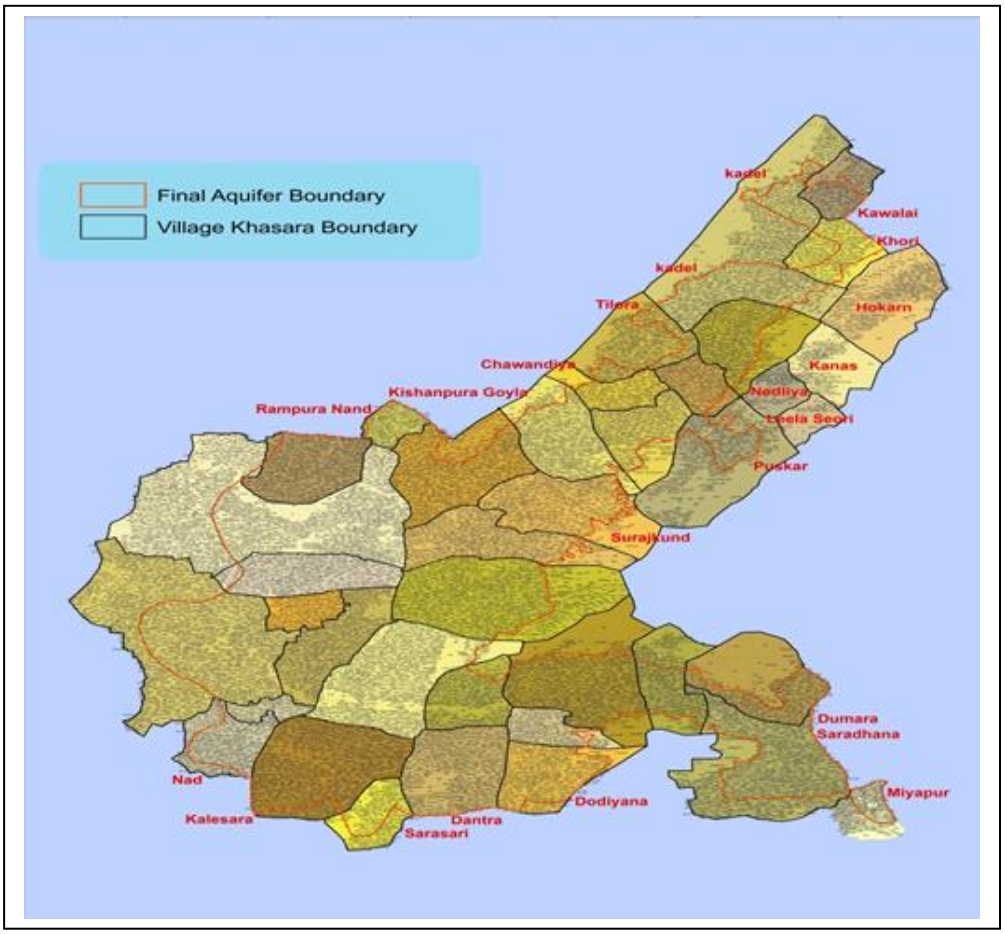
Cluster Agricultural Competitiveness Plan (CACP)

Ground Water Cluster Pisangan, Ajmer
Rajasthan Agricultural Competitiveness Project (RACP)



Theme: Ground Water, Blocks- Pisangan, District Ajmer

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Preface

The World Bank has approved credit amounting to INR 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 Pisangan Ground Water Cluster in Ajmer district has been prepared and an amount of **Rs.5840.19 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 Dr. V. P. Singh, Jt. Director Agriculture (Agronomy), Project Coordinators, Safeguard 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 INR 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.

Pisangan cluster in Ajmer district has been selected under the project after several visits by the PMU coordinators; consultations with officials of the GW Department Jaipur; (Ajmer), 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 Jowar, Bajra, Guwar and Green gram in Kharif and Wheat, Barley and Cumin in Rabi in the cluster. Horticulture is also of much significance, vegetables like Tomato, Pea, Cole crops and fruit plants like Aonla and Lime are cultivated in the cluster. Local and cross-breed goat population along with proximity to major markets of Ajmer, Jaipur, Delhi makes it an ideal cluster for Goat rearing for both milk and meat in the cluster.

The Pisangan ground water cluster of RACP is located in Pisangan block of Ajmer district, is about 45 Kms from the district headquarter. The cluster comprises of 23 Gram Panchayats and 44 villages which falls in Agro-climatic Zone IIIA (Semi arid eastern plain) of Rajasthan under RACP. About 96% 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 (509 mm/anum). 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 78883 and total number of households is 14981. Out of the total population female population is 48.77%, schedule caste (SC) population is 18.68% and 0.31% is the population of scheduled tribe (ST) population. This refers it is partly a scheduled cast belt mostly from farming community with low resources and hence needs support for upliftment.

The total cultivated area in the cluster is 26616 ha out of which 68.77% is rainfed and 31.23% is irrigated. Rest is temporary fellow land. Out of the total cultivated area, around 61.34% is being

cultivated by farmers other than large farmers. Most of the area is under 0-5% slope category. 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. The Climate is extreme with hot and humid summers and chilly winters. The temperature ranges from as much as 4^0C in the winter to 46^0C in the summer.

Total cropped area is about 24705 ha, out of which 16393 ha is in Kharif, 8312 ha is in Rabi season during the year 2015-16. Jowar crop is sown in about 4677 ha, Bajra in 4692 ha, Guar in 3611, Green Gram in 2530 ha followed by other crops. In Rabi season Wheat is sown in 2986, Barley in 3776, Cumin in 662 ha & followed by other crops. 2372 Ha area is under horticulture crops. Total area under these crops makes a total cropping intensity of 101.73%. Surplus production of the above mentioned crops is generally available in the area. Out of it the cropping intensity of Kharif crops is 61.59% and in Rabi, it is only 31.23%, in Horticultural Crops it is only 8.91%. Productivity of above crops is at par or little better than the district average.

Guar, Bajra in Kharif and Barley in Rabi are identified as value chain crops along with vegetables as a single segment 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 Rajasthan like Ajmer, Beawar, Kota, Jaipur, Jodhpur, Udaipur, offers immense opportunity for the cultivation of vegetables and fruits. The area is fairly suitable for fruits like Aonla and Lime and vegetables like Tomato, Pea and Cole vegetables. Hence, some area under cereal & other crops would be diversified in to the cultivation of above these fruits and vegetables crops. Pisangan cluster being mostly rain fed naturally supports goat rearing especially for the small holder farmers. The cluster has substantial goat population 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 Ajmer and Beawar. Currently is 1 cold store in existence in the Ajmer district with a total capacity of 3000 MT. One CWC of 15000 MT and 4 SWC with capacity of 28550 MT.

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 ground water cluster and activities related to soil and water conservation is being implemented by the Ground water 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. Based on the catchment area, total yield of the rainfall will be about 161.99 MCM. Net supply of water available is **25.9221 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 adoption of MIS. The present total demand is **56.5041 MCM** and it should be reduced to **25.9221 MCM** for Sustainable annual Ground Water availability. The gap can be achieved through **changes in ground water extraction rates through efficient on farm water**

usages by installation of water efficient technologies for irrigation (**Drip & Sprinklers** etc.) for Agriculture & Horticulture crops, Promotion of high value agriculture and Promotion of crops introduced and/or supported as part of improved crops rotation and management practices with lower water requirements**.**

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 Guar, Bajra and Barley 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 and intervention for goat milk. 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 ground water cluster, installation of ground water measuring and water withdrawal measuring equipment's 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.679.41 lakh** would be incurred. The Ground Water Department will be 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.1769.19 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.2356 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.1034.79 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. Maize, Soy, Wheat 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 agri preneurs can be supported under the project. A tentative investment of **Rs.257 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.

Barley

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

Bajra

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. • It provides feed to large number of animals and grown for silage and hay purpose also.	• 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 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, Morараka 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 bajra feed, roasted, 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.

Guar

Strength	Weakness
• About 80% of world production occurs in India and Pakistan, but due to strong demand, the plant is being introduced into new areas • The main areas of cultivation of Guar gum in India are Rajasthan, Gujarat, Haryana and Punjab • Guar is very drought-tolerant and sun-lovin Being a leguminous crop, guar fixes nitrogen, making the soil fertile. • Guar as a plant has a multitude of different functions for human and animal nutrition but its gelling-agent-containing seeds (guar gum) are today the most important use • Demand is rising rapidly due to industrial use of guar gum in hydraulic fracturing (oil shale gas) • Guar meal korma and Guar meal Chunni are widely used as prime raw material for producing various kinds of Cattle feeds, Aqua feeds, fish feeds, poultry Feeds, dairy feeds. • Only 10% of the Indian production stays within the country and the remaining 90% is exported for shale gas and oil industries	• The area under Guar cultivation is reducing in India • Reduced productivity as cultivation on marginal lands in states like Rajasthan • Due to inadequate infrastructural facilities with producers, traders and at market level results in marketing inefficiencies • Limited processing units for guar and its by-products such as flour units, roasted Guar units, etc. • Adequate storage facilities required. • Lack of guar processing units • Large number of intermediaries in the chain leads to low producer's income. • No grading on the farm level • Obsolete techniques are used in processing, which reduces the output. • Lack of market information regarding prevailing prices, arrivals etc. force farmers to sell in village itself.
Opportunities	**Challenges**
• Scope for tie up of FPOs through CFC with firms like Agro gums, etc • Scope for tie up of FPOs through CFC with guar processors/MSME firms • Scope for facilitation of start-ups from amongst FPOs or individual entrepreneurs, in secondary processing of value added products of Guar like guar gum, guar vegetable, etc • Scope for establishment of quality processing facilities by FPOs as part of Farmers Common Service Centre (FCSC), along with facilities for packaging and vehicle to facilitate transportation. • Establish storage facilities by FPO as a part of FCSC. • FPOs to undertake joint input sourcing activities for seeds, fertilizers, pesticides, etc. under the umbrella of CFC • FPOs to also undertake custom hiring services and hence lead farm mechanisation through CFC	• Adverse climatic condition like frost can impact the crop production and productivity • Lack of higher remuneration in guar may reduce farmer's interest from cultivating it.

Goat

Strength	Weakness
Strength of Goat milk as a product: • Potential of collecting around 52863 L of goat milk/day • Potential of goat milk as a health drink **Strength of meat from supply side:** • 80 goat specific MTGs and around 8748families own 44397 goats, averaging around 5 goats per goat rearing family. • It is a secondary source of livelihood for the farmers	• 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

• There is sufficient availability of fodder and water in the cluster for goat rearing	• 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, with support system from the RACP project provide enough opportunity for the goat rearers in the area for enhancing livelihood opportunity through creating efficient value chain linkages for live goat marketing	• Mortality remains a challenge for the farmers and hence they sometimes tend to sell small animals at half body weight (meat estimation basis). • Distance of cluster from major cities.

