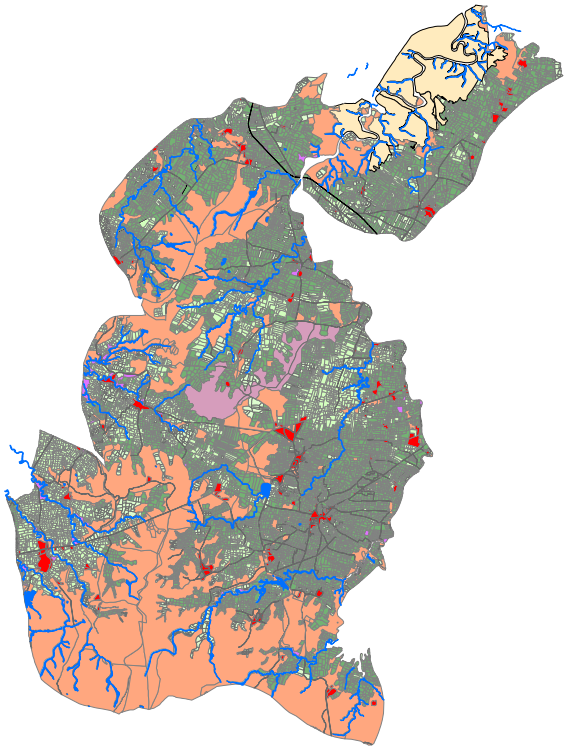
Cluster Agricultural Competitiveness Plan (CACP)

Watershed Cluster Bari, Dholpur
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 Bari Watershed Cluster in Dholpur district has been prepared and an amount of Rs.4170.18 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 Centers
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 and facilitating the Rajasthan Agriculture Competitiveness Project (RACP) by way of a credit of Rs.832.50 Cr. (166.5 USD) offered to Government of Rajasthan. This Project envisages to undertake structured interventions in 17 clusters, which are selected on the basis of water themes viz. watershed, surface water and ground water, and spread across 8 agro climatic zones of the State. The Project Development Objective (PDO) is to establish the feasibility of sustainably increasing agricultural productivity and farmers' incomes through a distinct agricultural development approach by integrating agriculture, water management, agricultural technology, farmer organizations and market innovations in selected locations across the ten agro-Ecological zones of the state. The Project Development Objectives aim to help farmers realise more rupees per unit of water in compensation for 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.

Bari cluster (Rainfed-watershed) cluster in Dholpur district has been selected under the project after several visits by the PMU coordinators; consultations with officials of the WD & SC Department Jaipur; Project Manager - WC DC, Zila Parishad (Dholpur), interactions with the local community and various value-chain actors. The area is predominantly rich in agriculture and livestock rearing. Dominant crops in the cluster include; Pearl Millet (Bajra), Sorghum (Jowar) in Kharif and Wheat, Barley, Gram, Mustard in rabi. Among vegetables, Potato is a major commodity grown in around 55 of the area. Other horticulture crops includes; Tomato, Brinjal, Cauliflower and lady finger in vegetables and mango, guava, Lemon, Ber in fruit trees. Cropping intensity of horticulture crops is around 7.19% in the cluster. Local and cross-breed goat population along with proximity to major markets of MP/ UP viz. Agra, Jhansi, Gwalier, Lucknow, Kanpur etc also offers potential for both goat meat and to some extent goat milk.

The Bari watershed cluster of RACP is located in Bari block of Dholpur district, is about 35 Kms from Dholpur, the district headquarter and 282 km from Jaipur. The cluster comprises of 11 Gram Panchayats and 44 villages which falls in It falls in III-B Agro Climatic Zone (Flood Prone Eastern Plains) of Rajasthan. About 93% of farmers belong to small, marginal category and a significant number of farmers are landless farmers in the cluster. Hence, they require support for economic

upliftment. The project area is characterized as humid and receives moderate rainfall (589 mm/anum) and risks of soil run off and hence requires watershed structures. Poor infrastructure development, farmer's low economic status, low literacy and high incidence of migration during drought are the other major challenges in the cluster area. Total population of the cluster is 49922 and total number of households is 6524. Out of the total population female population is 45.70%, schedule caste (SC) population is 25.00% and 21.64% is the population of scheduled tribes (ST). This refers, it is partly a semi tribal belt with low resources and hence needs support for upliftment.

The total cultivated area in the cluster is 3837 ha out of which 58% is rainfed and 39% is irrigated. Rest is temporary fello land. Out of the total cultivated area, around 77% is being cultivated by farmers other than large farmers. Most of the area is under 3% slope category. The soil of the Project Area is shallow to moderately deep, dominantly fine loam to coarse loom, imperfectly drained, and moderately to severely eroded. The Climate is extreme with hot and humid summers and chilly winters. The temperature ranges from as much as 5^0C in the winter to 45^0C in the summer.

Bajra is sown in about 1005 ha, Sorghum in 751 ha, Sesamum in 568 ha followed by Charry (Jowar for green fodder) Green & Black Gram & Groundnut crops. In Rabi season Mustard is sown in 714 ha, wheat in 541.02 ha, Gram in 65 ha & Barley in 7 ha. Only 306.90 ha area is sown in horticultural crops. Out of this, Potato is sown in 180 ha. Cropping intensity of the cluster is 106%. Surplus production of the above mentioned crops is generally available in the area. Productivity of above crops is at lower than the district average except that of potato and other vegetables.

Bajra in Kharif, Mustard in Rabi and Potato have been identified for value chain development under the project based on various value chain selection parameters like: surplus production, scope of value addition, industrial value and higher returns with less water requirement to the farmers. The availability of good land and quality water along with connectivity with major cities in Madhya Pradesh and Uttar Pradesh, offers immense opportunity for the cultivation of potatoes and other fruit and vegetable crops. The area is fairly suitable for fruits like Mango, Guava and vegetables like Tomato, Brinjal, Cauliflower, and Ladyfinger etc. Hence, some area under cereal & other crops would be diversified in to the cultivation of above these fruits and vegetables crops. Bari cluster being mostly rain fed and partly of semi tribal region naturally supports goat rearing especially for the small holder farmers. The cluster has substantial goat population (12562) and inclination for goat farming to generate income. The goat value chain is also identified to be supported under project investments. Accordingly, activities enhancing the above potentials are proposed to be implemented in the cluster. It is presumed that success of these technologies would be replicated in the similar areas

There are two APMCs, i.e. one each at Bari and Dholpur. Dholpur has 1 cold storage to provide marketing and warehousing support to the produce of the region.

The crops in the cluster also face adverse climatic conditions, high soil erosion, less adoption of package of practices and less seed replacement rate (SRR). The project would therefore also focus on adoption of package of practices, which would mitigate the adverse factors on crop production, seeing majority of the farmers are small and marginal and highly vulnerable to minor variations in climatic conditions.

The cluster is classified as a watershed cluster and activities related to soil and water conservation is being implemented by the Watershed Development & Soil Conservation department, while activities related to production are considered by Department of Agriculture, Horticulture and Animal Husbandry (GOR). The activities related to market and value chains will be addressed and

implemented by Farmer Producer Companies with the support from the Agri-Business Promotion Facility after their formation. Community mobilization, data collection and technical support to stakeholders will be provided by field level NGOs operating in the cluster.

The Project area is categorised as Average to bad catchment area. The ground water level is showing decreasing trend, of 0.02 m per year. Therefore cluster area is treated as semi critical category which indicates that the scope of ground water development irrigation purposes. Net annual ground water availability is 12.37 MCM and 0.98 MCM of ground water is available for ground water development. The entire project area has potential to harvest 20.55 MCM. In addition soil moisture would also be available repeatedly and fulfil the crop water requirement of Kharif crops. The adoption of Micro Irrigation System (MIS) can save about 50% of crop water demand. The field and horticulture crops being grown in Rabi seasons are depend on conserved moisture and ground water. It means 50% ground water may be saved through cultivation on conserved moisture and about 50 of ground water can be saved through adoption of MIS. Total 12.37 MCM ground water, is available annually in the cluster and there is no need to reduce present draft for maintaining water balance in the cluster. Total 3.48 MCM is proposed to be harvested and recharged ground water through various structures, in addition to in-situ moisture conservation. It clearly shows that Kharif can be grown with in – situ moisture conservation and as mentioned above, about 50% crops of Rabi season are grown with conserved moisture. It means the crop water requirement of Rabi crops may be reduced to 50%. Keeping in view, 100% area is covered under micro irrigation system the final crop water requirement would be about 12.48.19 MCM which would be drafted from ground water. Finally the gradually the dependency on ground water will be reduced to 8.19 MCM if MIS is adopted by 100 per cent farmers.

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 Bajra, Mustard, Potato have been selected for value chain study and intervention. Some basic interventions for Goat value chain planned under the project are; establishment a rural haat, and a Rural Technology Centre. 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, 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:

Since this is the index catchment (watershed) so limiting activities of Rain water management like contour / field bunding, construction of lined waste weir, sunken pond/ percolation tanks, mini percolation, Continuous Contour trenches, V-ditches, minor masonry structures / anicuts, construction of nadies (water storage structures), Azolla, afforestation, pasture development, sub surface barrier and training are proposed to be executed during the project period in the cluster. In addition to the above some expenditure on project management costs would also be done.

Ultimately on these activities a total amount of **Rs.1657.60 Lakh** would be incurred. The works would be executed on the pattern of Mukhyamantri Jal Swamlamban Abhiyan (MJSA) already agreed under the project keeping ensured community participation implementation of the activities. The Watershed Development and Soil Conservation department is responsible to implement these activities with the support of field staff, community groups and field NGO.

B. The activities of Technology transfer and market led advisory services in:

(I) Agriculture production (i) Promotion of efficient techniques of irrigation viz. drip and mini sprinklers to increase the irrigation efficiency, improve productivity and reduce cost of production (ii) 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 (iii) Promotion of farm mechanization to reduce the cost of production (iv) Promotion of seed production to improve the SRR and the farmer income (v) Promotion of fodder production to reduce the gap of demand and availability of 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 (feasibility of utilising infrastructure created for AH like Rural Haat will be done for utilising for 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.819.48 lakh** would be incurred on these aspects. The Agriculture department is responsible to implement these activities with the support of field staff, community groups and field NGO.

(II) Horticulture production activities will include (i) Demonstrations on production technologies for Fruit Cultivation, (ii) Demonstrations on production technologies for vegetable cultivation including assistance on green house, assistance on shade net house, pack house (iii) Solar Pump Program, (iv) Post-Harvest Management (v) Horticulture Mechanization and (vi) Farmers training, Seminars, Exhibition Kisan mela etc. An investment of **Rs.669.89 lakh** would be incurred. The Horticulture department is responsible to implement these activities with the support of field staff, community groups and field NGO.

(III) Livestock Strengthening & Management includes activities will include:

(i) improve productivity (milk and weight gain) through investment in breeding, feeding and animal health services (ii) improving market access and local level small value addition (iii) supporting farmer advisory and training of the farmers, and training of existing Animal Husbandry Department's technical staff and (iv) Project management. An investment of **Rs.789.08 lakh** would be incurred. The Animal Husbandry department is responsible to implement these activities with the support of field staff, community groups and field NGO.

2. Market and value chains activities include:

Market Value chain and marketing infrastructure will be developed in the cluster with the support local community crops i.e. Bajra, Mustard, Potato and Goat value chains. These crops are being selected for value chain development in the cluster. Accordingly the Farmer Producer Company and individual beneficiaries would be supported through (i) institutional cost for functional support, (ii) Value chain for FPCs and capital expenditure for individual agri preneurs. Total 4 units under FPC and 4 units for individual agripreneurs can be supported under the project. A tentative investment of **Rs.232 lacs** would be incurred during the project period on these activities and cost of Goat Value chain development has been included in Livestock Strengthening and management component. The Project Management Unit (PMU) and Agriculture & AH department are

responsible to implement these activities with the support of field staff, community groups, Agri-Business Promotion Consultants and field NGO.

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

Bajra:

S. No	Constraints	Action
1.	**Production**	
1.1	High production cost due to cost of seed and Agri input requires like fertilizer pesticides etc.	Pooled procurement through FPCs to reduce cost of inputs and ensure quality inputs.
2.	**Post-Harvest**	
2.1	Moisture content of harvested Bajra is high, because of that farmers get less price.	To make Framers aware about market price of bajra proportionate to moisture content, making availability of moisture meters in FCSC
2.2	High dirt content /foreign material in harvested millet.	Ensure availability of the Cleaning & Grading facility to farmers; usually in 10% higher income accrual to farmers.
2.3	Lack of market information related to price	Price discovery through NCDEX, eNAM
2.4	5 / 11 quintals/acre in poor/good harvest. During good harvest prices Collapse and hence storage option could help and distress sale.	Storage facility for farmers as part of FCSC
3.	**Processing**	
3.1	Not aware of special license option to source directly from farmers /FPOs.	Awareness seminars for farmers/Processors
3.2	Limited processing products are available in bajra	Promote handmade Namkeen bajra product
3.3	Lack of proper Product marketing	Awareness on Product Branding
3.4	Processor not aware of schemes of the GoI Including CLCSS, cluster Development scheme or “Sampada” for technology upgrading.	Awareness seminars for processors

Mustard:

S.no	Constraints	Action
1.	**Production**	
1.1	High cost of inputs including seeds, fertilizers and pesticides.	Pooled procurement through FPCs to reduce cost of inputs and ensure quality inputs.
1.2	Farmers not following recommended package of practices	PC to undertake custom hiring services & lead to farm mechanization
2.	**Post-Harvest**	
2.1	Inadequate storage facilities leading to post-harvest losses and distress sale during bumper harvest	Establishment of storage facilities by PC as a part of FCSC
2.2	Large no. of intermediaries in the value chain leads to low producers income	FPC to undertake bulk supplies to large processors.
3.	**Processing**	
3.1	Limited processing units for mustard and its by products such as mustard oil unit, mustard paste and sauce unit, etc.	Facilitate start-ups in secondary processing from amongst PCs or individual entrepreneurs and start ups

Potato:

S.no	Constraints	Action
1.	**Production**	
1.1	Limited awareness about processing varieties of potato varieties like, chipsona which could be cultivated in local climate.	To promote both table purpose varieties and processing purpose varieties
2.	**Post-Harvest**	
2.1	Lack of proper grading facility	To make farmer aware about quality parameter of potato for processing like value added products; grading facility as part of FCSC
2.2	Contractual harvesting of potato	Setting up alternate channel to sell directly from PC to processor or large retail shops.
2.4	Due to same harvesting time prices Collapse and hence storage/pack house option could help reduce distress sale.	Storage facility/ mini cold storage for farmers as part of FCSC
3.	**Processing**	
3.1	Lack of precooling and cold storage facility in the cluster	Setting up pre cooling and/or cold storage facility as part of FCSC or individual enterprise or start ups
3.2	Limited processed product available in the market which limits the marketing potential of the commodity	Facilitate the entrepreneur development to set up small scale processed product like chips, potato powder, potato biscuits, granules etc. and frozen foods like potato patties, puffs, wedges, pancakes etc.

Goat:

#	Constraints	Action
1.	**Production**	
1.1	Non availability of good variety of goats	Distribution of good variety goats
1.2	Health issues of animals	Animal health services through AH Department
1.3	Nutrition issues of goats	Farmers to be made aware of improved feed practices through training from AH department
1.4	Non availability of updated technology on animal rearing and management	Establishment of Rural technology Centre (RTC)
2.	**Post-harvest**	
2.1	Entire supply channel of live animals to market captured by multiple level of middlemen	Establishment of Rural hat Promoting FPO operating from rural hat

Total Investments in Bari Cluster

A total investment of **Rs.4170.18 lakh** is proposed to be incurred in the cluster during the project period to make the farmers and cluster competitive to get improvement in water as well as agricultural productivity and better market access. The summary of phasing is being given as hereunder:

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	Watershed Development & Soil Conservation	1619.02		18.58	20	1657.6
2	Agriculture	634.73	232.00	175.76	11.12	1053.61
3	Horticulture	622.89		36.00	11.00	669.89
4	Animal Husbandry	500.81	227.00	47.23	14.04	789.08
	Total	**3,377.45**	**459.00**	**277.57**	**56.16**	**4170.18**

The above table reveals that total investment amounting to **Rs.4170.18 lakh** would be incurred during the project period by March 2019 against activities related to improving water use efficiency, technology transfer and market led advisory services, livestock strengthening & management, market & value chains, farmers organization and capacity building, project management, along with monitoring & evaluation to make the cluster's farmers and production competitive to increase water and agricultural productivity. Out of the total investments, 95.95% would be incurred on the first component, i.e. Climate Resilient Agriculture, 11.05% on Market and Value Chains, 6.68% on Farmers Organization & Capacity Building and 1.35% investments would be incurred on 4th Component i.e. Project Management & M&E.

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 Bari cluster, there are majorly two water saving activities taking place viz activities of Watershed department and the micro-irrigation system (MIS) activities of Agriculture and Horticulture department. When the investment per unit of water saved is calculated, it is found that watershed activities are able to conserve water at higher investment of Rs.2.62 crore per mcm of water saved whereas MIS activities can save the water at an investment of Rs.0.79 crore per mcm of water. MIS activities like installation of drips and sprinklers for the agricultural and horticultural crops can have far reaching impact in the cluster during the project period.

Figure 1: Investment (in Rs crore/mcm) verses Water saved (in mcm) in Bari

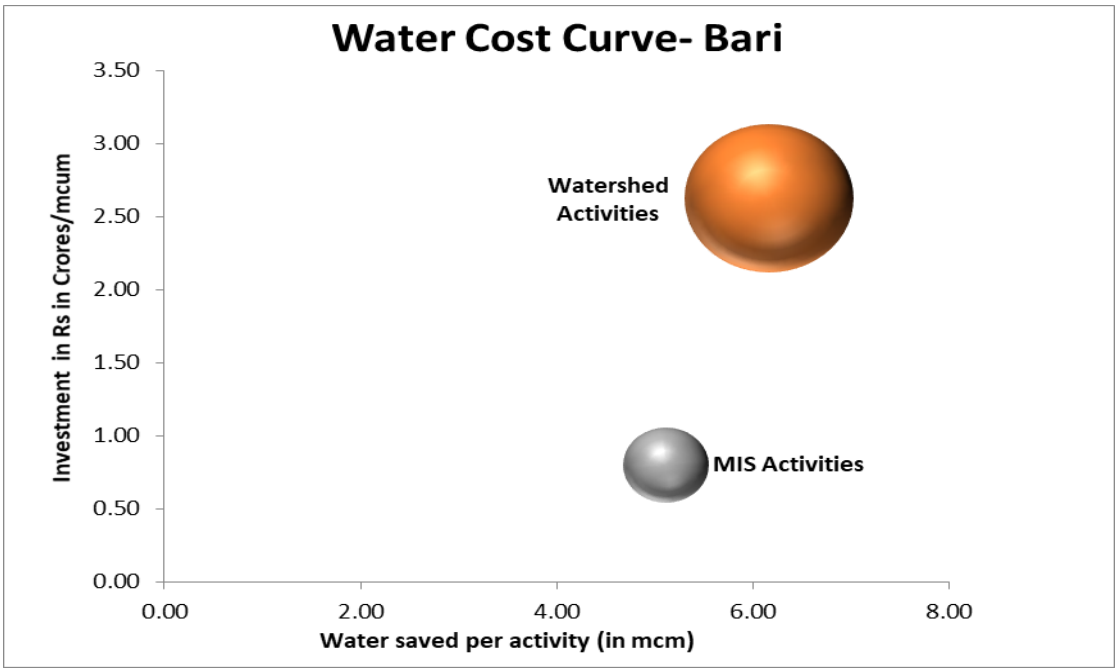


Table 1: Investment (in Rs/mcm) verses Water saved (in mcm) in Bari

Activities undertaken to save water	Water saved- per year in mcm	Investment- Rs crore/mcm	Total investment- Rs crore
Watershed activities	6.17	2.62	16.190
MIS Activities	5.11	0.79	4.06

Out of above investments, more than 6524 households will be benefitted and will lead to at least 5% increase in productivity and considerable increase in gross margin of the target community.

Additionally, the community institution building and infrastructure created will benefit the much larger population in a sustainable way even after the project period. It is also expected that the best learning will be replicated in a similar area to benefit the farming community on larger scale. Summary of overall benefits:

1. Reduced cost of cultivation – 5%
2. Productivity improvement – 5%
3. Improved market access - 15%
4. Overall targeted benefit – 25

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, Zila 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 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. Similarly goat value chain has been discussed in the present context of the cluster with respect to goat milk, meat, leather, illustration of organized market channel and fodder requirement for the same.

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 watershed 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 watershed cluster, proposed activities in the watershed cluster including studies/Field Surveys, institutional activities, trainings, watershed development activities to be implemented, site specific plan & cost estimates of the activities, estimated cost of Investments under watershed management, implementation arrangement for all the planned activities in the watershed 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 12 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 Bari cluster has been selected to achieve the Project Development Objective. The Bari cluster is a watershed cluster which is a hydrological unit. The Bari watershed cluster is situated in III-B Agro-climatic Zone (Flood Prone Eastern Plains). Bari is a tehsil headquarter of Dholpur district located about 35 Km from Dholpur. The Bari Cluster (Rainfed - Watershed) in Dholpur district 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 WD&SC Department, Jaipur & Project Manager, WCDC cum Ex. En. (Land Resources), Zila Parishad, Dholpur and interactions with the local community, following un-treated area as per details provided by the WD&SC Department have been identified. Nodal Department

i.e. Watershed Development & Soil Conservation, Government of Rajasthan has agreed for taking up this area under RACP cluster. This was approved from the competent level.

The area is predominantly rich in agriculture and livestock rearing. The average rainfall of this cluster area is approximately 589 mm (in Dholpur district). As elsewhere discussed, total cropped area is about 3837.02 ha, out of which 2443 ha is in Kharif and 1394.02 ha is in Rabi season. Bajra crop is sown in about 1005 ha, Sorghum in 751 ha, Sesamum in 568 ha followed by Charry (Jowar for green fodder) Green & Black Gram & Groundnut crops. In Rabi season Mustard is sown in 714 ha, wheat in 541.02 ha, Gram in 65 ha & Barley in 7 ha. Only 306.90 ha area is sown in horticultural crops. Out of this, the Potato crop is sown in 180 ha. Total of area under the above crops makes a total cropping intensity of 106.25%. 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 pearl millet & sorghum is being sold through unorganized local market and mandi of Bari and Dholpur. Apart from human consumption most of the produce of pearl millet including other similar crops is being used as cattle feed, hence looking to the enough livestock population of Dholpur district, there is a considerable scope of value addition in these crops. Apart from this, the area being sown under less paying crops would be diversified into cultivation of high pay off crops i.e. horticultural crops in future.

In view of the major crops which are being grown in Rabi season and the scope of barley as alternate crop (looking to the possibility) for malting; it would also be selected as value chain crop for the cluster. Since industrial value of the Mustard and Wheat crops is significant for any Producer Company (PC), so these crops may be taken as value chain crops in Bari Cluster.

Although there is not much area under Horticulture/fruit plantations at present, the availability of fertile land and availability of ground water along with connectivity with Agra & Delhi puts immense opportunity for the cultivation of vegetables and fruits. The area is fairly suitable for fruits like Guava, Lemon etc. & vegetables like Potato, Tomato, Brinjal, ladyfinger, cucurbits, green Chilly and Cole Crops. Hence, some area under cereal & other crops would be diversified in to the cultivation of above these vegetables and fruits crops.

As the dairy is experienced quite successful business in the cluster, cultivation of fodder crops has an important role in the cropping pattern to the local farmers. Similarly, the Goat rearing is quite popular in this area. About 4274 numbers of goats (Table-13) are available in the villages of the cluster, so there is a significant scope of value chain of goat meet.

Therefore, it can be concluded that the availability of fertile land and underground water along with the proximity to Agra & Delhi provides enough opportunity for the development of value chain crops and cultivation of vegetables, flowers and fruits, as well as scope of value chain in goat meat production. Therefore, Bari is an appropriate cluster to be developed under RACP.

Chapter – 2: Description of the Cluster

2.1. Spatial characteristics

Bari watershed cluster of Rajasthan Agricultural competiveness Project is located in Bari Block of Dholpur district. The project area is located between the latitudes 260.40' N to 260.44'N and 770.30' E to 770.38' longitudes. The Bari cluster is at a distance of 35 Kms from Dholpur district headquarters. The area of the cluster is spread over in 44 villages of 11 Gram Panchayats. The name and area of the Gram Panchayats and villages covered in the Project area is given in Annexure 2.1.

2.1.1.Land Use Pattern of the Cluster

Total area of the cluster is 12387 ha. Out of this, the cultivated area is 3837.02 ha with 2383 ha rainfed, 1394.02 ha irrigated and 60 ha temporary fellow land. The pasture land which belongs to Panchayats of Bari Cluster is 1290 ha and waste land is 6959 ha which belongs to Government and Community of the cluster.

2.2. Agro-ecological characteristics

2.2.1. Slope

The slope of the area ranges from the 0 to >20%. Most of the area is under the slope category upto 3% slope. The category wise and micro watershed wise slope area is being summarized in Annexure 2.19.

2.2.2. Soil Types

The soil of the Project Area is shallow to moderately deep, dominantly fine loam soil to coarse loom, imperfectly drained, and moderately to severely eroded. Topography of the Project Area is almost plain and majority of the area falls in the slope up to three per cent. The soil profile of the project area is being summarized as under:

Table 2: Table Soil Profile of Bari Cluster

S. No.	Major Soil Classes	Area in hectares
1.	Sandy loamy	5927
2.	Sandy Clay Loamy	6460
	Total	**12387**
	Soil Depth :	
S. No.	**Depth (cm)**	**Area in hectares**
1	0.00 to 7.50	673
2	7.50 to 45.00	1346
3	> 45.00	10368
	Total	**12387**

(Source: Agriculture Dept, Dholpur**)**

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

Table 3: The Soil fertility level of the Project Area

Soil fertility Status	Kg/ha	Recommended
N	NA	NA
P	20	23-56
K	320	144-336
Micronutrients	PPM	Recommended
Zn	0.34	0.60
Fe	1.89	4.50

(Source: Agriculture Dept, Dholpur**)**

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.

The need is:

- To check land degradation
- To reduce excessive biotic pressure by maintaining optimum number of livestock and management
- To check cultivation on sloping lands without adequate precautions of soil and water conservation measures
- To discourage cultivation along susceptible nalla beds
- To check faulty agriculture techniques
- To check uncontrolled grazing and developed cattle tracks
- To check deforestation of steep slopes

For delineated watershed projects: To check erosive velocity of runoff, store Runoff, to arrest silt carried by runoff and to recharge Ground Water structures, Earthen check dams, gully plugs, Bank Stabilization, Loose Stone Check Dams, Gabions, Earthen embankment (Nadi) and Anicuts would be taken up at appropriate locations.

2.2.3. Rainfall Pattern in Project Area

This cluster falls under III-B Agro-climatic zone (Flood Prone Eastern Plain). Winter season is observed between late November to mid-March months followed by summer season extending till June. July to September is the period that in which rainfall occurs. The identified project area falls under the Indian Metrological Department (IMD) Station Dholpur.

The average rainfall data is required to carry out water budgeting and based on which appropriate water harvesting structures are to be proposed in the cluster. The average rain fall data have been obtained from Irrigation Department of Dholpur, Government of Rajasthan by the Watershed Department. The rain fall data as obtained and given in the Annexure 2.7 and has been utilised while planning watershed development interventions in the cluster.

The average rainfall of the cluster area is 589 mm which has been used for calculation of water budgeting and similar other aspects. In addition to above the average rainfall (mm) of last 10 years the average rain fall pattern from the months of June to September is being summarized in Annexure 2.7.

Maximum intensity of rainfall and duration is also being summarized in Annexure 2.7.

2.2.4. Temperature

The temperature during the summers (from April to July) remains high and generally reaches up to 45oC and sometimes touches / reaches to as high as 48ºC. Hot wind commonly known as "Loo" blows between the months of May-June. On the other hand, winters generally have sunny and pleasant days and bitterly cold nights. At times the temperature can also touch to a lower level of

around 2-3ºC, mostly during the nights. A short presentation of the above aspects has been provided in the following table:

S. No.	Season	Maximum (C^0)	Minimum (C^0)
1	Summer Season	48	31
2	Winter Season	23	5
3	Rainy Season	38	17

2.2.5. Source of Irrigation

Bari cluster is a watershed cluster, so the rainwater is the main source of water which is required for crop production in Kharif season. The rainwater is also the main source of ground water recharge in the cluster. The Kharif crops are cultivated based on the rain water received during the monsoon. In Bari cluster the main source of irrigation is rain fall recharged ground water which is mainly used in Rabi season. The source (method) of ground water/extraction and related details as well as area irrigated is being summarized as under:

2.1.1.1. Ground Water Status in Bari Cluster

Hydrology

The principal source of recharge to ground water is rainfall. Normal monsoon and Normal non-monsoon rainfall (mm) from 1901-2008 to 1901-2012 and annual monsoon and non-monsoon rainfall (mm) from the year 2008 to 2012 of the Block Bari district Dholpur 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.

Ground Water Level

Ground Water department is monitoring seven wells in the Cluster Area. The average Pre-Monsoon depth to water in the year 2011-16 varies from 4.85 mts to 11.06 mts below ground level and Post-monsoon depth to water from 3.07 mts to 7.75 mts. The Water levels are given in Annexure 2.14.

Water Level trends (2001 – 2016)

16 years Water Level Trend for Pre monsoon, 2001–2016 and Post monsoon, 2001 - 2016 have been presented Annexure 2.14. During Pre-monsoon period in the long term, decreasing trend of ground water levels of 0.02 m/year has been observed whereas increasing trend of 0.02 m/year in ground water levels of Post-Monsoon period has been observed in the Cluster Area. The Water levels and trend are given in Table-2 & 3 of Annexure 2.14

Ground Water Extraction Status

Existing Gross Ground Water Draft of 9.90 MCM for Irrigation are withdrawn through 762 wells/Tube wells for irrigation purposes in the Bari Cluster area. The details are given in Annexure 2.14. Existing Gross Ground Water Draft of 1.41 MCM for Domestic purposes are withdrawn from Wells/Tube wells/Hand pumps. The details are given in Annexure 2.14.

Stage of Ground Water Development:

Stage of ground water development in the Bari Cluster area as on 31.3.2013 is 91.42% and the long term trend of Pre-Monsoon showing decreasing trend & Post-Monsoon for showing increasing trend as on 31.03.2013. Therefore, Cluster area is treated as Semi-Critical Category which indicates that the scope of ground water development for Irrigation purposes. Additional 0.98 MCM of Ground Water is available for Ground Water Development in addition to present draft of 9.90 MCM.

One Piezometer per 20 Sq.km area or site specific requirements installed with Digital water Level Recorder (DWLR-Telemetric) may be constructed for monitoring of impact assessment of Investments proposed in the Cluster area.

2.3. Demographic Characteristics

The Bari cluster comprises eleven (11) Gram Panchayats having forty-four (44) villages. The villages falling in the Project Area are characterized by average medium and undependable rain, ground water is the only source of irrigation, poor infrastructure development, low literacy and high incidence of migration during times of drought.

2.3.1. Population

Total population of the cluster is 49922. Out of the total population female population is 45.70% and schedule caste (SC) population is 25% and 21.64% is schedule tribe (ST) population. 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 4: Population Details

Male	Female	Total	SC	ST
27108	22814	49922	12482	10801
54.30%	**45.70%**	**100 %**	**25.00%**	**21.64%**

(Source: Watershed DPR of Bari Cluster)

2.3.2. Socio-economic condition of the cluster

Small farmers are 26.46% followed by marginal, BPL, Large farmers and landless household. The table below reveals that most of the farmers are either small, BPL or marginal farmers. Large farmers are only 6.73%. It means about 93.27% farmers require support for upliftment.

Table 5: Household Details

BPL household	Land Less	Small Farmer	Marginal Farmer	Large Farmer	Total household	SC household	ST household
1099	696	1726	3663	439	**6524**	380	587
16.85%	**10.67%**	**26.46%**	**56.15%**	**6.73%**	**100 %**	**5.82%**	**9.00%**

(Source: Watershed DPR of Bari Cluster)

Currently there is unorganized market in the cluster and farmers sell their produce in the local markets. The production of pearl millet and other crops is being sold through unorganized local market of Bari and mandi of Dholpur. The produce of pearl millet crop is also being used as cattle feed, hence looking to the considerable livestock population of the cluster as well as district, there is a huge scope of value addition in this crop. The Bari & district mandis (markets) are located just near to the cluster.

The poor source of irrigation, poor infrastructure development, low literacy and high level of migration are predominantly observed during times of drought. The development indicators of the project area are being summarized under:

Table 6: The development indicators of the project area

S. No.	Development Indicators	Rajasthan State	Project Area
1	Per capita income (Rs.)	16260	14570
2	Poverty ratio	0.22	0.32
3	Literacy (%)	60.40%	40.47%
4	Sex Ratio	1000:928	1000:984
5	Infant mortality rate	NA	NA
6	Maternal mortality ratio	NA	NA

(Source: Watershed DPR of Bari Cluster)

The above table indicates average socio economic conditions of the cluster. Although poverty ratio and sex ratio are more than the state average, literacy is less than the state average in the cluster along with lower per capita income. All these parameters need to be elevated 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. Dholpur district occupies an important place in the agricultural production of the state. It is located near to Dholpur district and 282 Kms from Jaipur. The total geographical area of the district is 300913 hectares which is about 0.88 per cent of the state. Out of this, the net area sown is 156741 ha. Out of this the rainfed area is 32566 ha and irrigated area is 124185 ha. At the same time some area is also double cropped with the help of irrigation and hence the total cropped area is 233422 ha. So the cropping intensity of the district is 149% against the state average of 143%.

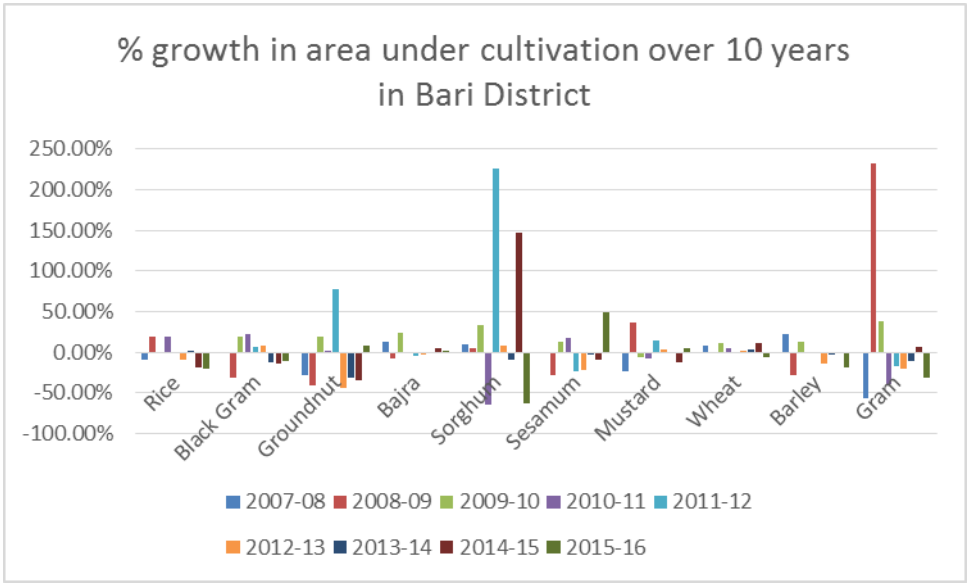
2.4.1. Cropping Pattern of Agricultural Crops

A number of crops are grown in Dholpur district. In the Kharif season, Pearl Millet (Bajra), Sorghum (Jowar), Kharif pulses, Sesamum (Til) etc. are sown in about 100410 hectares which is 0.61% of state's Kharif area (16378420 ha). In the Rabi season Wheat, Barley, Gram, Mustard etc. are cultivated in about 149599 ha which is 1.48% of state's Rabi area i.e. 10099049 ha. Thus, the total cropped area of the district is 250009 ha. The prime sources of irrigation here are wells and tube wells. A total area of around 112301 hectares is being irrigated by 7843 tube wells & 14742 wells in the district. By other sources like canals and tanks, an area of about 13180 ha is irrigated.

In Kharif, the Pearl Millet (Bajra), Sorghum (Jowar), & Sesamum crops and in Rabi season Mustard, Wheat, Barley & Gram crops are the main crops in Bari cluster. Before discussing Bari cluster, the detail of area of these crops in the State as well as in the district has to be kept in mind. So a comparison of the area of these crops in the State and district for the last 10 years from 2006-07 to 2015-16 has been presented in Annexure 2.2.

As per the figure 1, it is clearly visible that Sorghum crop area was increased by 226% in district in year 2011-12. In terms of Pearl Millet crop the growth is bit stable with slight declining and increasing trend. The major rabi crop grown in the district is Mustard, this crop has shown stable growth. The reason for increase or decline in the area is due to market prices, demand & supply and water availability.

Figure 2: Percentage growth in area under cultivation over 10 years in BARI District



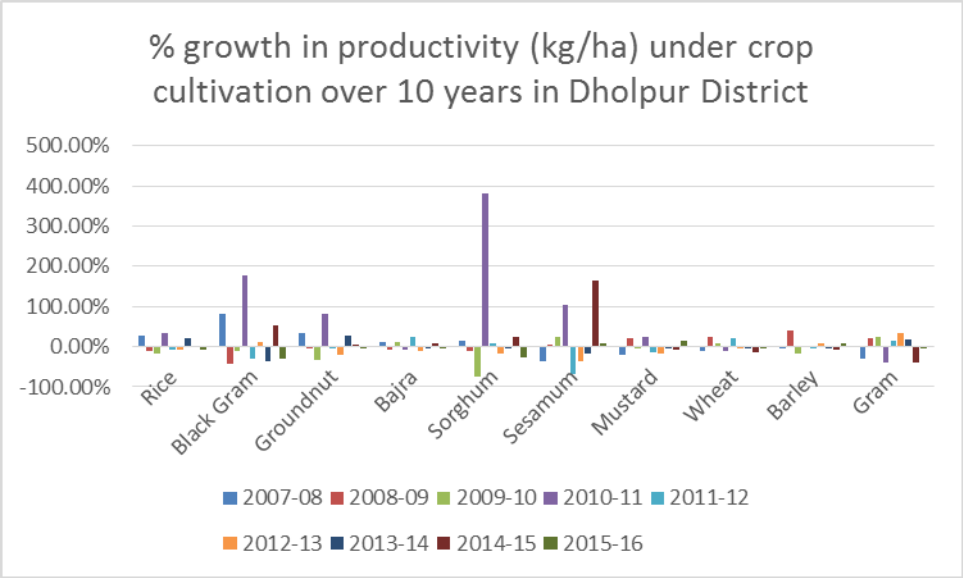
As far as area is concerned, there is no major change in the cropping pattern of the district as well as in the state. But due to occurrence of rains during the concern season, the area may have reduced or increased under the above crops. It is also relevant to mention here that the above crops are well established in state as well as in Dholpur district because of their suitability in this area for production.

It is worthwhile to mention here that the above crops are also prominent crops of the state as they have very signification rankings, if their area is compared to the area of all India.

The state was having first rank in the case of Bajra and Mustard crops in both years (2012-13 & 2013-14). Whereas, the Wheat crop, the state was having 5th rank in the year 2012-13 and 4th rank in the year 2013-14. The latest estimation of the state has also indicated that the said ranks in above crops is still continuing.

As per the figure 2, the growth in productivity of Sorghum, Black gram and Sesame is shown as 382%, 178% and 104% respectively in cluster in year 2010-11 the reason behind the huge deviation was due to year 2009-10 was a drought year and crop failure cases may be more. In terms of rabi crops, Mustard, wheat Barley and Gram crop have shown almost stable productivity with slight increase or decrease in 10 years.

Figure 3: Percentage growth in productivity (kg/ha) under crop cultivation over 10 years in Dholpur District



(Source: Data analysis by ABPF)

2.4.1.1. Overview of the crops identified in Bari Cluster

Since the Bari cluster is situated near to the tehsil Bari, so nomenclature of the cluster is based on the name of the tehsil i.e. Bari of Dholpur district. The cluster has been selected based on the basis of watershed approach. Therefore, improvement in water use efficiency would be achieved through watershed management and Agricultural productivity including agricultural & horticultural crops would be increased by way ensuring water availability whether in-situ moisture conservation or water harvesting in existing water harvesting structures or in proposed water harvesting structures or through conservation measures to be adopted/constructed in the cluster. As far as cluster area is concerned, the total area is 12387 ha and a total of 44 villages falling in 11 Gram Panchayats are there in the cluster. The cluster consists 3 macro watersheds and 17 micro watersheds.

2.4.1.2. Category wise Cultivated Area in Bari Cluster

Using remote sensing and Geographical Information System (GIS) and Participatory Rural Appraisal (PRA), the irrigated and rainfed area has been assessed. Using revenue as well as remote sensing data category of the farmers has been compiled into 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 area of the cluster is 3837.02 ha and the total households in the cluster are 6524. The category wise cultivated area in Bari cluster is being summarized in Annexure 2.3.

The data (Annexure 2.3.) clearly indicates that about 93% farmers are marginal, small, landless & BPL farmers. Only about 6.73% farmers are large in Bari cluster. Out of the total cultivated irrigated area, about 23.34% area is with large farmers and the rest belongs to other type of farmers. Similarly, 76.66% cultivated rainfed area is either with marginal, small or BPL farmers. Out of the total cultivated area, 30% total cultivated area is with farmers who belongs OBC category followed by Schedule Caste, General and Schedule Tribe farmers.

The total irrigated area is only 36.33% of the total cultivated area and out of it 37.88% irrigated area is with small farmers followed by marginal, BPL and large farmers. The rainfed area is 63.67% and out of it 34.79% area belongs to marginal farmers followed by small, large and BPL farmers.

