value chain crops, training and capacity building, market information services, cost estimate of investments, summary of proposed investments, brief description of implementing arrangements.

Sixth chapter is discussing about rain water management of the cluster to develop selected commodities as a pilot which consists description of surface water cluster, water budgeting including hydrological cycle, water budgeting exercise for the project area, water budgeting for the project area, calculations, objectives of the water management in surface water cluster, proposed activities in the surface water cluster including studies/Field Surveys, institutional activities, trainings, surface water development activities to be implemented, site specific plan & cost estimates of the activities, estimated cost of Investments under surface water management, implementation arrangement for all the planned activities in the area.

Seventh chapter includes social and environmental assessment of the proposed activities: social assessment of the proposed activities, the social assessment exercise has highlighted the following key social safeguard and social development issues, social inclusion strategies, social management plan under RACP and environment assessment of the proposed activities, environment management plan for crop intensification, environment management plan for water harvesting and water management, environment management plan for livestock management activities, environment management plan for value chain activities, training plan for implementation of environment management plan (EMP), objective of training plan, training type, target groups & frequency.

Eighth chapter is consisting department and component wise consolidated investments plan to be incurred in the cluster.

The Cluster Agricultural Competitive Plan (CACP) is consisting of investments to be made on improving water use efficiency, technology transfer and market led advisory services in agriculture & horticulture development, livestock strengthening and management specially for small ruminants, market and value chains in the cluster.

1.2. Objectives of the CACP

The Cluster Agricultural Competitive Plan (CACP) is the outcome of a planning process that aims to (a) identify opportunities as well as constraints towards developing one or two or more value chains in which the community deem themselves to have a potential competitive advantage and to (b) select from a list of eligible project investments and within the funding constraints of those public investments that will enable the community to address constraints and enhance opportunities towards establishing identified value chains. The value chain proposed would envisage addressing broad sub-sectorial issues as well as help establish specific partnership arrangements between farmer groups or producer organizations with agribusiness companies.

1.3. Rationale of selection of the cluster

The Rajasthan Agricultural Competitiveness Project (RACP) will be implemented in selected locations of the particular agro-ecological zones (AEZ) in Rajasthan. The AEZ will be supported by one or several commodities in a value chain approach. The same commodity can be supported across two and up to three AEZs. Commodities can include traditional crops (annual, perennial) cultivated in Rajasthan and for which an AEZ is believed to have a comparative advantage; or new crops for which a clear rationale and analysis exists that a comparative advantage can indeed be established over time. Small ruminant (goat and sheep) development will be taken forward as a value chain in 8 Agro-Climatic Zones.

Within an AEZ one district will be identified across which cluster will be developed with a primary focus on improving water management across the three water sources, i.e. either canal water or ground water or harvested rainwater (watersheds).

The principles for Cluster selection include: (1) Each Cluster provides for a demonstration or pilot on how to effectively support sustainable and profitable agriculture with a view towards potentially scaling up this model (if successful) in the future (outside of the RACP). For a Cluster to be "testable" it requires a defined theme, demonstration objective and research/development hypothesis that needs to be made explicit at the on-set and supported through the definition of a results framework (key indicators, baseline and monitoring arrangements). (2) If multiple Clusters are identified within one Cluster (based on selected lead commodity), these Clusters will be implemented within the same District to facilitate implementation. (3) For each Cluster the relevant hydrological catchment area will be identified which provides for the basis of water resource management activities. (4) Each Cluster will comprise at least 10,000 ha of cultivation for the lead commodity under the Value Chain approach.

Keeping in view the principles of the cluster selection, the Z-distributary cluster has been selected to achieve the Project Development Objective. The Z-distributary cluster is a canal water cluster which is a hydrological unit. The Z-distributary cluster is situated in I-B Agro-climatic Zone (Irrigated North Western Plains). Sriganganagar is block headquarters of the district and cluster is located just near to district and block headquarters. The Z-distributary Cluster falls in Sriganganagar district, which has been selected to be developed under the RACP after undertaking various field visits by the PMU coordinators and having consultations with the officials of Water Resource Department, Sriganganagar and Jaipur and interactions with the local community.

The area is predominantly rich in agriculture. The average rainfall of this cluster area is approximately 347 mm (in Sriganganagar). As elsewhere discussed, total average cropped area is about 15650 ha, out of which 4801 ha is in Kharif and 10849 ha is in Rabi season. Guar crop is sown in about 2282 ha, Sugarcane in 284 ha, & Cotton in 2235 ha. In Rabi season Wheat is being grown in 4159 ha, Mustard in 4719 ha and Barley is sown in 1970 ha. Only 173 ha are being covered under horticultural crops. Total of area under the above crops makes a total cropping intensity of 130.52%. The above crops which are sown in the cluster are also the main crops in the district. So, surplus production of major crops is generally available in the area.

The production of Guar, Sugarcane, Cotton & other crops is being sold through unorganized local market and mandi of Sriganganagar and nearby mandis. Apart from human consumption most of the produce of Guar crop is used for Guar gum and including other similar crops is also being used as cattle feed, hence looking to the enough livestock population of the district, there is a considerable scope of value addition in this crop. Similarly Mustard crop in Rabi has been selected as value chain in cluster because these crops are having industrial value for development. Apart from this, the area being sown under less paying crops would be diversified into cultivation of high pay off crops like vegetable and fruit crops gradually.

In view of the major crops which are being grown in Kharif and Rabi season and the scope of Guar, Barley crops and Kinnow fruit crop; these crops have been selected as value chain crops in the cluster. Since industrial value of the Guar, Mustard and Kinnow (Orange) fruit crops are significant for any Producer Company (PC), so these crops may be taken as value chain crops in Z-distributary Cluster.

Although there is not significant area under Horticulture/fruit plantations at present, the availability of average land and availability of canal water puts immense opportunity for the cultivation of vegetables and fruits. The area is fairly suitable for fruits like Kinnow (Orange), Date Palm and vegetable crops like Carrot, Orion, Potato & Radish. Hence, some area under cereal & other crops would be diversified in to the cultivation of above these vegetables and fruits crops gradually.

Although the cluster is not considered as livestock cluster due less goat population but the dairy is a quite successful business in the cluster, cultivation of fodder crops has an important role in the cropping pattern to the local farmers.

Therefore, it can be concluded that the availability of sufficient land and canal water along with the proximity to Sriganganagar and nearby big mandis provides enough opportunity for the development of value chain crops and cultivation of vegetables and fruits. Therefore, Z-distributary is an appropriate cluster to be developed under RACP.

Chapter -2: Description of the Cluster

2.1. Spatial characteristics

The Z-Distributary Irrigation project was completed during the year 1928 as a Gang Canal Irrigation project. The diversion head work is constructed across the Gang Canal River, a tributary of Sutlej & Beas River. It is situated in tehsil Sri Ganganagar, District, The latitude and longitude 29.961766 N and 73.899089 E respectively. This Z-Distributary irrigation system provides irrigation facility to area 12128 ha with irrigation intensity of 90%. The area of the cluster is spread over in 49 Chaks/Abadi of 10 Gram Panchayats. The name and area of the Gram Panchayats and chaks/abadi covered in the Project area are given in Annexure 2.1.

2.1.1. Land Use Pattern of the Cluster

Total area of the cluster and irrigated area is 12,128 ha. All 12128 ha area is under cultivation.

2.1.2. Current status of Connectivity

At present there is organized market in the cluster and farmers sell their produce in the Sri Ganganagar APMC markets. The mandis (markets) are located just 10 km from the cluster. Hanumangarh Mandi is situated 63 Kms from the cluster. Road & Rail is connectivity is there. Nearest Airport is Bikaner Airport which is around 312 Kms.

2.2. Agro-ecological characteristics

2.2.1. Slope

The slope of area in Z-Distributary canal project area ranges from the 0 to >1% means the cluster area is almost flat.

2.2.2. Soil Types

The soil of the Project Area is moderately deep and depth of the soil is more than 45 Cm, dominantly sandy loam soils, imperfectly drained, and moderately to severely eroded during the summer by wind.

Table 1: Soil Profile of Z-Distributary canal Cluster

S. No.	Major Soil Classes	Area in hectares
1.	Sandy loamy	12128
	Total	**12128**
	Soil Depth :	
S. No.	**Depth (cm)**	**Area in hectares**
1	> 45.00	12128
	Total	**12128**

(Source: Agriculture Dept., Sriganganagar**)**

The Soil fertility level of the Project Area is given as under:

Table 2: Soil fertility level of the Project Area

Soil fertility Status	Kg/ha	Recommended
Nitrogen	75-200	80 Kg/Ha
Phosphorus	22-40	32 Kg/Ha
Potassium	330-500	Sufficient
Micronutrients	PPM	Recommended
Zinc	0.28-0.80	15 Kg/Ha
Ferrous	2.5-7.8	10 Kg/Ha
Manganese	3.5-8.5	Sufficient
Copper	0.3-0.9	Sufficient

(Source: Agriculture Dept., Sriganganagar)

The analysis of soil data given in the above table shows the need to improve and maintain the soil fertility. Soil health card to every farmer, every crop season is proposed to be provided, which will include the recommendation for application micro nutrients and fertilizers as well as organic manures.

2.2.3. Rainfall Pattern

Climate is extreme with hot and humid summers and chilly winters. Winters are chilly with fog enveloping the whole area. Summers are characterized by high temperatures reaching up to 47 degrees. The cluster area falls under Integrated North Western Plains. Winter season is observed between mid of November to March months followed by summer season extending till June. July to September is the period that in which rainfall occurs. The Agro Climatic Zone under which the Project Area falls is marked as I-B agro climatic zone (Integrated North Western Plains).

The year wise rainfall has been discussed in chapter 5. The rains are source of crop water during Kharif and ground water recharge. The ground water is during the Kharif and Rabi for irrigation. The rain fall data as obtained and given in the table (Refer annexure 2.7) have been utilized while planning water resource development interventions in the cluster: The average rainfall of the cluster area is 347 mm if 10 years data is compared.

2.2.4. Temperature

The temperature during the summers (from April to July) remains high and generally reaches up to 480C. Hot wind commonly known as "Loo" blows between the months of May-June. On the other hand winters have sunny and pleasant days and bitterly cold nights. Temperature can touch the lowest level which is around 0ºC, mostly during the nights. The graphic presentation of temperature is being presented as under:

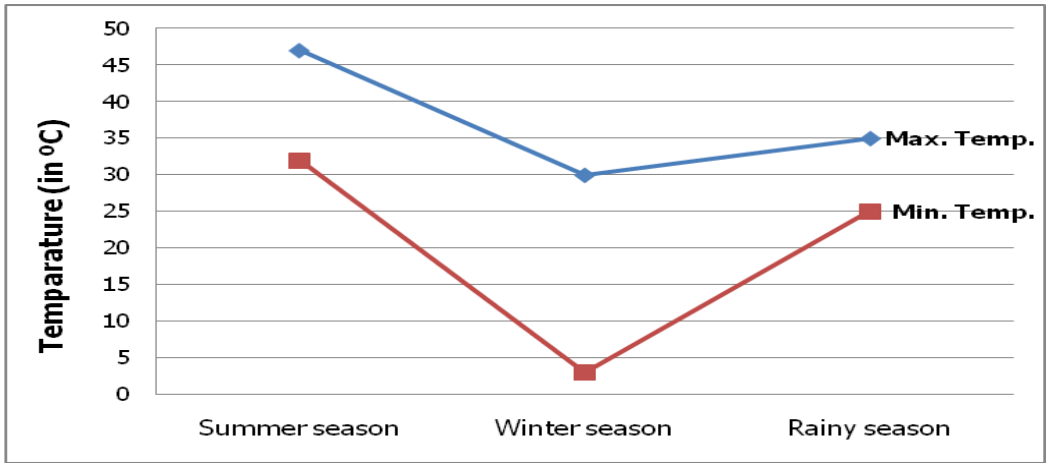


Figure 1: Maximum and Minimum Temperature – Z-distributary

2.2.5. Source of Irrigation

Z-Distributary is a canal water cluster, so the crop water requirement is fulfilled from canal water. In addition to canal water, the monsoon rains are also main source of ground water recharge. As discussed elsewhere, total 49.96 mcm water was released from the canal head for irrigation during the year 2016-17 and irrigated about 13193 ha area. The canal water is mainly used in Rabi and in Kharif crops only lifesaving irrigation is required from canal water.

It is also significant to mention here that total 156 diggies and 46 solar pumps already were constructed / installed in the cluster before launching of activities of RACP. Since there is great requirement of diggies and the solar pumps in the command of this canal system so that the canal water can be used through drip & sprinkler irrigation system and power can be available through solar panel.

The source (method) of ground water/extraction and related details as well as area irrigated is being summarized as under:

Ground Water Status in Z-distributary Cluster

Hydrology

The principal source of recharge to ground water is rainfall. Annual monsoon and non-monsoon rainfall (mm) from the year 2008 to 2012 of the Block Sri Ganganagar of district Sri Ganganagar are given in Annexure –2.14. In canal irrigated areas, a part of canal water through seepage from conveyance system and part of water utilized for irrigation that returns to ground water contribute to storage. The Cluster area falls in the Saline Zone.

Ground Water Level

Ground Water department is monitoring three wells in the Cluster Area. The Pre-Monsoon depth to water varies from 6.33 mts to 7.31 mts below ground level and Post-monsoon depth to from 6.12 mts to 7.03 mts. The Water levels are given in Table-2 of Annexure – 2.14.

Water Level trends (2003 – 2016)

16 years Water Level Trend for Pre monsoon, 2003–2016 and Post monsoon, 2003 - 2016 have been presented in figure-1 & 2 of Annexure–2.3 respectively. During Pre-monsoon period in the long term, increasing trend of ground water levels of 0.27 m/year has been observed in Pre-Monsoon period. Increasing trend of 0.29 m/year in ground water levels of Post-Monsoon period from 2003 to 2016 has been observed in the Cluster Area. The Water levels and trend are given in Table-3&4 of Annexure – 2.14.

Ground Water Extraction Status

Existing Gross Ground Water Draft of 0.77 MCM for Irrigation are withdrawn through 44 wells/Tube wells for irrigation purposes in the Z-Distributary Cluster area. The details are given in Table-4. Existing Gross Ground Water Draft of 0.002 MCM for Domestic purposes are withdrawn from Wells/Tube wells/Hand pumps. The details are given in Table-4 of Annexure –2.14.

The Z-distributary Cluster is under Saline Zone. Ground water potential of Z-Distributary cluster, block Sri-Ganganagar, Sri-Ganganagar district has been estimated as on 31.03.2013 on the basis of GEC-97 Guidelines. Net Annual Ground water Availability as on 31.03.2013 was 2.49 MCM. Net Ground Water is not available for Future Irrigation Development. The details are given in Table-5 of Annexure –2.14

Stage of Ground Water Development: Stage of Ground Water Development in the Z-Distributary Cluster area as on 31.3.2013 is 30.95 which comes under Safe Zone. 1.72 MCM is available for ground water development for Irrigation purposes (Table-5 of Annexure–2.3). However, in canal command areas, conjunctive use of groundwater & canal water is the need of the hour so as to avoid land degradation by water logging hazards and soil salinity/alkalinity.

Existing Gross Ground Water Draft of 0.77 MCM for Irrigation are withdrawn through 44 wells/Tube wells for irrigation purposes in the Z-Distributary Cluster area. Existing Gross Ground Water Draft of 0.002 MCM for Domestic purposes are withdrawn from Wells/Tube wells/Hand pumps. Increasing trend of 0.29 m/year in ground water levels of Post-Monsoon period from 2003 to 2016 has been observed in the Cluster Area. 1.72 MCM is available for ground water development for Irrigation purposes in conjunction with canal water. Based on the ground water study, the Z-distributary cluster area is under safe zone.

2.3. Demographic Characteristics

The Z-Distributary canal water cluster comprises ten (10) Gram Panchayats having 49 Chaks/Abadi areas. All chaks/abadi are falling in the command of this cluster. There is dependency on canal water, rain and ground water. The Kharif crops are being grown on the basis of monsoon rains and Rabi crops are based on canal water so canal is mostly operated in Rabi season only, although as per need lifesaving irrigation may be given during the Kharif also so canal water is available for Kharif crops but in the case of any dry spell ground water is used.

It means monsoon rains, canal and ground water are the source of the irrigation and there is poor infrastructure development, low literacy in the area.

2.3.1. Population

Total population of the cluster is 28885. Out of the total population female population is 46.98% and schedule caste (SC) population is only 36.76% and schedule tribe (ST) population is only 0.07%. During the implementation of the project activities, the involvements of all farmers/households have to be ensured whether these are from lower backward and other weaker classes or upper classes.

Table 3 Population Details of Z-distributary cluster

Male	Female	Total	SC	ST
15314	13571	28885	10618	21
53.02%	**46.98%**	**100.00%**	**36.76%**	**0.07%**

(Source: Field data collected by NGO)

2.3.2. Socio-economic condition of the cluster

The cluster has poor infrastructure development; low literacy levels and high level of migration, which is predominantly observed during times of drought. Although, the farmers have larger landholding, there is scope to improve their net realization from the crop cultivation. The table below reveals that large farmers are 51.63% of the total population, followed by landless 44.60%, BPL 16.16% and only 8.16% farmers are having land in the area. 7.45% farmers are large, 0.43% small, 0.28% marginal and

22.35% are BPL households. There is only 0.05% ST Farmer and only 22.76% farmers belong to schedule caste.

Table 4 Household Details of Z-distributary cluster

BPL household	Land Less	Small Farmer	Marginal Farmer	Large Farmer	Total household	SC household	ST household
942	2600	123	97	3010	5830	1327	3
16.16%	**44.60%**	**2.11%**	**1.66%**	**51.63%**	**100.00%**	**22.76%**	**0.05%**

(Source: District Project Manager, Sriganganagar)

The table given indicates average socio economic conditions of the area. Although poverty ratio and sex ratio are less than the state average, literacy is higher than the state average in the area. However, average per capita income of the project area is higher than the state average.

Table 5: Development indicators of the Z distributary project area

S. No.	Development Indicators	Rajasthan State	District/Cluster
1	Per capita income (Rs.)	4497	7386
2	Poverty (%)	20.10	8.80
3	Literacy (%)	60.40%	70.25%
4	Sex Ratio	1000:928	1000:886
5.	Human development index	The district stands first in Rajasthan	

(Source: WRD DPR of Z-Distributary canal Cluster)

All these parameter needs to be further improved in the project area for understanding the development to the occurred after the project implementation.

2.4. Agriculture-related livelihood characteristics

Agriculture is the chief contributor towards the economy of the district. Sriganganagar district occupies an important place in the agricultural production of the state. It falls in I-B Agro-Climatic Zone (Integrated North Western Plain) as discussed earlier. It is located just near to the Sriganganagar district. The total geographical area of the district is 1093282 hectares which is about 3.19 per cent of the state. Out of this, the average net area sown is 785440 ha. Out of this the rainfed area is 150209 ha and irrigated area is 602859 ha. At the same time some area is also double cropped with the help of irrigation and hence the total cropped area is 1243356 ha. So the cropping intensity of the district is 158% against the state average of 143%.

2.4.1. Cropping Pattern of Agricultural Crops

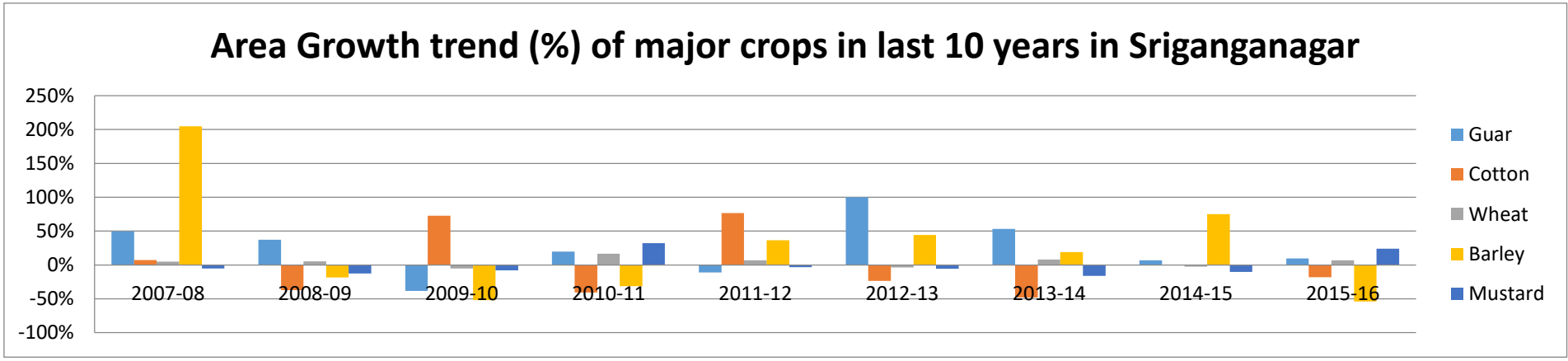
A number of crops are grown in Sriganganagar district. Likewise, the major crops grown in the cluster are Sugarcane, Cotton, Guar and Groundnut in Kharif and Mustard, Wheat, Barley and Gram crops are grown in Rabi season. Among horticultural crop, Kinnow is grown. The area/cropping pattern has been compiled for the state and the district so that the same can be compared with cluster. As per the statistics received from the agriculture department, Jaipur, in the Kharif season, the major crops Sugarcane, Cotton, Guar and other crops etc. are sown in 671138 hectares which is 4.37% of state's Kharif area (15369717 ha). In the Rabi season Mustard, Wheat, Barley & other crops are cultivated in about 613173 ha which is 6.59% of state's Rabi area i.e. 9308039 ha. Thus, the total cropped area of the district is 1243356. The prime sources of irrigation here are tube wells. A total area of around 6566 hectares is being irrigated by 30811 tube wells, whereas by canal, an area of 596293 ha is irrigated in the district.

Based on the crops being grown in the cluster, the cropping pattern of state and Sriganganagar district for 10 years (from 2006-07 to 2015-16) has been compiled from Agriculture department in table No. 5, 6 & 7. The annexure 2.2 clearly shows the increasing and decreasing trend in area & cropping pattern in the year 2015-16 over the year 2006-07. There is almost constant area / cropping pattern in Kharif as well as in Rabi crops over 10 years in the district, only 2.62% area is increased in Guar crop over last 10 years in the district. Whereas in other crops increase or decrease is near to negligible whether these are Kharif crops or Rabi crops.

The cropping pattern of state as well as district is almost constant over the 10 years; it means these crops are well accepted by the farmers in the area. If there is any increase/decrease or any deviation in the cropping pattern, it may be probably due to delay rains or excess rains or market rate and demand. Sometime crops are reached to permanent wilting point and dried due to scanty rainfall or long dry spell between two rains, sometime monsoon over before time. In such circumstances crops could not get ripen and harvested properly resulting productivity may also be affected adversely.

The presented graph (refer annexure 2.2) shows the growth trend of the major crops being cultivated in Sriganganagar in the last 10 years in term of area. It could be seen that guar, cotton and wheat have been on the decreasing side in terms of area.

Figure 2: Area Growth trend of major crops in last 10 years in Sriganganagar



(Source: Data analysis by GT)

Overview of the crops identified in Z-distributary Cluster

Since the Z-Distributary canal cluster is situated near to the tehsil & district i.e. Sriganganagar and nomenclature of the cluster is based on the name of the canal system i.e. Z-Distributary distributary canal system. The cluster has been selected based on the canal water approach. Therefore, improvement in water use efficiency would be achieved through improvement of conveyance efficiency of the system and decreasing water losses come across during the canal operation. In addition, field irrigation efficiency need to be improved to reduce the irrigation water foot print in agriculture. Agricultural productivity including agricultural & horticultural crops would be increased by way of ensuring water availability through adopting various measures in the cluster.

Category wise Cultivated Area in Z-distributary Cluster

Using field assessment and revenue record, category of the farmers has been compiled into various categories like large, small, marginal and below poverty line (BPL) farmers as well as landless households. At the same time the farmers have been categorized into General, scheduled caste, scheduled tribe and other back ward classes. The total cultivated and irrigated area of the cluster is 12128 ha and the total households in the cluster are 5830. The category wise cultivated area in Z-Distributary canal cluster is being summarized in Annexure 2.3.

The table presented in Annexure 2.3 clearly indicates that 44.60% farmers are landless, 16.16% BPL, 51.63% are large, 2.11% small and 1.66% are marginal farmers. Out of total irrigated land, 98.97% irrigated land belong to large farmers, 0.74% to small and 0.29% belong to marginal farmers in Z-Distributary canal water cluster. There is no non command area in the cluster. Total 2.64% land belong to SC large, 2.40% other small & 0.23% large & 0.01% land belong to SC marginal farmers. Only 2.64% irrigated land belong to SC farmers and 97.36% belong to other farmers.

Status of Cropped area of Agricultural Crops in the Z-distributary cluster

Although water resource department has also taken cropped and productivity data which is used for calculating Benefit cost ration (B:C ratio) as discussed in chapter 5. The officers of water resource department communicated that the area has been taken only available in the irrigation record but area irrigated by wells and monsoon rains have not been taken in to consideration. But agriculture department has been taken whole of the area which irrigated either by canal or wells. In addition the area which is sown based on monsoon rains have also been taken in to consideration.

The crops data being summarized hereunder has been taken from agriculture department and also has been confirmed during the Participatory Rural Appraisal (PRA)/ Walk through survey which was performed by field NGO during the year 2016-17. As discussed earlier, the major field crops of Kharif are Guar, Sugarcane and Cotton etc. in Kharif. Whereas, Wheat, Barley & Mustard crops are important crops, in Rabi season in Z-Distributary canal water cluster. Kharif crops are mostly grown on the basis of Monsoon rains. However, lifesaving irrigation is provided during the dry spells wherever irrigation facilities are available from canal or tube wells. The crop wise area under these crops is being presented in Annexure 2.4.

The data given in the above table clearly show that Kharif crops are sown in 75.76% area whereas Rabi crops are sown in 23.47% area. In addition to above area, horticultural crops are also being grown though only in 0.26% area. Thus there was a total cropping/intensity of only 99.49% during the year 2015-16 in the cluster which is very less than the district average i.e. 136% and state average of 143%. No additional area is covered in horticultural crops as irrigated crops. It means very less micro irrigation system is being practiced in irrigated crops in the project area. It indicates that currently there is a scope to enhance use of drip irrigation system in the area for bringing rainfed area into drip irrigation.

As far as crops are concerned, there is a scope to reduce the area of high water requiring crops and increase the area of those crops which water requirement is less and relative water use efficiency is more. For instance the area of Wheat which crop water requirement is more can be reduced and at the same time such crops requiring less water like Mustard, Barley & Gram can be promoted to more areas in Rabi season.

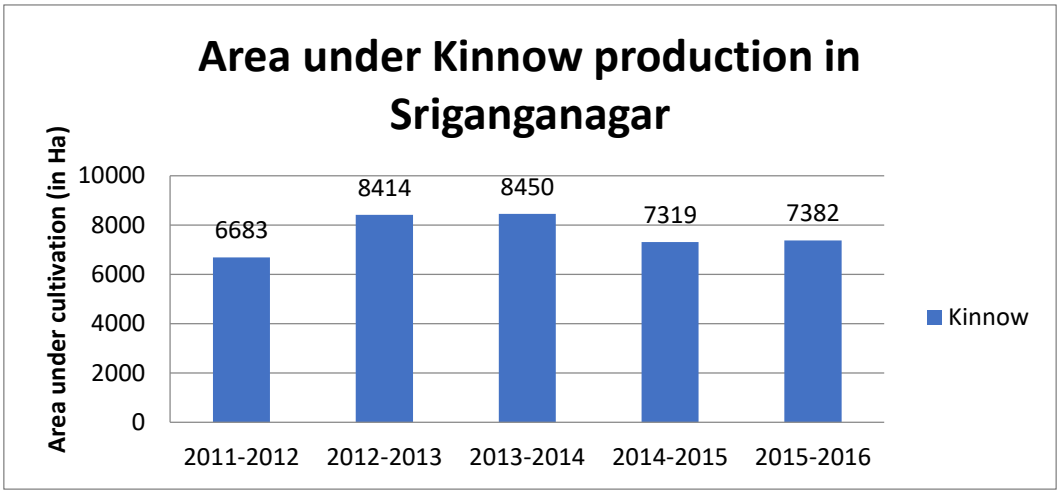
2.4.2. Cropping Pattern of Horticultural Crops

Similarly for better integration, the area under the horticultural crops has also been gathered from the Agriculture department. The area under horticultural crops is very less in comparison to agricultural crops because looking to the potential of the state as well as the district, area is increasing very slowly under horticultural crops i.e. fruits and vegetables crops. So there is a scope to increase area under horticultural crops and efforts need to be made by the concerned department. In case of Z-Distributary canal cluster the Onion, Pea, Okra & Tomato crops are most encouraging vegetable crops and similarly Pomegranate, Lemon and Ber fruit crops are suitable for the Z-Distributary canal cluster.

Year and Crop wise area of horticultural crops in Rajasthan and Sriganganagar district

The horticultural crops like Kinnow, Date fruit crops, Carrot, Potato, Onion, & Brinjal vegetable crops are suitable for the cluster. Horticulture crops very important crops should be promoted and included in the cropping pattern so that nutritional value of human diet may be increased and somehow malnutrition may be addressed. Therefore, horticultural crops have to be promoted through crop demonstrations in the area in the benefit of farmers of the cluster. On the basis of data which are available with the horticulture department, a comparison of State as well Sriganganagar district is being made hereunder for the year 2011-12 to 2015-16 (Refer Annexure 2.5)

Figure 3: Area under Kinnow cultivation in Sriganganagar for last 5 years



(Source: ABPF Analysis)

The above tables reveal that the available information for the district is not encouraging. Only 0.50% area of total net area sown covered under horticultural crops in state and about 1% area is covered in district which is very less and can be said it is near to negligible. Looking to the scope of marketing and potential and facility of the cluster (as it is well connected with National Highways and big mandis), the area may be increased under these crops. It reveals that looking to the potentiality of the area, needed effort has not been made in the district to promote horticultural crops. Hence effort has to be made to enhance the area under horticultural crops in the cluster so that the economic condition of selected farmers can be uplifted. A set of intervention has to be demonstrated in the area to link the farmers with the project to achieve the project development objectives. Here one thing is very much clear that 85% area of state average in the case of Kinnow (Orange) crop is in district. It means it is significant crop of the district and has immense opportunities for value chain development in the cluster

Crop wise area of Horticultural crops in Z-distributary Cluster

Before going to finalize the proposed area of horticultural crops in the selected cluster of Z-Distributary canal, the area of horticultural crops in the cluster has to be discussed. A field survey has been conducted in the project cluster to assess the area under horticultural crops and it was found

that there was no significant area under these crops during the year 2015-16. The reported under the horticulture crops are being presented in Annexure 2.6

The table in Annexure 2.6 clearly shows that reported area under horticultural crops is only 1.43% of the total cultivable command area (12128 ha) but there is a scope to increase the area under these crops i.e. (vegetables: Onion, Potato, Carrot & Radish and fruits crops Kinnow & Date Palm) by diversification of area from food grain crops to the horticultural crops. By this way some upliftment of economic level of farmers of the cluster could be done.

2.1.1. Crop Water Requirement in z distributary Cluster

The Crop Water Requirement of crops being grown in the Z-Distributary canal cluster is being summarized in Annexure 2.13. It shows that that total 1974 ha cropped area is proposed to be increased in the cluster under cultivation. Out of this total 1339 ha cropped area is proposed to be increased under cultivated irrigated area and 635 cropped areas are proposed to be increased under un-irrigated cultivated area. The total water requirement of cluster is 58.80 MCM.

Water Budgeting and Water Balance

Existing Gross Ground Water Draft of 0.77 MCM for Irrigation are withdrawn through 44 wells/Tube wells for irrigation purposes in the Z-Distributary Cluster area. Existing Gross Ground Water Draft of 0.002 MCM for Domestic purposes are withdrawn from Wells/Tube wells/Hand pumps. Increasing trend of 0.29 m/year in ground water levels of Post-Monsoon period from 2003 to 2016 has been observed in the Cluster Area. 1.72 MCM is available for ground water development for Irrigation purposes in conjunction with canal water. Based on the ground water study, the Z-distributary cluster area is under safe zone.

In addition soil moisture would also be available repeatedly and fulfil the crop water requirement of Kharif crops. As discussed elsewhere, the adoption of Micro Irrigation System (MIS) can save about 50% of crop water demand. The field and horticulture crops being grown in Rabi season are depend on conserved moisture and ground water. It means somehow the crops Gram, Mustard etc. crop may be grown on conserved moisture and considerable ground and canal water may be saved. Since the cluster is canal water cluster and sufficient water is available in the cluster. As per Water Resource Department total 49.96 MCM water is available from canal. As far as MIS is concerned, it can be used only on tube wells and diggies constructed or to be constructed on farmers' field under RACP or any other project like PMKSY, RKVY etc. If MIS is adopted in the cluster, maximum to 50% of ground water can be saved. It is also discussed elsewhere that total 1.72 MCM of ground water is available annually in the cluster and since the area is in safe zone including in increasing trend with 0.29 m/year so the same is available for irrigation.

The crop water requirement and need of the ground water may be summarized as hereunder to maintain the water balance in the cluster:

Table 6 Total crop water requirement, proposed saving and net crop water requirement

S. No.	Items	Crop Water Requirement (MCM)	Total Water to be saved due to in-situ moisture conservation in Kharif and adopting MIS (100%) (in MCM)	Net crop water requirement (MCM)
1	Crop water requirement of Kharif crops	18.503	13.877	4.626
2	Crop water requirement of Rabi crops	37.466	18.733	18.733
3	Crop water requirement of Horticultural crops	2.832	1.416	1.416
5	Domestic & drinking water requirement	0.700	0.000	0.700
	Total	**59.501**	**34.026**	**25.475**

Above table clearly reveals that total water requirement is 59.50 MCM and 34.026 MCM may be saved through adopting of MIS, in-situ moisture conservation, cultivation on conserved moisture etc. and net water requirement likely to be 25.475 MCM, whereas 49.96 MCM canal water and 1.72 MCM ground water is available for irrigation in the cluster.

Drinking Water Requirement

The water requirement of human being, animals, birds etc. will also be met out from the cluster. The total of such water requirement is being summarized as under:

Table 7 Requirement of drinking water in Z distributary cluster

S. No.	Particular	Nos.	Per day requirement (in liter)	Total Requirement (in liter)
1	Human	28885	40	1155400
2	Big animal	21940	30	658200
3	Small animal	6110	15	91650
4	Birds	3158	0.15	473.7
Total (in litres) Day				**1905723.7**
Per year Requirement of drinking water (in litres)				**695589150.5**
Per year Requirement of drinking water (in cum)				**695589**
Total requirement (MCM)				**0.70**

(Source: Agriculture department and NGO, Z- Distributary)

Above table reveals that the estimated total water requirement for human beings, animals & birds etc. is 0.70 MCM cum.

2.4.3. Seed Replacement Rate (SRR) in Z-distributary cluster

The status of Seed Distribution and Seed Replacement Rate in the State & District has to be discussed with reference to the project area i.e. Z-Distributary canal cluster. The status of Seed Distribution and Seed Replacement Rate in the State & District is summarized in Annexure 2.9 while that for cluster of z-distributary is given in annexure 2.10.

The Seed Replacement Rate (SRR) in Z-Distributary canal cluster is better than the district. As already mentioned elsewhere that the focus is to be given on adoption of certified seed and high yielding varieties, which are having disease & insect-pest resistance, have higher economic & commercial value in view of the storage capacity & marketing linkages and/or value chains.

2.4.4. Status of Fertilizer Consumption in Terms of Nutrients in State & District:

The consumption of fertilizers for the supply of nutrients is very significant to increase the productivity. But at the same time it is very necessary that they should be used judiciously in the crops. Integrated Nutrient Management (INM) is also important in the production sector. The department has also finalized the package of practices for adoption of INM in crop production. The current status of fertilizer consumption in terms of nutrients is being discussed here as used in the state as well as in the district. The current status of Fertilizer Consumption in Terms of Nutrients during 2014-15 (In Lac Tons) is being summarized under:

Table 8 The current status of Fertilizer Consumption in Terms of Nutrients during 2014-15 (In Lac Tons)

State/District-Sriganganagar	Nitrogenous (N)			Phosphate (P)			Potashic (K)			Total Fertilizer in terms of NPK			Per ha Fertilizer Consumed (Kg/ha)		
	K	R	T	K	R	T	K	R	T	K	R	T	K	R	T
Rajasthan	3.47	6.06	9.53	1.75	1.56	3.31	0.063	0.088	0.15	5.28	7.7	12.98	34.4	82.76	52.64
District	0.17	0.52	0.69	0.08	0.12	0.20	0.002	0.005	0.007	0.19	0.27	0.46	16.31	81.37	30.62

(K – Kharif, R – Rabi & T – Total)
(Source: Agriculture Department, Jaipur)

Above table reveals that average consumption of fertilizers in the district in Kharif is very low which is only 16.31Kg/ha and in Rabi it is 81.37 Kg/ha, which is lower than the state average. In totality the consumption of fertilizers in the district is 30.62 Kg/ha which is again lower than the state average. The judicious use of fertilizers is now needed & the farmers have to be promoted to adopt package of practices and the apply fertilizers in the crops judiciously.

2.4.5. Area Covered and Technical Grade Material (TGM) used under Plant Protection Measures

Rajasthan & Sriganganagar

The aspect of adoption of plant protection measures in the crop production is of paramount importance. Although the use of plant protection measures is not healthy in term of human health but optimum level of production is also need of the time. While adoption of plant protection measures, the Integrated Pest Management has to be kept in mind and accordingly package of practices for IPM has to be adopted at the time crop production in Agricultural as well as Horticultural crops. The current status of seed treatment, soil treatment, poly treatment, intensive treatment, rat & weed control etc. is being summarized in annexure 2.11.
The annexure 2.11 indicates that the seed treatment, poly treatment, intensive treatment, rat & weed control etc. is higher than the state average except soil treatment. It shows that the adoption of the package of practices needs further improvement in a big way keeping in view the Integrated Pest Management (IPM) so that crop production can be optimized without effecting environmental impact.

Z-Distributary canal Cluster

2.4.6. Crop-wise Area Covered and Technical Grade Material (TGM) used under Plant Protection Measures

Rajasthan & Sriganganagar

The crop wise area covered and technical grad material (TGM) used under plant protection measures in the crop production is very important factor to keep the productivity optimum. But excess use of chemicals is threat to the health, so IPM has to be kept in mind in the process of crop production and very careful use of plant protection measures are to be adopted in crop production. The crop wise area covered and technical grad material (TGM) used under plant protection measures in the state and district is being summarized in the annexure 2.12
The annexure 2.12 indicates that the crop wise area covered and technical grade material (TGM) used under plant protection measures is less than the optimum level in the state as well in the district. It means that the adoption of package of practices is not being done at the optimum level. So, further improvement is needed in a big way keeping in view the Integrated Pest Management (IPM) so that crop production can be increased without effecting environmental impact.

Z-Distributary canal Cluster

Likewise the data for Z-Distributary canal cluster is available at the movement. During the field survey, it was observed that the crop wise area covered and technical grade material (TGM) used under Plant Protection Measures in Z-Distributary canal cluster is almost the same as per the district. It means the focus is to be given on adoption of package of practices for enhancing the crop wise area to be covered and technical grade material (TGM) used under Plant Protection Measures keeping in view IPM and high yielding varieties which are having disease & insect-pest resistance and have higher economic & commercial value in view of the storage capacity & marketing linkages and / or value chains.

2.5. Structural characteristics

The Z – Distributary cluster is located in Sriganganagar district. The district has a number of industrial areas like Udyog Vihar I, Gharsana –II, Rawala –II, Rawala – I, Udyog Vihar II, Raisinghnagar and food park like Agro Food Park Sriganganagar (source: MSME Development Institute, "Brief industrial profile of Banswara district"). Apparently there are over 7 registered SME and 701 agro and

food based products unit in the district. Major leading processors in district are Ruchi Soya, Khendelia Oil and General Mill and Sugar Mill. They are into edible oil, soya meal and sugar respectively. Some of the supporting institutions and service providers supporting processing units with region are given in the Annexure 2.15

The structural infrastructure in the Z-distributary cluster that may influence Agri business activities in the clusters presented below:

2.5.1. Government departments

There is presence of Agriculture, Horticulture and Water Resource departments. These departments have head office in Jaipur but they have offices at district as well as district level too.

2.5.2. Farmer Producer Companies

The cluster has 10 Gram Panchayats covering 39 villages with 51 Chaks with 12123 Ha of area. There are 323 MTGs for Agriculture & Horticulture related farmers and 6 Water Users Associations. As per the field consultation and discussion with the local NGOs, there is inexistence of an operational or defunct farmer producer company in the region of Z-distributary cluster.