Total Investments in Pisangan Cluster

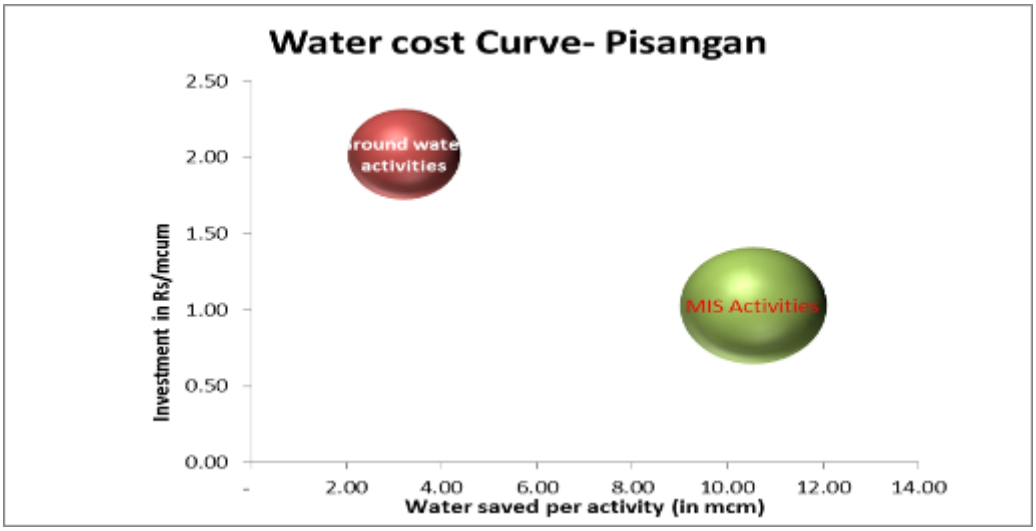
A total investment of **Rs.5840.19 lakh** is proposed to be incurred in the cluster during the project period to make the farmers and cluster competitive to get improvement in water as well as agricultural productivity and better market access. The summary of phasing is being given as hereunder:

#	Department	Components (Rs. Lakh)				
		Climate Resilient Agriculture	Market & Value Chains	Farmer's Organization and Capacity Building	Project Management and M&E	Total
1	Ground Water	646.57	-	21.53	11.31	679.41
2	Agriculture	1,367.01	232.00	159.91	10.27	1,769.19
3	Horticulture	2,309.80	-	36.00	11.00	2,356.80
4	Animal Husbandry	713.72	252.00	48.73	20.34	1,034.79
	Total	**5,037.10**	**484.00**	**266.17**	**52.92**	**5,840.19**

The above table reveals that total investment amounting to **Rs.5840.19** 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, 86.24% would be incurred on the first component, i.e. Climate Resilient Agriculture, 8.29% on Market and Value Chains, 4.56% on Farmers Organization & Capacity Building and 0.91% 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 Pisangan cluster, there are majorly two water saving activities taking place viz activities of Ground water department and the micro-irrigation system (MIS) activities of Agriculture and Horticulture department. Both these activities save water up to the extent of 3.20 mcm and 10.53 mcm per year respectively. When the investment per unit of water saved is calculated, it is found that MIS activities are able to conserve more water at lower investment of Rs 1.01 crore per mcm of water. Thus, it could be said that in Pisangan, MIS activities like installation of drips and sprinklers in the agricultural and horticultural crops can be economic means of saving water in span of a year.



Activities undertaken to save water	Water saved - in mcm	Investment- Rs/mcm	Total investment- Rs crore
Ground water resource	3.20	2.02	6.47
MIS Activities	10.53	1.03	10.84

Out of above investments, more than 14981 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 INR 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 (SPs) as decided at the time of signing of the agreement and community mobilization at cluster level would be done with the support of Field NGOs. Dy. Director Agriculture, Jila Parishad, at district level has been designated as District Project Manager and his office has been designated as office of the District Project Management Unit (DPMU). All concerned offices of the line departments at district level would be Project Implementation Agencies for planning and implementation of project activities in the cluster. There is District Level Implementing Committee (DLIC) will be responsible for coordination and implementation at district as well as at cluster level. District Collector is

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

1.1. Brief Description of the CACP

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

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

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

Third chapter discusses the strategic contexts of choosing the value chain crops for the cluster. 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.

Fourth 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 ground water management of the ground water cluster to develop selected commodities as a pilot which consists description of aquifer, Objectives of the Ground Water Resource Management in groundwater Cluster, water budgeting including supply and demand for the project area, Ground Water Resource Assessment, Proposed Activities for Ground water Management including studies/Field Surveys, Construction of Piezometer, Observation Wells and Procurement of DWLR (Digital Water level recorder), Monthly water levels Monitoring, Installation of Automated Weather Station, Supply side Interventions which includes Farm Pond to Individual Beneficiary, Demand Control Activities which includes Installation of drips and sprinklers for the agricultural and horticultural crops, Installation of Water Meter, Crop Water Budgeting, Enhancement the capacity of community, institutional activities, trainings, site specific plan & cost estimates of the activities, estimated cost of Investments underground water management, implementation arrangement for all the planned activities in the aquifer 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

ground water management, 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 eight AEZ.

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 Pisangan cluster has been selected to achieve the Project Development Objective (PDO). The Pisangan cluster is an aquifer based cluster which is a hydrological unit. The Pisangan aquifer based cluster is situated in Agro-climatic Zone IIIA (Semi Arid eastern plain). Pisangan is a block headquarter of Ajmer district located about **47 Kms** from Ajmer. The Pisangan ground water Cluster in Ajmer 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 Ground Water Department, Jaipur & Senior Hydrogeologist, Ajmer and interactions with the local community, following un-treated area as per details provided by the Ground Water Department have been identified. Nodal Department i.e.

Ground Water Department, 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. The average rainfall of this cluster area is approximately 509 mm. Total cropped area is about 24705 ha, out of which 16393 ha is in Kharif, 8312 ha is in Rabi season during the year 2015-16. Jowar crop is sown in about 4677 ha, Bajra in 4692 ha, Guar in 3611, Green Gram in 2530 ha followed by other crops. In Rabi season Wheat is sown in 2986, Barley in 3776, Cumin in 662 ha & followed by other crops. 2372 Ha area is under horticulture crops. Out of these, Tomato, Pea, Cole crops are major vegetable crops taken in 271, 446 and 1225 ha respectively. Aonla is in 212 ha and lemon is in 51 ha. Total area under these crops makes a total cropping intensity of 101.73%. 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 the above mentioned crops is being sold through unorganized local market of Pisangan and Mandi in Ajmer and Beawar. Apart from human consumption most of the produce of Juwar including other similar crops is being used as cattle feed, hence looking to the enough livestock population of Ajmer district, there is a considerable scope of value addition in these crops. The Mustard crop is to be used for extracting oil. 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 crop is significant for any Producer Company (FPC), so these crops may be taken as value chain crops in Pisangan Cluster.

There is great scope for Horticulture/fruit plantations at present, the availability of fertile land and availability of ground water along with connectivity with Jaipur, Ajmer, Jodhpur, Kota and Udaipur presents immense opportunity for the cultivation of vegetables and fruits. The area is highly suitable for Tomato, Pea, Cole crops and Aonala. 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 as 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 12562 numbers of goats are available in the villages of the clusters 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 major cities of rajasthan viz. Ajmer, Beawar and good communication with other cities like Jaipur, Jodhpur, Udaipur and Kota provides enough opportunity for the development of value chain crops and cultivation of vegetables and fruits, as well as scope of value chain in goat meat production. Therefore, Pisangan is an appropriate cluster to be developed under RACP.

Chapter -2: Description of the Cluster

2.1. Spatial characteristics

Pisangan watershed cluster of Rajasthan Agricultural competiveness Project is located in Pisangan, Blocks of Ajmer district. The project area is located between 26°20'20" to 26°28'30" North Latitude and 74°17'20" to 74°31' East longitude. The Pisangan cluster is at a distance of 47 Kms from Ajmer district headquarter. The area of the cluster is spread over in 44 villages of 22 Gram Panchayats. The name and area of the Gram Panchayats and villages covered in the Project area are given in Annexure 2.1

2.1.1. Land Use Pattern of the Cluster

Total area of the cluster is 31825 ha. Out of this, the cultivated area is 26616.58 ha. Out of cultivable area 16393 ha area is rainfed, 8312 ha area is irrigated and 1911.58 ha temporary fellow land. The pasture land which belongs to Panchayat of Pisangan Cluster is 583.88 ha which belongs to Government and Community of the cluster. The detail land use pattern of the cluster is summarized hereunder:

Table 1: Land Use Pattern of the Pisangan Cluster

S. No.	Land Use	Total area in Ha				
		Private	Panchayat	Government	Community	Total
1	**Agriculture land**	**26616.58**	-	-	-	**26616.58**
2	Temporary fallow	1911.58	-	-	-	**1911.58**
3	Waste Land	-	1018.15	2807.96	-	**3826.11**
4	Cultivated Rainfed	16393	-	-	-	**16393**
5	Cultivated irrigated	8312	-	-	-	**8312**
6	Water Bodies	-	-	92.18	-	**92.18**
7	Settlement	-	-	696.6	9.65	**706.25**
8	Pasture Land	-	-	583.88	-	**583.88**
9	Others	-	-	-	-	-
	Total (2 to 9)	**26616.58**	**1018.15**	**4180.62**	**9.65**	**31825**

(Source: DPM, Ajmer**)**

2.1.2. Current connectivity

At present there is unorganized market in the cluster and farmers sell their produce in the local markets. The Ajmer mandi (market) is located 47 km, Beawar mandi 37 km & Jaipur Mandi about 180 km from the cluster respectively.

2.2. Agro-ecological characteristics

2.2.1. Slope

The slope of the area ranges from 0 to more than 10%. Most of the area is under the slope category 0 to 5% slope. The category wise slope area is being summarized under:

Table 2: Slope range and area under the category

S. No.	Slope percentage	Area in hectares
1	0 to 1 %	13883.27
2	1 to 3 %	10065.20
3	3 to 5 %	5030.60
4	5 to 10 %	2463.21
5	10% to above	383.20
	TOTAL	**31825.48**

(Source: NGO, Pisangan cluster**)**

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. The soil profile of the project area is being summarized as under:

Table 3: Table Soil Profile of Pisangan Cluster

S. No.	Major Soil Classes	Area in hectares
1.	Loamy, Sandy Loam	13684.75
2.	Sandy	14639.50
3.	Back	3500.75
	Total	**31825.00**
	Soil Depth :	
B	**Depth (cm)**	**Area in hectares**
1	0 to 7.50	-
2	7.50 to 45.00	7001.50
3	> 45.00	24823.50
	Total	**31825**

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

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

Table 4: The Soil fertility level of the Project Area

Soil fertility Status	Kg/ha	Recommended
N	70-90	120-140
P	100	100-120
K	Nil	90-120
Micronutrients	PPM	Recommended
Zn	NA	NA
Fe	NA	NA

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

2.2.3. Rainfall Pattern in Project Area

This cluster falls under humid region climate. Winter season is observed during 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 Ajmer.