2.4.1.3. The Status of Cropped area of Agricultural Crops in the Bari cluster:

The cropped area has been compiled from the data collected while Participatory Rural Appraisal (PRA) which was performed by NGO during the year 2016-17. As discussed earlier, the major field crops of Kharif are Pearl-millet (Bajra), Sesamum (Til), Arhar & Guar. Whereas in Rabi, the crops are Wheat, Mustard and Barley in Bari cluster. Kharif crops are grown based on the monsoon rains and in Rabi Mustard crops is sown on conserved moisture. However, irrigation is provided during the dry spells wherever irrigation facilities are available. The crop wise area under these crops is being summarized in Annexure 2.4.

The data (Refer Annexure 2.4.) clearly shows that Kharif crops are sown in 81.57% area whereas Rabi crops are sown in 99.35% area. Total intensity of agricultural crops are 18.92% during the year 2015-16. The cropping intensity of the cluster is much more than the district average i.e. 149% and state average of 143%. It means very less micro irrigation system is being practiced in irrigated crops in 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. Similarly, in Kharif the area under Bajra crop has to be increased because this crop is having value chain importance so the same can become economic crop in the area. Likewise, Mustard, Barley, Wheat and Potato crops have also importance for value addition so the same may be selected for value chain.

2.4.2. Cropping Pattern of Horticultural Crops

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, vegetable and flower 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 Bari cluster Potato and Tomato crops are most encouraging vegetable crops and similarly Lemon and Guava fruit crops are suitable for the Bari cluster.

2.4.2.1. Year and Crop wise area of horticultural crops in Rajasthan and Dholpur district

The horticultural crops like Potato and Tomato in vegetable crops and Lemon and Guava in fruit crops are suitable for the area. Out of these the Potato crop can be taken as value chain crop of the cluster but other 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 Dholpur district from 2011-12 to 2015-16 is presented in Annexure 2.5.

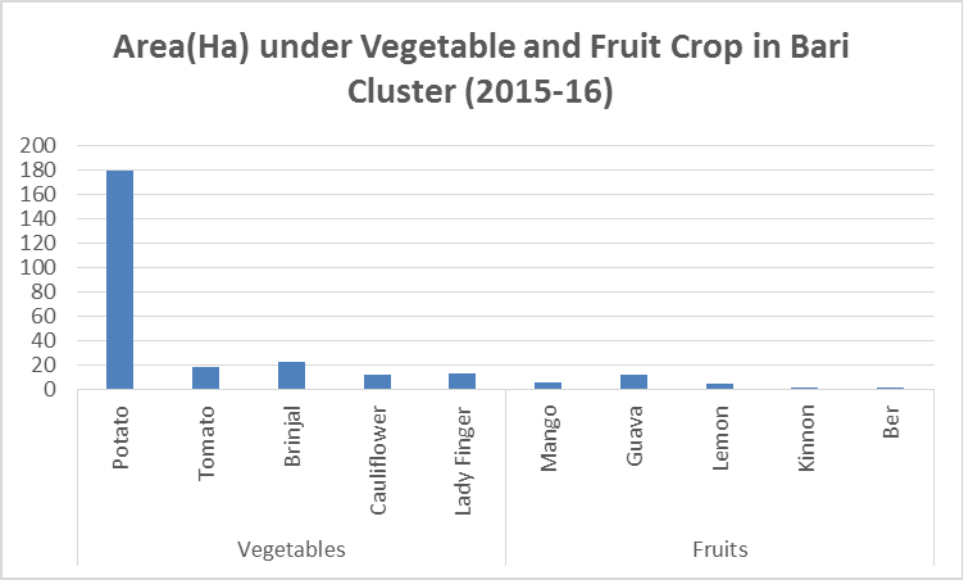
The data (Refer Annexure 2.5.) reveals that the available information for the district is not encouraging but looking to the scope of marketing and potential and facility of the cluster (as it is well connected with National Highway 11B (Lalsot to Dholpur). It also reveals that looking to the potentiality of the area, needed efforts have not been made in the district to promote horticultural crops. Hence efforts have 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.

2.4.2.2. Crop wise area of Horticultural crops in Bari Cluster

To finalize the proposed area of horticultural crops in the selected cluster of Bari, 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. Therefore, whatever area has been reported under these crops are being summarized in Annexure 2.6.

As per the figure 3 (Refer Annexure 2.6), the area under horticultural crops is only 7.19% of the total agriculture land (3837.02 ha) but there is a considerable scope to increase the area under these crops i.e. (vegetables: Potato & Tomato and fruits: Guava & lemon) 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.

Figure 4: Area under horticultural crops in Bari Cluster (2015-16)



(Source: Data analysis by ABPF)

2.4.3. Crop Water Requirement in Bari Cluster

The Crop Water Requirement of crops being grown in the Bari cluster is being summarized in Annexure 2.13

Above table shows that due to proposed cropping pattern, the total crop water requirement has been reduced to 17.26 MCM from 19.85 MCM so total 2.59 MCM water requirements have been reduced.

The crop water requirement of Kharif crops is 3.13 MCM, which would be met out from in-situ moisture conservation in arable area. There is total crop water requirement of Rabi & horticultural

crops are 17.26 MCM. It is also significant to mention here that in such watershed areas almost 50% Rabi crops are grown on conserved moisture, means only 25% crop water requirement of Rabi & horticulture crops will be taken from ground water in the cluster. In addition, if demand side water application methods are adopted on each and every wells/tube wells, about 50% of total water requirement may be saved out of total crop water requirement in lifesaving irrigation in Kharif and in Rabi & horticultural crops, it means total 7.38 MCM crop water will be met out from the ground water and water will be harvested through different measures to be done 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 project area

S. No.	Particular	Nos.	Per day requirement (in liter)	Total Requirement (in liter)
1	Human	40570	40	1622800
2	Big animal	17573	30	527190
3	Small animal	5327	15	79905
4	Birds	6448	0.15	967.2
Total (in liters) Day				**2230862.20**
Per year Requirement of drinking water (in liters)				**814264703**
Per year Requirement of drinking water (in cum)				**814264.70**
Per year Requirement of drinking water (in MCM)				**0.81**

(Source: DPR, WDSC, Bari)

Above table reveals that the estimated total water requirement for human beings, animals & birds etc. is 814264.70 cum.

Water Budgeting and Water Balance

Based on the ground water data mentioned elsewhere, the ground water level is showing decreasing trend, the ground water level decreasing 0.02 m per year. Therefore, cluster area is treated as semi critical category which indicates that the scope of ground water development for irrigation purposes. Net annual ground water availability as on 31.03.2013 was 12.37 MCM and additional 0.98 MCM of ground water is available for Ground Water Development in addition to present draft of 9.90 MCM.

As mentioned elsewhere, the entire project area has potential to harvest 20.55 MCM as per the strange table, soil characteristics and rainfall. As per ground water study about 6-18% of rains contribute ground water, which depend type of catchment, formation, intensity & quantity of rainfall etc. Kushalgarh cluster is under Average to bad catchment and its formation is older alluvium and rainfall is also good in the area so about 18% of rainfall, which contribute to the ground water. 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 seasons are depend on conserved moisture and ground water. It means 50% ground water may be saved through cultivation on conserved moisture and about 50 of ground water can be saved through adoption of MIS. It is also discussed elsewhere that total 12.37MCM ground water is available annually in the cluster. The crop water requirement and need of the ground water may be summarized as hereunder to maintain the water balance in the cluster:

Table 8: The crop water requirement and need of the ground water

S. No.	Items	Crop Water Requirement (MCM)	Total Ground Water Save due to Various Measures (MCM)/ cultivation on conserved moisture	Net crop water requirement to fulfilled from ground water (MCM)
1	Crop water requirement of Kharif crops	3.13	2.82	0.31
2	Crop water requirement of Rabi crops	12.60	6.30	6.30
3	Crop water requirement of Horticultural crops	1.53	0.77	0.77
4	Domestic & drinking water requirement	0.81	0.00	0.81
	Total	**18.07**	**9.88**	**8.19**

Total 3.48 MCM is proposed to be harvested and recharged ground water through various structures, in addition to in-situ moisture conservation. It clearly shows that Kharif can be grown with in – situ moisture conservation and as mentioned above, about 50% crops of Rabi season are grown with conserved moisture. It means the crop water requirement of Rabi crops may be reduced to 50%. Keeping in view, if it is assumed that the 100% area is covered under micro irrigation system gradually, the final crop water requirement would be about 8.19 MCM which would be drafted from ground water. Gradually, the dependency on ground water will be reduced to 8.19 MCM if MIS is adopted by 100 per cent farmers.

2.4.4. The Seed Replacement Rate (SRR) in Bari cluster:

2.4.4.1. Seed Replacement Rate (SRR) in the State & in District:

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. Bari cluster. The status of Seed Distribution and Seed Replacement Rate in the State & District is being summarized in Annexure 2.9.

The Pearl Millet in Kharif and Mustard, Barley and Gram crops in Rabi are suitable crops for the cluster and the scope of value chain in these crops is good. Although seed replacement rate in most of the crops are very low which ranges from 0% to 61.67% in the year 2014-15 whereas in the year 2013-14, it ranges from 0% to 82.13%. If the SRR of the district is compared with state average, it is higher in the case of Pearl Millet in 2013-14 but in the year 2014-15 it is much lower than the state average. Similarly, in Mustard crop, it is much lower than the state average in both the years. But in Barley & Wheat it is almost at par in both the years.

It indicates that in almost all the crops the SRR is less than what it should be. If the productivity of these crops is to be increased, then certified seed of high yielding varieties have to be sown for all the crops. There for, the SRR may have to be increased for getting optimum / desired productivity in the years to come in the district.

2.4.4.2. Seed Replacement Rate (SRR) in Bari cluster:

The Seed Replacement Rate (SRR) in Bari cluster has been compiled from Agriculture Department for last five years from 2011-12 to 2015-16 is being summarized in Annexure 2.10.

The data clearly reveals that the Seed Replacement Rate (SRR) in Bari cluster is almost the same as the SRR of the district but in case of Bajra crop, it more than the district. The above data shows that there is much scope to increase the SRR to optimize the crop productivity in the cluster. It means 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 values.

The 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 9: The current status of Fertilizer Consumption in Terms of Nutrients during 2014-15 (In Lac Tons)

State/District	Nitrogenous (N)			Phosphatic (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	6.05	9.52	1.75	1.56	3.31	0.06	0.09	0.15	5.29	7.70	12.99	34.40	82.76	52.64
Dholpur	0.103	0.14	0.242	0.046	0.027	0.073	0.0021	0.0014	0.0035	0.15	0.17	0.32	152.80	107.12	124.81

(K – Kharif, R – Rabi & T – Total)

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

Above table reveals that average consumption of fertilizers in the district in Kharif & Rabi seasons is higher than the state average. In totality the consumption of fertilizers in the district is 137.10% higher 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.

The Area Covered and Technical Grade Material (TGM) used under Plant Protection Measures in State & District:

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.

Here the current status of seed treatment, soil treatment, poly treatment, intensive treatment, rat & weed control etc. is being summarized in Annexure 2.12.)

The data (Refer Annexure 2.12.) indicates that the seed treatment, soil treatment, poly treatment, intensive treatment, rat & weed control etc. is being adopted nearly as per the package of practices which need further improvement in a big way keeping in view the Integrated Pest Management so that crop production can be increased without effecting environmental impact.

The Area Covered and Technical Grade Material (TGM) used under Plant Protection Measures in Bari Cluster:

During the field survey, it was observed that the area covered and technical grade material (TGM) used under Plant Protection Measures in Bari 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 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 chain.

The Crop-wise Area Covered and Technical Grade Material (TGM) used under Plant Protection Measures in the State & District:

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 INPM 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 Annexure 2.11.

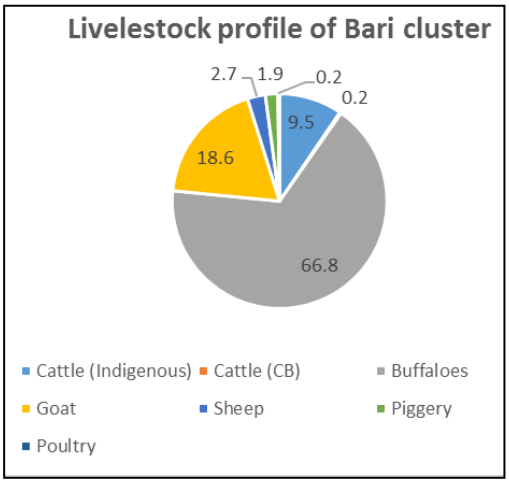
The data (Refer Annexure 2.11.) indicates that the crop wise area covered and technical grade material (TGM) used under plant protection measures in the state as well in the district is less than the optimum level. It means that the adoption of package of practices is not being done at the optimum level. So there is need to improve in a big way, keeping in view the Integrated Pest Management (IPM) so that crop production can be increased without effecting environmental impact.

The Area Covered and Technical Grade Material (TGM) used under Plant Protection Measures in Bari Cluster:

Likewise, the data for Bari 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 Bari 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. Livestock profile of Bari Cluster

In the Bari cluster large no of households possess cattle, buffalo, goats and sheeps. The district milk union collects around 10000-15000 liters of milk per day. In addition to the milk cooperative network many private players like Mother Dairy, Bhole Baba and AMUL are also procuring approximate 5000-10,000 litres milk per day from the area and supplying the milk to Delhi Agra and Lucknow market. Goats are also reared by substantial no of house holds and these house holds are primarily small holders with limited resources. Dholpur being near to Agra, Gwalior and Delhi markets coined with local demand, has a good scope for goat farming for meat and milk. The household wise livestock profile of the cluster is given in Annexure 2.16 as per the Livestock Census 2012. Livestock Profile of Bari cluster shows medium population of the goats i.e. 9% families rearing goats. However, Goat rearing can become a significant contributor to the livelihoods of the small and marginal farmers in the cluster. So there is the scope of popularising goat farming with suitable interventions for improving milk and meat productivity. Project intervention will also support small holders to collectively market breeding animals to institutional buyers.



The cluster has 71 goat specific MTGs and around 580 families own 4274 goats, averaging around 7-8 goats per goat rearing family. The village wise data for Goat population segregated further into male, female, calved etc. is in Annexure 2.17

As evident from the above data, Goat rearing is quite popular in this area., and there is a significant scope of the value chain of goat meat.

2.6. Structural characteristics

The Bari cluster is located in Dholpur district. The district has a number of industrial areas including processing units at Odela Dholpur, Bari, Growth Centre Dholpur, 6 Industria Area (TA), 6A-Old Chhwani Jhore Bachhiya Hamada, Vishroda Dholpur, and Growth Centre Extentions. (Source: MSME Development Institute, "Brief industrial profile of Dholpur district"). Apparently there are over 156 food processing and related MSE unit in the district. Some of the leading larger processors in the region include Bhole Baba Milk Food Industries Ltd, Growth Centre, Dholpur which is into ghee, milk powder & other dairy products and Garima milk & Food products Pvt. Ltd, Adalpur, Dholpur which is into ghee and SMP. 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 Bari cluster that may influence Agri business activities in the clusters presented below:

2.6.1. Government departments

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

2.6.2. APMCs

There are APMCs in the district which can have an impact on Bari cluster.

a) Bari (20 km)

b) Dholpur (35 km)

2.6.3. Cold stores

Although there is huge potential of cold storage in the district but currently only one cold store is in existence:

1. Jagan frozen Foods (P) Ltd., Khasra No.303-304 village Edalpur, Teh.Mania- Dholpur: It is having the capacity of 4505 MT and used for multiple commodities

2.6.4. 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.

2.6.5. Predominant practices for cultivation

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

Sr.no	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.
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 Bari 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. Bajra, Sesamum, Mustard and Wheat are the major crops from the cluster along with Potato in vegetable crops 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. Bajra scores the highest in this category as it has maximum cropped area, while Potato has the highest production in the cluster. When it comes to relative productivity of the crops in the cluster, Sesamum and Wheat have lower productivity when compared to their respective national average productivity, while all other crops have relatively higher productivity than national average. (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 where significant to get the actual required raw material to prepare the end product. For instance, the yield loss in case of Mustard oil, it has been considered as 60% while that for Roasted Bajra and Wheat flour, is taken as 10% only and Potato to be 80%.

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. Sesamum scores the highest with around Rs. 240 per quintal followed by Mustard with Rs. 124 per Quintal. This parameter signifies the small scope to get 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. Potato scores highest in getting maximum return per acre followed by Wheat, Bajra and Mustard.

The next parameter is on scope for processing in the state of Rajasthan, there are comparatively more number of secondary and tertiary processing units of Mustard. Although Wheat and Bajra have 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.

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, Potato has the highest number of value added products like dehydrated, chips, raw, powder etc whereas Wheat has second highest score followed by Mustard and Bajra.

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 the highest for Mustard and Potato (5%) followed by Wheat (3.60%) and Sesamum (2.00%). (Annexure 3.5)

3.1.3. Risk assessment of Potential Value Chain crops

The third category of parameter is regarding identifying the risk in the respective value chain of the crops of the cluster. Price volatility in the historical mandi prices of the respective commodity over the period of 3 years has been taken as the benchmark for capturing and measuring the risk in the commodities due to any adverse agronomic circumstances like drought, pest epidemic, bumper production and/or international market prices crash/upsurge. The price volatility is highest in case of Sesamum (60.45%) followed by Potato (40.00%). Hence Sesamum has scored highest in this category as it has highest scope for value chain intervention in order to curb the price volatility and thus, ensure sustained regular income to the farmers. (Annexure 3.2)

3.1.4. 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 is scored highest as it proposes highest scope for crop diversification in order to conserve water in the cluster. Importantly, Bajra with lowest water requirement of 1000 cum/ha has the highest scope for crop diversification followed by Mustard (3000 cum/ha) and Wheat with that of 5000 cum/ha. (Annexure 3.2)

3.2. Inference from the Scoring Matrix

It could be concluded from the total scores of the matrix that Mustard is the most important value chain crop in the matrix. It has the highest relative productivity when compared to national average. It also has the second highest scope at mandi but the scope for value addition and processing in the state is above average.

Second crop from value chain intervention is Potato considering its potential for value addition. It also has high price volatility and highest production in the cluster.

Third crop for value chain intervention is Bajra, which has the highest cropped area in the cluster. Relative productivity as compared to national average is also high in case of Bajra. Water requirement is least in case of Bajra with an increasing potential for value addition.

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)

Potato

The present pre-intervention or value chain for Potato may be viewed as one with two critical production-distribution or activity-marketing channels. The product is largely marketed by farmers

through the APMC, local vendors and private food processors. Channel 1 may be viewed in terms of one for table variety and other for processed products of Potato like chips, wafers, flakes, flour and starch, etc. The producers market their produce in both value chains through local traders and APMC Commission agents largely. It is estimated that about 2.8-10% of perishable agricultural products like potatoes are lost after harvesting which are harvested at the onset of summer season. About 50% of these losses can be prevented using appropriate post-harvest measures. (Annexure 3.3)

Pearl Millet (Bajra)

The pre-intervention value chain for bajra involves basically two production-distribution or activity-marketing channels, namely one related to food processors and the other related to feed processors. Presently, village traders and the mandi largely facilitate aggregation of produce. Producers suffer from want of storage and grading and sorting facilities and value accruals are limited. (Annexure 3.3)

Typically, the gross yield enjoyed by producers is barely 11.2 quintals per acre. Gross value realisation on sale at Rs.1400 per quintal is Rs.15, 680 per acre. The cost of cultivation is about Rs.7, 840 per acre and the net value realisation is about Rs.7, 840 per acre. (Annexure 3.6)

Mustard

The present pre-intervention or value chain for Mustard may be viewed as one with two critical production-distribution or activity-marketing channels. The product is largely marketed by farmers through the APMC. Channel 1 may be viewed in terms of one for table variety and other for edible oil and DOC. The producers market their produce in both value chains through APMC Commission agents largely. (Annexure 3.3)

Typically, the gross yield enjoyed by producers in mustard is 5.5 quintals per acre. Gross value realisation on sale at Rs.3100 per quintal is Rs.17, 050 per acre. The cost of cultivation is about Rs.11, 600 per acre and the net value realisation is about Rs.6, 000 per acre. (Annexure 3.6)

3.4. Strategic context of Goat Value chain in Bari cluster

3.4.1. Goat for milk production

The goat farmers mostly consume the milk from these goats domestically, apart from selling live animals. Many families also sell excess milk in the village at the rate of Rs 10 - 12/L in the dairy Cooperative mixing with Cow/Buffalo milk as there is currently no separate channel available for goat milk collection. This provides handy daily income during the milking cycle of these goats. Goats however produce far lesser quantity of milk compared to large ruminants. However goats start to produce 2-3 years earlier, and have considerably lower cost of production for both feed and water, and there are no limitations for slaughter of non-productive animals. Among the breeds of goats in the cluster, some of important milk production traits noted in field areas have been as follows.

Table 10: Productivity trend of goat milk in the cluster

Average daily milk production (Wet average)	500 ml to 1 liter (Range 250 ml to 3 Liter)
Lactation length	150 to 170 days (5 to 6 months)
Estimated lactation yield - Dry period 3 to 4 months	100 to 180 liters

Source: Department of AH

The cluster has a total of around 4272 goats out of which 29% are milking animals. The estimated milk yield would be around 3078 L/day at an average estimated yield of around 2.5 L per day in two milking. Out of this, if 1 L of milk per day per farmer is taken as marketable surplus, it can be estimated that around 1231 L per day is the potential for collection as on date and this can grow up

to 3078 L/day if maximum potential is achieved by developing a separate remunerative value chain for Goat milk. The volume is too low to focus on goat milk markets and hence intervention on goat milk chain is not considered.

3.4.1. Goat for meat production

The market linkage for live goats poses difficulties, as it is highly informal and the cluster is located nearby (within a radius of 300 km) from major bakra mandis i.e. Agra, Delhi, Gowalier and Jhansi. Breeders sell to traders who take animals to larger terminal markets as stated above. Traders are an organized group called Khatiks and look out for each other. They are an extremely tight community and make good profits from buying and selling livestock. This means it is not possible to eliminate them as middlemen, and the best option is to ensure fair prices are paid to the breeders. Otherwise, animals have to be brought live out of the state. Transportation costs for these movements are high, but traders who buy locally can organize themselves in groups to transport animals.

Major constraints in goat meat value chain in the cluster:

The process of goat selling and buying though deeply associated with the weight of the animal, do not involve any weighing of animals. • Goat rearers sell male goat and old female goats to traders visiting from nearby cities and town. The price of the animal is quoted by the trader first (on visual estimate) and not by the goat rearers. • Rearers are unaware of the live weights of the animals and fail to correlate the price of the sale with the live weight of the animal. Meat equivalent to 50-60% weight of the animal (depends on age and feed intake) can be obtained from the animal. Social taboo of meat handling also keeps the rearers uninterested. • Rearers have a tendency to sell off their male stocks at an early age. Fear of mortality and losses instigate rearers to sell off the male stocks early. Lack of proper knowledge on efficient and good animal management is generally absent, which increases mortality. • Old female goats are also sold off at very low prices for meat purposes. These goats are used for Defence Cantonment supplies as well as consumption in block/district level meat shops. The Defence Supplies generally go at very low tender rates (Rs 40-50 per kg) where supplying male goats is not viable for the supplier.• All goat parts have commercial value. Goat hair is sold at Rs.10-12 per kg to local traders who supply it to carpet industry in UP, Haryana and within Rajasthan. The skin of the animal is valued at Rs 70-80 per piece and the head for Rs 100.

Factors affecting sale price of goat by farmers:

i) Rearers also end up selling animals at a wrong time due to cash crunch. Generally business planning of selling animals in the festive seasons of Eid is absent. ii) Deciding the quantity of saleable meat in the goat. On an average the quantity of meat is found to be 50 to 60 % of the live weight of the animal, iii) the look and health of the animals. A sick animal will fetch a very low price. iv) The season and time of the year. Especially during Eid, animals fetch better prices. At this time goats are not judged by the above-mentioned points but by the sacrificial value of the animal. Although sick and imperfect animals are not sacrificed, some animals can fetch a fortune if it has certain religious marks like a star or a half moon etc. on its body.

It is therefore suggested to organize rural haat to provide better market linkages to the goat rearers.

3.4.2. Fodder Requirement and availability.in Bari cluster

The data given in the, Annexure 3.7 indicates the fodder requirement of livestock population of Bari cluster at 47595 MT. The fodder availability table in Annexure 3.7 indicates that the fodder availability 54240 MT which is excess the requirement. Bari cluster is thus self-sufficient in its fodder requirement.

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

4.1. Opportunities and challenges

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

#	Season/Type	Crop
1	Kharif	Bajra
2	Rabi	Mustard
3	Horticulture	Potato

(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. Bajra

Bajra is a major Kharif crop grown in Bari cluster. Bajra is mainly grown for cereal and fodder purpose.

Strength	Weakness
• Bajra is one of the most extensively cultivated cereals in the world, after rice, wheat, and sorghum • In India alone, 90% of the world's and in Rajasthan 45 % of country's total bajra is grown. • Its tolerance to drought, heat and soil salinity along with its higher water use efficiency makes it a climate-smart crop. • It performs better than cereals in semi-arid regions. • It gives sufficient energy to the field workers at a very low cost. Thus it is called Poorman's food'. It is rich in nutrients like iron and zinc apart from carbohydrate and protein.	• Bajra flour (prepared by pounding or milling) quickly goes rancid, and can be stored only for short periods. • It tastes bitter due to the presence of phenolic compounds • Limited processing units for bajra and its by-products such as flour units, roasted Bajra units, etc. • Inadequate grading & sorting facilities. • The production of the crop is seasonal, but its demand remains for a longer period. Thus, adequate storage facilities required. • Large number of intermediaries in the chain leads to low producer's income. • Lack of market information regarding prevailing

• It provides feed to large number of animals and grown for silage and hay purpose also.	prices, arrivals etc. force farmers to sell in village itself.
Opportunity	**Threat**
• Scope for tie up of FPOs through CFC with firms like VSR, Patanjali, Moraraka Organic, etc. • Scope for facilitation of start-ups from amongst FPOs or individual entrepreneurs, in secondary processing of value added products of Bajra like flour, snacks, animal feed, roasted bajra, etc. • Scope for establishment of quality sorting and grading facilities by FPOs as part of Farmers Common Service Centre (FCSC), along with facilities for packaging and vehicle to facilitate transportation. • Promote good agricultural practices with regard to planting, harvesting, use of inputs, disease management, pest control, etc. through FCSC • FPOs to undertake joint input sourcing activities for seeds, fertilizers, pesticides, etc. under the umbrella of CFC • Increasing use as roasted bajra and in malt shows better marketing opportunities	• Adverse climatic condition can impact the crop production and productivity • Bird damage at the time of grain filling and maturity also lower the production considerably • Lack of higher remuneration in bajra may reduce farmer's interest from cultivating it.

4.1.2. Potato

Strength	Weakness
• India is the second largest producer of potato, after China, in the world • Almost a third of all potatoes in the world is harvested in China and India • The major potato growing states are Uttar Pradesh, West Bengal, Punjab, Bihar, Haryana, Madhya Pradesh, Gujarat and Maharashtra • The major districts in Rajasthan producing potato area are Dholpur and adjoining region.	• Non-availability of improved & good quality planting material • Lack of washing, grading and storage facilities • Low market price during harvest time affect value accruals to producers • Non-availability of reliable insecticide/fungicide • Inadequate infrastructural facilities with producers, traders, processors and at market level results in marketing inefficiencies • Limited value added processing units in the region for potato and its by-products such as potato chips units • Inadequate grading & sorting facilities • Large number of intermediaries in the chain leads to low producer's income. • Inadequate market information regarding prevailing prices, arrivals etc. force farmers

	to sell in the villages itself.
Opportunity	**Threat**
• Scope for tie up of PCs through FCSC with firms like Patanjali, Pepsico, Fritolay etc • Scope for tie up of PCs through FCSC with potato processing units/ MSME firms • Scope for tie up of PCs through FCSC with housing societies in urban areas and retail outlets • Scope for facilitation of start-ups from amongst PC members or individual entrepreneurs, in secondary processing of value added products of Potato like chips, potato fingers, etc. • Scope for establishment of quality sorting and grading facilities by PCs as part of Farmers Common Service Centre (FCSC), along with facilities for packaging and vehicle to facilitate transportation. • Establish storage facilities by PCs as a part of FCSC. • Promote good agricultural practices with regard to planting, harvesting, use of inputs, disease management, pest control, etc. through FCSC • PCs to undertake joint input sourcing activities for seeds, fertilizers, pesticides, etc. under the umbrella of FCSC • PCs to also undertake custom hiring services and hence lead farm mechanization through FCSC	• Cloudy weather, rainfall at the time of flowering and seed formation (adverse weather conditions) • Infestation of insect-pest & other disease

4.1.3. Mustard

Strength	**Weakness**
• Mustard ranks second in terms of production in India. • However, due to more oil content (35%-40%) mustard ranks first in term of oil yield among all oil seed crops. • Rajasthan, UP, MP, Haryana, Gujarat and West Bengal states accounted for nearly 86.5% area and 91.4% production of mustard in India during 2012-13. • Rajasthan ranks third in term of mustard productivity in the country after Haryana and Gujarat.	• Mustard production trends represent fluctuating scenario. • The yield level also have been variable ranging from 1001(2007-08) to 1250(kg/ha) (2013-14) during last five years. • There was reduction in area and production of mustard in Rajasthan, Gujarat and U.P. • Adoption of scientifically recommended technology in mustard production, harvesting and processing is lower among both farmer and processors respectively.
Opportunity	**Threat**
• There is scope to grow the HYV of Mustard which are genetically enhanced. • Scope to develop thermo and photo insensitive mustard varieties. • Scope for FPOs undertake joint input sourcing activities for seeds, fertilizer, pesticides such that the farmer get good quality of inputs with	• High temperature during crop establishment and terminal stages cause shorting of growing seasons • Fog and intermittent rain during crop growth can reduce yield considerably. • Depleting availability and deteriorating quality of water.

lower cost of production. • Scope for secondary processing of mustard seeds and prepare value added products like mustard oil, mustard paste, sauce, etc. • Scope to tie up farmer of CFC to oil mill associations bulks buyer like ADM Agro, Amora exporters, etc.	

4.1.4. Goat

Strength	Weakness
• 71 goat specific MTGs, and 580 families own 4274 goats, averaging around 7 goats per goat rearing family. • It is a good livelihood option as most of the farmers are small and marginal • Goat milk is healthy and the cluster has a potential for collecting around 3078 L of goat milk per day. • The weather supports goat rearing • It is a secondary source of livelihood for the small holder farmers in the cluster • There is sufficient availability of fodder and water in the cluster for goat rearing • Bari is near to major markets in Delhi, Agra and Lucknow.	• Low milk yield and weight gain of non-descript goat population • Low penetration of animal health services and poor infrastructure of exiting animal husbandry institutions • Lack of knowledge of scientific goat husbandry practices specially feeding, breeding and management among farmers • Low resources specially among small holders for housing and feeding • Lack of aggregation practices for bulk procurement and marketing • No update knowledge of improves goat husbandry practices among veterinary professionals • Poor marketing practices • Poor Livestock resources (low milk and meat yield) and very poor mechanization resources leads to poor return to the farmers of the project area.
Opportunities:	**Challenges:**
• Goat specific FPC, and and support system from the RACP project provide enough opportunity for the goat rearars in the area for enhancing livelihood opportunity through creating new value chain for milk and efficient value chain linkages for live goat marketing • Goat cheese can be a good option and marketed with premium price. Fetches around Rs 1000 to 2000/kg depending upon quality. Mostly sold in five star hotels.	Mortality remains a challenge for the farmers and hence they sometimes tend to sell small animals at half body weight (meat estimation basis).

So is the scope of popularising goat farming with sutable interventions for improving meat productivity. Project intervention will also support small hoder's to collectively market breeding animals to institutional buyers.

4.2. Constraints in value chain crops of Bari Cluster

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

4.2.1. Production related constraints

Potato

Potato is important vegetable crop grown in Bari cluster, Productivity &production level is low for following reasons.

- Unavailability of good planting material.
- Improper field preparation, Timely plantation, Proper depth and row spacing, is not maintained
- Improper INM (Integrated Nutrient Management) on the basis of soil test report.
- Improper weed management.

Bajra

In Kharif Season Bajra has largest area under cultivation in the Bari cluster. Productivity & production level in the cluster is low for following reasons

- Negligence towards In-situ-soil moisture conservation practices.
- Improper seed bed preparation leading to low germination
- Non-adoption of recommended plant spacing as per soil types
- No application of organic manures.
- No application of basal fertilizers
- No seed inoculation with bio fertilizers
- Delay in sowing due to arrival of rains
- No protective irrigation

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

Potato

There is lack of post-harvest facility available for harvesting, cleaning and grading of harvested potatoes. 15 to 20 % losses due to Improper handling during harvesting, packaging and transport to market.

Bajra

In bajra manually harvesting and threshing is laborious, Bajra. Difficult to harvest as Bajra is usually cultivated with mix cropping.

Mustard

There is lack of cleaning and grading facility in Mustard. Mostly immature seed of mustard are harvested due to uncertain rain which occurs for less than harvesting period of mustard.

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 Bajra 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

Potato:

No major processing facility is available nearby the cluster. however, facility of cold storage available for storage.

Bajra

The processing facility of Bajra is available at market yard. Traders, after procuring and packaging Bajra send it to whole sellers and retailers while remaining material goes to animal feed unit.

Mustard

Small Processing facility is set up with in cluster area by the private ltd companies who are procuring material from traders from APMC with advance payments. they are interested to procure from farmers through farmer producer organisations only and not from individual farmers at Factory level.

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. The only rare exceptions are some contract farming and direct marketing initiative of a few (about 3,500) producers/farmers) and processors like Soufflet. Apparently, even such large players in Potato like SAB Miller and Carlsberg source significantly through APMCs in the cluster.

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.

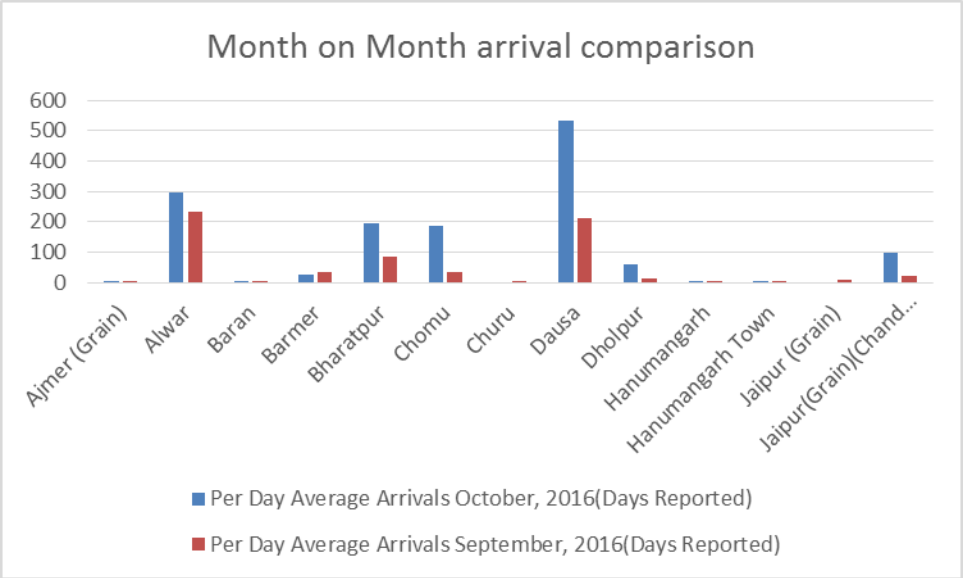
iii. There is acute lack of awareness among farmers regarding FAQ (Fair Average Quality) standards.

iv. Farmers do not practice the usage of basic equipment like moisture meter and weighing machine.

Distant markets: The nearest market from the cluster is the Bari APMC that is 55 kms away. This leads to farm gate selling where farmers receive non-competitive prices for their produce.

Fluctuations in prices: Generally, the price of Bajra 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. The table below illustrates case of Bajra prices for month of September and October 2016. It clearly shows that when prices in October 16 are less in almost all the APMCs than in September 16. This is mainly because of the heavy arrivals of Bajra in the month of October (refer graph).

Figure 5: Graphical presentation shows arrivals in October and September 16



Lack of marketing information: Due to a lack of market information regarding prevailing prices, arrivals etc., most of the producers' market Bajra in the Bari Mandi without studying the price trends.

Adoption of grading: Grading of Bajra 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 of Bajra i.e. excess weighment, delay in payment, high commission charges, delay in weighing and auction, different kinds of arbitrary deductions for religious and charitable purposes etc.

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

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. Team ABPF discussed contract farming issues with some of the processors and related challenges are given below:

i. **Rule 5** – Each agreement shall be written on stamp paper of the value of Rs.100. This increases cost of procurement and procurement time.

ii. **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.

iii. **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.

iv. **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 Bari Cluster

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

Potato:

S.no	Constraints	Action
1.	**Production**	
1.1	Limited awareness about processing varieties of potato varieties like, chipsona which could be cultivated in local climate.	To promote both table purpose varieties and processing purpose varieties
2.	**Post-Harvest**	
2.1	Lack of proper grading facility	To make farmer aware about quality parameter of potato for processing like value added products; grading facility as part of FCSC
2.2	Contractual harvesting of potato	Setting up alternate channel to sell directly from PC to processor or large retail shops.
2.4	Due to same harvesting time prices Collapse and hence storage/pack house option could help reduce distress sale.	Storage facility/ mini cold storage for farmers as part of FCSC
3.	**Processing**	
3.1	Lack of precooling and cold storage facility in the cluster	Setting up pre cooling and/or cold storage facility as part of FCSC or individual enterprise or start ups
3.2	Limited processed product available in the market which limits the marketing potential of the commodity	Facilitate the entrepreneur development to set up small scale processed product like chips, potato powder, potato biscuits, granules etc. and frozen foods like potato patties, puffs, wedges, pancakes etc

Bajra:

S. No	Constraints	Action
1.	**Production**	
1.1	High production cost due to cost of seed and Agri input requires like fertilizer pesticides etc.	Pooled procurement through FPCs to reduce cost of inputs and ensure quality inputs.
2.	**Post-Harvest**	
2.1	Moisture content of harvested Bajra is high, because of that farmers get less price.	To make Framers aware about market price of bajra proportionate to moisture content, making availability of moisture meters in FCSC
2.2	High dirt content /foreign material in harvested millet.	Ensure availability of the Cleaning & Grading facility to farmers; usually in 10% higher income accrual to farmers.
2.3	Lack of market information related to price	Price discovery through NCDEX, eNAM
2.4	5 / 11 quintals/acre in poor/good harvest.	Storage facility for farmers as part of FCSC

	During good harvest prices Collapse and hence storage option could help and distress sale.	
3.	**Processing**	
3.1	Not aware of special license option to source directly from farmers /FPOs.	Awareness seminars for farmers/Processors
3.2	Limited processing products are available in bajra	Promote handmade Namkeen bajra product
3.3	Lack of proper Product marketing	Awareness on Product Branding
3.4	Processor not aware of schemes of the GoI Including CLCSS, cluster Development scheme or "Sampada" for technology upgrading.	Awareness seminars for processors

Mustard:

S.no	Constraints	Action
1.	**Production**	
1.1	High cost of inputs including seeds, fertilizers and pesticides.	Pooled procurement through FPCs to reduce cost of inputs and ensure quality inputs.
1.2	Farmers not following recommended package of practices	PC to undertake custom hiring services & lead to farm mechanization
2.	**Post-Harvest**	
2.1	Inadequate storage facilities leading to post-harvest losses and distress sale during bumper harvest	Establishment of storage facilities by PC as a part of FCSC
2.2	Large no. of intermediaries in the value chain leads to low producers income	FPC to undertake bulk supplies to large processors.
3.	**Processing**	
3.1	Limited processing units for mustard and its by products such as mustard oil unit, mustard paste and sauce unit, etc.	Facilitate start-ups in secondary processing from amongst PCs or individual entrepreneurs and start ups

Goat

S.no	Constraints	Action
1	**Production**	
1.1	Most of the available animals are non-descriptive resulting in low yield of milk/meat	Distribution of bucks of good variety
1.3	Mortality of goats	Rural Technology Center for providing health care services and promoting rural employment
2	Marketing	
2.1	Non availability of live goat marketing infrastructure	Promotion of goat marketing through FPC through rural haat.
2.2	Non availability of community institution for goat rearers	Promoting a goat specific FPC

4.4. Interventions in the value chain crops of Bari cluster

4.4.1. FPC Development Approach

The FPC development approach may be viewed as depicted below:

Figure 6 FPC Development Approach

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

i. **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.

ii. **Initial discussions with MTG leaders**: After PRI is done, initial discussion will be done with the MTG leaders for further orientation on FPC concept.

iii. **Identification of MTG leaders**: MTG leaders who show inclination to the concept will be selected in the executive committee for FPC formation.

iv. 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.

v. 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.

vi. **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.

vii. **FPC business:** Following registration of FPC, ABPF will prepare business plan for the FPC and facilitate market linkage for input and output.

viii. 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)

i. Godown for storage, drying platforms
ii. 2-3 MT per hour grain cleaning, grading, and packing machinery with shed
iii. Additional need based Agricultural Equipment
iv. Computer with internet connectivity for market information
v. Display Board with Accessories
vi. Auction Hall
vii. Input Suppliers Shops
viii. Toilets
ix. 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 these investments

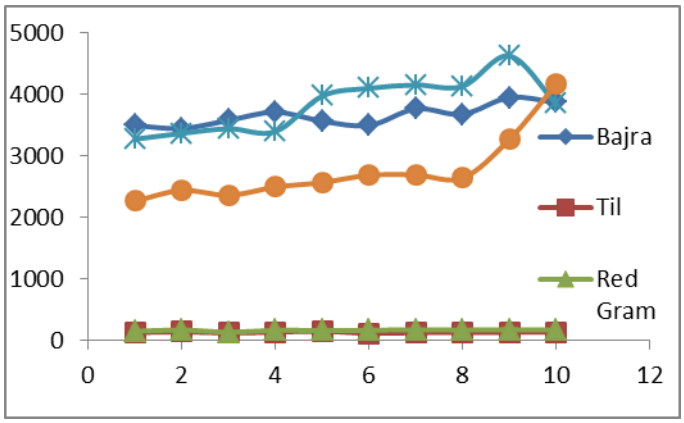
Post-Harvest infrastructure is of great relevance to small-holders, who tend to be geographically dispersed. The lack of primary processing infrastructure and efficient transport can therefore be a particular obstacle, making it difficult for them to obtain essential inputs and get their produce to markets. 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 in 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

Bajra (Pearlmillet), Mustard and Wheat are the major crops of the cluster. Use of sprinklers as well as drip irrigation is inevitable to reduce the production cost and improve the irrigation/ field water use efficiency. However, introduction of more efficient techniques (viz. Drip and mini sprinklers) is imperative along with the increment in domain of sprinklers. Fertigation and Automation techniques need to be demonstrated to synergise the micro irrigation technology.