2.5.3. APMCs

Regulated market is wholesale market where buying and selling is regulated and controlled by the state government through the market committee.

Z distributary cluster is in the boundaries of Sriganganagar district, which has 13 APMCs. The distance of the APMCs from the cluster area is as given below:

a. Anoopgarh, 153 kms from the cluster
b. Gajsinghpur, 50 kms from the cluster
c. Gharsana, 150 kms from the cluster
d. Jaitsar, 73 kms from the cluster
e. Kesarisinghpur, 20 kms from the cluster
f. Lalgarh jatan, 35 kms from the cluster
g. Padampur, 30 kms from the cluster
h. Raisinghnagar, 60 kms from the cluster
i. Rawla, 165 kms from the cluster
j. Sadulshahar, 55 kms from the cluster
k. Sri Karanpur, 34 kms from the cluster
l. Sri Vijaynagar, 100 kms from the cluster
m. Sriganganagar, 19 kms from the cluster.

Farmers sell their produce mostly in Bajju market which is a sub yard of main APMC in Sriganganagar, irrespective of the season or type of crop. In some cases, village level traders also approach and buy the produce at farm gate itself.

2.5.4. Private market yards

Rajasthan is a leading state in implementation of model act. Private mandis yards ensure alternative channel, availability of organized market in uncovered area as well as effective competition, among the mandi and has freed up monopoly of state government on agri marketing infrastructure supply in the state. The state has issued 10 licenses for the same and out of which 2 such yards are operational in Ganganagar.

a. Balaji Agri Trade pvt. ltd.

b. Vinayak sub market yard- Markets

2.5.5. Warehouses

During the discussion with the farmers of the Z-distributary cluster, it was found that their presence of public and private warehousing structure in the cluster. Due to inefficient type of grain storage structures and space, the farmers are compelled to sell their produce immediately after harvest at any unwarranted prices to the middlemen cum traders. Farmers are, thus, unable to garner high returns from their produce.

Sr. No.	Name of Warehouse	Capacity
1	Rural go-downs	23,300 MT
2	State warehouse corporation	6,000 MT
3	Central warehouse corporation	35,200 MT

2.5.6. e- Markets

We are currently witnessing the transition to online marketing for various marketing activities involved in agriculture business. Government has taken various initiatives to introduce trading platforms for the support of agriculture business. As of now no e-markets are available in the cluster.

2.6. Predominant practices for cultivation

Following are the predominant practices being carried out in the Z-distributary cluster with regard to the purchase of inputs, crop cultivation and transport of harvested produce-

#	Particulars	Present Practice
1	Seeds/Fertilizers	Local Input Shops
2	Fungicide & Pesticide	Local Input Shops
3	Land Preparation and other cultivation practices	Local Labour and own/hired tractors/implements
2	Harvesting and farm level grading	Combine Harvesters
3	Transport	Pick up vans/Tractor Trolleys/Bullock carts
4	Credit	Traders provide facilities, credit facilities with interest. KCC
5	Marketing	Local Traders
6	Packaging	Processors- Cleaned and grade and packages it in 30 Kg Bags for Retailing

Chapter – 3: Strategic context and rationale for selecting value chains in z-Distributary cluster

3.1. Parameters for selection of Value Chain crops

A scoring matrix consisting of the parameters along with their weightage has been designed for prioritisation and selection of commodities for value chain intervention in the cluster (Annexure 3.1). Broadly, there are four different types of parameter categories with different weights based upon which the crops have been scored. Guar, Wheat, Cotton, Mustard and Barley are the major agriculture crops and Kinnow and Carrot are major horticulture crops from cluster that have been considered and compared using this scoring parameter. (Annexure 3.2)

3.1.1. Existing size of the crops

The first category of parameters may be broadly categorised under with respect to existing size of crops in the cluster with regard to their area under cultivation, production and average cluster level productivity relative to national average productivity. Wheat has the largest cropped area while Mustard and Guar are next to Wheat. Wheat also has the largest production followed by Cotton and Barley (Annexure 3.2).

3.1.2. Potential for Value addition

The second category of parameters may be broadly categorised under the potential for value addition to the crops of the cluster, implying scope for increased value addition for local producers and processors and higher margin realization for producers. The typically processed value added products of each crop have been considered for estimating the retail level price spread. In order to maintain parity among these crops for their different value added products, the yield loss at processing level has been considered in cases to get the actual required raw material to prepare the end product. For instance, the yield loss in case of Barley malt, it has been considered as 20% while that for Guar gum, it is 30%. Yield loss has been taken 60% for Mustard oil and 25% loss in Kinnow pulp. Wheat sustains 10% yield loss in wheat flour manufacturing and Carrot has 85% loss in making of pickle. Thus, Carrot pickle gets the highest score in the price spread at retail level as pickle has retail price spread of Rs. 80,000/- which is based upon its market value of Rs. 800 per kg and gross realization of farm at Rs. 7 per kg. Barley malt realizes second highest retail price spread of Rs. 48,000/- per Qtl followed by Guar.

In the parameter related to price spread between farmer's gross realization at the farm and price paid by the primary processor at mandi, a margin of 4% has been considered as measure of price spread, over and above the prevalent mandi prices of the crops after consultation with traders and processors. Cotton scores the highest with around Rs. 192 per quintal followed by Guar with Rs. 116 per Quintal.

This parameter signifies the small scope of getting this margin transferred to farmers through relevant value chain interventions in the crops such as through establishment of primary processing FCSCs and reduction in mandi fees.

Net profit in production per acre is the measure of direct returns to farmers by selling the crop in the mandi and fodder locally without any value addition. The fodder yield for Barley and Wheat is almost equal to their commodity yield that is 15 Qtl/acre and Guar has fodder yield of about 5 Qtl/acre. Overall, Cotton gets the highest score in this category while Kinnow and Carrot being horticulture crops realizes highest net profit.

The next parameter is scope for processing in the state of Rajasthan. There are comparatively more number of secondary and tertiary processing units of Mustard like Adani Wilmar, Dhara and other private players in the state followed by Barley, having some multinational units in the vicinity along with many industries in the state.. Although wheat has multiple private flour mills and cleaning and grading units, it lacks nevertheless in high end technologically advance processing units which could yield refined and high quality end products. Kinnow and Carrot though have high end tertiary products but not many value addition units are present in the state.

The parameter regarding the number of value added products of the crop considers the scope for locally feasible value addition at the primary level, secondary level, tertiary level and above such that higher the degree of value addition, higher are the returns. Among these crops, Barley and Wheat have the highest number of value added products viz. flour, grains, malt and feed for Barley and grains, flour, bakery products and daliya.

In order to quantify the parameters of growth in market demand, the national growth rate of consumption has been calculated (as CAGR) for each commodity and equated against its market demand. It is highest for Guar (8.00%) followed by Mustard (5.00%) and Barley (4.50%) (Annexure 3.2)

3.1.3. Environmental Parameter

In the next category for environmental parameter with respect to water intensiveness of the crop, the water requirement of every crop has been compared with each other. The crop with lowest water requirement has scored the highest as it proposes the highest scope for crop diversification in order to conserve water in the cluster. Importantly, Guar with lowest water requirement of 2000 cum/ha has the highest scope for crop diversification followed by Barley and Mustard with that of 2500 cum/ha and 3000 cum/ha. (Annexure 3.2)

3.2. Inference from the Scoring Matrix

It could be concluded from the total scores of the matrix that Barley is the most important value chain crop in the matrix. Barley, currently, has the third highest cropped area in Rabi. Barley has the highest potential in value addition with the highest scope of processing along with the highest number of possible value added products used commonly. Barley also serves the main objective of project of saving water.

Second highest scoring crop is Wheat but from the discussions PMU and district officials it was concluded that a highest scoring crop from Kharif should be chosen instead of choosing two crops from same season. Guar has the highest cropped area in Kharif. In terms of potential for value addition, it has an average score less than Barley and Mustard only. Guar has the least crop water requirement and hence serves with the main objective of the project.

Although Kinnow is not among top 3 scoring commodities but as per the discussions with PMU and district, it was concluded that since Kinnow is exclusive commodity of the district so it should be included in the value chain intervention.

Based on the above facts, Barley, Guar and Kinnow are the three crops selected for the value chain intervention. Apart from Kinnow, Carrot is being promoted as the other vegetable crop in the cluster. (Annexure 3.2)

3.3. Current marketing chain of selected value chain crops

Present condition of overall value chain of selected commodities has been ascertained and formulated with the help of site visits and interaction with producers and related stakeholders. The questionnaire schedules can be referred in Annexures 3, 4, and 5. With support of the production analysis made in the earlier chapter, an attempt is made to arrive at the value added activities and value added products that could substantially add values. (Annexure 3.3)

Barley

There are 3 important production-distribution/marketing channels. In all these channels, farmers/producers supply commodities to the APMC through village level traders. APMC commission agents in turn supply them to malt processors and thereafter malt barley is supplied to domestic brewers and distillers (channel 1) and larger international brewers and distillers (channel 2). In channel 3 feed and barley is supplied through APMC commission agents to processors and then onward to domestic and global retailers. The critical constraints in many locations is that the price yield from barley cultivation is lower than that of wheat in some seasons affecting crop diversification into this less water intensive crop. There is apparently scope for diversification into higher value yielding food than feed barley in many clusters to cater to the many local processors in the region. (Annexure 3.3)

Typically, the gross yield enjoyed by producers is 15 quintals per acre. Gross value realisation on sale at Rs. 1,400 per quintal is Rs.7,901 per acre. The cost of cultivation is about Rs. 13,100 per acre and the net value realisation is about Rs. 12,401 per acre. (Annexure 3.6)

Kinnow

The current marketing channel of Kinnow consists of commissioning agents and APMC mandis which procure from the farmers and perform the primary processing such as waxing, sorting, grading and packaging. After this, it is sold to the processors and fruit and vegetable mandis located in the city where secondary processing of Kinnow takes place such as to prepare concentrate, pulp, flavoured drinks, etc. it is then packed and branded to be sold into wholesalers, retailers, supermarkets from where it is purchased by the consumers. It is also exported from there. (Annexure 3.3)

Typically, the gross yield enjoyed by producers is about 112 quintals per acre. Gross value realisation on sale at Rs. 2,000 per quintal is Rs. 104,000 per acre. The cost of cultivation is about Rs.120,000 per acre and the net value realisation is the same as the gross profit i.e. Rs 104,000 per acre. (Annexure 3.6)

Guar

The pre intervention value chain of Guar has essentially three value chains. In the recent years, farmers are mostly selling it to commission agents as Guar has become a highly speculative commodity and farmers are getting mandi price from their door step due to commission. The Guar then reaches the mandi from where it is being traded by whole sellers. However, NCDEX e-portal has become a big tool for determining the market price for Guar and many small commission agents apart from wholesalers are also trading in Guar in NCDEX platform. Most of the guar finds its way to guar

split/dal making units locally situated in Bikaner/ Jodhpur/ Ganganagar/ Jaipur from where, the split is being supplied to further processing to secondary processors or is directly exported. The husk (Guar churi and korma) is supplied by the primary processors to animal feed industry. It also has a good demand in the international market.

Guar has many industrial usages domestically in paints, gum, noodles and pharmaceutical industry. However the demand is stagnant. Most of the speculations in Guar have happened due to use of guar gum as a franking shell for extraction of petroleum in the US. The demand has however again reduced due to low oil prices internationally. It can be noted that, the USA promotes franking only when the prices of crude oil increase beyond a certain point to check expenditure on imports. Hence it can be inferred that, Guar prices are directly linked to the international crude oil price now a days. (Refer Annexure 3.3)

Typically, the gross yield enjoyed by producers is barely 3.86 quintals per acre. Gross value realisation on sale at Rs. 2,900 per quintal is Rs. 4,394 per acre. The cost of cultivation is about Rs.6, 800 per acre and the net value realisation is about Rs. 5,908 per acre. (Refer Annexure 3.6)

Chapter – 4: Key opportunities and challenges in selected value chain crops

4.1. Opportunities and challenges

(A) Looking at the cropping pattern, production, etc., the following crops have been selected for value chains study/diagnostics.

Sr. No	Season/Type	Crop
1	Kharif	Guar
2	Rabi	Barley, Kinnow

(B) The SWOT of key commodities reflects gaps in terms of storage and primary processing facilities, large number of intermediaries in the chain, limited market information on processing activities, limited support from financial institutions for producers and/or their networks etc.

The SWOT of the key commodities/crops as per value chain study is as follows:

4.1.1. Barley

Barley is a major Rabi crop grown in Z-Distributary cluster. It is mainly grown for Malt, Feed, Biscuit and Flour purpose.

Strength	Weakness
• Barley ranks as the major crop world wide • Barley is largely for animal feed and it is as food crop growing demand • USA is the leading producing country followed by Argentina, Brazil, and Ukraine • A.P , Karnataka, Bihar , Maharashtra, and Rajasthan are important producers • Good demand by poultry industry in India which constitutes 47% of demand for India's production • Rajasthan is one of the leading producers of Barley in India. • Less water intensive crop	• Barley productivity is less and variety is not suitable for processing (Malt) • Traditional packages of practices in cultivation of Barley • Limited identification efforts for farmer leaders (entrepreneurs)and BODS at field level in Barley Value Chain for capacity building • Banks do not support individual farmers for crop loans etc. • High dirt content in harvested barley • Mostly Rainfed crop usually resulting in harvesting of immature grain without water/critical irrigation at time of pod filling. Resulting in small-sized grain • During good harvest prices Collapse and hence storage option could help avoid distress sale • Not aware of special license option to source directly from farmers /FPCs. • No alternate marketing channel developed for Barley to facilitate crop diversification. • Inadequate links with farmers for direct procurement.

	• Inadequate capacity building programs on Market led extension services.
Opportunities	**Threat**
• Option for crop diversification in rainfed areas. • Growing demand for malt barley and presence of processing players in the state itself. • Good processing opportunities for Barley-Barley Feed, Barley Biscuits, Barley Flour. • Development of alternate marketing channel for barley procurement is possible.	• Less productivity may change farmers' interest to produce Barley. • Natural calamity may impact production and hence productivity and profitability.

4.1.2. Kinnow

Kinnow is a major Rabi crop grown in Z-Distributary cluster. It is mainly grown for Juices, Jams, and Jelly.

Strength	**Weakness**
• Growing global and national demand fortable variety and juice • Comparative advantage in production-Brazil, China, Indi, USA, Mexico, and Spain.(India- production of 79,86,683T in 2014. • Nagpur santra and kinnow variety grown in Rajasthan. Mandarin in renowned Ganganagar district • Jhalawar in Kota district hectares with 200,000MTproduction per annum. • Strong support institution like "Centre of Excellence for Oranges, Kota" etc.	• High cost of pesticides, unavailability/spurious pesticides. • Constraints vis-à-vis water source for irrigation • Net yield is nominal term for an acre presently is • Perishability: Highly perishable product if fresh
Opportunity	**Threat**
• Variety of value added products have demand: oranges juice, jams, jelly. • Scope to increase net yield in nominal terms • Scope to establish FCSC with washing, sorting, grading and waxing facilities	• Any sudden change in weather may impact the production of oranges • Crop diversification can adversely impact the production of oranges as the producers would tend to grow other crops instead softened. • Import policies of GOI may tend to increase orange imports which can impact prices of local oranges

4.1.3. Guar

Guar is a major Kharif crop grown in Z-Distributary cluster. About 90% of the crop is exported for shale gas and oil Industry

Strength	**Weakness**
• About 80% of world production occurs in India and Pakistan, but due to strong demand, the plant is being introduced into new areas • The main areas of cultivation of Guar gum in India are Rajasthan, Gujarat, Haryana and Punjab • Guar is very drought-tolerant and sun-lovin Being a leguminous crop, guar fixes nitrogen, making the soil fertile.	• The area under Guar cultivation is reducing in India • Reduced productivity as cultivation on marginal lands in states like Rajasthan • Due to inadequate infrastructural facilities with producers, traders and at market level results in marketing inefficiencies • Limited processing units for guar and its by-products such as flour units, roasted Guar units, etc.

• Guar as a plant has a multitude of different functions for human and animal nutrition but its gelling-agent-containing seeds (guar gum) are today the most important use • Demand is rising rapidly due to industrial use of guar gum in hydraulic fracturing (oil shale gas) • Guar meal korma and Guar meal Chunni are widely used as prime raw material for producing various kinds of Cattle feeds, Aqua feeds, fish feeds, poultry Feeds, dairy feeds. • Only 10% of the Indian production stays within the country and the remaining 90% is exported for shale gas and oil industries	• Adequate storage facilities required. • Lack of guar processing units • Large number of intermediaries in the chain leads to low producer's income. • No grading on the farm level • Obsolete techniques are used in processing, which reduces the output. • Lack of market information regarding prevailing prices, arrivals etc. force farmers to sell in village itself.
Opportunities	**Threat**
• Scope for tie up of FPOs through CFC with firms like Agro gums, etc • Scope for tie up of FPOs through CFC with guar processors/MSME firms • Scope for facilitation of start-ups from amongst FPOs or individual entrepreneurs, in secondary processing of value added products of Guar like guar gum, guar vegetable, etc • Scope for establishment of quality processing facilities by FPOs as part of Farmers Common Service Centre (FCSC), along with facilities for packaging and vehicle to facilitate transportation. • Establish storage facilities by FPO as a part of FCSC. • FPOs to undertake joint input sourcing activities for seeds, fertilizers, pesticides, etc. under the umbrella of CFC • FPOs to also undertake custom hiring services and hence lead farm mechanisation through CFC	• Adverse climatic condition like frost can impact the crop production and productivity • Lack of higher remuneration in guar may reduce farmer's interest from cultivating it.

4.2. Constraints in value chain crops of Z-Distributary Cluster

The constraints observed under various value chain crops in the cluster are divided under from different categories, Viz, Production related constrains, Post-Harvest related constrains and Processing and market infrastructure related constrains.

4.2.1. Production related constraints

Barley

Barley is a major crop of Rabi in the Z Distributary (Sri Ganganagar) cluster. Due to unavailability of irrigation water from canal, production of Barley gets affected.

Kinnow

Kinnow is major fruit crop of Sriganganagar district having more area and production under Kinnow cultivation as compared to other fruits crops. The area has great efficiency and potentiality for Kinnow production due to favourable climatic condition and irrigation facilities for Kinnow cultivation. There is fluctuation in production due to irregular and insufficient water supply from the canal. High initial cost in establishing of orchards, labour cost is very high, lack of credit facility & high cost of transport of fruits and plant materials.

Guar
This is an important industrial crop for gum and other industrial products, which is also used as green fodder vegetable. Guar is a major Kharif crop along with Cotton. There is increase in cost of production due to high fluctuation in price.

Training of producer: Farmers are not trained in the marketing system. Proper training will improve their skill for better marketing of their produce. They should be trained on AGMARK standards, how to get market information and factors on which prices are determined. For e.g. size, shape, colour, moisture in grains, weight loss in fruits and vegetables etc.

4.2.2. Post-Harvest related constraints

Barley
There is lack of post-harvest facility except sun drying in Barley produced. Cost of transportation of carrying crops to market is very high. Farmers don't get better price as price comes down in market when there is bulk arrival in market.

Kinnow
Due to unavailability of proper storage facility and primary processing unit, wastage is more. Transportation cost is very high.

Guar
Due to moisture content is high, farmers don't get better price for their produce. High fluctuation in price of Guar also leads to distress sell.

Inadequate storage facilities in rural areas: Storage facilities in villages are found to be inadequate which contributes leads to distress sale. Due to lack of storage facilities, substantial quantity of commodity is also lost.

Transportation facilities at producers' level: Due to inadequate facilities of transportation at the village level, producers are forced to sell farm produce in the village itself to itinerant merchants or traders directly at low prices. Aggregation and negotiation with buyers is only possible if farmers have volume to trade and transport up to procurement centre.

4.2.3. Processing and market infrastructure related constraints

Barley
Due to lack of Barley processing unit in the region, farmers don't get better price. Most of the processing units are situated in Kota & Alwar.

Kinnow
There is lack of processing units in Sriganganagar because of that farmers are dependent on processing units outside states which leads to wastage and high processing cost.

Guar
There is a lack of cleaning and grading facility at cluster level. Due to high fluctuation in price of Guar processing units are facing huge problem.

Traditional system of marketing: In the cluster, there is an absence of alternate channels of marketing. So farmers typically sell only through APMCs or village level traders.

Lack of market intelligence services: Farmers do not receive information on market prices. Some farmers sell crops through village level traders, because due to which they are not realising fair price.

Lack of primary processing infrastructure:

i. There is a non-availability of facilities for primary processing: cleaning, grading & sorting at the farm level.
ii. There is no practice and provision of producer level storage.
iii. There is acute lack of awareness among farmers regarding FAQ (Fair Average Quality) standards.
iv. Farmers do not practice the usage of basic equipment like moisture meter and weighing machine.

Fluctuations in prices: Generally, the price of farm produce goes down in the post-harvest period due to heavy arrivals in the market and later shoots up. Farmers in the catchment area do not have storage facility to store and they also don't use a warehouse receipt system.

Adoption of grading: Grading at the producers' level ensures better prices to producers and better quality to consumers. At present there is no infrastructure available at the farmers' level for primary processing.

Malpractices in markets: Many malpractices prevail in the markets i.e. excess weighment, delay in payment, high commission charges, delay in weighing and auction.

Infrastructure facilities: Due to inadequate infrastructural facilities available with the producers, traders, millers and at market level, the marketing efficiency is affected adv**ersely**

Long Supply Chain: The existence of a long chain of middlemen also reduces the producer's share in consumer's rupee.

4.2.4. Agri business policy related constraints

Contract farming: Rajasthan has adopted a model APMC Act, 2007. In Rajasthan Contract farming of desired variety and quantity as per buyer's/processor's need, has been allowed. Buyer/processors may supply inputs and technical know-how and farmers may produce the crop for sale to buyers at an agreed price. However, this price shall not be lower than minimum support price and title of land shall remain with farmer. Produce will be purchased at buyer/processor's business/factory place. But processors found less interested in registering under contract farming. As per the discussion carried out by Team ABPF with some of the processors regarding contract farming, the common issues and challenges are given below:

Rule 5 – Each agreement shall be written on stamp paper of the value of Rs.100. This increases cost of procurement and procurement time.
Rule 9 – Separate registration form shall be filled for each agreement. Large amount of paper work can be reduced by group registrations or procurement directly from FPCs.
Rule 17-In case the contract farming buyer fails or refuses to purchase the agreed quantity of the agriculture produce from the contract farming producer, he is to pay the amount of the difference between the agreed price and the actual sale price of the contracted produce in the market committee concerned to the producer. Mutual termination of contract should be allowed.
Rule 19 – The contract farming buyer need furnish an undertaking equal to 20% of the value of the contracted amount. This amount can be reduced and this will motivate big players to participate in contract farming.

4.3. Intervention plan of selected Value chain crop of Z-Distributary Cluster

The intervention plan in the selected commodities in the light of critical constraints may be viewed as follows:

4.3.1. Barley:

Table 9: Indicative intervention plan of Barley value chain

Sr.no	Constraints	Action	Action By
1.	**Production**		
1.1	Productivity is less and variety is not suitable for processing (Malt)	Introduction of new Malt Variety	Processors like Soufflet (ABPF)
1.2	Traditional package of practices	Farmers training on best package of practices	Processors like Soufflet (ABPF)
1.3	Limited identification efforts for farmer leaders (entrepreneurs)and BODS at field level in Barley Value Chain for capacity building	Soufflet to identify farmers' leaders and these farmers' leaders will be trained by ABPF to be evolved. ABPF to prepare DPR and link these entrepreneurs with bank to get credit facilities. Incubation support to entrepreneurs.	Processors like Soufflet and ABPF
1.4	Banks do not support individual farmers for crop loans etc.	Organise bankers meet with Soufflet; crop bans could also be used to measure input line seed	SLBC, ABPF and Soufflet
2.	**Post-Harvest**		
2.1	High dirt content in harvested barley.	Ensure availability of the Cleaning & Grading facility to farmers; ensure 10% lower income accruals to farmer.	
2.2	Mostly rain fed crop usually resulting in harvesting of immature grain without water/critical irrigation at time of pod filling. Resulting in small-sized grain	Farmer training, water management /sprinkler irrigation, pond + drip option etc. led to be considered.	RACP, SPs with input from ABPF
2.3	During good harvest prices Collapse and hence storage option could help avoid distress sale.	Storage facility with electronic weigh bridge for farmers as part of FCSC/individual unit	RACP, ABPF
3.	**Processing**		
3.1	Not aware of special license option to source directly from farmers /FPCs.	Awareness seminars for processors.	ABPF
3.2	No alternate marketing channel developed for Barley to facilitate crop diversification.	Soufflet to secure Single Purchase License. ABPF to link FPCs/farmers with Soufflet for Barley marketing.	Processors like Soufflet and ABPF
3.3	Inadequate links with farmers for direct procurement.	ABPF to organise BS meet with players like Soufflet, Cargill etc.	ABPF, RACP
3.4	High cost of procurement due to taxes like mandi tax and VAT	ABPF to work on policies for ease of procurement. Policy Support for value chain players like Soufflet	ABPF
3.5	Inadequate capacity building programs on Market led extension services and weds.	ABPF to organise capacity building program for farmers	

Sr.no	Constraints	Action	Action By
		with market leaders like Soufflet	

4.3.2. Kinnow:

Table 10: Indicative intervention plan of Kinnow value chain

Sr. No	Constraints	Action	Action By
1.	**Production**		
1.1	High cost of pesticides, unavailability or spurious pesticides	Aggregated input facilitation through FCSC/s ensuring good quality and reasonable price	FPC with support from RACP and SPs
1.2	Lack of appropriate information on availability of good quality versus scrummed planting material	FPC to undertake joint input sowing activities for seed fertilizer, pesticides, etc under umbrella of FCSC	FCSC with support from RACP
2.	**Post-Harvest**		
2.1	Lack of adequate water resources result in poor quality fruit	Farmer training on water management, means of irrigation drip/ sprinklers, pond farm, etc.	RACP with input of, SPs
2.2	Lack of knowledge of standard package of post-harvest practices	Farmers training on standards package of post- harvest practises	With support of RACP and ABPF
3.	**Processing**		
3.1	Inadequate sorting and grading facility	Technical services, establishment of common facility services are imperative	PC with support from RACP and SPs with inputs from ABPF
3.2	Lack of post-harvest farm level washing fungicidal treatment & waxing facility	Provision of packing, waxing, washing facility of FCSC	FCSC with support from RACP and SPs with inputs from ABPF
3.3	Very limited oranges development: pulping, juice manufacturing units, etc	Facilitate start-ups in secondary processing from amongst FPOs / individual entrepreneurs	FCSC with support from RACP and SPs and inputs of ABPF

4.3.3. Guar:

Table 11: Indicative intervention plan of Guar value chain

S.no	Constraints	Action	Action By
1	**Production**		
1.1	Unavailability of high yielding varieties of guar for farmers	Seed production programme using sources of Raj seeds through PC	PCs with support of SPs
2	**Post-harvest**		
2.1	Dearth of adequate storage facility	Storage facility for farmers as part of FCSC	RACP, PC, SP with inputs from ABPF
3	**Processing**		
3.1	Limited number of processing units such as guar gum processing unit in the region	Facilitate start up in secondary processing from among PC members or individual entrepreneurs; ties with large players such as Agro gum	RACP, PC with inputs from ABPF
3.2	Lack of cleaning and packaging facilities which result in losses as well as contamination	Provision of cleaning and packaging facilities as part of FCSC.	RACP, PC with inputs from ABPF

4.4. Interventions through FPC in the value chain crops of Z-Distributary cluster

4.4.1. FPC Development Approach

The FPC development approach may be viewed as depicted below:

Figure 4: FPC Development Approach

Following are the steps to be followed for formation of the FPC:

- **PRI of the MTG:** The MTGs will be made aware on the FPC model through PRI and individual farmers will be motivated to join the FPC as shareholder through respective MTGs.
- **Initial discussions with MTG leaders**: After PRI is done, initial discussion will be done with the MTG leaders for further orientation on FPC concept.
- **Identification of MTG leaders**: MTG leaders who show inclination to the concept will be selected in the executive committee for FPC formation.
- Resource mobilization and FPC planning: The executive committee will meet 2-3 times to plan further activities of FPC viz. crops, strategy for business etc.
- Election of BoD and Share collection: 10-12 BoD will be identified along with 2-3 expert directors one each from Agri, Horti, AH and WS dept. The BoD will decide on share value and initiate collection of share through MTG leaders.
- **FPC registration:** Following identification of FPC BoD, registration will be done. This may take 1-2 months as DIN no of BoD has to be generated first. Care should be take that all elected BoD should have PAN no so that there is no delay in paper formalities for registrations.

- **FPC business:** Following registration of FPC, ABPF will prepare business plan for the FPC and facilitate market linkage for input and output.
- Setup of processing/ financing – ABPF will further facilitate establishment of processing unit setup along with feasibility studies and planning business linkage with market players.

4.4.2. Policy and Management

A PC will function within the overall policy and regulatory framework as per the Producer Company Act. The management of a PC or FPO will vest with the elected Board from amongst the members. The provision about constitution of managing committee will be made in the byelaws. The management of PCs will be by an elected Board of Directors. Therefore, the representatives of farmers will actually oversee and manage the affairs of a Producer Company or FPO.

The selection criteria for membership of FPC may be viewed as follows:

1. A member will express his willingness to become a member of PG / CIG / FIG.
2. A member will actively participate in all functions and activities of PG / CIG/ FIG and PC.
3. A member will contribute his equity to the Producer Company (PC)
4. A member will bring all or part of his produce to the PC for sale.
5. A member will purchase all or part of his farm inputs through the PC.
6. A member will produce and prepare his produce for marketing as per directions of PC.
7. A member will contribute his share to the Producer Association as upfront payment for the business development plan of a PC as needed.
8. A member will contribute his share to the Producer Company towards the reserves of PC as needed.

Illustrative list of components of a common facility of a Producer Company (Food Grain)

- Godown for storage, drying platforms
- 2-3 MT per hour grain cleaning, grading, and packing machinery with shed
- Additional need based Agricultural Equipment
- Computer with internet connectivity for market information
- Display Board with Accessories
- Auction Hall
- Input Suppliers Shops
- Toilets
- Drinking water & Electricity

Note: Though the illustrative infrastructure proposed is shown in the above tables, the actual infrastructure to be developed will be need based and on participative consultation process.

Typically, start-up may be involved in secondary and tertiary processing activities while FPO's may be involved in post-harvest and primary processing activity. In many cases, start-up may emerge firm within FPO members.

4.4.3. Introduction to FPC Model

Aggregation is the proposed solution of the constraints farmers are facing at present. It is proposed to form Farmers Producers' Company by bringing farmers together in the form of voluntary groups of about 15 to 20 active farmers and federating 20 to 25 such groups into a Producer Company. These Producer Companies will be functioning on behalf of member farmers and will strive to undertake a range of activities which will result in added value accruals to farmers and value to farmers produce. To form a producer company, producer groups will be mobilized (in some cases, this initiative may have already been completed by NGO's).

It is envisaged that an elected committee of members of Producers Groups will form a management committee and oversee the performance of an incentivized manager/CEO. The manager will be trained in technical issues of post-harvest management, marketing and in operating a transparent accounting system. The ABPF will support the operation of the Producer Company, and accelerate the cross learning of best practices.

The evaluation of success should be evaluated on the parameters as under:

I. PCs operating without financial support by the end of 36 months.
II. The PC operates with a reserve fund to cover short term cash flow deficit and with potential for reinvestment in various activities
III. The PC has an effective governing structure.
IV. The PC has a transparent accounting system.
V. The PC can function as a working example for other farmer organizations to observe and learn from.
VI. Contribution towards increasing farmers'/members incomes.

Chapter – 5: Value Chain Investments

5.1. Rationale for investments

Post-Harvest infrastructure is of great relevance to smallholders, who tend to be geographically dispersed. The lack of primary processing infrastructure and efficient transport can therefore be a particular obstacle, making it difficult for them to obtain essential inputs and get their produce to markets. When smallholders do have access to transport services, the cost is often very high, limiting their competitiveness and ability to participate in agricultural value chains. Small-scale producers are at the greatest risk of significant post-harvest losses owing to the use of rudimentary storage facilities and limited access to reliable and efficient transportation systems. In the absence of primary processing infrastructure, transportation, farmers carry most of the produce (without any processing) themselves, often resulting in limited loads and produce spoilage. Small-scale farmers may also lack the resources to comply with increasingly strict food safety standards, particularly traceability requirements. It is therefore important to integrate and empower small-scale agricultural producers in the food supply chain by giving them access to information and communication technologies. Access to the right information at the right time gives smallholders the capacity to make informed decisions that enable them to optimize their price negotiations and the way in which they place their produce on the market.

5.2. Non water use interventions in value chain

The focus of this sub-component is on improving on-farm water use efficiency and productivity in the clusters by promoting micro irrigation techniques, demonstrations and crop husbandry practices which improve agricultural productivity, profitability and sustainability while reducing the water footprint of agriculture.

5.2.1. Agriculture

Wheat, Mustard, Barley, Cotton, Guar and sugarcane are the major crops of the area. Use of micro irrigation techniques is a challenge in canal command areas to reduce the production cost and improve the irrigation/ field water use efficiency. Hence, introduction of efficient techniques (viz. Drip, mini sprinklers and sprinklers) along with the water storage diggies is most important intervention for the area. Fertigation and Automation techniques need to be demonstrated to synergise the micro irrigation technology.

The improved seed of the Cotton and Mustard crop is being used but the seed replacement rate (SRR) for Guar, Moong, Gram, Barley and Wheat needs to be further enhanced by more promising varieties. Seed production activity and adoption support for the same is required. More promising crops, varieties and technology also needs to be intervened to match the fodder demand of the cluster area. The Integrated Nutrient Management (INM), Integrated Pest Management (IPM) and other innovative techniques are still needs to be intervened for the environmental and techno friendly agriculture.

The soil preparation, sowing and threshing of the crops is performed through tractor drawn implements but still there is a great need to introduce the more efficient mechanization tools for farm operations. Post-harvest techniques are also imperative to introduce in the cluster for the prevailing and ensuing crops.

The farmers' community is supported by the extension machinery of Agriculture department up to the grass root level but the extension system still needs to be compatible with the ICT (Information and Communication Technology) for more effective delivery of the services. Market information and market access is an important intervention to be looked into. The capacity building and regular technical back up to the farmers for the latest updates of the agriculture technologies would be a useful tool for the competitiveness, sustainability and profitability.

Thus looking to the present scenario, the main proposed activities of the Agriculture subcomponent with certain desired objectives are:

a. Promotion of efficient techniques of irrigation to increase the irrigation efficiency, improve productivity and reduce cost of production.

b. Promotion and facilitate the water storage structures (diggies) to store the water during the rotation to synergise the use of micro irrigation and create a potential of available water for critical irrigation stages of the crops during canal closure.

c. Diversify the present wheat crop to Barley with the aim to improve the irrigation water use efficiency and to develop a new value chain crop through demonstrations and capacity building.

d. Promotion of farm mechanization to reduce the cost of production.

e. Promotion of seed production and adaption support to improve the SRR and the farmer income.

f. Promotion of fodder production to reduce the gap of demand and availability of fodder for the animals.

g. Introduction of ICT based extension system for the quick reach of the solutions to the beneficiaries.

h. Capacity building of the beneficiaries to achieve the PDO.

Details are given in Annexure 5.1.

Table 12 Investments and Cost Estimates under Agriculture Subcomponent under RACP

S.N.	Name of sub-component	Unit	Unit cost	Assistance (%)	Z Distributary			
					Phy	Assistance	Beneficiary Contribution	Total Project Cost
						Fin	Fin	Fin
1	**Component 1: Climate Resilient Agriculture**							
1A	Sub Component 1A: Improved water use efficiency (Micro Irrigation (MI) based technology)							
1	Integrated demonstration for Drip Irrigation System with Automation and fertigation based techniques for field crops	ha	2.20	75	5	8.25	2.75	11.00
2	Integrated demonstration for Mini Sprinkler based techniques for field crops	ha	1.45	75	10	10.88	3.63	14.50
3	Drip Irrigation System	ha	1.10	75	45	43.88	14.63	58.50
4	Mini/ Micro Sprinkler Irrigation System	ha	1.00	75	120	81.00	27.00	108.00
5	Sprinkler Irrigation System	ha	0.20	75	600	90.00	30.00	120.00
6	Pipeline for piped conveyance of irrigation water	100 mtr	0.10	75	10	0.75	0.25	1.00
7	Water Storage Structure/ Diggies	Nos	6.00	50	80	236.79	236.79	473.58
Subtotal 1A						**471.54**	**315.05**	**786.58**
1B	Sub Component 1B: Technology transfer and market led advisory services (Promoting Adoption and Documentation of Improved Technologies)							
1	Soil Testing	Nos	0.00	100	1400	1.40	0	1.40

S.N.	Name of sub-component	Unit	Unit cost	Assistance (%)	Z Distributary			
					Phy	Assistance	Beneficiary Contribution	Total Project Cost
						Fin	Fin	Fin
2	Demonstrations on production technologies for value chain crops to bridge gap	ha	0.10	75	2476	195.76	65.25	261.01
3	Demonstrations on farm mechanisation and PHM technologies	Nos	1.00	75	110	82.50	27.50	110.00
4	Demonstrations on forage/ fodder	ha	0.10	75	217.5	16.24	5.41	21.65
5a	1. Promotion to seed production	ha	0.05	100	800	40.00	0	40.00
5b	2. Promotion to Adaption support	ha	0.05	50	1500	37.50	37.50	75.00
6	Innovative activities/ INM/ IPM	No.	1.00	75	20	15.00	5.00	20.00
	Subtotal 1 Ba					**388.40**	**140.67**	**529.06**
1B-b	Information and Communication Technologies (ICT) based demand driven participatory extension system (Modernization of extension/ research linkages)							
1	KSK strengthening as model in project area-to serve as level I platform for ICT	Nos	2.50	100	2	7.00	0	7.00
2	Agriculture Research Institute strengthening to serve as level II/ III platform for ICT	Nos	1.00	100	1	3.00	0	3.00
3	Honorarium to the experts for solution of the problems and facilitate field visits	LS	1.00	100	2	2.00	0	2.00
4	Digital instruments to field coordinator/ staff	Nos	0.50	100	20	10.00	0	10.00
5	Potential threats led/ Pro-P based literature on cluster specific crops	Nos	0.50	100	2	1.00	0	1.00
	Subtotal 1 Bb					**23.00**	**0.00**	**23.00**
	Subtotal 1 Ba +1 Bb					**411.40**	**140.67**	**552.07**
	Subtotal 1 (1A + 1 B)					**882.94**	**455.71**	**1338.65**
2	**Component 2: Markets and Value Chains**							
3	**Component 3: Farmer Organization and Capacity Building**							
1	Field days, exposure visits, orientation, capacity building	LS		100	2	16.00	0	16.00
2	Hiring the Services of NGO for Community Participation, Social Screening and Social Mobilization required for implementation of Cluster Agricultural Competitiveness Plan (CACP)	As per deliverables		100	0	145.84	0	145.84
	Sub Total 3					**161.84**	**0.00**	**161.84**
4	**Component 4: Project Management, Monitoring and Learning**							
1	PIA Operating costs including Photostat, computer typing & printing, fax, Machine with man, mobility (hired taxi/POL), TA/DA etc.	LS	3.00	100	2	9.04	0	9.04
	Subtotal 4					**9.04**	**0.00**	**9.04**
Total Cost (Agriculture Department)						**1053.82**	**455.71**	**1509.53**

5.2.2. Horticulture

In agriculture water productivity is major concern in the state, means promotion of high payoff and low water requiring crops is main focus under the project. The horticultural crops are recognized high payoff, nutritious value crops. Water management issue is also very important issue in the agriculture. Areas depend on rains and ground water is become very important in the field of water management. Whatever ground water is available in the cluster should be used judiciously. The horticulture is one of the sectors has emerged as major drivers of growth in the agricultural and allied sector.

The problems in development of Horticulture are pressures emanating from climate change; post-harvest losses; bio-security concerns; absence of market linkages and resultant price fluctuations; changing quality consciousness; and global competition. These concerns need to be addressed in order

to sustain the growth momentum in horticulture. The focus of growth strategy, therefore, needs to be on raising productivity by supporting high density plantations, protected cultivation, efficient irrigation methods i.e. micro irrigation, quality planting material, rejuvenation of senile orchards and a thrust on post-harvest management to ensure that the farmers do not lose their produce in the transit from the farm gate to the consumer's plate.