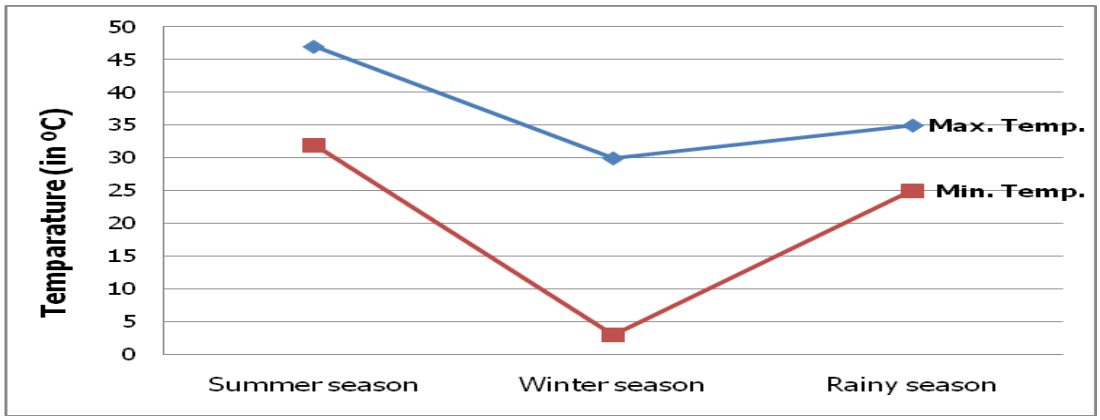
The average rainfall data are required to carry out water budgeting and based on which appropriate water harvesting structures are proposed have been obtained from Irrigation Department of Ajmer, Government of Rajasthan. The rain fall data (Refer Annexure 2.7) as obtained and given in the following table have been utilised while planning Ground Water Management interventions in the cluster.

The average rainfall of the cluster area is 509 mm which has been used for calculation of water budgeting and similar other aspects.

2.2.4. Temperature

The temperature during the summers (from April to July) remains high and generally reach up to 45oC and some time to touch as high as 46ºC. Hot wind commonly known as "Loo" blows between the months of May-June. On the other hand, winters have generally sunny and pleasant days and bitterly cold nights. At time the temperature can also touch to a lower level of around 3-4ºC, mostly during the nights.

Figure 1: Maximum and Minimum Temperature



(Source: IMD, Ajmer**)**

2.2.5. Source of Irrigation

Pisangan cluster is an aquifer based cluster, so the rainwater and ground water is the main source of water which is required for crop production. 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 Pisangan cluster the main source of irrigation is recharged through rain fall of 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:

2.2.6. Ground Water Status in Pisangan Cluster

Total 3109 wells are energised by Electric Motor Pump, Diesal Motor Pump and Solar Pump and total 11456 ha area are irrigated by wells in the cluster area. Almost 365 days of the year water is available in deep wells.

Table 5: Ground Water Status

S. No.	Total No. of running wells	Energy Source of Wells			Irrigation by Wells		
		Well operated by Diesal Engine	Well operated by Electric Moter	Well operated by Solar Pump	Area Irrigated by Sprinkler in (ha)	Area Irrigated by DRIP in (ha)	Area Irrigated by Flood Irrigation in (ha)
1	3109	167	2893	49	41.90	32.89	11381.20

(Source: Ground water Department, Ajmer)

Hydrology

The principal source of recharge to ground water is rainfall. Average rainfall for year 2007 to 2016 Pisangan cluster district Ajmer are given in **Annexure 2.7**. 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. Study ground water occurrence is dealt in Appendix-2.8.

Ground Water Level

The Pre-Monsoon depth to water varies from 21.57 mts to 25.24 mts below ground level and Post-monsoon depth to from 20.20 mts to 23.64 mts Increased groundwater draft to meet the increased demand of agriculture sector is the main cause for declining trend of Ground Water levels. (See water Level sheet of **Annexure 6.1.**

Water Level trends (2007 – 2016)

10 years Water Level Trend for Pre monsoon, 2001–2016 and Post monsoon, 2001 - 2016 have been analysed. During Pre-monsoon period in the long term, decreasing trend of ground water levels of 0.35 m/year has been observed in Pre-Monsoon period. Decreasing trend of 0.36 m/year in ground water levels of Post-Monsoon period from 2007 to 2016 has been observed in the Cluster Area. The Water levels trends are given in Annexure – 2.14.

Ground Water Extraction Status

Existing Gross Ground Water Draft of 46.4705 **MCM** for Irrigation are withdrawn through 3109 wells/Tube wells for irrigation purposes in the Pisangan Cluster area. The details are given Annexure – 2.14. Existing Gross Ground Water Draft of **6.3565 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 Pisangan Cluster area as on 30.06.2017 is 217.91 **%** which indicates Cluster area are coming under Over-Exploited Zone but Pre-Monsoon period showing increasing trend and post-monsoon trend sowing increasing trend. The scope of ground water development for Irrigation purposes is already exhausted. The Ground water Draft should be reduced to **25.9221 MCM** bringing a balance between water recharge and extraction over time for Sustainable Ground Water availability. (**See: Annexure-2.14**)

Efficient use of ground water on farm water usages through:

- Demonstration of water efficient technologies for irrigation (Drip & Sprinklers etc.)
- Promotion of high value agriculture.
- Promotion of crops introduced and/or supported as part of improved crops rotation and management practices with lower water requirements.

For monitoring of impact assessment of Investments proposed in the Cluster area, 24 Piezometers & Observation wells or as per Site Specific requirement with installation of Digital Water Level Recorder (DWLR-Telemetric) is proposed to be constructed.

Demographic Characteristics

The Pisangan cluster comprises twenty three (23) Gram Panchayats having forty four (44) villages. The villages falling in the project Area are characterized by low and undependable rain. Ground water is the only source of irrigation.

2.2.7. Population

Total population of the cluster is 78883. Out of the total population female population is 48.77% and schedule caste (SC) population is 18.68% and 0.31% 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 6: Population Details

Male	Female	Total	SC	ST
40411	38472	**78883**	14734	242
51.23%	**48.77%**	**100.00%**	**18.68%**	**0.31%**

(Source: Data collected by NGO during the field survey)

2.2.8. Socio-economic condition of the cluster

The table below reveals that most of the farmers are either small, BPL or marginal farmers. Large farmers are only 4%. It means about 96% farmers require support for upliftment.

Table 7: Household Details

BPL household	Land Less	Small Farmer	Marginal Farmer	Large Farmer	Total household	SC household	ST household
749	648	4295	9439	599	**14981**	2107	117
5.00%	**4.33%**	**28.67%**	**63.01%**	**4.00%**	**100.00%**	**14.06%**	**0.78%**

(Source: Data collected by NGO during the field survey)

Currently there is unorganized market in the cluster and farmers sell their produce in the local markets. The production of Jowar, Bajra, Green Gram and other crops is being sold through unorganized local market of Pisangan and mandi of Ajmer. The produce of Bajra & Jowar crops 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 Bajra crop. The Pisangan & district mandies (markets) are located just 47 Kms from the cluster.

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

Table 8: The development indicators of the project area

S. No.	Development Indicators	Rajasthan State	Ajmer district
1	Per capita income (Rs.)	16260	56105
2	Poverty ratio	0.22	NA
3	Literacy (%)	60.40%	79.6%
4	Sex Ratio	1000:928	1000:951

(Source: Compilation from Website)

The above table indicates average socio economic conditions of the district. However, per capita income of the area is less than the state average. Although sex ratio are more than the state average, literacy is more than the state average in the district. All these parameter needs to be elevated in the project area for understanding the development to the occurred after the project implementation.

2.3. Agriculture-related livelihood characteristics

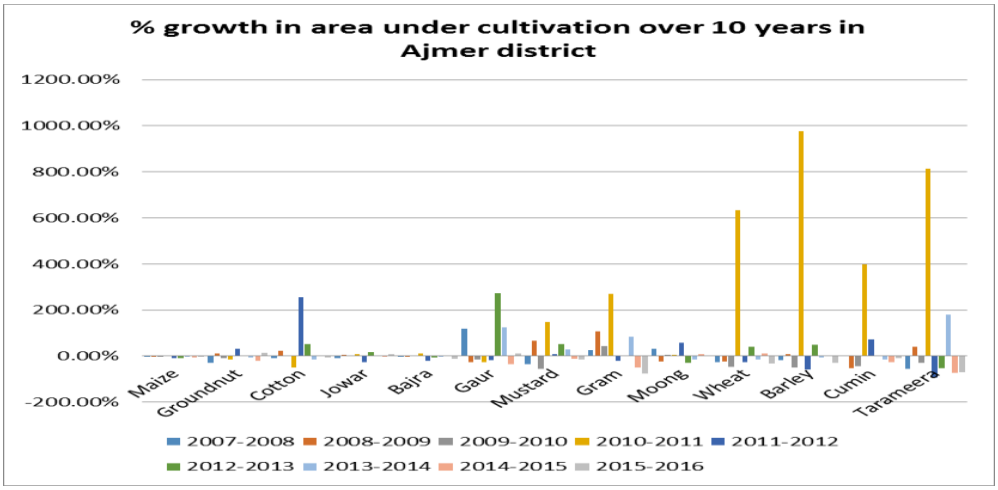
Agriculture is the chief contributor towards the economy of the district. Ajmer district occupies an important place in the agricultural production of the state. It falls in IIIA Agro Climatic Zone (Semi arid eastern plains) as discussed earlier. It is located 47 Kms from Ajmer district. The total geographical area of the district is 842994 hectares which is about 2.46 per cent of the state. Out of this, the net area sown is 457973 ha. Out of this the rainfed area is 319639 ha and irrigated area is 138334 ha. At the same time some area is also double cropped with the help of irrigation and hence the total cropped area is 654949 ha. So the cropping intensity of the district is 143% which is just equal to the state average.

2.3.1. Cropping Pattern of Agricultural Crops

Bajra, Sorghum (Jowar), Guar, Green Gram etc. are major crops which are being grown in Kharif in Ajmer district whereas in Rabi season major crops like Wheat, Barley, Cumin and Mustard etc. are being cultivated in the district. In the Kharif season, crops are sown in about 409291 hectares which is 2.66% of state's Kharif area (15369717 ha). In the Rabi, the crops are cultivated in about 245658 ha which is 2.64% of state's Rabi area i.e. 9308039 ha. Thus, the total cropped area of the district is 654949 ha. The prime sources of irrigation here are wells and tube wells. A net area of around 138334 hectares is being irrigated by 1446 tube wells & 43338 wells in the district. By other sources like canals and tanks, an area of about 10140 ha is irrigated.

Bajra, Sorghum (Jowar), Guar, Green Gram etc. crops and in Rabi season Wheat, Barley, Cumin and Mustard etc. crops are the main crops in Pisangan cluster. Before discussing Pisangan cluster, the details of area of these crops in the State as well as in the district have 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 is presented in Annexure 2.2. In addition to the increase (+) / decrease (-) over 10 years in cropped area and % area in district over state average have also been summarized in Annexure 2.2.