The hybrid varieties for Bajra crop and improved seed of the wheat crop is being used but the seed replacement rate (SRR) for Mustard, Sesame, Red Gram 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. Diversify the present wheat crop to mustard and Barley with the aim to improve the irrigation water use efficiency and to develop a new value chain crop through demonstrations and capacity building.
c. Promotion of farm mechanization to reduce the cost of production.
d. Promotion of seed production and adaption support to improve the SRR and the farmer income.
e. Promotion of fodder production to reduce the gap of demand and availability of fodder for the animals.
f. Introduction of ICT based extension system for the quick reach of the solutions to the beneficiaries.
g. Capacity building of the beneficiaries to achieve the PDO.

Detailed description on the activities is given in the Annexure 5.1.

The Investments and Cost Estimates under Agriculture Subcomponent under RACP Bari

To achieve the above proposed cropping pattern and productivity level, the Seed Replacement Rate has to be increased so that productivity can be increased. To promote farmers to achieve above targets following investments of amounting **Rs.819.48 lacs** have to be done under Agriculture sub component. Out of this **Rs.661.18 Lacs** to be provided by the project and **Rs.158.30 Lacs** would be borne by the beneficiaries.

The Investments and Cost Estimates under the Agriculture Subcomponent under RACP, Bari:

Table 11: Investments and Cost Estimates under the Agriculture Subcomponent under RACP

S. N.	Name of sub-component	Unit	Unit cost	Assistance (%)	Physical	Assistance	Beneficiary Contribution	Total Project Cost
						Financial Rs. In Lacs		
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	1.30	75	25	24.375	8.12	32.50
4	Mini/ Micro Sprinkler Irrigation System	ha	0.90	75	50	33.75	11.25	45.00
5	Sprinkler Irrigation System	ha	0.20	75	637	95.50	31.83	127.33
6	Pipeline for piped conveyance of irrigation water	100 mtr	0.10	75	767	57.50	19.17	76.67
	Sub Total 1A					**230.25**	**76.75**	**307.00**
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	1250	1.03		1.03
2	Demonstrations on production technologies for value chain crops to bridge gap	ha	0.10	75	1250	86.41	28.80	115.21
3	Demonstrations on farm mechanization and PHM technologies	Nos.	1.00	75	110	82.50	27.50	110.00
4	Demonstrations on forage/ fodder	Ha	0.10	75	160	11.99	4.00	15.99
5a	1. Promotion to seed production	Ha	0.05	100	200	10.00		10.00
5b	2. Promotion to Adaption support	Ha	0.05	50	650	16.25	16.25	32.50
6	Innovative activities/ INM/ IPM	No.	1.00	75	20	15.00	5.00	20.00
	Sub Total 1 Ba					**223.18**	**74.39**	**297.57**
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.	3.50	100	2	7.00		7.00
2	Agriculture Research Institute strengthening to serve as level II/ III platform for ICT	Nos.	3.00	100	1	3.00		3.00
3	Honorarium to the experts for solution of the problems and facilitate field visits	LS	1.00	100	2	2.00		2.00
4	Digital instruments to field coordinator/ staff	Nos.	0.50	100	20	10.00		10.00
5	Potential threats led/ Pro-P based literature on cluster specific crops	Nos.	0.50	100	2	1.00		1.00
	Sub Total 1 Bb					**23.00**	**0.00**	**23.00**
	Sub Total 1 Ba +1 Bb					**246.18**	**74.39**	**320.57**
	Sub Total 1 (1A + 1 B)					**476.43**	**158.30**	**634.73**
2	**Component 2: Markets and Value Chains**							
	Sub Total 2							
3	**Component 3: Farmer Organization and Capacity Building**							
1	Field days, exposure visits, orientation, capacity building	LS		100	15	29.83		29.83

S. N.	Name of sub-component	Unit	Unit cost	Assistance (%)	Physical	Assistance	Beneficiary Contribution	Total Project Cost
						Financial Rs. In Lacs		
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	143.80		143.80
	Sub Total 3					**173.63**	**0.00**	**173.63**
4	**Component 4: Project Management, Monitoring and Learning**							
1	PIA Operating costs	LS		100		11.12		11.12
	Sub Total 4					**11.12**	**0.00**	**11.12**
Total Cost (Agriculture Department)						**661.18**	**158.30**	**819.48**

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 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 Guava, Mango & Lemon etc., hence, the area under pearl millet in Kharif crops, would be diversified in to the cultivation of vegetables and fruits crops. Looking to the potentiality and acceptance of the area Potato, Tomato, Cole Crops & Cucurbits in vegetable crops, Guava, Mango & 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.

a. 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.106.78 lacs is to be made on demonstration and establishment of 38 ha orchard with Pomegranate, lemon and papaya orchard establishment. The assistance will be provide 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.

b. 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. 389.90 lacs is to be incurred for demonstration and establishment of 70 ha orchards with Guava and Mango HDP (3x3m spacing). The assistance will be provided 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. 116.8 lacs is to be incurred on demonstration and cultivation of 40 ha with Potato, Tomato, Cole & Cucurbits, which are the leading crops & selected for demonstration. The assistance will be provided 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.88.00 lacs is to be needed for establishment of green house in 8,000 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. 192.5 lacs for 35 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. 30.0 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. 21.00 lacs.

Farmers training, Seminars, Exhibition Kisan mela etc

These extension methodologies have been proposed to make farmers acquainted with the best available technologies and to promote adoption. The training programmes, exposure visits, seminars, kisan mela etc would be organized with the support of Irrigation Management and

Training Institute (IMTI) and other suitable institute. The trainings would be implemented as per the training manual of RACP.

The investments under the horticulture sub component

Total **Rs.669.89 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 Bari cluster. Out of this an amount of **Rs.489.34 Lacs** will be provided from the project and **Rs.180.55 Lacs** would be borne by the beneficiaries. The investments are being summarized as under:

The investments under the horticulture sub component are being summarized as under:

Table 12: Investment proposal for the Bari Cluster and Cost Estimate under RACP for FY 2016-17 to 2018-19

S. No.	Name of sub-component / Activity	Unit	Unit cost	Assistance (%)	Amount of Assistance	Grand Total (Rs. In lacs)			
						Physical	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	38	26.676	80.104	106.78
i.	First year Maintenance support	ha	0.58	75	0.435	20	2.9	8.7	11.6
ii.	Second year Maintenance support	ha	0.75	75	0.561	5	0.945	2.805	3.75
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	40	29.2	87.6	116.8
4	Assistance on green house	SqM	0.01	75	0.00816	8000	22.72	65.28	88.00
5	Assistance on shade net house	SqM	0.01	75	0.00647	0	0	0	0
6	Solar Pump Program	Nos	5.5	70	3.85	35	57.75	134.75	192.5
7	Post-Harvest Management	Nos	28	50	14	1	14	14	28.00
8	Horticulture Mechanization	Nos	7.5	50	3.75	4	15	15	30
9	Micro Irrigation in Horticulture Crops (Drip System)	Ha							
	Fruits		0.80	75	0.60	10	2.00	6.00	8.00
	Vegetable		1.30	75	0.975	10	3.25	9.75	13.00
	Sub Total IB						**180.553**	**442.337**	**622.89**
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						**180.55**	**489.34**	**669.89**

5.2.3. Livestock

RACP envisages investing and working in a cohesive way with all the identified components for benefitting farmers, especially small holders in a sustainable manner, up-scaling the successes and documenting the learnings. For this purpose, it is planned to prepare the Cluster Agriculture Competitiveness Plan (CACP). The CACP has a defined objective and after analyzing primary and

secondary data of the cluster proposes interventions including investments, Community level Institutional Development, Water Conservation and Resource Management, Climate Resilient Agriculture, and Value Chain Development. The CACP provides a detailed project report for the selected cluster. CACPs are prepared through a participative process involving a broad range of stakeholders, including private sector.

Based on the constraints identified with the community, project investments are planned to achieve the Project Development Objectives (PDOs). The details are as under the identified and eligible Investments under the project

Climate resilient agriculture –It is planned to improve productivity (milk and weight gain) through investment in breeding, feeding and animal health services.

Market and value Chain- It is planned to establish separate goat milk collection chain by establishing chilling nits in a phased manner and also installing a processing and packaging facility of goat milk. Improving market access for goat rearing farmers is to be done through rural haat.

Capacity building- supporting farmer advisory and training of farmers, and training of existing Animal Husbandry Department's technical staff

Project management & Monitoring

The impact of investment will arrive from increased profit to farmers by realising a higher price for their goats (through access to market information and value chain development not only through sale of animal/milk & meat, but also products like manure, hair, and hides); increased sale of goats due to reduced mortality and higher fecundity; and increased productivity (as a result of better breeding, feeding and healthcare). Women in particular will benefit; they provide the majority of labour for goat production though they are often excluded from marketing the produce.

The following activities would be undertaken at the Bari cluster under Livestock Strengthening and management component:

Climate Resilient Agriculture

Productivity enhancement

Breed improvement; and advisory services to ensure that the breeding cycle coincides with market demand, climatic conditions/ resources availability. This will include:

i. Improved Jamnapari Bucks distribution to MTG members
ii. Goat distribution to Widows and/or specially abled women for livelihood development
iii. Risk Coverage through Animal Insurance

Low milk yield and low weight gain in non-descript goat population of the cluster is the major constraint for improving farmers' income. The Department of Animal Husbandry breeding policy recommends Jamnapari breed for the cluster area, so it is planned to induct elite breeding bucks in the area. The Project will support distribution of breeding bucks to those MTG (Goat) members who have at least 10 breeding goats. It is found that in the cluster many women especially widows and disabled are in need of livelihood support and they are willing to adopt goat farming. It is planned to support these women to provide a unit of 4 Goats for adopting goat farming. Asset insurance is critical for the poor and small holder farmers; under the project distributed bucks and goats will be insured with project support.

Activity	Total Requirement	Year Wise requirement		
		I year	II year	III Year
Buck Distribution	325	125	100	100
Goat Distribution	180 MTG Members	25	100	55
Animal Insurance	1045	225	500	320

The primary objective of investment under livestock strengthening and management component of RACP (Rajasthan Agriculture Competitiveness project) is to improve Goat productivity and provide market access for the produce. This will improve the competitiveness of the small holder and improve her income from the activity.

Goat productivity **majorly depends upon the breed** and also on nutrition & management. In context of the project cluster small goat rearer keeps non -descript (not true to breed) goats; this results in low milk production and weight gain. To improve the breed of the goat of the farmers in the project clusters; it is envisaged to induct quality bucks to those MTG members who are already keeping goats.

Project will primarily support **sourcing of elite bucks from open nucleus farm for multiplier herds (RAJUVAS) and from the multiplier herd to the MTG members** Goat usually reared by small & medium landholders that too 50-100 in numbers (max) by a farmer; looking to the constraint of resources esp. fodder & space availability. These farmers keep very good quality goats and bucks and by selling the progeny maintain their herd size. These farmers are usually available on the breeding tract of the particular breed. So in a sense well organized suppliers/vendors in the form of large breeders are very limited for buck & goat procurement. . There would be many breeding herd from which MTG can select animals directly without involvement of any middleman.

It is proposed to **procure buck and goats** by a cluster level committee (including MTG members & Veterinary doctor of the department of animal husbandry). The committee will procure from organized Farms (very few) and in case of non-availability/ suitability they may procure from private farmers of the breeding tract.

In the case of animals' procurement, **selection of each animal is important because standardization of all characters and uniformity among all is not possible**. In the project farmer's contribution for buck purchase is 25 percent of the purchase cost. Bucks & goats being the valuable asset of poor small holder farmer, it is always advisable to cover the risk factor of mortality of the animal or permanent disability through insurance coverage. Considering the importance of Buck/Goat insurance coverage, the component was included in the animal husbandry activities. MTG members will also contribute 25 percent of the insurance premium cost and rest 75 percent will be supported as project contribution.

Improved feeding practices:

This may include better utilisation of local resources; improving fodder availability, silvi-pasture development on common lands and fodder demonstration on private lands, better integration of crops with livestock through simple storage, production and processing of crop residues to include, feed blocks, chaffing and fodder banks. Watershed department is doing pasture development work in the project clusters. It will be suggested them for plating as per the local climatic conditions and fodder requirement. Potential for storage and pelleting will also be explored. These will improved feeding practices which proposed are described in the following points:

Azolla Demonstration to MTG members

The cost norm for demonstrations would cover the expenditure on provision of critical inputs i.e. know-how, seeds, fertilizers, insecticides, micronutrients etc. Fodder Demonstration will be organized/laid out on the field of members of MTGs. One demonstration only would be provided to one farmer. The area of each demonstration would be up to 0.4 ha per farmer and an estimated cost of the inputs would be around Rs.5000 (on actual basis)/0.4 ha. Project will support the full cost of seeds and inputs (Fertilizer, pesticides & micronutrients). This component may be linked up with the Department of Agriculture.

The demand for milk and meat is creating new potential in the profitability of animal husbandry as an occupation. Yet, at the same time, there is a substantial decline in fodder availability. The area

under forest and grasslands is decreasing as is the amount of various crop residues available for feed, largely due to the introduction of high yielding dwarf varieties. The shortage of fodder is therefore compensated with commercial feed, resulting in increased costs in meat and milk production. Moreover, as commercial feed is mixed with urea and other artificial milk boosters, it has a negative effect on the quality of milk and the health of the livestock. The search for alternatives to concentrates led us to a wonderful plant azolla, which holds the promise of providing a sustainable feed for livestock.

Azolla is a floating fern and belongs to the family of Azollaceae. Azolla hosts symbiotic blue green algae, Anabaena azollae, which is responsible for the fixation and assimilation of atmospheric nitrogen. Azolla, in turn, provides the carbon source and favourable environment for the growth and development of the algae. It is this unique symbiotic relationship that makes azolla, a wonderful plant with high protein content.

Demonstration of Azolla with capacity of producing sufficient Azolla for feeding minimum 20 +1 unit of goats daily (Approximately 3 KG. Daily) will be organised at MTG's field. AS being new technology initial 1-2 days field training & hand holding support and all related inputs will be provided with project support. One demonstration would be given per farmer.

Activity	Total Requirement	Year Wise requirement		
		I year	II year	III Year
Azolla Demonstration	600	0	300	300

Chaff cutter Demonstration to MTG members

To save the wastage and improve digestibility project will demonstrate and motive chaff cutter use by small holder farmers. Good quality manually operated Chaff cutter as per BIS specification will be provided to goat rearer with project support**.** DAH through NGO will promote regular use of chaff cutter.

Activity	Total Requirement	Year Wise requirement		
		I year	II year	III Year
Chaff Cutter Distribution	800	275	350	175

Feed supplement to Goat & Buck of cluster:

Goats have an ability to thrive in the harshest environments. Their high digestive ability enables them to deal with high cellulose/high fibre diets of a very coarse nature; with its relatively large digestive system in relation to its body size, the work of digestion involves the use, and loss, of large quantities of minerals. Goats are also prolific breeders; achieve sexual maturity at the age of 10-12 months. Gestation period is short and at the age of 16-17 months and starts giving milk. Twining is common and triplets and quadruplets are also possible.

It is observed that growth rate (body weight gain) and timely fertility gain of female goat restricts goat farming economics in the cluster. One of the reason in the cluster is absence of essential minerals and vitamins in the goat feed. Small holder's lack resources to buy quality feed supplement and DAH resources usually exhaust with large dairy animals.

In this context, the project may support the goat population of the cluster for feed supplement (20 gm per day for 90 days in a year) to demonstrate benefits:

Activity	Total Requirement (KG)	Year Wise requirement		
		Ist year	II year	III Year
Feed Supplement	4500	0	2000 Buck & Goat	2500 Buck & Goat

Animal Health Services

It is observed that timely availability of animal health services, both prophylactic and curative are very important for ensuring productivity and this leads to better returns to the farmers. Common diseases like PPR, ET and kid mortality can easily be controlled by animal health management. For animal health management major identified constraints in the cluster are:

a. Availability of animal health services at village level

b. Regular Deworming and Vaccination
c. Local Resource for motivation and support
d. Regular health check-up of the stock
e. Strengthening of Animal Husbandry institutions for providing quality animal health care

For overcoming above constraints in possible effective sense following investments are planned for livestock owners especially the small holders. Animal Health services will be provided to Large as well as small animals through Animal health Camps, RTC and Mobile Van.

Establishment of Rural Technology Centers (RTCs)

Suitable existing institutions of Department of Animal Husbandry will function as Rural Technology Centres (RTCs) in the project clusters at the strategic location for livestock development with aim to provide health, prophylactic services and centres for technology demonstration & extension.

There would be two types of RTC: A & B Grade, "A" grade shall ideally be centrally located. Vet. Doctor placed at RTC 'A'grade will be responsible for organising all the project activities under DD LSD / OIC RACP supervision, in the cluster and also manage Emergency animal health services.

DAH has 5 Veterinary hospitals (Aanwa, Banthali, Rajkot, sitapura and Bari), and 6 sub centres (Junia, kanwara, badoli, khawajpura, chansinghpura and Dholpurrawas). In the project area. But available infrastructure is not sufficient to provide effective services to the livestock owners. Therefor additional support is required for extension and capacity building services at technology centres.

Following Locations in discussion with community and department of AH are identified for RTC's in the Bari cluster

RTC "A" Grade:- Bari with Rural Haat

RTC"B" Grade;- 1. Aangai 2. Bhagwan singh ka pura

The Project will support building construction and procurement of basic furniture, equipment and recurring expenditure during project period for effective functioning of RTCs. The RTC will have an organic relation with DAH as after the project period assets and functions will be transferred to DAH. The RTC will also have facility for feed & fodder, vaccine, medicines & mineral mixture Storage. The meeting place for MTA/PO/Cluster federation, RTC can be a place for organising health camps, training, exhibition and seminars.

RACPPMU & DAH with the help of construction expert will finalise the design of the RTC. The RTC will also have required equipment and furniture etc. Facilities for organising trainings, meetings and farmer's workshop will also be created. The project will also support operating cost of the RTCs that will include office expenses, running and maintenance cost of the emergency mobile vehicle.

Health and awareness camps

a. It is planned to organize need based health and sterility camps periodically through Rural Technology Centre (RTC)/ DAH institutions in order to cover all health related issues in the project area. The health camps will be organized for vaccination; deworming, etc. **at least once in a month in each gram Panchayat**.
b. Organization of health care and awareness camps by RTC/ DAH institutions where activities like vaccination, de-worming, castration, Feed supplement distribution, treatment, extension, etc. will be undertaken.
c. Health check-up and treatment of infertile animals shall be covered in these camps. Department of Animal Husbandry in consultation with research institutions shall provide technical aid in addressing health related problems in the project area.

d. DAH will organise health camps under its free vet. Medicine and **"Pashu Chiktsayalya Pashu Palakke Dwar"** scheme and project will financially support Rs.5000 per camp for additional expenses. This will cover expenses towards registration/vaccination, cleaning, tent, sitting, water, publicity, small refreshment and miscellaneous/contingency.

e. Further the opportunity will be used for organising Farmer's meeting (Pashu Palak Goshti) of at least 50 farmers for disseminating the latest technical and other information and knowledge of animal husbandry.

Activity	Total Requirement (No)	Year Wise requirement		
		I year	II year	III Year
Animal health Camps (One per GP per month)	456	192	132	132

Mobile Emergency Animal Health Van cum Ambulatory clinic:

The mobile Emergency animal health van cum ambulatory clinic is an excellent support tool for implementation of the activities related to the animal husbandry. The Mobile van will provide animal health services

The Project will provide one Mobile animal health van cum ambulatory clinic in cluster and 100% cost will be borne by the project and it will be procured by the project as per the World Bank procurement guidelines. The project will also support its running and recurring expenditure during the project period. It will be handed over to the DAH and will be used for providing services in the cluster The Mobile vehicle shall be equipped with storage of medicine/ vaccines, primary testing and minor surgical interventions.

Department of Animal Husbandry Rajasthan has given commitment for operating RTC and Mobile van to provide regular services to the project cluster even after the project period. The assets has been handover to the DAH.

Installation of Travis in project cluster:

The Project will support the animal health services in the project cluster villages, and for inspecting the animal it is essential to restrain the animal. This is safe for the professionals and also comfortable for the animal. It is planned to install travis for restraining the animals in all the villages where already not available through department of animal husbandry. Actual requirement will be accessed and procurement will be done as per World Bank procurement guidelines.

Animal husbandry management and advisory support

Distribution of Feeding and water troughs to MTG members

It is observed that there is no standardisation in feeding and watering appliances. The animals tend to contaminate the feed in most of these devices by voiding faeces and urine and by standing inside or over these feeders or keeping the fore legs inside these devices. Farmer incurs about seventy percent running expenditure on feeding material. To minimise the cost, it is of utmost importance to reduce the wastage and contamination of feed and to increase efficiency of feeders. It will also help in the prevention of goat diseases, caused due to contamination of feed and water. Design developed by CIRG (central Institute for Research on Goats) Makhdoom U.P. will be utilised as these feeders are suitable for various types of feed and fodder.

Activity	Total Requirement	Year Wise requirement		
	(No)	Ist year	II year	III Year
Feeding & Water Trough	600	0	300	300

Heifer International will also be consulted for alternative model. This unit (One feeding trough and one water trough) is costing Rs.5000 i.e. USD 80 only. Average life of the troughs are at least 5 years. In feeding trough fodder and concentrated can be feed in parallel. Through Water trough it will be demonstrated the importance to making available water ad lib for improving milk

productivity and growth. Many Breeding Farm and herds are already using CIRG model by themselves.

Goat Housing

Presently Goat rearing on zero input concepts is mainly sustained but this does not provide attractive returns to the farmers. Goat are exposed to harsh environmental conditions, does not provided balance ration and scientific health management; leads to underutilization of resources and lower returns.

The Project will support adoption of intensive or semi intensive goat management system by the farmers. Goat housing is important in intensive system of production; in fact one must ensure proper comfort of animals for production to gain maximum profits. The main aim of housing is to protect animals from harsh, uneven climate as well as environmental stress. The goats shall be provided enough floor space to avoid crowding and proper ventilation. NREGA Model has been adopted so that remaining beneficiaries can be motivated and linked with NREGA for adoption.

The Project will also support construction of goat house for one (40 goats+1Buck) Unit with 220 Sq Feet floor space. The design will be prepared by utilising local material to reduce cost. The Project may support 75 percent of goat house cost and remaining 25 percent cost will born by the beneficiary.

Activity	Total Requirement	Year Wise requirement		
	(No)	Ist year	II year	III Year
Goat House	90	0	45	45

Lady Link Worker cum Marketing Facilitator

Small Ruminant development especially for small holder is possible only through regular and timely help. This is only possible when a local resource person is available with information and professional linkage. Under the project it is envisaged that one progressive women farmer preferably MTG member per Gram Panchayat, will be trained as resource person i.e. Lady Link Worker cum marketing facilitator.

This worker will be the local common linkage both for the project and women farmer. She will maintain the inventory of MTG members', their goats, goat health status, project activities schedules etc. She will coordinate organisation of camps and Goat Haats for the project beneficiaries. LLWs will have support of ICT application for information dissemination and marketing access.

Roles and Responsibilities:

a. LLW will facilitate extension services; make farmers aware about vaccination, de-worming and health care, feed - fodder and housing and other management practices.

b. LLW would support in timely implementation of various activities planned under AHD component of RACP

c. LLW would also facilitate formation and mobilising the MTG (goat)

d. LLW shall play a role in creating awareness about animal health, safety in case of outbreak of contagious diseases, extreme climatic changes like heavy Rainfall, flooding, extreme cold and hot temperatures, food scarcity due to drought.

e. LLW shall creating awareness in neo-natal care of young kids and does, weaning and milking of goats.

f. Lady Link Worker shall play role of entitlement facilitator and enhancing outreach of schemes of Department of Animal Husbandry to marginalized farmers.

g. She will maintain an inventory of ready to market animals for organizing rural haats and also motivate farmers to sell animals on weight basis.

These LLWs will be supported initially for monthly work related honorarium. After Project period the model will be self-sustainable. The LLWs will make following services available to the goat farmers and on cost basis:-

1. Sale of Bucks and Goats (On commission Basis)
2. Selling feed and other inputs
3. Selling inputs like Azolla, Chaff cutter, Clean milk Kits, weighing balance, feed and water troughs etc. They will be linked with the quality supplier of the project.
4. LLWs may also be train for goat milk collection and testing so they can work as milk collection center operator (commission Basis)

Market and Value Chains

To improve market and value addition, the project will support:

Formation of Farmer Producer groups

Multi Task Groups (MTG) for Goats that would enable the producer to access diversified markets, better access to inputs and services on a gender equitable basis and access to market information. The Goat farmers are to be organized into MTGs @10-15 farmers per MTG through NGO selected by PMU RACP. On the basis of the potential of goat farming and available resources a total of 90 **MTGs (Goat) will be organized in the project cluster**. Selection criteria for Small Ruminants (SR) farmers to become member of MTG would be as follows. Farmer should be:

i. Only women and preferably small or marginal goat rearer
ii. possess at least 3 goats (not essential for widows and specially abled)
iii. Willing to participate in the programme and willing to contribute her investment as per pattern of funding.
iv. Members of SC/ST community must be included at least as per the funding pattern.
v. The list of members shall be informed to Gram Panchayat, if Gram Panchayat have any observation/suggestion shall be communicated to Implementing Agency for improvement.

Small ruminant market "Rural Haat" in the project cluster

Marketing is most crucial activity for producers to realize proper price and income of their farm produce. One of the major constraints identified to raise the income of goat farmers in the cluster is absence of any animal/Small ruminant markets. Further no standards are laid down for small ruminants marketing.

In goat value chain actors involved are farmer, block/district/state level trader, butcher, retailer and consumer. Live goat, initially, moves from farmer to traders at different levels and further moves up in the value chain in processed form (meat). The key actors involved in goat value chain are as follows:

Farmer- Goat rearing farmers are usually small and marginal farmers who have small landholdings of 0.6 hectare to 1.4 hectares. Their entire livelihood depends on wage labour & agriculture and allied activities. These farmers have flock size of five to twenty five goats. Average flock size of 7 goats per farmer was found in Rajasthan. Farmers are not oriented towards sale of goat milk and limit themselves to the sale of live goat which is mainly used for meat purpose.

Trader- The traders in goat trading business are mainly from Khatik and Muslim Community in Rajasthan and they work on different levels i.e. block, district and state level in goat value chain. Traders visit 4-5 villages to directly procure goats from farmers and sell it either to retailer (butcher) or block and district traders. Depending upon collection, traders in turn sell live goats either to district and state level markets or directly bring it to Ghazipur (Delhi) and Mumbai market. They also deal in marketing of Bakra-Eid goat which is governed by different marketing dynamics.

Commission Agent- Commission agents facilitate transactions between buyers and sellers in goat market. These commission agents provide services such as shed area to stock goats in night; credit facility to buyers and accommodation facilities to traders who arrive in goat markets.

Retailer (Butcher) - Butchers have their retail shops at village/block/district level. In some cases it was found that block traders double up as butcher and generally slaughter 2-3 goats daily at their retail shop. The district and state level retailers also double up as butchers and daily slaughter 10 to 40 goats and more.

Consumer- Live goat moves from farmers to traders and butchers. It is the goat meat that is consumed by end consumer located at village/block/district and state level. Each level of consumer shows different buying behavior and preference and can be broadly categorized in two categories i.e. regular goat meat consumer and Bakra -Eid consumer.

There is need for developing local markets at potential location where sale and purchase deals are done locally & timely and farmers get good price of their produce. In this context it is envisaged to establish one Small Ruminants markets at a centralized location of the cluster with basic infrastructure supported from the project.

The selection criteria for Haat includes: (a) Preferably it should be in the project cluster or very nearby (b) at least one weekly or fortnightly market can be organized in the haat; and (c) village Panchayat will provide place for Rural Haat (it may be already existing in the area, if it is not available then land (5-10 Bigha) will be provided free of cost)

Initially, DAH and RACP contract staff and Technical Resource Agency (TRA)/ABPF will mobilize the Farmer Producer Company (FPC)/ Community to initiate the goat marketing operation at Rural Haat and also build capacity of the community & PRIs so that they can implement rural haat on sustainable basis. Technical / Market Resource Agency/ABPF in consultation with PMU/PIU/DAH will finalize the SOP (standard operating procedures) of Rural Haat functioning.

The issue was discussed with the community, PRIS, local department of animal husbandry officials and "Bari" was identified as potential location of the SR Rural Haat. The Gram Panchayat is proactively supporting the market establishment and provided NOC for land allotment. The available land area is 10 bigha. Basic infrastructure (civil and Equipment) will be supported by the project as per World Bank procurement guidelines. Physical markets are required so that buyers can developed a faith that on particular date at a particular place farmers gather to sell their animals and they can source required quantity and quality from these rural haats.. In an organized market buying selling can occur in an transparent manner. This place will also use for extension of best practices of goat farming, displaying improved technologies, place for producer company meetings and capacity building of CBOs.

The illustrative facilities would be provided in the haat including among others Compound wall, few goat sheds, electricity/solar, drinking water, toilets Vet. Facility, loading-unloading platforms, waste disposal, feed storage office cum meeting room and essential equipment like weighing balance, milking machine, computer etc. Construction consultant hired by RACP will design the Rural Haat in consultation with PMU and DAH.

These SR markets will also be used for organizing health check-up camps, vaccination & deworming of SR, field visits & demonstrations, MTG /Producer Company meetings.

Distribution of weighing scale to MTG members

Live goat sale is the largest adopted method by the small holder farmers. Sometime in case of urgent need it becomes ready cash for the farmer. Goat sale usually occurs through middle man, who taking the benefits of approximation cheats the farmer by paying less in comparison to animal's actual weight. Project may provide advisory to MTG members for weighing the animals before selling and will also provide weighing scale for ready use. Weighing scale will also help farmers to know the weight gain of animals for supporting the right quantity of feed intake.

Activity	Total Requirement	Year Wise requirement		
		I year	II year	III Year
Weighing Scale	1125	0	1125	0

Goat Milk Value chain and Clean milk production

Bari cluster within have substantial goat milk production and strengthening goat milk value chain will provide remunerative price to the small goat rearers. The value chain may include milk collection, chilling and value addition and packaging. Nearness to the Agra and Delhi market will provide opportunity to market value added products like Goat Cheese. Value addition demands high quality milk and project proposed to support this practice in a coherent manner for adoption at the large scale. Post intervention value chain maps for milk and meat are given in Annexure 5.2.

Capacity Building and Training

Goat Management training of MTG members

A training need analysis has to be done for various stakeholders like goat farmers, NGO, and AHD staff. Accordingly, the relevant training programs will be organized for all the stakeholders. It will be ensured that majority of the members of MTG receives basic training involving skill up gradation and orientation on the technical and organizational aspects. Farmer Field School (FFS) model will also be adopted in the project.

The Project will support to organize exposure visits of successful Animal Husbandry projects for members of MTGs and professional staff with the aim to adopt best practices and improved technologies. Project will also support refresher training of professional staff engaged in project implementation at national level institute in relation to goat development.

In each village all the members of the MTG will be given 3 Days training on Goat Management at RTC/GP/Village level. This will cover General Management, Breeding, feeding esp. fodder development and Goat marketing esp. synchronization as per the market demand.

Activity	Total Requirement (No)	Year Wise requirement		
		Ist year	II year	III Year
3 days MTG Goat Management Training & 1 day refresher course	1350 MTG Members	50	650	650

Professional Training

It is observed that knowledge of veterinary professionals in the project cluster is also limited for goat management practices especially for latest development for feed and breeding as well as for cattle and buffalo. Veterinarians focus on animal health and have little knowledge of feeding and nutrition, breed improvement, housing and management, and marketing. They also do not receive any training in business management, farmer extension and communications

Professionals training of the DAH and project staff will be organized at reputed National institutes.

Goat Exhibition cum Seminars

Goat Exhibition cum Seminars will be organised to motivate farmers towards rearing quality animals and showcasing best practices. RTC will take the initiative with the help of NGO and under JD/DD LSD supervision. The goat exhibition cum seminars will be organised at the cluster level and as per the approved action plan and Project guidelines

Estimated Cost of Investments on Livestock activities

An estimated cost amounting of Rs.789.09 lacs is to be incurred as tentative investments for the implementation of various activities in Bari cluster. Out of this an amount of Rs.740.52 Lacs will be provided by the project and Rs.48.57 Lacs will be borne by the Beneficiaries. The tentative Action Plan & Cost Estimates for Bari cluster is being summarized as under:

Table 13: Estimated Cost of Investments on Livestock activities

S.	Items	UNIT	Unit	Assistance	Physical	Total Financial (Rs. In Lacs)

NO.			cost (Rs. In lac)	(Rs. In lac)		Farmer Share	Project Cost	Total Cost
I.	**Climate Resilient Agriculture**							
1 C	**Livestock Strengthening and Management**							
3	DISTRIBUTION OF BUCKS (FARMERS)	No.	0.100	0.075	325	8.125	24.375	32.5
4	DISTRIBUTION OF GOATS (WIDOWS & DISABLED) (One UNIT OF 4 GOATS)	No.	0.32	0.320	180	0	57.6	57.6
5	GOAT INSURANCE(8% PER ANNUM) OF UNITS RECEIVING IMPROVED BUCKS AND DOES	No.	0.008	0.006	1045	2.09	6.27	8.36
6	Veterinary Health Camp support (one camp Per GP Per month)	No.	0.05	0.050	456	0	22.8	22.8
7	ESTABLISHMENT OF REGIONAL TECHNOLOGY CENTER (RTC)							0
i.	A- GRADE	No.	60	60.000	1	0	60	60
ii.	B- GRADE	No.	30	30.000	2	0	60	60
8	Vehicle for emergency animal health services	No.	10	10.000	1	0	10	10
9	Operating cost of RTC including POL for Vehicle **	No.	3.6	3.600	6	0	21.6	21.6
10	link worker/MF honorarium (One per Gram Panchayat)	No.	0.36	0.360	22	0	7.92	7.92
11	Azolla Demonstration	No.	0.065	0.065	600	0	39	39
12	HOUSING SUPPORTS ***	No.	0.66	0.495	90	14.85	44.55	59.4
13	FEEDING & water TROUGHS DISTRIBUTION	No.	0.05	0.038	600	7.5	22.5	30
14	Travis installation in project villages (one per village)	No.	0.15	0.150	44	0	6.6	6.6
15	DISTRIBUTION OF CHAFF CUTTER	No.	0.08	0.060	800	16	48	64
16	ANIMAL IDENTIFICATION							0
i.	TAGS	5000 Nos	0.00018	0.00018	5000	0	0.9	0.9
ii.	NEEDLE	5000 Nos		0.000	360	0	0	0
iii.	TAG APPLICATOR	5000 Nos	0.015	0.015	10	0	0.15	0.15
17	Weighing Balance	No.	0.01	0.010	1350	0	13.5	13.5
18	Feed Supplement Distribution	No.	0.00126	0.001	4272	0	5.38272	5.38272
17	ICT Support for LLW/MF	No.	0.1	0.100	11	0	1.1	1.1
18	ILD centre	N0	10	10.000	0	0	0	0
	Sub Total					**48.57**	**452.25**	**500.81**
II.	**Market & Value Chain**							
1	FORMATION OF MTG (Goat)	No.	0	0	90	0	0	0
2	ESTABLISHMENT OF RURAL HAAT****	No.	200	200	1	0	200	200
3	Clean Milk Production	No.	0.01	0.01	2700		27	27
4	Goat Milk Collection & Value Add	No.	25	25	0		0	0

S. NO.	Items	UNIT	Unit cost (Rs. In lac)	Assistance (Rs. In lac)	Physical	Total Financial (Rs. In Lacs)		
						Farmer Share	Project Cost	Total Cost
	Sub Total					**0**	**227**	**227**
III.	**Farmers Organisation & capacity Building**							
1	MTG members Goat Management	No.	0.02763	0.02763	1350	0	37.3005	37.3005
2	MTG members Refresher Goat Management	No.	0.00545	0.00545	1350	0	7.3575	7.3575
3	LLW training	No.	0.075	0.075	11	0	0.825	0.825
4	Professional staff training	No.	0.075	0.075	10	0	0.75	0.75
5	Goat Exhibition/Seminar	No.	0.5	0.5	2	0	1	1
	Sub Total					**0**	**47.233**	**47.233**
IV.	**Project Management & M&E**							
1	Operating expenses of DD Office	No.	0.6	0.6	3	0	1.8	1.8
2	District Goat Development Plan Consultation (One at each District)	No.	2	2	0	0	0	0
3	Vehicle on Hire for Cluster /POL	No.	1.8	1.8	3	0	5.4	5.4
4	Incentive for different project activities (Rs 1500 per capm)	No.	0.015	0.015	456	0	6.84	6.84
	Sub Total					**0**	**14.04**	**14.04**
	TOTAL					**48.57**	**740.52**	**789.09**

** Department of AH Rajasthan has given commitment for sustaining these after project period.

*** NREGA Model has been adopted so that remaining beneficiaries can be motivated and linked with NREGA for adoption.

**** Physical markets are required so that buyers can developed a faith that on particular date at a particular place farmers gather to sell their animals and they can procure required quantity and quality from these rural haats. In an organized market buying selling can occur in an transparent manner. This place will also use for extension of best practices of goat farming, displaying improved technologies, place for producer company meetings and capacity building of CBOs.

5.3. Market and value chains

It 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 and ultimate consumers, (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) PESTEL & SWOT analysis for each value chain for intervention. (xiii) Comparative study of stakeholders' role and cost contribution in each cluster separately.

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: Bajra, Barley and Mustard along with vegetables primarily Carrot, Tomato and Chilli. 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. **Bajra**

The concept of FPC as suggested in Chapter 4, will get complimented by an FCSC unit. A reference value chain map of Bajra, post intervention along with the incremental benefit by comparing the traditional marketing chain of farmer with a suggested marketing chain, is shown in Annexure 5.2.

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. A reference model is proposed in Annexure 5.3.

2. **Mustard**

Value chain map of Mustard, post intervention along with the incremental benefit comparison is show in Annexure 5.2.

In mustard, a mini oil unit can be a primary processing unit because as per the consultation, in mustard, only cleaning and grading will not increase the returns by such margin. Hence a mini oil mill unit can be proposed including oil testing machine so that member farmers can have option of selling their produce in open market just by checking the oil content. A reference model is proposed in Annexure 5.3.

3. **Potato**

Value chain map of vegetables, post intervention is shown in Annexure 5.2. Currently, horticulture crops are being promoted in the cluster and a ready market available in the vicinity.

Since potato comes from underground hence it needs cleaning and grading. Cleaned commodity fetch premium returns.

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
2	**Value added unit- Goat**	FCSC	25	75%	18.75	1	6.25	18.75	25

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	**Bajra 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
	Electricity/Generator	35,000
	Total	**3,035,000**
2	**Potato cleaning and grading unit (5 QPH)**	
	Shed construction (1000 sq ft @ Rs. 700/sq ft)	700,000
	Potato Cleaning and Grading Machines (Grading Tables, Water Tank, Washing Tank)	1500,000
	Vehicle (2 MT capacity)	800,000
	Total	**3,000,000**
3	**Mustard oil unit (3 QPH)**	
	Shed construction (1000 sq ft @ Rs. 700/sq ft)	700,000
	Oil Unit Machines	1,200,000
	Electricity/Generator	50,000
	Vehicle (2 MT capacity)	750,000
	Total	**2,700,000**

Capital investment required for the goat milk business model is as under.

#	Description	No. of unit	Per unit value	Total Value
1	Shed construction	300	1000	300,000
2	Chiller (500 litre capacity)	2	650,000	1,300,000
3	Milk Collection Equipment's (weighing scale, milk testing equipment and other utensils)	1	100,000	100,000
4	Solar Panel for CIP	2	250,000	500,000
5	Sterilization and packaging equipment	1	300,000	300,000
Total				**2,500,000**

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

Table 15 Estimated Cost of Investments on Value chain activities

S. No.	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. and Horti.)**								
	Sub Component 2B: Market Infrastructure and Agribusiness								

S. No.	Name of sub-component / Activity	Unit	Unit cost	Assistance (%)	Amount of Assistance	Phy.	Financial		
							Farmer share	Project	Total
	Support								
1	**Nurturing farmers group**								
i)	Registration expenses and other pre-operative expenses- FPC	FPC	1	100%	1	4	0	4	4
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
2b	**Value added unit- Goat**	FCSC	25	75%	18.75	1	6.25	18.75	25
3	**Start up (Private investment)**	Private	20	0%	0	4	80	0	80
	G. Total						**118.25**	**138.75**	**257**

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.