Although there is not much horticultural fruit plantations at present, but the availability of Loam fertile land and good quality water provides immense opportunity for the cultivation of fruits as well as vegetables. The area is suitable for fruits like Kinnow and Lemon hence, the area under pearl millet and Cotton in Kharif crops, would be diversified in to the cultivation of vegetables and fruits crops. Looking to the potentiality and acceptance of the area Chilly, Tomato, Carrot and Potato in vegetable crops, Kinnow & Lemon in fruit crops are to be promoted through demonstration with drip irrigation. . Solar technology would also be promoted to assure irrigation. Farm mechanization would also be promoted to reduce the cost of cultivation. Post-harvest management would also be promoted.

Based on the above facts and to promote horticulture in the area following activities would be attempted in the cluster:

Promoting Adoption and Documentation of Improved Technologies

Demonstrations on production technologies for Fruit Cultivation

Under this component assistance to farmers shall be provided for establishment of fruit orchards at normal / wide spacing as well as high density plantations. The attempt has been made to integrate various components of scientific fruit production viz. efficient water use devices like Drip irrigation system with Package of practices, IPM, INM, Fertigation, mulching, automation etc.

Wide spacing crops with inter cropping:

Under this activity assistance to farmers for scientific establishment of fruit orchards will be provided. It has been contemplated that various aspects of modern fruit production at wide spacing/normal spacing with intercrop are integrated. The farmers shall be provided planting material, drip system, mulch, fertilizers and plant protection chemicals.

An investment of Rs.224.8 lacs is to be made on demonstration and establishment of 80 ha orchard with Pomegranate, lemon and papaya orchard establishment. The assistance will be provided to farmers 75% of total unit cost Rs.2.81lacs in different inputs. After plantation of fruit crops in first year, additional support during second year and third year would be given.

High density plantations

"High density planting technique is a modern method of fruit cultivation involving planting of fruit plants densely, allowing small or dwarf plants with modified canopy for better light interception and distribution and case of mechanized field operation". HDP and meadow orchard gives higher yield as well as returns/unit area due to increasing the no. of plants/unit area resulting increasing productivity and return per unit area.

Under this component technological and input assistance shall be provided to the farmers for establishment of fruit orchard at high density. An investment of Rs. 22.28 lacs is to be incurred for demonstration and establishment of 4 ha orchards with Kinnow HDP (5x3m spacing). The assistance will be provide to farmers 75% of total unit cost Rs. 5.57 lacs in different inputs. After plantation of fruit crops in first year additional support during second year and third year would be given.

Demonstrations on production technologies for vegetable Cultivation:

The cultivation of vegetables has been very remunerative but due to lack of investment capacity of the farmers and involvement of high level of technical skills, the rate of adoption of vegetable as well as floriculture is not picking up the desired scales. It has been contemplated that various aspects of modern vegetable production technologies with drip and automation ,hybrid and improved quality seeds, soil sterilization full POP, water soluble fertilizer, mulching, PP chemical and growth regulators and others cultural practices are integrated.

Under this component technological and input assistance shall be provided to the farmers for vegetable technology demonstration. An investment of Rs. 87.6 lacs is to be incurred on

demonstration and cultivation of 30 ha with Chilly, Tomato, Carrot and Potato, which are the leading crops & selected for demonstration. The assistance will be provide to farmers 75% of total unit cost Rs. 2.92 lacs in different inputs.

On farm Demonstration on Protected Horticulture

The protected cultivation has opened avenues for intensifying the land use. This can provide excellent avenue for small size of holdings owned by families having ample of underemployed manpower. The weather proof (protected) cultivation results in high quality product and better income to farmers with optimum use of water. There are the two types of protected structure proposed in cluster.

A. Green house (GH) -The benefits of Green House to improve the productivity and quality are as

1. Equal distribution of light inside the green house.
2. To optimize the heat inside the green house.
3. To control the micro climate & establish optimal environment for cultivation & adjust temperature, humidity, lighting etc.
4. Protection against disease, pest etc.
5. Excellent ventilation.
6. Optimum sealing against rains & air.
7. To increase production
8. To ensure off season production, resulting good market rates.

Under this component technological and input assistance shall be provided to the farmers for establishment of G.H. is 75% of total cost of Rs.0.0108 per sqm. The total investment of Rs. 132.00 lacs is to be needed for establishment of green house in 12,000 sqm.

Assistance on shade net house:

Shade net houses provide a cost effective avenue for protected cultivation in areas where the crop production is limited by intense heat and sunlight. The shade net house is a low cost structure which covered by the net for protect the plants from high temperature & heat.

Under this component technological and input assistance shall be provided to the farmers for establishment of shade net house is 75% of total cost of 0.009 per sqm .The total investment for shade net house is Rs.36.00 lacs for 4,000 sqm.

Solar Pump Program:

Energy as input in horticulture has great importance as with increase in intensity of production we need may more and more energy. The solar pumps have paved new pathways for independent energy system for the farmers. It is proposed that solar pump of an estimated cost of Rs.5.5 lac shall be provided to the farmers on 70% assistance. The SPV system should be operated with a PV array capacity in the range of 3,000 watts peak to 5,000 watts peak. The operation of solar powered pumps is more economical mainly due to the lower operation and maintenance costs and has less environmental impact than pumps powered by an internal combustion engine (ICE). Solar pumps are useful where grid electricity is unavailable.

Under this component technological and equipment assistance shall be provided to the farmers for establishment of SPV is 70% of total cost. The total investment for SPV establishment is Rs. 715 lacs for 130 SPV.

Post-Harvest Management:

The post-harvest management of horticultural crops is of paramount importance as these products are of perishable nature and any attempt to service the gluts results in ensuring fair price realization to the farmers. It is contemplated that assistance to the entrepreneurs is to be needed for establishing new post-harvest units. The contemplated assistance will be 50% of eligible project cost in the form of credit linked back ended subsidy or 50% of total cost of PHM equipment and Machinery.

Under this component assistance shall be provided to the farmers for establishment of pack house, grading, sorting, washing, packing, primary and secondary PHM Machinery and equipment .The total investment for this activity is Rs.28 lacs. The maximum assistance will be provided 50% of the unit cost of Rs. 28 lacs.

Horticulture Mechanization:

Mechanization is the effective tool to reduce the production cost, increase the efficiency of farm and reduction in chemical weedicides. Power operated machines and mini tractors for field operations, planting, sowing, spraying, Mulch laying machine, training and pruning, grading, harvesting etc. operations are proposed to be provided with the assistance level of 50 per cent to the selected beneficiary of the cluster. An estimated maximum cost of Rs. 7.5 Lac has been kept for the implements/ mechanization technology per unit.

The total investment for this activity is Rs. 45.00 lacs. The maximum assistance will be provided 50% of the unit cost of Rs.7.5 lacs or 50% of the total cost of machinery and equipment.

Micro irrigation in horticulture crops

With a view to produce more crop per drop of water and also to obtain higher and qualitative yield from horticulture crops, assistance would be provided to the farmers who are willing to adopt drip irrigation system especially in fruit orchards and vegetable cultivation. Under this component, farmers will be promoted to adopt drip irrigation system. A unit cost of Rs. 0.80 lacs for establishment of drip irrigation in fruit orchards and Rs. 1.30 lacs for vegetable cultivation has been decided. Farmers would be provided 75% assistance for adoption of drip irrigation system. The total investment for this activity is Rs. 45.00 lacs.

Farmers training, Seminars, Exhibition Kisan mela etc

To upgrade the technical knowledge of the farmers, training programmes, exposure visits, seminars, kisan mela etc would be organized.

Justification of Procurement of Planting Material of Fruit Plants and Inputs from RAJHANS, Gram Sahkari Samiti, Cooperative Society, KVSS, RSSC, NSC etc is given at Annexure -5.2.

The investments under the horticulture sub component

Total **Rs. 1428.86 lacs** is proposed to be invested on inventions mentioned above of horticulture sub component to make farmers competitive for getting optimum water as well as horticultural productivity in z distributary cluster. Out of this an amount of Rs.401.65 lacs would be borne by the farmers/beneficiaries and **Rs. 1027.21 lacs** would be borne by the project. The investments are being summarized as under:

Table 13 Investment proposal under horticultural sub component

S. No.	Name of sub-component / Activity	Unit	Unit cost	Assistance (%)	Amount of Assistance	Grand Total (Rs. In lacs)			
						Phy.	Financial		
							Farmer share	Project	Total
I.	**Component 1: Climate Resilient Agriculture**								
IB	**Sub Component 1B: Technology transfer and market led advisory services**								
1	**Promoting Adoption and Documentation of Improved Technologies**								
i.	**Assistance on production technologies for Fruit Cultivation**								
1	Wide spacing crops with inter cropping	ha	2.81	75	2.108	80	56.16	168.64	224.8
i.	First year Maintenance support	ha	0.58	75	0.435	50	7.25	21.75	29
ii.	Second year Maintenance support	ha	0.75	75	0.561	20	3.78	11.22	15
2	High density plantations	ha	5.57	75	4.178	4	5.568	16.712	22.28
i.	First year Maintenance support	ha	1.09	75	0.818	2	0.544	1.636	2.18
ii.	Second year Maintenance support	ha	1.32	75	0.986	0	0	0	0
3	Assistance on production technologies for vegetable Cultivation	ha	2.92	75	2.19	30	21.90	65.70	87.60
4	Assistance on green house	SqM	0.01	75	0.00816	12000	34.08	97.92	132
5	Assistance on shade net house	SqM	0.01	75	0.00647	4000	10.12	25.88	36.00

S. No.	Name of sub-component / Activity	Unit	Unit cost	Assistance (%)	Amount of Assistance	Grand Total (Rs. In lacs)			
						Phy.	Financial		
							Farmer share	Project	Total
6	Solar Pump Program	Nos	5.5	70	3.85	130	214.5	500.5	715
7	Post-Harvest Management	Nos	28	50	14	1	14	14	28
8	Horticulture Mechanization	Nos	7.5	50	3.75	6	22.5	22.5	45
9	Micro Irrigation in Horticulture Crops (Drip System)	Ha							
	Fruits		0.80	75	0.60	40	8	24	32.00
	Vegetable		1.30	75	0.975	10	3.25	9.75	13.00
	Sub Total IB						**401.65**	**980.21**	**1381.86**
III.	**Farmer's Organization and Capacity Building**								
1	2 days Farmer's training (50 farmers in each)	Nos	1	100	1	12	0	12	12
2	Exposure visit for 50 farmers for 5 days	Nos.	2	100	2	6	0	12	12
3	Seminar for 100 participants for 2 days	Nos.	2	100	2	6	0	12	12
	Sub Total III					**24**	**0**	**36**	**36**
IV.	**Project Management & M&E**								
1	Operating cost including (Photostat, computer, printer, fax, manpower, services outsourcing, mobility (hired taxi), TA for District unit)p	0	LS	100	0	0		11	11
	Sub Total IV						**0**	**11**	**11**
	G. Total						**401.65**	**1027.21**	**1428.86**

5.3. Market and value chains

The objective of this component is to enable farmers to engage in profitable market oriented production, that is sustainable, and to promote partnerships and market linkages with other value chain participants and agribusinesses. The component will help producer groups, agro enterprises, and commodity associations, to actively engage in the development of commodity value chains by partially financing demand-driven investment proposals to producer organization through a matching grant. This will be done by further organizing members of MTG and developing their capacity and skills for input and output marketing. It is expected that aggregation will bring economies of scale in procurement of inputs and marketing of agricultural produce, thus enabling wider access to markets. These producer organizations will be an important vehicle for promoting market-oriented production in their geographical jurisdiction and can act as centres for technology dissemination and input/output marketing. Project will develop (a) value chains aiming to establish longer term partnerships and market linkages between farmer groups and agribusiness enterprises, facilitated through an Agri-Business Promotion Facility (ABPF); and (b) alternate market channels. It is in this context that the FPCs that are developed may serve as input facilitators of seeds, pesticides etc. operators of common facilities by way of primary processing facilities, custom hiring (of farm equipment) facilitators, seed producers as well as platforms for B2B linkages directly with secondary processors/marketers.

5.3.1. Value chain studies of identified commodities in the cluster

As discussed in Chapter 3, following commodities are selected for the value chain intervention in the cluster: Guar, Barley, Kinnow. This was done based on broadly four set of parameters: 1) Existing size of the crop, 2) Potential for value addition, 3) Risk assessment and 4) Environmental parameter.

A comprehensive value chain study has been conducted that includes following activities, but not limited to: (i) participatory meetings with value chain stakeholders of each cluster such as – producers, aggregators, transport facilitators, storage facilitators, commission agents, wholesalers, retailers, (ii) analysis of potential for new value chains, volume & value of the selected crop with respect to its production, postharvest management practices, processing, storage, transport and marketing), (iv) analysis of the data / information collected from various sources, (v) feedback from market

participants & relevant agencies, (vi) understanding on the role of stakeholders (vii) cost contribution analysis per stakeholder wise (viii) Margins at each level of value addition (ix) study gaps and issues in value chains (x) suggested intervention (xi) SWOT analysis for each value chain for intervention. (xiii) Comparative study of stakeholders' role and cost contribution in each cluster separately.

5.3.2. Value chain analysis and key opportunities

As discussed in the chapter 4, there is scope in the selected crops for value chain interventions. As mentioned, intervention can be started with primary processing at common facilities (FCSC). Thus the income of farmers can be increased by 25% instantly.

1. **Barley**

The concept of FPC as suggested in Chapter 4, will get complimented by an FCSC unit. A reference value chain map of Barley, post intervention along with the incremental benefit by comparing the traditional marketing chain of farmer with a suggested marketing chain, is shown in Annexure 5.3.

Farmers are exploited by traders based on the quality of the produce brought. Processors are willing to pay a premium based on FAQ (Fair Average Quality) parameters. Hence a small cleaning and grading unit can increase the returns by 20% because apart from getting premium, farmers will also save on the expenses as a result of aggregation. Farmers can then sell their cleaned and graded produce directly to processors. A warehouse along with the cleaning and grading unit can ensure longer use of the unit and can also cater the price volatility so that farmers need not go for distress sale.

2. **Guar**

Value chain map of Guar, post intervention, is show in Annexure 5.3.

Farmers sell their crop at farm gate or at the nearest mandi without any level of processing. From the discussions with the processors of Guar, they can give premium price for cleaned and graded material. Reason for premium is not the clean produce but it is because they can save yield loss of cleaning and grading. A small warehouse along with cleaning and grading can prevent farmers from distress selling and realise better price by selling at the right time.

3. **Kinnow**

Value chain of Kinnow, post intervention, is shown in Annexure 5.3.

In current practice, farmers sell their orchard, before harvesting, to processors on a mutually agreed upon price. But this results in realizing lower price than potential. Since there is a high demand of waxed Kinnow in market for table purpose hence a small cleaning, grading and waxing unit can service premium price of the produce. These products have far off demand like South Indian cities and neighbouring countries too.

Apart from the hard intervention, there is a need of soft interventions too. Based on the FPC model approach as discussed in Chapter 4, there is a requirement of other activities as listed below and a detailed description is in Annexure 5.4.

- Scouting of technologies and business ideas for identified commodities
- Incubation services to agri entrepreneurs
- Management and business training to FCSC and producer company personnel
- Facilitating reforms in agri policies

5.3.3. Value chain cost estimate

To promote Farmers' Producer Company along with the development of farmer common service center, it would require a support from the project as discussed below.

FPC registration and related licenses

Registration fees along with the fees of the facilitator can be budget under this amount. This component can also cover the fees to apply for other licenses as well like electricity, procurement etc.

100% assistance is required from the project as it is just the starting of the FPC hence there would be no other source of cash inflow for the unit.

S. No.	Name of sub-component / Activity	Unit	Unit cost	Assistance (%)	Amount of Assistance	Phy.	Financial		
							Farmer share	Project	Total
i)	Registration expenses and other pre-operative expenses- FPC	FPC	1	100%	1	4	0	4	4

Human Resource

Dedicated resource person is required at each FPC to manage and control day to day activities along with other compliances and business as well. 100% assistance is required in manpower.

S. No.	Name of sub-component / Activity	Unit	Unit cost	Assistance (%)	Amount of Assistance	Phy.	Financial		
							Farmer share	Project	Total
ii)	Manpower Expenses - FPC (Rs. 25,000 per month for 2 years)	FPC	6	100%	6	4	0	24	24

Office infrastructure

An office can be set up in a rented building with basic amenities like table, chair, computer, printer etc. Office is purely on the brand building basis to show the identity of the FPC hence a 50% support can be given by the project.

S. No.	Name of sub-component / Activity	Unit	Unit cost	Assistance (%)	Amount of Assistance	Phy.	Financial		
							Farmer share	Project	Total
iii)	Office Establishment (only physical assets like chair, tables, computer, printer and other furniture)	FPC	1	50%	0.5	4	2	2	4

Common Facility

This is the component for the establishment of the common facility infrastructure. On an average and also as per the business models suggested in the previous section an FCSC along with an FPC has a capital expenditure of Rs. 30 lakh. It can be taken as a standard by the project to assist any unit by 75% or Rs. 22.5 lakh whichever is lesser.

S. No.	Name of sub-component / Activity	Unit	Unit cost	Assistance (%)	Amount of Assistance	Phy.	Financial		
							Farmer share	Project	Total
1	**Value Added Unit (Common Facility) - FPC**	FPC	30	75%	22.5	4	30	90	120

Start-ups (Private investment)

Minimum 4 startups will be promoted in the cluster district with average investment of Rs. 20,00,000 per startup. The startups will be identified by conducting startup meets periodically in the region. The startups will mainly focus on the secondary processing activities and which may perform the part of backward or forward linkage for the FCSCs formed in the cluster area.

Team ABPF will support this startup in preparation of bankable proposals and will provide technical support in formation of the unit and will guide the investor periodically.

S. No.	Name of sub-component / Activity	Unit	Unit cost	Assistance (%)	Amount of Assistance	Phy.	Financial		
							Farmer share	Project	Total
1	**Start up**	Private	20	0%	0	4	80	0	80

For the suggested business models following table summarizes the capital expenditure required in the FCSC.

Table 14 Capital expenditure for the common facilities

#	Suggested value chain interventions in the cluster	Amount (Rs.)
1	**Barley cleaning and grading unit (2 TPH)**	
	Shed construction (1000 sq ft @ Rs. 700/sq ft)	700,000
	Grains cleaning machine 2 TPH	1,200,000
	Weighing scales, bag sealing machines	20,000
	Warehouse (200 MT)	1,080,000
	Total	**3,000,000**
2	**Guar cleaning and grading unit (1 TPH)**	
	Shed construction (1000 sq ft @ Rs. 700/sq ft)	700,000
	Cleaning and grading unit	700,000
	Warehouse (200 MT) (1200 sq ft @ Rs. 900/ sq ft)	1,080,000
	Vehicle (1.5 MT)	600,000
	Total	**3,080,000**
3	**Kinnow grading and waxing unit (2 TPH)**	
	Shed construction (1000 sq ft @ Rs. 700/sq ft)	700,000
	Cleaning, grading and waxing unit	1,500,000
	Electricity/Generator	50,000
	Vehicle (2 MT)	750,000
	Total	**3,000,000**

A summary of the expenditure and the assistance required through project is as follows:

Table 15 Estimated Cost of Investments on Value chain activities

#	Name of sub-component / Activity	Unit	Unit cost	Assistance (%)	Amount of Assistance	Phy.	Financial		
							Farmer share	Project	Total
I.	**Component 2: Market and Value Chain (Agri.)**								
	Sub Component 2B: Market Infrastructure and Agribusiness Support								
1	**Nurturing farmers group**								
i)	Registration expenses and other pre-operative expenses- FPC	FPC	1	100%	1	4	0	4	4

#	Name of sub-component / Activity	Unit	Unit cost	Assistance (%)	Amount of Assistance	Phy.	Financial		
							Farmer share	Project	Total
ii)	Manpower Expenses - FPC (Rs. 25,000 per month for 2 years)	FPC	6	100%	6	4	0	24	24
iii)	Office Establishment (only physical assets like chair, tables, computer, printer and other furniture)	FPC	1	50%	0.5	4	2	2	4
2a	**Value Added Unit (Common Facility) – FPC**	FPC	30	75%	22.5	4	30	90	120
3	**Start up (Private investment)**	Private	20	0%	0	4	80	0	80
	G. Total						**112**	**120**	**232**

An indicative profitability study for all the FCSC units proposed are as given below:

Table 16 Profitability indicators on proposed value chain units

Particulars	Barley cleaning and grading unit (Rs.)	Guar cleaning and grading unit (Rs.)	Kinnow waxing, cleaning and grading unit (Rs.)
Revenue	1,536,000	2,438,400	1,920,000
Total Revenue	**1,536,000**	**2,438,400**	**1,920,000**
Fixed Cost (HR, other fixed cost)	383,000	412,000	508,000
Variable Cost	360,000	144,000	468,000
Total Operational Expenses	**743,000**	**556,000**	**976,000**
Earnings Before Interest, Depreciation, Taxes and Amortization (EBITDA)	**793,000**	**1,882,400**	**944,000**
Depreciation	268,500	219,000	265,000
Amortization	0	0	
Earnings Before Interest and Taxes (EBIT)	**524,500**	**1,663,400**	**679,000**
Interest Expense	0	0	0
Earnings Before Taxes (EBT)	**524,500**	**1,663,400**	**679,000**
Tax (@ 30%)	157,350	165,600	182,574
Earnings After Taxes (EAT)	**367,150**	**1,497,800**	**496,426**
Financial Indicators			
Net Present Value (@ discount rate 10%)	**132,293**	**3,490,492**	**722,457**
Internal Rate of Return	51.50%	44.80%	18.21%
Payback period in years (Equity)	1.13	0.64	0.99
Payback period in years (Total)	3.91	2.06	3.36
Breakeven point	45.45%	43.96%	43.89%

Detailed profit and loss statement for all the models are given in Annexure 5.5.

5.3.4. Economic impact

The interventions proposed at the initial level are primary in nature and to build up the Agri business activities in the cluster. The process will lead to increase in business acumen of the farmers along with social and environmental development. At primary level, farmers can realize 15% - 20% more income at their farm.

With the model of FPC, there will be an advantage of aggregation which leads in cutting of cost hence increasing the income by 5%-10%. Members will also receive dividend on the profit earned by FPC through business hence, indicatively, farmer will get 35%-40% increased income once a full model of FPC and FCSC along with market linkages gets established.

5.3.5. Brief description of Implementing Arrangements

Above mentioned technological gaps would be addressed through various interventions suggested and through farmers groups (MTGs) formed under RACP. Group leaders of MTGs/MTAs can be trained on market led extension to spread adaption of technologies speedily. Also for better implementation role of ATMA, KVK would be crucial and they can be involved for registration of groups, trainings to farmers.

Implementation process for agri business units is proposed as follows:

1. Preparation of potential business model of units proposed above with the help of AB consulting agency.
2. Submission of project proposals to the PMU by the beneficiary.
3. Evaluation of projects by an appointed technical committee of PMU.
4. Approval of project by PMU/ EC RACPMIS for the proposed support through RACP.
5. Commissioning of the unit and business activity initiation
6. Phasing of subsidy during implementation:
    a. 20% after mobilization of PC/entrepreneur fund
    b. 40% during the purchase of the plant and machinery
    c. 40% at the commencement of the unit

5.4. Investment per unit of water saved

The comparison of investment (in Rs crore per mcm) is a useful tool for assessing data to understand the relative effectiveness and cost of the full spectrum of approaches to improving water security. When coupled with realistic assessments of operational risk, such comparisons can also help policy makers and investors to improve water-sector productivity.

In the case of Z-distributary cluster, there are majorly two water saving activities taking place viz activities of Water resource department and the micro-irrigation system (MIS) activities of Agriculture and Horticulture department. Both these activities save water up to the extent of 1.46 mcm and 3.71 mcm per year. When the investment per unit of water saved is calculated, it is found that MIS activities are able to conserve more water at lower investment of Rs.0.79 crore per mcm of water saved for an area of 1784 ha impacted. Thus, it could be said that MIS activities like installation of drips and sprinklers for the agricultural and horticultural crops has far reaching impact in the span of a year.

Figure 5: Investment (in Rs crore/mcm) verses Water saved (in mcm) in Z-distributary

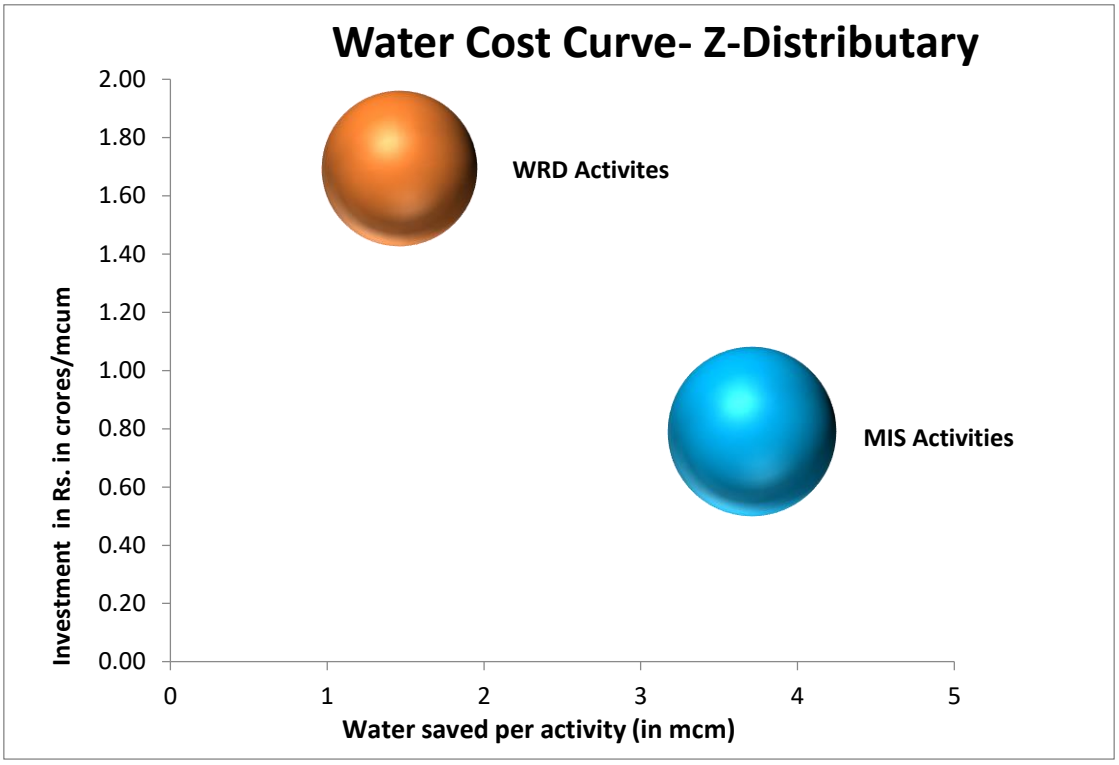


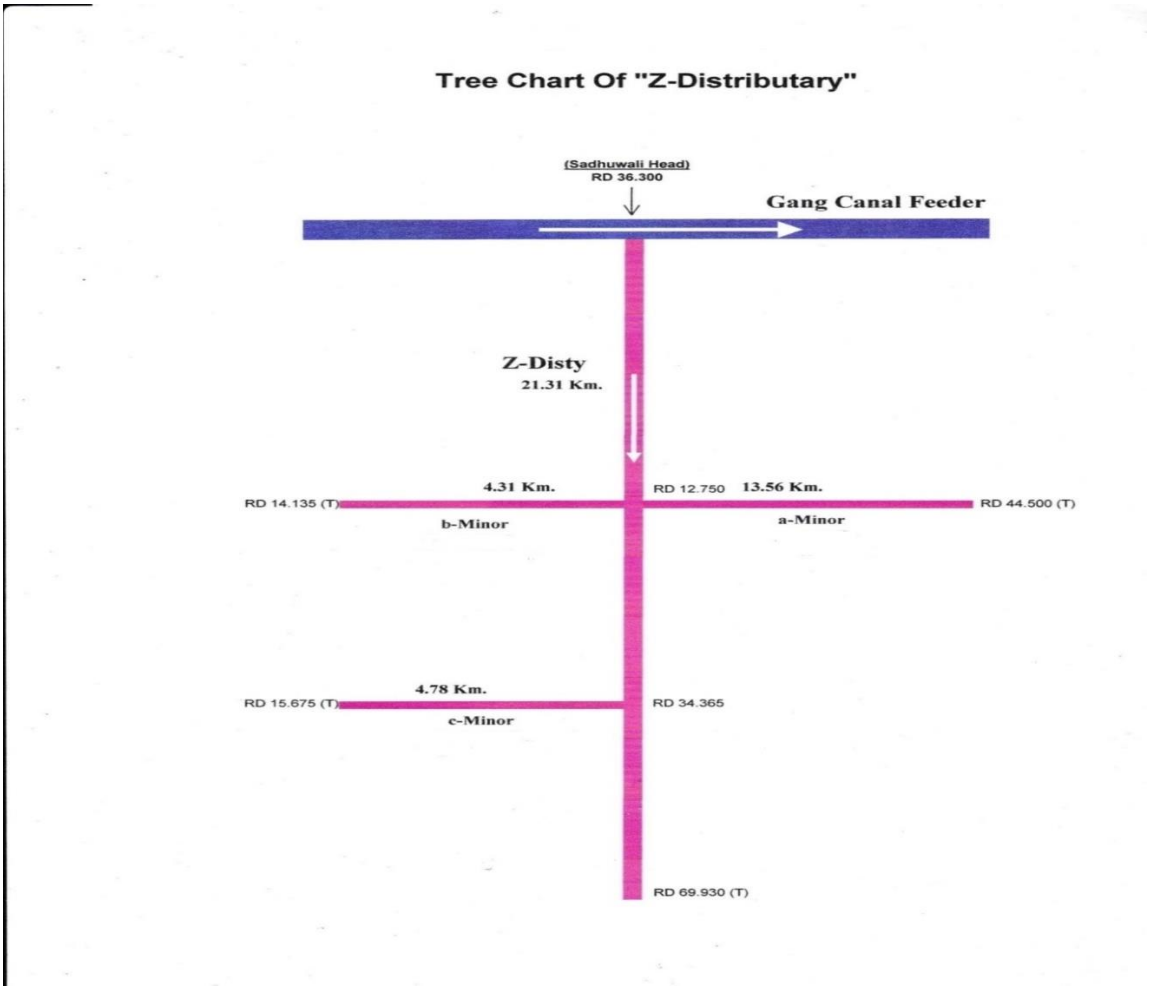
Table 17: Investment (in Rs/mcm) verses Water saved (in mcm) in Z-distributary

Activities undertaken to save water	Water saved- per year in mcm	Investment- Rs crore/mcm	Total investment- Rs crore
WRD activities	1.46	1.69	2.47
MIS Activities	3.71	0.79	2.94

Chapter – 6: Water Resources Management of Cluster

6.1. Description of Z - Distributary Canal System

The Z-Distributary Irrigation project was completed during the year 1928 as a Gang Canal Irrigation project. The diversion head work is constructed across the Gang Canal river, a tributary of Sutlej & Beas River. It is situated in tehsil Sri Ganganagar, District, The latitude and longitude 29.96 N and 73.90 E respectively. This Z-Distributary irrigation system provides irrigation facility to area 12128 Ha with irrigation intensity of 75%. The Z-Distributary is facilities to 49 nos Chaks. and main city. Discharge of Z-Distributary Main canal at head is 136.66 cusec and length is 21.31 km. The system has 3 Minors (a, b, c minor). All these minors off taking from Z-Distributary, named as a-minor, b-minor and c-minor. Total system length is 43.96 Km. Charts of cluster is being given as under:



Salient Features/Technical Data

S.No.	Particulars	Details
1	Name of the project	Z-distributary Irrigation Project
1.1	District	Sri Ganganagar
1.2	Tehsil	Sri Ganganagar
1.3	River / Tributary	Sutlej & Beas River
1.4	Location Dam / Diversion Structures	Sadhuwali, Sri Ganganmagar
1.5	Name of river / basin	Outside basin
1.6	Longitude & Latitude	29.96176-N
		73.99089-E
3	**Hydrological data**	
3.1	Rainfall (mm)	Acc. To last 25 year data
3.2	Maximum annual rainfall	576 mm (2014)
3.3	Minimum annual rainfall	98 mm (2002)
3.4	Mean annual rainfall	200 mm

Length of the Canal Distribution System

S.N.	Name of Canal	Total length of Canal (Km)
1.	Z-Distributary	21.31
2.	a- Minor	13.56
3.	b-Minor	4.31
4.	C-Minor	4.78
Total		**43.96**

Full supply discharge at canal heads in cusecs

S.N.	Name of Canal	Discharge in Cumec
1.	Z-Distributary	3.8674
2.	a- Minor	0.6336
3.	b-Minor	0.3170
4.	C-Minor	0.3954

WUAs of Z-Distributary with CCA in ha

S.N.	Name of WUA	CCA in Hact.
1	15-Z	1742
2	4-C Chhoti	2738
3	Shriganganagar	1748
4	Sahib Singh Wala	2325
5	11-Z	2489
6	4-Z	1086
	Total	**12128**

Water Saving and Cost of Rehabilitation

Total 1.46 Mcum water is to be saved through Rehabilitation & Modernization of Z Distributary Canal System with an estimated cost amounting to Rs.247.17 Lac.

6.2. Objectives of Water Management in z-distributary, Canal system

To achieve the objective of sub component under Surface Water Clusters, the rehabilitation / modernization of canal system & structures and construction activities as per the need would be done in the cluster. Also installation and modernization of measuring devices would be taken up by the department under the project. The main objective of these works is to reduce the water losses and at the same time to improve the conveyance efficiency of the canal system so that water availability to the crops at the outlet level may be increased. With the increase in water saving crop production as well as other farm activities would be better in the cluster.

The formation and strengthening of the Farmers Organizations i.e. Water Users Associations, Distributary Committees & Project Committees formed under **Rajasthan Farmers Participation in Management of Irrigation Systems Act 2000 (Act No.21 of 2000) (RFPMIS) by Water Resource Department (WRD)**. The ultimate objectives of the water management in canal system are:

i) To promote the distribution of water among the command area farmers on equitable basis.

ii) To promote the participation of Farmers Organizations in preparation and implementation of activities, implementation of canal operation plan and maintenance of canal network and canal structures.

iii) To promote awareness regarding due share of water and its receipt among farmers.

iv) To promote awareness regarding prevention of water theft in canal system.

v) To promote awareness regarding availability of canal water and accordingly deciding its use.

vi) To promote awareness for collection of water charges and getting the due share from GoR for the canal maintenance.

vii) To promote regular meetings of FOs and resolution of dispute among members.

viii) To ensure optimum & judicious utilization of canal water for the production activities

Studies/Field Surveys

The detailed survey / studies have been conducted through a technical agency by the department and at the same time a walk through survey with members of Water User's Associations (WUAs) has conducted to identify the problems faced by the members during the operation of the canal. The problems have been listed and prioritize based on the financial limit and technical feasibility. The detailed survey report is the detailed findings based on the walk through survey / actual field problems faced during canal operations by the department. It is attached at Annexure – 6.1.

Deficiencies in Canal system

The condition of fall, Outlet of canals, canal banks, VRBs, inspection roads etc. are not good. During canal regulations water is over topped and canal breaches at several places. Canal beds are also damaged at several places. It affects the efficiency of system as well as water loss occurrence.

Justification/Need for Renovation

As the command of Z Distributary irrigation system having 12128 ha CCA area and people having very small land holdings. They usually adopt traditional practice of sowing crops & irrigation practices by flooding method. It caused to consume more water, more consumption of fertilizer, & less quantum of production. Due to illiteracy, they do not level their fields & thinks that more water to crop, will produce more. Other problems encountered in the channels in terms of operation and maintenance is;

a) Section of unlined canals/damaged deteriorated lined canals are irregular, resulting in to less discharge than designed.
b) Absence of measuring devices.
c) Inlets and outlets requiring redesign.
d) Damaged portion channels causing undesirable seepage, weed growth (water hyacinth)

6.3. Proposed Activities in the Canal System

The canal system requires rehabilitation and construction of some new structures to overcome the present water losses and improve the conveyance efficiency. The site specific investments are proposed to be implemented on canal system has been detailed in Annexure – 6.2. Out of these works some important / major works are being described as under:

Earthwork, raising, repairing and construction of fair weather road:-

a. Earthwork in excavation/filling is required to complete the design section.
b. Side banks are needed to strengthen the embankment of canal weekend due to rain water.
c. The dowel needs to be repaired and raised to stop the debris fall into the canal which gets collected at tail of canal and at outlets which sometimes causes overflowing of canal.
d. Service banks of canal are also used for military services because of boarder area, so the banks of canal need to be strengthened.
e. To improve condition of inspection and service roads on the banks of canals.

Repairing and construction of existing structures and proposal of new works

a. Structures like V.R.B are fully or partially damaged. Slabs and parapets need to be re-constructed or repaired. So, provision for dismantling, CC, RCC, plaster and pointing have been taken as per requirement.
b. Proposed V.R.B. is to be constructed as demanded by farmers for their easy connectivity with road.

Repairing of outlets and lining

a. Damaged lining and provision to repair or re outlets causing seepage and weed growth are taken in -construct to stop the discharge losses.

Provision of measuring gauge wells

a. Provision of installing measuring devices in main channel, branch channel and minors for measuring the water level by W.U.A's members and farmers for improving operational activities.

Construction of W.U.A buildings

a. Providing office building to W.U.A for proper operation of W.U.A's works
b. W.U.A office buildings will be equipped with computer set with printers and furniture.

Table 18 Investments for rehabilitation & modernization of Z- Distributary canal system

S. No.	Work Details / Investments	Amount (Rs. In Lacs)
1.	**Component 1: Climate Resilient Agriculture**	
1.1	Raising & repair of Z Distributary canal system	96.13
1.1.1	Construction of fair weather road	25.18
1.1.2	Construction of 4 nos VRB	29.99
1.1.3	Construction of gauge well for discharge measurement	6.80
1.1.4	Construction of outlets, tail cluster & 10 mts length water course	35.67
1.1.5	Survey and Investigation of Canal System & Preparation of DPR , Tender document etc.	2.00
	Sub Total	**195.77**
2.	**Component 2: Market & Value Chain**	
3.	**Component 3: Farmers Organization & Capacity Building**	
3.1	Formation/ updating of WUAs	2.00
3.2	Construction of new/ repairing of WUAs Office Building	20.00
3.3	Providing of Computer Set with Printer & Furniture to WUAs	5.40
3.4	Honorarium to Community Resource Persons (CRP) provided to FOs	7.50

S. No.	Work Details / Investments	Amount (Rs. In Lacs)
3.5	Training of WUA Member through IMTI Kota and other as per need	9.00
	Sub Total	**43.90**
4.	**Component 4: Project Management, Monitoring & Learning**	
4.1	PIU operating costs including Photostat, computer typing & printing, fax, mobility support (hired taxi / POL), TA/DA etc.	7.50
	Sub Total	**7.50**
	Total Cost of Components 1 to 4	**247.17**

Proposed Outcome of Rehabilitation and modernization of canal system

Particulars	Existing	Proposed
Irrigated Culturable command area (ICA)	9217 ha	9702 ha
Intensity of Irrigation (% age of CCA)	76%	80%
Field Application Efficiency	65%	65%
Average Conveyance Efficiency of canal system	75%	80%

6.4. Benefit Cost Ratio

The Cost and Benefit ratio of this investment has been calculated keeping in mind agricultural and horticultural present and proposed cropping pattern and area irritated after rehabilitation of canal system. The final cost benefit ratio 1.63 has been driven in this cluster. The investment to be made on other sub component other than agriculture and horticulture has not been taken in to consideration. The B: C ratio of the project investments prepared is investments are being summarized at Annexure – 6.3

6.5. Institutional Activities

a. Total six (6) Water User Associations (WUAs) are formed by the department as per Rajasthan Farmers Participation in Management of Irrigation System (RFPMIS) Act 2000.
b. The construction of 6 nos. WUAs Office building has also been proposed in the cluster.
c. Office furniture and Computer with printers will be provided to each WUA.
d. One Community Resource Person (CRP) to each WUA is to be provided for support of various activities like functioning of WUA's offic0e, maintenance of office records and registers as per PIM Act, estimation of irrigated area, collection of water charges etc.
e. Training and capacity building of members of WUAs,
f. The WUAs would ensure quantity and quality of works of rehabilitation and modernization of canal and structures and other repairing works,
g. The WUAs will inform the department regarding any suggestions related to the works being implemented on the works,
h. The WUAs will also act as per the PIM Act 2000.