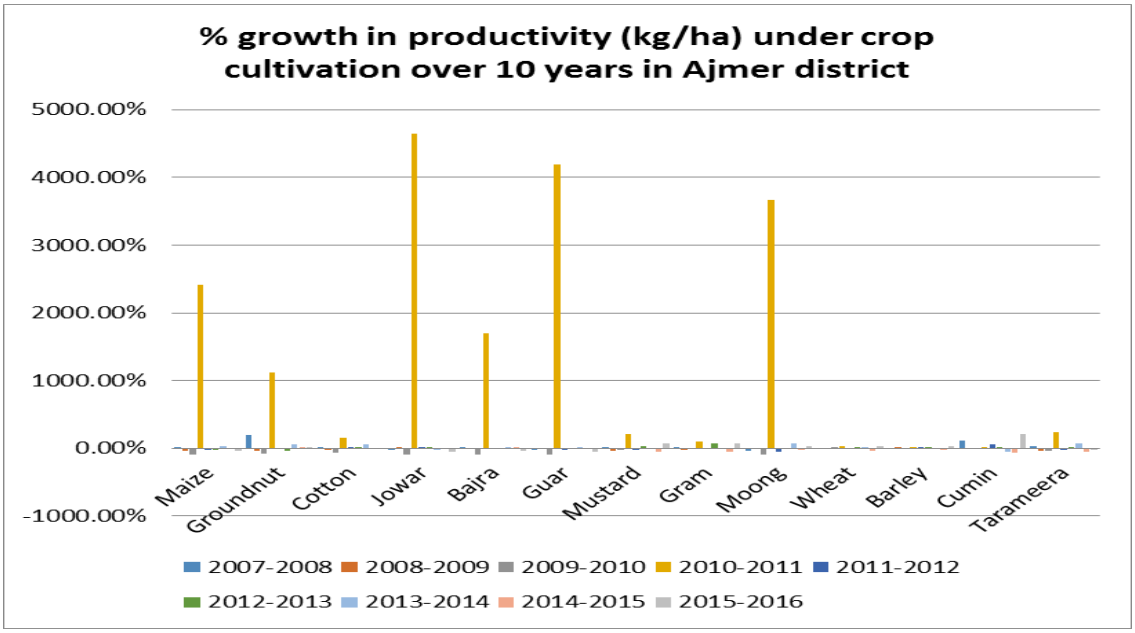
Figure 2: Percentage growth in area under cultivation over 10 years in Ajmer District



The data (Annexure 2.2) reveals that the Bajra, Moong, Guar, Ground nut and Jowar in Kharif and Wheat, Barley, Mustard, Cumin and Taramira are major crops in Rabi season in the district. 2009-10 witnessed very low cropping hence high spikes for most of the crops in 2010-11. As far as area is

concerned, the area under Bajra has reduced during the said period and that of Guar has significantly increased. Guar area has increased due to speculation. In Rabi, the area under wheat and Cumin has increased and the increase has been compensated by de growth in mustard. The variation in cropping pattern is also dependant on the variations in rain fall in the cluster. It is also relevant to mention here that the above crops are well established in state as well as in Ajmer district because of their suitability in this area for production.

Figure 3: Percentage growth in productivity (kg/ha) under crop cultivation over 8 years in Ajmer District



The productivity increase spiked in 2010 is because of drought/ low productivity in 2009. 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 level as summarized for the years 2012-13 and 2013-14:

Table 9: Area Status of Rajasthan area Compared to all India under Major Crops (Area in Million ha)

Crops	2012-13				2013-14			
	India	Rajasthan	% share	Rank	India	Rajasthan	% share	Rank
Kharif								
Bajra	7.3	3.99	54.66	1	7.89	4.43	56.23	1
Rabi								
Mustard	6.36	2.83	44.55	1	6.7	3.08	45.95	1
Wheat	30	3.06	10.21	5	31.19	2.81	9.01	4
Barley	NA	NA	NA	NA	NA	NA	NA	NA

(Source: Agriculture department, Pisangan)

The above table reveals that the state was having first rank in the case of Mustard & Bajra crops in both years (2012-13 & 2013-14). Whereas in the Wheat crop, the state was having 5th rank in the year 2012-13 and 4th rank in the year 2013-14 and Maize crop 2nd rank in 2012-13 & 5th rank in 2013-14. The latest estimation of the state also indicates that the said ranks in above crops are still continuing.

2.3.1.1. Overview of the crops identified in Pisangan Cluster

Since the Pisangan cluster is situated Pisangan Tehsil, nomenclature of the cluster is based on the name of the block i.e. Pisangan of Ajmer district. The cluster has been selected based on the basis of

aquifer approach. Therefore, improvement in water use efficiency would be achieved through ground water management and Agricultural productivity including agricultural & horticultural crops would be increased by the 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.

2.3.1.2. Category wise Cultivated Area in Pisangan 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 26616 ha and the total households in the cluster are 14981. The category wise cultivated area in Pisangan cluster is being summarized in Annexure 2.3.

The data (Refer Annexure 2.3.) clearly indicates that about 96% farmers are marginal, small, landless & BPL farmers. Only about 4% farmers are large in Pisangan cluster. Out of the total cultivated area, about 38.66% area is with large farmers. Similarly, 61.34% cultivated area is either with marginal, small or BPL farmers. Out of the total cultivated area, 53.86% total cultivated area is belongs to OBC category farmers followed by General, Schedule Caste and Schedule Tribe farmers.

The total irrigated area is only 31.23% of the total cultivated area and out of it 43% irrigated area is with marginal farmers followed by small, large & BPL farmers. The rainfed area is 68.77% and out of it 48.04% area belongs to large farmers followed by marginal, small and BPL farmers. Out of the total area, the area 53.86% belongs to OBC followed by General, SC & ST farmers.

2.3.1.3. Status of Cropped area of Agricultural Crops in the Pisangan 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 Bajra, Jowar, Guar and Moong etc. whereas Wheat, Barley, Cumin and Mustard crops are important crops in Rabi season in Pisangan cluster. Kharif crops are mostly grown on the basis of Monsoon rains. However, lifesaving, irrigation is provided during the dry spells wherever irrigation facilities are available. 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 61.59% area whereas Rabi crops are sown in 31.23% area during the year 2015-16. Thus there was a total cropping/intensity of 92.82% during the year 2015-16 in the cluster which is very less than the district as well as State average i.e. 143%. Area under irrigated crops has been doubled i.e. 15.68%, it means there is a scope to enhance use of drip & sprinkler irrigation system and although irrigated cropping has been increased even then there is scope to bring rainfed area into drip & sprinkler 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 that water requirement is less and relative water use efficiency is more. For instance, the area of Wheat crop for which water requirement is more can be reduced and at the same time such crops requiring less water like Barley can be promoted in Rabi season. Similarly, in Kharif the area under Bajra and Guar crops have to be promoted because these crops are having value chain importance.

2.3.2. Cropping Pattern of Horticultural Crops

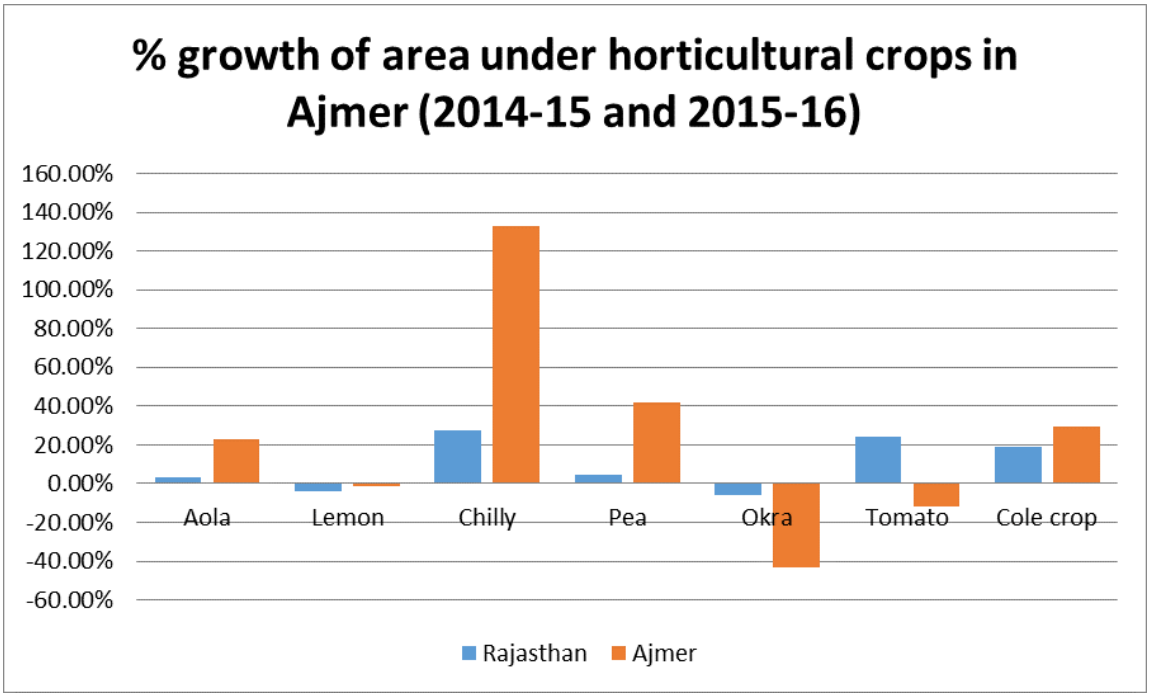
Similarly, for better integration, the area under the horticultural crops has also been gathered from the Horticulture department. The area under horticultural crops is very less in comparison to agricultural crops because looking to the potential of the state as well as the district, the area is increasing very slowly under horticultural crops i.e. fruits and vegetable crops but there is a scope to increase area under horticultural crops and efforts need to be made by the concerned department. In case of Pisangan cluster the Cole crops, Pea, Tomato, Okra & Chilly crops are most encouraging and similarly Aonla & Lemon fruit crops are suitable for the Pisangan cluster. The Rose flower crop is also an important crop in the cluster.

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

The horticultural crops like Cole crops, Pea, Tomato, Okra & Chilly etc. in vegetable crops and Aonla & Lemon in fruit crops and Rose as flower crop are suitable for the area. The vegetable crops in the area have been considered as an additional value chain and would be dealt through establishment of a pack house through a FPC plus crop demonstrations from Horticulture department. On the basis of data which are available with the Horticulture department a comparison of State and Ajmer district is being given for last 5 years from 2011-12 to 2015-16 in Annexure 2.5

The Figure 4 reveals that the Aonla, Pea, Tomato, Chilly and Cole crops are very important crops of the district. Looking at the scope of marketing and potential and facility of the area, the horticulture cultivation has to be promoted through crop demonstrations and persuasions. The data also reveal that looking to the potentiality of the area needed effort has not been made in the district to promote horticultural crops. Hence effort has to be made to enhance area under horticultural crops in project area 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 objective (PDO).