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

Table 16 Profitability indicators on proposed value chain units

Particulars	Potato cleaning and grading unit (Rs.)	Mustard oil mil (Rs.)	Bajra CnG (Rs.)	Goat milk chilling unit (Rs.)
Revenue	1,440,000	31,104,000	1,536,000	4,015,000
Total Revenue	**1,440,000**	**31,104,000**	**1,536,000**	**4,015,000**
Fixed Cost (HR, other fixed cost)	225,400	514,000	383,000	221,000
Variable Cost	158,400	25,408,480	360,000	3,016,798

Particulars	Potato cleaning and grading unit (Rs.)	Mustard oil mil (Rs.)	Bajra CnG (Rs.)	Goat milk chilling unit (Rs.)
Total Operational Expenses	**383,800**	**25,922,480**	**743,000**	**3,237,798**
Earning Before Interest, Depreciation, Taxes and Amortization (EBITDA)	**1,056,200**	**5,181,520**	**793,000**	**777,202**
Depreciation	265,000	235,000	268,500	142,388
Amortization	-	-	-	-
Earnings Before Interest and Taxes (EBIT)	**791,200**	**4,946,520**	**524,500**	**634,815**
Interest Expense	-	-	-	177,734
Earnings Before Taxes (EBT)	**791,200**	**4,946,520**	**524,500**	**457,081**
Tax (@ 30%)	237,360	1,483,956	157,350	137,124
Earnings After Taxes (EAT)	**553,840**	**3,462,564**	**367,150**	**319,957**
Financial Indicators				
Net Present Value (@ discount rate 10%)	941,961	10,380,669	132,293	897,873
Internal Rate of Return	20.62%	75.43%	51.50%	25.50%
Payback period in years (Equity)	0.94	0.77	1.13	1
Payback period in years (Total)	3.15	1.40	3.91	3
Breakeven point*	30.90%	9.02%	45.45%	17.54%

*Breakeven point in terms of percentage indicates the turnover to reach out of annual turnover to make a break even in the business.

Detailed Profit and loss statement for all the models including goat milk unit are given in Annexure 5.5.

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 Bari cluster, there are majorly two water saving activities taking place viz activities of Watershed department and the micro-irrigation system (MIS) activities of Agriculture and Horticulture department. When the investment per unit of water saved is calculated, it is found that watershed activities are able to conserve water at higher investment of Rs.2.62 crore per mcm of water saved whereas MIS activities can save the water at an investment of Rs.0.79 crore per mcm of water. MIS activities like installation of drips and sprinklers for the agricultural and horticultural crops can have far reaching impact in the cluster during the project period.

Figure 7: Investment (in Rs crore/mcm) verses Water saved (in mcm) in Bari

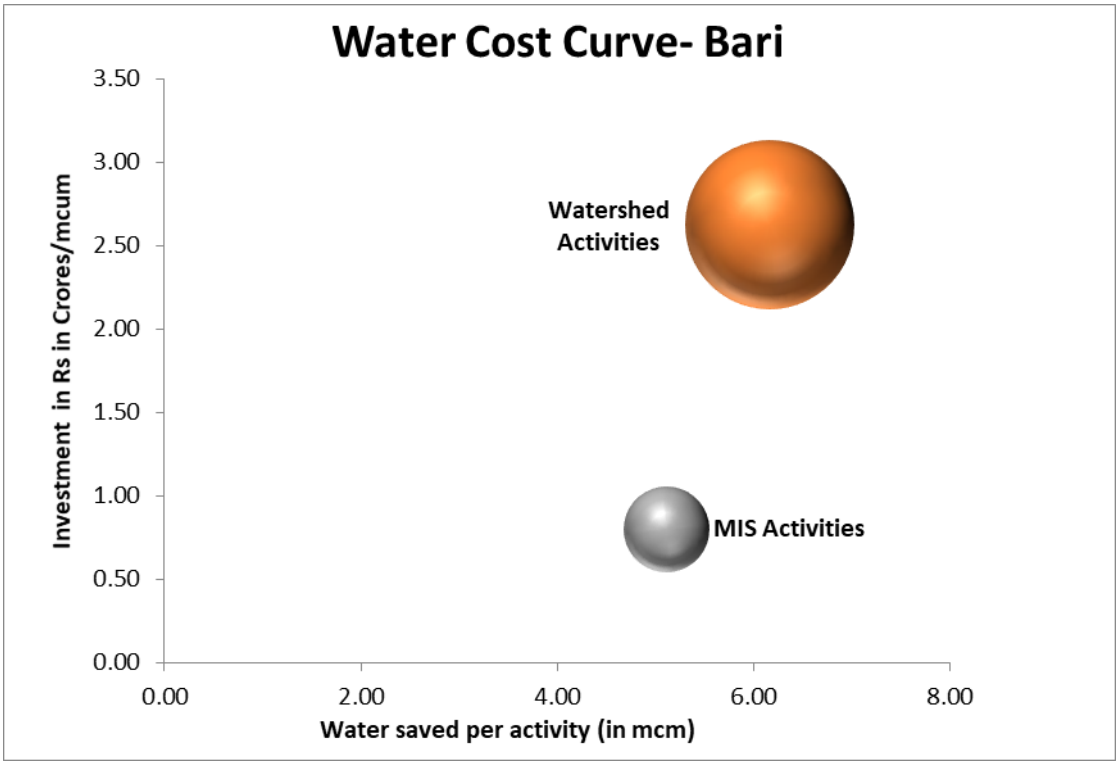


Table 17: Investment (in Rs/mcm) verses Water saved (in mcm) in Bari

Activities undertaken to save water	Water saved- per year in mcm	Investment- Rs crore/mcm	Total investment- Rs crore
Watershed activities	6.17	2.62	16.190
MIS Activities	5.11	0.79	4.06

Chapter – 6: Watershed Development & Rain Water Management for Ground Water Recharge and addressing water demand

6.1 Description of watershed cluster

The Bari watershed cluster of RACP is located in Panchayat Samiti Bari, Dholpur district. There are 44 no. of villages situated in 11 Gram Panchayats in the Project area. The elevation difference is maximum 98 meters and slope range from 0-10%. The major water stream is the Parvati River.

6.2 Objectives of Water Management in the Cluster

a. To promote the socio-economic development of the village community through optimum utilisation of natural resources of watershed,

b. To conserve soil, rainwater and vegetation effectively and harvest rain-water to create surface water sources and the stored water may be utilized through drip irrigation and to recharge groundwater.

c. To promote sustainable farming and stabilise crop yields by adopting suitable crop management system. Thus increasing the production and yield per hectare,

d. To cover the non-arable areas effectively through afforestation, horticulture and pastures based on land capability classification,

e. To improve the economic and social conditions of the resource - poor and disadvantaged sections of the watershed community by employment generation and enhancing the income of individuals by adopting alternate enterprise.

f. Restoration of ecological balance,

Thus, watershed development activities in rain-fed areas aim at conservation and management of natural resources on arable and non-arable lands to harvest and conserve rainwater, improve the productivity of crops, horticulture plantation, fuel and fodder resulting in increased income of Below Poverty Line (BPL) families, SC/ST, landless and marginal farmers, poverty alleviation and drought proofing.

6.3 Water Budgeting Exercise for the Project Area

The micro watershed-wise area for water budgeting purpose (Potential Runoff contributing areas including upper forest lands within the micro watersheds, if any) is given in Annexure 6.1.The water budget is a basic tool that may be utilised to evaluate occurrence and movement of water through the natural environment. Water budget for a given area can be looked at as water inputs, outputs and changes in harvesting, recharge & storage. The inputs into the area of investigation (precipitation, groundwater or surface water inflows etc.) must be equal to the outputs (evapo-transpiration, water harvesting, and recharge, supply, abstractions, surface or groundwater outflows) as well as any changes in storage within the area. Water budgeting of watershed is necessary to work out the total number and size of water harvesting structure, i.e. how much total runoff is available,

out of which how much is being already stored in existing structures and also how much is available for further storage.

a. Estimation of Rainwater

The process to estimate runoff may be summarized as under:

Classification of Project Area based on inputs received from Revenue Record, GIS layers, and PRA exercise. The basis of the criteria is presented below:

Good Catchment – where maximum runoff & minimum infiltration like hillocks, plateau etc.

Average Catchment – cultivated land, forest land with vegetation.

Bad Catchment - where runoff is minimum and infiltration is maximum e.g. Sandy soil.

The Project area was categorised on the basis of information available in the land records.

S. No.	Catchment	Area in Ha
1	Good Catchment	771.23
2	Average Catchment	6664.12
3	Bad Catchment	6589.49
	Total	**14024.84**

(i) Average Annual Rainfall: 589 mm (Data provided by Water Resource Deptt, Dholpur)

(ii) Calculation of Runoff (Expected Yield) based on the "Strange-Table"

Rating of the Catchment	Characteristics	Coefficient in the strange table (Cum/Ha) [1]	Area (in Hectare) [2]	Expected Yield (in Cum) [1 x 2]
Good	Runoff is maximum & infiltration is minimum like hillocks, plateau etc.	2218.50	771.23	1710973.755
Average	Runoff is medium like cultivated land, forest land with vegetation	1704.00	6664.12	11355660.48
Bad	Runoff is minimum and infiltration is maximum e.g. Sandy soil	1136.00	6589.49	7485660.64
Total			**14204.84**	**20552294.88**

(iii) Estimation of water-storage in existing water harvesting structures situated in Project Area:-

S. No.	Type of Structure	Nos.	Storage Capacity (In Cum)	Storage Capacity (% of Total Surface Runoff)
1	Farm Ponds	25	30000	3.17 %
2	Anicuts	29	174000	
3	Dam	3	45000	
4	Talab	35	380000	
5	Check Dam	9	22500	
	TOTAL		**651500**	

(iv) Above table reveals that a total of 651500 cum water is already being harvested through farm ponds, nadis, anicuts, dam, village ponds and check dam in the cluster.

(v) Calculation of the Balance Runoff:

Balance Runoff = Expected Yield (iii) – Present Storage Capacity (iv)

Balanced Runoff = 20552294.88 cum – 651500 cum = 19900794.88 Cum

Proposed Project Activities/Structures:

The activities/interventions presented below have been selected and proposed based on the outcomes of (i) the PRA exercise carried out in each project village (ii) Water budgeting carried out for the watershed (iii) Information gathered through DGPRS survey and GIS based thematic layers.

b. Proposed Project Activities/Structures for Arable Land

S. No.	Activity	Unit	Quantity	Storage Capacity (Cum)	Total Storage Capacity (Cum)
A.	**Conservation measures for Arable land**				
1.	Field Bunding Type-I	Rmt	81513	4.50	366808.50
2.	Field Bunding Type-II	Rmt	1845	1.50	2767.50
3	**Field Bund**	**Rmt**	**187667**	**4.50**	**844501.50**
4	**Peripheral Bund**	**Rmt**	**19783**	**4.50**	**89023.50**
	Sub Total A1				**1303101.00**
1.	Dugout Pond	Nos.	71	1450	102950
2	**Earthen check dam**	**Nos.**	**5**	**5500**	**27500**
3	**Embankment cum Dugout Pond**	**Nos.**	**23**	**5500**	**126500**
	Sub Total A2				**256950**

Note:- As per the on field Study Report of Dr. P.K. Singh, Professor and Head, Soil & Water Conservation Department, MPUAT, Udaipur, (Annexure- 6.2) recently carried out in 2015, as a general principle, the total ground water recharge during the entire season or per year is about 2-3 times of the total water storage capacity of the rain water harvesting structure. The Department of Watershed Development & Soil Conservation has adopted total ground water recharge (from Arable-Water harvesting, Non Arable and Drainage lines treatment structures) as 2 times of the total storage capacity for all Water Harvesting Structures.

As per this 2 times of the total storage capacity of dug out ponds = 256950 x 2 = 513900 **cum**

Total of likely ground water recharge from Arable Land activities (Cum):

= Table 1(Sub Total A1) + Table 1(Sub Total A2) = 1303101+ 513900 = 1817001 cum

In watershed clusters, during the course of implementation of field activities similar type of trials would be carried out with the support of the State Agricultural University.

c. Proposed Project Activities/Structures for Non-Arable Land & D.L.T.

S. No.	Activity	Unit	Quantity	Storage Capacity(Cum	Total Storage Capacity (Cum)
B.	**Conservation measures for Non-Arable land**				
1	MPT- L 50 mt ht 1.50 mt	Nos.	4	2500	10000
2	MPT- L 30 mt. ht 3 mt	Nos.	3	1200	3600
3	MPT- L 50 mt ht 2.0 mt	Nos.	1	3000	3000
4	Earthen Check Dam L50 m ht 2 mt	Nos.	2	1250	2500
5	**Embankment cum Dugout Pond**	**Nos.**	**29**	**5500**	**159500**

S. No.	Activity	Unit	Quantity	Storage Capacity(Cum	Total Storage Capacity (Cum)
6	**WHS- L 50 mt ht 1.5 mt**	**Nos.**	**20**	**7500**	**150000**
7	**WHS- L 75 mt ht 1.5 mt**	**Nos.**	**23**	**9000**	**207000**
	Total				**535600**
C.	**Drainage Line Treatment**				
1	MPT- L 30 mt. ht 3 mt	Nos.	11	1200	13200
2	MPT- L 50 mt ht 1.50 mt	Nos.	12	2500	30000
3	MPT- L 50 mt ht 2.00 mt	Nos.	9	3000	27000
4	MPT- L 70 mt ht 2.00 mt	Nos.	3	4500	13500
5	Earthen Check Dam L50 m ht 2 mt	Nos.	5	1250	6250
6	Earthen Check Dam L65 m ht 2.5 mt	Nos.	6	1500	9000
7	Earthen Check Dam L66 m ht 3 mt	Nos.	5	1600	8000
8	Earthen Check Dam L90m ht 2.5 mt	Nos.	3	2450	7350
9	**Earthen Check Dam L 65m**	**Nos.**	**9**	**5500**	**49500**
10	**Double Wall MMS**	**Nos.**	**8**	**6500**	**52000**
11	**MMS L 20 mt. ht.2.0 mt.**	**Nos.**	**10**	**15325**	**153250**
12	**MMS L 25 mt. ht.2.0 mt.**	**Nos.**	**25**	**22215**	**555375**
13	**MMS L 30 mt. ht.2.00 mt.**	**Nos.**	**20**	**29510**	**590200**
14	Anicut L 20.3 m	Nos.	10	8000	80000
15	Anicut L 25 m	Nos.	4	12000	48000
	Total				**1642625**
	Grand Total (N.A.+ D.L.T.)				**2178225**

Similarly, for above proposed structures, 2 times of the total storage capacity i.e. ground water recharge = 2178225 x 2 = 4356450 Cum

Total of likely ground water recharge from Arable Land + Non Arable Lands + DLT activities

= 1817001+4356450

= 6173451 cum

Remaining (still untapped) Runoff = i.e. 19900794.88– 6173451.00= 13727343.88 **cum (which is 66.79% of Total Surface Runoff)**

Expected Yield of Water	Present storage capacity	Balance Runoff to be utilized	Estimated Collective Storage Capacity of the Proposed Structures	Remaining Runoff (Still Untapped)
1	**2**	**3 = (1 – 2)**	**4**	**5 = (3 – 4)**
20552294.88 Cum	651500 Cum	19900794.88 Cum	6173451.00 Cum	13727343.88 Cum
100%	**3.17%**	**96.83 %**	**30.04 %**	**66.79 %**

Above table clearly shows that only **33.21% (3.17 +30.04)** rain water is proposed to be harvested and rest **66.79%** rain water still to be untapped and allowed to flow to lower areas beyond the cluster.

6.4 Proposed Activities in the watershed cluster

The activities to be proposed in the watershed cluster is dependent on extent of the soil erosion and crops to be grown in the cluster so that soil erosion can be controlled and requirement of the crops of the cluster could be met out. Although Kharif crops are grown in rainfed areas but for getting more production lifesaving irrigation has to be applied on the crops through drip/sprinkler system. Similarly, in Rabi crops, the crop requirement is to be catered either from ground water or from harvested water done through Dugout Pond and other water storage structures needed in the area. Keeping this in view, field survey has been undertaken in the cluster and is summarized herewith.

Participatory Rural Appraisal (PRA)

A field level survey using Participatory Rural Appraisal (PRA) has been carried out by the project team and estimation of field level findings has been identified.

Participatory Rural Appraisal (PRA) is a systemic tool for intensive action with community members to facilitate collection, analysis and understanding needs/problems of their community. PRA emphasizes local knowledge and involves communities in inventing, monitoring, and planning of local resources. The PRA approach relies heavily on visualization, diagramming and people participation. It provides information to outsiders who wish to understand how the community uses and manages its own resources. PRA activity empowers marginalized communities, de-emphasizes hierarchies, and helps identify resource needs and its sustainable use.

PRA Outcome - SWOT Analysis

SWOT analysis was performed for the project area to identify the strengths, weaknesses, opportunities and threats in the context of the RACP project so that strategic planning can be pursued to improve the prevailing condition.

Strength	Weakness
➢ The project area is blessed in terms of fertility of land resources. ➢ Most of the villages in the Project Area are located in the vicinity of 10-15 kms of Bari NH-11B that enables better access to urban centres such as Bari..	➢ Lack of diversity in livelihood sources, as agriculture and Animal Husbandry are the only major sources of livelihood. This situation compels the villagers to work as daily labourers in the urban areas and even migrate to urban areas during drought periods. ➢ Weak or absence of village level community based organization/farmers groups presented in the project area. ➢ Dismal level of literacy and awareness in the Project villages resulting in lack of transformation on agriculture and other livelihood practices, poor awareness about government schemes related to agriculture/horticulture etc.
Opportunity	**Threat**
➢ Most of the places soil quality is very good, rich in organic matter in growth; has good potential for increase in production and productivity with better input management and water use. ➢ Very good access to adjoining urban areas through the adjoining NH offers tremendous opportunity for effective marketing of the agriculture and milk produce in nearby cities. ➢ Effective implementation of watershed development activities can potentially enhance the productivity of land resources in the project area and thereby transform the economy of the entire area by increased production of crops,	➢ Dependence on rains for agriculture makes the economy of the entire project area bit challenging ➢ Limited road infrastructure may result into delay in supply and demand chain management. ➢ How to increase the productivity in small land holdings is a issue. ➢ Most of the tribal population has poor literacy ➢ Proximity with urban centres may cause are strong chances of increased rate of migration causing socio-cultural problems.

vegetables, fruits, milk etc.	

6.5 Watershed Development Activities

Apart from need based training, workshops, capacity building, IEC and exposure visit activities, WD&SC Department will carry out Hydrological Monitoring Networks (HMN) at the cluster level and instruments like automatic rain gauge & instruments housing facility etc. shall be provided. A provision of Rs. 27.25 Lakh is being kept in CACP.

In addition to this, to enable the DPR/CACP Sub Plan preparation, Field Surveys, PRA was done, baseline data, secondary data, revenue record was collected and Thematic Layers i.e. Khasra map on watershed map, Present Land use and land cover, digital elevation model (DEM) using Remote Sensing & Geographical Information System (RS&GIS) are procured, analysed & scientifically used.

Based on need of the area and runoff to be harvested, various watershed activities are taken up for in-situ moisture conservation, water harvesting, and water recharge. This will ensure growth of Kharif crops from in-situ moisture & harvested water to support lifesaving irrigation and most importantly contributing to ground water recharge and to the water balance.

Keeping these factors in mind, details of field level location specific and need based watershed activities to be carried out in Bari and expected beneficiaries/outcome are presented under the following activities proposed for watershed development.

S. No.	Activity	Description	Water Recharged/ Harvested (Cum)	Likely Beneficiaries (Nos)
1.	Field Bunding Type I	Field bunds-I are constructed to check soil erosion reduced velocity of rainfall then increase infiltration rate of water and conserve moisture to grow crops then save irrigation and conserve moisture to grow crops. By constructing 81513 Rmt. Field bund with proposed financial cost Rs. 51.21 lacs runoff will conserve by in-situ moisture conservation.	366808.50	405
2	Field Bunding Type II	Field bunds-II are constructed to check soil erosion reduced velocity of rainfall then increase infiltration rate of water and conserve moisture to grow crops then save irrigation and conserve moisture to grow crops. By constructing 1845 Rmt Field bund with proposed financial cost Rs. 1.75 lacs runoff will conserve by in-situ moisture conservation.	2767.50	12
3	Field Bund	Field bunds are constructed to check soil erosion, reduced velocity of rain-fall then increase infiltration rate of water and conserve moisture to grow crops then save irrigation. By constructing 187667 rmt Field bund with proposed financial cost Rs. 118.23 lacs water will conserve by in-situ moisture conservation.	844501.50	940
4	Peripheral Bund	Peripheral Bund activity is taken to stabilize the banks of drains/nallah along Agricultural Land, so that land do not erode. By constructing 19783 Rmt Peripheral bund with proposed financial cost Rs. 19.59 lacs.	89023.50	105

S. No.	Activity	Description	Water Recharged/ Harvested (Cum)	Likely Beneficiaries (Nos)
5	Dug out Pond	Dugout Ponds, at a lower elevation, are constructed to harvest the excess runoff after in-situ moisture conservation. Farm pond helps in providing supplemental irrigation as well as increasing cropping intensity. By constructing 71 Dugout Ponds with Proposed financial cost Rs. 73.21 lacs.	205900	71
6	Ramp-cum Waste weir	Ramp-cum Waste Weir activity is proposed to stop further elongation of gullies, to stabilize gullies & to provide safe disposal of excess water on agricultural land. By constructing 537 Ramp-cum Waste Weir with proposed financial cost Rs. 37.05 lacs elongation of gullies will stop and will be stabilized on agricultural land.	Along bunds at suitable designated places	
7	Chute Spillway	A chute spillway is a common and basic design which transfers excess water from behind the dam down a smooth decline into the river below. These are usually designed following an ogee curve. Most often, they are lined on the bottom and sides with concrete to protect the dam and topography. Chute spillways can be ingrained with a baffle of concrete blocks but usually have a 'flip lip' and/or dissipater basin which creates a hydraulic jump, protecting the toe of the dam from erosion. By constructing 52 Chute Spillway with proposed financial cost Rs. 38.48 lacs.	Along Peripheral bunds at suitable designated places	
8	Earthen Check Dam	Earthen Check Dam activity is proposed to harvest & infiltration of runoff in Drainage line of lst & llnd order. By constructing 35 Earthen Check Dam Structures in arable & Non- arable land with proposed financial cost Rs.82.72 lacs runoff will harvested for irrigation use	220200	35
9	Embankment cum Dugout pond	Embankment cum Dugout ponds, at a lower elevation, are constructed to harvest the excess runoff after in-situ moisture conservation. Farm pond helps in providing supplemental irrigation as well as increasing cropping intensity. By constructing 52 Embankment cum Dugout pond structures in arable & Non arable land with proposed financial cost Rs. 54.60 lacs runoff will harvested for irrigation use	572000	52
10	Construction of Azola unit	Azola activity is proposed in summer for Livestock feeding to increase milk production. Previously, it was taken in all the micro watersheds but after receiving direction regarding revised CACP, It remains only in Macro/Micro 2/5 & 2/6 in which tender process started in January 2017 & Contract awarded in June 2017. This has cleared by STEP also. By constructing 21 Azola unit in arable land with proposed financial cost Rs. 4.20 lacs, 21 cultivators will be benefited having alternative income & livestock feeding Source.	-	21

S. No.	Activity	Description	Water Recharged/ Harvested (Cum)	Likely Beneficiaries (Nos)
11	Pasture land develop-ment	Pasture Development activity is choosen to meet the fuel, fodder, timber requirements of the community and to increase the carrying capacity of the degraded pastures. Pasture Development activities will carried out in 34 ha. with proposed financial cost of Rs. 40.03 lacs..	-	Users Groups
12	MPT	MPT (Mini percolation tank) activity is proposed to harvest & infiltration of runoff in Drainage line of 1st & 2nd order. By constructing 43 MPT's structures with proposed financial cost Rs. 64.19 lacs runoff will harvested for irrigation use.	200600	Users Group
13.	SGPT with loose stone bund	SGPT activity is proposed to reduce the velocity of runoff in drainage line of I order	-	-
14	WHS	WHS structure to be constructed at 3rd & 4th order drainage line because in 3rd & 4th order drainage the runoff & intensity of water flow is high & the Earthen structure is not sustainable. By constructing 43 WHS structures with proposed financial cost Rs. 59.20 lacs runoff will harvested for irrigation use	714000	Users Group
15	Anicut	Anicut structure to be constructed at 3rd & 4th order drainage line because in 3rd & 4th order drainage the runoff & intensity of water flow is high & the Earthen structure is not sustainable. By constructing 14 Anicut structures with proposed financial cost Rs. 151.40 lacs will harvested for irrigation use.	256000	Users Group
16	M.M.S. & Double Wall M.M.S.	Constructed at 3rd & 4th order drainage line because in 3rd & 4th order drainage the runoff & intensity of water flow is high & the earthen structure is not sustainable. 63 MMS Structures with cost Rs.751.67 lacs.	2701650	Users Group

The Department of Watershed Development & Soil Conservation has Technical Manual for watershed activities into operation state-wide and all the details of activities, justification, technical parameters, location specific requirements etc. are available with the PIA-District/Clusters.

During the planning process of CACP Bari, the proposed locations of all the interventions have been finalised in consultation with the MTG members/beneficiaries, users groups and other concerned stake holders and activity locations are geo-tagged with longitude and latitudes. At the time of concurrent monitoring during implementation of activities, these geo-tags will be referred for random quality checks also.

6.6 Implementation Strategy for execution of Watershed Development Works

However, separate detailed **Operational Guidelines** for Watershed Development & Soil Conservation activities has been issued, still some important strategic aspects are enumerated as under:

a. Approach for implementation of Watershed Works under RACP as per MJSA

Under Mukhyamatri Jal Swablamban Abhiyan (MJSA), the works are carried out through contractors and machines both Arable, Non Arable and DLT on "Four Waters Concept" and

ensuring higher technical requirements, quality skills and timely execution of activities. There are two types of scenario i.e. shopping & N.C.B. which are being done at the level of District level Officers of the WD&SC Department and accordingly procurement plan is being prepared by the Department and being submitted to the World Bank through STEP.

b. Beneficiary's Contribution and involvement:

Under the RACP, farmer's contribution is an integral part of project cost besides World Bank and State Government's contribution in order to ascertain the belongingness of the local community. There is a beneficiary contribution of **10% for S & M farmers and 20% for others farmers** in all individual watershed activities. These contributions would be acceptable in Cash/Labour/Material. There will be no beneficiary contribution for activities on common / Panchayat land.

One of the major strengths of the RACP is that one dedicated NGO having technical team and community organizers has been deployed to carry out data collection, community mobilization, training, IEC, social screening, need based technical support to the PIAs of all line departments. It is strengthening the linkage between the contractors and community, its participation, sustainability and ownership of assets created.

c. Broad Approach followed for selecting and design of proposed structures:

a. GIS Based thematic layers (Maps) prepared on the basis of high resolution NRSA data.

b. GIS based Flow Accumulation layer utilised to estimate water accumulation at various points/locations and the corresponding catchment areas for each such location.

c. GIS based Slop Layer utilised to assess the land slope at various points of the project area so as to choose appropriate structures/interventions based on the land slope as well

d. GIS based Drainage/Water-Bodies layer utilised to mark the location and required dimensions of drains and water bodies

e. Reconnaissance survey carried out for location of *Nallah* marked on the drainage/water-bodies GIS layer and *Nallah* figure correctly marked on the map

f. GIS based Land-Use-Land-Cover layer utilised to access usages of the land and accordingly selection of appropriate location for various structures

g. GIS based *Khasra* layer utilised for identification of locations for construction of the proposed structures identified based on potential for water storage and size of the land parcels

h. Inputs received from the community during the PRA exercise carried out in all 10 project villages were considered for deciding the nature and location of the structures

i. Standard criteria and formats being followed by the Department of Watershed, Government of Rajasthan, adopted for the purpose of designing structures.

j. Latest BSR of PR&RD, P.S. Bari, District Dholpur & Irrigation Department Dholpur adopted for estimation of item-wise costs for the proposed interventions.

6.7 Estimated Cost of Investments under Watershed Management

The total project period details of activities / measures / works / structures proposed in Bari cluster are as under:

S. No.	Name of Activity	Unit Cost	Unit	Total of New CACP provisions	
				Phy.	Fin.
1	2	3	4	5	6
1	Component 1: Climatic Resilient Agriculture				
1A	Sub Component 1A : Improving Water use efficiency				

S. No.	Name of Activity	Unit Cost	Unit	Total of New CACP provisions	
				Phy.	Fin.
	Physical Activities :				
1.1	Watershed Sub Plan of Cluster Agricultural Competitiveness Plan (CACP)				9.91
1.2	Hydrological Monitoring Network (HNM) & Crop Water Budgeting (CWB) Etc.				50.00
1.3	ACTIVITIES ON ARABLE LAND				
1.3.1	Arable Conservation Measure				
1	Field Bunding Type-I	0.00063	Rmt	81513	51.21
2	Field Bunding Type-II	0.00095	Rmt	1845	1.75
3	Dug out Pond	1.03	Nos.	71	73.21
4	Field Bund	0.00063	Rmt	187667	118.23
5	Peripheral Bund	0.00099	Rmt	19783	19.59
6	Ramp-cum waste weir	0.07	Nos.	537	37.05
7	Chute Spillway	0.74	Nos.	52	38.48
8	Earthen check dam	1.63	Nos.	5	8.17
9	Embankment cum Dugout Pond	1.05	Nos.	23	24.15
	Total 1.3.1				371.84
1.3.1	Arable Production Measure				
1	Construction of Azola unit	0.19	Nos.	21	4.07
	Total 1.3.2				4.07
	Total Arable 1.3.1 +1.3.2				375.91
1.4	ACTIVITIES ON NON ARABLE LANDS				
1.4.1	Non-Arable Conservation Measure				
1	MPT- L 50mt ht 1.50 mt	1.26	Nos.	4	5.02
2	MPT- L 30 mt ht 3 mt	1.48	Nos.	3	4.43
3	MPT- L 50mt ht 2.0 mt	1.64	Nos.	1	1.64
4	SGPT with loose stone bund	0.10	Nos.	8	0.79
5	Earthen Check Dam L50m ht 2 mt	1.80	Nos.	2	3.59
6	Embankment cum Dugout Pond	1.05	Nos.	29	30.45
7	WHS- L 50mt ht 1.5 mt	1.12	Nos.	20	22.40
8	WHS- L 75 mt ht 1.5 mt	1.60	Nos.	23	36.80
	Total 1.4.1				105.12
1.4.2	Non-Arable Production Measure				
1	Pasture Development	1.18	Ha	34	40.03
	Total 1.4.2				40.03
	Total Non-Arable (1.4.1+1.4.2)				145.15
1.5	Drainage Line Treatment				
1	MPT- L 30 mt ht 3 mt	1.48	Nos.	11	16.32
2	MPT- L 50mt ht 1.50 mt	1.28	Nos.	12	15.31
3	MPT- L 50mt ht 2.0 mt	1.62	Nos.	9	14.59
4	MPT- L 70mt ht 2.00 mt	2.29	Nos.	3	6.88
5	SGPT with loose stone bund	0.10	Nos.	35	3.49
6	Earthen Check Dam L50m ht 2 mt	1.80	Nos.	5	9.01
7	Earthen Check Dam L65m ht 2.5 mt	2.69	Nos.	6	16.12
8	Earthen Check Dam L 65m	1.63	Nos.	9	14.67

S. No.	Name of Activity	Unit Cost	Unit	Total of New CACP provisions	
				Phy.	Fin.
9	Earthen Check Dam L66 m ht 3 mt	3.58	Nos.	5	17.92
10	Earthen Check Dam L90m ht 2.5 mt	4.41	Nos.	3	13.24
11	Double Wall MMS	4.54	Nos.	8	36.32
12	MMS L 20 mt. ht.2.0 mt.	10.72	Nos.	10	107.20
13	MMS L 25 mt. ht.2.0 mt.	12.27	Nos.	25	306.75
14	MMS L 30 mt. ht.2.00 mt.	15.07	Nos.	20	301.40
15	Anicut L 20.3m	9.34	Nos.	10	93.35
16	Anicut L 25m	14.51	Nos.	4	58.05
	Total D.L.T. 1.5				1030.62
	Grand Total (1.3+1.4+1.5)				1551.68
1.6	Consolidation of Works				7.43
	Total 1 (1.1 to 1.6)				1619.02
3	Component 3 : Farmer Organization & Capacity building				
3.1	Community Mobilization, IEC, Group Formation, training, Capacity Building				18.58
	Sub Total 3				18.58
4	Component 4 : Project Management, Monitoring and Learning				
4.1	District + PIA Level Operating Costs including Photostat, computer typing & printing, fax, mobility (hired taxi/POL), TA/DA etc.				20.00
	Sub Total 4				20.00
	Grand Total (1+2+3+4)				1657.60

Site Specific Plan & Cost estimates

The measures/works/structures as discussed above are proposed to be executed/constructed/ implemented to harvest the rain water during the monsoon to the benefit of farmers so that crops can be grown satisfactorily in the cluster and productivity of crops may be increased accordingly, and Water table in area may also be increased gradually in every year.

The farm level plans of all individual activities have been prepared by the PIA and his team. The list of farmers with all the details including longitude and latitude, where the work/structures are proposed are collected, geo tagged are available before start of implementation.

The site Specific designs, plan and cost estimates of all the activities are prepared in detail and are available with the PIA-Bari-Watershed.

6.8 Implementation Arrangement for all the planned activities in the watershed Area

Planning and implementation of the project activities is being undertaken by the line department i.e. that of Watershed Development and Soil Conservation with the support of dedicated Project Implementation Unit (PIU) of the department. The implementation structure at the state, district, cluster and community level for implementation and monitoring for all the planned activities in the watershed Area under the project is described below:

At the State level, in addition to the Steering Committee i.e. Apex Body & Executive Committee, a Project Management Unit (PMU) has been established under the society i.e. RACPMIS and dedicated Project Implementation Unit (PIU). The PMU & PIU will be having effective

coordination and provide a robust governance and coordination mechanism for the project. To support livestock activities and supply of bucks, the Rajasthan University of Veterinary and Animal Sciences (RAJUVAS), Bikaner has been added in the project as Partner Agency and similarly a MOU has been signed with the ARAVALI for support in community mobilization and other training activities for the project.

At District Level: A district level Project Implementation Agency (PIA) has been assigned for planning and implementation of project activities in the cluster. Although one District Coordinator (Watershed Engineer) has been deputed with the PIA, the Project Manager and his office has been designated by the department for implementation of the watershed management activities in the cluster. This is with the support of PRIs and field level NGO under overall supervision of PIU and District-Level Implementation Committee (DLIC). DLIC is headed by the District Collector with District Project Manager (RACP) as member secretary already established under the RACPMIS. DLIC will also maintain convergence at the district, Zilla Parishad level to PRIs at block and GP level. The linkage between the PRIs and the project is critical so that no conflict situation arises between the PRIs and different community level organizations set up within the RACP.

At the Cluster Level: A field level NGO has been deployed in the cluster to support implementation of technical activities in the cluster. In addition to the Team Leader, Community Mobilization Specialist, Community Organizers, a Watershed Assistant is with the NGO to support field level activities in the cluster. As per the operational guidelines issued under the project, the Multi Task Groups, Multi Task Associations, User's Groups and Farmer Producer Company are being formed in the cluster. Participation of these Institutions would be ensured in implementation of the project activities to maintain quality and quantity. For support of other technical activities in the cluster the Agriculture, Horticulture and Livestock Assistant are also deployed with the NGO to support related activities in the cluster. A contractor would also be contracted to implement the activities for Natural Resources Management in the cluster.

Chapter – 7: Social & Environmental Management Plan

7.1. Social Management Plan (SMP)

The SMP is described to minimise 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 mobilisation 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 (Bari Cluster):-

Project Area covers an area of 12387 hectare (ha) comprising eleven (11) Gram Panchayats and forty four (44) villages. The Cluster village has a population of 49922 of which 27108 are males while 22814 are females as per field survey by NGOs. In the cluster scheduled caste 12482 and scheduled tribe category 10801 population. Cluster had household of 6524 of which of which small farmer 1726, marginal farmer 3663, large farmer 439 and remaining farmer landless.