6.6. Trainings

Training Needs for Surface Water Management:

Canal irrigated areas, with typically low water use efficiencies and outdated irrigation management practices, are the only areas within Rajasthan where major saving of water are potentially possible for diversion to other, non-agricultural water uses, through appropriate system improvements, adoption of modern management practices/instruments, and appropriate policy interventions. In case of canal irrigated clusters, therefore, the focus will be to reduce the water foot print in agriculture (without reducing the present area under irrigation or the cropping intensity/farmers income) through

improving the water use efficiencies at all levels of the system, and using the water thus saved to other sectors of water uses (such as drinking water)

Mass Awareness and Orientation Programmed for farmers

All the farmers have equal rights to take benefit from the irrigation system. To ensure active participation of farmers in irrigation system Rajasthan Govt. has made provision of Farmer's Participation in Management of Irrigation System Act, 2000 and Rule 2002.

In the present situation, due to lack of farmer's participation there is unequal distribution of water amongst farmers and misuse of water. Powerful farmers get more benefits through illegal approach by interrupting in main canal, distributary and minor. Small and poor farmers and farmers of tail end area are getting less benefit and the disputes are taking place amongst farmers. So to ensure their active participation in irrigation management a mass awareness training camp on PIM has been proposed.

Training to WUA members and WRD officials are being provided at Irrigation Management Training Institute (IMTI) Kota regarding Participatory Irrigation Management and operation and maintenance of Irrigation Project.

6.7. Phasing of Activities in Canal Command Area:

The total estimated cost of activities in Z Distributary. Cluster is Rs.247.17 Lacs. Out of this an amount of Rs. 0.02 lacs have been incurred by the year 2016-17. The remaining estimated cost of rehabilitation and modernization of canal and structures including other works like institutional, training, operational cost has been phased out from the year 2017-18 to 2018-19 but if these works could not be executed during the prescribed time then the time has to be extended further. It is universal truth the renovation or repairing works on canal system can be done during summer season from April to June only. It means the monsoon and canal operation time has to be taken in to consideration as off season because during this time new work or repairing work execution is not possible. Keeping in mind everything would be fine and work will be executed smoothly and available project period, the project activities under this sub component has been phased out from 2017-18 to 2018-19. Accordingly the phasing of project activities proposed under this sub component is being summarized here asunder:

6.8. Implementation Arrangement for all the Planned Activities in the Canal Command Area

Planning and implementation of the project activities are being done by the line department i.e. Water Resource Department. At the state level a Planning and Implementation Unit (PIU) has been established headed by a Nodal Officer under the control of Chief Engineer Quality Control & Vigilance for monitoring the planning and implementation activities of surface water sub plan. The planning and implementation including procurement activities will be done at zonal level by respective Chief Engineer / Addl. Chief Engineer of respective Water Resources zones. The detail for this cluster is as below:

Cluster	District	Concern Executive Engineer	Concern Superintending Engineer	Concern Zonal Officer
Z- Distributary of Gang Canal System	Shriganganagar	Water Resources North Division, Shriganganagar	WR Circle, Shriganganagar	Chief Engineer (North), WR Hanumangarh

Chapter – 7: Social & Environmental Management Plan

7.1. Social Management Plan (SMP)

The SMP is described to minimize or mitigate any adverse social and livelihood impacts emanating from various sub-projects supported by the RACP project. The SMP will be used for developing appropriate social mitigation strategies, and mechanisms for minimizing the risks and expected adverse impacts. In addition, the SMP also includes strategies for consultation and participation, social mobilization and inclusion, gender and women's empowerment and social risk management.

The SMP therefore provides guidelines to assess the social impact of all the sub-projects and design cluster-specific plans, including the tribal development plan and the resettlement/ rehabilitation assistance plans. Overall, the SMP aims to avoid/minimize risks, avoid exacerbation of social and economic disparities between and among social groups, ensure equitable spread of project investments and benefits, and contribute to long-term social and institutional sustainability of the RACP.

SMP consists of the following strategies:

- Social baseline information
- Consultant held - Key social issue of cluster
- Social mobilisation strategy
- Targeting and beneficiary selection criteria for project goods/services
- Subproject require social impact screening and rehabilitation assistance

Social baseline information (Z-Distributary Cluster):-

Project Area covers an area of 12128 hectare (ha) comprising Ten (10) Gram Panchayats and forty nine (49) chaks / abadi. The Cluster village has a population of 28885 of which 15314are males while 13571 are females as per field survey by NGOs. In the cluster scheduled caste 10618 and scheduled tribe category 21 population. Cluster had household of 5830 of which of which small farmer 123, marginal farmer 97, large farmer 3010 and remaining farmer landless.

Consultation held - Key social issue of the Cluster

Major issues in the Z-Distributary cluster that emerged from the farmer and group consultations during field visit are summarized below.

a. Women folk believe that though they do most of the work in agriculture except for ploughing and selling, they have no role in decision making regarding purchase of inputs or selling of produce.
b. Women are not recognized as farmers in their own right.
c. Problem of access to credit by small and marginal farmers.
d. Lack of timely supply of agriculture inputs including seed and fertilizers.
e. Marginalization of small and marginal farmers in technologies and investments, training and capacity building.

f. Lack of breed improvement and livestock health care services.
g. Outreach of extension services very low in villages.
h. Community based organizations (multi task groups, multi task group - goat) should be integrated into the Farmer Producer Companies (FPC) that will be facilitated in the RACP.

The project does not envisage acquisition of any private land for purposes of storage, processing or any other activity. There will be no adverse impacts related to land acquisition. Therefore abbreviated resettlement plan does not require at cluster level. The detailed social management plan can be referred from Annexure 7.1.

7.2. Environment Management Plan (EMP)

The key interventions under RACP can be grouped as under:-

- Crop intensification
- Water Management
- Value chain development activities

Environment Management Plan for Crop Intensification/Water management / Value Chain development activities

The key objective of interventions in crop production is to increase crop productivity so that farmer income is also enhanced. The dominant and "business-as-usual" approach to achieving this is to intensify crop production by introducing hybrid seed varieties that respond well to chemical fertilizers and apply chemical pesticides to control pests and diseases that attack the crop. The RACP proposes to adopt "green" agricultural practices that would promote Integrated Nutrient Management (INM) and Integrated Pest Management (IPM) and therefore, the possibility of excessive use of agri-chemicals is largely mitigated.

Water harvesting and water management activities are expected to be implemented in the RACP, namely, rain fed, groundwater based and surface water based. The main objectives are to harvest and store water in rain fed systems, harvest and recharge in groundwater systems and under all water regimes to sustainably use water for cropping and livestock, reduce use of water in agriculture sector and increase water-use efficiency in cropping.

The project proposes to provide health care through organizing Animal Health Camps and also by providing permanent services through a Rural Technology Centre-cum-Animal Health Centre. The likely impacts of these are issues related to safe disposal of syringes, needles and vaccines used in treating the animals.

Storage and processing of produce are activities expected to be taken up under value chain development component of the RACP. The operations include input supply to its members, output marketing and processing support to its members, providing warehousing facility, Food processing Unit, etc. These activities when carried out in a "business-as-usual" manner would affect the environment in one way or the other.

The Line Department /NGO/ Design consultants/engineers /FPC for designing and executing the structures will abide by the Environmental measures listed in the Environment Management Plan (EMP) given below. The Line Department shall include the EMP requirements in the Programme of RACP Works. The requirements stated in the EMP should therefore be studied properly and implemented accordingly.

Detailed activities can be referred from Annexure 7.2.

Chapter – 8: Consolidated investment plan with budget and source of funds

8.1. Procurement and Financial Management

The financial management and procurement aspects are at the core and are stated in the Loan Agreement, Project Agreement, Disbursement Letter and detailed in the Project Financial Management Manual (PFMM) and Project Procurement Manual (PPM). Accordingly both the PFMM and PMM have already been shared with all agencies (The PMU, DPMU, Jaipur the six Line departments and partner agencies) to ensure consistency and compliance. While the Financial Management aspects include: Planning and Budgeting, Funds Flow, Accounting, Reporting, Internal Control, including internal Audit and External Audit the Procurement aspects include procurement planning, use of standard bid documents, contract management aspects and procurement prior and post review based on threshold in agreed procurement plan.

The procurement is done as per the procurement plan approved by the World Bank and Procurement Manual & World Bank Procurement Guidelines are followed. As far as fund flow management is concerned, fund management is done as per the Financial Management Manual.

Financial Management and Procurement Framework for releases of funds to WUAs/FPCs/Individual Beneficiaries (IBs) under grants, as mentioned above the procurement will be done as per the Procurement Management Manual (PMM) and fund flow will be done as per the Financial Management Manual (FMM). In this cluster, WUAs have been formed and Farmer Producer's Companies (FPCs) are to be formed. The related activities are to be performed by these WUAs /FPCs/Individual Beneficiaries (IBs). A Community Resource Person (CRP) is being deployed with each of the WUAs and Chief Executive Officer (CEO) is to be deployed with each of the FPC in the cluster. These CRPs/CEOs will be paid based on the performance. The certain works have been assigned to them to be performed by them. Following actions are needed:

- A fiduciary capacity assessment of WUAs /FPCs/IBs shall be carried out by the Bank. (This shall be completed by assessing a representative sample of WUAs/FPCs/IBs, as determined by the Bank.)
- Based on the completed assessment, appropriate mitigation measures, including issuing the fiduciary guidelines; availability of procurement and financial management point person at their level and capacity building shall be adopted.
- Some activities like institutional & infrastructure support to Farmer's Producer Companies and Post-Harvest Management support to be given to individual farmers which are to be treated as grant in Agriculture and Horticulture departments. Upon verification that above

actions have been completed, funds flow to WUAs/MTAs/FPCs/IBs through Grants under approved sub projects as part of the CACPs can be initiated

8.2. Investment Plan

The **consolidated investment plan** has been explained in the concerned chapters to make the area and farmers of the cluster competitive so that they can get optimum water as well crop's productivity. An estimated consolidated investment amount of **Rs.3419.69 lakh** would be incurred on various activities. The source of funds is credit available in components of Rajasthan Agricultural Competitiveness Project (RACP). The department, major activity and component wise investment plan with budget are being summarized as under:

Table 19: Consolidated Investment Plan

#	Department	Components (Rs. Lakh)				
		Climate Resilient Agriculture	Market & Value Chains	Farmer's Organization and Capacity Building	Project Management and M&E	Total
1	Water Resource	195.77	0.00	43.90	7.50	**247.17**
2	Agriculture	1338.65	232.00	163.97	9.04	**1743.66**
3	Horticulture	1381.86	0.00	36.00	11.00	**1428.86**
	Total	**2916.28**	**232.00**	**243.87**	**27.54**	**3419.69**

Above table reveals that investments related to improvement of water use efficiency, transfer of technology and market led advisory services, livestock strengthening, market infrastructure and value chain development an estimated total amount of **Rs.3419.69 lakh** likely to be incurred in the cluster to make the farmer and cluster competitive and to maximize water as well as agricultural productivity in the cluster.

8.2.1. Consolidated Investment Plan – by nature of expenditure:

Investments related to improvement of water use efficiency, transfer of technology and market led advisory services, livestock strengthening, market infrastructure and value chain development an estimated total amount of **Rs.3419.69 lacs** likely to be incurred in the cluster to make the farmer and cluster competitive and to maximize water as well as agricultural productivity in the cluster.

Table 20: Consolidated Investment Plan – by nature of expenditure

Type of Expenditure/ Line Dept.	Water Resource	Agriculture	Horticulture	Total
Goods	5.40	638.42	976.21	**1620.03**
Works	213.77	2.22	0.00	**215.99**
Consultant Services	2.00	147.84	0.00	**149.84**
Operating Costs	7.50	16.55	11.00	**35.05**
Training	11.00	18.13	36.00	**65.13**
Grants	7.50	352.79	4.00	**364.29**
Beneficiary Contribution	0.00	567.71	401.65	**969.36**
Total	**247.17**	**1743.66**	**1428.86**	**3419.69**

Note:

1. The column for "Grants" would state project's share for any goods/services provided to WUAs/FPCs/IBs and column for "Beneficiary contribution" will include share of WUAs/FPCs/IB.

2. The proposed activities in the CACP will be implemented as per the subject specific operational guidelines already approved. The revisions in the guidelines have been made as per the reply sent to the World Bank and committed during the Mid Term Review (MTR) and approved in the meetings of Executive Committee held till now. If any change in subject specific operational guidelines in future is to be made during the course of implementation, then it would be applicable accordingly

Annexure 2.1 Gram Panchayat and Village-wise area in Z-distributary Cluster

Table 21 Gram Panchayat and Village wise area in Z-distributary Cluster

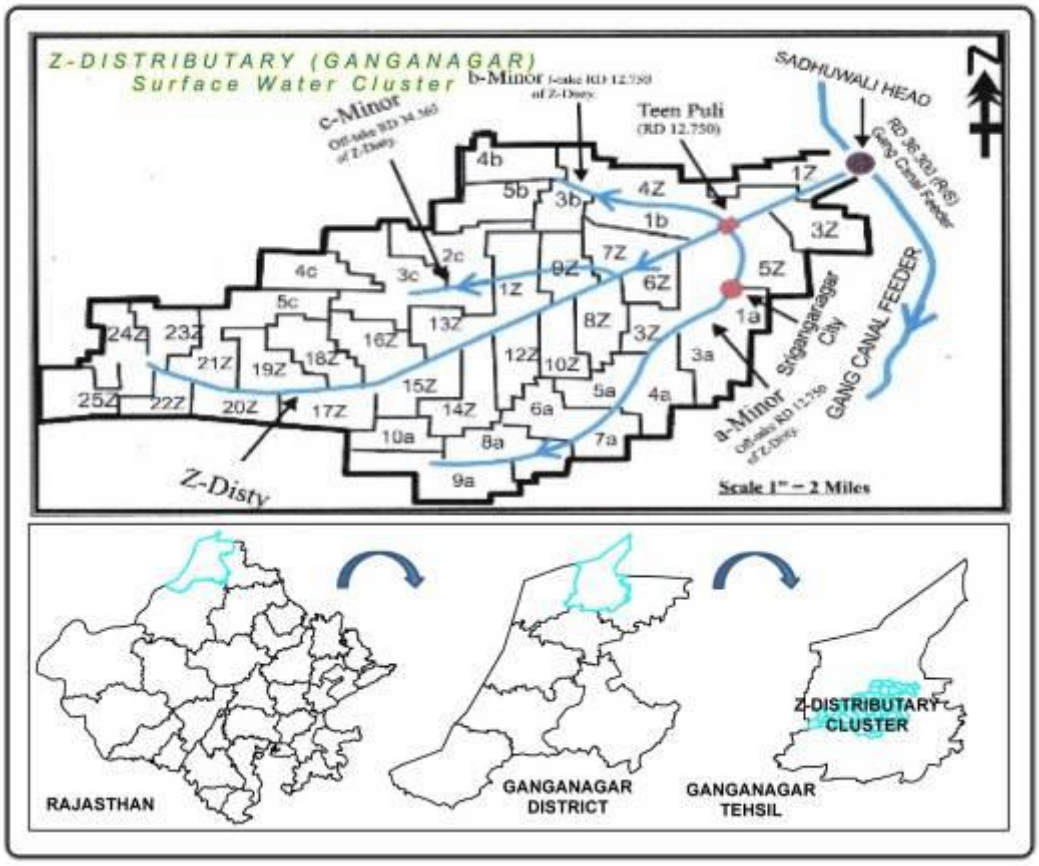
S. N.	Chak / Abadi	Gram Panchayats	Tehsil	CCA in Ha	% area in Cluster
1	1 z-I	4 z	Sriganganagar	192	1.58%
2	1z-II	4 z	Sriganganagar	104	0.86%
3	4z-I	4 z	Sriganganagar	127	1.05%
4	4z-II	4z	Sriganganagar	224	1.85%
5	5z-I	4z	Sriganganagar	127	1.05%
6	5z-II	4z	Sriganganagar	124	1.02%
7	6z	10z	Sriganganagar	186	1.53%
8	6az	10z	Sriganganagar	117	0.96%
9	7z	9z	Sriganganagar	271	2.23%
10	8z	10z	Sriganganagar	329	2.71%
11	9z	9z	Sriganganagar	306	2.52%
12	10z	10z	Sriganganagar	271	2.23%
13	11z	9z	Sriganganagar	335	2.76%
14	12z	10z	Sriganganagar	298	2.46%
15	13z	18z	Sriganganagar	332	2.74%
16	14z	10z	Sriganganagar	303	2.50%
17	15z	10z	Sriganganagar	276	2.28%
18	16z	18z	Sriganganagar	355	2.93%
19	17z	18z	Sriganganagar	289	2.38%
20	18z	18z	Sriganganagar	335	2.76%
21	19z	18z	Sriganganagar	296	2.44%
22	20z	3H-Chhoti	Sriganganagar	304	2.51%
23	21z	Sahibsinghwala	Sriganganagar	226	1.86%
24	22z	3H-Chhoti	Sriganganagar	302	2.49%
25	23z	Sahibsinghwala	Sriganganagar	311	2.56%
26	24z	Sahibsinghwala	Sriganganagar	287	2.37%
27	25z	Sahibsinghwala	Sriganganagar	310	2.56%
28	3a-I	Sahuwala	Sriganganagar	66	0.54%
29	3a-II	Sahuwala	Sriganganagar	82	0.68%
30	4a	Sahuwala	Sriganganagar	190	1.57%
31	5a	Sahuwala	Sriganganagar	192	1.58%
32	6a	Sahuwala	Sriganganagar	206	1.70%
33	7a-I	Sahuwala	Sriganganagar	161	1.33%
34	7a-II	Sahuwala	Sriganganagar	100	0.82%
35	8a	10z	Sriganganagar	270	2.23%
36	9a	5g Saharanwali	Sriganganagar	245	2.02%
37	10a-I	10z	Sriganganagar	205	1.69%
38	10a-II	10z	Sriganganagar	179	1.48%
39	1b-I	4z	Sriganganagar	188	1.55%

S. N.	Chak / Abadi	Gram Panchayats	Tehsil	CCA in Ha	% area in Cluster
40	1b-II	4z	Sriganganagar	149	1.23%
41	3b	9z	Sriganganagar	312	2.57%
42	2b	Mohanpura	Sriganganagar	293	2.42%
43	4b	Mohanpura	Sriganganagar	324	2.67%
44	5b	9z	Sriganganagar	313	2.58%
45	1c	3c- Chhoti	Sriganganagar	309	2.55%
46	2c	3c- Chhoti	Sriganganagar	349	2.88%
47	3c	3c- Chhoti	Sriganganagar	364	3.00%
48	4c	3c- Chhoti	Sriganganagar	347	2.86%
49	5c	3c- Chhoti	Sriganganagar	347	2.86%
			Total	**12128**	100%

(Source: Water Resource Department DPR of Z-distributary Cluster)

The index map of Z-distributary cluster is given as under:

Figure 6: Index Map of Z-distributary cluster



Annexure 2.2 Trend of change in cropped area and cropping over 10 years in Rajasthan & Sriganganagar district

Table 22 Area (in ha %) of Agricultural Crops in 2006-07 & 2015-16, increase / decrease over 10 years in State & Sriganganagar district

Crops	State							Sriganganagar							
	2006-07		2015-16		Increase (+)/Decrease (-) over 10 Years		Average of 10 Years	2006-07		2015-16		Increase (+)/Decrease (-) over 10 Years		Average of 10 Years	% area over state average
	Area (ha)	%	Area (ha)	%	Area (ha)	%		Area (ha)	%	Area (ha)	%	Area (ha)	%		
Guar	2807913	15.88%	4786781	27.08%	1978868	11.19%	3670753.10	120301	0.68%	583866	3.30%	463565	2.62%	298466.90	8.13%
Sugarcane	10897	0.06%	6141	0.03%	-4756	-0.03%	6851.30	2651	0.01%	2347	0.01%	-304	0.00%	2228.90	32.53%
Cotton	349602	1.98%	447649	2.53%	98047	0.55%	390183.10	140088	0.79%	56003	0.32%	-84085	-0.48%	114280.60	29.29%
Groundnut	306037	1.73%	516850	2.92%	210813	1.19%	387853.00	1947	0.01%	1465	0.01%	-482	0.00%	3484.20	0.90%
Wheat	2564840	14.51%	3108973	17.59%	544133	3.08%	2851321.60	192667	1.09%	274584	1.55%	81917	0.46%	233668.50	8.20%
Barley	232271	1.31%	256029	1.45%	23758	0.13%	281434.60	23435	0.13%	36641	0.21%	13206	0.07%	42638.20	15.15%
Gram	1010754	5.72%	941950	5.33%	-68804	-0.39%	1297770.40	75982	0.43%	67746	0.38%	-8236	-0.05%	90355.90	6.96%
Mustard	3099570	17.53%	2532330	14.32%	-567240	-3.21%	2561288.30	278340	1.57%	239948	1.36%	-38392	-0.22%	244553.50	9.55%
Taramira	112107	0.63%	16792	0.09%	-95315	-0.54%	206125.00	20326	0.11%	2498	0.01%	-17828	-0.10%	9512.10	4.61%
Net Area Shown	17678784.1		17678784.1				**17678784.14**	753068		753068				**753068.00**	

(Source: Agriculture department, Sriganganagar)

Table 23 Cropping Pattern (%) for 10 Years (2006-07 to 2015-16) at the State level

Crops	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	Average of 10 Years
Guar	15.88%	17.02%	18.91%	15.21%	16.25%	17.16%	25.94%	27.75%	26.16%	27.08%	20.76%
Sugarcane	0.06%	0.06%	0.04%	0.04%	0.03%	0.04%	0.03%	0.03%	0.03%	0.03%	0.04%
Cotton	1.98%	2.16%	2.20%	2.62%	1.83%	0.73%	2.99%	2.86%	2.22%	2.53%	2.21%
Groundnut	1.73%	1.62%	1.85%	1.92%	1.90%	2.30%	2.30%	2.53%	2.83%	2.92%	2.19%
Wheat	14.51%	15.16%	13.08%	14.10%	16.55%	16.28%	17.53%	17.55%	18.77%	17.59%	16.13%
Barley	1.31%	1.46%	1.63%	1.32%	1.79%	1.54%	1.76%	1.69%	1.94%	1.45%	1.59%
Gram	5.72%	7.20%	7.18%	5.21%	9.72%	7.95%	7.17%	10.53%	7.11%	5.33%	7.34%
Mustard	17.53%	14.38%	15.60%	13.03%	13.57%	13.54%	13.87%	15.23%	13.77%	14.32%	14.49%
Taramira	0.63%	0.22%	0.57%	0.57%	6.48%	0.34%	0.63%	1.62%	0.23%	0.09%	1.17%

Table 24. Cropping Pattern (%) for 10 Years (2006-07 to 2015-16) in in Sriganganagar District

Crops	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	Average of 10 Years
Guar	15.97%	24.86%	32.68%	22.55%	23.67%	20.98%	41.37%	63.43%	70.77%	77.53%	39.63%
Sugarcane	0.35%	0.37%	0.24%	0.35%	0.32%	0.36%	0.24%	0.19%	0.23%	0.31%	0.30%
Cotton	18.60%	20.78%	12.52%	24.25%	12.65%	22.24%	16.73%	8.71%	9.08%	7.44%	15.18%
Groundnut	0.26%	0.35%	0.83%	1.40%	0.49%	0.50%	0.26%	0.22%	0.23%	0.19%	0.46%
Wheat	25.58%	27.93%	28.21%	29.95%	30.66%	32.65%	30.94%	33.46%	34.08%	36.46%	31.03%
Barley	3.11%	9.86%	7.71%	4.16%	2.51%	3.41%	4.85%	5.77%	10.54%	4.87%	5.66%
Gram	10.09%	16.98%	16.08%	12.04%	13.51%	12.10%	12.73%	9.97%	7.69%	9.00%	12.00%
Mustard	36.96%	36.41%	30.54%	31.50%	36.55%	35.18%	32.71%	27.42%	25.71%	31.86%	32.47%
Taramira	2.70%	1.60%	2.30%	1.66%	1.67%	0.60%	1.32%	0.30%	0.25%	0.33%	1.26%

(Source: Agriculture department, Sriganganagar)

Annexure 2.3 Farmers' category wise Cultivated Area in Z-distributary Cluster

Table25. Farmers' Category wise Cultivated Area in Z-distributary Cluster

Type of Farmer	Total Households (Nos)	Area (in ha)			Area (in ha) Category wise		
		Irrigated	Un-Irrigated	Total	Others	SC	ST
Large farmer	3010	12003	0	12003	11685	28	0
Small farmer	123	90	0	90	88	291	0
Marginal farmer	97	35	0	35	35	1	0
Landless person	2600	0	0	0	0	0	0
No. of BPL households	942	0	0	0	0	0	0
Total	**5830**	**12128**	**0**	**12128**	**11808**	**320**	**0**
Category wise Cultivated Area in Z-Distributary canal Cluster in %							
Large farmer	51.63%	98.97%	0.00%	98.97%	96.35%	0.23%	0.00%
Small farmer	2.11%	0.74%	0.00%	0.74%	0.73%	2.40%	0.00%
Marginal farmer	1.66%	0.29%	0.00%	0.29%	0.29%	0.01%	0.00%
Landless person	44.60%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
No. of BPL households	16.16%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Total	**100.00%**	**100.00%**	**0.00%**	**100.00%**	**97.36%**	**2.64%**	**0.00%**

(Source: Agriculture Department, Z distributary)

Annexure 2.4 Status of Cropped area of Agricultural Crops in Z-distributary cluster

The cropped area has been compiled from the data collected while Participatory Rural Appraisal (PRA) which was performed by the NGO during the year 2016-17.

Table 26. The Status of Cropped area of Agricultural Crops in Z-distributary cluster

S. No.	Name of Crop	2006-07	2007-08	2008-09	2009-2010	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	Average of 10 Years
A.	**Kharif**											
1	Sugarcane	278	234	206	229	251	256	398	192	266	303	**261.30**
2	Cotton	2793	2783	1850	2496	1924	2208	1014	1503	740	1792	**1910.30**
3	Guar	703	869	2789	727	904	2913	2115	6276	3573	1835	**2270.40**
B.	**Rabi**											
4	Wheat	3704	3777	3298	3494	3690	3641	4135	4499	3470	4002	**3771.00**
5	Mustard	5305	4998	3994	3455	5832	4969	3944	2975	2518	2604	**4059.40**
6	Barley	627	1112	1898	1285	673	2866	3021	2970	3278	1561	**1929.10**
						Area (%)						
A.	**Kharif**											
1	Sugarcane	2.29%	1.93%	1.70%	1.89%	2.07%	2.11%	3.28%	1.58%	2.19%	2.50%	**2.16%**
2	Cotton	23.04%	22.96%	15.26%	20.59%	15.87%	18.21%	8.36%	12.40%	6.10%	14.78%	**15.76%**
3	Guar	5.80%	7.17%	23.01%	6.00%	7.46%	24.03%	17.45%	51.77%	29.47%	15.14%	**18.73%**
B.	**Rabi**											
4	Wheat	30.55%	31.16%	27.20%	28.82%	30.44%	30.03%	34.11%	37.11%	28.62%	33.01%	**31.11%**
5	Mustard	43.76%	41.23%	32.95%	28.50%	48.11%	40.99%	32.53%	24.54%	20.77%	21.48%	**33.49%**
6	Barley	5.17%	9.17%	15.66%	10.60%	5.55%	23.64%	24.92%	24.50%	27.04%	12.88%	**15.91%**

(Source: Agriculture department, Bikaner)

Annexure 2.5 Change in Area and Cropping Pattern of horticultural crops over 5 years in Rajasthan and Sriganganagar district

Table 27. Area (%) and Cropping Pattern (%) of horticultural crops and Increase (+) / decrease (-) over 5 years in Rajasthan and Sriganganagar district

Crops	2011-12		2015-16		Increase (+)/Decrease (-) over 5 Years		Average of 5 Years	2011-12		2015-16		Increase (+)/Decrease (-) over 5 Years		Average of 5 Years	% area over state average
	Area (ha)	%	Area (ha)	%	Area (ha)	%		Area (ha)	%	Area (ha)	%	Area (ha)	%		
Kinnow	7923	0.04%	8821	0.05%	898	0.0001	**8997.60**	6683	0.86%	7382	0.98%	699	0.0012	**7649.60**	85.02%
Date	0	0.00%	0	0.00%	0	0.0000	**0.00**	0	0.00%	0	0.00%	0	0.0000	**0.00**	0.00%
Carrot	1122	0.01%	1530	0.01%	408	0.0000	**1094.40**	67	0.01%	130	0.02%	63	0.0001	**96.60**	8.83%
Potato	11859	0.07%	14322	0.08%	2463	0.0002	**11473.60**	257	0.03%	265	0.04%	8	0.0000	**239.40**	2.09%
Onion	64171	0.36%	86306	0.49%	22135	0.0013	**63596.20**	6	0.00%	71	0.01%	65	0.0001	**34.40**	0.05%
Brinjal	5296	0.03%	6078	0.03%	782	0.0001	**5418.15**	55	0.01%	29	0.00%	-26	0.0000	**69.00**	1.27%

(**Source:** Horticulture department, Jaipur)

Table 28. Area (ha) and Cropping Pattern (%) of horticultural crops during last 5 Years in Rajasthan and Sriganganagar district

Crops	2011-12	2012-13	2013-14	2014-15	2015-16	Average of 5 Years	2011-12	2012-13	2013-14	2014-15	2015-16	Average of 5 Years
Kinnow	0.04%	0.06%	0.05%	0.05%	0.05%	**0.05%**	0.86%	1.07%	1.08%	0.97%	0.98%	**0.99%**
Carrot	0.01%	0.01%	0.01%	0.00%	0.01%	**0.01%**	0.01%	0.00%	0.02%	0.02%	0.02%	**0.01%**
Potato	0.07%	0.05%	0.05%	0.07%	0.08%	**0.06%**	0.03%	0.02%	0.03%	0.03%	0.04%	**0.03%**
Onion	0.36%	0.27%	0.32%	0.35%	0.49%	**0.36%**	0.00%	0.00%	0.01%	0.00%	0.01%	**0.00%**
Brinjal	0.03%	0.03%	0.03%	0.03%	0.03%	**0.03%**	0.01%	0.00%	0.02%	0.02%	0.00%	**0.01%**

(**Source:** Horticulture department, Jaipur)

Annexure 2.6 Change in Area and Cropping Pattern of horticultural crops over 5 years in Z-distributary

Table 29: Cropping Pattern (in ha & %) of Horticultural crops in Z-Distributary canal Cluster

Crops	Area (ha)	Cropping Intensity (%)
Vegetable		
Carrot	50	0.41
Onion	3	0.02
Brinjal	5	0.04
Okra	4	0.03
Total	**62**	**0.51%**
Fruits		
Kinnow	108	0.89%
Date Palm	2	0.02%
Total Fruits	**110**	**0.91%**
Total Horticulture fruits	**172**	**1.43%**

(Source: Horticulture department, Z-Distributary canal)

Annexure 2.7 Average Annual Rainfall in the last decade in Z-distributary cluster

Table 30: Average Annual Rainfall in the last 10 years (decade) in Z-Distributary cluster

S. No	Year	Average Annual Rainfall (mm)
1	2005	191
2	2006	233
3	2007	479
4	2008	292
5	2009	297
6	2010	366
7	2011	453
8	2012	287
9	2013	296
10	2014	576
	Total	**3470**
	Average	**347**

(Source: Water Resource department, Sriganganagar)

Annexure 2.8: Approach to study ground water occurrence

To study about ground water occurrence & its movement, the various litho units have been classified on the basis of their degree of consolidation and related parameters. Alluvium is the Aquifer in Z-distributary Cluster, the most important unconsolidated formations due to their wide-spread occurrence. The sediments are composed of clay, silt, sand, gravel and mixture of concretions etc. Sand, gravel and a mixture of these form the potential aquifers. Ground water occurs under unconfined to semi-confined conditions. The Cluster area falls in the **Saline Zone**. The area is not suitable for Irrigation by Ground Water**.**

Ground Water Resource Estimation Methodology—1997 (GEC'97)

In GEC'97, two approaches have been recommended. The water level fluctuation method is based on the concept of storage change due to difference between various input and output components. Input refers to recharge from rainfall and other sources and subsurface inflow into the assessment unit. Output refers to ground water draft, ground water evapo-transpiration and base flow to streams and subsurface outflow from the Aquifer. Since the data on subsurface inflow/ outflow are not readily available, therefore the inflow/ outflow across these boundaries may be taken as negligible. In each assessment unit, hilly areas having slope more than 20% are deleted from the total area to get the area suitable for recharge.

Further, areas where the quality of ground water is beyond the usable limits should be identified and handled separately. Ground water assessment in Z-distributary Cluster is done on Saline areas for monsoon and non-monsoon seasons and consolidated as Net Annual Ground water Availability in the Cluster area. The Z-distributary Cluster is under Saline Zone. Ground water potential of Z-Distributary cluster, block Sri-Ganganagar, Sri-Ganganagar district has been estimated as on 31.03.2013 on the basis of GEC-97 Guidelines. Net Annual Ground water Availability as on 31.03.2013 was 2.49 MCM. Net Ground Water is not available for Future Irrigation Development. The details are given in Table-5 of Annexure – 2.1. Stage of Ground Water Development: Stage of Ground Water Development in the Z-Distributary Cluster area as on 31.3.2013 is 30.95 which comes under Safe Zone. 1.72 MCM is available for ground water development for Irrigation purposes (Table-5 of Annexure - 1). However, in canal command areas, conjunctive use of groundwater & canal water is the need of the hour so as to avoid land degradation by water logging hazards and soil salinity/alkalinity.

Existing Gross Ground Water Draft of 0.77 MCM for Irrigation are withdrawn through 44 wells/Tube wells for irrigation purposes in the Z-Distributary Cluster area. Existing Gross Ground Water Draft of 0.002 MCM for Domestic purposes are withdrawn from Wells/Tube wells/Hand pumps. Increasing trend of 0.29 m/year in ground water levels of Post-Monsoon period from 2003 to 2016 has been observed in the Cluster Area. 1.72 MCM is available for ground water development for Irrigation purposes in conjunction with canal water. Based on the ground water study, the Z-distributary cluster area is under safe zone**.**

Annexure 2.9 SRR in Sriganganagar district & Rajasthan

Table 31: Seed Replacement Rate (SRR) in Rajasthan and Sriganganagar

Crop	Rajasthan						Sriganganagar					
	2013-14			2014-15			2013-14			2014-15		
	Area (lac ha)	Seed Dist. (Qtl)	SRR (%)	Area (lac ha)	Seed Dist. (Qtl)	SRR (%)	Area (lac ha)	Seed Dist. (Qtl)	SRR (%)	Area (lac ha)	Seed Dist. (Qtl)	SRR (%)
Kharif												
Guar	50.72	56519	7.43	46.30	44883	6.46	4.98	14998	20.08	5.33	12.032	15.05
Cotton BT	2.74	3787	100	2.91	3927	100	1.20	4192	23.37	1.96	5487	18.70
Sugarcane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Rabi												
Mustard	27.83	90171	81.02	24.34	87925	90.32	2.15	6435	74.68	1.94	9450	100
Wheat	32.06	1022634	31.9	33.18	1082866	32.63	2.63	118058	44.92	2.57	186016	72.48
Barley	3.09	115195	37.25	3.43	132971	38.73	0.45	20388	44.99	0.79	25995	32.74

(Source: Agriculture Department, Sriganganagar)

Annexure 2.10 SRR in Z-distributary cluster

Table 32: Seed Replacement Rate (SRR in %) in the Z distributary Cluster from 2011-12 to 2015-16

Crop	Name of Certified / Improved varieties being shown in the cluster	2011-12			2012-13			2013-14			2014-15			2015-16		
		Area		SRR (%)	Area		SRR (%)	Area		SRR (%)	Area		SRR (%)	Area		SRR (%)
		Sown	under Improved Varieties		Sown	under Improved Varieties		Sown	under Improved Varieties		Sown	under Improved Varieties		Sown	under Improved Varieties	
Sugarcane	CO-05009,CO-6617,7717	256	-	-	398	-	-	192	-	-	266	-	-	303	-	-
Cotton	RG-8,RS 2013,RHH-16,Bt.Cotton	2208	1582	71.67 %	1014	447	44.10 %	1503	939	62.47 %	740	740	100.00 %	1792	1792	100.00 %
Guar	HG-2-20,RGC-1002,936,1066,HG-365	2913	496	17.04 %	2115	628	29.70 %	6276	1260	20.08 %	3573	538	15.05 %	1835	564	30.71 %
Wheat	WH-1105,HD-3086,RAJ-3077,HD-2329	3641	1621	44.52 %	4135	2360	57.08 %	4499	2021	44.92 %	3470	2515	72.48 %	4002	2881	72.00 %
Mustard	RGN-298,229,236,RGN-73,13,LAKSMI	4969	3422	68.87 %	3944	3808	96.54 %	2975	2222	74.68 %	2518	2518	100.00 %	2604	2604	100.00 %
Barley	RD-2052,2035,2660,2592,2552,2664	2866	1522	53.09 %	1473	1032	70.06 %	2970	1336	44.99 %	3278	1073	32.74 %	1561	500	32.00 %

(Source: Agriculture Department, Sriganganagar**)**

Annexure 2.11 Area Covered and Technical Grade Material used under Plant Protection Measures during 2014-15 in Rajasthan & Sriganganagar

Table 33. The Area (in 000ha) Covered and Technical Grade Material (TGM) used under Plant Protection Measures during 2014-15 in Rajasthan and Sriganganagar(Method of Plant Protection)

State/District	Season	Seed Treat	Soil Treat	Poly Treat	Intensive Treat	Rat Control	Weed Control	Total Area	TGM in tones
Rajasthan	K	6940	349	700	1178	138	355	9660	719
	R	4503	329	518	848	278	525	7001	1975
	K&R	11443	678	1218	2026	416	880	16661	2694
District	K	279	54	85	185	16	19	638	96
	R	227	18	33	164	22	97	561	86
	K&R	506	72	118	349	38	116	1199	182
Rajasthan (%)	K	45.15 %	2.27 %	4.55%	7.66%	0.90%	2.31%	62.85 %	4.68%
	R	48.38 %	3.53 %	5.57%	9.11%	2.99%	5.64%	75.21 %	21.22 %
	K&R	46.37 %	2.75 %	4.94%	8.21%	1.69%	3.57%	67.51 %	10.92 %
District (%)	K	41.57 %	8.05 %	12.67 %	27.57%	2.38%	2.83%	95.06 %	14.30 %
	R	37.02 %	2.94 %	5.38%	26.75%	3.59%	15.82%	91.49 %	14.03 %
	K&R	39.40 %	5.61 %	9.19%	27.17%	2.96%	9.03%	93.36 %	14.17 %

(K – Kharif, R – Rabi & T – Total)
(Source: Agriculture Department, Jaipur)

Annexure 2.12 Area Covered and Technical Grade Material used under Plant Protection Measures during 2014-15 in Z distributary cluster

Table 34 The Area Covered and Technical Grade Material (TGM) used under Plant Protection Measures during 2014-15 (Method of Plant Protection)

State/District	Season	Cereals	Pulses	Food Grains	Oilseed	Sugarcane	Cotton	Guar	Others
Rajasthan	K	4049	1277	5326	1856	16	775	1242	445
	R	2862	1160	4022	2289	0	0	0	690
	K&R	6911	2437	9348	4145	16	775	1242	1135
Sriganganagar	K	15	25	40	30	14	237	216	101
	R	185	94	279	269	0	0	0	13
	K&R	200	119	319	299	14	237	216	114
Rajasthan (%)	K	26.34%	8.31%	34.65%	12.08%	-	-	-	2.90%
	R	30.75%	12.46%	43.21%	24.59%	-	-	-	7.41%
	K&R	28.00%	9.88%	37.88%	16.80%	-	-	-	4.60%
Sriganganagar (%)	K	2.24%	3.73%	5.96%	4.47%	-	-	-	15.05%
	R	30.17%	15.33%	45.50%	43.87%	-	-	-	2.12%
	K&R	15.57%	9.27%	24.84%	23.28%	-	-	-	8.88%

(K – Kharif, R – Rabi & T – Total)
(Source: Agriculture Department, Jaipur)

Annexure 2.13 Crop Water Requirement of Agricultural and Horticultural Crops in Z-distributary

Table 35. Crop Water Requirement of Agricultural and Horticultural Crops in Z-distributary

Name of crop	Area in Ha	Crop Water Requirement in Cum /ha	Total Current Crop Water Requirement in cum	Proposed Area (ha) to be sown	Total Proposed Crop Water Requirement in cum
Kharif					
Sugarcane	261	11000	2871000	283	3113000
Cotton	1910	6000	11460000	1451	8706000
Guar	2270	2000	4540000	3342	6684000
Total	**4441**		**18871000**	**5076**	**18503000**
Rabi					
Wheat	3771	5000	18855000	3016	15080000
Mustard	4059	3000	12177000	5277	15831000
Barley	1929	2500	4822500	2622	6555000
Total	**9759**		**35854500**	**10915**	**37466000**
Grand Total (K+R)	**14200**		**54725500**	**15991**	**55969000**
Vegetable					
Carrot	50	8000	400000	80	640000
Onion	3	8000	24000	5	40000
Brinjal	5	8000	40000	10	80000
Okra	4	8000	32000	8	64000
Total	**62**		**496000**	**103**	**824000**
Fruits					
Kinnow	108	8000	864000	250	2000000
Date Palm	2	4000	8000	2	8000
Total Fruits	**110**		**872000**	**252**	**2008000**
Total Hort. Crops	**172**		**1368000**	**355**	**2832000**
Grand Total	**14372**		**56093500**	**16346**	**58801000**

(Source: Agriculture Department, Sriganganagar**)**

Annexure 2.14 Data to calculate ground water status of Z-distributary cluster

The principal source of recharge to ground water is rainfall. Annual monsoon and non-monsoon rainfall (mm) from the year 2008 to 2012 of the Block Sri Ganganagar district Sri Ganganagar are attached in the excel sheets with the CACP report of Z distributary .