Figure 4: Percentage growth for area under horticulture crops (2013-14 and 2014-15) in State and Ajmer District

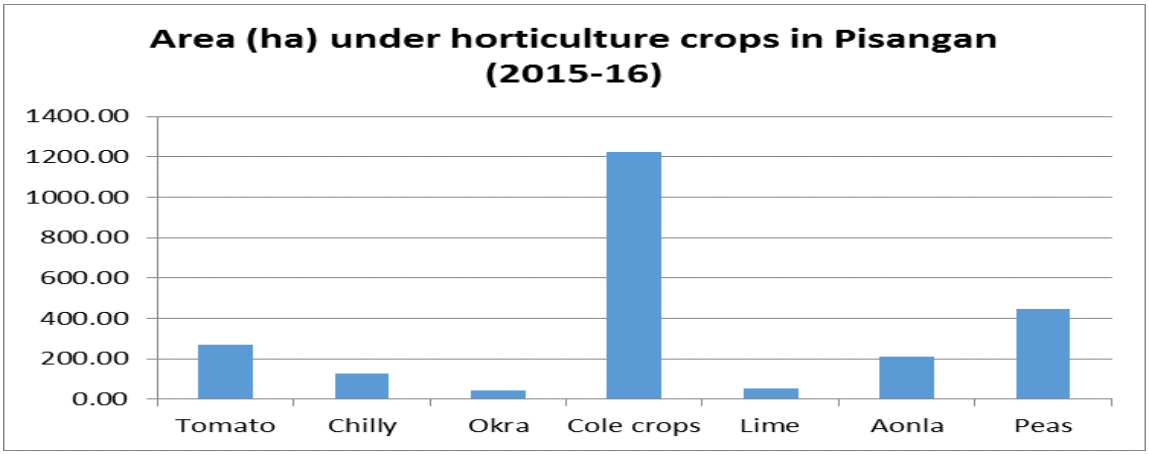


(Source: Analysis by Team ABPF)

Crop wise area of Horticultural crops in Pisangan Cluster

To finalize the proposed area in horticultural crops, current area of horticultural crops in cluster has to be discussed in the selected cluster. 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

Figure 5: Area under horticultural crops in Pisangan Cluster (2015-16)



(Source: Data analysis by ABPF)

The above figure clearly shows that the area under horticultural crops is only 11.99% of the total agriculture land (2373 ha) but there is a considerable scope to increase the area under these crops i.e. vegetables: Tomato, Cole crops, Chilly, Pea and Lemon by diversification of area from food grain crops to the horticultural crops upliftment of economic level of farmers of the cluster could be done.

2.3.3. **Water** Budgeting

The water budget is a basic tool that may be utilised to evaluate occurrence and movement of water through the natural environment. Cluster 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 cluster is necessary to work out 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.

Ground water has an important role in meeting the water requirements of agriculture, industrial and domestic sectors in India. Ground water is annually replenished resource but finite resource and part of the water cycle. Groundwater resources in the aquifer gets seasonally recharged and discharged through rainfall and other sources which are reflected in the water level fluctuations and below this zone of water level fluctuations, the aquifers remain perennially saturated. Technically, the dynamic ground water refers to the quantity of ground water available in the zone of saturation, which is replenished annually. The excessive withdrawal of groundwater may lead to depletion of groundwater storage which may have serious social, economic and environmental consequences; therefore, historically there has always been an attempt to define the exploitable quantity of groundwater resources i.e. the volume of groundwater which is authorized for withdrawal. Hence,

the sustainable development of ground water resources warrants precise quantitative assessment based on reasonably valid scientific principles.

Table 10: Total Annual Sustainable Availability of water

S. No.	Yield of Rainfall (MCM)	Expected Runoff Yield of Effective rain (MCM)	Annually Sustainable Ground Water availability in MCM	Existing Water storage in surface water structures in MCM	Proposed Water storage in surface water structures in MCM	Total Annual Sustainable Availability of water in MCM
1.	161.99	19.2978	24.2421	1.53	0.14	25.9121

As mentioned above in table, total annual GW availability is **21.2421 MCM**, **1.53 MCM** is harvested and **0.14 MCM** is proposed to be harvested and recharged ground water through various structures. Hence total supply available is **25.91 MCM** in addition to in-situ moisture conservation

2.3.4. Crop Water, drinking & domestic Water Requirement and Water Balance in Pisangan Cluster

Table 11: Area Water balance: Gap between supply and demand

S. No.	Supply (in MCM)	Ex Existing Water storage in surface water structures in MCM	Proposed Rain water storages in farm pond in MCM	Total Supply available in MCM	Total demand in MCM	Gap (in MCM)
1	24.2421	1.53	0.14	25.92	56.50	(-) 30.58

The Crop Water Requirement of crops being grown in the Pisangan cluster is being summarized in Annexure 2.13. Data in Annexure 2.13 shows that present crop water requirement **46.47 MCM.** The drinking & domestic water requirement is **6.3565 MCM**. As per State Water Policy Drinking water is the first priority. Hence drinking water requirement for next 25 year as on year 2041 is estimated as **10.0341 MCM**. Hence total water requirement is **56.50 MCM**. Net supply of water availability is **25.9221 MCM**. Hence gap between supply & demand is **30.5821 MCM.** Due to Water Resources Management activities, the total cropped area is proposed to be increased from **20072.12 ha** to **20390.05 ha**, it means **318 ha** more area is to be sown. This area is proposed to be increased due to creation of additional water resources in area and proposed micro irrigation system. As per the objective of the project area under such crops have been proposed which are having less crop water requirement.

Table 12: The crop water requirement and need of the ground water

S. No.	Items	Crop Water Requirement (MCM)	Proposed Crop Water Requirement after change in area of crop (MCM)	Total Ground Water Save due to Various Measures (MCM)/ cultivation on conserved moisture	Net crop water requirement to fulfilled from ground water (MCM)	Net annual sustainable availability of supply of water (surface+ Ground) (MCM)	Net Gap in supply & demand after all measures (MCM)
1	Crop water requirement of	17.23	16.26	14.63	1.63		

S. No.	Items	Crop Water Requirement (MCM)	Proposed Crop Water Requirement after change in area of crop (MCM)	Total Ground Water Save due to Various Measures (MCM)/ cultivation on conserved moisture	Net crop water requirement to fulfilled from ground water (MCM)	Net annual sustainable availability of supply of water (surface+ Ground) (MCM)	Net Gap in supply & demand after all measures (MCM)
	Kharif crops						
2	Crop water requirement of Rabi crops	17.60	15.79	7.89	7.89		
4	Crop water requirement of Horticultural crops	11.64	16.19	8.09	8.09		
	Sub-Total Agriculture & Horticulture	**46.47**	**48.23**	**30.62**	**17.61**		
1	Domestic & drinking water requirement	10.03	10.03	0.00	10.03		
	Total	**56.50**	**58.26**	**30.61**	**27.64**	**25.9221**	**(-)1.7221**

The proposed crop water requirement of Kharif crops is **16.26 MCM**, Rabi crop is **15.79 MCM** & horticultural crop is **16.19 MCM.** It is also significant to mention here that in such Ground water areas **14.63 MCM** of water would be saved as Kharif can be grown with in–situ moisture conservation and as mentioned above, about 50% crops of Rabi season are grown with conserved moisture, improvement in conveyance efficiency and implementation gradually over course of time the 100% crop area covered under MIS (Drip & Sprinkler). Hence total **30.61 MCM** water can be saved. Keeping in view, the final water requirement would be about **27.64 MCM as detailed out above in table** against the total surface and ground water availability of **25.92 MCM** in Pisangan cluster**.** The gap in supply & demand will be **(-) 1.72 MCM** which will be still over drafted from Ground water after all measures.

2.3.5. The Seed Replacement Rate (SRR) in Pisangan cluster:

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

The Bajra, Moong, Guar, Ground nut and Jowar crops in Kharif and Wheat, Barley, Mustard, Cumin and Tarameera crops in Rabi are suitable for cluster and the scope of value chain in these crops is good. The SRR for crops like Maize, wheat, gram and barley is quite less than the state average whereas it is higher or at par in case of Mustard and Bajra. If the productivity of these crops is to be increased with 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 and cluster.

Seed Replacement Rate (SRR) in Pisangan cluster:

During the field survey, it was observed that the Seed Replacement Rate (SRR) for almost all the crops is encouraging year to year in the cluster. If it is compared to district, the SRR is higher in

cluster area than the district average except Mustard crop. But there is still scope to increase SRR in all the crops. 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. (Data in Annexure 2.10)

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 13: 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
Ajmer	0.055	0.091	0.145	0.052	0.019	0.072	0.001	0.002	0.004	0.41	0.11	0.23	26.39	45.87	83.7

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

Above table reveals that average consumption of fertilizers in the district in Kharif & Rabi season is lower than the state average. In totality the consumption of fertilizers in the district is 83.70 kg/ha which is 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 fertilizer in the crops very 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.

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 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 Pisangan Cluster:

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

The crop wise area covered and technical grad material (TGM) used under plant protection measures in state and district is being summarized in Annexure 2.11.

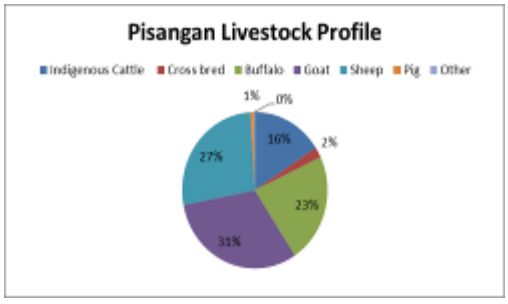
The data (Refer Annexure 2.11) indicates that the crop wise area covered and technical grade material (TGM) used under plant protection measures in the state as well in the district is less than the optimum level. It means that the adoption of package of practices is not being done at the optimum level.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

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

Likewise, the data for Pisangan 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 Pisangan 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 chain.

2.4. Livestock profile of Pisangan Cluster

In Pisangan cluster large no of households keep cattle, buffalo and Goats but the dairy cooperative network is **well developed**. District Milk Union Ajmer total milk procurement is 2, 50,000 litres per day.



Goats are also reared by substantial no of house hold and these house hold are primarily small holders with limited resource. Ajmer being the major tourist centre and huge local demand of meat has good scope for goat farming for meat and milk. Small ruminants have an important place in Rajasthan's rural economy. Goat and sheep rearing is done by almost all castes and classes of households in Rajasthan.

The cluster has 80 goat specific MTGs and around 8748 families own 44397 goats, averaging around 5 goats per goat rearing family. The village wise data for Goat population segregated further into male, female, calved etc. is in Annexure 2.17

2.5. Structural characteristics

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

2.5.1. Government departments

There is presence of Agriculture, Horticulture, Animal husbandry and Watershed departments in the cluster HQ. These departments have head office in Ajmer but they have offices at as well as the block level too.