Consultant held - Key social issue of the Cluster

Major issues in the Bari 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 & Pastureland Development
- Livestock Management
- Value chain development activities

Environment Management Plan for Crop Intensification/Water management & Pastureland Development/Livestock 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 description on each activity is given in 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 MTAs/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, MTAs have been formed and Farmer Producer's Companies (FPCs) are to be formed. The related activities are to be performed by these MTAs/FPCs/Individual Beneficiaries (IBs). A Community Resource Person (CRP) is being deployed with each of the MTAs 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 MTAs/FPCs/IBs shall be carried out by the Bank. (This shall be completed by assessing a representative sample of MTAs/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 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.4170.18 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 18: Consolidated Investment Plan

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	Watershed Development & Soil Conservation	1619.02		18.58	20.00	1657.60
2	Agriculture	634.73	232.00	175.76	11.12	1053.61
3	Horticulture	622.89		36.00	11.00	669.89
4	Animal Husbandry	500.81	227.00	47.23	14.04	789.08
	Total	**3377.45**	**459.00**	**277.57**	**56.16**	**4170.18**

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.4170.18 lakh** likely to be incurred in 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.4170.18 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 19: Consolidated Investment Plan – by nature of expenditure

Type of Expenditure/ Line Dept.	Watershed Management	Agriculture	Horticulture	Animal Husbandry	Total
Goods	0.00	468.70	442.34	329.72	1240.76
Works	1514.00	2.22	0.00	320.00	1836.22
Consultant Services	59.91	145.80	0.00	0.00	205.71
Operating Costs	20.00	18.63	11.00	43.56	93.19
Training	18.58	31.96	36.00	47.23	133.77
Grants	0.00	116.00	0.00	0.00	116
Beneficiary Contribution	45.11	270.30	180.55	48.57	544.53
Total	**1657.60**	**1053.61**	**669.89**	**789.08**	**4170.18**

Note:

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

Table 20 Gram Panchayat and Village wise area in Bari Cluster

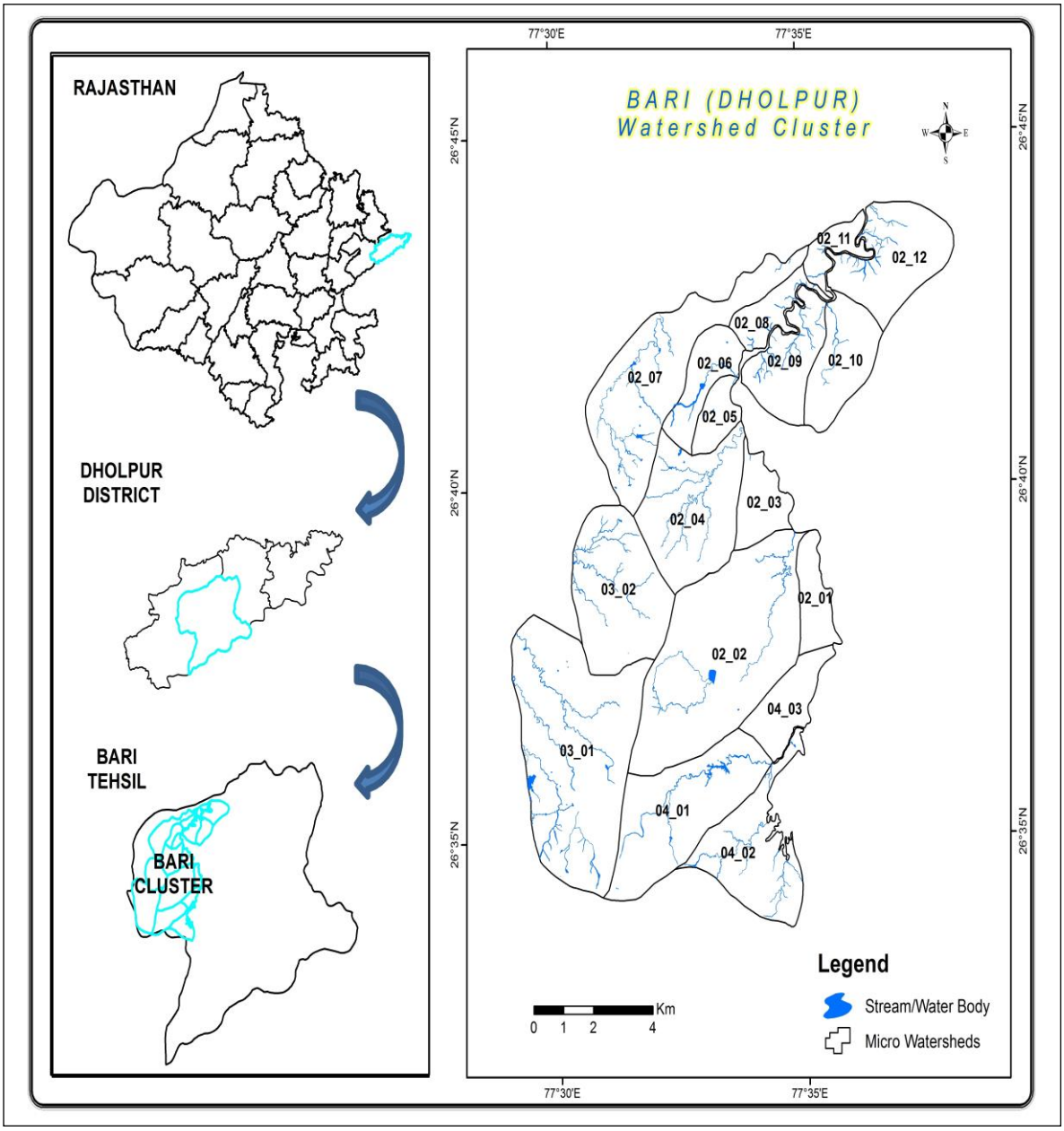
S. No.	Name of Gram Panchayat	Name of Villages Covered	Area Covered in Cluster (in Ha.)	Area in % in Cluster
1	Ibrahimpur	Khairari	300.69	2.43%
		Rewai	343.6	2.77%
		Ibrahimpur	350.08	2.83%
		Tamoti	465.93	3.76%
		Totpura	925.1	7.47%
		Kachhpura	90.71	0.73%
2	Garhikhirana	Garhi Khirana	10.44	0.08%
		Garhi	84.47	0.68%
		Dadur	31.33	0.25%
3	Tontri	Tontri	474.02	3.83%
		Puramdari	168.58	1.36%
		Reti	86.31	0.70%
4	Sigorai	Bateshwar Kala	269.49	2.18%
		Bateshwar Khurd	24.94	0.20%
		Kuhawani	74.25	0.60%
		Sigorai	480.87	3.88%
5	Saheri	Saheri No. 2	125.19	1.01%
6	Naksauda	Jamboora	339.34	2.74%
		Sunipur	530.91	4.29%
		Naksauda	675.72	5.46%
		Nadroli	394.04	3.18%
		Koyla	180.63	1.46%
		Talab Umreh	100.28	0.81%
7	Umreh	Umreh	580.72	4.69%
		Sagaur	160.61	1.30%
		Salemabad	83.63	0.68%
		Dauapura	85.81	0.69%
8	Sanaura	Sanaura	1175.4	9.49%
		Kankrai	584.96	4.72%
		Gardarpura	152.48	1.23%
9	Nidhara	Nidhara	231.42	1.87%
		Rudh Ka Pura	186.29	1.50%
		Hulasipura	89.63	0.72%
		Maharajpur	70.61	0.57%
		Rundh Nidhara	147.76	1.19%
10	Chila Chaund	Halle Ka Pura	77.7	0.63%
		Mundpura	218.3	1.76%
		Reechhai	240.14	1.94%

S. No.	Name of Gram Panchayat	Name of Villages Covered	Area Covered in Cluster (in Ha.)	Area in % in Cluster
		Chila Chaund	875.68	7.07%
		Ranpura	229.61	1.85%
11	Dheemiri	Khoole Ka Pura	64.89	0.52%
		Sikarra	60.59	0.49%
		Todpura	228.85	1.85%
		Dheemiri	315	2.54%
		TOTAL	12387	100.00%

(Source: Water Resource Department DPR of Bari Cluster)

The index map of Bari cluster is given as under:

Figure 8: Index Map of Bari cluster



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

Table 21: Area (in ha & %) of Agricultural Crops in 2006-07 & 2015-16, increase / decrease over 10 years in State & district Dholpur and % Area over State Average in the district

Crops	State							Dholpur							
	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)	%		
Rice	107758	0.61%	182877	1.03%	75119	0.42%	**140697.80**	536	0.35%	403	0.26%	-133	-0.09%	**565.70**	**0.40%**
Black Gram	107946	0.61%	298714	1.69%	190768	1.08%	**180374.40**	164	0.11%	126	0.08%	-38	-0.02%	**152.10**	**0.08%**
Groundnut	306037	1.73%	516850	2.92%	210813	1.19%	**387853.00**	180	0.12%	43	0.03%	-137	-0.09%	**95.80**	**0.02%**
Bajra	4910409	27.78%	4044591	22.88%	-865818	-4.90%	**4739211.00**	67478	44.02%	85045	55.49%	17567	11.46%	**79858.20**	**1.69%**
Sorghum	662055	3.74%	631170	3.57%	-30885	-0.17%	**641570.10**	78	0.05%	124	0.08%	46	0.03%	**128.80**	**0.02%**
Sesamum	273345	1.55%	366736	2.07%	93391	0.53%	**424089.00**	3829	2.50%	2767	1.81%	-1062	-0.69%	**2849.90**	**0.67%**
Mustard	3099570	17.53%	2532330	14.32%	-567240	-3.21%	**2561288.30**	66976	43.70%	63972	41.74%	-3004	-1.96%	**65044.00**	**2.54%**
Wheat	2564840	14.51%	3108973	17.59%	544133	3.08%	**2851321.60**	47649	31.09%	64066	41.80%	16417	10.71%	**57712.00**	**2.02%**

Crops	State							Dholpur							
	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)	%		
Barley	232271	1.31%	256029	1.45%	23758	0.13%	**281434.60**	986	0.64%	611	0.40%	-375	-0.24%	**888.20**	**0.32%**
Gram	1010754	5.72%	941950	5.33%	-68804	-0.39%	**1297770.40**	1885	1.23%	949	0.62%	-936	-0.61%	**1854.30**	**0.14%**

(Source: Agriculture department, Dholpur)

Table 22: Cropped Area (ha) 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
Rice	107758	127807	133418	150691	131126	134337	125635	145577	167752	182877	**140697.80**
Black Gram	107946	144744	137230	116377	127792	255221	218009	195998	201713	298714	**180374.40**
Groundnut	306037	276345	324209	326032	349331	414671	402252	461979	500824	516850	**387853.00**
Bajra	4910409	5077396	5206162	5168502	5519448	4986783	3988912	4412998	4076909	4044591	**4739211.00**
Sorghum	662055	625646	576744	718457	726916	553754	680375	579615	660969	631170	**641570.10**
Sesamum	273345	314871	521210	598306	548011	512765	415128	360613	329905	366736	**424089.00**
Mustard	3099570	2458197	2738014	2212339	2489906	2441254	2424956	2782539	2433778	2532330	**2561288.30**
Wheat	2564840	2591804	2294848	2394215	3036141	2935341	3063202	3205604	3318248	3108973	**2851321.60**
Barley	232271	249189	286950	223406	327991	278016	307911	309281	343302	256029	**281434.60**
Gram	1010754	1231273	1259428	884358	1783281	1433928	1252908	1923501	1256323	941950	**1297770.40**

Cropping Pattern (%)

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
Rice	0.61%	0.75%	0.76%	0.89%	0.71%	0.74%	0.72%	0.80%	0.95%	1.03%	**0.80%**
Black Gram	0.61%	0.85%	0.78%	0.69%	0.70%	1.42%	1.25%	1.07%	1.14%	1.69%	**1.02%**
Groundnut	1.73%	1.62%	1.85%	1.92%	1.90%	2.30%	2.30%	2.53%	2.83%	2.92%	**2.19%**

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
Bajra	27.78%	29.70%	29.66%	30.45%	30.08%	27.65%	22.82%	24.16%	23.06%	22.88%	**26.81%**
Sorghum	3.74%	3.66%	3.29%	4.23%	3.96%	3.07%	3.89%	3.17%	3.74%	3.57%	**3.63%**
Sesamum	1.55%	1.84%	2.97%	3.52%	2.99%	2.84%	2.38%	1.97%	1.87%	2.07%	**2.40%**
Mustard	17.53%	14.38%	15.60%	13.03%	13.57%	13.54%	13.87%	15.23%	13.77%	14.32%	**14.49%**
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%**

(Source: Agriculture department, Dholpur)

Table 23: Cropped Area (ha) for 10 Years (2006-07 to 2015-16) at the district 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
Rice	536	484	574	569	679	675	614	619	504	403	**565.70**
Black Gram	164	162	111	132	161	172	187	164	142	126	**152.10**
Groundnut	180	128	75	89	91	161	90	61	40	43	**95.80**
Bajra	67478	76435	69923	86376	86253	82914	80454	80180	83524	85045	**79858.20**
Sorghum	78	85	89	119	42	137	148	134	332	124	**128.80**
Sesamum	3829	3788	2701	3030	3576	2746	2138	2060	1864	2767	**2849.90**
Mustard	66976	50852	69802	65931	60772	69037	71388	70483	61227	63972	**65044.00**
Wheat	47649	51180	50807	56832	59191	58477	59520	61419	67979	64066	**57712.00**
Barley	986	1209	865	978	957	939	803	774	760	611	**888.20**
Gram	1885	827	2748	3778	2266	1874	1496	1321	1399	949	**1854.30**

Cropping Pattern (%)

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
Rice	0.35%	0.34%	0.38%	0.37%	0.43%	0.43%	0.39%	0.39%	0.33%	0.26%	**0.37%**
Black Gram	0.11%	0.11%	0.07%	0.09%	0.10%	0.11%	0.12%	0.10%	0.09%	0.08%	**0.10%**
Groundnut	0.12%	0.09%	0.05%	0.06%	0.06%	0.10%	0.06%	0.04%	0.03%	0.03%	**0.06%**
Bajra	44.02%	54.06%	46.83%	56.28%	55.12%	52.59%	50.96%	51.15%	54.49%	55.49%	**52.10%**
Sorghum	0.05%	0.06%	0.06%	0.08%	0.03%	0.09%	0.09%	0.09%	0.22%	0.08%	**0.08%**
Sesamum	2.50%	2.68%	1.81%	1.97%	2.29%	1.74%	1.35%	1.31%	1.22%	1.81%	**1.86%**
Mustard	43.70%	35.97%	46.75%	42.96%	38.84%	43.79%	45.22%	44.97%	39.95%	41.74%	**42.44%**
Wheat	31.09%	36.20%	34.03%	37.03%	37.83%	37.09%	37.70%	39.19%	44.35%	41.80%	**37.65%**
Barley	0.64%	0.86%	0.58%	0.64%	0.61%	0.60%	0.51%	0.49%	0.50%	0.40%	**0.58%**
Gram	1.23%	0.58%	1.84%	2.46%	1.45%	1.19%	0.95%	0.84%	0.91%	0.62%	**1.21%**

(Source: Agriculture department, Dholpur)

Table 24: Area (in ha), Production (in MT) and Productivity (in Kg/ha), increase (+)/decrease (-) in area, Production & Productivity trend and in the State & Dholpur district and Area & Production in % over state average & increase(+)/decrease (-) in Productivit

Crops	Details	State				District Dholpur				
		2006-07	2015-16	increase(+)/decrease (-) in area, Production, & Productivity	Average of 10 Years	2006-07	2015-16	increase(+)/decrease (-) in area, Production, & Productivity	Average of 10 Years	Area & Production in % over state average & increase(+)/decrease (-) in Productivity in kg/ha
Rice	**Area**	107758	182877	75119	**140697.8**	536	403	-133	**565.7**	**0.40%**
	Production	169823	369780	199957	**496951.4**	845	815	-30	**1070.9**	**0.22%**
	Productivity	1576	2022	446	**1896.6**	1576	2022	446	**1896.8**	**0.2**
Black Gram	**Area**	107946	298714	190768	**180374.4**	164	126	-38	**152.1**	**0.08%**
	Production	31557	114592	83035	**82786.7**	48	48	0	**70.4**	**0.09%**
	Productivity	292	384	92	**450.9**	293	381	88	**451.7**	**0.8**
Groundnut	**Area**	306037	516850	210813	**387853**	180	43	-137	**81.25**	**0.02%**

Crops	Details	State				District Dholpur				
		2006-07	2015-16	increase(+)/decrease (-) in area, Production, & Productivity	Average of 10 Years	2006-07	2015-16	increase(+)/decrease (-) in area, Production, & Productivity	Average of 10 Years	Area & Production in % over state average & increase(+)/decrease (-) in Productivity in kg/ha
	Production	399509	1048718	649209	**684356.8**	235	87	-148	**142.25**	**0.02%**
	Productivity	1305	2029	724	**1723.2**	1306	2023	717	**1774.88**	**51.68**
Bajra	**Area**	4910409	4044591	-865818	**4739211**	67478	85045	17567	**79858.2**	**1.69%**
	Production	3440400	3211656	-228744	**4220252.1**	114031	178135	64104	**155888.2**	**3.69%**
	Productivity	701	794	93	**894**	1690	2095	405	**1943.4**	**1049.4**
Jowar	**Area**	662055	631170	-30885	**641570.1**	78	124	46	**128.8**	**0.02%**
	Production	367816	344269	-23547	**828508.1**	43	68	25	**78.9**	**0.01%**
	Productivity	556	545	-11	**589.2**	551	548	-3	**586.6**	**-2.6**
Sesamum	**Area**	273345	366736	93391	**424089**	3829	2767	-1062	**2849.9**	**0.67%**
	Production	88694	115310	26616	**127664.6**	2959	1698	-1261	**1790.7**	**1.40%**
	Productivity	324	314	-10	**306.3**	773	614	-159	**585.7**	**279.4**
Mustard	**Area**	3099570	2532330	-567240	**2561288.3**	66976	63972	-3004	**65044**	**2.54%**
	Production	3766923	3257987	-508936	**3269315.2**	103446	84984	-18462	**91964.3**	**2.81%**
	Productivity	1215	1287	72	**1267.4**	1545	1328	7783	**2210.8**	**943.4**
Wheat	**Area**	2564840	3108973	544133	**2851321.6**	47649	64066	16417	**57712**	**2.02%**
	Production	7755883	10468161	2712278	**8721618.8**	159087	218346	59259	**210700.5**	**2.42%**
	Productivity	3024	3367	343	**3225.6**	3339	3408	69	**3641.1**	**415.5**
Barley	**Area**	232271	256029	23758	**281434.6**	986	611	-375	**888.2**	**0.32%**
	Production	591582	766379	174797	**798120.9**	2491	1829	-662	**2517.8**	**0.32%**
	Productivity	2547	2993	446	**2818.7**	2526	2993	467	**2865.9**	**47.2**
Gram	**Area**	1010754	941950	-68804	**1297770.4**	1885	949	-936	**1854.3**	**0.14%**
	Production	872559	840341	-32218	**1022230.1**	2637	916	-1721	**2267.9**	**0.22%**
	Productivity	863	892	29	**779**	1399	965	-434	**1191.8**	**412.8**

(Source: Agriculture department, Jaipur)

Table 25: Area (in ha), Production (in MT) and Productivity (in Kg/ha) in Dholpur District

Crops	Details	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	Average of 10 Years
Rice	Area	536	484	574	569	679	675	614	619	504	403	**565.70**
	Production	845	984	1037	862	1375	1273	1087	1329	1102	815	**1070.90**
	Productivity	1576	2033	1807	1515	2025	1886	1770	2147	2187	2022	**1896.80**
Black Gram	Area	164	162	111	132	161	172	187	164	142	126	**152.10**
	Production	48	86	33	35	119	89	108	59	79	48	**70.40**
	Productivity	293	531	297	265	739	517	578	360	556	381	**451.70**
Groundnut	Area	180	128	75	89	91	161	90	61	40	43	**95.80**
	Production	235	221	125	97	179	311	139	119	81	87	**159.40**
	Productivity	1306	1727	1667	1090	1967	1932	1544	1951	2025	2023	**1723.20**
Bajra	Area	67478	76435	69923	86376	86253	82914	80454	80180	83524	85045	**79858.20**
	Production	114031	142456	121083	167775	155134	184950	160945	156519	177854	178135	**155888.20**
	Productivity	1690	1864	1732	1942	1799	2231	2000	1952	2129	2095	**1943.40**
Sorghum	Area	78	85	89	119	42	137	148	134	332	124	**128.80**
	Production	43	54	51	17	29	101	91	82	253	68	**78.90**
	Productivity	551	635	573	143	690	737	615	612	762	548	**586.60**
Sesamum	Area	3829	3788	2701	3030	3576	2746	2138	2060	1864	2767	**2849.90**
	Production	2959	1884	1431	1976	4757	1140	556	442	1064	1698	**1790.70**
	Productivity	773	497	530	652	1330	415	260	215	571	614	**585.70**
Mustard	Area	66976	50852	69802	65931	60772	69037	71388	70483	61227	63972	**65044.00**
	Production	103446	61977	104311	95340	108787	107960	93654	88520	70664	84984	**91964.30**
	Productivity	1545	1219	1494	1446	1790	1564	1312	1256	1154	1328	**2210.80**
Wheat	Area	47649	51180	50807	56832	59191	58477	59520	61419	67979	64066	**57712.00**
	Production	159087	150681	185291	222278	206385	246225	243792	242823	232097	218346	**210700.50**
	Productivity	3339	2944	3647	3911	3487	4211	4096	3954	3414	3408	**3641.10**
Barley	Area	986	1209	865	978	957	939	803	774	760	611	**888.20**
	Production	2491	2887	2879	2713	2727	2665	2498	2358	2131	1829	**2517.80**

Crops	Details	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	Average of 10 Years
	Productivity	2526	2388	3328	2774	2850	2838	3111	3047	2804	2993	**2865.90**
Gram	Area	1885	827	2748	3778	2266	1874	1496	1321	1399	949	**1854.30**
	Production	2637	813	3240	5486	2034	1939	2091	2168	1355	916	**2267.90**
	Productivity	1399	983	1178	1452	898	1035	1398	1641	969	965	**1191.80**

(Source: Agriculture department, Jaipur)

Annexure 2.3 Farmers' category wise Cultivated Area in Bari Cluster

Table26. Farmers' Category-wise Cultivated Area in Bari Cluster

S. No.	Category of	Total Households	Cultivated Area (ha)			Category wise Cultivated Area (ha)			
			Irrigated	Rainfed	Total	General	SC	ST	OBC
1	Large farmer	439	320.00	570.30	**890.30**	213.67	222.49	186.96	267.18
2	Small farmer	1726	707.56	1199.90	**1907.46**	313.79	326.74	574.56	692.37
3	Marginal farmer	3663	366.46	672.80	**1039.26**	162.57	157.60	353.96	365.13
4	Landless person	696	0.00	0.00	**0.00**	0	0	0	0
5	No. of BPL households	1099	88.46	232.00	**320.46**	19.27	35.22	104.89	161.08
	Total (1to 4)	**6524**	**1394.02(36.33%)**	**2443.00(63.37%)**	**3837.02**	**690.03**	**706.83**	**1115.48**	**1324.68**
	Category wise Cultivated Area in Bari (Dholpur) Cluster in %								
1	Large farmer	6.73%	22.96%	23.34%	23.20%	5.57%	5.80%	4.87%	6.96%
2	Small farmer	26.46%	50.76%	49.12%	49.71%	8.18%	8.52%	14.97%	18.04%
3	Marginal farmer	56.15%	26.29%	27.54%	27.09%	4.24%	4.11%	9.22%	9.52%
4	Landless person	10.67%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
5	No. of BPL households	16.85%	6.35%	9.50%	8.35%	0.50%	0.92%	2.73%	4.20%
	Total (1to 4)	**100.00%**	**100.00%**	**100.00%**	**100.00 %**	**17.98%**	**18.42 %**	**29.07 %**	**34.52 %**

(Source: Watershed DPR of Bari Cluster)

Annexure 2.4 Status of Cropped area of Agricultural Crops in Bari cluster

Table 27. The Status of Cropped area of Agricultural Crops in Bari cluster

S. No.	Crops	2006-07		2015-16		Increase (+) / decrease (-) over last 10 Years		Average of 10 Years
		Area (ha)	%	Area (ha)	%	Area (ha)	%	
A.	**Kharif**							
1	Bajra	2493	64.97%	2769	72.17%	276	7.19%	**2563.90**
2	Sesamum	135	3.52%	144	3.75%	9	0.23%	**135.50**
3	Red Gram (Arhar)	157	4.09%	176	4.59%	19	0.50%	**170.50**
4	Guar	45	1.17%	41	1.07%	-4	-0.10%	**51.10**
	Total	**2830**	**73.76%**	**3130**	**81.57%**	**300**	**7.82%**	**2921.00**
B.	**Rabi**					0	0.00%	
1	Mustard	2012	52.44%	2002	52.18%	-10	-0.26%	**2010.60**
2	Wheat	1816	47.33%	1810	47.17%	-6	-0.16%	**1796.80**
3	Barley	8	0.21%	0	0.00%	-8	-0.21%	**9.60**
	Total	**3836**	**99.97%**	**3812**	**99.35%**	**-24**	**-0.63%**	**3817.00**
	Grand Total	**6666**	**173.73%**	**6942**	**180.92%**	**276**	**7.19%**	**6738.00**

Table 28: Area in ha and Cropping Pattern in % Agricultural Cropped area in Bari cluster

S. No.	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
A.	**Kharif**											
1	Bajra	2493	2447	2397	2402	2496	2495	2628	2678	2834	2769	**2563.90**
2	Sesamum	135	148	129	143	120	123	134	139	140	144	**135.50**
3	Red Gram (Arhar)	157	177	143	172	168	172	182	175	183	176	**170.50**
4	Guar	45	51	47	57	48	40	52	64	66	41	**51.10**
	Total	**2830**	**2823**	**2716**	**2774**	**2832**	**2830**	**2996**	**3056**	**3223**	**3130**	**2921.00**
B.	**Rabi**											
1	Mustard	2012	1998	2045	2078	1986	1984	2001	2004	1996	2002	**2010.60**
2	Wheat	1816	1802	1756	1749	1810	1809	1796	1805	1815	1810	**1796.80**
3	Barley	8	9	12	9	12	9	12	10	15	0	**9.60**
	Total	**3836**	**3809**	**3813**	**3836**	**3808**	**3802**	**3809**	**3819**	**3826**	**3812**	**3817.00**
	Grand Total	**6666**	**6632**	**6529**	**6610**	**6640**	**6632**	**6805**	**6875**	**7049**	**6942**	**6738.00**
Cropping Pattern in %												
A.	**Kharif**											
1	Bajra	64.97%	63.77%	62.47%	62.60%	65.05%	65.02%	68.49%	69.79%	73.86%	72.17%	**66.82%**
2	Sesamum	3.52%	3.86%	3.36%	3.73%	3.13%	3.21%	3.49%	3.62%	3.65%	3.75%	**3.53%**
3	Red Gram (Arhar)	4.09%	4.61%	3.73%	4.48%	4.38%	4.48%	4.74%	4.56%	4.77%	4.59%	**4.44%**
4	Guar	1.17%	1.33%	1.22%	1.49%	1.25%	1.04%	1.36%	1.67%	1.72%	1.07%	**1.33%**
	Total	**73.76%**	**73.57%**	**70.78%**	**72.30%**	**73.81%**	**73.76%**	**78.08%**	**79.65%**	**84.00%**	**81.57%**	**76.13%**
B.	**Rabi**											
1	Mustard	52.44%	52.07%	53.30%	54.16%	51.76%	51.71%	52.15%	52.23%	52.02%	52.18%	**52.40%**
2	Wheat	47.33%	46.96%	45.76%	45.58%	47.17%	47.15%	46.81%	47.04%	47.30%	47.17%	**46.83%**
3	Barley	0.21%	0.23%	0.31%	0.23%	0.31%	0.23%	0.31%	0.26%	0.39%	0.00%	**0.25%**
	Total	**99.97%**	**99.27%**	**99.37%**	**99.97%**	**99.24%**	**99.09%**	**99.27%**	**99.53%**	**99.71%**	**99.35%**	**99.48%**
	Grand Total	**173.73%**	**172.84%**	**170.16%**	**172.27%**	**173.05%**	**172.84%**	**177.35%**	**179.18%**	**183.71%**	**180.92%**	**175.61%**

(Source: Data collected using PRA by NGO)

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

Table 29: Year and Crop wise areas (in ha) of horticultural crops in Rajasthan and Dholpur district

Crops	State							Dholpur district							
	2011-12		2015-16		Increase (+) / decrease (-) over last 10 Years		Average of 05 Years	2011-12		2015-16		Increase (+) / decrease (-) over last 10 Years		Average of 05 Years)	% area over state average
	Area	%	Area	%	Area	%		Area	%	Area	%	Area	%		
Guava	2299	0.08%	3850	0.13%	1551	0.05%	2720	86	0.34%	90	0.35%	4	0.01%	89.41	3.29%
Lemon	2701	0.09%	2891	0.10%	190	0.01%	2841	139	0.54%	140	0.55%	2	0.01%	137.93	4.85%
Kinnow	7923	0.27%	8821	0.30%	898	0.03%	8997.6	195	0.76%	218	0.85%	23	0.09%	201.00	2.23%
Ber	968	0.03%	714	0.02%	-254	-0.01%	854.4	507	1.98%	697	2.73%	190	0.74%	540.60	63.27%
Tomato	17646	0.60%	20507	0.70%	2861	0.10%	17465.56	24	0.09%	16	0.06%	-8	-0.03%	27.00	0.15%
Brinjal	5296	0.18%	6078	0.21%	782	0.03%	5418.15	105	0.41%	162	0.63%	57	0.22%	159.50	2.94%
Okra	3743	0.13%	3282	0.11%	-461	-0.02%	3695.242	85	0.33%	140	0.55%	55	0.22%	102.80	2.78%
Onion	64171	2.18%	86306	2.93%	22135	0.75%	63596.2	2	0.01%	14	0.05%	12	0.05%	3.60	0.01%

(Source: Agriculture department, Bari)

Annexure 2.6 Change in Area and Cropping Pattern of horticultural crops over 5 years in Bari cluster

Table 30: Cropping Pattern (in ha & %) of Horticultural crops in Bari Cluster

Crops	Area (ha)	Cropping Intensity (%)
Vegetables		
Potato	180	4.69%
Tomato	19	0.50%
Brinjal	23	0.60%
Cauliflower	13	0.34%
Lady Finger	14	0.36%
Total Vegetables	**249**	**6.49%**
Fruits		
Mango	6	0.16%
Guava	12	0.31%
Lemon	5	0.13%
Kinnon	2	0.05%
Ber	2	0.05%
Total Fruits	**27**	**0.70%**
Total Horticulture	**276**	**7.19%**

(Source: Horticulture department, Bari)

Annexure 2.7 Average Annual Rainfall in the last decade in Bari cluster

Table 31: Average Annual Rainfall in the last 10 years (decade) in Bari Cluster

S. No	Year	Average Annual Rainfall (mm)
1	2006	417.60
2	2007	449.00
3	2008	963.00
4	2009	347.00
5	2010	600.00
6	2011	570.00
7	2012	804.00
8	2013	797.00
9	2014	521.00
10	2015	431.00
	Total	5899.60
	Average	589.96
	Say	**589**

(Source: Water Resource department, Dholpur)

Table 32: 10 year average rain fall pattern from the months of June to September in Bari Cluster

S. No	Month	Rainfall (mm)
1	June	85.3
2	July	228.5
3	August	208.99
4	September	59.02

Table 33: Maximum intensity of rainfall and duration

S. No	Duration	Rain fall Intensity (mm)
1	15 minute duration	37 mm
2	30 minute duration	65 mm
3	60 minute duration	80

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 and Sandstone are both Aquifers in Bari Cluster. Alluvium is the unconsolidated and composed of clay, silt, sand, gravel and mixture of concretions etc. Sand, gravel and a mixture of these form the potential aquifer. Consolidated sedimentary rocks comprised of sandstones belong to Vindhyan Super group. Ground water occurs under unconfined to semi-confined conditions.

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. The remaining area, after deleting the hilly area and separating the area with poor ground water quality, has been delineated into command and non-command areas. Ground water assessment in Bari Cluster is done on non-command and Command areas for monsoon and non-monsoon seasons and consolidated as Net Annual Ground water Availability in the Cluster area.

Ground water potential of Bari cluster area block Bari, Dholpur 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 12.37 MCM. The details are given in Annexure 2.14

Stage of ground water development in the Bari Cluster area as on 31.3.2013 is 91.42% and the long term trend of Pre-Monsoon showing decreasing trend & Post-Monsoon for showing increasing trend as on 31.03.2013. Therefore, Cluster area is treated as Semi-Critical Category which indicates that the scope of ground water development for Irrigation purposes. Additional 0.98 MCM of Ground Water is available for Ground Water Development in addition to present draft of 9.90 MCM.

One Piezometer per 20 Sq.km area or site specific requirements installed with Digital water Level Recorder (DWLR-Telemetric) may be constructed for monitoring of impact assessment of Investments proposed in the Cluster area.

Annexure 2.9 SRR in Dholpur district & Rajasthan

Table 34: Seed Replacement Rate (SRR) in Rajasthan and Dholpur

Crop	Rajasthan						District					
	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 (%)
Pearl Millet	**44.13**	**105614**	**59.83**	**40.76**	**94439**	**57.92**	**0.80**	**2628**	**82.13**	**0.84**	**1050**	**31.25**
Sorghum	5.79	12715	21.95	6.61	10876	16.45	0.00130	0.00	0.00	0.00330	0.00	0.00
Sesamum	3.61	2188	20.23	3.30	2997	30.27	0.02	16	26.67	0.02	37	61.67
Mustard	**2.78**	**90171**	**81.02**	**2.43**	**87925**	**90.32**	**0.705**	**588**	**20.86**	**0.61**	**745**	**30.42**
Wheat	**32.06**	**1022634**	**31.90**	**33.18**	**1082866**	**32.63**	**0.614**	**15546**	**25.31**	**0.68**	**23855**	**35.09**
Barley	**3.09**	**115195**	**37.25**	**3.43**	**132971**	**38.73**	**0.008**	**154**	**19.90**	**0.08**	**231**	**30.39**
Gram	19.23	170104	11.79	12.56	171839	18.24	0.013	190	19.18	0.014	195	18.58

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

Annexure 2.10 SRR in Bari cluster

Table 35: Seed Replacement Rate (SRR in %) in the Bari Cluster from 2011-12 to 2015-16

S. No.	Crop	2011-12	2012-13	2013-14	2014-15	2015-16
1	Bajra	74.50%	74.50%	72.00%	74.50%	89.65%
2	Sesamum	17.10%	17.10%	16.00%	17.10%	56.67%
3	Guar	15.70%	15.70%	50.00%	15.70%	34.67%
4	Wheat	31.60%	31.06%	30.00%	30.42%	30.42%
5	Mustard	30.84%	30.84%	25.00%	35.09%	35.09%
6	Barley	35.60%	35.60%	32.00%	30.39%	0.00%

(Source: Agriculture Department, Dholpur)

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

Table 36. The Area (in 000ha) Covered and Technical Grade Material (TGM) used under Plant Protection Measures during 2014-15 in Rajasthan and Dholpur (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
Dholpur	K	76	0	76	1	0	0	0	6
	R	53	3	56	67	0	0	0	14
	K&R	129	3	132	68	0	0	0	20
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%
Dholpur (%)	K	76.68%	0.00%	76.68%	1.01%	-	-	-	6.05%
	R	33.81%	1.91%	35.72%	42.74%	-	-	-	8.93%
	K&R	50.41%	1.17%	51.59%	26.57%	-	-	-	7.82%

(K – Kharif, R – Rabi & T – Total)

(Source: Agriculture Department, Bari)

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

Table 37 Area Covered and Technical Grade Material (TGM) used under Plant Protection Measures during 2014-15 (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
Dholpur	K	73	3	2	1	3	1	83	5
	R	107	6	6	4	10	4	137	8
	K&R	180	9	8	5	13	5	220	13
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%
Dholpur	K	73.65%	3.03%	2.02%	1.01%	3.03%	1.01%	83.74%	5.04%
	R	68.26%	3.83%	3.83%	2.55%	6.38%	2.55%	87.39%	5.10%
	K&R	70.35%	3.52%	3.13%	1.95%	5.08%	1.95%	85.98%	5.08%

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

Annexure 2.13 Crop Water Requirement of Agricultural and Horticultural Crops in Bari

Table 38. Crop Water Requirement of Agricultural and Horticultural Crops in Bari

Name of crop	Area in ha during the year 2015-16	Requirement of water for crops per Ha (In cum)	Water Requirement in present time (in cum)	Proposed Area (ha) after Watershed Development	Water Requirement in future when cultivated area increase (in cum)	Additional Crop water requirement (in cum)
Kharif						
Pearl Millet	2769	1000	2769000	2215.2	2215200	-553800
Sesamum	144	1000	144000	589.3	589300	445300
Red Gram (Arhar)	176	1000	176000	264	264000	88000
Guar	41	1000	41000	61.5	61500	20500
Total	**3130**		**3130000**	**3130**	**3130000**	**0**
Mustard	2002	3000	6006000	2002	6006000	0
Wheat	1810	5000	9050000	914.5	4572500	-4477500
Barley	0	2500	0	810	2025000	2025000
Total	**3812**		**15056000**	**3726.5**	**12603500**	**-2452500**
Vegetables						
Potato	180	8000	1440000	250	2000000	560000
Tomato	19	8000	152000	35	280000	128000
Brinjal	23	8000	184000	0	0	-184000
Cauliflower	13	8000	104000	0	0	-104000
Lady Finger	14	8000	112000	0	0	-112000
Total Vegetables	**249**		**1992000**	**285**	**2280000**	**288000**
Fruits						
Mango	6	11000	66000	6.5	71500	5500
Guava	12	8000	96000	50	400000	304000
Lemon	5	8000	40000	20	160000	120000
Kinnon	2	7000	14000	0	0	-14000

Name of crop	Area in ha during the year 2015-16	Requirement of water for crops per Ha (In cum)	Water Requirement in present time (in cum)	Proposed Area (ha) after Watershed Development	Water Requirement in future when cultivated area increase (in cum)	Additional Crop water requirement (in cum)
Ber	2	8000	16000	0	0	-16000
Total Fruits	**27**	8000	216000	**76.5**	0	**-216000**
Total Horticulture	**276**	-	**1666300**	**361.5**	**1530000**	**-136300**
Grand Total	**7218**		**19852300**	**7218**	**17263500**	**-2588800**

(Source: Agriculture Department & Watershed DPR, Bari)

Annexure 2.14 Data to calculate ground water status of Bari 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 Dholpur District are attached in the excel sheets with the CACP report of Bari .

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 Dholpur

Table 39: Supporting institutions and service providers in Dholpur

Sr. No	Type of Assistance	Websites Address & Name/ address of promotional institution
1	Identification of Project Profiles, techno-economic and managerial consultancy services, market survey and economic survey reports.	Micro Small Medium enterprises development institute ,Industrial Estate Bais Godam, Jaipur
2	Land and Industrial shed	Rajasthan State Industrial Development and Investment Corporation Ltd. (RIICO) Dholpur
3	Financial Assistance	Rajasthan Financial Corporation, Dholpur
4	For raw materials under Govt. Supply	Rajasthan State Small Industrial Corporation, Ltd. Udyog Bhavan
5	Plant and machinery under hire/ purchase basis.	National Small Industrial Corporation Ltd. Nehru place, Tonk Road, Jaipur.
6	Power/ Electricity	Jaipur Vidhut Vitran Nigam, Dholpur
7	Technical Know –how.	Micro Small Medium enterprises development institute ,Industrial Estate Bais Godam, Jaipur
8	Quality & Standard	Bureau of Indian Standards, Directorate of Marking Inspection, Jhalana Dungari Jaipur.
9	Marketing /Export Assistance	1. National Small Industrial Corporation Ltd. 2. Rajasthan State Small Industrial Corporation, Ltd. Udyog Bhavan.
10	Other Promotional Agencies	1. Khadi and village Industries Commission, 2. Rajasthan and khadi & village Industries Board, 3. Centre Food Technological Research Institute, 4. PPDC for Essential Oils (Fragrance and flavor Development Centre) Govt. of India Society, 5. Small Industries Development Bank of India 6. CIPET, Sitapura Industrial Area, Jaipur

Annexure 2.16 Number of Household and Household Enterprises owing Animal/Poultry Birds in Bari Cluster

Table 40: Number of households owing animal/ poultry in Bari cluster

S. No.	Village	Cattle	Buffaloes	Goats	Sheep	Pigs	Backyard Poultry	Poultry Farm & Hatcheries
1	Bateshwar Kalan	5	47	8	0	0	0	0
2	Bateshwar Khurd	6	40	6	0	0	0	0
3	Chila Chaund	91	439	40	3	6	0	0
4	Dadur	9	161	22	0	0	0	0
5	Dauapura	3	55	13	0	0	0	0
6	Dheemiri	53	249	16	0	1	0	0
7	Gadarpura	15	69	13	9	0	0	0
8	Garhi	2	151	14	0	0	0	0
9	Garhi Khirana	18	245	26	0	0	0	0
10	Halle Ka Pura	4	64	9	0	1	0	0
11	Hulasi Ka Pura	5	57	6	0	0	0	0
12	Jamboora	0	47	5	1	0	0	0
13	Kachhpura	18	142	10	0	1	0	0
14	Kankrai	49	202	19	2	3	0	0
15	Khairari	2	50	3	0	0	0	0
16	Khauri Ibrahimpur	20	111	4	0	0	0	0
17	Khoole Ka Pura	13	147	5	1	1	0	0
18	Koyla	16	114	12	1	1	0	0
19	Kuhawani	19	130	0	0	0	0	0
20	Maharajpur	6	34	8	0	0	0	0
21	Mundpura	10	48	8	0	0	0	0

S. No.	Village	Cattle	Buffaloes	Goats	Sheep	Pigs	Backyard Poultry	Poultry Farm & Hatcheries
22	Nadroli	0	90	5	0	0	0	0
23	Naksauda	4	122	7	1	1	0	0
24	Nidhara	18	115	0	0	0	0	0
25	Puramdari	24	127	26	0	0	0	0
26	Ranpura	17	74	9	4	0	0	0
27	Reechhai	14	60	13	0	0	0	0
28	Reti	7	89	27	0	0	0	0
29	Rewai	11	193	17	0	2	0	0
30	Rudh Ka Pura	23	163	9	1	0	0	0
31	Rundh Nidhara	4	16	3	0	0	0	0
32	Sagaur	16	113	19	0	0	0	0
33	Saheri No. 2	23	44	0	0	0	0	0
34	Salemabad	4	56	16	0	0	0	0
35	Sanaura	32	185	29	0	0	0	0
36	Sigorai	26	210	14	0	0	0	0
37	Sikarra	11	85	19	1	0	0	0
38	Sunipur	20	304	38	4	3	4	0
39	Tal Umreh	0	2	0	0	0	0	0
40	Tamoti	22	83	2	0	1	0	0
41	Todpura	45	96	12	0	0	0	0
42	Tontri	51	272	57	2	2	2	0
43	Totpura	8	54	8	0	0	0	0
44	Umreh	24	244	3	1	3	0	0
TOTAL		**768**	**5399**	**580**	**31**	**26**	**6**	**0**

Annexure 2.17 Goat Population profile of Bari cluster

Table 41: Goat population profile of Bari Cluster

S No.	Village	Male			Female					Total Goats
		Under 1 Year	1 Year and Above	Total	Under 1 Year	1 Year and Above			Total	
						In Milk	Dry	Not Calved Once		
1	Bateshwar Kalan	4	9	13	4	14	2	0	20	33
2	Bateshwar Khurd	10	7	17	7	8	2	0	17	34
3	Chila Chaund	64	46	110	76	104	75	76	331	441
4	Dadur	16	3	19	26	39	22	8	95	114
5	Dauapura	16	6	22	18	29	17	5	69	91
6	Dheemiri	2	12	14	11	25	12	4	52	66
7	Gadarpura	24	22	46	30	36	13	0	79	125
8	Garhi	5	0	5	7	6	2	10	25	30
9	Garhi Khirana	15	0	15	29	23	1	3	56	71
10	Halle Ka Pura	17	15	32	20	35	12	9	76	108
11	Hulasi Ka Pura	4	5	9	8	8	1	0	17	26
12	Jamboora	38	8	46	53	107	38	37	235	281
13	Kachhpura	8	7	15	4	17	28	29	78	93
14	Kankrai	19	10	29	48	65	57	4	174	203
15	Khairari	0	0	0	0	1	3	1	5	5
16	Khauri Ibrahimpur	3	9	12	9	18	21	25	73	85
17	Khoole Ka Pura	8	17	25	7	9	17	12	45	70
18	Koyla	22	0	22	20	30	19	22	91	113
19	Kuhawani	0	0	0	0	0	0	0	0	0
20	Maharajpur	22	14	36	16	15	3	0	34	70

S No.	Village	Male			Female					Total Goats
		Under 1 Year	1 Year and Above	Total	Under 1 Year	1 Year and Above			Total	
						In Milk	Dry	Not Calved Once		
21	Mundpura	10	8	18	11	18	8	6	43	61
22	Nadroli	9	5	14	13	18	14	13	58	72
23	Naksauda	5	0	5	6	11	7	2	26	31
24	Nidhara	0	0	0	0	0	0	0	0	0
25	Puramdari	1	0	1	5	7	1	0	13	14
26	Ranpura	7	6	13	7	9	4	1	21	34
27	Reechhai	25	22	47	13	24	16	12	65	112
28	Reti	19	4	23	27	36	23	16	102	125
29	Rewai	9	17	26	17	31	32	28	108	134
30	Rudh Ka Pura	8	14	22	15	18	2	0	35	57
31	Rundh Nidhara	5	4	9	7	6	0	0	13	22
32	Sagaur	12	2	14	13	20	14	1	48	62
33	Saheri No. 2	0	0	0	0	0	0	0	0	0
34	Salemabad	9	0	9	12	15	10	4	41	50
35	Sanaura	57	56	113	41	70	33	0	144	257
36	Sigorai	37	38	75	45	46	0	0	91	166
37	Sikarra	11	16	27	19	28	42	36	125	152
38	Sunipur	51	32	83	64	82	54	27	227	310
39	Tal Umreh	0	0	0	0	0	0	0	0	0
40	Tamoti	2	3	5	2	7	5	5	19	24
41	Todpura	2	7	9	5	10	10	9	34	43
42	Tontri	42	15	57	65	148	43	27	283	340
43	Totpura	3	4	7	2	9	10	9	30	37
44	Umreh	21	32	53	23	29	6	1	59	112
TOTAL		**642**	**475**	**1117**	**805**	**1231**	**679**	**442**	**3157**	**4274**