It also includes the following-

a. Ground water level of the cluster
b. Ground water extraction status

Annexure 2.15 Supporting institutions and service providers in Sriganganagar

Table 36: Supporting institutions and service providers in Sriganganagar

Sr. No.	Type of assistance	Name and address of agencies
1.	Provisional Registration Certificate (EM-1) & Permanent Registration Certificate (EM-II)	D I C, Shri Ganganagar
2.	Identification of Project Profiles, techno-economic and managerial consultancy services, market survey and economic survey reports.	MSME—DI, 22 Godam Indl Area, Jaipur
3.	Land and Industrial shed	RIICO Udyog Bhavan, Tilak marg, Jaipur
4.	Financial Assistance	RFC Udyog Bhavan, Tilak marg, Jaipur
5.	For raw materials under Govt. Supply	RSIC Ltd Udyog Bhavan, Tilak marg, Jaipur
6.	Plant and machinery under hire / purchase basis.	NSIC Nehru Place, Tonk Road, Jaipur
7.	Power/ Electricity	RSEB Ltd, Sri Ganganagar
8.	Technical Know –how.	MSME—DI, 22 Godam Indl Area Jaipur
9.	Quality & Standard	BIS Yudhishter Marg, C Scheme, Jaipur
10.	Marketing /Export Assistance	DG & FT, Udyog Bhavan, Tilak marg, Jaipur
11.	Other Promotional Agencies	DIC , RFC , RIICO

Annexure 3.1 Parameters and their definition for selection of Value Chain crops

Parameters and Weightage for the selection of Value Chain reports

#	Parameters	Weightage
A.	**Existing size**	**30**
1	Cropped Area of the crop in the cluster (in acre)	10
2	Crop Production in the cluster (in quintals)	10
3	Crop Productivity (cluster level compared to national's average)	10
B.	**Potential for Value addition within Rajasthan (implying scope for increased value addition for local producers and processors)**	**45**
4	Price spread in Rs/Q (Price paid at APMC mandi- realization by farmer at farm level)	5
5	Price spread in Rs/Q (Price paid by customer at retail level realization by farmer at farm level)	5
6	Net profit in production (Rs per acre)	5
7	Scope for processing in the state	10
8	Scope for value addition (Primary/ secondary/ tertiary processing)	10
9	Growth in market demand 5 year	10
C.	**Risk assessment**	**10**
10	Price Volatility (last 5 years; due to monsoon, due to adverse agronomical conditions)	10
D.	**Others (Environmental & Social Parameter)**	**15**
11	Water requirement	15
Total		**100**

Definition of Parameters

1. **Area**

It is the cropped area in acres under cultivation of the particular crop in the concerned cluster as per data available with RACP for the year 2016-17. The area parameter has been accorded weightage of 10%. Crops have been given scores from 1 to 10 based upon their area of cultivation. The crop with the largest area is accorded the highest score of 10 while the remaining crops are given proportionately lower marks.

2. **Production**

It is the total production of the crop in quintal in the cluster as per data available with RACP for the year 2016-17. The area parameter has been accorded weightage of 10%. Crops have been allotted

scores from 1 to 10 based on their production levels. The crop with maximum production gets highest score of 10 while the remaining crops get proportionately lower marks.

3. **Productivity**

The productivity value of the crop is the comparison of the productivity (Q/Acre) of the crop in the cluster (as per the data available from RACP for the year 2016-17) as against average national productivity (Q/Acre) of the same crop (as per the data by Directorate of Economics and Statistics). The area parameter has been given a weightage of 10%. Cluster level productivity of the crops has been scored from 1 to 10. The crop having average productivity of the cluster greater than or equal to that of national average will get 10 whereas the crop having average productivity of the cluster less than that of national average will get proportionately/ relatively less score. For eg. Crop having cluster average productivity of 5 Q/acre and national average of 10 Q/acre will get 5 marks. Similarly if crop has cluster productivity of 3 Q/acre then it will get 3 marks. If the crop is having either 12 Q/acre or 15 Q/acre then both will get 10 marks.

4. **Price spread at Mandi level**

The price spread at mandi level can be defined as the difference between the value realization by farmer at the farm level (as per field consultation) by selling the raw crop produce and the price of the same crop obtained at primary processor level (as per the data available on www.agmarknet.nic.in). It is measured in Rs per quintal. The price spread at mandi level (parameter) has been accorded weightage of 5%. The crops have been scored from 1 to 5 based upon their price spread at mandi level; with the crop with higher price spread at mandi level receiving a higher score.

5. **Price spread at retail level**

The price spread at retail level can be defined as the difference between the value realization of farmer at the farm level (as per field consultation) by selling the raw crop produce and the price of the same crop, with highest degree of value addition, paid by consumer at the retail level (as per field consultation). It is measured in Rs per quintal. The price spread at retail level parameter has been given a weightage of 5%. The crops have been scored from 1 to 5 based upon their production, with the crop with higher price spread at retail level receiving higher score.

6. **Net profit in production**

It is the net income accrued to the farmer by selling the raw produce (commodity) at the farm level after deduction of the total cost of production involved (as per field consultation). It is measured in Rs. per quintal. This parameter has been accorded a weightage of 5%. The crops have been given scores from 1 to 5 based upon their net profit. The crop with the maximum net profit from production is given the highest score of 5 while the remaining in the crops area are accorded proportionately lower marks.

7. **Scope for processing in the state**

It is the total number of functionally active processing units of a particular commodity in the state as per the data available from DICs. This parameter has been given a weightage of 10%. Commodities have been given scores from 1 to 10 based on the total number of functional processing units. The

commodity with higher number of processing units in the state gets higher score because it portrays higher availability of ready market in the vicinity of the farms which reduces the intermediary logistics costs for the producers as well ensures steady returns.

8. Scope for value addition

The number of feasible value added products of a particular commodity in the concerned cluster indicates the scope for value addition (primary, secondary and tertiary) in the respective crop. This parameter has been accorded weightage of 10%. Commodities have been given scores from 1 to 10. The commodity with higher number of value added products gets a higher score.

9. Growth in market demand

In order to capture the growth in market demand of a particular commodity, an assumption has been formulated that consumption of that commodity for the last 5 years can be equated with the current growth in consumer level consumption of the commodity (as per data available on authentic public domain) This parameter has been given a weightage of 10% and commodities have been scored from 1 to 10 based on the basis of growth in their consumption demand. The commodity with higher growth in demand will get a higher score.

10. Price Volatility

Price volatility is per cent difference between the highest attained mandi price of a crop compared to the lowest attained mandi price during last 3/5 years (as per data available on www.agmarknet.nic.in). This parameter has been given a weightage of 10% and commodities have been scored from 1 to 10 based on the price volatility. The commodity with the higher range gets a higher score as they have greater scope for intervention in their existing value chain such that the farmer's risk gets reduced and higher returns could be ensured.

11. Water requirement

This is the water required by the crop in cubic metres per hectare at the cultivation stage in one season (as per data available from RACP for the year 2016-17). This parameter has been given a weightage of 15% and commodities have been scored from 1 to 15 based on the water requirement. The commodity with the lower water requirement gets a higher score as it could be promoted for crop diversification and efficient water use at the farm level.

Appendix 3.2 Scoring Matrix for prioritization of Value chain crops in Z-distributary

The parameters as well as relative scores of commodities in the Z-distributary cluster presented below:

Table 37: Parameters for prioritization of Value chain commodities in Z-distributary cluster

Sr. No.	Parameters	Weightage	Barley	Guar	Mustard	Guar	Kinnow	Cotton	Carrot
A.	**Existing size**	**30**	**17.8**	**15.8**	**19.1**	**30.0**	**12.3**	**18.6**	**11.0**
1	Cropped Area of the crop in the cluster (in acre)	10	3.9	4.6	6.5	10.0	0.3	4.5	0.1
2	Crop Production in the cluster (in quintals)	10	3.9	1.2	2.6	10.0	2.0	4.1	0.8
3	Crop Productivity (cluster level compared to national's average)	10	10.0	10.0	10.0	10.0	10.0	10.0	10.0
B.	**Potential for Value addition within Rajasthan (implying scope for increased value addition for local farmers and processors)**	**45**	**29.9**	**23.4**	**27.8**	**22.9**	**20.0**	**19.8**	**20.3**
4	Price spread in Rs/Qtl (Price paid at APMC mandi- realization by farmer at farm level)	5	1.5	3.0	3.2	1.7	2.1	5.0	0.7
5	Price spread in Rs/Qtl (Price paid by customer at retail level- realization by farmer at farm level)	5	3.2	3.1	0.5	1.1	1.2	1.3	5.0
6	Net profit in production (Rs per acre)	5	0.6	0.3	0.4	0.6	5.0	2.6	1.8
7	Scope for processing in the state	10	9.0	2.0	10.0	5.0	4.0	4.0	4.0

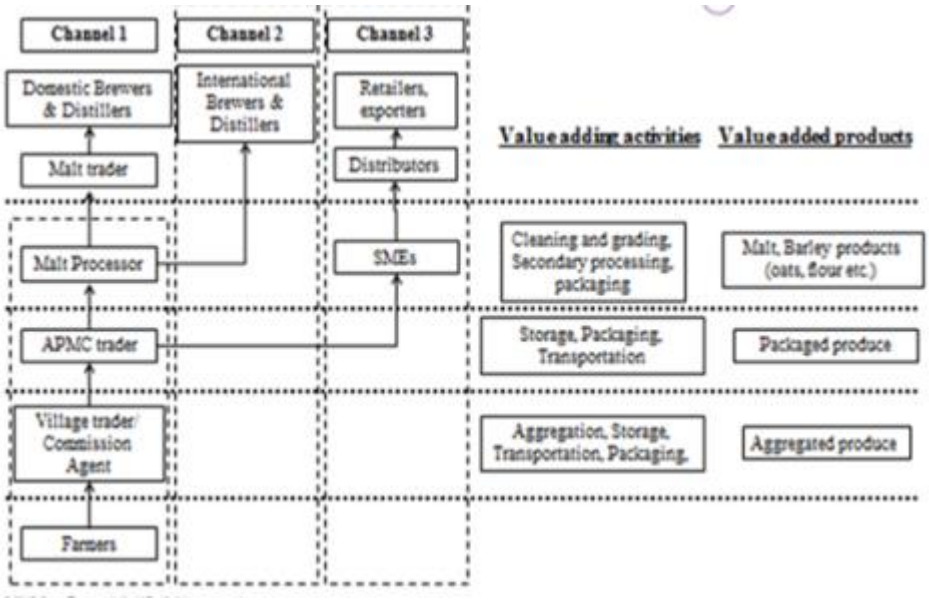
8	Scope for value addition (Primary/ secondary/ tertiary processing)	10	10.0	5.0	7.5	10.0	7.5	5.0	7.5
9	Growth in market demand 5 year	10	5.6	10.0	6.3	4.5	0.3	1.9	1.3
C.	**Risk assessment**	**10**	**2.4**	**1.7**	**1.8**	**1.7**	**10.0**	**2.0**	**5.0**
10	Price Volatility (last 5 years; due to monsoon, due to adverse agronomical conditions	10	2.4	1.7	1.8	1.7	10.0	2.0	5.0
D.	**Others (Environmental & Social Parameter)**	**15.0**	**13.8**	**15.0**	**12.5**	**7.5**	**0.0**	**5.0**	**0.0**
11	Water requirement	15.0	13.8	15.0	12.5	7.5	0.0	5.0	0.0
Total		**100.0**	**82.5**	**63.8**	**55.8**	**61.2**	**62.1**	**42.3**	**45.4**

Source: Data analysis by ABPF- Grant Thornton

Appendix 3.3 Current marketing chain of Value chain crops in Z-Distributary

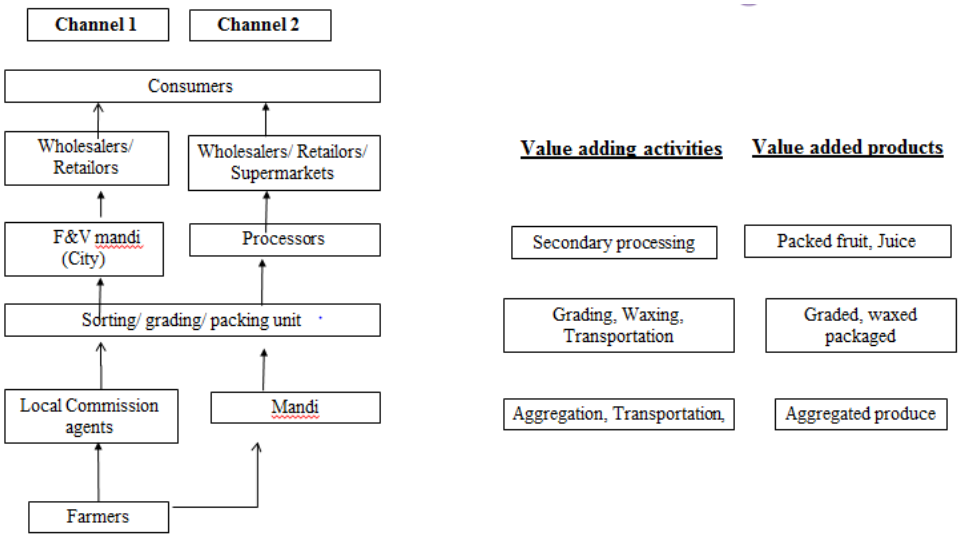
- **Barley**

Figure 7: Current structure of marketing chains - Barley



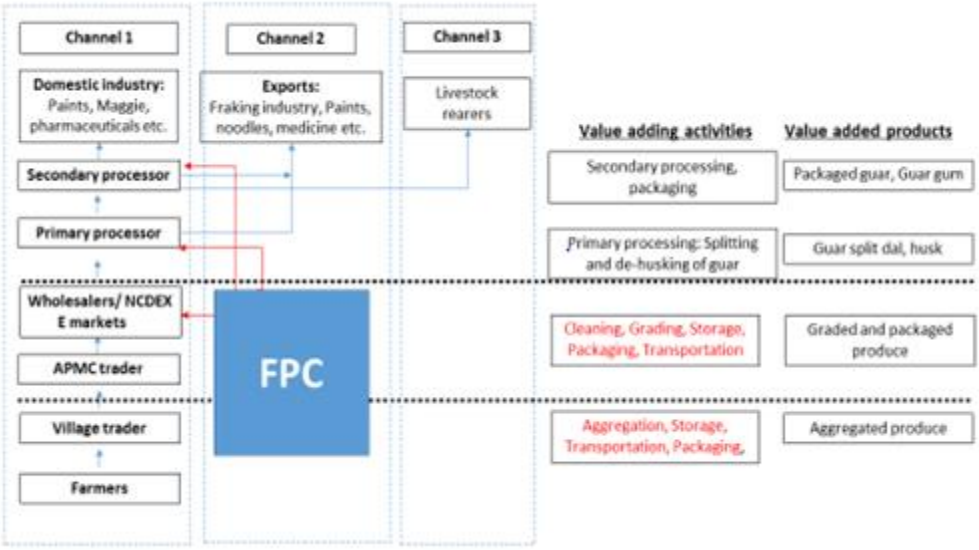
- **Kinnow**

Figure 8: Current structure of marketing chains - Kinnow



- **Guar**

Figure 9: Current structure of marketing chains - Guar



Appendix 3.4 Historical mandi/ farm gate prices (or farmer operating margins) trends of Value Chain crops

To identify the trend of the commodity, prices of 3 seasons have been gathered:

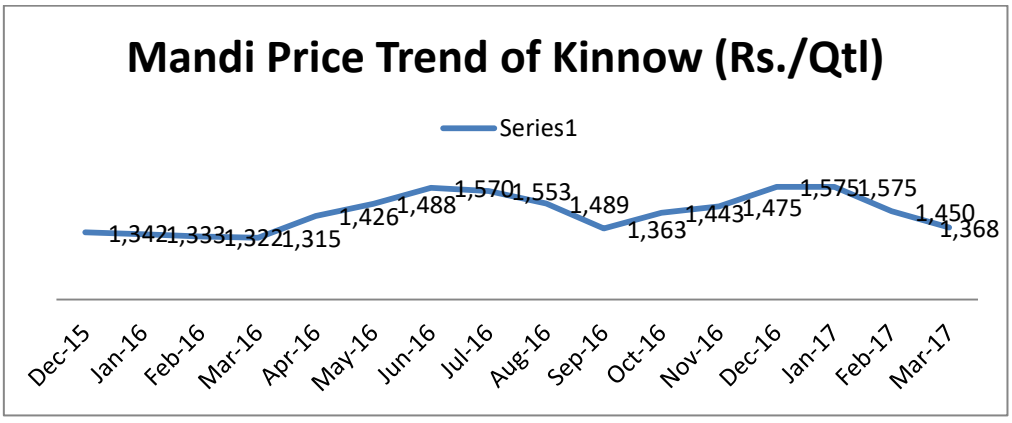
Kinnow

Table 38: Price trend of Kinnow in Jaisalmer mandi for 2 years

Month	Price (Rs./Qtl)
Dec-15	827
Jan-16	889
Feb-16	1,473
Mar-16	1,782
Nov-16	1,533
Dec-16	1,463
Jan-17	1,233
Feb-17	1,185
Mar-17	2,208

The trend shows that in Rajasthan, price of the commodity is varying over the period of 3 years. This is in respect to all the commodities that price dips to lowest at the harvesting time and rise to the highest during the cultivation time.

Figure 10: Price trend of Kinnow in Jaisalmer mandi for 2 years



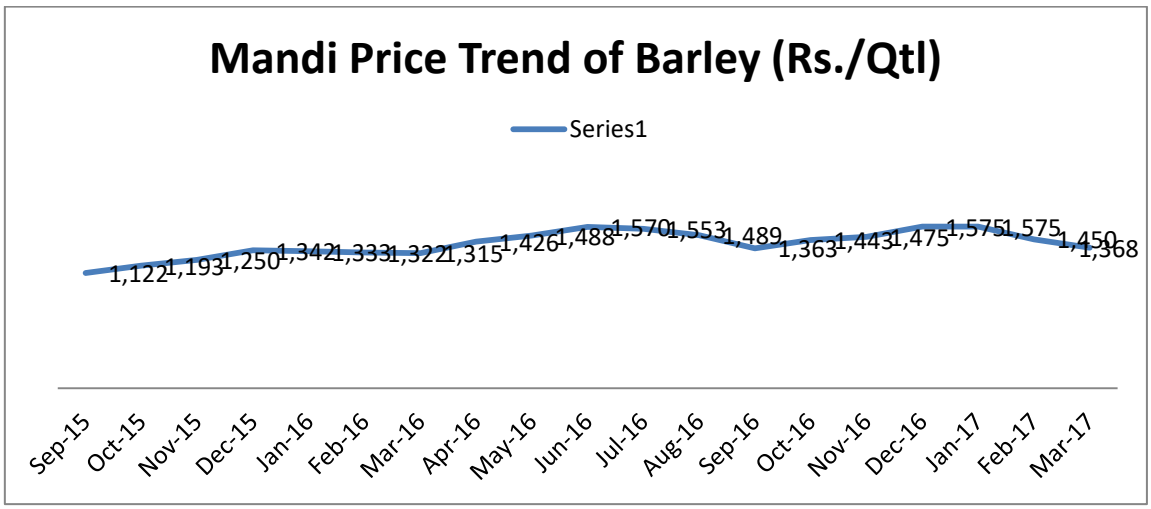
Barley

Table 39: Price trend of Barley in Jaisalmer mandi in last 3 years

Month	Price (Rs./Qtl)	Month	Price (Rs./Qtl)
Sep-15	1,122	Jul-16	1,553
Oct-15	1,193	Aug-16	1,489
Nov-15	1,250	Sep-16	1,363
Dec-15	1,342	Oct-16	1,443
Jan-16	1,333	Nov-16	1,475
Feb-16	1,322	Dec-16	1,575
Mar-16	1,315	Jan-17	1,575
Apr-16	1,426	Feb-17	1,450
May-16	1,488	Mar-17	1,368
Jun-16	1,570		

Price range of Barley in past 3 seasons was from Rs. 1,100 to Rs. 1600

Figure 11: Price range of Barley in past 3 seasons



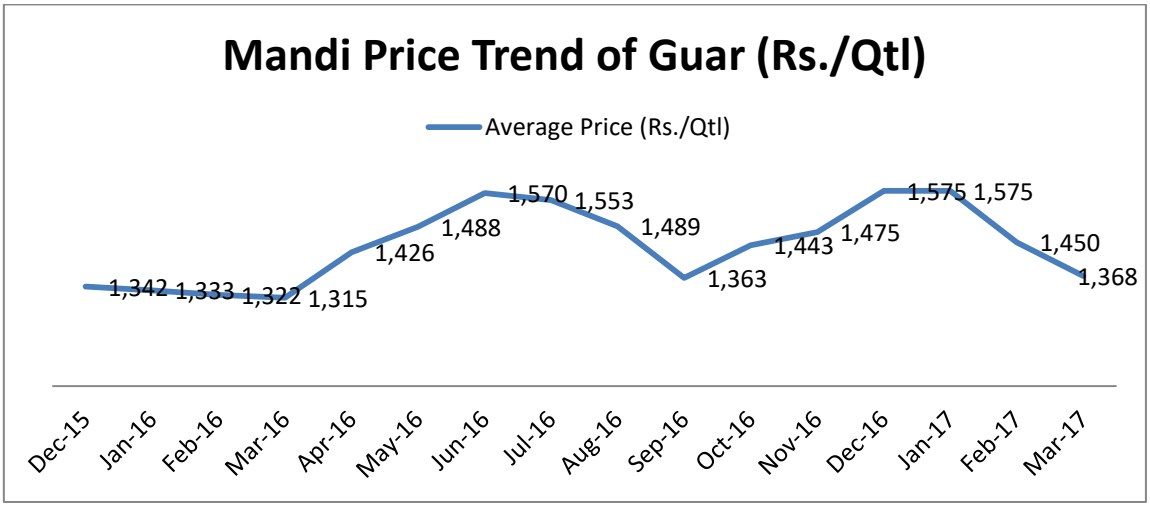
Guar

Table 40: Price trend of Guar in Jaisalmer mandi for past 3 season

Month	Price (Rs.)	Month	Price (Rs.)
Sep-15	3,864	Jul-16	3,223
Oct-15	3,658	Aug-16	3,285
Nov-15	3,337	Sep-16	3,241
Dec-15	3,047	Oct-16	3,117
Jan-16	2,985	Nov-16	2,966
Feb-16	2,804	Dec-16	2,943
Mar-16	2,752	Jan-17	2,958
Apr-16	3,051	Feb-17	3,000
May-16	2,852	Mar-17	3,485
Jun-16	2,810		

Guar crop has variation from Rs. 3,300 to Rs. 5,000. Currently it is selling at the lowest considering the fact that this is harvesting time of the crop.

Figure 12: Price trend of Guar in Jaisalmer mandi for last 3 season



Appendix 3.5 Growth in demand of Value chain crops

Parameters as under are identified, which support in determination of future demand growth of a commodity. With the consultation of the various stakeholders of value chain, growth in upcoming 3 years for Kinnow has been formulated which is shown in the table below.

With the consultation of the various stakeholders of value chain, growth in upcoming 3 years for Kinnow has been formulated which is shown in the table below.

Kinnow

The growth rate of Kinnow has an estimated global consumption of 49,610 Million MT in the year 2016-17 which has grown at a CAGR of 0.2% in last 5 years. Since the prices of Kinnow are very much driven by the international prices. Hence the global demand growth rate has been used in order to compare its growth rate.

Global Demand Growth of Orange(000MT)					
2011/12	2012/13	2013/14	2014/15	2015/16	2016/17
53,797	49,851	52,082	48,940	47,075	49,610

Barley

The national consumption of Barley in the year 2017-18 is 1,900 MT which has grown at CAGR of 4.50 % in last 5 years.

National Demand Growth of Barley(000 MT)					
2012/13	2013/14	2014/15	2015/16	2016/17	2017/18
1,525	1,200	1,400	1,520	1,800	1,900

Guar

As per a report market size of Guar will increase with a CAGR of 8 % in next 5 years, while the CAGR of Asia pacific is the highest i.e. 25%.

Appendix 3.6 Economic Analysis of Selected Value Chain Crops

Cost of cultivation is the prerequisite aspect in the calculation of economics of a crop. Primary researches helped in getting the whole information related to economics of a crop.

Table 41: Cost of economics of commodities

S.N.	Commodity	Cost of cultivation (Rs./acre)	Productivity (Qtl/acre)	Selling Price (Rs./Qtl)	Revenue from crop (Rs./acre)	Net surplus including fodder (Rs./acre)
1	Barley	13,100	15.00	1,400	7,901	12401
2	Guar	6,800	3.86	2,900	4,394	5908
3	Mustard	11,600	6.10	3,100	7,310	7295
4	Wheat	16,000	15.12	1,600	8,192	12986
5	Kinnow	120,000	112.00	2,000	104,000	104000
6	Cotton	13,600	14.00	4,800	53,600	53600
7	Carrot	32,000	100.00	700	38,000	38000

Annexure 5.1: Operational and Implementation Arrangements (Agriculture)

The eligible activities for investment under Agriculture subcomponent would be implemented through Agriculture Department. The Deputy Director, Agriculture (Extension) ZP of the concerned district who is also DPM, RACP is responsible for implementation of the activities.

Component 1: Climate Resilient Agriculture

On-farm Integrated Crop Management (ICM) demonstrations will be the core project intervention under this sub-component, and the main vehicle for the dissemination of improved technologies to the farmers. Demonstrations serve as an effective instrument for rapid dissemination of technology. The effectiveness of demonstrations would increase with organization of field days around the demonstrations. The demonstrations to be organized under this project would be preferably composite demonstrations, demonstrating complete technology package of production.

Adoption rate of demonstration's technologies will be recorded in the years following the year in which demonstrations are organized. The adoption rates (number of farmers adopting demonstrated technologies, area on which, the technologies are adopted and farm level yield gains achieved by the farmers) will be monitored in the following years. This is essential for evaluating the productivity/quality gains achieved by the farmers as a result of demonstrations and trainings.

Improved Water Use Efficiency: Micro-Irrigation (MI) based technology

Micro-irrigation (MI) is proved to be an efficient method in saving water and increasing water use efficiency as compared to the conventional surface method of irrigation, where water use efficiency is only about 35-40 per cent or sometimes even less. The on-farm irrigation efficiency of properly designed and managed drip irrigation system is estimated to be about 90 per cent, while the same is only about 35 to 40 per cent for surface method of irrigation (INCID, 1994). In sprinkler irrigation method, water saving is relatively low (up to 70 per cent) as compared to drip irrigation since SIM supplies water over the entire field of the crop (INCID, 1998; Kulkarni, 2005, A. Narayanamoorthy, Dr.S.Raman). Thus, saving over the surface irrigation method through sprinkler irrigation and drip irrigation method would be 75% and 125%, simultaneously. In addition to above use of pipelines is also important for improving field efficiency. About 30-40% water can be saved by reducing the conveyance losses through using Pipelines.

Based on the above, the project would support various institutional, physical and modern water management practices with a view to promote sustainable water use available for agriculture, and improved water use efficiency. The project will also support promotion of on-farm water use efficiency measures, including drip and sprinkler irrigation & pipelines for irrigation water.

A. Integrated demonstration for Drip Irrigation System with Automation and fertigation based techniques for field crops

Micro irrigation along with automation and fertigation is getting popularity in horticultural crops but still the same needs to be percolated in wide spaced agricultural crops. It has been planned to lay this technology by promotional support at the selected beneficiaries to demonstrate the effect of the

technology and further replication. This will effectively improve the productivity and quality along with the water and labour saving. The package of technology along with the inputs required for first crop will be provided with an assistance of 75 per cent to the beneficiaries. Drip automation will be the optional/ need based item and it will be installed on the willingness of the beneficiary. The district unit will ensure the coordination of MI supplier and the Automation supplier (in case, they are separate entity) to make compatible commissioning and avoid duplication of the components. The estimated cost for the system with fertigation, automation along with crop demonstration is Rs.2.20 lac per ha. These technological demonstrations will be provided to the selected beneficiaries in the cluster by district unit of Agriculture department along with the other stakeholders.

B. Integrated demonstration for Mini/ Micro Sprinkler based techniques for field crops

Micro Irrigation based demonstrations for close space field crops like, Bajra, Sorghum, guar, pulses, Wheat, Mustard, Barley etc. has been proposed to improve the productivity per unit of water along with reduction in the production cost. The estimated cost for such demonstrations is Rs.1.45 lacs per ha including automation and crop demonstration. Implementation process will be similar as in the case of drip technology activity.

C. Micro Irrigation –Drip, Mini/ Micro Sprinklers and Sprinklers:

The micro irrigation systems viz. Drip, Mini/ Micro Sprinklers and portable Sprinklers would be promoted on large scale in the cluster with a view to cover most of the irrigated area under such techniques. The per ha model cost of Drip, Mini/ Micro Sprinklers and portable Sprinklers is estimated to be Rs. 1.10, 1.00 and 0.20 lacs respectively. The project assistance up to 75% is proposed to be provided to the beneficiaries.

D. Pipe line for piped conveyance of irrigation water:

Conveyance losses play a major role to increase/ decrease the irrigation efficiency. Traditionally, the farm water is conveyed through field channels which lead to leaching and evaporation losses. The conveyance of irrigation water at far ends of the farm through PVC/ HDPE pipelines leads to check such water losses. The estimated cost of 100 mts pipe line unit (generally sufficient to cover 1 ha) is Rs. 0.10 lacs and the project assistance of 75% has been proposed for this activity.

E. Water Harvesting/ Storage Structures (Diggies) in Command Area

Diggies are water storage structures with various storage capacities (4-55 lac litres) in the canal command areas with the aim to store the water of canal rotation (Bari) and to use the stored water through efficient irrigation methods especially, during the off rotation and critical crop stages of irrigation for the field crops. Thus, these structures ensures the more efficient use of irrigation water along with enhanced crop productivity leading to sustainable agriculture, improved farm income along with reduced water footprint.

The assistance of 50 percent of the unit cost with maximum limit of Rs. 3.00 lac (whichever is lower) is proposed to be provided to the beneficiary farmers on construction of at least 4 lac litre capacity plastic lined (ISI Marked 250 GSM MLCLUV sheet/ 500 micron LDPE sheet) or pukki diggi (Cement/ Brick/ Stone Concrete/ Sand). On the basis of above parameters, these structures will be constructed in the RACP clusters by the individual beneficiaries through their own resources in the close supervision of PIA. The eligible investment/ grant will be reimbursed to the beneficiary after due verification according to the technical parameters. The rest 50 percent (or more) amount for the structure would be met through beneficiary contribution with the objective to benefit more farmers and create ownership right from the construction stage of the structure.

Technology Transfer and market led advisory services

<u>Promoting adoption and documentation of improved technologies</u>

This is the major activity where need based demonstrations to bridge the gap, improve productivity, to promote the efficient use of irrigation water, to enhance farm income, promote mechanisation and for the sustainability of agriculture have been proposed under the project. Field days, exposure visits, stakeholders' orientation and capacity building supportive activities have also been proposed for the effective adoption of the technologies. The detail of the activity is given as under:

b. Soil testing and distribution of Soil Health Cards

To know the fertility status of the farmer's field, soil testing will be done after taking soil samples from the farmer's field. After getting report of soil sample, the soil health card will be prepared and distributed to the farmers. The Dy. Director Agriculture would ensure soil testing and distribution of soil health cards to all the farmers of multi task groups of the cluster with convergence to the regular programme of the department. This activity needs to be completed within first year with the support of NGO. The district unit will train Multi Task Groups regarding process of taking soil samples from the fields.

c. Demonstrations on production technologies for value chain crops to bridge gap

The ICM demonstrations will preferably include the complete package of practices for a particular crop from land preparation to harvesting of the crop. Majority of the demonstrations will be on the value chain crops with a focus on popularizing high payoff interventions and reducing water foot print of the crop in the cluster. Demonstrations will also be conducted on other crops which are grown in a cropping sequence with the value chain crop with the objective of improving water use efficiency, diversification to low water requiring, high value and other crops, reducing water foot print, etc. Another set of demonstrations will be on promoting resource conservation technologies and for popularizing climate smart agricultural practices. These demonstrations will need to be integrated with the on-farm water conservation structures developed under water sub-component of the project. The estimated cost for these demonstrations is Rs.10000 per ha including inputs and operations.

d. Demonstrations on Farm Mechanization and Post-Harvest Management (PHM) technologies

The objective of these demonstrations will be on promoting farm mechanization and Post-Harvest Management. Mechanization is the effective tool to reduce the production cost, increase the efficiency of farm and reduction in chemical weedicides. Medium category power operated/ self-propelled machines for field preparation, hoeing, weeding, planting, sowing, spraying, grading, harvesting etc. operations is included to encourage by assistance. PHM activities like farm level drying; cleaning, grading and post-harvest management of the harvested produce has also been included. It will also include provision of low cost plastic sheets to be used as movable threshing floor as well as for protection against damage by rain and water. The district unit will identify the potential implements for the cluster and will be made available to the farmers on 25% beneficiary's contribution.

e. Demonstrations on forage/ fodder

There is limited scope/ range of prevailing varieties of fodder in package of practices (POP). The programme planned to be implemented through outsourcing the agencies specified in fodder seed production. The range of fodder crops/ varieties which still could not be included in POP/ release may also be considered in the programme to foster the demand of fodder and new introduction. All inputs may be provided for these demonstrations and a part of the demonstration plot may be used for seed production of the same to ensure the seed availability of fodder crops/ varieties in the cluster. The estimated cost for such demonstrations is Rs.10000 per ha.

f. Promotion to seed production and adoption support

Seed Production: Special attention will be paid to technology empowerment of the farming community for production of quality seed of high yielding varieties of self-pollinated crops by organizing seed production demonstrations, including grading, packaging and certification and this program will be facilitated by NGO though Multi Task Groups. Seed production activity will be interlinked with FPO/ FCSC activity. Focus will be on improving the SRR of the cluster along with

the improved income of the farmers. Tie-up will be made with certification and production agencies by the PIA.

Adoption Support: Quality seed of high yielding crop varieties is a critical input for increasing productivity. It also acts as a catalyst for the adoption of other improved crop husbandry practices. In view of the importance of seed in increasing crop productivity and the low seed replacement rates in the selected micro-clusters, adoption support in terms of 50% cost of seed will be provided to the farmers in the selected villages provided they give an undertaking to adopt the package of practices demonstrated for the value chain crop in the ICM demonstrations organized in that village in the preceding year. This will also help in tracking adoption rates of the demonstrated improved technologies by the farmers.

g. Innovative Activities/ INM/ IPM

The for foliar spray of micro nutrients, bio fertilizers, organic products, bio pesticides, IPM kits, pheromone traps, solar based light traps, wormy-compost units, tank based low pressure drip units, deionization units, nano-products for crop, other innovative techniques etc. are the activities which are proposed to be implemented as per need of particular crop/ technology with an assistance level of 75 percent.

Information and communication technologies (ICT) based demand driven participatory extension system (modernization of extension research linkages)

This activity pertains to creation of model information infrastructure at cluster level to support the beneficiaries for all the agricultural related problems along with the marketing support. The theme is to revitalize the existing extension system compatible with the modern techniques and farmers friendly software to support the farmers and grass root level staff on pilot basis. The KSK (Krishi Sewa Kendra) at cluster level will act as the problem solution/ technical back up and information centre, strengthened with IT and interlinked with the team of experts through software application. Efforts will be made for real time problem solution through IT enabled system. The KSK will also be strengthened with the literature, especially, related to potential threats led/ Pro-P based to support the grass root level staff for the precise identification and solution of major crop threats. The provision of technical back up from the experts at higher level has also been kept. Formation of a core team at project level to visualise and implementation monitoring of the ICT activities will be the axis of this activity.

a. KSK strengthening as model in project area-to serve as level I platform for ICT –

There is a provision of Kisan Sewa Kendra (KSK) among 2-3 Gram Panchayats in existing agriculture extension system of the state. It is felt that the KSK strengthening with modern information system is a must to fulfil the need of the beneficiary. Hence, 2 KSK in cluster have been proposed to be developed as modal KSK with modern infrastructure to serve as I level solution for the beneficiary. The model KSK will be strengthened by electronic devices, literature, furniture/ fixture, minor repairs and the operating costs.

b. Agriculture Research Institute strengthening to serve as level II/ III platform for ICT –

Each KSK needs to be backed up technically with the group of experts. It has been proposed that the existing Adaptive Trial Centre (ATC)/ Krishi Vigyan Kendra (KVK)/ Agriculture Research Station (ARS)/ Agriculture Research Sub Station (ARSS)/ ICAR Institute of the concerned district will be strengthened to support the model KSK.

c. Honorarium to the II/ III level experts for solution of the problems and facilitate field visits

ICT core team will assemble quarterly to review and monitor the progress of the activity. Expert at level I will be AS, AAO, AO, ARO and AD of concerned area. Expert panel for field problem solution at the level II and III will be finalised at PMU level. These will be provided excess to the software application where field problems in the form of text/ photo/ video will be uploaded by the farmer or KSK (which could not be solved at KSK level). The same may be got analysed by the panelled expert

and online solution of the problem will be communicated. For each solution the honorarium will be provided to concerned expert. There should not be any repetition of problem/ solution. In some complex cases field visit may also be made. The main discipline of the experts will be Agronomy, Horticulture, Plant Breeding, Entomology, Plant Pathology, Nematology, Soil Science, Prop-P, Fertigation, Irrigation, Agribusiness, Post-Harvest Management etc. The honorarium in the range of Rs.200- 1000 will be provided to the different level of experts for providing the solutions of the farmers' problem. However, the honorarium will be decided at competent level.

d. Digital instruments to field coordinator/ staff–

It has been proposed that some kit of digital instruments viz. smart phone/ tablet, EC/ pH meter, digital/infrared thermometer/ hygrometer, GPS, digital camera, soil sample kit etc. to the field coordinator, technical experts/ AS/ AAO/ STA/ AO/ AD may be provided for the quick diagnosis of the problem. A set of some of these instruments will be provided according to the need of the particular cluster.

e. Potential threats led/ Pro-P based literature for crop crisis management on cluster specific crops

It is proved fact that each crop has some specific/ potential problems/ threats which are generally able to reduce the yield substantially. The Production with Protection (Pro-P) technique evolved by the departmental experts Dr. Prakash Kumar and Mr.Rajendra Singh provided a methodology to transfer and utilize high level diagnosis and treatment expertise to grass root level by prescribing a written treatment to the farmers on the base of 'diagnosis and recommendation photo sheets' prepared with the help of key subject experts. These prescriptions will promote the use of scientifically recommended biological pest control methods with specific and safe pesticides/ bio-products to control the identified problem. This technique has initiated on pilot basis in Kota Division during 2014-15. The 'diagnosis and recommendation photo sheets' will support and synergize the level I experts for the quick solution of field problems. These photo sheets will develop a professional way of prescription in departmental officials and discourage the practice of misleading prescription by some dealers/ sales persons. This literature is proposed to be made available to in the cluster for major potential crops.

f. Platform/ Software development to facilitate the problem solution at the I/II/III level and user interface-

Comprehensive platform/ software application will be developed to facilitate the beneficiaries and the expert to put the problems and solutions in a very simplified manner. The software will connect KSK, level I, level II, level lII, selected beneficiaries, other stakeholders and PMU. The problem related to crops, production, plant protection, PHM, marketing etc. will be uploaded at the level of KSK/ cluster in the form of text or photo or video. The online solution will be provided by level I/ II/ III expert in most simplified way. The solution will be available/ accessible at KSK computer for the beneficiary. It will also be tried to communicate through some applications on the smartphone of grass root level officials and selected beneficiaries. The Project Management Unit (PMU) will be able to monitor the activity through the software itself. The software will be developed at PMU level. The software will also contain a set of technical information related to Agriculture sector. No provision has been kept at cluster level because this activity would be supported at PMU level.