2.5.2. Farmer Producer Companies

Pisangan cluster comes under watershed area. Jaipur Seva foundation has been working in the cluster for formation and mobilization of 710 MTGs of Agriculture and horticulture farmers, 90 MTGs of goat rearers in 44 villages of 23 gram panchayats over 31825 ha area of Groundwater. 4 FPOs are proposed to be formed covering 14981 household in Groundwater. SRS NGO is in process to federate all this groups in Farmer producer organization under RACP. Hence proper training for NGO, Staff, BOD, and line department staff (stakeholders of RACP) is required to clear the vision of formation of FPO and working of farmer common service center of FPO, steps and guidelines for formation of FPO and common service center. There is need for training and exposure of board of directors of newly registered FPOs in the cluster.

2.5.3. APMCs

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

a. Ajmer
b. Beawar

2.5.4. Cold Storages and warehouses

There is warehousing facility of State Warehousing Corporation at Ajmer. All types of food grains can be kept in warehouse. Ware house receipts are provided on which producer can avail credit from the bankers.

Currently is 1 cold store in existence in the Ajmer district with a total capacity of 3000 MT along with one CWC of 15000 MT and 4 SWC with capacity of 28550 MT.

2.5.5. 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.

2.5.6. Predominant practices for cultivation

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

#	Particulars	Present Practice
1	Seeds/Fertilizers	Local Input Shops
2	Fungicide & Pesticide	Local Input Shops
3	Land Preparation and other cultivation practices	Local Labour and own/hired tractors/implements
2	Harvesting and farm level grading	Combine Harvesters
3	Transport	Pick up vans/Tractor Trolleys/Bullock carts
4	Credit	Traders provide facilities, credit facilities with interest.
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 Pisangan 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, Barley, Green gram, Guar, Groundnut and Wheat are the major crops of the cluster that have been considered and compared using this scoring parameter. (Annexure 3.2)

3.1.1. Existing size of the crops

The first category of parameters may be broadly categorised under with respect to existing size of crops in the cluster with regard to their area under cultivation, production and average cluster level productivity relative to national average productivity. Bajra scores the highest in this category as it has maximum cropped area among all existing crops in the cluster followed by Barley and Guar. Wheat accounts for the highest production in the cluster followed by Bajra and Guar. When it comes to relative productivity of the crops in the cluster, except Groundnut and Barley all other crops have higher productivity when compared to their respective national average productivity. Apparently, Bajra could provide maximum marketable surplus for processing purposes. (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 of the crops in 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 roasted Bajra and Wheat has been considered as 10% while that for malt from Barley it is taken as 20%. Yield loss has been taken as 25%, 30% and 50% respectively in case of roasted Green Gram, Guar gum and Groundnut kachhi ghani oil. Thus, Bajra scores the highest in the price spread at retail level as roasted bajra has retail price spread of almost Rs 50,000 per quintal which is based upon its market value of Rs 500 per kg and gross realization of farmer as Rs 12 per kg. Barley malt also reflects higher margin between the farmer's gross realizations at farm (Rs. 1200 per quintal) against that at the retail level which comes to be Rs. 48,250 per quintal.

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. Groundnut scores the highest with a price spread of Rs 180 per Q followed by Green Gram (Rs 160 per Q) and Guar (Rs 116 per Q). 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 it's by product locally without any value addition. For according parity, the selling price has been taken as Rs 3 per kg for most types of fodder crops. The fodder yield for Bajra, Barley and Wheat has been taken as 25q, 15q and 16q based upon field level consultation. Especially, Groundnut followed by Wheat and Bajra, offers the maximum net profit in production per acre to the farmer.

In the next parameter of scope for processing in the state of Rajasthan, there are comparatively more number of secondary and tertiary processing Groundnut oil and cake processing units of Adani Wilmar and other private players in the state followed by that of barley viz. malt processing units and breweries which are established by the MNCs like SabMiller, Carlsburg and Soufflet. Although wheat has multiple private flour mills and cleaning and grading units, it lacks nevertheless in high end technologically advance processing units which could yield refined and high quality end products. Same is the case of Bajra. In the case of Green Gram, there are multiple primary and secondary processing units in Dal clusters.

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, Wheat and Barley have the highest number of value added products after Groundnut viz. cleaned wheat grain, flour, bakery products and soozi for wheat while cleaned barley grains, flour, malt and oats for Barley. Next comes Bajra and Green gram with 3 value added products viz. cleaned bajra grains, bajra malt and bajra flour of bajra and roasted moong, moong dal etc of Green gram. Guar has only 2 value added products i.e. Guar gum and powder.

In order to quantify the parameters of growth in market demand, the National growth rate of consumption has been calculated (as CAGR) for each commodity and equated against its market demand. It is highest for Guar (8%) followed by Green gram (5.05%) and Barley (4.5%). The market growth in demand has been negative for Bajra. (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 the highest in case of Barley (40.37%) followed by Green Gram (37.20%) while guar and wheat have the lowest price volatility at 28.78%. Barley has scored the highest in this category as it has the 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, Green gram and Guar with the lowest water requirement of 1000 cum/ha have the highest scope for crop diversification followed by Barley and Wheat with that of 2500 cum/ha and 4000 cum/ha. Groundnut has the highest water requirement of 6000 cum/ha, making it least preferred for crop diversification. (Annexure 3.2)

3.2. Inference from the Scoring Matrix

It could be concluded from the total scores of the matrix that Guar is the most important value chain crop in the matrix. It has one of the highest cropped area and the production in the cluster. It has a good scope at mandi but the scope for value addition and processing in the state is above average. This crop has the least water requirement and hence most suitable regarding the objective of the project.

Second highest scoring crop as per the matrix is Bajra that has the highest cropped area in the cluster. Scope of processing along with value added products is not very high but it is a very suitable crop as it is less water intensive and with high price volatility.

Third highest scoring crop is Barley as per the matrix, for which the major reason is the highest potential for value addition and very low crop water requirement. Although current cropped area of Barley in cluster is second highest but with the field level discussions with industry players, there is high investment being expected from private players thereby increasing the scope of the crop.

Based on analysis shown above Guar, Bajra, and Barley are the top 3 crops that will be selected for the value chain interventions.

Apart from the agriculture, scope for horticulture crop is increasing in the cluster. Area of Tomato, Chilly, Okra, Peas and Cole crops like cauliflower and cabbage is growing significantly along with Aonla, Lime and Rose. It is a proven fact, that fruit, vegetable & floriculture are more economical farming than field crops in the any of the area. Therefore, horticultural plantations (fruits and vegetables) would definitely enhance the economic condition of the farmers in the cluster. They occupy comparatively smaller cultivated area yet have the potential and scope for value addition with higher returns to the producers because of cluster's proximity to the national capital region. In such case, there could be a provision of pack house (as part of FCSCs) for these vegetables consisting of cleaning, washing and packaging facility which has been discussed in detail in Chapter 5.

3.3. Current marketing chain of selected value chain crops

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

Barley

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

higher value yielding food than feed barley in many clusters to cater to the many local processors in the region. (Annexure 3.3)

Typically, the gross yield enjoyed by producers is 10 quintals per acre. Gross value realisation on sale at Rs. 1,400 per quintal is Rs. 14,000 per acre. The cost of cultivation is about Rs. 6,100 per acre and the net value realisation is about Rs. 7,900 per acre. (Annexure 3.6)

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)

Guar

The pre intervention value chain of Guar has essentially three value chains. In the recent years, farmers are mostly selling it to commission agents as Guar has become a highly speculative commodity and farmers are getting mandi price from their door step due to commission. The Guar then reaches the mandi from where it is being traded by whole sellers. However, NCDEX e-portal has become a big tool for determining the market price for Guar and many small commission agents apart from wholesalers are also trading in Guar in NCDEX platform. Most of the guar finds its way to guar split/dal making units locally situated in Bikaner/ Jodhpur/ Ganganagar/ Jaipur from where, the split is being supplied to further processing to secondary processors or is directly exported. The husk (Guar churi and korma) is supplied by the primary processors to animal feed industry. It also has a good demand in the international market.

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

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

3.4. Strategic context of Goat Value chain in Pisangan 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 13 - 14/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. Among the breeds of goats in the cluster, some of important milk production traits noted in field areas have been as follows.

Table 14: 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 44397 goats out of which 40% are milking animals. The estimated milk yield would be around 52863 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 17621 L per day is the potential for collection as on date and this can grow up to 52863 L/day if maximum potential is achieved by developing a separate remunerative value chain for Goat milk. This suggests Goat milk.

3.4.2. Goat for meat production

Most of the live goat population of Pisangan find their way into Ajmer bakra mandi. Breeders sell to traders who take animals to larger terminal markets like Jaipur and other places like Delhi, Mumbai, Hyderabad, Ahmedabad, Surat etc. Transportation cost for these movements is high, but traders who buy locally can organize themselves in groups to transport animals. 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.

Major constraints in goat 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 rearer.. • 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 rearer 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 wool 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.

3.4.3. Livestock population and Fodder Requirement of Pisangan cluster

The data given in the table of Annexure 3.7 indicates the fodder requirement of livestock population of Pisangan cluster at 185524 MT/annum. It has to be fulfilled from the fodder to be produced in the cluster and if there is some gap, then two current measures have to be followed, one is to increase production within the cluster through promoting cultivation practices and second is to import from the outside the cluster.

3.4.4. Fodder availability in Pisangan Cluster

The table of Annexure 3.7 reveals that the estimated total requirement of dry matter (Fodder) is 185525 MT against the fodder availability of 82578.66 MT which is lower than the requirement. There is a gap of 102946.34 MT against the total requirement of the fodder. The gap of 102946.34 MT. This has to be fulfilled by importing from other areas or to increase the productivity with in the cluster through the fodder demonstrations.

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

4.1. Opportunities and challenges

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

Sr. No	Season/Type	Crop
1	Kharif	Bajra, Guar
2	Rabi	Barley
3	Horticulture	Vegetables, fruits

(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:

Barley

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

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

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

Bajra

Bajra is a major Kharif crop grown in cluster and is one of the most extensively cultivated cereals. Rich in Nutrients like Zinc, Protein and Iron, it is used as flour and feed.

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. • It provides feed to large number of animals and grown for silage and hay purpose also.	• 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 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, Mororaka 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 bajra feed, roasted, 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.

Guar

Guar is a major Kharif crop grown in cluster. Guar is consumed in the form of whole pulse as well as split pulse. It also helps control blood pressure, lose weight and is a good source of fibre and iron.