Annexure 2.18 Village wise Resources in Bari cluster

Table 42 Village wise Resources in Bari cluster

S. No.	Village	Milking Machine	Mechanized Fodder Cutter	Chopper & Baler	Dung Collection & Disposal Equipment
1	Bateshwar Kalan	0	13	0	0
2	Bateshwar Khurd	0	11	0	0
3	Chila Chaund	0	135	0	0
4	Dadur	0	53	0	0
5	Dauapura	30	30	0	0
6	Dheemiri	0	152	0	0
7	Gadarpura	0	20	0	0
8	Garhi	0	41	0	0
9	Garhi Khirana	0	110	0	0
10	Halle Ka Pura	0	27	0	0
11	Hulasi Ka Pura	0	12	0	0
12	Jamboora	19	19	0	0
13	Kachhpura	0	43	0	0
14	Kankrai	65	65	0	0
15	Khairari	0	15	0	0
16	Khauri Ibrahimpur	0	51	0	0
17	Khoole Ka Pura	0	43	0	0
18	Koyla	57	57	0	0
19	Kuhawani	0	34	0	0
20	Maharajpur	0	11	0	0
21	Mundpura	0	22	0	0
22	Nadroli	38	38	0	0
23	Naksauda	57	57	0	0
24	Nidhara	0	38	0	0
25	Puramdari	0	70	0	0
26	Ranpura	0	8	0	0
27	Reechhai	0	25	0	0
28	Reti	0	45	0	0
29	Rewai	0	70	0	0

S. No.	Village	Milking Machine	Mechanized Fodder Cutter	Chopper & Baler	Dung Collection & Disposal Equipment
30	Rudh Ka Pura	0	38	0	0
31	Rundh Nidhara	0	6	0	0
32	Sagaur	57	57	0	0
33	Saheri No. 2	0	13	0	0
34	Salemabad	25	25	0	0
35	Sanaura	0	46	0	0
36	Sigorai	0	52	0	0
37	Sikarra	0	22	0	0
38	Sunipur	0	0	0	0
39	Tal Umreh	0	0	0	0
40	Tamoti	0	18	0	0
41	Todpura	0	33	0	0
42	Tontri	0	154	0	0
43	Totpura	0	28	0	0
44	Umreh	0	76	0	0
Total		**348**	**1883**	**0**	**0**

Annexure 2.19.: Category wise and micro watershed wise slope area

Table 43: category wise and micro watershed wise slope

#	Macro_ Micro watershed	Area (in Ha) covered in various slope ranges (Slope in %)						Total
		0-1	1-3	3-5	5-10	10-20	>20	
1	02_01	223.4271	50.1578	14.7959	1.4387	0	0	289.8195
2	02_02	1364.395	576.9023	175.1415	84.0787	1.5776	0.0077	2202.103
3	02_03	149.1559	136.9833	29.4491	17.5103	0.0892	0	333.1878
4	02_04	534.9601	420.1729	99.0973	22.5272	0.0061	0	1076.764
5	02_05	109.2055	83.7726	12.7657	1.1416	0	0	206.8854
6	02_06	158.9173	142.9908	53.1171	24.7198	1.3996	0.0251	381.1697
7	02_07	602.3137	559.7775	188.2809	50.4986	1.5233	0.0391	1402.433
8	02_08	103.8321	107.4061	43.7521	3.724	0.0205	0	258.7348
9	02_09	289.4341	162.0593	68.9991	24.5786	0.202	0.0112	545.2843
10	02_10	379.684	131.5611	41.9096	6.6246	0.0014	0	559.7807
11	02_11	101.57	57.9086	26.4697	10.5055	0.123	0.0046	196.5814
12	02_12	401.4177	281.3477	102.2511	25.8346	0.0983	0	810.9494
13	03_01	778.8349	731.4313	448.5722	234.712	5.2704	0.0617	2198.883
14	03_02	459.0607	452.3872	148.2533	60.4016	0.2403	0.0196	1120.363
15	04_01	352.5766	420.8648	277.0138	148.3779	4.5011	0.0427	1203.377
16	04_02	293.2636	342.6264	173.0734	33.9873	0	0	842.9507
17	04_03	286.8899	91.6105	11.2221	4.4343	0.8657	0	395.0225
	Total	**6588.9382**	**4749.9602**	**1914.1639**	**755.0953**	**15.9185**	**0.2117**	**14024.29**

(Source: DPR of Watershed, Dholpur**)**

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 Bari

The parameters as well as relative scores of commodities in the Bari cluster presented below:

Table 44: Parameters for prioritization of Value chain commodities in Bari cluster

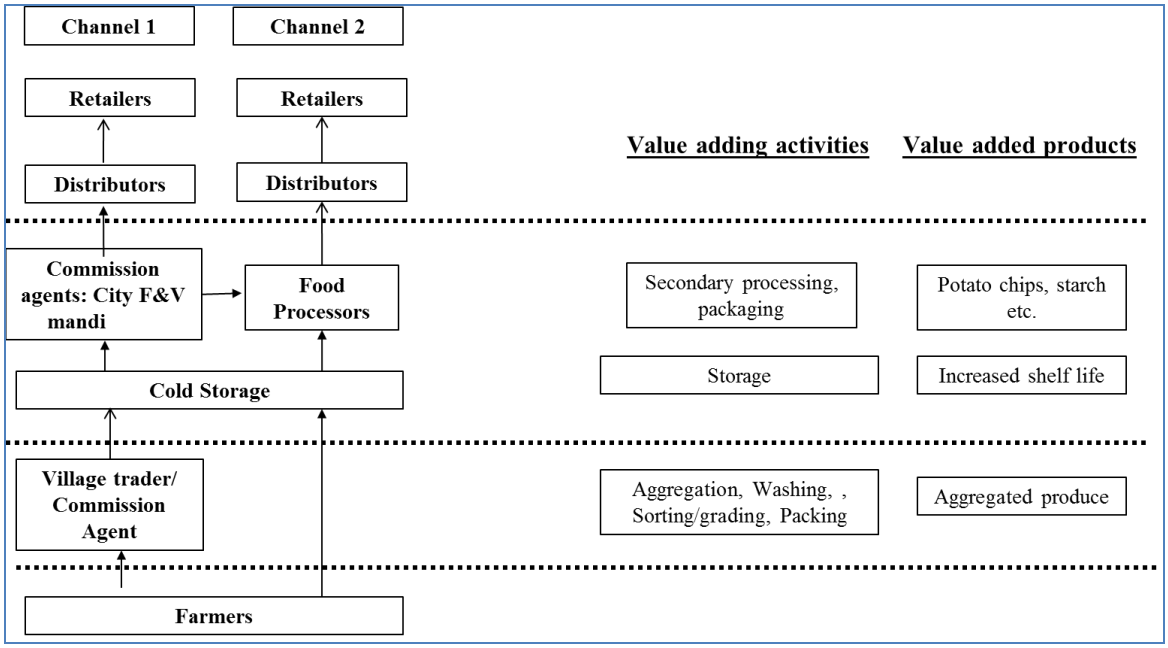
Sr. No.	Parameters	Weightage	Bajra	Sesamum	Potato	Mustard	Wheat
A.	**Existing size**	**30**	**22.8**	**11.0**	**21.8**	**19.0**	**11.9**
1	Cropped Area of the crop in the cluster (in acre)	10	10.0	5.7	1.8	7.1	5.4
2	Crop Production in the cluster (in quintals)	10	2.8	0.5	10.0	1.9	1.7
3	Crop Productivity (cluster level compared to national's average)	10	10.0	4.9	10.0	10.0	4.7
B.	**Potential for Value addition within Rajasthan (implying scope for increased value addition for local farmers and processors)**	**45**	**17.9**	**22.2**	**35.5**	**29.8**	**24.2**
4	Price spread in Rs/Qtl (Price paid at APMC mandi- realization by farmer at farm level)	5	1.2	5.0	0.8	2.6	1.3
5	Price spread in Rs/Qtl (Price paid by customer at retail level- realization by farmer at farm level)	5	5.0	4.9	4.6	0.8	1.7
6	Net profit in production (Rs per acre)	5	0.8	0.3	5.0	0.4	1.0
7	Scope for processing in the state	10	5.0	4.0	5.0	10.0	5.0
8	Scope for value addition (Primary/ secondary/ tertiary processing)	10	6.0	4.0	10.0	6.0	8.0
9	Growth in market demand 5 year	10	0.0	4.0	10.0	10.0	7.2
C.	**Risk assessment**	**10**	**5.7**	**10.0**	**6.6**	**4.9**	**4.7**
10	Price Volatility (last 5 years; due to monsoon, due to adverse agronomical conditions	10	5.7	10.0	6.6	4.9	4.7
D.	**Others (Environmental & Social Parameter)**	**15.0**	**15.0**	**15.0**	**0.0**	**10.7**	**6.4**
11	Water requirement	15.0	15.0	15.0	0.0	10.7	6.4
Total		**100.0**	**61.4**	**58.3**	**63.9**	**64.4**	**47.2**

Source: Data analysis by ABPF- Grant Thornton

Appendix 3.3 Current marketing chain of Value chain crops in Bari

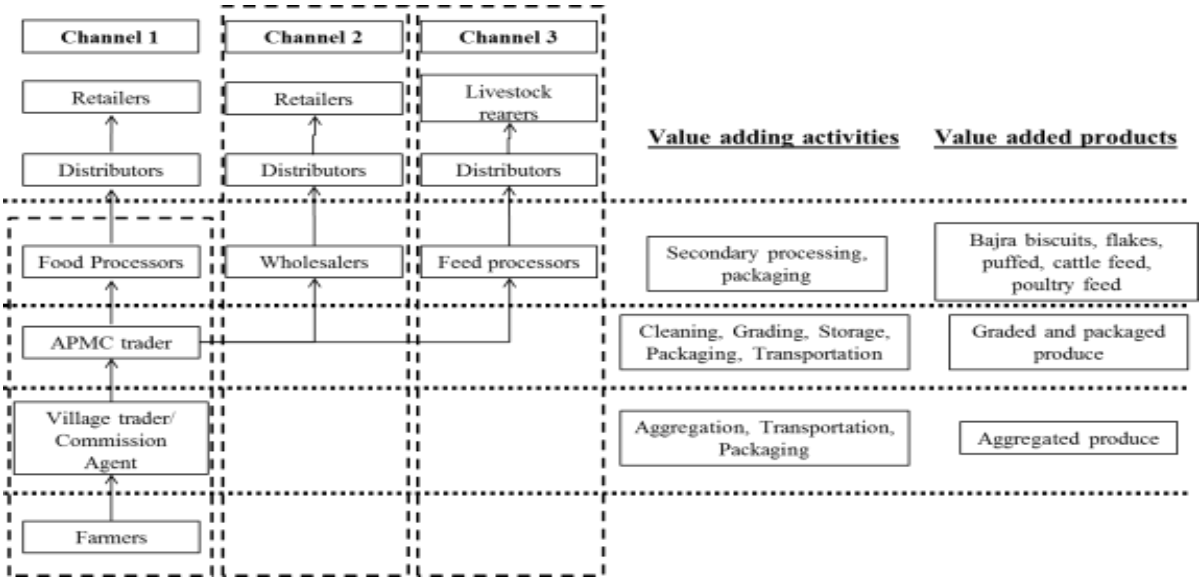
- **Potato**

Figure 9: Current structure of marketing chains - Potato



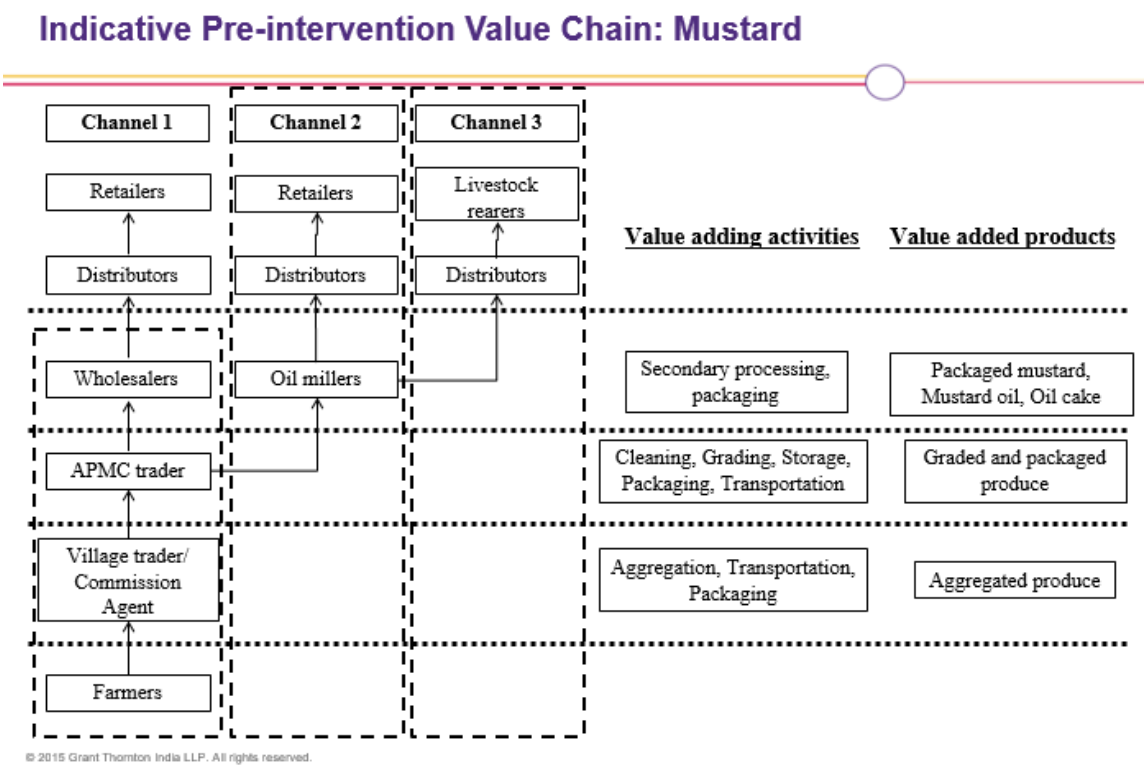
- **Bajra**

Figure 10: Current structure of marketing chains - Bajra



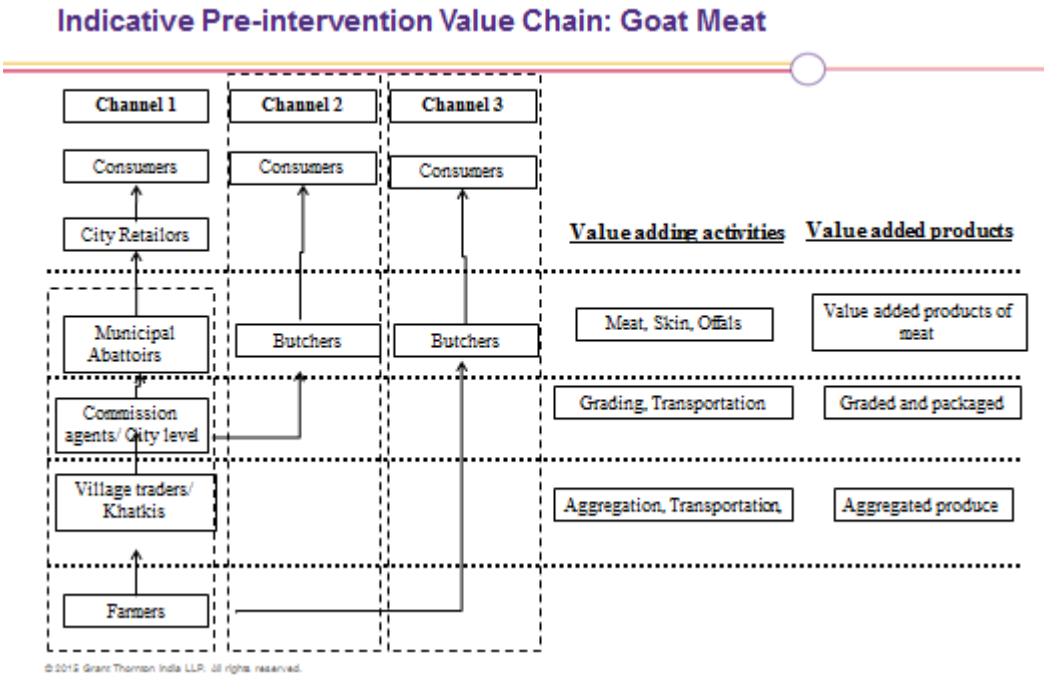
- **Mustard**

Figure 11: Current structure of marketing chains of Mustard



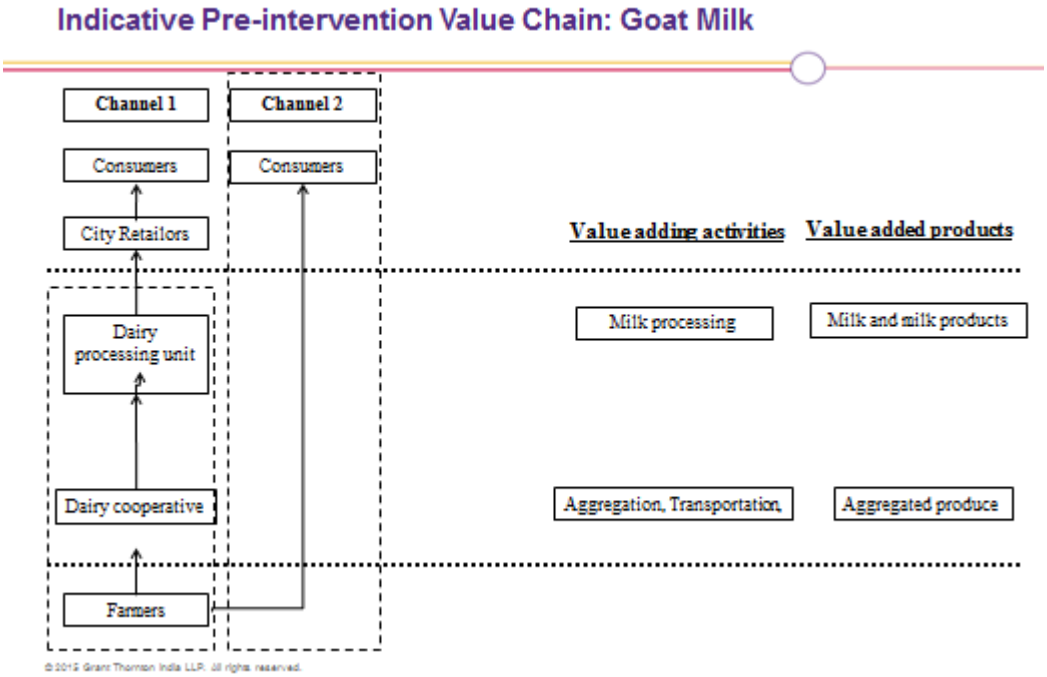
- **Goat Meat**

Figure 12: Current structure of marketing chains of Goat Meat



- **Goat Milk**

Figure 13: Current structure of marketing chains of Goat Milk



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:

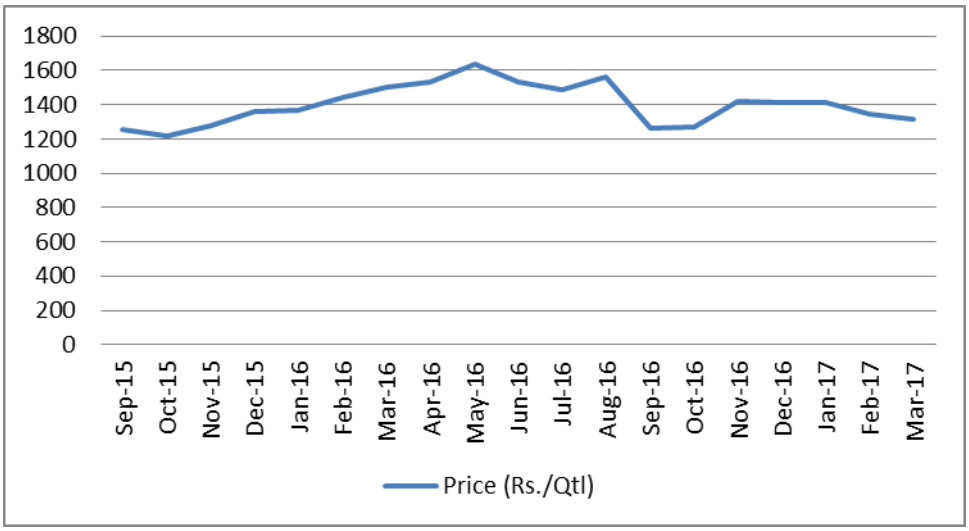
Bajra

Table 45: Price trend of Bajra in Alwar mandi for 2 years

Month	Price (Rs./Qtl)	Month	Price (Rs./Qtl)
Sep-15	1255	Jul-16	1488
Oct-15	1216	Aug-16	1561
Nov-15	1281	Sep-16	1264
Dec-15	1362	Oct-16	1270
Jan-16	1369	Nov-16	1421
Feb-16	1439	Dec-16	1409
Mar-16	1504	Jan-17	1413
Apr-16	1528	Feb-17	1343
May-16	1633	Mar-17	1316
Jun-16	1528		

The trend shows that in Rajasthan, price of the commodity is largely in the same range 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 14: Price trend of Bajra in Alwar mandi for 2 years



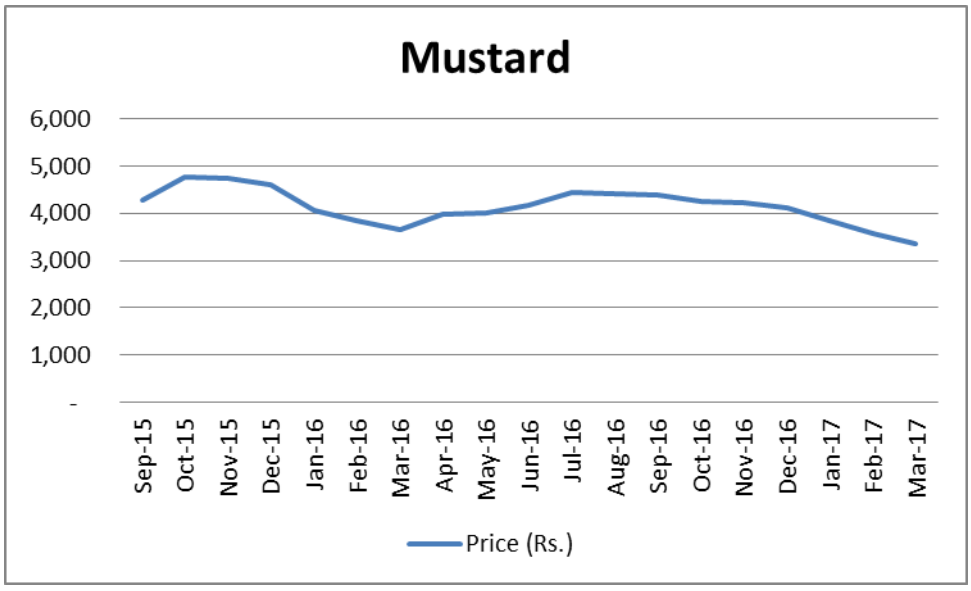
Mustard

Table 46: Price trend of Mustard in Alwar mandi for past 3 season

Month	Price (Rs.)	Month	Price (Rs.)
Sep-15	4,268	Jul-16	4,448
Oct-15	4,771	Aug-16	4,419
Nov-15	4,736	Sep-16	4,378
Dec-15	4,603	Oct-16	4,250
Jan-16	4,063	Nov-16	4,231
Feb-16	3,849	Dec-16	4,105
Mar-16	3,648	Jan-17	3,835
Apr-16	3,978	Feb-17	3,583
May-16	4,005	Mar-17	3,366
Jun-16	4,171		

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

Figure 15: Price trend of Mustard in Alwar 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 Bajra 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 Bajra has been formulated which is shown in the table below.

Bajra

Bajra has larger consumption in rural areas than urban. Although the demand for food Bajra has decreased by 14% CAGR in past 3 years but the demand in alternate segment (non-food) like cattle feed and malt is increasing and currently captures almost about 70% of the total consumption of Bajra.

National Demand Growth of Bajra (per capita consumption in kg)		
1999-2000	2004-2005	2009-2010
2.79	1.66	2.07

Mustard

The national consumption of Mustard Seeds in the year 2017-18 is 7.2 MT which has grown at CAGR of 10% in last 3 years.

National Demand Growth of R&M (000 MT)		
2015/16	2016/17	2017/18
5,930	6,800	7,170

Wheat

The national consumption of Wheat in the year 2017-18 is 100,000 MT which has grown at CAGR of 3.59 % in last 5 years.

National Demand Growth of Wheat(000 MT)					
2012/13	2013/14	2014/15	2015/16	2016/17	2017/18
83,824	93,848	93,102	88,551	97,500	100,000

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 47: 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	Bajra	8,000	8	1,400	11,200	10,600
2	Mustard	11,600	5.5	3,100	17,050	6,000

Appendix 3.7 Livestock population and Fodder Requirement of Bari cluster

Table 48: Livestock population and Fodder Requirement of Bari cluster

S. No.	Description of animals	Population in No.	Yield (milk/mutton/ Wool)	Units	Dry Matter Requirement per animal (KGPD)	Total requirement of dry fodder per year in M.T.
1.	Cattle (Indigenous)	2183	3.31	Lit/day	7	5578
2.	Cattle (CB)	49	6.94		7	125
3.	Buffaloes	15341	4.48	Lit/day	7	39196
4.	Goat	4274	0.50 – 0.75	Lit/day, kg/no.	1.2	1872
5.	Sheep	621	0.50 - 1.00/ 1-2	Lit/day, kg/Yr.	1.2	272
6.	Piggery	432			3.5	552
7.	Poultry	55	50-60	Eggs per year		0
	Total Livestock	**22955**				**47595**

(Source: Animal Husbandry Department, Bari)

Table 49: Fodder availability in Bari Cluster (Qty. in MT)

Name of crop	Proposed Area (ha)	Productivity (Kg/ha)	Production (in MT)
Kharif			
Pearl Millet	2215.2	4000	8860.8
Sesamum	589.3	4000	2357.2
Red Gram (Arhar)	264	1000	264
Guar	61.5	3000	184.5
Total	**3130**		**11666.5**
Mustard	2002	0	0
Wheat	914.5	5000	4572.5
Barley	810	5000	4050
Total	**3726.5**		**8622.5**
Pasture & Community Lands	8249	16463.25	33951
Grand Total			**54240**

(Source: Agriculture Department, Bari)

Annexure-5.1: Operational and Implementation Arrangements

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, Rs. 1.00 and Rs. 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. 1.00 lacs and the project assistance of 75% has been proposed for this activity.

Technology Transfer and market led advisory services

Promoting adoption and documentation of improved technologies

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.

Integrated Crop Management is a system of crop production which conserves and enhances natural resources while producing food on an economically viable and sustainable foundation. It is based on a good understanding of the interactions between biology, environment and land management systems. ICM is particularly appropriate for small farmers because it aims to minimize dependence on purchased inputs and to make the fullest possible use of indigenous technical knowledge and land use practices. As discussed earlier regarding the topographical profile of the cluster, following are the key focus areas of ICM demonstration in the cluster-

a. The soil of the project area is moderately to deeply eroded. It needs to be addressed by field level and village level bunding.

b. Emphasis upon the application of Vermi-compost and other organic manures to rejuvenate the depleted soil nutrient condition of the cluster soil.
c. In order to maintain and conserve the ground water level of the cluster, the water harvesting techniques are imperative to be discussed in detail with the farmers
d. Village level Soil moisture conservation techniques also need to be demonstrated in order to get appropriate crop production in Rabi and Zaid season, which has lesser incidence compared to Kharif.

Adoption of Solar pumps for irrigations could be promoted among farmers as the local conditions are feasible like depth of ground water level is 100cm.

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.

Component 3: 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.
6. 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.

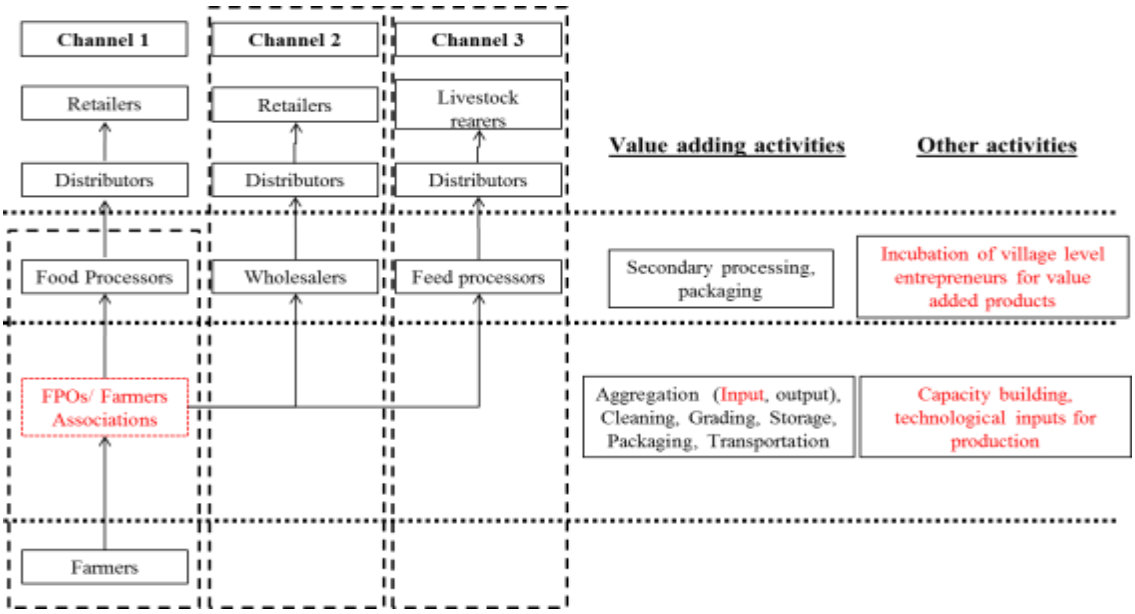
Annexure 5.2: Post intervention value chain map

1. Bajra

In the post intervention value chain a third channel may be developed targeting value-added products like multi-grain flour (by large players like Ashirvad), breakfast cereals (Kellog), also large players like Cargill for animal feed. Also, the restructured value chain will have PCs and their FCSC replacing Mandi's and undertaking aggregation plus grinding and sorting and packaging services. The PCs may need input facilitation, custom hiring and marketing of produce.

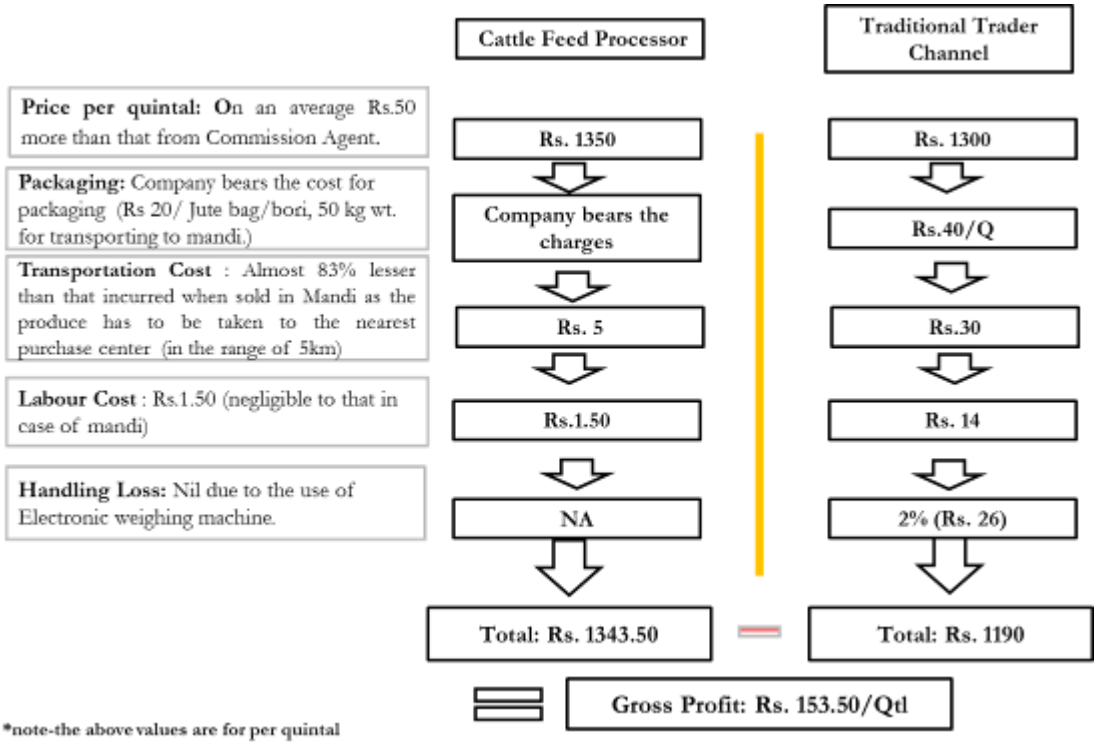
The unavailability of HYV of bajra for farmers is a critical constraint experienced by farmers. In this context, a seed production programme need to be launched availing the services of players Raj seeds. Also, limitation in terms of threshers and harvester combines are apparent. At the post-harvest stage there are constraints in terms of high moisture content, storage facility, high level of dirt and impurities in harvested which may be addressed through common facilities. There is also scope enterprises/links with large players like Cargill etc. Dissemination of benefits of direct Purchase license and apt contract farming modes are other related interventions.

Figure 16: Scope of interventions in value chain of Bajra



A comparative chart of Bajra shows the value chain difference between the incremental profits realized by farmers by going with leading value chain players channel rather traditional trader channel.

Figure 17: Value chain difference between the incremental profits realized by farmers

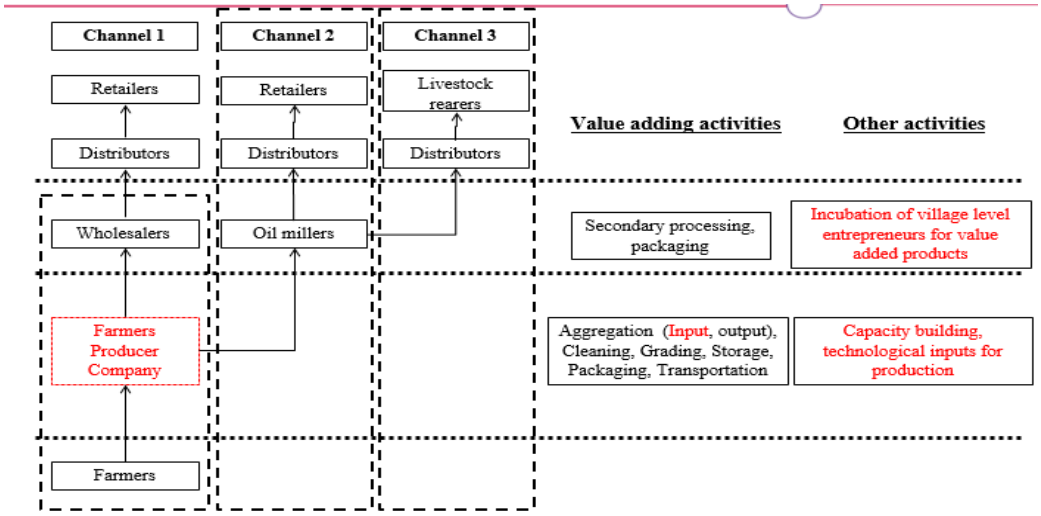


2. Mustard

The post intervention value chain map for Mustard may be visualised as one with three production-distribution or activity-marketing channels: edible oil and De-oiled cake, value added products like Mustard paste/Sause. It is also envisaged that PCs of producers with FCSCs is evolved. Such FCSCs undertakes storage, grading and sorting and packaging of produce activity. These FCSCs may offer other related services in terms of input facilitation, custom hiring, facilitating B2B connectivity etc.

Farmers' income from Mustard cultivation may be enhanced. Presently, the gross average yield per acre is 19 quintal per acre. The average market rate of sale is about Rs.1250 per quintal or Rs.23, 750 per acre. The average cost of cultivation is about Rs.11, 112 per acre. Other than good harvest practices, input facilitation (high seed prices during cropping season) needs to be provided/disseminated amongst farmers.

Figure 18: Scope of interventions in value chain of Mustard



With the above given intervention plan, producers will get better returns with the help of aggregation and primary processing. Due to the traditional market channel there are certain constraints for processors as discussed below.

Two forms of mustard oil are traded in the Indian market namely Kacchi Ghani and Pakki Ghani (expeller oil). This industry constitutes the small-scale sector that markets the oil in loose form to about 80% and the rest contribution is made by the organized sector.

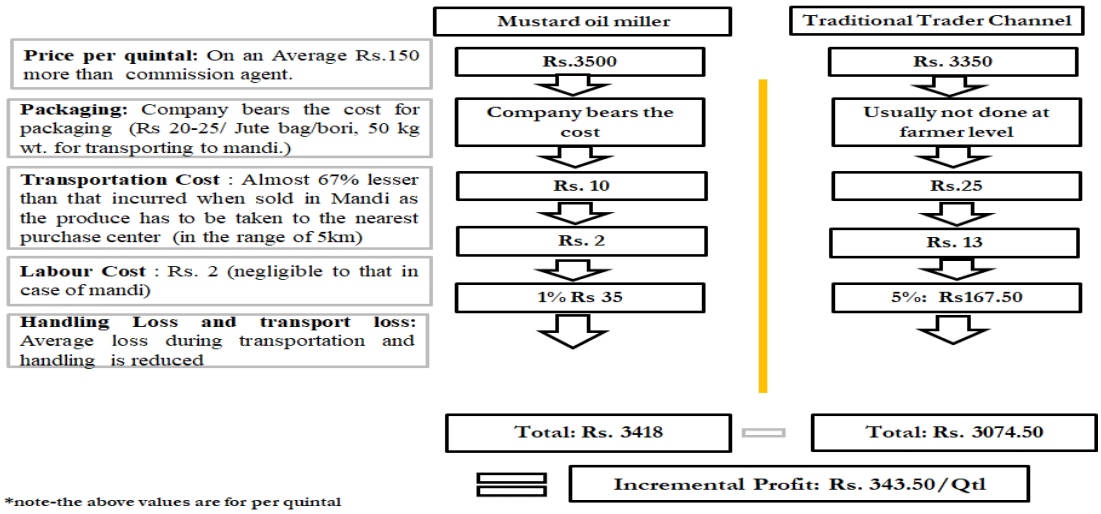
Constraints:

- Processors are dependent on "Arthiya's" traders in APMC for supply of inputs. However, Mustard Oil, arrivals in the market from Rajasthan is in Mar-April.
- Heavy competition among oil processors.
- Consumers - Price sensitive
- Pressure on processors to keep rate around Rs.80 per litre.
- Competition with soybean, palm, sunflower, groundnut oil.
- Consumption of Mustard oil: Highest in North and N.E. India. (Relatively poor states) impacts on retail pricing mustard.
- Also, Nepal supplies major chunk of mustard oil to India at relatively competitive price.
- Processing margins are barely 2-3 percent.
- Few units are upgraded into "Buhler" or quality equipment, and most are not aware of govt. scheme to encourage fuel upgrading and enhance processing margins.

- Most units are yet to have links with large retailers.

A comparative chart of Mustard 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.

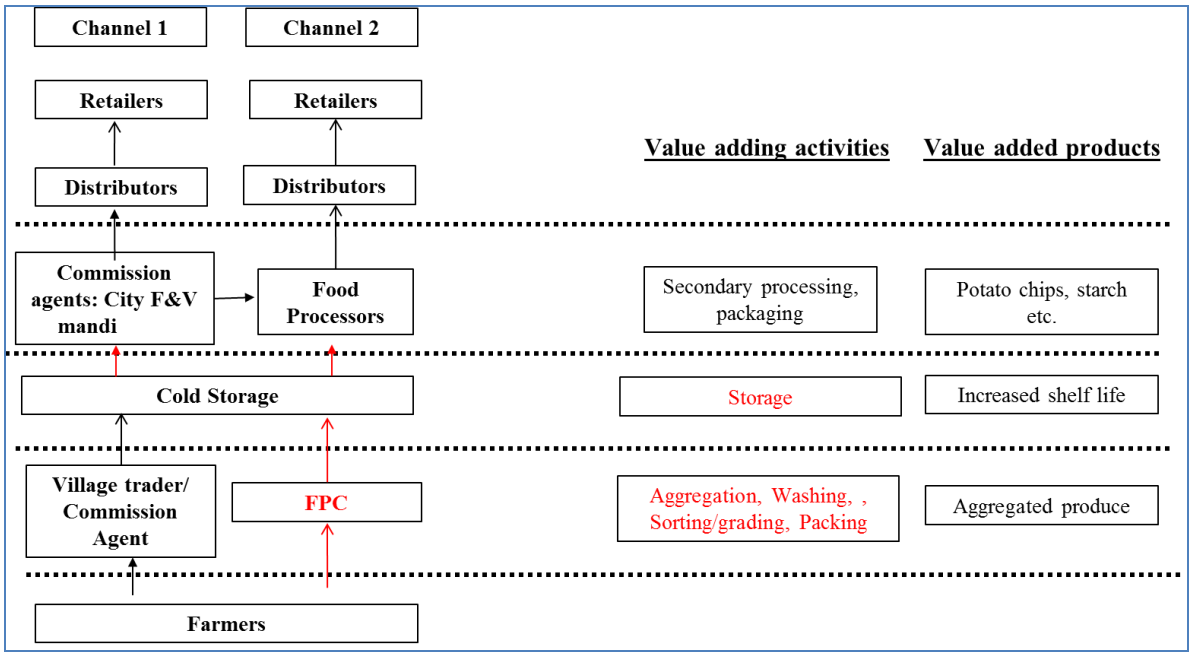
Figure 19: Value chain difference between the incremental profits realized by farmers



3. Potato

The post intervention value chain map for Potato may be visualised as one which is facilitated through a Farmer's producer company, purely farmer's association which would directly procure from the farmers, then take it forward in the value chain instead of local traders and middlemen. The marketing channels would be for raw Potato and value added products of Potato like chips, flakes, flour and starch, etc. It is also envisaged that PCs of producers with FCSCs is evolved. Such FCSCs undertakes cold storage, washing, grading and sorting and packaging of produce activity. These FCSCs may offer other related services in terms of input facilitation, custom hiring, facilitating B2B connectivity etc.