Farmer Organization and Capacity Building

Capacity Building

Capacity building component is to be implemented on the cost norms of the RACP training manual. The cluster specific activities and the action plan in the limit of provisions should be prepared by concerned district unit. These programmes will run on year round basis.

Field days, exposure visits, orientation, capacity building-

Field days-For dissemination of the improved technologies demonstrated in the ICM demonstrations to large number of farmers, field days will be organized in the villages in which these

demonstrations are organized. The field days will be organized near the harvesting or critical stage of the crop so that the farmers are able to see the differences between the prevalent farmer practice and the improved package of practices for a particular crop. Selection of fields/ beneficiaries will be made by concerned AD/DD/ DPMU through field coordinators, field staff and NGOs (if functional). Organise field days by the field staff, NGO and district coordinator with experts. PMU will approve the plan for field days.

Exposure visits- Exposure visits for farmers will be organized within the state and outside the state so that the farmers are able to see the successful production, post-harvest handling and marketing innovations developed at different places. For selection of the proposed locations to be visited/ beneficiaries by AD/ DD/DPMU, a proposal has to be sent and get approved by PIU/ PMU.

Farmer's Training: These will cover training and capacity building programs for farmers and farm women for adoption of knowledge-based crop husbandry and natural resource management/conservation practices for increasing productivity, enhancing diversification to high value and low water requiring crops/practices for reducing water foot print of agriculture, enhancing farmer incomes and improving rural livelihoods.

Training of Service Provider Staff: These will cover training for program implementing staff about the project design, implementation arrangements, technical areas of crop production, post-harvest management and related aspects.

Orientation/ capacity building training- Orientation and capacity building training would be the on regular basis, as and when required.

Documentation of success stories: The success stories on specific issues may be documented in the form of text, photographs with text of small films/ movies. The proposals for the same may be sent to the PIU/ PMU.

To organize above several of trainings, Irrigation Management and Training Institute (IMTI) would be nodal agency. If specific trainings are needed during course of implementation, would be organized in state as well as national level Institute.

Procurement of inputs for technology demonstrations

The inputs viz. seeds, fertilizers, PP chemicals and bio-products need to be arranged for seed production program and adoption support, demonstrations on production technologies for value chain crops, fodder, integrated drip and mini sprinkler demonstrations. The agriculture inputs are to be procured from the Cooperative sector/ Govt Agri. Research Centre/ RSSC/ NSC/ SAUs/ RAJFED instead of competitive bidding because:

1. The cooperative/ public sector agencies have a strong network in the rural area through GSS, KVSS and their retail outlets which can cater the need of scattered beneficiary in the rural area.
2. These inputs have specific packing size but the project activities require different quantities which does not match the packing. The farmers/ beneficiaries and the field functionaries are in direct touch with these cooperative outlets. Thus, group of farmers may get the inputs collectively and distributed as per their requirement. It is practically not possible in the case of private suppliers.
3. Requirement of some inputs, especially, PP chemicals and bio-products depends on outbreak of particular insect/ pest/ disease/ weed which is practically not possible to predict precisely in advance. The procurement of such inputs within a very short notice is possible from these outlets to control the losses through infestation. The formalities of formal procurement will lose this beauty which may lead to worse consequences in the fields.
4. The inputs like seed, fertilizer and PP chemical are only sold by the licensed agencies/ firms. The licenses are governed as per respective Acts and regulations. Hence, supplies are restricted with the licensed firms only.

5. The major Fertilizers have the government control over rates. Hence, the rates for the same will be similar with each supplier. So procurement through tenders for such items does not make any logical sense.

The department of Agriculture has some set procedure to procure these inputs from the cooperative/ public sector agencies which prevails from long time. Moreover, field functionaries are not allowed to procure and store such inputs from private market. Hence, procurement through bidding process will be contradictory to the field functionaries.

Annexure 5.2: Operational and Implementation arrangements (Horticulture)

Procurement of Planting Material of Fruit Plants and Inputs

The cooperative/public sector agencies have a strong network in the rural area through GSS, KVSS and their retail outlets which can cater the need of scattered beneficiary in the rural area.

These inputs have specific packing size but the project activities require different quantities which does not match the packing. The farmers/beneficiaries and the field functionaries are in direct touch with these cooperative outlets. Thus, group of farmer may get the inputs collectively and distributed as per their requirement. It is practically not possible in private suppliers.

Requirement of some inputs, especially, P.P. chemicals depends on outbreak of particular insect/ pest/ disease/ weed which is practically not possible to predict precisely in advance. The procurement of such inputs within a very short notice is possible from these outlets to control the losses through infestation. The formalities of formal procurement will lose this beauty which may lead to worse consequences in the fields.

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The department of Agriculture has some set procedure to procure these inputs from the cooperative/ public sector agencies which prevails from long time. Moreover, field functionaries are not allowed to procure and store such inputs from private market. Hence, procurement through bidding process will be contradictory to the field functionaries.

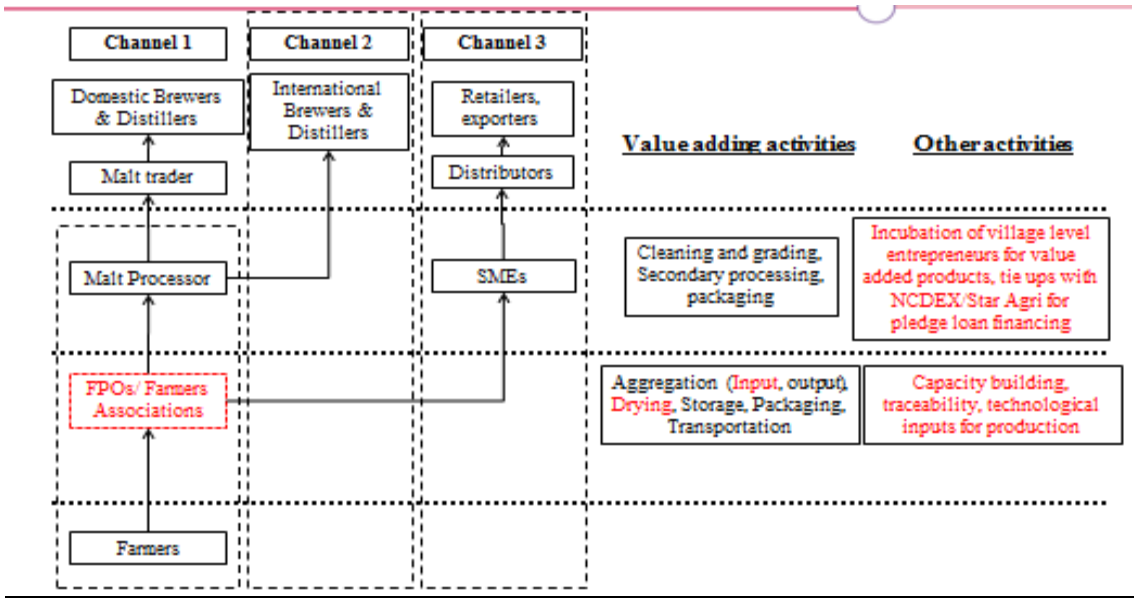
The requirement of planting material is very small and cluster specific according to selected value chain crop. Most of the planting material is imported from other State like Gujarat, Maharashtra, and Uttar Pradesh etc. Planting material is very soft and succulent and intend to high motility during transport so that it is not feasible to procure the small quantity of different kind of planting material from different States. RAJHANS is the only option for timely supply of planting material due to availability of all kind of planting material in their local nurseries. RAJHANS grows planting material in their 27 nurseries and also procure the planting material from different State and provide quality hybrid or grafted planting material in State.

Annexure 5.3: Post intervention value chain map

1. Barley

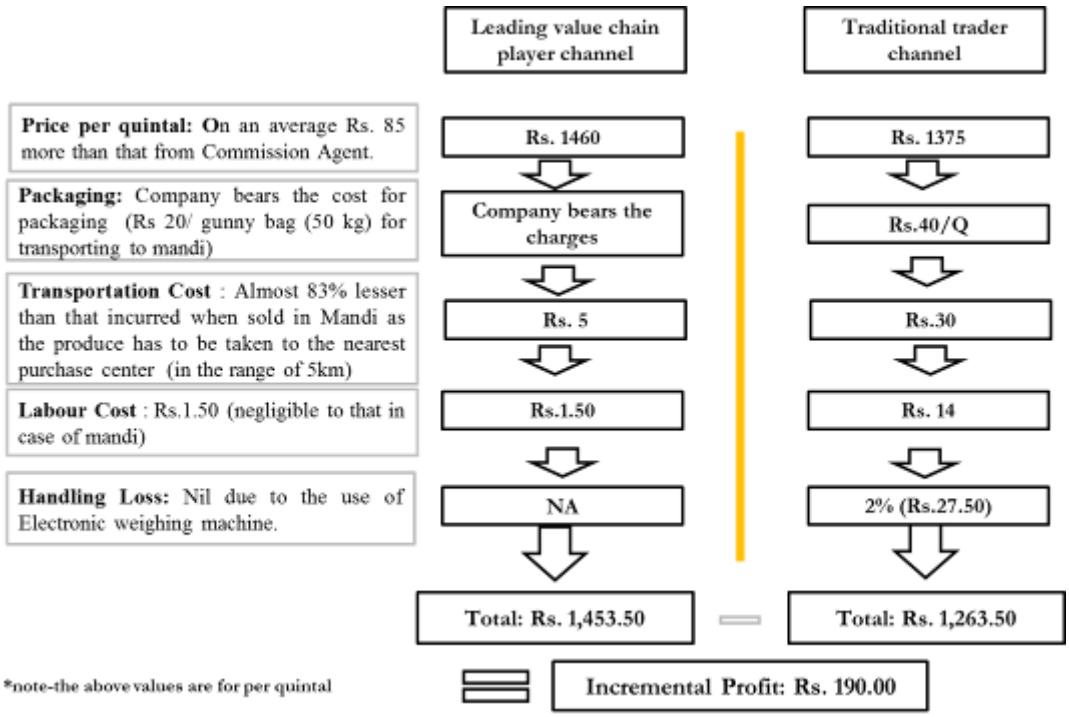
The intervention plan of Barley may be broadly considered in the context of activities and stakeholders in three stages- Production stage/ Cultivation by producers/farmers, post-harvest stage and the processing stage. In the context of shift towards barley production to greater extent, the production of apt food/malt barley production than feed barley is important. It should be strengthened by adaption of Best Package of Agricultural Practices, capacity building of producers so as to evolve governance structures like PCs etc. Undertaking contract farming practices are some of the interventions required to redress related constraints at the production stage. At the post-harvest stage, constraints in terms of high dirt content in harvested paddy, (largely) rain-fed irrigation and adequate storage facility are present. Well-designed FCSCs could help address these limitations at the farm/producer level. At the processing stage, gaps are most apparent, in terms of awareness amongst processors of contract farming options as well as limitations in contract farming policy. These may be reduced through information dissemination and B2B initiatives matched with policy reorientation and incentives (like mandi tax exemption) to facilitate the same.

Figure 13: Scope of interventions in value chain of Barley



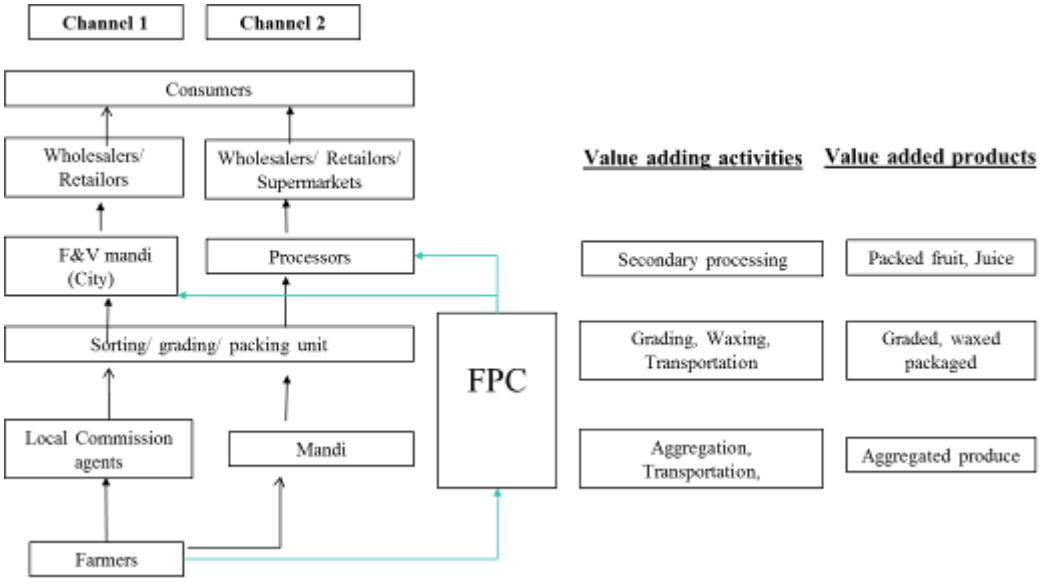
A comparative chart of Barley shows the value chain difference between the incremental profit realized by farmers by going along with the leading value chain players channel rather than the traditional trader channel.

Figure 14: Value chain difference between the incremental profits realized by farmers



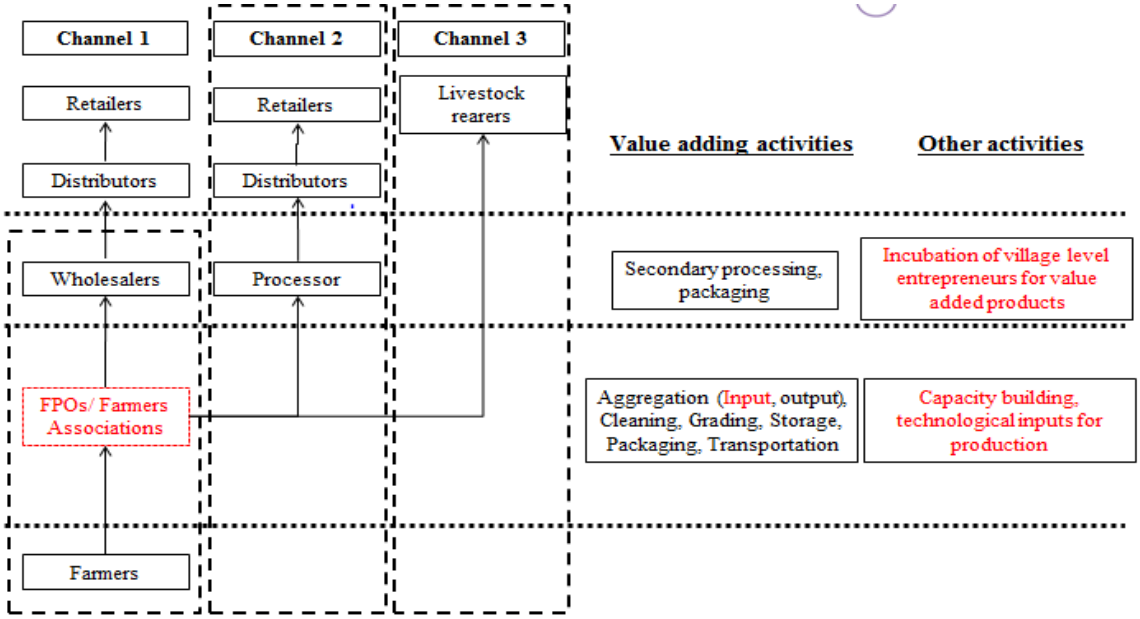
2. Kinnow

Figure 15: Scope of interventions in value chain of Kinnow



3. Guar

Figure 16: Scope of interventions in value chain of Barley



Annexure 5.4: Activities for soft intervention

Scouting of technologies and business ideas for such identified commodities

The ABPF shall scout for new and innovative models in agriculture and allied sector for developing local entrepreneurship for providing productive services to value chain stakeholders.

It shall include the following activities, but not limited to: (i) review of literature, (ii) participatory meetings with market participants and representatives of relevant business models such as – producers, aggregators, transport facilitators, storage facilitators, commission agents, wholesalers, retailers and ultimate consumers, (iii) field work (surveys on existing cold stores, pack houses, ripening rooms etc., surveys to assess the potential for establishing new marketing venture for FCSC, E-Trading and the role of local aggregators), (iv) analysis of the data / information, (v) feedback from market participants & relevant agencies, (vi) sharing the business models on a web platform.

Incubation services to Agri-entrepreneurs

ABPF shall provide agri-business incubation services, with the objective to identify, mobilize and groom emerging agro entrepreneurs and CBOs.

Training on market research methodologies, business proposals, business skills, business plan preparation, grants access, financial linkages and market linkage, legal framework, etc. to establish own business through competent trainers subject to approval from PMU-RACP.

ABPF shall also empower the youth and women to start their agri-business resulting in their social and economic development. At least 10% women candidates are desirable among the candidates trained under incubation program. The ABPF will be responsible for networking with other entrepreneurs, customers and other support agencies; provide mentorship support through development of a resource base of mentors, and subsequently ensure their deployment.

Management and Business Training to FCSC and Producer Companies personnel

The ABPF shall undertake training for management & business skill building for personnel of the Producers' Companies (PCs) and Farmer Common Service Centres (FCSCs) under the project. The ABPF shall develop comprehensive training plan.

Training is provided to personnel with an objective of enhancing the knowledge & skills of PC personnel (related to management of FCSC) for efficiently facilitating management & business of the FCSC.

#	Name of Component	Name of sub-component
1	Capacity building	Field days, exposure visits, orientation, capacity building
		Field days
		Exposure visits (Within state)
		Exposure visits (Out of state)
		Orientation
		Capacity Building

Facilitating Agri Policies

Agro-Processing and Agri-Marketing has been included as a Thrust sector in RIPS 2014. All Agro-Processing and Agri-Marketing Units shall be eligible for benefits under RIPS 2014.

Following additional incentives would be admissible under this Policy after obtaining the entitlement certificate under RIPS 2014.

Incentive for market development and diversification:

- Transport subsidy on export of the spices
- Subsidy on the export insurance
- Vehicle Registration Concession (Reefer vans and chilled milk transportation vehicles
- Incentives for quality and certification
- Incentive for project development
- Transport subsidy on export of Fruits & vegetables
- Incentive for Research & Development
- Incentives in Land Related Issues

It shall also facilitate agriculture policy seminars thereby providing a forum for stakeholders (agri industry, NGOs, PCs, Govt. bodies, etc.) in Rajasthan to discuss improvements to the agribusiness investment climate.

Linking producers and producer groups to the market

The ABPF shall retain the important role to identify and develop linkages between producers and processors so that return realized should be greater and major part of the consumer money should go down to the producer.

Market Information services

After the analysis of the existing information services, there is a scope of development of online portal based on the inputs from mobile based application as well as conventional method. As a pilot intervention, such portal can be developed to cater to the cluster area and which can gradually be rolled over to the whole district and eventually the state.

Existing sources of information services are as follows:

a. Mobile based applications

- **Agmarknet**

AGMARKNET portal also providing market information by connecting more than three thousand regulated markets of country to the farmers but due to lack of awareness and computer system, farmers are unable to access it. AGMARKNET Portal provides following information to farmers:

  - Dissemination of market information for arrivals and prices of crops grown across the states without the limit of geographical boundaries
  - Provides information on weather forecast, crop advice, use of fertilizers & pesticides etc.
  - Up loads latest research reports related to marketing and analysis of information and trends in prices, demand on continual basis.

The sampled farmers were not using this facility as they are unaware about these facilities. However, they get market information from fellow farmers and traders.

IKSL –Iffco Kisan Samridhi ltd. is offering voice based message services in this area.

b. Conventional method

- **Kisan Call Center (1800-180-1551)**[1]

The country today has an impressive telecom network both in the private and Government sector. Over 5 lakh villages have a public telephone in the country. It has been felt for long that this impressive telecom network could be put to effective use for delivering knowledge and information to the farming community. A call centre based extension service will be delivering knowledge and information exactly as per the requirements of the farming community. This system would also help to keep a record of what is being delivered to the farmers in terms of knowledge and information. The Kisan Call Centre scheme is available throughout the country. The Kisan Call Centre scheme has been functioning from 21.1.04.**The Call Centres can be accessed by farmers all over the country on common Toll Free Number 1800-180-1551.** Since 10th June, 2004, the Call Centres service has been made available right from 6 A.M. to 10 P.M. except on Sundays and gazetted holidays, beyond these hours the calls are attended in the voice recording mode.

The calls are received at 13 Call Centres wherein 116 Agriculture Graduates attend to answer the queries of the farmer in the local language. 123 experts located in different parts of the country at State Agriculture Universities, ICAR institutes, State Department of Agriculture, Horticulture and other developments are answering the calls at Level –II.

The SMS service has been started by the National Bank for Agriculture and Rural Development (NABARD) in collaboration with the India Meteorological Department (IMD, agrimet division). The focus of the project includes meteorological advisory services to the farmers, bringing together experts and grass-root level communities with the objective of making knowledge accessible to farmers, dissemination of agriculture advisory and feedback from farmers through the involvement of farmers clubs, joint liability groups, village watershed committees in area where watershed projects are being implemented and research and development in operational agriculture meteorology.

- **India Meteorological Department**

The service is provided by the India Meteorological Department, under the Ministry of Earth Sciences of Government of India. The IMD has set up nine agromet field units (AMFU) in the state. After these units get the forecast, they prepare agro advisory with the help of experts. This advisory is sent to IMD where the bulletin is composed and then disseminated to farmers through SMS, radio, newspapers and other means.

- **Tata Consultancy Services (TCS)**

The Tata Group's information and technology firm created a customizable Mobile Agro Advisory System called mKrishi that would address farmers' specific queries in real time. The name mKrishi combines "m" for mobile and "krishi," which refers to agriculture in many Indian languages.

[1] http://liferajasthan.blogspot.in/2011/04/know-kissan-call-center-1800-180-1551.html

Annexure 5.5 Profit and loss statements of selected business models

Table 42: Profit and loss statement of Guar processing unit

Figures in Rs.

Particulars	Y1	Y2	Y3	Y4	Y5
0	-	-	-	-	-
CnG Service	1,056,000	1,178,100	1,309,770	1,451,662	1,604,468
Storage	1,382,400	1,542,240	1,714,608	1,900,357	2,100,395
0	-	-	-	-	-
Total Revenue	**2,438,400**	**2,720,340**	**3,024,378**	**3,352,019**	**3,704,863**
Fixed Cost	412,000	432,600	454,230	476,942	500,789
Variable Cost	144,000	151,200	158,760	166,698	175,033
Total Operational Expenses	**556,000**	**583,800**	**612,990**	**643,640**	**675,821**
Earning Before Interest, Depreciation, Taxes and Amortization (EBITDA)	**1,882,400**	**2,136,540**	**2,411,388**	**2,708,379**	**3,029,042**
Depreciation	219,000	219,000	219,000	219,000	219,000
Amortization	-	-	-	-	-
Earnings Before Interest and Taxes (EBIT)	**1,663,400**	**1,917,540**	**2,192,388**	**2,489,379**	**2,810,042**
Interest Expense	-	-	-	-	-
Earnings Before Taxes (EBT)	**1,663,400**	**1,917,540**	**2,192,388**	**2,489,379**	**2,810,042**
Tax	466,405	559,472	657,033	759,789	868,434
Earnings After Taxes (EAT)	**1,196,995**	**1,358,068**	**1,535,355**	**1,729,591**	**1,941,608**

Table 43: Profit and loss statement of Barley CnG unit

Figures in Rs.

Particulars	Y1	Y2	Y3	Y4	Y5
0	-	-	-	-	-
CnG Service	1,344,000	1,499,400	1,666,980	1,847,570	2,042,051
Total Revenue	**1,344,000**	**1,499,400**	**1,666,980**	**1,847,570**	**2,042,051**
Fixed Cost	383,000	402,150	422,258	443,370	465,539
Variable Cost	360,000	378,000	396,900	416,745	437,582
Total Operational Expenses	**743,000**	**780,150**	**819,158**	**860,115**	**903,121**
Earning Before Interest, Depreciation, Taxes and Amortization (EBITDA)	**601,000**	**719,250**	**847,823**	**987,454**	**1,138,929**
Depreciation	268,500	268,500	268,500	268,500	268,500
Amortization	-	-	-	-	-
Earnings Before Interest and Taxes (EBIT)	**332,500**	**450,750**	**579,323**	**718,954**	**870,429**
Interest Expense	-	-	-	-	-
Earnings Before Taxes (EBT)	**332,500**	**450,750**	**579,323**	**718,954**	**870,429**
Tax	55,852	110,788	166,263	222,890	281,242
Earnings After Taxes (EAT)	**276,648**	**339,962**	**413,060**	**496,064**	**589,187**

Table 44: Profit and loss statement of Kinnow waxing, cleaning and grading unit

Figures in Rs.

Particulars	Y1	Y2	Y3	Y4	Y5
CnG Waxing	1,920,000	2,142,000	2,381,400	2,639,385	2,917,215
0	-	-	-	-	-
Total Revenue	**1,920,000**	**2,142,000**	**2,381,400**	**2,639,385**	**2,917,215**
Fixed Cost	508,000	533,400	560,070	588,074	617,477
Variable Cost	468,000	491,400	515,970	541,769	568,857
Total Operational Expenses	**976,000**	**1,024,800**	**1,076,040**	**1,129,842**	**1,186,334**
Earning Before Interest, Depreciation, Taxes and Amortization (EBITDA)	**944,000**	**1,117,200**	**1,305,360**	**1,509,543**	**1,730,881**
Depreciation	265,000	265,000	265,000	265,000	265,000
Amortization	-	-	-	-	-
Earnings Before Interest and Taxes (EBIT)	**679,000**	**852,200**	**1,040,360**	**1,244,543**	**1,465,881**
Interest Expense	-	-	-	-	-
Earnings Before Taxes (EBT)	**679,000**	**852,200**	**1,040,360**	**1,244,543**	**1,465,881**
Tax	163,461	235,134	308,814	385,212	465,002
Earnings After Taxes (EAT)	**515,539**	**617,066**	**731,546**	**859,331**	**1,000,879**

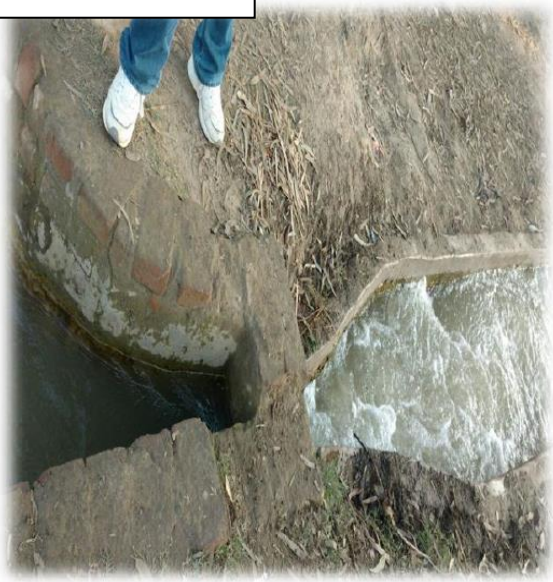
Annexure 6.1: Walk Through Survey

<u>जैड वितरिका के वाक थ्रू सर्वे की रिपोर्ट</u>

आज दिनांक 18.01.2017 को जैड वितरिका के जल उपयोक्ता संगमों के सदस्यों के साथ वाक थ्रू सर्वे किया गया। वाक थ्रू सर्वे में निम्न तथ्य सामने आये :–

1. जैड वितरिका के उपर वनी पुलियाओं के कारण नहर में सिल्ट जमा होने एवं नहर में केली के आने के दौरान नहर के प्रवाह को ये पुल बाधित करते है। जिसके कारण नहर के अन्तिम सिरों पर पानी की बारिया प्रभावित होती है।
2. जैड नहर एवं इससे निकलने वाली नहरों के उपर गेज वेल बनाये जावें। जिससे नहर में प्रवाहित हो रहे जल की मात्रा को आंकलित किया जा सके।
3. जैड वितरिका की टूट फूट को ठीक कराया जावे।
4. जैड वितरिका के अपस्ट्रीम में नहर की पटरी को दुरूस्त कराया जावें एवं इस पर मक डलवाकर सड़क बनवायी जावे जिससे नहर से होने वाली पानी की चोरी को रोका जा सके।
5. जैड वितरिका पर गन्ने की पाईप स्वीकृत हैं यही नहीं पेयजल के लिये कई पाईप स्वीकृत है। इन पाईपों से निकलने वाले पानी का प्रावधान स्वीकृत केपेसिटी में नहीं है। यही नहीं इसके कारण गन्ना उत्पादक किसानों आपेक्षित पानी प्राप्त नहीं हो पाता है साथ अन्य कृषको को भी समुचित मात्रा में पानी नहीं होता है। जिसके कारण कृषकों को उनके कृषि क्षैत्र को सिंचित करने के लिये ट्युबवेल से पानी लगाना पड़ता है। टयुबवेल का पानी खारा होने के कारण फसलों को नुकसान के साथ– मिट्टी की उत्पादकता प्रभावित होती है यही नहीं पक्के खालें क्षतिग्रस्त हो रहे हैं।
6. जल उपयोक्ता संगमों को जल कर से प्राप्त होने वाली राशि कम होने के कारण नहर की सामयिक सफाई में परेशानी होती है। अतः नहरों की सफाई को मनरेगा में कार्यकारी ऐजेन्सी जल संसाधन विभाग रखते हुए जल उपयोक्ता संगमों के माध्यम से कराया जावे।

WALK THROUGH SURVEY PHOTOGRAPHS



PHOTOGRAPHS OF EXISTING CONDITION OF CANAL LINING, STRUCTURES BY WALK THROUGH SURVEY OF SYSTEM

Annexure 6.2: General Abstract of Cost & Quantity

Annexure has been attached separately.

Annexure 6.3: Benefit Cost Ratio

Estimated cost of the project	200
CCA (ha)	12128
Cost of land development @ Rs.0 per ha	0.00

Rs. In Lacs

Items	Before Irrigation / Pre Project	After Irrigation / Post Project
A. Gross Receipts		
1. Gross value of farm produce	5918.08	5857.92
2.Dung receipts (at 30% of fodder expenditure)	266.31	175.74
3. Total (A) Gross receipts (1 & 2)	6184.39	6033.66
B. Expenses		
1. Expenditure on seeds	477.03	401.17
2.Expenditure on manure etc.	275.18	293.68
3.Expenditure on hire labour (human & Bullock)	402.06	411.00
4.Fodder expenses (Assume 15% of A1 before and 10%of A1 after the project)	887.71	585.79
5.Depreciation on implements (Assume 2.7% of A1 before and after the project)	159.79	158.16
6.Share and Cash rent (Assume 5% of A1 before and 3%of A1 after the project)	295.90	175.74
7.Land Revenue (Assume 2% of A1 before and after the project)	118.36	117.16
Total B Expenses(1 to 7)	2616.04	2142.70
C. Net value of Produce		
1.Total Gross receipts	6184.39	6033.65
2.Minus total expenses	2616.04	2142.70
3.Net value of produce	3568.36	3890.95

Items	Values
D. Annual Agricultural Benefits	
1.Net value after Irrigation	3890.95
2.Net value before Irrigation	3568.36
3.Net annual Benefits	322.60
E. Other Benefits	
F. Total net Annual Benefits	322.60
G. Annual Cost	

Items	Values
1. Interest on capital @10%	20.00
2.Depriciation of the project @2% of cost of project	4.00
3. Annual Operation & Maintenance charges @ Rs 1175/ ha of CCA or annual irrigation (11380 ha)	171.51
4.Maintenance of Headworks @ 1% of it's cost	2.00
5. Annual maintenance cost of settling basin (As per actual tender cost)	0.00
5.Depriciation of the pumping system @8.33% of the estimated cost of the pumping system	0.00
6.Depriciation of the raising main @ 3.33% of the estimated cost of the raising main	0.00
7. Power charges considered @ Rs. 5250.70 per ha	0.00
8. Total (G) Annual Cost (1 to 7)	197.51
Benefit Cost Ratio : Annual Benefit / Annual Cost	1.63

Table 45: Calculation of the Post project benefits for Phoolasar Irrigation Project

Name of the Crop	Area under the crop	Receipts						Expenditure on										Total	Total	Benefit/ha	Total
		Yield/ha	Total produce	Rate	Gross produce value Rs Lakh	Dung Receipts	Gross Receipts	Seeds Rs/ha	Cost of Seed (Rs. In Lakh)	manure etc	Cost of manure (Rs. In Lakh)	Hired labour human bullocks	Labour Cost Rs. In Lakh)	Fodder Expenses	Depreciation on implements	share &cash rent	Land Revenue	Expenses	Expenses/ha		Benefit for Crop
Cotton	1334.00	20.00	26680.00	6000.00	1600.80	48.02	1648.82	15000.00	200.10	3200.00	42.69	5300.00	70.70	160.08	43.22	48.02	32.02	596.83	0.45	1051.99	78860.00
Guar	3638.40	10.00	36384.00	4000.00	1455.36	43.66	1499.02	1000.00	36.38	3200.00	116.43	3000.00	109.15	145.54	39.29	43.66	29.11	519.56	0.14	979.46	26920.13
Wheat	606.00	33.65	20391.90	1500.00	305.88	9.18	315.05	3000.00	18.18	3120.00	18.91	3000.00	18.18	30.59	8.26	9.18	6.12	109.41	0.18	205.64	33934.71
Gram	970.24	8.15	7907.46	8000.00	632.60	18.98	651.57	10500.00	101.88	2500.00	24.26	5300.00	51.42	63.26	17.08	18.98	12.65	289.53	0.30	362.04	37314.97
Sugarcane	242.56	480.00	116428.80	300.00	349.29	10.48	359.76	10500.00	25.47	3200.00	7.76	5300.00	12.86	34.93	9.43	10.48	6.99	107.91	0.44	251.85	103830.52
Barley	242.56	5.40	1309.82	1250.00	16.37	0.49	16.86	2400.00	5.82	3262.00	7.91	3000.00	7.28	1.64	0.44	0.49	0.33	23.91	0.00	-7.04	0.00
Mustard	2668.16	14.21	37914.55	3950.00	1497.62	44.93	1542.55	500.00	13.34	2838.00	75.72	5300.00	141.41	149.76	40.44	44.93	29.95	495.55	0.19	1047.00	39240.68
Vegetable	0.00	20.00	0.00	3000.00	0.00	0.00	0.00	11250.00	0.00	2494.00	0.00	5300.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	9701.92		247016.53	28000.00	5857.92	175.74	6033.66		401.17	23814.00	293.68		411.00	585.79	158.16	175.74	117.16	2142.70			320101.01

Table 46: Calculation of the Pre project benefits for Phoolasar Irrigation Project

Sr. No	Receipts								Expenditure on											Total Expenses/ ha	Benefit	Benefit /ha in Rs
	Name of the Crop	Area in Ha	Yield/ ha	Total produce	Rate	Gross produce value	Dung Receipts	Gross Receipts	Seeds Cost Per ha	Cost of Seed (Rs. In Lakh)	manure etc Cost Per ha	Cost of manure (Rs. In Lakh)	Labour charges Cost Per ha	Labour Cost Rs. In Lakh)	Fodder Expenses	Depreciation on implements	share &cash rent	Land Revenue	Total Expenses			
1	Cotton	1213.00	20.00	24260.00	6000.00	1455.60	65.50	1521.10	15000.00	181.95	3200.00	38.82	5300.00	64.29	218.34	39.30	72.78	29.11	644.59	0.53	876.51	72259.59
2	Guar	2789.44	10.00	27894.40	4000.00	1115.78	50.21	1165.99	1000.00	27.89	3200.00	89.26	3000.00	83.68	167.37	30.13	55.79	22.32	476.43	0.17	689.56	24720.35
3	Wheat	728.00	33.65	24497.20	1500.00	367.46	16.54	383.99	3000.00	21.84	3120.00	22.71	3000.00	21.84	55.12	9.92	18.37	7.35	157.15	0.22	226.84	31159.54
4	Gram	1697.92	8.15	13838.05	8000.00	1107.04	49.82	1156.86	10500.00	178.28	2500.00	42.45	5300.00	89.99	166.06	29.89	55.35	22.14	584.16	0.34	572.70	33729.56
5	Sugarcane	485.12	480.00	232857.60	300.00	698.57	31.44	730.01	10500.00	50.94	3200.00	15.52	5300.00	25.71	104.79	18.86	34.93	13.97	264.72	0.00	465.29	0.00
6	Barley	242.56	5.40	1309.82	1250.00	16.37	0.74	17.11	2400.00	5.82	3262.00	7.91	3000.00	7.28	2.46	0.44	0.82	0.33	25.05	0.00	-7.94	0.00
7	Mustard	2061.76	14.21	29297.61	3950.00	1157.26	52.08	1209.33	500.00	10.31	2838.00	58.51	5300.00	109.27	173.59	31.25	57.86	23.15	463.93	0.23	745.40	36153.58
8	Vegetable	0.00	20.00	0.00	3000.00	0.00	0.00	0.00	11250.00	0.00	2494.00	0.00	5300.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total	9217.80	591.41	353954.68	28000.00	5918.08	266.31	6184.39		477.03	23814.00	275.18		402.06	887.71	159.79	295.90	118.36	2616.04			198022.62

Table 47: Cost of Inputs, Crop Yields and other Parameters

S. No.	Crop	Seed Rate [kg/ha]	Rate of Seed [Rs./kg]		Cost of Seed [Rs./ha]		Fertilizer Cost [Rs./ha]	Yield (with-rehabilitation) [q/ha]	Irrigation Charges [Rs./ha]
			Local	Improved	Local	Improved			
1	Cotton	100	120	150	12000	15000	3200	20	110
2	Guar	10	80	100	800	1000	3200	10	110
3	Wheat	100	20	30	2000	3000	3120	33.65	149
4	Gram	75	100	140	7500	10500	2500	8.15	110
5	Sugarcane	75	100	140	7500	10500	3200	480	114
6	Barley	30	60	80	1800	2400	3262	5.4	129.5
7	Mustard	5	80	100	400	500	2838	14.21	139.25
8	Vegetable	75	100	150	7500	11250	2494	20	110

Table 48: Present Average Cropping Area

No.	Crop	Present Average Cropping Area Irrigated by canal	
		% CCA	Area [ha]
	Kharif		
1	Cotton	10.00%	1213
2	Guar	23.00%	2789
3	Sugarcane	4.00%	485
	Total Kharif	**37.00%**	**4488**
	Rabi		
1	Wheat	6.00%	728
2	Gram	14.00%	1698
3	Barley	2.00%	243
4	Mustard	17.00%	2062
	Total Rabi	**39.00%**	**4730**
	Total	**76.00%**	**9218**

Table 49: Proposed Average Cropping Area

No.	Crop	Proposed Average Cropping Area Irrigated by canal	
		% CCA	Area [ha]
	Kharif		
1	Cotton	11.00%	1334
2	Guar	30.00%	3638
3	Sugarcane	2.00%	243
	Total Kharif	**43.00%**	**5215**
	Rabi		
1	Wheat	5.00%	606
2	Gram	8.00%	970
3	Barley	2.00%	243
4	Mustard	22.00%	2668
	Total Rabi	**37.00%**	**4487**
	Total	**80.00%**	**9702**

Annexure 6.3.1 & 6.3.2: The Pre & Post Irrigation Planning

The Annexures have been attached as MS Excel file separately

Appendix 1: Cropping Areas - with/without Rehabilitation

Cropping Areas - Without-Rehabilitation (Average)

No.	Crop	Average Cropping Area					
		Irrigated		Unirrigated		Total	
		% CCA	Area [ha]	% CCA	Area [ha]	% CCA	Area [ha]
	Kharif						
1	Sugarcane	1.0	121	0.0	0	1.0	121
2	Jowar	3.0	364	0.3	36	3.3	400
3	Bajra	2.0	243	0.3	36	2.3	279
4	Kh.Pulses/Others	4.0	485	0.3	36	4.3	521
5	Guwar	8.0	970	4.0	485	12.0	1,455
6	Cotton	19.0	2,304	2.0	243	21.0	2,547
	Total Kharif	37.0	4,487	6.9	836	43.9	5,323
	Rabi						
1	Wheat	25.0	3,032	1	121	26.0	3153
2	Gram	10.0	1,213	0.1	12	10.1	1225
3	Mustard	6.0	728	3.5	424	9.5	1152
4	Others	1.0	121	0	0	1.0	121
	Total Rabi	42.0	5,094	4.6	557	46.6	5651
	Grand Total	**79.0**	**9581**	**11.5**	**1393**	**90.5**	**10974**
	CCA =	12,128	Ha				

Cropping Areas - With-Rehabilitation (Average)							
No.	Crop	Average Cropping Area					
		Irrigated		Unirrigated		Total	
		% CCA	Area [ha]	% CCA	Area [ha]	% CCA	Area [ha]
	Kharif						
1	Sugarcane	1.7	206	0.0	0	1.7	206
2	Jowar	1.0	121	1.7	206	2.7	327
3	Bajra	1.5	182	0.3	36	1.8	218
4	Kh.Pulses/Others	1.5	182	3.0	364	4.5	546
5	Guwar	9.0	1,092	1.4	170	10.4	1,262
6	Cotton	23.0	2,789	1.7	206	24.7	2,995
	Total Kharif	37.7	4,572	8.1	982	45.8	5,554
	Rabi						
1	Wheat	27.0	3,275	0.7	85	27.7	3360
2	Gram	0.5	61	0.1	12	0.6	73
3	Mustard	23.5	2,850	1.7	206	25.2	3056
4	Others	1.3	158	0.1	12	1.4	170
	Total Rabi	52.3	6,344	2.6	315	54.9	6,659
	Grand Total	**90.0**	**10,916**	**10.7**	**1,297**	**100.7**	**12,213**

CCA = 12,128 ha

Note:

Cultivation area of other crops in Kharif season such as groundnuts, soybeans, cotton, guar etc. shall be included in area of "Kharif .pulses".