Strength	Weakness
• About 80% of world production occurs in India and Pakistan, but due to strong demand, the plant is being introduced into new areas • The main areas of cultivation of Guar gum in India are Rajasthan, Gujarat, Haryana and Punjab • Guar is very drought-tolerant and sun-lovin Being a leguminous crop, guar fixes nitrogen, making the soil fertile. • Guar as a plant has a multitude of different functions for human and animal nutrition but its gelling-agent-containing seeds (guar gum) are today the most important use • Demand is rising rapidly due to industrial use of guar gum in hydraulic fracturing (oil shale gas) • Guar meal korma and Guar meal Chunni are widely used as prime raw material for producing various kinds of Cattle feeds, Aqua feeds, fish feeds, poultry Feeds, dairy feeds. • Only 10% of the Indian production stays within the country and the remaining 90% is exported for shale gas and oil industries	• The area under Guar cultivation is reducing in India • Reduced productivity as cultivation on marginal lands in states like Rajasthan • Due to inadequate infrastructural facilities with producers, traders and at market level results in marketing inefficiencies • Limited processing units for guar and its by-products such as flour units, roasted Guar units, etc. • Adequate storage facilities required. • Lack of guar processing units • Large number of intermediaries in the chain leads to low producer's income. • No grading on the farm level • Obsolete techniques are used in processing, which reduces the output. • Lack of market information regarding prevailing prices, arrivals etc. force farmers to sell in village itself.
Opportunities	**Challenges**
• Scope for tie up of FPOs through CFC with firms like Agro gums, etc • Scope for tie up of FPOs through CFC with guar processors/MSME firms • Scope for facilitation of start-ups from amongst FPOs or individual entrepreneurs, in secondary processing of value added products of Guar like guar gum, guar vegetable, etc • Scope for establishment of quality processing facilities by FPOs as part of Farmers Common Service Centre (FCSC), along with facilities for packaging and vehicle to facilitate transportation. • Establish storage facilities by FPO as a part of FCSC. • FPOs to undertake joint input sourcing activities for seeds, fertilizers, pesticides, etc. under the umbrella of CFC • FPOs to also undertake custom hiring services and hence lead farm mechanisation through CFC	• Adverse climatic condition like frost can impact the crop production and productivity • Lack of higher remuneration in guar may reduce farmer's interest from cultivating it.

Goat

Strength	Weakness
Strength of Goat milk as a product: • Potential of collecting around 52863 L of goat milk/day • Potential of goat milk as a health drink **Strength of meat from supply side:** • 80 goat specific MTGs and around 8748families own 44397 goats, averaging around 5 goats per	• 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

goat rearing family. • It is a secondary source of livelihood for the farmers • There is sufficient availability of fodder and water in the cluster for goat rearing	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, with support system from the RACP project provide enough opportunity for the goat rearers in the area for enhancing livelihood opportunity through creating efficient value chain linkages for live goat marketing	• Mortality remains a challenge for the farmers and hence they sometimes tend to sell small animals at half body weight (meat estimation basis). • Distance of cluster from major cities.

So, there is the scope of popularising goat farming with sutable interventions for improving milk and 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 Cluster

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

4.2.1. Production related constraints

Barley

In Rabi Season Barley has large area under cultivation in the cluster. There are two types of barley i.e one that is cultivated as animal feed crop and other for processing of malt. Barley is not cultivated commercially but is cultivated as feed crop for animals but recently contract farming is done in cluster by malt processor like Soufflet. Barley is comparatively low water demanding crop than wheat. Productivity & production level in the cluster is low for following reasons

- Use of new high yielding certified, truthful varieties of barley, is low in the cluster.
- Improper field preparation, Timely sowing, Proper depth and row spacing, seed rate is not maintained
- Improper water management
- Improper weed management

Bajra

In Kharif Season Bajra has largest area under cultivation in the 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

Guar

In Kharif season Guar has large area under cultivation in the cluster. Guar gum is an export oriented commodity used in mining, petroleum drilling, construction industries, pharmaceuticals, paper industry, water treatment, cosmetics and textile industry. It is used in food processing sector as a thickener and as a mean of preventing ice crystal formation in frozen desserts. Productivity & production level in the cluster is low for following reasons

a. Use of new high yielding certified, truthful varieties of Guar, is low in the cluster.
b. Yield of Guar seeds fluctuate highly with rainfall as there is more dependency of farmers on rain water.

Increasing adoption level of producer: Farmers are trained with production lead extension approach till date but hence forth market led extension approach is necessary to increase farmers' income in terms of money. For increasing level of adoption of good agriculture practices to reduce the constrains in value chain of crops following strategies are proposed in agriculture extension

- Multi- agency Extension Strategies
- Farming System Approach
- Convergence of ongoing schemes
- Sustainability of Extension Services
- Improving productivity and income of existing crops.
- Promoting diversification and or intensification of crops and enterprises
- Improving sustainability in production and income
- Mobilization of farmers Groups
- Increasing Research- Extension – Farmers linkages by organizing farmers –scientists interaction, Field Days and Kisan Goshties farmer field schools.
- Farmers oriented activities for their capacity building regarding production, post-harvest management, value addition, processing and marketing
- Farm Information Dissemination through District level exhibition, Kisan melas, fruit, vegetable shows, information dissemination through Printed materials, technology package, electronic media
- Mainstreaming Gender Concern

4.2.2. Post-Harvest related constraints

Barley

There is a lack of post-harvest facility except sun drying in barley produce. There is leaning tendency in barley and is harvested manually using threshing machine. Also, combine harvester is available on hire basis. If not harvested at proper time will lead to low productivity due to losses. There are practices among the farmers taking harvested barley directly from farm to mandi without drying or cleaning.

Bajra

In Bajra harvesting and threshing is done manually. It is difficult to harvest as it is usually cultivated with mix cropping.

Guar

In Guar manually harvesting and threshing is laborious. Lack of storage facility and primary processing facility are also major constraints.

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. Distress sale is obligatory on some farmers as they have to repay the loan availed from traders during the time of sowing for seed, fertilisers etc .

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

4.2.3. Processing and market infrastructure related constraints

Barley

The processing facility of Barley is not available at local level. In commercial production of barley processors do aggregate produce at cluster level and transport to their respective processing facility.

Bajra

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

Guar

The processing facility of Guar is available at Bikaner. High fluctuation in price of Guar leads to loss to traders and processors. Guar Gum powder is exported majorly to USA, Germany and France. Price is determined by international market.

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

Lack of market intelligence services: Farmers do not receive information on market prices. Some farmers sell crops through village level traders, 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 Tonk & Bundi APMC that is approximately 50 kms away. This leads to farm gate selling where farmers receive non-competitive prices for their produce.

Fluctuations in prices: Generally, the price of commodities 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 either.

Lack of marketing information: Due to lack of market information regarding prevailing prices, arrivals etc.

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

Malpractices in markets: Many malpractices prevail in the markets i.e. excess weighment, delay in payment, high commission charges, delay in weighing and auction, different kinds of arbitrary deductions for religious and charitable purposes etc. oil percentage in mustard is determined by rubbing on wall by the traders.

Hundekari System: farmers are compelled to sell the produce to the trader from whom he has received credit for sowing of crops. It was observed that even MSP procurement is facilitated by the respective trader of that farmer for weighing and bagging of his produce to FCI through Housing Corporation.

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

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

4.2.4. Agri business policy related constraints

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

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

4.3. Intervention plan of selected Value chain crop of Cluster

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

Barley

Table 15: Indicative intervention plan of Barley value chain

Sr.no	Constraints	Action	Action By
1.	**Production**		
1.1	Productivity is less and variety is not suitable for processing (Malt)	Introduction of new Malt Variety	Processors like Soufflet (ABPF)
1.2	Traditional package of practices	Farmers training on best package of practices	Processors like Soufflet (ABPF)
1.3	Limited identification efforts for farmer leaders (entrepreneurs)and BODS at field	Soufflet to identify farmers' leaders and these farmers' leaders will be	Processors like Soufflet and ABPF

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

Bajra

Table 16: Indicative intervention plan of Bajra value chain

Sr.No	Constraints	Action	Action By
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	Department of Agriculture
		Support to FPCs for establishing seed grading unit	
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	RACP, .KVK, Agriculture universities

2.2	High dirt content /foreign material in harvested millet.	Ensure availability of the Cleaning & Grading facility to farmers; usually in 10% lower income arrival to farmer.	RACP, SPs with input from ABPF
2.3	Lack of market information related to price	Price discovery through NCDEX, eNAM	RACP, KVK
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	RACP, SPs with input from ABPF
3	**Processing**		
3.1	Not aware of special license option to source directly from farmers /FPOs.	Awareness seminars for farmers/Processors	ABPF, Rajasthan
3.2	Limited processing products are available in bajra	Promote handmade Namkeen bajra product	ABPF, Rajasthan
3.3	Lack of proper Product marketing	Awareness on Product Branding	ABPF, Rajasthan
3.4	Processor not aware of schemes of the GoI Including CLCSS, cluster Development scheme or "Sampada" for technology upgrading.	Awareness seminars for processors	ABPF, Rajasthan

Guar:

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

Goat

S.no	Constraints	Action	Action By
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	DH
1.2	Farmers do not take proper care of the goats	Training on improved goatry practices including housing, feeding, grazing etc.	DH
1.3	Mortality of goats	Rural Technology Center for providing health care services and promoting rural employment	DH
2	Marketing		
2.1	Non availability of milk supply chain	Piloting goat milk collection, value addition and market linkage through FPC	DH, FPC, ABPF
2.2	Non availability of live goat marketing infrastructure	Promotion of goat marketing through FPC and rural haat	DH, FPC, ABPF
2.3	Non availability of community institution for goat rearers	Promoting a goat specific FPC	DH, FPC, ABPF

4.4. Interventions through FPC in the value chain crops of Dooni 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:

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

4.4.2. Policy and Management

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

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

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

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

- Godown for storage, drying platforms
- 2-3 MT per hour grain cleaning, grading, and packing machinery with shed
- Additional need based Agricultural Equipment
- Computer with internet connectivity for market information

- Display Board with Accessories
- Auction Hall
- Input Suppliers Shops
- Toilets
- Drinking water & Electricity

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

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

4.4.3. Introduction to FPC Model

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

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

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

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

Chapter – 5: Value Chain Investments

5.1. Rationale for these investments

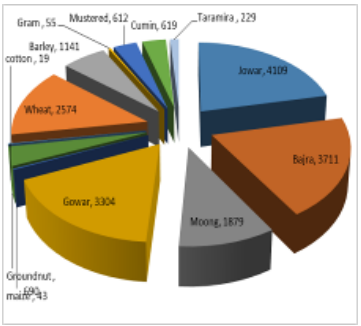
Post-Harvest infrastructure is of great relevance to small-holders, who tend to be geographically dispersed. The lack of primary processing infrastructure and efficient transport can therefore be a particular obstacle, making it difficult for them to obtain essential inputs and get their produce to markets.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

As goat or small ruminants are basic livelihood of the villagers/farmers, so the emphasis on these aspects is to be needed in the cluster. Therefore, appropriate investment provision has to be made in the cluster. The support to small ruminants will focus on improving productivity through breeding, feeding and health activities at the cluster level. Improved feeding will not only aim to optimize the use of crop residues, but also make better use of common property lands.