Figure 20: Scope of interventions in value chain of potato



Farmer Producer Organizations and more specifically (FPCs) are a tool for facilitating the collectivization concept as to increase the bargaining power of farmers who are the most important player of the value chain but who realise the non-equitable returns for their effort.

4. Goat

An indicative post intervention value chain map for goat milk is shown below:

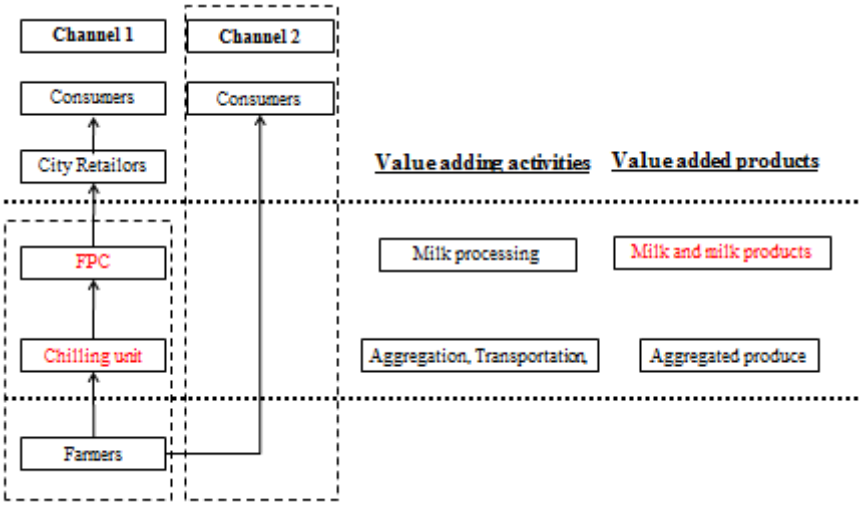


Figure 21 Indicative Post intervention value chain map of Goat milk

A value chain study on goat meat has been done and the value chain map for goat meat is shown below:

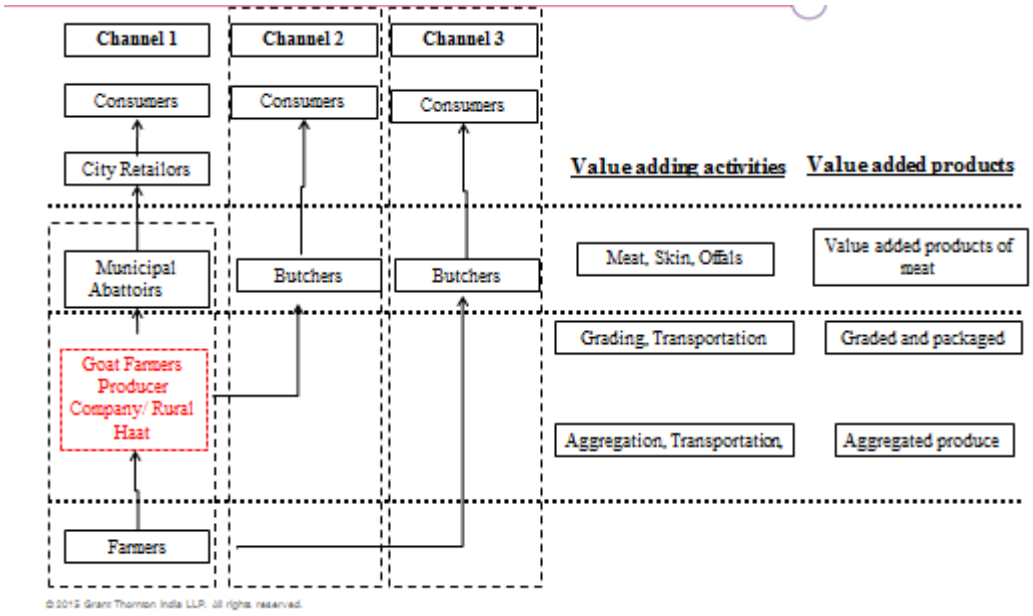


Figure 22 Indicative Post intervention value chain map for goat meat

Annexure 5.3: Reference Business Models

Reference Business Model – Mustard oil mill

Opportunity assessment

Suitability and sustainability of the crop(s)

Mustard is one of important oilseed in the state as a matter of fact. Rajasthan is the top Mustard producing state in India with area of 2.83 million ha (in 2015-16) with production of 3.5 million tonnes and productivity of 1237 kg/ha. The crop is predominantly cultivated in Rabi Season.

Key Districts (in the ABPF project area) by production are: S Ganganagar, Alwar, Tonk, Bharatpur, Hanumangarh

Area and Productivity: As per 2015-16 data, area under Mustard in Rajasthan was 2,838,000 Ha.

Average productivity of Mustard in India is 1253 Kg/Ha whereas for Rajasthan it is 1237 Kg/Ha and is equal to the national average.

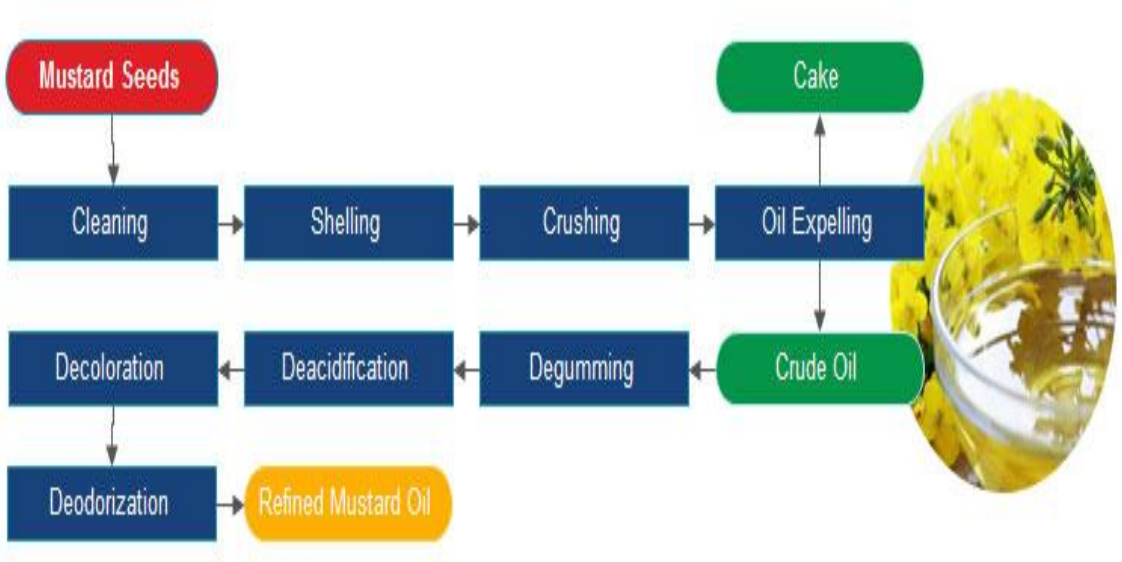
Current market scenario and marketing channels

- Based on government statistics and primary interviews with the farmers, we understand that currently most of the sale of Mustard is done through local traders, middlemen and APMCs.
- There are no *Mustard oil extraction unit* facilities in the district. Given the proximity of Alwar to major urban centers such as Jaipur, Delhi there is enough demand for *Mustard oil* from the consumers of rural and urban origin.

Proposed Business Initiative/Idea

Description of the business operations

There is significant potential for additional value capture by the Mustard farmers in Alwar. The business idea outlined in this document is for a "farmer owned and operated Mustard cattle feed unit". The following diagram depicts suggested operating model of the processing unit:



Seasonality

Mustard requires cool weather during early growth and warm and dry weather at maturity. It grows reasonably well in temperate as in sub-tropical regions of the state. Being drought resistant, Mustard suits areas with scanty rainfall. Sowing of Mustard in Rajasthan takes place during October to December. Harvesting of Mustard in Rajasthan takes place from the third week of March to the middle of April.

Backward linkages

- The Mustard can be purchased directly from the farmer members
- Would need to establish relationships with infrastructure suppliers to procure key equipment. This would be available in Mumbai.
- Mustard is grown majorly in the cluster of so the unit can be located in there.

Key Target Market and Market Linkages

It has enormous demand as one of the edible oils and used as cooking medium especially in northern, eastern and north eastern of India. The demand of Mustard Oil is increasing with the time. Refined Ghani, filtered, double filtered mustard oil have given new thrust to its market. Due to consumption in household and in pickle industries it appears to be good scope for establishing mustard oil industry. Market linkages would need to be either is built with large retail chains or large wholesalers who supply to small neighbourhood shops (*kirana* stores).

Suggested organization structure

The key responsibilities involved in the operations are classified below. Organization structure would have to cover these roles

Function	Roles and responsibilities
CEO	Overall responsibility; reporting to the Board about performance
Marketing	To reach out to the market, to build relationships and to get a sense of the type and the size of demand.
Finance	To monitor finances and payments & collections
Operations-Logistics	Oversee transport of raw material and finished goods
Purchase	Manage relationships with farmer-members directly. Relay market feedback. Negotiate pre-agreed price and quantity with the farmer-member. Reach out to farmers not in the FPC in case of a shortfall.
Shop floor supervisor	Oversees the production and ensures that the operation is running smoothly.

Note: The above structure is recommended for farmer groups; agri-entrepreneurs might use different structures depending on their need.

Infrastructure and investment required

Initial investment includes expenditure on key components such as plant and machinery, working capital and initial marketing costs. The proposed facility has been designed with an installed capacity of 160 kg/hour (assuming that the facility will be operational for at least 300 days a year, the total annual output is expected to be 134 MT/annum of mustard oil and 230 MT/annum of mustard cake). The facility will require 2000 sq m of land. The following table provides the key components of the proposed facility and the approximate cost associated with each of the components:

#	Particulars	Amount (Rs.)
I	Shed construction (1000 sq ft @ Rs. 700/sq ft)	700,000
Ii	Oil Unit Machines	1,200,000
Iii	Electricity/Generator	50,000
Iv	Vehicle (2 MT capacity)	750,000
	Total	**2,700,000**

Sources of capital can include equity from farmer members, soft loans/grants from government and loans from development institutions like NABARD.

Potential for Public-Private Partnership

Joint Venture (JV) between a Producer Association and a Private entity is the most obvious PPP model; some of the private parties to be targeted for such a JV could be large retail players. Furthermore, in terms of operations, while the Producer Association could bring in expertise in producing the product, the retail player could ensure its marketing by providing a steady channel for the Mustard feed to be sold.

Potential for Impact

- The business model does not require high start-up capital. Thus it can be easily adopted by a group of farmers.
- Collectively marketing the produce will ensure better negotiating power
- Currently, farmers sell Mustard at APMCs at ~Rs34/kg while *Mustard oil* can be sold at prices which are 150% higher than this.
- Large impact footprint: a large number of the farmers in Alwar are involved with Mustard farming

Key Success Factors and Typical Risks

Success factors

- The business needs to tie-up with retailer/wholesalers in urban/rural centers to ensure forward linkages
- Need to plan the capacity installation and expansion according to demand.
- Regular maintenance of machinery and equipment to reduce downtime and ensure steady supply for buyers which might be part of critical procurement contract terms

Typical risks

- **Inefficient working capital management** –It is imperative for the processing unit to devise an appropriate inventory strategy for raw materials to reduce inventory costs and loss to decomposition of raw ingredients.

Underutilization of installed capacity –Farmer organizations need to start on a smaller scale till there is ample raw material supplier base to justify investment in higher capacity processing facility. Usually, there would be high debt which will increase the strain on cash flows in the initial period when there are not many suppliers and the processing capacity utilization is low.

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 statement for FCSC units

Potato unit

Particulars	Y1	Y2	Y3	Y4	Y5
0					
Cleaning and Grading	1,440,000	1,638,000	1,852,200	2,083,725	2,333,772
Total Revenue	**1,440,000**	**1,638,000**	**1,852,200**	**2,083,725**	**2,333,772**
Fixed Cost	225,400	236,670	248,504	260,929	273,975
Variable Cost	158,400	180,180	203,742	229,210	256,715
Total Operational Expenses	**383,800**	**416,850**	**452,246**	**490,138**	**530,690**
Earning Before Interest, Depreciation, Taxes and Amortization (EBITDA)	**1,056,200**	**1,221,150**	**1,399,955**	**1,593,587**	**1,803,082**
Depreciation	265,000	265,000	265,000	265,000	265,000
Amortization	-	-	-	-	-
Earnings Before Interest and Taxes (EBIT)	**791,200**	**956,150**	**1,134,955**	**1,328,587**	**1,538,082**
Interest Expense	-	-	-	-	-
Earnings Before Taxes (EBT)	**791,200**	**956,150**	**1,134,955**	**1,328,587**	**1,538,082**
Tax	237,360	267,254	338,044	411,181	487,312
Earnings After Taxes (EAT)	**553,840**	**688,896**	**796,911**	**917,405**	**1,050,770**

Mustard oil mill

Particulars	Y1	Y2	Y3	Y4	Y5
Oil	20,736,000	21,772,800	22,861,440	24,004,512	25,204,738
Cake	10,368,000	10,886,400	11,430,720	12,002,256	12,602,369
Total Revenue	**31,104,000**	**32,659,200**	**34,292,160**	**36,006,768**	**37,807,106**
Fixed Cost	514,000	539,700	566,685	595,019	624,770
Variable Cost	25,408,480	26,678,904	28,012,849	29,413,492	30,884,166
Total Operational Expenses	**25,922,480**	**27,218,604**	**28,579,534**	**30,008,511**	**31,508,936**
Earning Before Interest, Depreciation, Taxes and Amortization (EBITDA)	**5,181,520**	**5,440,596**	**5,712,626**	**5,998,257**	**6,298,170**
Depreciation	235,000	235,000	235,000	235,000	235,000
Amortization	-	-	-	-	-
Earnings Before Interest and Taxes (EBIT)	**4,946,520**	**5,205,596**	**5,477,626**	**5,763,257**	**6,063,170**
Interest Expense	-	-	-	-	-
Earnings Before Taxes (EBT)	**4,946,520**	**5,205,596**	**5,477,626**	**5,763,257**	**6,063,170**
Tax	1,486,760	1,582,882	1,680,705	1,780,764	1,883,553
Earnings After Taxes (EAT)	**3,459,760**	**3,622,714**	**3,796,920**	**3,982,493**	**4,179,617**

Bajra cleaning and grading lab

Particulars	Y1	Y2	Y3	Y4	Y5
CnG Service	1,536,000	1,713,600	1,905,120	2,111,508	2,333,772
Total Revenue	**1,536,000**	**1,713,600**	**1,905,120**	**2,111,508**	**2,333,772**
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)	**793,000**	**933,450**	**1,085,963**	**1,251,393**	**1,430,651**
Depreciation	268,500	268,500	268,500	268,500	268,500
Amortization	-	-	-	-	-
Earnings Before Interest and Taxes (EBIT)	**524,500**	**664,950**	**817,463**	**982,893**	**1,162,151**
Interest Expense	-	-	-	-	-
Earnings Before Taxes (EBT)	**524,500**	**664,950**	**817,463**	**982,893**	**1,162,151**
Tax	115,180	176,976	239,848	304,447	371,384
Earnings After Taxes (EAT)	**409,320**	**487,974**	**577,615**	**678,446**	**790,766**

Goat milk chilling unit

Particulars	Y1	Y2	Y3	Y4	Y5
Milk Product	4,015,000	4,742,719	5,533,172	6,390,814	7,320,386
Total Revenue	**4,015,000**	**4,742,719**	**5,533,172**	**6,390,814**	**7,320,386**
Fixed Cost	221,000	232,050	243,653	255,835	268,627
Variable Cost	3,016,798	3,563,593	4,157,525	4,801,941	5,500,405
Total Operational Expenses	**3,237,798**	**3,795,643**	**4,401,177**	**5,057,776**	**5,769,032**
Earning Before Interest, Depreciation, Taxes and Amortization (EBITDA)	**777,202**	**947,076**	**1,131,995**	**1,333,037**	**1,551,354**
Depreciation	142,388	142,388	142,388	142,388	142,388
Amortization	-	-	-	-	-
Earnings Before Interest and Taxes (EBIT)	**634,815**	**804,689**	**989,607**	**1,190,650**	**1,408,967**
Interest Expense	177,734	184,707	163,556	139,598	112,462
Earnings Before Taxes (EBT)	**457,081**	**619,982**	**826,051**	**1,051,052**	**1,296,505**
Tax	137,124	185,995	247,815	315,316	388,952
Earnings After Taxes (EAT)	**339,406**	**442,149**	**576,164**	**724,489**	**887,993**

Annexure 6.1: Watershed area distribution

Table 50 Micro Watershed-wise Area for water budgeting purpose

S. No.	Macro No.	Micro No.	Name of Village	Micro Watershed wise area (in ha)
1	04	01	ChilaChaund, Kankrai, Koyla, Mundpura, Nadroli, Naksoda, Umreh	1203.377
2	04	02	Jamboora, Nadroli, Naksoda, Saheri no.2, Umreh	842.9507
3	04	03	Nadroli, Sagaur, Salemabad, Umreh	395.0225
4	03	01	Chilachond, Halle KaPura, Kankrai, Mundpura, Ranpura,	2198.883
5	03	02	KhoolekaPura, Ranpura, Sanaura, Todpura, Totpura	1120.363
6	02	01	HulasiKaPura, Maharajpura, RudhKaPuraSagaur, Salemabad	289.8195
7	02	02	Dauapura, Gadarpura, Hulasipura, Kankrai, koyla, Maharajpur, Nidhara, RudhKaPura, RudhNidhara, Sagaur, Salemabad, Sanaura, Sunipur, TalabUmreh, Totpura, Umreh	2202.103
8	02	03	Nidhara, Rewai, RunddhNidhara, Totpura	333.1878
9	02	04	KhauriIbrahimpur, Rewai, Sanaura, Sunipur, Totpura	1076.764
10	02	05	KhauriIbrahimpur, Rewai, Totpura	206.8854
11	02	06	Khairari, KhauriIbrahimpur, Rewai, Tamoti, Totpura	381.1697
12	02	07	Dheemiri,Kachhpura, Khairari, KhauriIbrahimpur, Tamoti, Totpura	1402.433
13	02	08	Khairari, Tontri	258.7348
14	02	09	Bateshwar Kala, BateshwarKhurd, Kuhawani, Sigorai, Tontri	545.2843
15	02	10	Dadur, Garhi, GarhiKhirana, Kuhawani, Reti, Sigorai, Tontri	559.7807
16	02	11	Tontri	196.5814
17	02	12	Dadur, Puramdri, Reti, Tontri	810.9494
Total	**3**	**17**		**14024.29**

(Source: Watershed DPR, Bari)

Annexure 6.2: Assessment of Groundwater Recharge from Rainwater Harvesting Structures

The project is important for semi-arid regions of Rajasthan especially for hard-rock areas, which makes it difficult to apply basic hydrologic principles derived for alluvial and unconsolidated geologic formations. The study area, is situated in hard-rock region of Udaipur district. Therefore, the results of the study will be mainly applicable to other hard-rock regions of India. The results will definitely be useful for the planners, researchers and decision makers in the study area to formulate suitable strategies for implementing artificial recharge projects on large scale.

Groundwater recharge is one of the vital components of the water cycle and is highly uncertain to be predicted accurately. In hard-rock areas of Rajasthan, cost-effective and feasible methods for artificial groundwater recharging have not been identified. Also, studies on evaluating impact of artificial groundwater recharge on improving groundwater quality are rare.

Water scarcity and depletion of groundwater levels are among the major problems in southern Rajasthan. During May-June every year, most of the wells become dry due to decline in groundwater levels. Artificial recharge of groundwater seems to be an appropriate solution under the present situation. It has been observed that rainwater harvesting-cum-groundwater recharging structures play an effective role in augmenting groundwater tables in the region. The small water harvesting ponds/Anicuts get submerged atleast two times during the entire monsoon season depending on rainfall and other watershed characteristics. In this study the recharge rate and recharge volume through a small masonry check dam/ anicut is determined by monitoring the inflow of runoff and percolation from the reservoir through staff gauge.

Preparation of Depth Capacity Curve for Shishvi Water Harvesting Structure

During the monsoon period of 2012 to 2015 daily surface water levels of water harvesting structure as well as the water table of identified open dug well were monitored to find out the impact of constructed structure for groundwater recharging. During the monsoon months, the constructed structure gets completely filled up two to three times because of occurrence of normal rainfall and its proper distribution. Depth-capacity curve of the structure was prepared by preparing contour map of the submergence area. The capacity of the pond at different depth is given in Table 1. The prepared depth-capacity curve is shown in Fig. 1

Table 51 Storage capacity of groundwater recharges structures constructed at Shishvi

Contour Value	Depth (m)	Capacity (m^3)
98.50	0.5	250.00
99.00	1.0	992.50
99.50	1.5	2285.00
100.00	2.0	4235.00

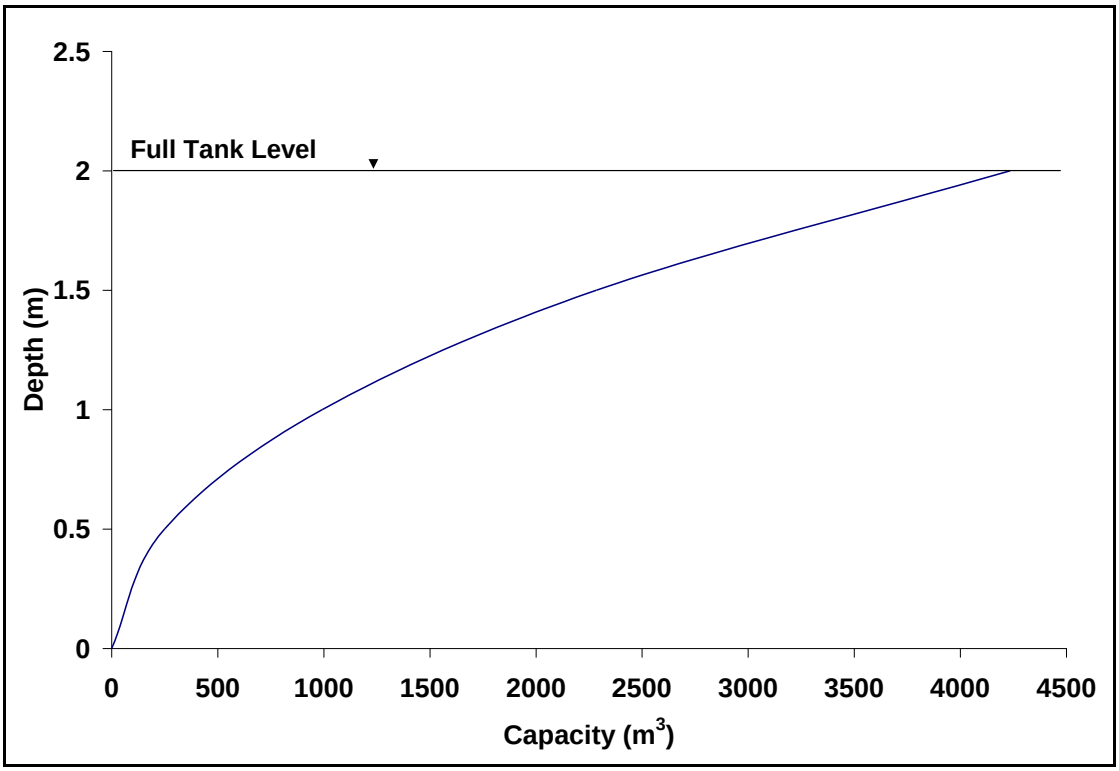


Figure 23 Depth-Capacity Curve of Shishvi Water Harvesting Structure

Assessment of Groundwater Recharge through Rainwater Harvesting Structure Constructed at Shishvi

For assessment of groundwater recharge through rainwater harvesting structures, daily monitoring of surface water level were carried out through the installation of gauge in the Anicut. The water table of the identified open dug well situated in the downstream side of the structure were also measured on daily basis. The pan-evaporation data were collected from the CTAE Meteorological Observatory. The collected data were analyzed for computation of groundwater recharge and recharge rate through the construction of water harvesting structure. The average recharge rate was found to be 3.95 cm/day whereas net recharge volume was 7902.28 m^3 for the year 2015. The net recharge as well as recharge rate is shown in Table 2 and Table 3.

Table 52 Estimation of Recharge Rate through Water Harvesting Structure Constructed at Shishvi

Date	Rainfall (mm)	Water level (meters)	Depletion/ addition (meters)	Pan Evaporation (mm)	Actual Evaporation (mm)	Recharge (cm)
1	2	3	4	5	6	7
16-06-2015	27.00	0.30	0.00	7.20	5.04	0.00
17-06-2015	10.60	0.38	0.04	2.60	1.82	3.82
18-06-2015	6.80	0.40	0.04	5.80	4.06	3.59
19-06-2015	0.00	0.32	0.08	8.30	5.81	7.42
20-06-2015	0.00	0.25	0.07	8.60	6.02	6.40
21-06-2015	0.00	0.17	0.08	7.50	5.25	7.48
22-06-2015	0.00	0.10	0.07	6.40	4.48	6.55
23-06-2015	12.20	0.15	0.04	4.00	2.80	3.72
24-06-2015	0.00	0.06	0.09	4.00	2.80	8.72
25-06-2015	0.00	0.00	0.00	5.50	3.85	0.00
26-06-2015	0.00	0.00	0.00	6.10	4.27	0.00
27-06-2015	0.00	0.00	0.00	6.30	4.41	0.00
28-06-2015	0.00	0.00	0.00	5.50	3.85	0.00
29-06-2015	0.00	0.00	0.00	5.70	3.99	0.00
30-06-2015	0.00	0.00	0.00	6.00	4.20	0.00

Date	Rainfall (mm)	Water level (meters)	Depletion/ addition (meters)	Pan Evaporation (mm)	Actual Evaporation (mm)	Recharge (cm)
1	2	3	4	5	6	7
01-07-2015	0.00	0.00	0.00	5.90	4.13	0.00
02-07-2015	0.00	0.00	0.00	4.80	3.36	0.00
03-07-2015	0.00	0.00	0.00	5.70	3.99	0.00
04-07-2015	0.00	0.00	0.00	5.60	3.92	0.00
05-07-2015	0.00	0.00	0.00	5.90	4.13	0.00
06-07-2015	0.00	0.00	0.00	6.20	4.34	0.00
07-07-2015	0.00	0.00	0.00	6.40	4.48	0.00
08-07-2015	0.00	0.00	0.00	5.60	3.92	0.00
09-07-2015	0.00	0.00	0.00	5.30	3.71	0.00
10-07-2015	0.00	0.00	0.00	5.30	3.71	0.00
11-07-2015	0.00	0.00	0.00	5.50	3.85	0.00
12-07-2015	0.00	0.00	0.00	5.10	3.57	0.00
13-07-2015	0.00	0.00	0.00	4.90	3.43	0.00
14-07-2015	0.00	0.00	0.00	5.60	3.92	0.00
15-07-2015	0.00	0.00	0.00	6.10	4.27	0.00
16-07-2015	0.00	0.00	0.00	4.80	3.36	0.00
17-07-2015	0.00	0.00	0.00	4.30	3.01	0.00
18-07-2015	0.00	0.00	0.00	3.30	2.31	0.00
19-07-2015	12.20	0.00	0.00	1.80	1.26	0.00
20-07-2015	0.00	0.00	0.00	0.80	0.56	0.00
21-07-2015	25.00	0.65	0.04	1.10	0.77	3.92
22-07-2015	0.00	0.60	0.05	2.00	1.40	4.86
23-07-2015	25.70	1.35	0.04	2.20	1.54	3.85
24-07-2015	19.00	1.65	0.04	2.20	1.54	3.85
25-07-2015	0.00	1.58	0.07	1.60	1.12	6.89
26-07-2015	12.20	1.70	0.04	1.60	1.12	3.89
27-07-2015	32.00	2.00	0.04	0.80	0.56	3.94
28-07-2015	0.00	1.94	0.06	0.70	0.49	5.95
29-07-2015	67.40	2.00	0.04	0.60	0.42	3.96
30-07-2015	0.00	1.94	0.06	1.20	0.84	5.92
31-07-2015	0.00	1.89	0.05	1.80	1.26	4.87
01-08-2015	0.00	1.84	0.05	3.00	2.10	4.79
02-08-2015	0.00	1.78	0.06	4.30	3.01	5.70
03-08-2015	0.00	1.73	0.05	5.40	3.78	4.62
04-08-2015	0.00	1.68	0.05	5.50	3.85	4.62
05-08-2015	0.00	1.61	0.07	6.00	4.20	6.58
06-08-2015	0.00	1.54	0.07	6.00	4.20	6.58
07-08-2015	0.00	1.49	0.05	5.60	3.92	4.61
08-08-2015	0.00	1.42	0.07	5.20	3.64	6.64
09-08-2015	0.00	1.36	0.06	5.40	3.78	5.62
10-08-2015	0.00	1.31	0.05	4.30	3.01	4.70
11-08-2015	0.00	1.24	0.07	1.30	0.91	6.91
12-08-2015	43.20	2.00	0.04	0.20	0.14	3.99
13-08-2015	0.00	1.96	0.04	1.30	0.91	3.91
14-08-2015	0.00	1.91	0.05	2.00	1.40	4.86
15-08-2015	43.20	2.00	0.04	1.90	1.33	3.87
16-08-2015	0.00	1.95	0.05	3.10	2.17	4.78
17-08-2015	10.40	2.00	0.04	1.40	0.98	3.90
18-08-2015	7.40	1.96	0.04	1.50	1.05	3.90
19-08-2015	0.00	1.90	0.06	2.20	1.54	5.85
20-08-2015	0.00	1.83	0.07	4.20	2.94	6.71
21-08-2015	0.00	1.76	0.07	2.90	2.03	6.80
22-08-2015	0.00	1.70	0.06	3.20	2.24	5.78
23-08-2015	0.00	1.66	0.04	4.40	3.08	3.69
24-08-2015	0.00	1.60	0.06	4.70	3.29	5.67
25-08-2015	0.00	1.55	0.05	4.50	3.15	4.69
26-08-2015	0.00	1.49	0.06	5.10	3.57	5.64
27-08-2015	0.00	1.45	0.04	4.80	3.36	3.66
28-08-2015	0.00	1.40	0.05	5.30	3.71	4.63

Date	Rainfall (mm)	Water level (meters)	Depletion/ addition (meters)	Pan Evaporation (mm)	Actual Evaporation (mm)	Recharge (cm)
1	2	3	4	5	6	7
29-08-2015	0.00	1.34	0.06	4.70	3.29	5.67
30-08-2015	0.00	1.29	0.05	4.80	3.36	4.66
31-08-2015	0.00	1.21	0.08	4.40	3.08	7.69
01-09-2015	0.00	1.16	0.05	3.40	2.38	4.76
02-09-2015	55.00	2.00	0.04	3.30	2.31	3.77
03-09-2015	0.00	1.95	0.05	3.80	2.66	4.73
04-09-2015	0.00	1.90	0.05	3.90	2.73	4.73
05-09-2015	0.00	1.84	0.06	4.10	2.87	5.71
06-09-2015	0.00	1.78	0.06	4.10	2.87	5.71
07-09-2015	0.00	1.72	0.06	4.00	2.80	5.72
08-09-2015	0.00	1.67	0.05	4.30	3.01	4.70
09-09-2015	0.00	1.62	0.05	4.30	3.01	4.70
10-09-2015	0.00	1.56	0.06	3.80	2.66	5.73
11-09-2015	0.00	1.51	0.05	3.80	2.66	4.73
12-09-2015	0.00	1.47	0.04	4.20	2.94	3.71
13-09-2015	0.00	1.42	0.05	5.50	3.85	4.62
14-09-2015	0.00	1.38	0.04	5.30	3.71	3.63
15-09-2015	0.00	1.32	0.06	4.80	3.36	5.66
16-09-2015	0.00	1.27	0.05	5.90	4.13	4.59
17-09-2015	0.00	1.23	0.04	6.40	4.48	3.55
18-09-2015	8.00	1.20	0.03	4.30	3.01	2.70
19-09-2015	17.20	1.50	0.04	1.70	1.19	3.88
20-09-2015	0.00	1.46	0.04	1.00	0.70	3.93
21-09-2015	0.00	1.41	0.05	1.00	0.70	4.93
22-09-2015	3.60	1.37	0.04	2.10	1.47	3.85
23-09-2015	0.00	1.32	0.05	4.40	3.08	4.69
24-09-2015	0.00	1.28	0.04	4.00	2.80	3.72
25-09-2015	0.00	1.22	0.06	4.20	2.94	5.71
26-09-2015	0.00	1.18	0.04	4.10	2.87	3.71
27-09-2015	0.00	1.13	0.05	3.80	2.66	4.73
28-09-2015	0.00	1.08	0.05	4.60	3.22	4.68
29-09-2015	17.00	1.40	0.04	4.50	3.15	3.69
30-09-2015	0.00	1.36	0.04	4.50	3.15	3.68
01-10-2015	0.00	1.32	0.04	4.40	3.08	3.69
02-10-2015	0.00	1.28	0.04	5.10	3.57	3.64
03-10-2015	0.00	1.22	0.06	5.50	3.85	5.62
04-10-2015	0.00	1.18	0.04	6.00	4.20	3.58
05-10-2015	0.00	1.13	0.05	5.20	3.64	4.64
06-10-2015	0.00	1.08	0.05	5.90	4.13	4.59
07-10-2015	0.00	1.02	0.06	5.20	3.64	5.64
08-10-2015	0.00	0.97	0.05	5.50	3.85	4.62
09-10-2015	0.00	0.93	0.04	5.30	3.71	3.63
10-10-2015	0.00	0.87	0.06	4.50	3.15	5.69
11-10-2015	0.00	0.81	0.06	5.80	4.06	5.59
12-10-2015	0.00	0.77	0.04	4.90	3.43	3.66
13-10-2015	0.00	0.72	0.05	4.90	3.43	4.66
14-10-2015	0.00	0.65	0.07	4.30	3.01	6.70
15-10-2015	0.00	0.60	0.05	4.10	2.87	4.71
16-10-2015	0.00	0.54	0.06	5.10	3.57	5.64
17-10-2015	0.00	0.48	0.06	5.10	3.57	5.64
18-10-2015	0.00	0.41	0.07	5.30	3.71	6.63
19-10-2015	0.00	0.34	0.07	5.70	3.99	6.60
20-10-2015	0.00	0.27	0.07	5.60	3.92	6.61
21-10-2015	0.00	0.20	0.07	4.30	3.01	6.70
22-10-2015	0.00	0.13	0.07	3.90	2.73	6.73
23-10-2015	0.00	0.06	0.07	4.20	2.94	6.71
24-10-2015	0.00	0.00	0.00	4.60	3.22	0.00
					Recharge rate (cm/day)	**3.95**

Table 53 Estimation for Recharge Volume through Water Harvesting Structure at Shishvi

Date	Rainfall (mm)	Water Level (m)	Depletion/ Addition (m)	Volume of Storage (m^3)	Surface Area (m^2)	Volume of Depletion (m^3)	Volume of Actual Evaporation (m^3)	Net Recharge (m^3)
16-06-2015	27.00	0.30	0.00	150	180	0.00	0.00	0.00
17-06-2015	10.60	0.38	0.04	190	227	9.08	0.41	8.67
18-06-2015	6.80	0.40	0.04	200	240	9.60	0.97	8.63
19-06-2015	0.00	0.32	0.08	160	190	15.20	1.10	14.10
20-06-2015	0.00	0.25	0.07	125	149	10.43	0.90	9.53
21-06-2015	0.00	0.17	0.08	89	104	8.32	0.55	7.77
22-06-2015	0.00	0.10	0.07	76	64	4.48	0.29	4.19
23-06-2015	12.20	0.15	0.04	87	82	3.28	0.23	3.05
24-06-2015	0.00	0.06	0.09	48	40	3.60	0.11	3.49
25-06-2015	0.00	0.00	0.00	0	0	0.00	0.00	0.00
26-06-2015	0.00	0.00	0.00	0	0	0.00	0.00	0.00
27-06-2015	0.00	0.00	0.00	0	0	0.00	0.00	0.00
28-06-2015	0.00	0.00	0.00	0	0	0.00	0.00	0.00
29-06-2015	0.00	0.00	0.00	0	0	0.00	0.00	0.00
30-06-2015	0.00	0.00	0.00	0	0	0.00	0.00	0.00
01-07-2015	0.00	0.00	0.00	0	0	0.00	0.00	0.00
02-07-2015	0.00	0.00	0.00	0	0	0.00	0.00	0.00
03-07-2015	0.00	0.00	0.00	0	0	0.00	0.00	0.00
04-07-2015	0.00	0.00	0.00	0	0	0.00	0.00	0.00
05-07-2015	0.00	0.00	0.00	0	0	0.00	0.00	0.00
06-07-2015	0.00	0.00	0.00	0	0	0.00	0.00	0.00
07-07-2015	0.00	0.00	0.00	0	0	0.00	0.00	0.00
08-07-2015	0.00	0.00	0.00	0	0	0.00	0.00	0.00
09-07-2015	0.00	0.00	0.00	0	0	0.00	0.00	0.00
10-07-2015	0.00	0.00	0.00	0	0	0.00	0.00	0.00
11-07-2015	0.00	0.00	0.00	0	0	0.00	0.00	0.00
12-07-2015	0.00	0.00	0.00	0	0	0.00	0.00	0.00
13-07-2015	0.00	0.00	0.00	0	0	0.00	0.00	0.00
14-07-2015	0.00	0.00	0.00	0	0	0.00	0.00	0.00
15-07-2015	0.00	0.00	0.00	0	0	0.00	0.00	0.00
16-07-2015	0.00	0.00	0.00	0	0	0.00	0.00	0.00
17-07-2015	0.00	0.00	0.00	0	0	0.00	0.00	0.00
18-07-2015	0.00	0.00	0.00	0	0	0.00	0.00	0.00
19-07-2015	12.20	0.00	0.00	0	0	0.00	0.00	0.00
20-07-2015	0.00	0.00	0.00	0	0	0.00	0.00	0.00
21-07-2015	25.00	0.65	0.04	539	469	18.76	0.36	18.40
22-07-2015	0.00	0.60	0.05	275	432	21.60	0.60	21.00
23-07-2015	25.70	1.35	0.04	2060	1770	70.80	2.73	68.07
24-07-2015	19.00	1.65	0.04	3078	2175	87.00	3.35	83.65
25-07-2015	0.00	1.58	0.07	2407	2013	140.91	2.25	138.66
26-07-2015	12.20	1.70	0.04	3166	2251	90.04	2.52	87.52
27-07-2015	32.00	2.00	0.04	4235	2722	108.88	1.52	107.36
28-07-2015	0.00	1.94	0.06	4108	2641	158.46	1.29	157.17
29-07-2015	67.40	2.00	0.04	4235	2722	108.88	1.14	107.74
30-07-2015	0.00	1.94	0.06	4108	2641	158.46	2.22	156.24
31-07-2015	0.00	1.89	0.05	4002	2573	128.65	3.24	125.41
01-08-2015	0.00	1.84	0.05	3896	2436	121.80	5.12	116.68
02-08-2015	0.00	1.78	0.06	3288	2336	140.16	7.03	133.13
03-08-2015	0.00	1.73	0.05	3222	2290	114.50	8.66	105.84
04-08-2015	0.00	1.68	0.05	3130	2224	111.20	8.56	102.64
05-08-2015	0.00	1.61	0.07	2999	2132	149.24	8.95	140.29
06-08-2015	0.00	1.54	0.07	2355	1967	137.69	8.26	129.43
07-08-2015	0.00	1.49	0.05	2270	1906	95.30	7.47	87.83
08-08-2015	0.00	1.42	0.07	2163	1880	131.60	6.84	124.76
09-08-2015	0.00	1.36	0.06	2072	1715	102.90	6.48	96.42
10-08-2015	0.00	1.31	0.05	1996	1540	77.00	4.64	72.36