Cultivation area of other crops in Rabi season such as spices, vegetables, fruits, medicinal plants shall be included in area of "others".

Appendix 2: Cost of Inputs, Crop Yields and other Parameters

Without Rehabilitation

	Crop	Gross Receipts						(1) Expenditure on Seed			(2) Expenditure on fertilizer and manure	(3) Expenditure on Labor/bullock		(8) Plant protection
		Rate 1/ (Financial)	Rate 2/ (Economic)	Yield 3/	Gross value of farm produce	Value of by-products	Value of by-products	Input of seed	Rate of seed	Cost of seed		Family/owned labor/bullock	Hired labor/bullock	
		[Rs./q]	[Rs./q]	[q/ha]	[Rs./ha]	[%]	[Rs./ha]	[kg/ha]	[Rs./kg]	[Rs./ha]	[Rs./ha]	[Rs./ha]	[Rs./ha]	[Rs./ha]
	KHARIF													
1	Sugarcane	271	250	480.0	130,080	20%	26,016	2,000	3	6,000	5,000	15,000	20,000	-
2	Jowar	1,864	1,789	5.5	10,252	50%	5,126	9	72	648	2,141	5,262	9,302	-
3	Bajra	1,446	1,388	9.1	13,159	50%	6,580	5	188	940	1,121	10,206	5,215	-
4	Kh.Pulses	6,219	5,970	4.0	24,876	10%	2,488	15	120	1,800	1,058	7,790	6,476	300
5	Guwar	4,500	4,300	13.0	58,500	20%	11,700	20	60	1,200	2,500	15,000	15,000	880
6	Cotton	5,898	5,662	20.3	119,729	5%	5,986	1,462	4	5,848	6,529	35,136	12,378	2,940
	RABI													
1	Wheat	1,817	1,394	33.6	61,051	20%	12,210	151	26	3,926	4,755	14,488	10,080	100
2	Gram	3,792	3,640	8.1	30,715	10%	3,072	58	68	3,944	1,158	11,021	3,564	650
3	Mustard	3,934	3,782	13.5	53,109	0%	-	6	166	996	3,100	11,324	6,572	100
4	Others	1,252	1,202	94.5	118,314	0%	-	10	396	3,960	18,387	10,554	25,986	3,900

With Rehabilitation

	Crop	Gross Receipts						(1) Expenditure on Seed			(2) Expenditure on fertilizer and manure	(3) Expenditure on Labor/bullock		(8) Plant protection
		Rate 1/ (Financial)	Rate 2/ (Economic)	Yield 3/	Gross value of farm produce	Value of by-products	Value of by-products	Input of seed	Rate of seed	Cost of seed		Family/owned labor/bullock	Hired labor/bullock	
		[Rs./q]	[Rs./q]	[q/ha]	[Rs./ha]	[%]	[Rs./ha]	[kg/ha]	[Rs./kg]	[Rs./ha]	[Rs./ha]	[Rs./ha]	[Rs./ha]	[Rs./ha]
	KHARIF													
1	Sugarcane	271	250	480.0	130,080	20%	26,016	2,000	3	6,000	5,000	15,000	20,000	-
2	Jowar	1,864	1,789	5.5	10,252	50%	5,126	9	70	630	2,141	5,262	9,095	-

3	Bajra	1,446	1,388	9.1	13,159	50%	6,580	5	183	915	1,121	10,206	5,099	-
4	Kh.Pulses	6,219	5,970	4.0	24,876	10%	2,488	15	117	1,755	1,058	7,790	6,332	300
5	Guwar	4,500	4,300	13.0	58,500	20%	11,700	20	60	1,200	2,500	15,000	15,000	880
6	Cotton	5,898	5,662	20.3	119,729	5%	5,986	1,462	4	5,848	6,529	35,136	12,378	2,940
	RABI													
1	Wheat	1,817	1,394	37.0	67,229	20%	13,446	151	27	4,077	4,993	15,213	9,856	105
2	Gram	3,792	3,640	9.0	34,128	10%	3,413	58	71	4,118	1,216	11,572	3,485	680
3	Mustard	3,934	3,782	14.1	55,469	0%	-	6	174	1,044	3,255	11,890	6,426	105
4	Others	1,252	1,202	99.2	124,198	0%	-	10	416	4,160	19,306	11,082	25,409	4,095
Source:														
1/ Calculated by JICA Survey Team based on Rajasthan Agricultural Statistics at a Glance 2013-14, published Nov. 2015, DoA, Rajasthan														
2/ Economic price of maize, wheat and barley was calculated based on FOB price. The other price was calculated by using SCF = 0.96.														
3/ Ave. 5 years data up to 2012-13, Rajasthan Agricultural Statistics at a Glance 2013-14, published Nov. 2015, DoA, Rajasthan														
4/ Cost of cultivation data is prepared based on 2012-13 data, Estimates of Cost of Cultivation/Production & Related Data, Directorate of Economics & Statistics														
Note :														
- Cost of cultivation has converted to price at 2016 by using CPI (2012 to 2016, 132)														
- Increase in production of 20% for wheat, barley & gram and 5% of mustard & other crops are anticipated for the crop budget with rehabilitation condition														
- Increase of 5% of labor cost and material inputs are anticipated for Kharif crops with rehabilitation condition														

Appendix 3: Value of Crop and Cost of various Inputs (Without-Rehabilitation)										
A) GROSS RECEIPTS										
S.No	**Crop**	**Area[ha]**	**Yield**		**(1) Gross value of farm produce (Financial)**		**(1) Gross value of farm produce (Economic)**		**(2) Value of by-products**	
			Average	**Total**	**Rate**	**Value**	**Rate**	**Value**	**Rate**	**Value**
			[q/ha]	**[q]**	**[RS./q]**	**[Rs.]**	**[RS./q]**	**[Rs.]**	**[Percentage]**	**[Rs.]**
	Kharif									
1	Sugarcane	121	480.0	58,080	271	15,739,680	250	14,520,000	20%	3,147,936
2	Jowar	400	5.5	2,200	1,864	4,100,800	1,789	3,935,800	50%	2,050,400
3	Bajra	279	9.1	2,539	1,446	3,671,249	1,388	3,523,993	50%	1,835,625
4	Kh.Pulses/Others	521	4.0	2,084	6,219	12,960,396	5,970	12,441,480	10%	1,296,040
5	Guwar	1,455	13.0	18,915	4,500	85,117,500	4,300	81,334,500	20%	17,023,500
6	Cotton	2,547	20.3	51,704	5,898	304,950,782	5,662	292,748,614	5%	15,247,539
	Rabi									
1	Wheat	3,153	33.6	105,941	1,817	192,494,434	1,394	147,681,475	20%	38,498,887
2	Gram	1,225	8.1	9,923	3,792	37,626,120	3,640	36,117,900	10%	3,762,612
3	Mustard	1,152	13.5	15,552	3,934	61,181,568	3,782	58,817,664	0%	-
4	Others	121	94.5	11,435	1,252	14,315,994	1,202	13,744,269	0%	-
	Total	10,974		278,372		732,158,523		664,865,696		82,862,538

B) FARM INPUTS												
S.No	**Crop**	**Area[ha]**	**(1) Expenditure on seeds**		**(2) Expenditure on fertilizer/manures**		**(3.1) Expenditure on family bullock and labour**		**(3.2) Expenditure on hired bullock and labour**		**(8) Plant Protection**	
			Rate	**Cost**	**Rate**	**Cost**	**Rate**	**Cost**	**Rate**	**Cost**	**Rate**	**Cost**
			[RS./ha]	**[Rs.]**	**[RS./ha]**	**[Rs.]**	**[RS./ha]**	**[Rs.]**	**[RS./ha]**	**[Rs.]**	**[RS./ha]**	**[Rs.]**
	Kharif											
1	Sugar Cane	121	6,000	726,000	5,000	605,000	15,000	1,815,000	20,000	2,420,000	-	-
2	Jowar	400	648	259,200	2,141	856,400	5,262	2,104,920	9,302	3,720,600	-	-
3	Bajra	279	940	262,260	1,121	312,759	10,206	2,847,474	5,215	1,454,999	-	-
4	Kh.Pulses/Others	521	1,800	937,800	1,058	551,218	7,790	4,058,330	6,476	3,373,970	300	156,300
5	Guwar	1,455	1,200	1,746,000	2,500	3,637,500	15,000	21,825,000	15,000	21,825,000	880	1,280,400
6	Cotton	2,547	5,848	14,894,856	6,529	16,629,363	35,136	89,491,392	12,378	31,526,766	2,940	7,488,180
	Rabi								-		-	
1	Wheat	3,153	3,926	12,378,678	4,755	14,992,515	14,488	45,681,295	10,080	31,783,659	100	315,300
2	Gram	1,225	3,944	4,831,400	1,158	1,418,550	11,021	13,501,215	3,564	4,365,900	650	796,250
3	Mustard	1,152	996	1,147,392	3,100	3,571,200	11,324	13,045,018	6,572	7,570,714	100	115,200
4	Others	121	3,960	479,160	18,387	2,224,827	10,554	1,277,070	25,986	3,144,324	3,900	471,900
	Total	10,974		37,662,746		44,799,332		195,646,713		111,185,932		10,623,530

Table: Value of Crop and Cost of various Inputs (With-Rehabilitation)										
A) GROSS RECEIPTS										
S.No	**Crop**	**Area[ha]**	**Yield**		**(1) Gross value of farm produce (Financial)**		**(1) Gross value of farm produce (Economic)**		**(2) Value of by-products**	
			Average	**Total**	**Rate**	**Value**	**Rate**	**Value**	**Rate**	**Value**
			[q/ha]	**[q]**	**[RS./q]**	**[Rs.]**	**[RS./q]**	**[Rs.]**	**[Percentage]**	**[Rs.]**
	Kharif									
1	Sugarcane	206	480.0	98,880	271	26,796,480	250	24,720,000	20%	5,359,296
2	Jowar	327	5.5	1,799	1,864	3,352,404	1,789	3,217,517	50%	1,676,202
3	Bajra	218	9.1	1,984	1,446	2,868,575	1,388	2,753,514	50%	1,434,287
4	Kh.Pulses/Others	546	4.0	2,184	6,219	13,582,296	5,970	13,038,480	10%	1,358,230
5	Guwar	1,262	13.0	16,406	4,500	73,827,000	4,300	70,545,800	20%	14,765,400
6	Cotton	2,995	20.3	60,799	5,898	358,589,553	5,662	344,241,107	5%	17,929,478
	Rabi									
1	Wheat	3,360	37.0	124,320	1,817	225,889,440	1,394	173,302,080	20%	45,177,888
2	Gram	73	9.0	657	3,792	2,491,344	3,640	2,391,480	10%	249,134
3	Mustard	3,056	14.1	43,090	3,934	169,514,486	3,782	162,964,867	0%	-
4	Others	170	99.2	16,864	1,252	21,113,728	1,202	20,270,528	0%	-
	Total	12,213		366,981		898,025,306		817,445,373		87,949,915

B) FARM INPUTS												
S.No	**Crop**	**Area[ha]**	**(1) Expenditure on seeds**		**(2) Expenditure on fertilizer/manures**		**(3.1) Expenditure on family bullock and labour**		**(3.2) Expenditure on hired bullock and labor**		**(8) Plant Protection**	
			Rate	**Cost**	**Rate**	**Cost**	**Rate**	**Cost**	**Rate**	**Cost**	**Rate**	**Cost**
			[RS./ha]	**[Rs.]**	**[RS./ha]**	**[Rs.]**	**[RS./ha]**	**[Rs.]**	**[RS./ha]**	**[Rs.]**	**[RS./ha]**	**[Rs.]**
	Kharif											
1	Sugarcane	206	6,000	1,236,000	5,000	1,030,000	15,000	3,090,000	20,000	4,120,000	-	-
2	Jowar	327	630	206,010	2,141	700,107	5,262	1,720,772	9,095	2,974,065	-	-
3	Bajra	218	915	199,470	1,121	244,378	10,206	2,224,908	5,099	1,111,582	-	-

4	Kh.Pulses/Others	546	1,755	958,230	1,058	577,668	7,790	4,253,067	6,332	3,457,272	300	163,800
5	Guwar	1,262	1,200	1,514,400	2,500	3,155,000	15,000	18,930,000	15,000	18,930,000	880	1,110,560
7	Cotton	2,995	5,848	17,514,760	6,529	19,554,355	35,136	105,232,320	12,378	37,072,110	2,940	8,805,300
	Rabi											
1	Wheat	3,360	4,077	13,698,720	4,993	16,776,480	15,213	51,115,680	9,856	33,116,160	105	352,800
3	Gram	73	4,118	300,614	1,216	88,768	11,572	844,756	3,485	254,405	680	49,640
4	Mustard	3,056	1,044	3,190,464	3,255	9,947,280	11,890	36,335,840	6,426	19,637,856	105	320,880
5	Others	170	4,160	707,200	19,306	3,282,020	11,082	1,883,940	25,409	4,319,530	4,095	696,150
	Total	12,213		39,525,868		55,356,056		225,631,283		124,992,980		11,499,130

Appendix 4: Annual Net Receipt (Total Gross Margin)						
Without-Rehabilitation						
	Type of Produce/Input	**Product Value/Cost of Farm Inputs [Rs.]**				
		Factors	**Financial**	**Conversion Factor**		**Economic**
(A)	**Gross Receipts**					
	(1) Gross value of farm produce	-	732,158,523			664,865,696
	(2) Value of by-products	-	82,862,538	1/	0.96	79,548,037
	(3) Dung receipts at 30% of the fodder expenditure	30.0%	32,947,134	1/	0.96	31,629,248
	Total Gross Receipts		**847,968,194**			**776,042,980**
(B)	**Farm Inputs**					
	(1) Expenditure on seeds	-	37,662,746	2/	1.14	42,935,530
	(2) Expenditure on fertilizer/manures	-	44,799,332	2/	1.14	51,071,238
	(3.1) Expenditure on family bullock and labour	-	-	3/	0.90	176,082,042
	(3.2) Expenditure on hired bullock and labour	-	111,185,932	3/	0.90	100,067,338
	(4) Fodder expenditure (15% of the gross value of produce)	15.0%	109,823,778	1/	0.96	105,430,827
	(5) Depreciation on implements (2.7% of the gross value of farm produce)	2.7%	19,768,280	1/	0.96	18,977,549
	(6) Share and cash rent (5% of the gross value of produce)	5.0%	36,607,926	1/	0.96	35,143,609
	(7) Land revenue (2% of the gross value of farm produce)	2.0%	14,643,170	1/	0.96	14,057,444
	(8) Plant Protection	-	10,623,530	2/	1.14	12,110,824
	Total Farm Inputs		**385,114,695**			**555,876,402**
(C)	**Net Receipts (Total Gross Margin) (Total A – B)**		**462,853,500**			**220,166,578**

1/ Standard Conversion factor = 0.96

2/ Standard conversion factor + subsidised portion (20%) - VAT (5.5%), conversion factor = 0.96/(1-20%)/(1+5.5%)

3/ Shadow Wage Rate = 0.9

With-Rehabilitation						
	Type of Produce/Input	**Product Value/Cost of Farm Inputs [Rs.]**				
		Factors	**Financial**	**Conversion Factor**		**Economic**
(A)	**Gross Receipts**					
	(1) Gross value of farm produce	-	898,025,306			817,445,373
	(2) Value of by-products	-	87,949,915	1/	0.96	84,431,918
	(3) Dung receipts at 45% of the fodder expenditure	30.0%	26,940,759	1/	0.96	25,863,129
	Total Gross Receipts		**1,012,915,980**			**927,740,420**
(B)	**Farm Inputs**					
	(1) Expenditure on seeds	-	39,525,868	2/	1.05	41,502,161
	(2) Expenditure on fertilizer/manures	-	55,356,056	2/	1.05	58,123,859
	(3.1) Expenditure on family bullock and labor	-	-	3/	0.90	203,068,155
	(3.2) Expenditure on hired bullock and labor	-	124,992,980	3/	0.90	112,493,682
	(4) Fodder expenditure (10% of the gross value of produce)	10.0%	89,802,531	1/	0.96	86,210,429
	(5) Depreciation on implements (2.7% of the gross value of farm produce)	2.7%	24,246,683	1/	0.96	23,276,816
	(6) Share and cash rent (3% of the gross value of produce)	3.0%	26,940,759	1/	0.96	25,863,129
	(7) Land revenue (2% of the gross value of farm produce)	2.0%	17,960,506	1/	0.96	17,242,086
	(8) Plant Protection	-	11,499,130	2/	1.05	12,074,087
	Total Farm Inputs		**390,324,513**			**579,854,404**
(C)	**Net Receipts (Total Gross Margin) (Total A – B)**		**622,591,467**			**347,886,017**
1/ Standard Conversion factor = 0.96						
2/ Standard conversion factor + subsidized portion (20%) - VAT (14.5%), conversion factor = 0.96/(1-20%)/(1+14.5%)						
3/ Shadow Wage Rate = 0.9						

Appendix 5: Cash Flow Schedule and EIRR

1. Annual Net Receipts, Without Rehabilitation [Rs.'000]

Irrigated:	9,581	ha
Unirrigated:	1,393	ha
Total crop area:	**10,974**	ha
Total economic gross margin:	**220,167**	

2. Annual Net Receipts, With Rehabilitation [Rs.'000]

Irrigated:	10,916	ha
Unirrigated:	1,297	ha
Total crop area:	**12,213**	ha
Total economic gross margin:	**347,886**	

3. Annual Incremental Economic Value of Production [Rs.'000]	**Discount Rate**	
127,719	i =	**12%**

4. Capital Cost [Rs.'000]		
282,164	SID =	4%
	Consultancy	6%

Appendix 6: Calculation of Benefit Cost Ratio			
Benefits Cost Ratio			
		Without Rehabilitation	With Rehabilitation
(A)	GROSS RECEIPTS		
1	Gross value of farm produce	732,158,523	898,025,306
2	Value of by-products	82,862,538	87,949,915
3	Dung receipts at 30% of the fodder expenditure	32,947,134	26,940,759
4	Total (A) : Gross Receipts (1+2+3)	**847,968,194**	**1,012,915,980**
(B)	FARM INPUTS		
1	Expenditure on seeds	37,662,746	39,525,868
2	Expenditure on fertilizer/manures etc.	44,799,332	55,356,056
3	Expenditure on hired bullock and labour	111,185,932	124,992,980
4	Fodder expenditure (15%/10% of the gross value of produce)	109,823,778	89,802,531
5	Depreciation on implements (2.7% of the gross value of farm produce)	19,768,280	24,246,683
6	Share and cash rent (5%/3% of the gross value of produce)	36,607,926	26,940,759
7	Land revenue (2% of the gross value of farm produce)	14,643,170	17,960,506
9	Total (B) Expenses (1 to 6)	**374,491,165**	**378,825,383**
(C)	NET VALUE OF PRODUCE		

1	Total Gross Receipts (Total A.4)	847,968,194	1,012,915,980
2	Minus Total Expenses (Total B.7)	374,491,165	378,825,383
3	Net Value of Produce (C) :(1-2)	**473,477,030**	**634,090,597**
(D)	ANNUAL AGRICULTURE BENEFITS:		
1	Net Value with rehabilitation (C.3)	634,090,597	
2	Minus Net Value without rehabilitation (C.3)	473,477,030	
3	Net Annual Benefits (D) :(1-2)	**160,613,567**	
(E)	Other net annual benefits due to aqua- culture including pisiciculture, drinking & industrial water supply, hydro power generation, animal husbandry etc.(average Rs 5.0 lakh per sub project)		
(F)	TOTAL NET ANNUAL BENEFITS (D+E)	160,613,567	
(G)	ANNUAL COSTS:		
1	Interest on capital @10% (Estimated total cost of the project)	28,216,400	
2	Depreciation of the project @ 2% of the cost of the project	5,643,280	
3	Annual operation and maintenance charges @657 per ha of CCA	7,968,096	
4	Maintenance of the head works @ 1.0% of its cost	-	
5	Depreciation of the pumping system @ 8.33% of the estimated cost of the pumping system assuming life of the system as 12 years (Applicable to lift irrigation)	0	
6	Depreciation of the raising mains @3.33% of the estimated cost of the raising mains assuming life of the system as 30 years (Applicable to lift irrigation)	0	
7	Power charges for lift irrigation @ Rs…per ha(applicable to lift irrigation)	0	
8	Total (G) Annual costs(1 to 7)	41,827,776	
	BENEFIT COST RATIO = F: Annual Benefits/G8: Annual Costs	3.84	

Annexure 7.1: Social Management Plan under RACP (Implementation strategy of cluster)

1. Stakeholder Consultations

To avoid/minimize risks, avoid exacerbation of social and economic disparities between and among social groups, ensure equitable spread of project investments and benefits, and contribute to long-term social and institutional sustainability of the RACP, stakeholder consultations in form of Focused Group Discussion were carried out in entire villages of 10 gram panchayats of Z-Distributary Cluster Surface Water Cluster. Major issues in the Z-Distributary cluster that emerged from the farmer and group consultations during field visit are summarized below.

i. Equal distribution of technologies and investment should be ensured under RACP through reframing the beneficiary contribution. As though the farmer is having big farm land but financially not able to contribute the beneficiary share and similarly small and marginalized farmer doesn't having amounted to share the beneficiary contribution.

j. Women believe that they do most of the work in agriculture except for ploughing and selling, they have no role in decision making regarding purchase of inputs or selling of produce.

k. Farmers are not getting affected with land acquisition as there is no displacement through canal rehabilitation works.

l. Women are not recognized as farmers in their own right.

m. Problem of access to credit by small and marginal farmers.

n. Marginalization of small and marginal farmers in technologies and investments, training and capacity building.

o. Extension services timely in villages.

p. The safety provision should be taken for diggies to protect any domestic animals, wild animals and human specially children through wire fencing around diggies

q. The villagers identified that the new infrastructure would be created for water management (Canal System) which would provide sufficient water for agriculture production.

r. In Z-Distributary cluster, Agriculture and Horticulture are the main source of livelihood for majority of population residing in the Project Area. Most of the villages are located in Cluster Area And the connected market Sriganganagar city Near By Project area like Punjab (Abohar City).

1.1 Field Consultant held - Key social issue of cluster

Major issues in the cluster that identified after consultation from the Sarpanch, PRIS and other MTG groups like Men group, SC groups, field NGOs, representative of PRIs etc. during field visit with, are summarized below

Date	Village	Gram Pnachyat	Place
03/10/2016	18Z	18Z	18Z
22/10/2016	3c	3c	3c
08/11/2016	15Z	15Z	15Z
03/12/2016	4Z	4Z	4Z
26/12/2016	12Z	10Z	12Z
11/01/2017	25Z	Sahibsinghwala	25Z
20/01/2017	10 a choti	10Z	10 a choti
03/02/2017	Mohanpura(4 b choti)	Mohanpura	4 b choti
09/02/2017	17Z	18Z	17Z
14/02/017	20Z	3 h choti	20Z
23/02/2017	6 a choti	Sahuwala	6 a choti
04/03/2017	9 a choti	Saharanwali(5g)	9 a choti
17/03/2017	11Z	9Z	11Z
22/03/2017	1Z	4Z	1Z
03/04/2017	22Z	3 h choti	22Z
06/04/2017	19Z	18Z	19Z
11/04/2017	2c	3c	2c
10/05/2017	5 b choti	9z	5 b choti
22/05/2017	4c	3c	4c
19/06/2017	8Z	10Z	8Z

Agriculture:-

Construction of diggies are the most important and useful work in Surface water Cluster Z-Distributary, as farmer can store the canal water and use to secure their crops with irrigation.

1. For every farmer, those who get benefitted with digging construction in his field, installation of solar pumps and mini sprinkler should be must.
2. Farmers having large farm aprrox. 6.25ha. Land and they showing the crop in 75% of total area.
3. Sprinkler is very successful in cluster area.
4. Regular farmer training and exposure visit activities should be conducted so that they can adopt new technology and innovation idea in Agriculture field.
5. Farm land fencing could be done to save crops from wild animals.
6. Those farmers who are very poor / BPL should be facilitated with more project share to construct diggies in their respective fields.
7. The target of Diggies may be increased.

Water resources:-

1. Time to time water courses repairing should be ensured.
2. Banks (canal side road) should also be constructed
3. Sometimes canals get breakdown so along with construction, there should be a

Provision of repairing also time to time.

Market Linkages:-

1. Cluster area is located nearby District head quarter Sriganganagar and market facility of Sriganganagar super A Class Krshi Upaj Mandi Samiti Sriganganagar.
2. Due to lack of investment money with farmers, they generally borrows cash from Mandi wholesalers / businessman during the sowing time and therefore they have to sell their crop production to them only. Which results high rate of interest and suffering the farmers.
3. Though farmers are having Kisan Credit cards, but once they get defaulter, banks doesn't allow to give them loan and therefore the farmers has to rely to Mandi wholesalers / businessman

Value Chain:-

1. Guar, Cotton, Moong in Kharif and Wheat, Gram, Mustered, Barley, in Rabi are the major crop in cluster area.
2. Guar, Mustered and Kinnow Crop selected under value chain crops so that value chain activity may be taken..

Farmer Discussion in Cluster Area in different villages which name of farmers and photograph Enclosed.

10 a choti Field Consultation:-

Sr. No.	Name Of Farmer	Father Name	Village	Gram Panchayat	Chack No.	Mobile No.
1	Rakesh	Rameshwar lal	10 a choti	10Z	10 a choti	7742802007
2	Narender singh	Birbal singh	10 a choti	10Z	10 a choti	9875132405
3	Baldev singh	Lal singh	10 a choti	10Z	10 a choti	9667490436
4	Ashok kumar	Sant ram	10 a choti	10Z	10 a choti	8955555289
5	Krishan	Bagwant singh	10 a choti	10Z	10 a choti	9875132405

15Z Field Consultation:-

Sr. No.	Name Of Farmer	Father Name	Village	Gram Panchayat	Chack No.	Mobile No.
1	Chanan ram	Kanha ram	15Z	10Z	15Z	
2	Inder mohan	Hera lal	15Z	10Z	15Z	9530474041
3	Sukhdev singh	Bhagirath	15Z	10Z	15Z	9413685375
4	Jagmal ram	Rattu ram	15Z	10Z	15Z	
5	Gopi chand	Norang das	15Z	10Z	15Z	

1Z Field Consultation

Sr. No.	Name Of Farmer	Father Name	Village	G.P.	Chack No.	Mobile No.
1	Sukh mahender singh	Sohan singh	1Z	4Z	1Z	9461914700
2	Gajender singh	Jarnail singh	1Z	4Z	1Z	9414580282
3	Simraj brar	Jarnail singh	1Z	4Z	1Z	7568980000
4	Sohan lal	Rajaram	1Z	4Z	1Z	9694675951
5	Ved prakash	Prithivi raj	1Z	4Z	1Z	9494675561
6	Sanjay kumar	Vijay kumar	1Z	4Z	1Z	9828285000

Sr. No.	Name Of Farmer	Father Name	Village	G.P.	Chack No.	Mobile No.
7	Sukhdev singh	Jaswant singh	1Z	4Z	1Z	9699497758
8	Parvinder singh	Baldev singh	1Z	4Z	1Z	9413930839

3 b Field Consultation

Sr. No.	Name Of Farmer	Father Name	Village	Gram Panchayat	Chack No.	Mobile No.
1	Sarvjeet singh	Sadhu singh	3 b	9Z	3 b	9829782320
2	Inderpal	Maiya das	3 b	9Z	3 b	9549424009
3	Narvail singh	Gurdayal singh	3 b	9Z	3 b	9782554156
4	Jogender singh	Bachhan singh	3 b	9Z	3 b	9982095040
5	Kulwant singhq	Gurdeep singh	3 b	9Z	3 b	9983462084
6	Sardul singh	Kartar singh	3 b	9Z	3 b	9887122745

2 b Field Consultation

Sr. No.	Name Of Farmer	Father Name	Village	G.P.	Chack No.	Mobile No.
1	Mahender singh	Gurbachan singh	2 b	Mohanpura	2 b	9001827492
2	Sakhjot singh	Sohan singh	2 b	Mohanpura	2 b	9269000050
3	Natha singh	Jogender singh	2 b	Mohanpura	2 b	9784572260
4	Hargovind singh	Jeet singh	2 b	Mohanpura	2 b	7665864962
5	Jaswinder singh	Labh singh	2 b	Mohanpura	2 b	9782277815
6	Balraj singh	Jagmail singh	2 b	Mohanpura	2 b	9660823307
7	Sarvan singh	Kikkar singh	2 b	Mohanpura	2 b	9783057008

3 c choti Field Consultation

Sr. No.	Name Of Farmer	Father Name	Village	Gram Panchayat	Chack No.	Mobile No.
1	Bikkar singh	Gurdev singh	3c	3c	3c	9587231005
2	Baldev singh	Harchand singh	3c	3c	3c	9772797501
3	Jagdeep singh	Mandar singh	3c	3c	3c	8870370852
4	Kuldeep singh	Veer singh	3c	3c	3c	9001148549
5	Malkeet singh	Veer singh	3c	3c	3c	01542821399

18Z Field Consultation

Sr. No.	Name Of Farmer	Father Name	Village	G.P.	Chack No.	Mobile No.
1	Gurdeep singh	Naryan singh	18Z	18Z	18Z	8894350598
2	Gurlal singh	Harjinder singh	18Z	18Z	17Z	8233860002
3	Devender pal singh	Labh singh	18Z	18Z	17Z	9950910011

Sr. No.	Name Of Farmer	Father Name	Village	G.P.	Chack No.	Mobile No.
4	Samandeep singh	Shital singh	18Z	18Z	18Z	8529797556
5	Gurjinder singh	Manjeet singh	18Z	18Z	18Z	9950580408

Sahibsinghwala(25Z) Field Consultation:-

Sr. No.	Name Of Farmer	Father Name	Village	G.P.	Chack No.	Mobile No.
1	Gurmeet singh	Baltej singh	25Z	Sahibsinghwala	24Z	9928112018
2	Jalandhar singh	Gurdayal singh	25Z	Sahibsinghwala	25Z	7062534576
3	Manjeet singh	Lakhveer singh	25Z	Sahibsinghwala	25Z	9672438235
4	Amreek singh	Gurcharan singh	25Z	Sahibsinghwala	25Z	9460204075
5	Ram singh	Sampuran singh	25Z	Sahibsinghwala	25Z	--------
6	Harnaik singh	Savran singh	25Z	Sahibsinghwala	23Z	9982661848

Findings of PRA in cluster area

As of field consultation during field visits, Participatory Rural Appraisal (PRA) activities viz. Resource mapping, Transit walk etc. were also carried out in the cluster area. The main findings during PRA exercise in Z-Distributary cluster are summarized as under:

Sr No.	Date	GP	Chak/Village
1	3/10/2016	18Z	13Z, 16Z,17Z,18Z, 19Z
2	4/10/2016	9Z	7Z, 9Z, 11Z, 3b, 5b
3	5/10/2016	10Z	6Z, 6Z-a, 8Z, 10Z, 12Z
4	5/10/2016	10Z	14Z, 15Z, 8a, 10a-I, 10a-II
5	6/10/2016	Sahibsinghwala	21Z, 23Z, 24Z, 25Z
6	13/10/2016	3h	20Z, 22Z
7	17/10/2016	Mohanpura	2b, 4b,
8	20/10/2016	Sahuwala	3a-I, 3a-II, 4a, 5a, 6a, 7a-I, 7a-II
9	22/10/2016	3c	1c, 2c, 3c, 4c, 5c
10	24/10/2016	4Z	1Z-I, 1Z-II, 4Z-I, 4Z-II, 5Z-I, 5Z-II, 1b-I, 1b-II
11	28/10/2016	Saharanwala	9a

Findings of PRA in cluster area

1. There is high need/requirement from farmers Any demonstration or input provided to farmers from line departments shall also include proper training and follow up for effective learning, adoption and impact on ground Farmers with large land holding. Cluster area required more financial assistance under Diggi. The cluster is under canal irrigation system and under Warabandi system. The farmer gets irrigation water for Fluctuated time that may be one hour or six hour. Warabandi system is not

regular maintained by Irrigation department so that regular agitation by farmers for their water availability. This reduces the crop productivity.

2. There is lack of education and health services in the area as compared to rest of the state average of schools or PHC per GP There is land of many farmers in the cluster who does not reside in the cluster. Many of these farmers are out of state and also abroad who hire local farmers to do farming on their land.

3. The connecting canals are Constructed Pukka. Also many connecting canals are damaged and their repair is requested. The rainfall in project area is very less that is 260mm leading to loss of crop production. Project area is dominated by Sikh and Jaat caste. The soil type is loam in the project area. One Murbba is equal to 25 Beegha or 6.25 hectares. One Chak consist to 40-50 Murbba land. Major crop in kharif is Gwar, Cotton. And Wheat, Gram and Mustard are major Rabi crops. Farmers making pakki Diggy ask for more financial assistance and target of diggi from Government.

4. There is requirement of solar water pump in the project area. Crop insurance is in high demand in project area. Farmers have demanded more time irrigation.

5. Under project area Orchard of Kinnow crop planted by farmers. Drip system is successful in orchard. Farmers demand is more subsidies in drip system.

1.2 Social mobilization strategy

The consultations with participant are followed by / carried out through Information, Education and Communication (IEC) activities like display board, pamphlet distribution and awareness campaign with school children on activities and benefits for preparing of CACP under RACP. The detail of IEC activities are given as bellow in table.

S.N.	Name of Activities	Target	Achieve
1	Display Board at GP/Village Level	10	10
2	Kala Jattha and Puppet shows at the Chack Level	20	20
3	Pamphlet Distribution	18800	18800
4	RACP Awareness Rallies of School Children	20	20
5	Flex Stand	8	8
6	Slogan Writing	105	105

2. Socioeconomic Profile (based on CACP baseline data)

Project Area covers an area of 12128 hectare (ha) comprising four (10) Gram Panchayats and Forty Nine (49) villages. The Cluster village has a population of 28885 of which 15314 are males while 13571 are females as per field survey by NGOs. In the cluster scheduled caste 10618 and there is no population of scheduled tribe category. Cluster has household of 5830 out of which small farmer is 1172, marginal farmer is 2211, large is 1954 and landless is 493.

The populations of cluster are counted through baseline survey conducted by field NGOs which are counted different to census data due to variation of village boundary. Some GP population are not counted of hole village population because of some area of village are not consider in cluster boundary hence the population of census data is variable to baseline survey.

Socioeconomically disaggregated baseline: The Baseline data are documented the existing status of farmers and estimate the resource dependency of the village common lands. CACP is included a

summary of socioeconomic baseline, consultations held with various socioeconomic groups and their key concerns and a social strategy.

Population Details (according Census data 2011)

Male	Female	Total	SC	ST
15314	13571	28885	10618	0
53.02%	**46.98%**	**100.00%**	**36.76%**	**0.00%**

Household Details (according baseline survey)

BPL household	Land Less	Small Farmer	Marginal Farmer	Large Farmer	Total household	SC household	ST household
943	493	1172	2211	1954	5830	220	0
16.17%	**8.46%**	**20.10%**	**37.92%**	**33.52%**	**100.00%**	**3.77%**	**0.00%**

Category wise Cultivated Area in Z-Distributary Cluster

The cluster is recognized with all categories of farmers. These farmers have land as per category of farmer. The cluster is having rich soil, good fertility and high yield.

S.N	Type of Farmer	Total Households (Nos)	Area (in ha)			Area (in ha) Category wise		
			Command	Non Command if any	Total	General	SC	ST
1	Large farmer	1954	8895	0	8895	8895	0	0
2	Small farmer	1172	1905	0	1905	1857	48	0
3	Marginal farmer	2211	1328	0	1328	1157	172	0
4	Landless person	493	0	0	0	0	0	0
5	No. of BPL households	942	0	0	0	0	0	0
	Total (1to 4)	**5830**	**12128**	**0**	**12128**	**11908**	**220**	**0**

3. Beneficiary Targeting and Social Inclusion

Ensuring Targeting, Inclusion, Participation and Access of small and marginal farmers, SC and women farmers to agricultural inputs (seeds, fertilisers, credit, training, information, etc.), extension services and markets; are the basic need for the project to reach out and involve these groups at all stages. Through social mobilization including IEC activities and field consultation / PRA exercise, equitable access of small and marginal farmers, women farmers, and scheduled caste farmers in CACP preparation, farmer mobilization, and farmers' organisations is ensured.

Though most of the activities planned under CACP in Z-Distributory cluster is belongs to individual farmer / beneficiary, few activities viz. Rehabilitation & Modernization of Canal System, Head regulator, Adjustable Proportional Module (APM) type outlet and Cattle Ghats etc. has to be done on existing canal which is Water Resources Department land. Therefore there is no need to do Participatory Planning for Interventions on Panchayat Lands and Village Commons in Z-Distributary cluster. Water distribution equal through WARABANDI system in Z-Distributary cluster.

4. Social Inclusion in Selection of Individual beneficiaries

RACP is offering a range of assets and resources to individual beneficiaries on a cost-sharing basis. Since most of these will not be on a saturation basis, the targeting and beneficiary selection criteria for all the categories of private assets will prioritise selection of small and marginal farmers, from scheduled caste, women headed and other vulnerable households highlighted in the social assessment of the CACP.

5. Gender and Women's Empowerment

During and before CACP planning, FGDs were conducted among different women groups where the anticipated benefits of the project were shared among them. It was also ensured that women from every group (caste/religion) should participate in such meetings with support of Female outreach workers viz. Anganwari Worker, Asha Sahyogini and ANM etc.

i) As beneficiaries of individually targeted assets: -The selection of beneficiary is also being done in group meetings with women and tried to get benefitted to those women MTG members, who are needier. Women from SC/ST and BPL families are given priority.

ii) As members of MTGs, WUAs, and FPOs: - Apart from beneficiary selection, it is also taken care that women could participate as a member of MTGs, WUAs and FPOs. It would also be taken care that in WUAs and FPO, there would be active participation of women members in meetings, capacity building and decision making. It is envisaged that for any decision regarding the WUAs / FPO, maximum women members' participation is mandatory.

iii) as participants in training program:-Though it is being ensured that women member's participation in group formation, meetings, planning and decision making but also it would be encouraged that women members could participate in capacity building programs / trainings. For every group / WUA, it would be mandatory that maximum participants would be women members.

iv) specially targeted women's activities:-Under RACP, recognition of women as farmers across the project structures are benefiting under project activities like vegetable production etc. for generating her income. Women are aware through training, capacity building and consultation for preparation of CACP under activities and benefit in RACP.