Date	Rainfall (mm)	Water Level (m)	Depletion/ Addition (m)	Volume of Storage (m^3)	Surface Area (m^2)	Volume of Depletion (m^3)	Volume of Actual Evaporation (m^3)	Net Recharge (m^3)
11-08-2015	0.00	1.24	0.07	1626	1457	101.99	1.33	100.66
12-08-2015	43.20	2.00	0.04	4235	2722	108.88	0.38	108.50
13-08-2015	0.00	1.96	0.04	4150	2668	106.72	2.43	104.29
14-08-2015	0.00	1.91	0.05	4044	2600	130.00	3.64	126.36
15-08-2015	43.20	2.00	0.04	4235	2722	108.88	3.62	105.26
16-08-2015	0.00	1.95	0.05	4129	2654	132.70	5.76	126.94
17-08-2015	10.40	2.00	0.04	4235	2722	108.88	2.67	106.21
18-08-2015	7.40	1.96	0.04	4150	2668	106.72	2.80	103.92
19-08-2015	0.00	1.90	0.06	4023	2587	155.22	3.98	151.24
20-08-2015	0.00	1.83	0.07	3875	2423	169.61	7.12	162.49
21-08-2015	0.00	1.76	0.07	3278	2330	163.10	4.73	158.37
22-08-2015	0.00	1.70	0.06	3166	2251	135.06	5.04	130.02
23-08-2015	0.00	1.66	0.04	3095	2190	87.60	6.75	80.85
24-08-2015	0.00	1.60	0.06	2703	2080	124.80	6.84	117.96
25-08-2015	0.00	1.55	0.05	2360	1975	98.75	6.22	92.53
26-08-2015	0.00	1.49	0.06	2270	1906	114.36	6.80	107.56
27-08-2015	0.00	1.45	0.04	2239	1898	75.92	6.38	69.54
28-08-2015	0.00	1.40	0.05	2132	1818	90.90	6.74	84.16
29-08-2015	0.00	1.34	0.06	2041	1640	98.40	5.40	93.00
30-08-2015	0.00	1.29	0.05	1966	1516	75.80	5.09	70.71
31-08-2015	0.00	1.21	0.08	1587	1422	113.76	4.38	109.38
01-09-2015	0.00	1.16	0.05	1422	1363	68.15	3.24	64.91
02-09-2015	55.00	2.00	0.04	4235	2722	108.88	6.29	102.59
03-09-2015	0.00	1.95	0.05	4129	2654	132.70	7.06	125.64
04-09-2015	0.00	1.90	0.05	4023	2587	129.35	7.06	122.29
05-09-2015	0.00	1.84	0.06	3896	2436	146.16	6.99	139.17
06-09-2015	0.00	1.78	0.06	3288	2336	140.16	6.70	133.46
07-09-2015	0.00	1.72	0.06	3204	2277	136.62	6.38	130.24
08-09-2015	0.00	1.67	0.05	3111	2211	110.55	6.66	103.89
09-09-2015	0.00	1.62	0.05	3018	2145	107.25	6.46	100.79
10-09-2015	0.00	1.56	0.06	2379	1989	119.34	5.29	114.05
11-09-2015	0.00	1.51	0.05	2300	1926	96.30	5.12	91.18
12-09-2015	0.00	1.47	0.04	2248	1885	75.40	5.54	69.86
13-09-2015	0.00	1.42	0.05	2163	1880	94.00	7.24	86.76
14-09-2015	0.00	1.38	0.04	2102	1758	70.32	6.52	63.80
15-09-2015	0.00	1.32	0.06	2011	1650	99.00	5.54	93.46
16-09-2015	0.00	1.27	0.05	1935	1492	74.60	6.16	68.44
17-09-2015	0.00	1.23	0.04	1615	1442	57.68	6.46	51.22
18-09-2015	8.00	1.20	0.03	1575	1410	42.30	4.24	38.06
19-09-2015	17.20	1.50	0.04	2284	1911	76.44	2.27	74.17
20-09-2015	0.00	1.46	0.04	2222	1884	75.36	1.32	74.04
21-09-2015	0.00	1.41	0.05	2148	1850	92.50	1.30	91.21
22-09-2015	3.60	1.37	0.04	2087	1745	69.80	2.57	67.23
23-09-2015	0.00	1.32	0.05	2011	1650	82.50	5.08	77.42
24-09-2015	0.00	1.28	0.04	1951	1505	60.20	4.21	55.99
25-09-2015	0.00	1.22	0.06	1601	1433	85.98	4.21	81.77
26-09-2015	0.00	1.18	0.04	1550	1387	55.48	3.98	51.50
27-09-2015	0.00	1.13	0.05	1482	1328	66.40	3.53	62.87
28-09-2015	0.00	1.08	0.05	1416	1238	61.90	3.99	57.91
29-09-2015	17.00	1.40	0.04	2132	1818	72.72	5.73	66.99
30-09-2015	0.00	1.36	0.04	2072	1715	68.60	5.40	63.20
01-10-2015	0.00	1.32	0.04	2011	1650	66.00	5.08	60.92
02-10-2015	0.00	1.28	0.04	1951	1505	60.20	5.37	54.83
03-10-2015	0.00	1.22	0.06	1601	1433	85.98	5.52	80.46
04-10-2015	0.00	1.18	0.04	1550	1387	55.48	5.83	49.65
05-10-2015	0.00	1.13	0.05	1482	1328	66.40	4.83	61.57
06-10-2015	0.00	1.08	0.05	1416	1238	61.90	5.11	56.79
07-10-2015	0.00	1.02	0.06	1013	1168	70.08	4.25	65.83

Date	Rainfall (mm)	Water Level (m)	Depletion/ Addition (m)	Volume of Storage (m^3)	Surface Area (m^2)	Volume of Depletion (m^3)	Volume of Actual Evaporation (m^3)	Net Recharge (m^3)
08-10-2015	0.00	0.97	0.05	963	1112	55.60	4.28	51.32
09-10-2015	0.00	0.93	0.04	923	1066	42.64	3.95	38.69
10-10-2015	0.00	0.87	0.06	864	997	59.82	3.14	56.68
11-10-2015	0.00	0.81	0.06	804	917	55.02	3.72	51.30
12-10-2015	0.00	0.77	0.04	735	742	29.68	2.55	27.13
13-10-2015	0.00	0.72	0.05	560	610	30.50	2.09	28.41
14-10-2015	0.00	0.65	0.07	539	469	32.83	1.41	31.42
15-10-2015	0.00	0.60	0.05	275	432	21.60	1.24	20.36
16-10-2015	0.00	0.54	0.06	256	358	21.48	1.28	20.20
17-10-2015	0.00	0.48	0.06	240	288	17.28	1.03	16.25
18-10-2015	0.00	0.41	0.07	205	246	17.22	0.91	16.31
19-10-2015	0.00	0.34	0.07	170	204	14.28	0.81	13.47
20-10-2015	0.00	0.27	0.07	135	162	11.34	0.64	10.70
21-10-2015	0.00	0.20	0.07	100	120	8.40	0.36	8.04
22-10-2015	0.00	0.13	0.07	84	78	5.46	0.21	5.25
23-10-2015	0.00	0.06	0.07	48	40	2.80	0.12	2.68
24-10-2015	0.00	0.00	0.07	0	0	0.00	0.00	0.00
25-10-2015	0.00	0.00	0.00	0	0	0.00	0.00	0.00
Total	**455.10**					**8314.50**	**412.22**	**7902.28**

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

Stakeholder consultation

Summary report of field consultation with leader/farmer

Field consultation was held in 44 villages of 11 Gram Panchayats of Bari watershed cluster, Dholpur in the months of July and August of year 2016 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 11 gram Panchayat of Bari Watershed Cluster. Major issues in the Bari Watershed cluster that emerged from the farmer and group consultations during field visit are summarized below.

a) Ensuring Targeting, Inclusion, Participation and Access of small and marginal farmers, tribal farmers, SC and women farmers to agrarian sources of info (seeds, fertilisers, credit, training, information, etc.), extension services and markets; requirement for the project to connect and include these gatherings at all stages;

b) Ensuring representation, inclusion and requirement for the project to connect and include these gatherings farmers, women farmers, tribal farmers and scheduled caste farmers in CACP preparation, farmer mobilization, and farmers' organisations; CACP planning to be founded on solid participatory procedures including every single essential stakeholders of RACP.

c) Ensuring equitable access of these socio-economic groups to project resources and benefits.

d) Dealing with traditional bias towards medium and large farmers with resources to influence project processes, farmer's institutions and benefit sharing norms; the requirement for customisation of project interventions to suit the needs of small and marginal farmers and women.

e) Promotion and strengthening of community based approaches and capacity building for farmer's mobilisation and resource use.

f) Inclusion and participation of Tribal and other vulnerable groups.

g) Inclusion and participation of women farmers in project institutions, interventions and benefits. Project interventions could increase gender imbalances and/or enhance the drudgery of women; these should be accompanied by other interventions that offset the imbalance by reducing drudgery, or re-distribute work responsibilities between women and men; Ensuring that women are not further disempowered because of, nor do they get excluded from, promotion of market-oriented agriculture.

h) Addressing any potential adverse impacts from utilisation of common and Panchayat lands Land.

i) Avoiding social conflict over water, natural resources and common lands. Addressing issues of inequitable sharing and unregulated use of water resources, both surface and ground water, and conceptualizing water as a common resource, while it continues to be used as a private good.

j) Safeguarding against elite capture. Given the widely varied social and economic stratification, the near absence of social solidarity that comes with traditional community institutions and the vast geographical spread observed in the villages of Rajasthan, the risks of project investments and benefits being cornered by the powerful few in the village run very high.

k) A case in point is the widespread encroachment and occupation of common lands (grazing lands), usually by the large farmers, for purposes of cultivation and grazing their cattle, with the goat-rearing families being forced to dispose of or cut down the size of their herds.

Sr. No.	Village(GP)	Date	Gram Panchayat	Place	Leader
1.	Khairari	25.07.2016	Ibrahimpur	Word panch	Surpanch
2.	Rewai	25.07.2016	Ibrahimpur	Kolli colony	Word panch
3.	Ibrahimpur	26.07.2016	Ibrahimpur	Rajivgandisewakevdra	Shachiv
4.	Tamoti	05.07.2016	Ibrahimpur	Sarpanch home	Surpanch
5.	Totpura	26.07.2016	Ibrahimpur	Pratapsingh home	Word panch
6.	Kachhpura	26.07.2016	Ibrahimpur	Upsarpanchke home	Shachiv
7.	GarhiKhirana	13.07.2016	GarhiKhirana	Sarpanch home	Surpanch
8.	Garhi	27.07.2016	GarhiKhirana	Buddiramke home	Word panch
9.	Dadur	27.07.2016	GarhiKhirana	Tikkaramke home	Shachiv
10.	Tontri	29.07.2016	Tontri	Dharmke home	Surpanch
11.	Puramdari	29.07.2016	Tontri	Bittodevike home	Word panch
12.	Reti	30.07.2016	Tontri	Word panchke home	Shachiv
13.	Bateshwar Kala	31.07.2016	Sigorai	Pandit colony	Surpanch
14.	BateshwarKhurd	31.07.2016	Sigorai	Jatavbasti	Word panch
15.	Kuhawani	01.08.2016	Sigorai	Sri chand home	Shachiv
16.	Sigorai	14.07.2016	Sigorai	Mansinghke home	Surpanch
17.	Saheri No. 2	01.08.2016	Saheri	Vidhya ram keghar	Word panch
18.	Jamboora	03.08.2016	Naksauda	Shyamkeghar	Shachiv
19.	Sunipur	03.08.2016	Naksauda	Vinod keghar	Surpanch
20.	Naksauda	15.07.2016	Naksauda	Rajivgandisewakevdra	Word panch
21.	Nadroli	05.08.2016	Naksauda	Meenabasti	Shachiv
22.	Koyla	06.08.2016	Naksauda	Meenabasti	Surpanch
23.	TalabUmerh	21.07.2016	Naksauda	Meenabasti	Word panch
24.	Umreh	12.07.2016	Umreh	Village chopal	Shachiv
25.	Sagaur	07.08.2016	Umreh	villageHouse	Surpanch

Sr. No.	Village(GP)	Date	Gram Panchayat	Place	Leader
26.	Salemabad	07.08.2016	Umreh	Chock	Word panch
27.	Dauapura	08.08.2016	Umreh	Chock	Shachiv
28.	Sanaura	09.08.2016	Sanaura	Main Choraha	Surpanch
29.	Kankrai	21.07.2016	Sanaura	Co home	Word panch
30.	Gardarpura	09.08.2016	Sanaura	Sarpanch home	Shachiv
31.	Nidhara	22.07.2016	Nidhara	Rajivgandisewakevdra	Surpanch
32.	RudhKaPura	16.08.2016	Nidhara	Chock	Word panch
33.	Hulasipura	12.08.2016	Nidhara	Chock	Shachiv
34.	Maharajpur	12.08.2016	Nidhara	Chock	Surpanch
35.	RundhNidhara	16.08.2016	Nidhara	Mandir Chock	Word panch
36.	Halle KaPura	19.08.2016	ChilaChaund	School	Shachiv
37.	Mundpura	19.08.2016	ChilaChaund	School	Surpanch
38.	Reechhai	21.08.2016	ChilaChaund	School	Word panch
39.	ChilaChaund	21.08.2016	ChilaChaund	Sarpanch home	Shachiv
40.	Ranpura	23.07.2016	ChilaChaund	School Ground	Surpanch
41.	Khoolekapura	23.08.2016	Dheemiri	School Ground	Word panch
42.	Sikarra	23.08.2016	Dheemiri	Ragvanderkeghar	Shachiv
43.	Todpura	23.08.2016	Dheemiri	school	Surpanch
44.	Dheemiri	20.07.2016	Dheemiri	Rajivgandisewakevdra	Word panch

Field Consultant held - Key social issue of cluster

Major issues in the cluster that identified after consultation from the Sarpanch, PRIs and other groups like Women group, SC/ST groups, field NGOs, representative of PRIs etc. during field visit with, are summarized below:-

Agriculture:-

1. Almost all the households in of Bari cluster are in the trap of indebtedness because of the substantial amount of loan ranging from 20000 to 100000 for the purchase of agriculture inputs and meeting the household needs. Widespread indebtedness of farmers also reported due to costs incurred on agricultural inputs including water resources.
2. Problem of access to credit by small and marginal farmers.
3. Lack of timely supply of agriculture inputs including seed and fertilizers.
4. Farmers feel that RACP will provide employment to agricultural labour and this will decrease migration from project villages.
5. Marginalization of small and marginal farmers in technologies and investments, training and capacity building.

Gender

1. Women mentioned 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.
2. Very low coverage of women in extension programs (to training, decision making, exposure visits, markets & enterprises).

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

Tribals

1. Agricultural inputs such as seeds and fertilizers are distributed by concerned department but people have no proper knowledge of use of the inputs.
2. In tribal areas women are able to attend mixed group meetings along with men, but are not able to interact freely.
3. Adoption of practices by women will be better if some of the trainings are conducted with women only.

Livestock & pasturelands

1. Lack of breed improvement and livestock health care services.
2. Goat purchasers use weighing scales for ascertaining weight of goats.

Markets

1. Small farmers lack information about market prices.
2. If farmers are not satisfied by the auction price offered, they cannot afford to take back the produce and have to sell at lower than MSP price.

Institutions

1. Outreach of extension services very low in villages.
2. Community based organizations (multi task groups, multi task group goat groups, ground water management committees, women's groups) should be integrated into the Farmer Producer Companies that will be facilitated in the RACP. This will also help in coordinating management of different ecosystems in the village/Panchayat.

Water resources:-

1. Inequity in the use and distribution of water is scattered
2. The conflicts among water users resulting from collective efforts at establishing more efficient water usage norms.
3. There is an issue of exclusion of women and marginal/small farmers from project investments and other benefits.

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 Bari cluster are summarized as under:

a) All Project villages are connected with NH 11B and SH 42, 43.

b) The villagers identified the existing infrastructure on the maps and also indicated their choice for creating new infrastructure for watershed development (anicut, naadis and rainwater harvesting structures) which would provide additional water for agriculture, thus enhancing potential for additional income for the inhabitants of these villages. Entire Project Area is Rain-fed and agriculture is majorly dependent on rains there.

c) Project Area has been receiving 60-65 cm average amount of rainfall for last two-three years resulting in availability of water in ponds, naadis etc and substantial amount of agriculture production.

d) Watershed in the most parts of the Project Area is gets dried after six-seven months of rains which also causes water scarcity in the Bari cluster.

e) Due to high fluoride in the cluster, watershed is utilised for irrigation purposes there.

f) Few villages under the Project Area Agriculture and animal husbandry are the main source of livelihood for majority of population residing. Most of the villages are located in vicinity of approx. 10-15kms of Bharatpur-Dholpur section of NH-11B which allows better access to urban centres such as Dholpur, Baseri, and Agra etc.

g) It was discovered during PRA exercise after discussion with PRIs member that pasture land is essential activity. It's required to be developed because of fodder scarcity in the project area, but the large area of pasture land is under encroachment therefore, only 10-20 % area is available for the development of pasture.

h) The villagers indicated their choice for the location for the proposed infrastructure (naadis, ponds, anicut, water harvesting structures etc.) on the resource map. Based on this input information regarding proposed watershed interventions is provided in this report incorporating stakeholders' recommendations.

PRA – Resource mapping in Bari cluster area

PRA held Date of the Villages falling in the Project Area

S.N.	Village name	PRA Date	No of Household in Project areas	Total Population in Project areas	Male	Female	SC Population	ST Population
1	Khairari	25.07.2016	85	534	297	237	486	0
2	Rewai	25.07.2016	395	2785	1460	1325	859	0
3	Ibrahimpur	26.07.2016	254	1026	536	490	385	10
4	Tamoti	05.07.2016	302	1415	740	675	38	554
5	Totpura	26.07.2016	65	460	267	193	10	0
6	Kachhpura	26.07.2016	190	1085	575	510	5	0
7	GarhiKhirana	13.07.2016	328	2010	1108	902	734	0
8	Garhi	27.07.2016	225	1314	670	644	466	0
9	Dadur	27.07.2016	189	1170	618	552	474	0
10	Tontri	29.07.2016	304	1878	988	890	193	0
11	Puramdari	29.07.2016	136	886	482	404	172	0
12	Reti	30.07.2016	102	660	342	318	281	0
13	Bateshwar Kala	31.07.2016	90	556	312	244	150	0
14	BateshwarKhurd	31.07.2016	70	422	237	175	155	12
15	Kuhawani	01.08.2016	227	1578	892	686	155	901
16	Sigorai	14.07.2016	335	2156	1140	1016	768	735
17	Saheri No. 2	01.08.2016	64	530	300	230	43	0
18	Jamboora	03.08.2016	39	216	118	98	0	0
19	Sunipur	03.08.2016	394	2560	1390	1170	743	1236
20	Naksauda	15.07.2016	142	1012	560	452	429	0
21	Nadroli	05.08.2016	72	445	243	202	0	436
22	Koyla	06.08.2016	140	856	474	382	200	526
23	TalabUmerh	21.07.2016	1	4	3	1	0	4
24	Umreh	12.07.2016	575	4204	2324	1880	789	2634
25	Sagaur	07.08.2016	124	856	454	400	352	508
26	Salemabad	07.08.2016	75	504	272	232	344	0
27	Dauapura	08.08.2016	84	470	270	200	262	142
28	Sanaura	09.08.2016	342	2390	1280	1110	548	0
29	Kankrai	21.07.2016	201	1224	684	540	105	1004
30	Gardarpura	09.08.2016	112	724	403	321	98	235
31	Nidhara	22.07.2016	213	1350	762	588	275	0
32	RudhKaPura	16.08.2016	244	1410	754	656	145	71
33	Hulasipura	12.08.2016	160	657	364	293	13	1
34	Maharajpur	12.08.2016	75	378	219	159	138	0
35	RundhNidhara	16.08.2016	49	198	112	86	191	0
36	Halle KaPura	19.08.2016	95	485	289	196	148	0
37	Mundpura	19.08.2016	60	378	205	173	0	369
38	Reechhai	21.08.2016	77	475	268	207	42	98
39	ChilaChaund	21.08.2016	567	3356	1792	1566	945	1325
40	Ranpura	23.07.2016	115	546	295	251	168	0

S.N.	Village name	PRA Date	No of Household in Project areas	Total Population in Project areas	Male	Female	SC Population	ST Population
41	Khooleka pura	23.08.2016	152	985	577	408	255	0
42	Sikarra	23.08.2016	102	595	331	264	0	0
43	Todpura	23.08.2016	130	735	423	312	230	0
44	Dheemiri	20.07.2016	394	2454	1278	1176	694	0
Total			6524	49922	27108	22814	12482	10801

The PRA shows the population i.e. 49922 which consist of 27108 Males and 22814 Females in the forty four villages of eleven (11) gram Panchayat. The Gram panchayat has 6524 households in which schedule tribe are 9% and schedule caste is 5.82 percent of total households.

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 village Level	48	48
3	Pamphlet Distribution	20000	20000
4	RACP Awareness Rallies of School Children	26	26
5	Flex Stand	8	8
6	Slogan Writing	200	200

Village wise household detail

Name of villages	No. of farmers (HH)	Farmers types and Numbers(HH)									
		Farmers types				Categories wise				BPL	Woman headed House Hold
		Landless	Small	Marginal	Large	General	SC	ST	OBC		
Khairari	79	22	25	32	0	0	51	0	28	17	15
Rewai	152	42	62	39	9	58	55	0	39	58	29
Ibrahimpur	194	22	68	91	13	0	21	1	172	21	66
Tamoti	122	14	55	38	15	38	4	8	72	17	9
Totpura	83	12	34	20	17	11	2	0	70	9	5
Kachhpura	207	56	75	57	19	19	1	0	187	18	6
GarhiKhirana	94	15	22	47	10	0	41	0	53	24	38
Garhi	152	32	16	96	8	26	31	0	95	95	19
Dadur	61	9	21	20	11	11	26	0	24	15	11
Tontri	245	22	93	116	14	157	10	0	78	59	6
Puramdari	114	11	58	35	10	57	8	0	49	28	8
Reti	112	13	61	30	8	12	14	0	86	11	4
Bateshwar Kala	102	13	34	43	12	42	8	0	52	6	17
BateshwarKhurd	71	7	21	33	10	21	7	6	37	4	12
Kuhawani	289	21	85	169	14	113	8	36	132	29	25

Name of villages	No. of farmers (HH)	Farmers types and Numbers(HH)									
		Farmers types				Categories wise				BPL	Woman headed House Hold
		Landless	Small	Marginal	Large	General	SC	ST	OBC		
Sigorai	392	13	81	278	20	124	34	24	210	51	23
Saheri No. 2	38	4	17	17	0	12	4	0	22	4	3
Jamboora	24	3	9	12	0	0	0	0	24	9	4
Sunipur	290	22	61	202	5	48	31	66	145	46	58
Naksauda	118	12	39	53	14	15	28	0	75	21	39
Nadroli	68	6	14	45	3	7	0	61	0	7	6
Koyla	116	14	31	66	5	6	13	47	50	29	26
TalabUmreh	1	1	0	0	0	0	0	1	0	0	0
Umreh	605	52	88	456	9	78	32	74	421	76	106
Sagaur	116	9	27	77	3	11	19	18	68	9	18
Salemabad	73	5	16	47	5	15	16	0	42	8	6
Dauapura	61	6	25	27	3	9	12	9	31	3	15
Sanaura	304	25	82	176	21	238	27	0	39	51	58
Kankrai	204	14	47	135	8	124	7	42	31	19	29
Gardarpura	51	8	15	25	3	23	4	9	15	16	5
Nidhara	158	10	42	84	22	22	9	0	127	27	43
RudhKaPura	114	15	33	57	9	56	10	7	41	37	14
Hulasipura	149	12	55	77	5	47	2	1	99	15	19
Maharajpur	65	8	17	37	3	18	9	0	38	10	9
RundhNidhara	42	16	7	19	0	0	11	0	31	8	5
Halle KaPura	84	12	10	55	7	10	10	0	64	7	8
Mundpura	62	6	9	47	0	0	0	23	39	12	7
Reechhai	81	2	19	55	5	0	3	10	68	4	11
ChilaChaund	596	55	87	403	51	384	34	37	141	65	113
Ranpura	52	5	15	26	6	18	26	0	8	12	16
KhooleKaPura	143	8	29	90	16	38	20	0	85	31	13
Sikarra	65	11	17	30	7	44	0	0	21	44	14
Todpura	113	8	35	58	12	58	14	0	41	14	11
Dheemiri	262	23	69	143	27	52	25	0	185	53	54
Total	**6524**	**696**	**1726**	**3663**	**439**	**2022**	**687**	**480**	**3335**	**1099**	**1003**

Category wise Cultivated Area in Bari Cluster

Using remote sensing and Geographical Information System (GIS) and Participatory Rural Appraisal (PRA), the irrigated and rainfed area has been assessed. Using revenue as well as remote sensing data category of the farmers has been compiled into 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 area of the cluster is 3837.02 ha and the total households in the cluster are 6524.

The data clearly indicates that about 93% farmers are marginal, small, landless & BPL farmers. Only about 6.73% farmers are large in Bari cluster. Out of the total cultivated irrigated area, about 23.34% area is with large farmers and the rest belongs to other type of farmers. Similarly, 76.66% cultivated

rainfed area is either with marginal, small or BPL farmers. Out of the total cultivated area, 30% total cultivated area is with farmers who belongs OBC category followed by Schedule Caste, General and Schedule Tribe farmers.

The total irrigated area is only 36.33% of the total cultivated area and out of it 37.88% irrigated area is with small farmers followed by marginal, BPL and large farmers. The rainfed area is 63.67% and out of it 34.79% area belongs to marginal farmers followed by small, large and BPL farmers.

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; need for the project to reach out and involve these groups at all stages. Ensuring equitable access of small and marginal farmers, women farmers, tribal farmers and scheduled caste farmers in CACP preparation, farmer mobilization, and farmers' organisations to project resources and benefits.

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, scheduled tribe, women headed and other vulnerable households highlighted in the social assessment of the CACP.

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) In CACP planning:-To promote goat raring among the women, information and eligibility criteria for distribution of goats and bucks among women (widow, physically challenged/divorced) is discussed so that they could adopt such livestock raring as a livelihood support. Under RACP, there is a provision of distribution of Goat and bucks, chaff cutter etc. and the same is being ensured by the TL & CMS with due support of livestock assistant and community organizers.

ii) 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.

iii) 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 and FPOs. Though the small ruminant MTGs is having all the members are women mandatory but it is also ensured that at-least 30% members would be women in MTGs for agriculture and horticulture. It would also be taken care that in 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 FPO, 60% women members' participation is mandatory.

iv) 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, it would be mandatory that at-least 30% participants would be women members.

v) Specially targeted women's activities:-Under RACP, recognition of women as farmers across the project structures are benefiting under project activities like goat rearing, chaff cutter, water troughs, cattle shed 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. Apart from Goat Rearing, vegetable production etc. specially targeted women's activities, Lady Link workers were also being selected in the cluster under the Animal husbandry Department. Time to time their capacity building and trainings were also being carried out.

Tribal Development

The tribal population is 9.0%i n BARI WATER SHED CLUSTER.

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

Major Activity	Sub Activity	Social Impact	Mitigation
Watershed	Field Bunding **Dug out pound** Field Bunding **Dug out pound** Azola unit Pasture land	Inequity in the use and distribution of water The risk of conflicts among water users resulting from collective efforts at establishing more efficient water usage norms. The risk of exclusion of women and marginal/small farmers from project investments and other benefits	Exposure visits of farmers to water scarce areas use of water to more managed and equitable resource-sharing arrangement close monitoring of water use and distribution arrangements by CBOs, CRPs and F-NGO Identification of women-owner farmers, and their prioritized inclusion in all project benefits (see SMF – gender and women empowerment) 82%age of small and marginal farmers receiving the project benefits (in terms of numbers and investments) will be – to be monitored through PMIS
Agriculture	Drip Irrigation System with Automation Mini Sprinkler Drip Irrigation System Soil testing Seed Demo Fodder Demo Seed production	The risk of exclude in farmer selection specially women and SC for benefit distribution Risk of resource- farmers being further indebted to moneylenders. Increased perish ability, 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.
Horticulture	Wide Spacing Crop with inter cropping Solar Pump Program Green house PHM Vegetable demo	The risk of exclusion of women and SC farmers from project investments and other benefits. Risk of livelihood security due to Increasing marketability produce.	Farmer selection process through MTG discussion Identification of women household headed, and SC farmers, and their prioritized inclusion in all project benefits
Animal Husbandry	Buck Distribution Goat Distribution Azolla Demonstration Chaff Cutter Distribution Feeding & Water Trough Animal health camp Goat Insurance of unit receiving improve Buckand does LLW Facilitator	The risk of exclude poorest women of SC, widow, disabled for getting the benefit of activities The risk of women being excluded from training and related activities. The risk of migrant households particularly sheep herds getting excluded from receiving the benefit. Affect access to the land for grazing/ stalling livestock	Identification of women household headed, and SC farmers, and their prioritized inclusion in all project benefits. Develop a cadre of women CRPs and LLW in different thematic areas, including animal husbandry Allow medical supplies (deworming and routine vaccination) for migrant herds to be given in bulk for the duration away from the village. Formation of common land user associations/ resource institutions for development and management of the

Major Activity	Sub Activity	Social Impact	Mitigation
			resource.
Market & value chain	FPC	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.
Farmers' organization and capacity building	Formation of MTGs	Risk of exclude of women/SC/BPL farmer in MTGs	Priority of memberships & leadership of women/SC/BPL farmer in MTGs/UG s/FPC All household data collection of cluster area. Equitable distribution of project benefits between women and men of categories wise percentage
	Formation of UGs		
	Formation of FPC		
	Socio economic Data collection		
	Identification of Beneficiary	Risk of exclude of women, SC/BPL from beneficiary selection for Project activities	
	Capacity building & Training	Risk of exclusion of women from training for technological interventions	

1. ***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.

2. ***Key Social Indicators***

The key social indicators are given below in table:-

Major activity	Sub activity	Social indicators
Water shed	The project will carry out rehabilitation and modernization of Field bonding ,Dug out pound	Focus will be on improved management of rehabilitated canal networks through UGs/MTG/CBOs 82% of MTGs, UG, FPCs members and leaders from SC,ST, small, marginal and women farmers 14.82% of trainees from SC,ST, small, marginal and women farmers
Agriculture	Soil testing, Demonstrations ,PHM technologies, Seed Production	Increase in farm production and productivity as a result of improved seed management and cultivation practices. 85% of SC, ST, small and marginal and women farmers as beneficiaries of individually targeted assets/services and demo activities 82% of MTGs, WUA, FPCs members and leaders from SC,ST, small, marginal and women farmers 12% of trainees from SC,ST, small, marginal and women farmers
Horticulture	Greenhouse, shade net house cultivation, Solar pump set including fencing, Post-Harvest Management, Horticulture Mechanization	Greater access of farmers to markets and financial institutions and higher incomes. 82 % of SC, ST, small and marginal and women farmers as beneficiaries of individually targeted assets/services and demo activities 82 % of MTGs, WUA, FPCs members and leaders from SC,ST, small, marginal and women farmers 13% of trainees from SC,ST, small, marginal and women farmers
Animal Husbandry	Buck Distribution ,Goat distribution to Widows and/or especially abled women, Health and Awareness camps, Fodder Demonstrations on private lands, Azolla Demonstration, Lady Link Worker cum Marketing Facilitator and Chaff Cutter Distribution	All farmers with goats will stand to benefit from project interventions under the livestock component. The overall impact of these interventions will be a rise in income from goat rearing.
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. 80% of FPCs members and leaders from SC,ST, small, marginal and women farmers 80% of trainees from SC,ST, small, marginal and women

Major activity	Sub activity	Social indicators
		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. 85 % of MTGs, UG , FPCs members and leaders from SC,ST, small, marginal and women farmers 14.82 % of trainees from SC,ST, small, marginal and women farmers Cluster's all community will be benefited

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.

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Annexure 7.2 Environment Management Plan (EMP)

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

- Crop intensification
- Water Management
- Livestock 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-watershed 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	Use of seeds of good quality that are pests & disease free determines crop performance		% 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**
			disease infected leading to pest attack and crop loss or increased use of chemical pesticides	to a large extent. Therefore, Seeds when purchased 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				
			Safety issues in				

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**
			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	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**
				avoid the potential for soil 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

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.

Climate variability and emerging climate change in semi-arid areas in India pose considerable threat to the natural resources that sustain fodder production for livestock. Pasture lands, in absence of appropriate management practices, are at risk of further degradation with precipitation expected to occur in future, in more concentrated rainfall events interrupted by longer dry spells. Loss of grazing lands may result in more intensive management practices, increasing competition between land for food grain cultivation and livestock activities, or decreasing livestock populations, under mining the security function that livestock rearing provides.

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	Water Harvesting Recharge & Storage Structures:- and Pastureland Development	Top soil removal Cutting of trees	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. 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. Plant species should be grown for pastureland development and Water harvesting structures as following:- Tree species : Acacia albida. Albizia lebbek, Azadirachta indica, Prosopis cineraria, Zizyphus mauritiana, Acacia senegal, Acacia tortilis, Dichrostachys cineria, Hardwickia binata, etc Shrubs Capparis decidua, Zizyphus sp., Balanites aegyptica, Calligonum polygonoides,etc. Grasses and legumes : Lasiurus	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. % Water harvest structure with vegetative cover to prevent erosion and siltation. % Water harvest structures with safety provisions.	% survival of trees planted under compensatory planting. % of water harvest structure designed and constructed on the basis of catchment area, rainfall pattern, Physiographic condition and water demand and followed safety measures. % of water harvest & Storage structures properly designed and constructed to ensure that not more than 70 % of total runoff from drained area. % of pastureland developed.

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**
				sindicus, Cenchrus ciliaris, Cenchrus setigerus, Stylosanthes scabra, 8Panicum antidotale, Chloris gayana. Desmodium trifolium, Macroptelium atroperpureum, etc. The basic requirement for pastureland management should be balanced the number of grazing animals (livestock) with grazing capacity (Carrying capacity) and rotational grazing. Not more than 80% of the range resource should be utilized. • Fencing should be conventionally used for closing the area and protecting it from biotic interference.			
		Siltation, seepage & erosion of Water harvest & storage structures		Following measures should be confirmed to standard design, safety and maintenance for water harvest & storage structure. Standard design for these storage structures should be related to the size of the plot on which the storage structures are to be sited and quantity of runoff expected. Thus, size of storage structures can be expressed as a percentage of the plot area for a given range of runoff. Water should be passed through a			

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**
				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.			
		Too many water harvesting structures may affect downstream flows • With ground water getting recharged more bore wells are dug and more water is		The focus of the project is to transfer knowledge and skills to organized groups of farmers on understanding, addressing the groundwater situation and its sustainable use. • Where a no. of Nadi and tanka are being constructed, care shall be taken to ensure that not more than 70% of total runoff from the drained area is being stored. This is to ensure that there is adequate flow to meet downstream economic and ecological services.			

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**
		extracted.		• Shifting to crops with lower water demand if available water is not sufficient • 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			
		Alienation of pasture land for purpose other than grazing		The RACP shall adopt a simple resolution stating that it shall not use public pasture land for any purposes other than for pasture development and/or constructing water harvesting, recharge and storage structures with a view to benefiting the development of the pasture. Further, it shall not accept any pasture land provided by any authority for any purpose other than those mentioned above.			

Environment Management Plan for Livestock Management activities

RACP has recognized the importance of livestock in ensuring nutrient recycling in cropping systems. Accordingly, it has included a component that focuses on improving livestock management, especially for goats. The key environmental impact of this activity would be shortage of fodder,increased grazing pressure on existing pastures and disposal of wastes (manure).
Further, 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.

Therefore, there is a need to develop pasture (tree & grasses) lands on common and private land, bring in improved feed practices such as using chaff cutters to ensure that there is no rejection of fodder by the animals, use of mineral supplements to increase productivity, inclusion of fodder crops in the cropping pattern to ensure year-round feed and fodder availability etc. Of these, for small ruminants, development of pastures is the most important intervention since they need both tree leaves as well as grasses. Further, since small ruminants are almost entirely free grazed, availability of well-developed pastures is very essential.

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**
Livestock Development & Management	Breed improvement of goats through introduction of bucks	Breed may not be suited to the area	Low	• Good quality bucks of the chosen breed (ensure that the breed being promoted complies with The Rajasthan Livestock Improvement Act No.45 of 1958). The bucks born in twins and triplets should be selected as breeding bucks. A buck is generally sufficient to serve about 30-40 females. • Bucks kept with a goat rearer group should be exchanged with other similar groups after 10-12 months to avoid inbreeding.	At the time of CACP. At the time of preparation of the Livestock Management Plan	Ratio of elite bucks of chosen breed to no. of females in a herd/goat rearers group. % of nondescript and mixed breed kids castrated to total kid population.	% of herd showing full characteristics of chosen breed.
		Fodder may not be sufficient to support the herd		• Development of community pasture land goes hand in hand with herd improvement. • Planting tree species such as Gliricidia, Prosopis cineraria, Acacia, etc. on field bunds, backyards			

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**
				and on bunds of pasture lands would help in meeting the fodder requirements of goats. • Kids should also be given very succulent green fodder such as maize, Lucerne, etc. If adult goats are completely stall fed they should be given a daily feed of • Green fodder – 3to 4 kg • Dry fodder - 1 to 2 kg • Readymade concentrate – 200-250 g • If they are partly stall fed and partly free grazed they may be given half these rations.			
	Animal Health Inputs	Disposal of Used and expired vaccines and Biomedical waste		Biomedical wastes including needles, syringes, vaccines, medicines etc. generated from animals health camps should be disposed of after treating 10% Sodium	At the time of CACP. At the time of preparation of the Livestock Management Plan	% of staff who have attended training on Biomedical Waste Management for animal health camps	% of animal health camps that have adopted safe disposal of medical wastes % Animal Health Camp sites that

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**
				Hypochlorite solution then before burying them in deep pits which are at least 500 m away from water bodies, grazing land and other human habitations. These pits should be covered with soil immediately after disposal of the wastes.			have a safe disposal pit
		Use of banned veterinary medicines Use of antibiotics as growth promoters (eg: tylosin, quinolone, tetracycline, gentamicin, amantadine) may lead to side effects on human heath.		Diclofenac and its formulations (for animal use) are prohibited for manufacture and sale through GSR NO. 499(E) Dated 04.07.2008 under section 26 A of Drugs & Cosmetics Act 1940 by The Ministry of Health and Family Welfare, India. Use of antibiotics and growth promoters should be strictly prohibited.		% of farmers who received awarenes s on banned medicine s and ill effects of antibiotic s and growth promoter s.	
	Goat shade and Manure	Congested and improperly		The sheds must have enough space and	At the time of CACP. At the time of	% of goat herd owner has	% of goat herd owner adopted

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**
	Management	maintained sheds may result in quick outbreak of diseases. If improperly managed, manure and shad can be a source of water pollution, odor, flies, parasites, and other nuisances. It can contaminate drinking water and harm goat.		ventilation equipped with feed and water troughs and facilities for manure and urine collection.. Livestock owners must take responsibility for the manure generated by their animals in order to prevent water pollution. Composting is a controlled and managed aerobic (“with air”) decomposition process for manure and other organic materials waste.	preparation of the Livestock Management Plan	aware shade and manure management.	shade and manure management

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 Use of plastic for packaging may lead to issue of solid waste disposal. Exposure to noise and dust pollution may result in occupational health hazards among the		• 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.		% 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**
		workers. Use of energy from renewable sources will encourage high emissions.		A .Membrane applications 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. • First aid kit should be available in each processing unit that involves use of machinery. • Use energy efficient equipment for processing (such as steam boilers).			

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.			

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**
		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 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			

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**
				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. • 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	Provision	Relevance to RACP Project
Air (Prevention and Control of Pollution) Act 1981	Setting air quality standards, procedures for consent to operate enterprises, penalties etc. Consent should be taken to establish and operate. All processing units should obtain consents from the State pollution Control Board or establishment and operation. The procedures are different for Green, Orange and Red category industries.	Applicable to, processing activities (dal mills, rice mills fish/poultry feed manufacture etc. All processing units will obtain the consents as applicable (
The Water (Prevention and Control of Pollution) Act Amended: 1988	Laying down the permissible limits/ standards of pollutants likely to be emitted, collection of samples of effluent and analysis and provisions for penalties. Effluent treatment may be required in certain food processing units.	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. The Project will ensure the effluent treatment wherever applicable.
The Biological Diversity Act, 2002 G.S.R.261 (E), [15/04/2004] - Biological Diversity Rules, 2004	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.	The project envisages maintaining the biodiversity through selection of locally suitable crop cultivars. At the same time the project will enhance crop productivity through sustainable natural resource management.
Forest (Conservation) Act, 1980 (With Amendments made in 1988) Forest (Conservation) Rules, 2003 (With Amendments made in 2004)	Necessary Clearance should be obtained from Forest Dept or Revenue Department for trees cutting and plantation..	Applicable to the project where agriculture or Any construction of common facilities are promoted near forest areas or canal works
The Wild Life (Protection) Act, 1972	,destruction or diversification of habitat of any wild animal, or the diversion, stoppage or enhancement of the flow of water into or outside the sanctuary is prohibited without a permit granted by the Chief Wildlife Warden.	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. Eg: Desert National Park in Jaisalmer.

Relevant Acts/Rules	Provision	Relevance to RACP Project
The Insecticides Act. 1968 Amendment: Insecticides (Amendment) Act, 1977 World Bank Operational Policy on Pest Management OP/BP 4.09	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.	Applicable to agricultural activities. Mitigation measures taken care in Pest Management Plan • Purchase, stock, sale, distribution or exhibition of the following pesticides will not be supported: pesticides classified in Class Ia, Ib and II of WHO classification;
The Fertilizer (Control) Order, 1985	Registration is required for selling fertilizer at any place as wholesale dealer or retail dealer.	Applicable to POs in cases where stocking and sale of fertilisers may happen
The Seeds Act 1966, The Seeds Rules 1968	No person shall, himself or by any other person on his behalf, carry on the business of selling, keeping for sale, offering to sell, bartering or otherwise supplying any seed of any notified kind or variety, unless- (a) such seed is identifiable as to its kind or variety; (b) such seed conforms to the minimum limits of germination and purity specified under clause (a) of section 6; (c) the container of such seed bears in the prescribed manner, the mark or label containing the correct particulars thereof, specified under clause (b) of section 6; and (d)he complies with such other requirements as may be prescribed.	Relevant to the project where seed production is proposed. The project will follow the necessary provisions under Seed Act – labelling requirements, germination and purity etc.
Bio-Medical Waste(Management & Handling) Rules, 1998	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.	The bio medical waste will be treated and disposed safely or sent to the near by collection facility.
Rajasthan Soil and Water Conservation Acts, 1964	provide for the conservation and improvement of soil and water resources at cluster	Applicable to water harvesting & storage structures on arable and non-arable land
National Environment Policy 2006 Rajasthan State Environment Policy, 2010	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.	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

Relevant Acts/Rules	Provision	Relevance to RACP Project
State Water Policy 2010 The Rajasthan Regulation and Control of The development and Management of Ground Water Bill, 2006	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.	Optimization of water resources exploitation and raising the level of reliability of supplies through conjunctive use of surface and ground water.
National Policy for Farmers 2007	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.	The project envisages improvement of the land productivity and income of farmers in a sustainable manner.
State Policy for promotion of agro-Processing and Agri-business, 2010	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.	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.

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 source 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 workshop	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
Value Chain	Farmer Producer Company (FPCs)	EG producer organisation 2.1
	Establishing Food Processing Units	-
	Construction of	EG common 10-1

Intervention	Activity	Reference of Environment guideline(EG) as per EMSF
	Warehouse/ Food processing Unit	

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

SN	Detail of activity	Unit	Unit cost	Estimation Cost	Remarks
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.