6. Social Impact Mitigation (for activities involving land, structures, crops, livelihoods and access)

S.N	Major Activity	Sub Activity	GP/common/ private/other land	Social Impact	Mitigation
1	Water Resource	Rehabilitation & Modernization of Canal System	Water resource department land	The risk of encroachment on canal as a farmer hut, cattle house etc. Inequity in the use and distribution of water The risk of conflicts among water users	Ensure that the encroachment on canal as farmer hut and cattle not house is not permissible. Exposure visits of farmers to water scarce areas use of water to more managed and equitable resource-
		Head regulator	Z-Distributary, Sriganganagar		
		Adjustable Proportional Module (APM) type outlet	Z-Distributary, Sriganganagar		

S.N	Major Activity	Sub Activity	GP/common/ private/other land	Social Impact	Mitigation
				resulting from collective efforts at establishing more efficient water usage norms. The risk of child labor during rehabilitation work on existing canal.	sharing arrangement. Close monitoring of water use and distribution arrangements by CBOs, CRPs and F-NGO. RACP would not encourage child labor. Social safeguard screening will be carried out for selected infrastructure
		Solar light	Z-Distributary, Sriganganagar		
		Construction of office Building for WUA's	Proposed in WRD and GP land		
2	Agriculture	Drip Irrigation System with Automation	Own land	The risk of exclude in farmer selection specially women and SC for benefit distribution Risk of resource-farmers being further indebted to moneylenders. Increased perishability, and challenges in marketability of produce	Ensuring for benefit for SC and Women on basis of cluster population parentage. Facilitate for market oriented agriculture comprising high-value and high-risk crops. Promote establishment of grain banks with exclusive membership of farmers.
		Mini Sprinkler	Own land		
		Crop Demonstration	Own land		
		Fodder Demonstration	Own land		
		Seed Production	Own land		
		Pipeline for piped conveyance of irrigation water	Own land		
		Water Storage Structure/ Diggies	Own land	Risk of children, wild and domestic animal identified to fall in Diggies.	The farmers are required wire fencing for all Diggies
3	Horticulture	Orchard Plantation	Own land	The risk of exclusion of women and SC farmers from project investments and other benefits. Risk of livelihood security due to	Farmer selection process through MTG discussion Identification of women household headed, and SC farmers, and their prioritized inclusion in all project benefits
		Vegetable Cultivation	Own land		
		Solar Pump Program	Own land		
		Post-Harvest Management	Own land		
		Horticulture Mechanization	Own land		
		Green house	Own land		

S.N	Major Activity	Sub Activity	GP/common/ private/other land	Social Impact	Mitigation
		Shade net House	Own land	Increasing marketability produce.	
4	Market & value chain	FPC	Proposed Gram panchayat land	It is expected that sufficient land would be available with the Gram Panchayat for establishment and/or construction of common use facilities proposed under the project. Loss of control of women over farm production with commercialization-on and formalization of markets – further disempowerment of women in the household economy	Land-based interventions would be located only in those areas where such land is readily available and voluntarily offered by the Gram Panchayat. The procedure for obtaining a "no objection certificate" from the Gram Panchayat. Social safeguard screening will be carried out for selected infrastructure Form and strengthen exclusive women farmers' groups for collective enterprise development.
		FCSC	Proposed Gram panchayat land		
5	Farmers' organization and capacity building	Formation of MTGs	Not applicable	Risk of exclude of women/SC/BPL farmer in MTGs	Priority of memberships & leadership of women/SC/BPL farmer in MTGs/WUAs/FPC All household data collection of cluster area. Equitable distribution of project benefits between women and men of categories wise percentage
		Formation of WUAs	Not applicable	Risk of exclude of Women/SC/BPL farmer in WUAs	
		Formation of FPC	Not applicable	Risk of exclude of Women/SC/BPL farmer in MTGs	
		Socio economic Data collection	Not applicable	Risk of exclude of Women/SC/BPL farmer in MTGs	
		Identification of Beneficiary	Not applicable	Risk of exclude of women, SC/BPL from beneficiary selection for Project activities	

S.N	Major Activity	Sub Activity	GP/common/ private/other land	Social Impact	Mitigation
		Capacity building & Training	Not applicable	Risk of exclusion of women from training for technological interventions	

7. Grievance Redress

The Grievance Redress Mechanism (GRM) are developing at three tier level (first, second and third level). The first, second and third level recognized as followed village, district and PMU level. The grievance redressal registers are maintained at all three tier level for received grievance under project activities.

First tier-Grievance mechanism operating and grievance register maintain by community organizer at village level with participation of MTGs leader.

Second tier-Grievance received through web application, hand on and toll free number and redress by Grievance Redressal Cell (GRC) which headed by cluster representative of PRIs/Zila Parisad with DPMU coordination.

Third tier– GRM monitor through web application, toll free number, forward by DPMU by state level GRC which headed by project director.

8. Key Social Indicators

The key social indicators are given below in table:-

Major activity	Sub activity	Social indicators
Water resource	The project will carry out rehabilitation and modernization of canal works	Focus will be on improved management of rehabilitated canal networks through WUAs/CBOs About 10 to 35% of MTGs, WUA, FPCs members and leaders from SC, and women farmers About 10 to 35% of trainees from SC and women farmers
Agriculture	MIS, Diggies, Soil testing, Demonstrations, PHM technologies, Seed Production, Farmer Training and Exposure visit.	Increase in farm production and productivity as a result of improved seed management and cultivation practices. About 10 to 35% of SC and women farmers as beneficiaries of individually targeted assets/services and demo activities. About 10 to 35% of MTGs, WUA, FPCs members and leaders from SC, and women farmers About 10 to 35% of trainees from SC and women farmers

Major activity	Sub activity	Social indicators
Horticulture	Greenhouse, shade net house cultivation, Solar pump set including fencing, Post-Harvest Management, Horticulture Mechanization, Orchard plantation, Farmer Training and Exposure visit.	Greater access of farmers to markets and financial institutions and higher incomes. About 10 to 35% of SC and women farmers as beneficiaries of individually targeted assets/services and demo activities. About 10 to 35% of MTGs, WUA, FPCs members and leaders from SC, and women farmers About 10 to 35% of trainees from SC and women farmers
Markets and value chains	Agri-Business Promotion Facility (ABPF) Pre-Investment Advisory Support Market Infrastructure and Agribusiness Support	Higher income from market-oriented agriculture and market advisory services is the expected outcome of this component. Formation of producers' companies will lead to an increase in farmers' bargaining capacity and help in collective procurement of quality agriculture inputs. About 10 to 35% of trainees from SC and women farmers
Farmers' organization and capacity building	Capacity building Socio economic Data collection Identification of Targeting and Beneficiary MTGs (Multi Task Groups) MTA (Multi Task Association) FPC (Farmer Producer Company) Training on Social management Plan	Community will aware about RACP Project. Ensuring community participation. Project goal be achieved. Analyses the findings by different socio-economic groups. Cluster's all community will be benefited About 10 to 35% of MTGs, WUA, FPCs members and leaders from SC, and women farmers About 10 to 35% of trainees from SC and women farmers

The project does not envisage acquisition of any private land for purposes of storage, processing or any other activity. There will be no adverse impacts related to land acquisition. Therefore abbreviated resettlement plan does not require at cluster level.

Annexure 7.2 Environment Management Plan (EMP)

The key interventions under RACP can be grouped as under:-

- Crop intensification
- Water Management
- Value chain development activities

Environment Management Plan for Crop Intensification

The key objective of interventions in crop production is to increase crop productivity so that farmer income is also enhanced. The dominant and "business-as-usual" approach to achieving this is to intensify crop production by introducing hybrid seed varieties that respond well to chemical fertilizers and apply chemical pesticides to control pests and diseases that attack the crop. However, use of such intense chemical based crop production technologies results in the long-run in decreased yield. Increased use of chemical pesticides leads to destruction of pest predators and increase in pest and diseases. Most, hybrid seeds are designed to respond to higher doses of chemical fertilizers and do not perform well if they are not provided.

Thus, if a "business-as-usual" approach is taken to increasing crop productivity under RACP, there is a high likelihood of use of agri-chemicals increasing substantially leading to deterioration of soil quality which would reduce crop productivity and thereby agricultural competitiveness in the long run. Further, these agri-chemicals would pollute the village ecosystem and affect the health of the farming families in the village and their livestock as well.

The RACP proposes to adopt "green" agricultural practices that would promote Integrated Nutrient Management (INM) and Integrated Pest Management (IPM) and therefore, the possibility of excessive use of agri-chemicals is largely mitigated.

It is defined as producing more from the same area of land while reducing negative environmental impacts and increasing contributions to natural capital and the flow of environmental services. Sustainable Crop Production Intensification (SCPI) views farming as an ecosystem which uses inputs, such as land, water, seed and fertilizer, to complement the natural processes that support plant growth, including pollination, natural predation for pest control, and the action of soil biota that allows plants to access nutrients.

The Line Department /NGO will abide by the Environmental measures listed in the Environment Management Plan (EMP) given below. The Line Department shall include the EMP requirements in the Programme of RACP Works. The requirements stated in the EMP should therefore be studied properly and implemented accordingly.

Multiple Sectors						Monitoring Indicators	
Intervention	**Activity**	**Impact on Environment**	**Possible Environmental Impacts**	**Measures to be Taken/Implemented by the Line Department**	**Stage of Application**	**Process**	**Outcome**
Demonstration packing of practices for higher production of selected crops	Crop Selection	Low	Selected crop may lead to consumption of more water	The sustainable availability of water and crop water requirement of each crop that is suited to the agro-climatic conditions of the cluster and choosing only those crops that can be grown within the available water. This assessment has to be conducted at the sub- level for rained areas, at the aquifer level for groundwater conditions.	Design of package of practices	% of farmers got aware that crops have been selected based on water availability. % of crops that are water efficient (50%)	% of farmers following crops recommended based on water availability
			Selected cropping pattern may lead to nutrient depletion	Cropping pattern should be chosen such that the same crop is not being grown in the same patch of land season after season, year after year. Crops should be rotated to ensure that crops with different root zones, different demands on nutrients and different pests and diseases are grown. This would help in better soil, nutrient and pest management.		% of farmers got aware that identified cropping pattern based on crop rotation.	% of farmers following recommended cropping pattern
	Seed Selection		Variety may not be suited to the area or preferred by the farmers	Well adapted, high-yielding varieties with resistance to biotic and a -biotic stresses and improved nutritional quality should be chosen to mitigate risks of crop.	Design of Package of Practices & at the time of purchase of seeds for distribution.	% of farmers got awareness on the varieties that are suitable to the local conditions.	% of Farmers using the varieties suitable for the region
			Seed selected may be pest or disease infected leading to pest	Use of seeds of good quality that are pests & disease free determines crop performance to a large extent. Therefore, Seeds when purchased		% of farmers has access to certified seed.	

Multiple Sectors						Monitoring Indicators	
Intervention	**Activity**	**Impact on Environment**	**Possible Environmental Impacts**	**Measures to be Taken/Implemented by the Line Department**	**Stage of Application**	**Process**	**Outcome**
			attack and crop loss or increased use of chemical pesticides	should be only from certified sources and should be used well within the expiry date.			
			Genetically modified seeds may be used that are not approved for use in Rajasthan	In case of selection of Genetic Modified varieties guidance should be sought from the Department of Agriculture on whether it is an approved variety in the state or not.			
	Soil Health & Nutrient Management		Degradation of soil physical characteristics due to intensive cropping	Nutrient management is based on Integrated Nutrient Management Plan (INM). Package of practices considering the soil nutrient status of the cluster	Design of Package of Practices & at the time of purchase of fertilizers including biofertilizers for distribution.	% of farmers got aware on Integrated Nutrient Management practices. % of farmers who have been issued Soil Health Cards % of farmers who have received Soil Test results before taking up cropping	% of farmers who are applying fertilizers as per dosage recommended by the Soil Test result % reduction in use of chemical fertilizers over baseline in kg/Ha.
			Deterioration of nutrient content of soil due to intensive cropping				
			Increased and imbalanced use of chemical fertilizers				
	Pest & Disease Management		Increased chemical pesticide use	Restricting the use of banned pesticides (as per WHO, list) and promoting the Integrated Pest management Plan (IPM).	Design of Package of Practices & at the time of purchase of pesticides including biopesticides / bio-control	% of farmers who have attended training/demonstration on IPM	% of farmers who have adopted all components of IPM. % reduction in use of chemical pesticides over baseline in l/Ha.
			Increased incidence of pests if the same crop is promoted repeatedly				

Multiple Sectors						Monitoring Indicators	
Intervention	**Activity**	**Impact on Environment**	**Possible Environmental Impacts**	**Measures to be Taken/Implemented by the Line Department**	**Stage of Application**	**Process**	**Outcome**
			Safety issues in storing and using chemical pesticides		agents /pheromone traps for distribution.		
	Demand-side Water Management		Introduction of micro irrigation devices may lead to expansion of cropped area leading to no net reduction in water used in agriculture sector Cropping pattern may be leading to unsustainable use of available water	The key practices to be adopted at the design stage itself are: ➢ Compulsory use of micro irrigation to irrigate crops in all water regimes so as to reduce absolute quantity of water applied and also increase water use efficiency ➢ Simple low pressure, gravity fed drip systems could be used in such situations to reduce the capital cost to the beneficiary. ➢ Mulching is an important operation to be carried out for weed control as well as improve water use.	At the time of design of cropping plan in CACP As a process during implementation of water management plan	% of farmer who have attended training on water conservation.	% of farmer who have adopted micro irrigation and drip system. % of farmer who have carried out mulching practices.
	Storage & Handling of Agri-inputs		Poor storage, handling can lead to spills and leaks of fertilizers and pesticides leading to contamination of soil and water	The following precautionary principles shall be followed an existing storage facility: ➢ Bagged fertilizer must be handled in a manner to prevent fertilizer from escaping to the environment. ➢ Spills should be cleaned up immediately to avoid the potential for soil	Design of Package of Practices & at the time of purchase of seeds, fertilizer, pesticides for distribution.	% of farmers who have attended training on precautions mentioned in measures to be taken/Implemented for storage and Handling of agri-inputs.	% of farmers followed code of practices for storage and handling agri-inputs.

Multiple Sectors						Monitoring Indicators	
Intervention	Activity	Impact on Environment	Possible Environmental Impacts	Measures to be Taken/Implemented by the Line Department	Stage of Application	Process	Outcome
				and groundwater contamination.			
			Poor storage may lead to pest and disease infestation of seeds	Seeds should be stored in air tight containers and away from sunlight, heat and moisture. Before storage, the moisture level of the seeds should be bought down to an appropriate level by drying it in sunlight followed by drying in shade. Seeds of different should be stored in separate containers and clearly labeled.			

Environment Management Plan for Water Management

Rehabilitation of distributaries has no major adverse environment impact since this related to only rehabilitation and not construction of new structures. Activities in rehabilitation are bring the canal components to their originally designed parameters i.e. restoring them to original section and the canal capacities etc. including remodeling /re-sectioning, re-aligning of canal.

Overall, activities under this subcomponent are expected to reduce absolute quantity of water use in agriculture while increasing water-use efficiency. Therefore, environmental impacts are expected to be positive.

The Line Department /NGO will abide by the Environmental measures listed in the Environment Management Plan (EMP) given below. The Line Department shall include the EMP requirements in the Programme of RACP Works. The requirements stated in the EMP should therefore be studied properly and implemented accordingly.

Multiple Sectors						Monitoring Indicators	
Intervention	**Activity**	**Possible Environmental Impacts**	**Impact on Environment**	**Measures to be Taken/Implemented by the Line Department**	**Stage of Application**	**Process**	**Outcome**
Water Supply Augmentation	Restoring original section and the canal capacities etc. including remodeling /resectioning, re-aligning of canal, Some gates of regulators require minor repairing, oiling, greasing, alignment, nut & bolt, rods etc. Digging of Diggies	Top soil removal	Medium	Soil removed during the process of digging water harvesting storage structures should be used to build bunds and top soil should be spread over the rest of the farm.	At the time of CACP. At the time of sanction of individual structure for implementation	% of trees actually planted as compared to number of trees to be taken up under compensatory planting.	% survival of trees planted under compensatory planting.
		Cutting of trees		As far as possible, these structures should be sited where there are no trees. If tree cutting is unavoidable, then compensatory planting in the ratio of 1:10 should be carried out and the beneficiary group made responsible for maintaining it with at least 90% survival till 3 years.			
		With distributaries rehabilitated and diggies dug farmers would expand cropped area and also prefer water intensive crops.		Compulsory uses of micro irrigation to irrigate crops in all water regimes so as to reduce absolute quantity of water applied and also increase water use efficiency.		% diggies with vegetative cover to prevent erosion and siltation. % diggies with safety provisions	% of diggies designed and constructed on the basis of water demand and followed safety measures.

Multiple Sectors						Monitoring Indicators	
Intervention	**Activity**	**Possible Environmental Impacts**	**Impact on Environment**	**Measures to be Taken/Implemented by the Line Department**	**Stage of Application**	**Process**	**Outcome**
		Siltation of canal and diggies.		Water should be passed through a silt filter to prevent frequent silting up to these storage structures. Reduction in the seepage rate may be achieved by mixing swelling clay material such as bentonite with soil. Bunds should be covered with vegetative cover to ensure longevity with lower maintenance costs. Grasses such as Lasiurus sindicus, Cenchrus ciliaris, Cenchrus setigerus, Stylosanthes scabra,Panicum antidotale, Chloris gayana. Desmodium trifolium, Macroptelium atroperpureum,Vetiveria zizaniodes , Saccbarum munja etc. could be grown to help bind the soil together and thereby stabilize the bund.			
		Environment pollution may be generated During construction activities.		The sewage system for the labour/ camp is designed, built and operated in such a manner that no health hazard occurs and no pollution to the air, ground water or adjacent water sources takes place. • Waste water generated from the sanitary facilities of			

Multiple Sectors						Monitoring Indicators	
Intervention	**Activity**	**Possible Environmental Impacts**	**Impact on Environment**	**Measures to be Taken/Implemented by the Line Department**	**Stage of Application**	**Process**	**Outcome**
				labour camp is disposed in a septic tank/soak pits. • Solid waste generated at the construction site, camp site, will be collected in covered wasted bins and segregated as biodegradable (food waste, paper, etc) and non-biodegradable (plastic, polyethylene bag etc.). Polyethylene/plastic wastes will be stored in empty cement bags and should be sent for recycling. Biodegradable (food waste, paper etc.) solid waste will be disposed in a compost pit. The contractor will take every precaution to reduce the level of dust and gaseous pollution from the work site/s. Measures to reduce the level of dust (PM 2.5 and PM 10) will be taken and the Contractor will make arrangements to minimize dust pollution through provision of wind screens/barriers, water sprinkling/mist fine spray arrangement and encapsulation of dust source (as required) shall be made. Only acoustic enclosures fitted DG set will be allowed at the construction and camp sites. All measures required for ensuring safety and health of the			

Multiple Sectors						Monitoring Indicators	
Intervention	**Activity**	**Possible Environmental Impacts**	**Impact on Environment**	**Measures to be Taken/Implemented by the Line Department**	**Stage of Application**	**Process**	**Outcome**
				workers shall be taken up by the Contractor. This includes provision and enforcement of appropriate personal protective equipment; first aid facilities at camp, plant site and work zones; emergency response arrangements; proper storage of hazardous/ toxic and/or polluting materials; measures for ensuring electrical, fire and mechanical safety arrangements.			

Environment Management Plan for value chain activities

Storage and processing of produce are activities expected to be taken up under value chain development component of the RACP.
The operations include input supply to its members, output marketing and processing support to its members, providing warehousing facility, etc. These activities when carried out in a "business-as-usual" manner would affect the environment in one way or the other. For example, if the Farmer Producer Organization **(**FPC) were to promote agri chemicals indiscriminately, as a pesticides dealer would, it would result in increased use of such chemicals in the project area. Therefore, there is a need for the FPC to operate as a responsible business entity.
All of food processing units consume huge amount of water for processing food. A considerable part of these waters are potential wastewaters to be treated for safe disposal to the environment. Wastewater and solid waste are the primary waste streams for the food processing units.

The Line Department /NGO/ Design consultants/engineers hired for designing and executing the structures will abide by the Environmental measures listed in the Environment Management Plan (EMP) given below. The Line Department shall include the EMP requirements in the Programme of RACP Works. The requirements stated in the EMP should therefore be studied properly and implemented accordingly.

Multiple Sectors						Monitoring Indicators	
Intervention	**Activity**	**Possible Environmental Impacts**	**Impact on Environment**	**Measures to be Taken/Implemented by the Line Department**	**Stage of Application**	**Process**	**Outcome**
Value Chain Development	Farmer Producer Organization (FPO)	FPO activities may promote increased use of agri chemicals	Medium	Unlike a general agri-input merchant, the FPO shall not stock, sell and promote agri-chemicals. pesticides banned/restricted as per WHO classification. indiscriminately. It shall make strong efforts to ensure that its members follow IPM and INM and accordingly shall stock and sell inputs relevant to implementing INM and IPM.	At the time of preparation of the business plan of the FPC.	% FPCs trained on Code of Practices for value chain	% FPCs with a CoP developed and adopted by the BoD.
	Establishing Food Processing Units	Water pollution ,air pollution , noise pollution and Solid waste may be generated through food processing Units		• Water used in conveying materials, facility cleanup, or other non-ingredient uses will be reduced, which in turn will reduce the wastewater volume from food-processing facilities. • Sanitizers or anti-microbials in wash water and other processing water may be useful in reducing pathogens on the surface of produce and/or reducing pathogen build-up in water. Chlorine is a commonly used anti-microbial. • Typically, pathogens, suspended solids, dissolved solids, nitrogen, and phosphorus are removed in advanced wastewater treatment. • The following is a listing of some technologies being used in advanced wastewater treatment. A .Membrane applications		% of workers of food processing Units are aware waste water and solid waste management practices.	% of food processing units are adopted waste water treatment and solid waste management practices.

Multiple Sectors						Monitoring Indicators	
Intervention	**Activity**	**Possible Environmental Impacts**	**Impact on Environment**	**Measures to be Taken/Implemented by the Line Department**	**Stage of Application**	**Process**	**Outcome**
				B. Charge separation etc. • Food processing units will continue to look at ways to reduce solid waste generation, use less or reusable packaging, and use biodegradable packing products. • Solid waste pollution can be reduce through management alternatives as following: A. Using the food by-product as an animal feed. B. Composting or land spreading the food by-product. • Noise protective equipment should be provided to the operator of machines. Silencer should be attached to the equipment to reduce noise from the equipment to surrounding areas. • Use energy efficient equipment for processing (such as steam boilers/solar energy /LED light).			

Multiple Sectors						Monitoring Indicators	
Intervention	**Activity**	**Possible Environmental Impacts**	**Impact on Environment**	**Measures to be Taken/Implemented by the Line Department**	**Stage of Application**	**Process**	**Outcome**
	Construction of Warehouse/ Food processing Unit	Cutting trees		As far possible, RACP would promote options wherein trees would not be cut to carry out an activity. However, where it is not feasible it would support compensatory planting in the ratio of 10 trees for every tree cut. The onus on planting will lie with the beneficiary who is cutting the trees.	At the time of CACP At the time of design and approval of building plans.	% of trees actually planted as compared to no. of trees to be taken up under compensatory planting. % of construction workers who have detailed mitigation measures for building construction.	% survival of trees planted under compensatory planting. % of construction workers adopted EMP for building construction.
		Top soil removal		Top soil removed during the process should be used to build bunds and excess soil should be spread over the rest of the farm.			
		Improper construction leading to damage of stored material		In addition to the above general guidance on building constructions, the RACP shall adhere to Code of Practice for Construction of Food grains Storage Structures as defined under the Warehouse Manual published by the Department of Food & Public Distribution, Ministry of Food & Consumer Affairs, GoI under operationalization of the Warehousing (Development & Regulation) Act, 2007.			
		Environment pollution may be generated During		• The sewage system for the labour/ camp is designed, built and operated in such a manner that no health hazard occurs and no pollution to the air,			

Multiple Sectors						Monitoring Indicators	
Intervention	**Activity**	**Possible Environmental Impacts**	**Impact on Environment**	**Measures to be Taken/Implemented by the Line Department**	**Stage of Application**	**Process**	**Outcome**
		construction activities.		ground water or adjacent water sources takes place. • Waste water generated from the sanitary facilities of labour camp is disposed in a septic tank/soak pits. • Solid waste generated at the construction site, plant/camp site, will be collected in covered wasted bins and segregated as biodegradable (food waste, paper, etc) and non-biodegradable (plastic, polyethylene bag etc.). Polyethylene/plastic wastes will be stored in empty cement bags and should be sent for recycling. Biodegradable (food waste, paper etc.) solid waste will be disposed in a compost pit. • The contractor will take every precaution to reduce the level of dust and gaseous pollution from the work site/s. Measures to reduce the level of dust (PM 2.5 and PM 10) will be taken and the Contractor will make arrangements to minimize dust pollution through provision of wind screens/barriers, water sprinkling/mist fine spray arrangement and encapsulation of dust source (as required) shall be made.			

Multiple Sectors						Monitoring Indicators	
Intervention	**Activity**	**Possible Environmental Impacts**	**Impact on Environment**	**Measures to be Taken/Implemented by the Line Department**	**Stage of Application**	**Process**	**Outcome**
				• Construction debris should be put to alternate uses such as land filling. If not utilized it should be disposed off in nearby safe places. • Only acoustic enclosures fitted DG set will be allowed at the construction and plant/camp sites. • All measures required for ensuring safety and health of the workers shall be taken up by the Contractor. This includes provision and enforcement of appropriate personal protective equipment; first aid facilities at camp, plant site and work zones; emergency response arrangements; proper storage of hazardous/ toxic and/or polluting materials; measures for ensuring electrical, fire and mechanical safety arrangements. • Energy conservation measure should be followed in constructed building like installation of solar energy, LED lighting etc as energy efficient building.			

Clearance requirement

Agriculture and allied activities per se have not been incorporated under the ambit of the Environment Impact Assessment (EIA) notification 1994 so the project per se will not require any clearance under this act. The clearance requirements for individual subprojects have been specified in the table below.

Relevant Acts/Rules	Relevance to RACP Project	Provision
Air (Prevention and Control of Pollution) Act 1981	Applicable to, processing activities (dal mills, rice mills fish/ poultry feed manufacture etc.	Setting air quality standards, procedures for consent to operate enterprises, penalties etc. Consent should be taken to establish and operate.
The Water (Prevention and Control of Pollution) Act Amended: 1988	Applicable to any activities that release wastes into water bodies (eg: processing units etc.) The project will address the issue of Water contamination due to chemicals by adopting an IPM strategy.	Laying down the permissible limits/ standards of pollutants likely to be emitted, collection of samples of effluent and analysis and provisions for penalties.
The Biological Diversity Act, 2002 G.S.R.261 (E), [15/04/2004] - Biological Diversity Rules, 2004	The project envisages maintaining the biodiversity. At the same time the project will enhance crop productivity through sustainable natural resource management.	Regulation of access to biological diversity, empower National Biodiversity Authority and State Biodiversity Board to restrict certain activities that affect biodiversity adversely. Provision of appropriate legislation for declaration of Biodiversity Heritage sites at local level.
Scheduled Tribes and other Traditional Forest Dwellers (Recognition Forest Rights) Act, 2006	The Act determines the use rights for the collection Non Timber Forest Product (NTFP), agricultural operation, animal rearing and construction of common facilities.	Recognition of rights and responsibilities and authority for sustainable use, maintenance of ecological balance and strengthening the conservation regimen of forest while ensuring livelihood and food security.
Forest (Conservation) Act, 1980 (With Amendments made in 1988) Forest (Conservation) Rules, 2003 (With Amendments made in 2004)	Applicable to the project where agriculture or Any construction of common facilities are promoted near forest in tribal areas.	Reserved forest or any portion thereof, shall cease to be reserved. Forest land or any portion thereof may be used for any non-forest purpose. Necessary Clearance should be obtained from Forest Dept or Revenue Department for trees cutting and plantation..
The Wild Life (Protection) Act, 1972	Applicable to the activities like livestock Development where grazing is involved in forest areas, collection of NTFP and construction of common facilities near forest areas.	Destruction, exploitation or removal of any wild life including forest produce from a sanctuary of the destruction or diversification of habitat of any wild animal, or the diversion, stoppage or enhancement of the flow of water into or

Relevant Acts/Rules	Relevance to RACP Project	Provision
		outside the sanctuary is prohibited without a permit granted by the Chief Wildlife Warden.
The Insecticides Act. 1968 Amendment: Insecticides (Amendment) Act, 1977	Applicable to agricultural activities. Mitigation measures taken care in Pest Management Plan	Regulate the import, manufacture, sale, transport, distribution and use of insecticides with a view to prevent risk to human beings or animals, and for matters connected therewith.
The Fertilizer (Control) Order, 1985	Applicable to POs in cases where stocking and sale of fertilisers may happen	Registration is required for selling fertilizer at any place as wholesale dealer or retail dealer.
The Seeds Act 1966, The Seeds Rules 1968	Relevant to the project. The project does not envisage seed production yet, but will take cognizance of the act if promoted.	Regulation of sale of seeds of notified kinds or varieties. Determine the responsibilities for making and labelling. Certification agency and grant/ revoke of certificate, provision of penalties.
Bio-Medical Waste(Management & Handling) Rules, 1998	Rules will help in managing the waste generated by the veterinary health centres that may have adverse environment affects.	It shall be the duty of the every occupier of an institution generating bio medical waste which includes Veterinary institution and animal house to ensure-that such waste is handled without any adverse effect to the human health and the Environment.
Rajasthan Soil and Water Conservation Acts, 1964	Applicable to water harvesting & storage structures on arable and non-arable land	provide for the conservation and improvement of soil and water resources at cluster
Policies		
National Environment Policy 2006 Rajasthan State Environment Policy, 2010	The project promotes conservation and sustainable use of land, water and biomass which is one of the major challenges in agriculture sector. The project addresses the issue of awareness generation and mitigation measures	To protect and conserve critical ecological system and resources and to ensure equitable access to these resources for communities which are dependent on these resources for their livelihood.
State Water Policy 2010 The Rajasthan Regulation and Control of The development and Management of Ground Water Bill, 2006	Optimization of water resources exploitation and raising the level of reliability of supplies through conjunctive use of surface and ground water.	Necessary permission should be obtained from ground water board or water resources department for extraction of water from ground water through for bore wall or canal for irrigation.

Relevant Acts/Rules	Relevance to RACP Project	Provision
National Policy for Farmers 2007	The project envisages improvement of the land productivity and income of farmers in a sustainable manner.	To improve economic viability of farming by substantial increase in net income of the farmers, to conserve and regenerate land, water and genetic resources for sustainable improvement in productivity, profitability and stability of major farming system. To develop support services including provisions of timely input supply and agriculture credit at affordable interest rates to the farmers. Provide suitable risk management measures for adequate and timely compensation to the farmers.
State Policy for promotion of agro-Processing and Agri-business, 2010	The project envisages promotion of agro-processing industries and agri-business, thus, seeks to address the entire value chain in agro-processing and marketing, including development of the supply chain, market development and diversification.	To promote and encourage value addition and loss reduction in agriculture, including horticulture; introduce new post harvesting technologies; promote export of agriculture products produced and encourage the development of agro processing infrastructure and human resources.

Training Plan for Implementation of Environment Management Plan (EMP)

Apart from the training plan being presented here, every training provided under RACP should include where relevant a module on Environment Management Framework (EMF) and its application.

Objectives of training plan

The key objectives of the training plan are:

- To create awareness about RACP project activities and their environmental impacts.
- To create awareness about the Environmental Guidance that provides information on how to mitigate or avoid those impacts.
- To create awareness about the concept, approach and processes of EMF including selection of project activity, application of the specific Environment Guidelines (EGs), preparation of EMPs, monitoring performance of EMF and reporting.
- To teach how to apply the EMF and prepare EMPs for specific activities.

Training Type, Target Groups & Frequency

A 4-tier strategy for imparting training on the EMP is proposed and is presented **Error! Reference ource not found.** :

Type of Training	Target Groups	Number of training	Frequency	Modes of training
Sensitization	• PMU • PIU • DPMU	One	Launch of the Project	Lectures, Presentation
State Level Training (Training workshops for trainers)	• Environment Specialist (ES, PMU) • Line Department (Team Leader) • Field NGO (Team Leader)	Two (Planned)	1st year at the beginning of the project 2nd Year a refresher course after preparation of Audit Report	On-field demonstrations, Case Studies, Group Exercises.
State Level Training of Trainers (Demand Driven)		Three (if Required)	3rd year onwards on assessment of requirement through the environment audit	
District Level training Workshops	• DPMU /DLIC • NGO (entire team) • Representatives of Cluster level /GP level / Village level Community Institutions • Representative of FPC including CEO	One in each of the districts every year in district where there are interventions	1st year before interventions are initiated and thereafter each year after completion of audit.	Field Demonstrations, lectures, group discussions, case studies
Community Level Training Workshops	• All Community Institutions Leaders • FPC Board Members	One in each of the districts every year in district where there are interventions	1st year before interventions are initiated and thereafter each year after completion of audit.	Field demonstration, group exercises, lectures

Tier-wise Suggested Training Content

Provides a brief outline of training content and duration for the 4 tiers of trainings envisaged. The actual content, pedagogy and duration should be developed as part of the general training being planned under RACP.

Type of Training	Content	Duration
Sensitization	Sensitization on RACP activities, environmental impacts Brief concept of EMP, Institutional arrangement for implementing EMP	1 day as a part of larger induction training at the launch of RACP
State Level Training (Training workshops for trainers)	Project activities and environmental impacts EMP to be presented thematically as Agriculture, Water Management, Livestock, Input Storage, etc. institutional arrangements for implementing EMP	2 days including 1 day of field visit to apply in EMP for sample project interventions
State Level ToT (Demand Driven)	Project activities and environmental impacts EMP to be presented thematically as Agriculture, Water Management, Livestock, Input Storage, etc. EMP process, institutional arrangements for implementing EMP	As per need
District Level training workshops	Project activities and environmental impacts EMP to be presented thematically as Agriculture, Water Management, Livestock, Input Storage, etc. EMP process, institutional arrangements for implementing EMP	2 days including 1 day for field visit to understand environmental issues and apply in EMP to understand IPM and INM in action. etc.
Community level training orkshop	Project activities and environmental impacts EG to be presented thematically as Agriculture, Water Management, Livestock, Input Storage, etc. EMF process, institutional arrangements for implementing EMF	2 days including 1 day for field visit to understand environmental issues and apply in EMP to understand Integrated Pest Management (IPM) and Integrated Nutrient Management (INM) in action etc.

Training required on activities wise for implantation of Environment Management Plan (EMP) as per Environment Management Safeguard (EMSF) guidelines under RACP as follows:-

Intervention	Activity	Reference of Environment guideline(EG) as per EMSF
Demonstration packing of practices for higher production of selected crops	Crop Selection	EG Agri 1
	Seed Selection	EG Agri 2
	Soil Health & Nutrient Management	EG Agri 3
	Pest & Disease Management	EG Agri 4
	Water use Management	EG Agri 6
	Storage & Handling of Agri-inputs	EG Agri 5
Water Supply Augmentation	Water harvesting structures	EG water 7.1

Intervention	Activity	Reference of Environment guideline(EG) as per EMSF
Value Chain	Farmer Producer Company (FPCs)	EG producer organisation 2.1
	Establishing Food Processing Units	-
	Construction of Warehouse/ Food processing Unit	EG common 10-1

Time Schedule on yearly basis for conducting training on Implementation of Environment management Plan:-

Type of Training	Jan.	Feb.	March	April	May	June	July	August	September	October	November	December
Sensitization												
State Level Training (Training workshops for trainers)												
District Level training Workshops												
Community Level Training Workshops												

Tentative Budget for training (As per yearly basis) as follows:-

SN	Items	Nos.	No. of Days	Qty.	Rate (Rs.)	Unit	Amount (Rs.)
One Sensitization (One day Training)							
1	Training Kit - pen, note book, folder, Course material, inputs, other utility based required materials, reference literature, Registration etc.	50	1	50	300	Each	15000
2	Mobility support	1	1	1	2000	Day	2000
3	Miscellaneous						
	Total	One sensitization training will be carried out in a year					17,000
Two State, Three District and Three Cluster Level training (Two days training).							
1	Training Kit - pen, note book, folder, Course material, inputs, other utility based required materials, reference literature, Registration etc.	40	2	40	300	each	12000
2	Lodging and Boarding of participants	40	2	40	1000	each	40000
3	Mobility support	1	1	1	7000	day	7000
4	Rent for other training facilities (Class-room, LCD, etc.)	1	1	1	15000	day	15000
5	Travel for participants	40	1	40	300	Person	12000
6	Miscellaneous						
	Total	Eight numbers of two days training including one day field visit will be carried out in a year.					86,000*8=6,88,000/-
	Grand Total						7,05,000/-

Information, Education and Communication (IEC) & capacity building Strategy and it tentative budget for implementation of Environment Management Plan (EMP) at cluster

Introduction:-

Information, Education and Communication (IEC) is a process of working with individuals, communities, societies and policy & decision makers to develop communication strategies to promote positive behaviours which are appropriate to their Culture& Social/Community behaviours. IEC combine all suitable strategies, approaches and methods that enable individuals, families, groups, organizations and communities to play active role in achieving, protecting and sustaining the desired behavioural change.

IEC plays a pivotal role in creating awareness, mobilizing people, and making development process participatory through advocacy and by sharing knowledge, skills and techniques with the people. It is also critical for bringing about transparency in implementation of programmes at the field level and for promoting the concept of accountability and social audit. There are various techniques of communication, which include mass communication as well as inter personal communication. There are no any fixed formulae and the techniques mobilize and ensuring participatory development .It varies from place to place, according to their specific problems, cultures and social setup.

Strategy for the IEC, Public awareness & Capacity Development.

Principles of strategy for IEC and Public awareness are based on the downward dissemination theory and Convergence theory for the message dissemination, Behaviour change and capacity development on environment management Plan (EMP) of activities under RACP.

Followings strategies shall be adopted at the Implementations level.

- IEC strategy has been prepared; to generate awareness amongst the stakeholders for achieving the objectives of the Rajasthan Agricultural Competitiveness Project (RACP). It is essential to use all type of communication mediums such as Inter Personnel Communication (IPC), Print media, electronic media, outdoor media and folk media. Extensive publicity and designing and printing of IEC material will be undertaken to disseminate the designated communication issues.

- IEC activities taken up in the action plan are telecast and broadcast of issues through electronic media, publication of public appeals in print and extensive use of social media, In addition to this orientation workshops, trainings, designing and printing of IEC material like posters, banners, flex, booklets, leaflets, flip chart and other material, etc will be undertaken.

- The major focus has been given to the grass root level interpersonal activities. The interpersonal communication will help in clearing the doubts of audience and take instant action. The advantage of this medium is that the messages can be communicated to the target audience who are not adequately educated.

- Greater emphasis has been given to grass root level activities whereas some activities have been taken for environment building and positioning the programme in proper perspective across all stakeholders.

The details are follows:-

i. New media
    - Bulk SMS
    - U –tube and face book

- What's up messages

ii. Reminder Media
- Wall Paintings
- Slogans
- Hoardings

iii. Inter Personal Communication (IPC)
- Workshop
- Exhibition
- Community rally
- Youth Rally
- Women Rally
- Rally by School Students
- Door to door visits
- Nukkad Natak
- Essay and drawing competitions
- Quiz competitions
- PRA
- SHG, Water User Association, MTG, FPCs

iv. Print media
- Printing of IEC materials (Poster, banners, flex, Signboards on the buses, folders at bus stands, Mandi, street etc.

Template for IEC activities

IEC required on activities wise for implantation of Environment Management Plan (EMP) as per Environment Management Safeguard (EMSF) guidelines under RACP as follows:-

Stakeholders	Content of Information as per activity wise under RACP	Reference of Environment guideline(EG) as per EMSF	Methods to convey the Information (Methodology)	Responsibility
House holds	Crop Selection, Seed Selection, Soil Health & Nutrient Management, Pest & Disease Management, Water use Management, Storage & Handling of Agri-inputs, Water Harvesting Recharge & Storage Structures Farmer Producer company(FPCs), Establishing Food Processing Units and Construction of Warehouse/ Food processing Unit	EG Agri 1,2,3,4,5,6 EG water 7-1 EG common 11-2 EG producer organisation 12-1 EG common 10-1	IPC with Poster, Leaflet, Brochure	Line Departments and NGOs
Community			Hoarding and workshops of Town leader and IPC at Community level with town leaders and NGOs as community participation. Lecture Series Exhibitions, Panel Discussion and Group meeting.	
Mass level			Print Media, Electronics Media, Poster, Hoardings, Use of Public Transport and Workshop at village level of Govt. officers and public Representation.	

Tentative Cost Estimation for the IEC & Capacity development activities at Cluster and village level on yearly basis.

SN	Detail of activity	Unit	Unit cost	Estimation Cost	Remarks
1	Workshop at clusters and village level	5	10,000	50,000	One day workshop in village having population more than 500
2	Installation of Hording	10	1000	10,000	Hording Size 8 ft*5ft
3	Community Rally	5	2000	10,000	rally in village having population more than 500
4	Youth rally	5	2000	10,000	Rally in village having population more than 500
5	Women rally	5	2000	10,000	Rally in village having population more than 500
6	Rally by school student	5	2000	10,000	Rally in village having population more than 500 with the participation of all school.
7	Essay and drawing competition	10	1500	15,000	Sensitization of school children
8	Nukkad natak	5	1500	7500	One Nukkad natak at public place
9	Poster	100	500	50,000	Poster size 1.6ft×2ft
10	Leaflet	200	100	20,000	Size A4
11	Brochure	100	200	20,000	Half fold
Total for Cluster				2,12,500/-	

The above expenditures of IEC activities for capacity building on implementation of Environment Management Plan (EMP) are included in budget of sub-component activities of agriculture. This activity will be implemented through DPM with the support of Environment Specialist and NGO. The expenditure of training will be incurred through Project Management Unit. The provision of the training related to EMP has not been included in cluster plan.