5.2. Non water use interventions in value chain

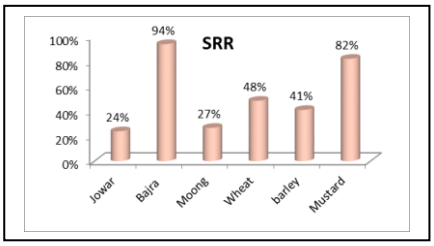
The focus of this sub-component is on improving on-farm water use efficiency and productivity in the clusters by promoting micro irrigation techniques, demonstrations and crop husbandry practices which improve agricultural productivity, profitability and sustainability while reducing the water footprint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

5.2.1. Agriculture



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

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

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

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

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

b. Promotion of construction of farm ponds for harvesting of excess rain water for its efficient use for irrigation at critical stages of the crops and recharge the ground water.

c. Improvement in productivity level of crops and reducing the cost of production through introduction of new varieties, farm mechanization, efficient irrigation techniques, capacity building, INM and IPM.

d. 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.

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

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

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

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

i. Capacity building of the beneficiaries to achieve the PDO

Investments and Cost Estimates under Agriculture Subcomponent under RACP Pisangan

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.1769.19 lacs** have to be done under Agriculture sub component. Out of this an amount of **Rs.1309.76 Lacs** is proposed to be provided from the project and **Rs.459.43 Lacs** is proposed to be borne by the beneficiaries.

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

Table 17: Investments and Cost Estimates under the Agriculture Subcomponent under RACP

(Rs in Lacs)

S. No.	Name of sub-component	Unit	Unit cost	Assistance (%)	Physical	Assistance	Ben. Contribution	Total Cost (Rs in Lacs)
1	**Component 1: Climate Resilient Agriculture**							
1	**Sub Component 1A: Improved water use efficiency**							
2	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
3	Integrated demonstration for Mini Sprinkler based techniques for field crops	ha	1.45	75	10	10.88	3.63	14.50
4	Drip Irrigation System	ha	1.30	75	90	87.75	29.25	117.00
5	Mini/ Micro Sprinkler Irrigation System	ha	0.90	75	270	182.25	60.75	243.00
6	Sprinkler Irrigation System	ha	0.20	75	1220	183.00	61.00	244.00
7	Pipeline for piped conveyance of irrigation water	100 mtr	0.10	75	1100	82.50	27.50	110.00
8	Construction of Farm Ponds pond including portable pumping system on Farmer's Field	Nos	1.33	75	150	150.00	50.00	200.00
	Subtotal 1A					**704.62**	**234.87**	**939.50**
1B	**Sub Component 1B: Technology transfer and market led advisory services**							
1	**Promoting Adoption and Documentation of Improved Technologies**							
1	Soil Testing	Nos	0.00237	100	1800	4.27	0.00	4.27
2	Demonstrations on production technologies for value chain crops to bridge gap	ha	0.10	75	2200	135.19	45.06	180.25
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	0	0.00	0.00	0.00
5	1. Promotion to seed production	ha	0.05	100	500	20.00	0.00	20.00
6	2. Promotion to Adaption support	ha	0.05	50	1400	35.00	35.00	70.00
7	Innovative activities/ INM/ IPM	No.	1.00	75	20	15.00	5.00	20.00
	Subtotal 1 Ba					**291.96**	**112.56**	**404.51**
	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	0.00	7.00
2	Agriculture Research Institute strengthening to serve as level II/ III platform for ICT	Nos	3.00	100	1	3.00	0.00	3.00
3	Honorarium to the experts for solution of the problems and facilitate field visits	LS	1.00	100	2	2.00	0.00	2.00
4	Digital instruments to field coordinator/ staff	Nos	0.50	100	20	10.00	0.00	10.00

S. No.	Name of sub-component	Unit	Unit cost	Assistance (%)	Physical	Assistance	Ben. Contribution	Total Cost (Rs in Lacs)
5	Potential threats led/ Pro-P based literature on cluster specific crops	Nos	0.50	100	2	1.00	0.00	1.00
	Subtotal 1 Bb					**23.00**	**0.00**	**23.00**
	Subtotal 1 Ba +1 Bb					**314.96**	**112.56**	**427.51**
	Subtotal 1 (1A + 1 B)					**1019.58**	**347.43**	**1367.01**
2	**Component 2: Markets and Value Chains**							
2A	**Sub Component 2A: Agri-Business Promotion Facility/ 1B: Technology transfer and market led advisory services**							
1	Registration expenses and other pre-operative expenses- FPC	Nos	1.00	100	4	4.00	0.00	4.00
2	Manpower Expenses - FPC (Rs. 25,000 per month for 2 years)	Nos	6.00	100	4	24.00	0.00	24.00
3	Office Establishment (only physical assets like chair, tables, computer, printer and other furniture)	Nos	1.00	50	4	2.00	2.00	4.00
4	Value Added Unit (Common Facility) - FPC	Nos	30.00	75	4	90.00	30.00	120.00
5	Start up (Private investment)	Nos	20.00	0	4	0.00	80.00	80.00
2	**Subtotal 2**					**120**	**112**	**232.00**
3	**Component 3: Farmer Organization and Capacity Building**							
1	Field days, exposure visits, orientation, capacity building	LS		100	16	23.75	0	23.75
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	136.16	0	136.16
	Subtotal 3					**159.91**	**0**	**159.91**
4	**Component 4: Project Management, Monitoring and Learning**							
1	Operating costs for PIA	LS		100	2	10.27		10.27
	Subtotal 4					**10.27**	**0**	**10.27**
	Total Cost (Agriculture Department)					**1309.76**	**459.43**	**1769.19**

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 Aonla & Lemon hence, the area under Jowar and 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 Chilly, Tomato, Okra, Cole & Pea in vegetable crops and Aonla and Lemon in fruit crops are to be promoted through demonstration with drip irrigation. Solar technology would also be promoted to ensure 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.56.20 lacs is to be made on demonstration and establishment of 20 ha orchard with Pomegranate, lemon and papaya orchard establishment. The assistance will be provided to farmers 75% of total unit cost Rs.2.81lacs in different inputs. After plantation of fruit crops in first year, additional support during second year and third year would be given.

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. 27.85 lacs is to be incurred for demonstration and establishment of 5 ha orchards with Pomegranate 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.584.00 lacs is to be incurred on demonstration and cultivation of 200 ha with Chilly, Tomato, Okra and Cole crops, which are the leading crops & selected for demonstration. The assistance will be provide to farmers 75% of total unit cost Rs. 2.92 lacs in different inputs.

Demonstration of micro irrigation (Drip) with mulch

Under this component micro irrigation (Drip) devices and mulch sheet provided in fruits and vegetables orchards for increasing water use efficiency. An investment of Rs.73.00 lacs is to be incurred on demonstration of 60 ha.

Demonstrations on production technologies for Rose Cultivation:

The cultivation of Rose flowers (Desi) 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 Rose Cultivation as floriculture is not picking up the desired scales. It has been contemplated that various aspects of modern production technologies with drip and automation, improved quality planting material, 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. 200.00 lacs is to be incurred on demonstration and cultivation of 50ha Rose crop, which are the leading crops & selected for demonstration. The assistance will be provide to farmers 75% of total unit cost Rs. 4.00 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.

Assistance on green house

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. 550.00 lacs is to be needed for establishment of green house in 50,000 sqm.

Assistance on shade net house:

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

Under this component technological and input assistance shall be provided to the farmers for establishment of shade net house is 75% of total cost of 0.009 per sqm. The total investment for shade net house is Rs.54.00 lacs for 6,000 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.660.00 lacs for 120 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.56 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.37.50 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. 40.50 lacs.

Farmers training, Seminars, Exhibition Kisan mela

These extension methodologies have been proposed to make farmers acquainted with the best available technologies and to promote adoption so 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.

Investments under the horticulture sub component

Total **Rs. 2356.80 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 Pisangan cluster. Out of this an amount of **Rs. 1716.81 Lacs** is proposed to be provided from the project and **Rs. 639.99 Lacs** is proposed to be borne by the beneficiaries themselves. The investments are being summarized as under:

Table 18 Investments and Cost Estimates under the Horticulture Subcomponent under RACP

S. No.	Name of sub-component / Activity	Unit	Unit cost	Assistance (%)	Amount of Assistance	Phy.	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	20	14.04	42.16	56.2
i.	First year Maintenance support	ha	0.58	75	0.435	10	1.45	4.35	5.8
ii.	Second year Maintenance support	ha	0.75	75	0.561	0	0	0	0
2	High density plantations	ha	5.57	75	4.178	5	6.96	20.89	27.85
i.	First year Maintenance support	ha	1.09	75	0.818	5	1.36	4.09	5.45
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	200	146	438	584
3a	Assistance on production technologies for Rose Cultivation	ha	4	75	3.00	50	50	150	200
4	Micro irrigation in horticulture crops (Drip irrigation system)	ha.		0	0	0	0	0	0
4(i)	Fruits	ha.	0.8	75	0.6	10	2.00	6.00	8.00
4(ii)	Vegetables and others	ha.	1.3	75	0.975	50	16.25	48.75	65
5	Assistance on green house	SqM	0.01	75	0.00816	50000	142	408	550
6	Assistance on shade net house	SqM	0.01	75	0.00647	6000	15.18	38.82	54
7	Solar Pump Program	Nos	5.5	70	3.85	120	198	462	660
8	Post-Harvest Management	Nos	28	50	14	2	28	28	56
9	Horticulture Mechanization	Nos	7.5	50	3.75	5	18.75	18.75	37.5
	Sub Total IB						**639.99**	**1669.81**	**2309.8**
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						**0.00**	**36.00**	**36.00**
IV.	**Project Management & M&E**								
1	Operating cost including (Photostat, computer, printer, fax, manpower, services outsourcing, mobility (hired taxi), TA for District unit)	0	LS	100	0	0	0.00	11.00	11.00

S. No.	Name of sub-component / Activity	Unit	Unit cost	Assistance (%)	Amount of Assistance	Phy.	Farmer share	Project	Total
	Sub Total IV						**0.00**	**11.00**	**11.00**
	G. Total						**639.99**	**1716.81**	**2356.8**

5.2.3. Livestock

RACP envisage investing and working in a cohesive way with all the identified components for benefitting the farmers especially the small holders in a sustainable manner, up-scaling the successes and documenting the learning. For the purpose it is planned to prepare the Cluster Agriculture Competitiveness plan (CACP).The CACP have a defined objective and after analyzing the 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 detailed project report for the selected cluster. CACPs 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 Identified and eligible Investments under 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 improving market access and local level small value addition.

Capacity building- supporting farmer advisory and training of the 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 getting 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 in marketing

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

Climate Resilient Agriculture

Productivity enhancement

Breed improvement

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

i. Improved Bucks distribution to MTG members
ii. Goat distribution to Widows and/or especially 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 the farmers income. Department of Animal Husbandry breeding policy recommends **Sirohi** breed for the cluster area, so it is planned to induct elite breeding bucks in the area. Project will support distribution of breeding bucks to those MTG (Goat) members 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.

Table 19 Project distributed bucks and goats

Activity	Total Requirement	Year Wise requirement		
		I year	II year	III Year
Buck Distribution	500	100	200	200
Goat Distribution	150 MTG Members	50	50	50
Animal Insurance	1100	300	400	400

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. It is 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 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 propose 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 organised Farms (very few) and in case of non-availability/ suitability they may procure from private farmers of the breeding tract.

In 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:

Through advisory support and 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 This will include:

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 linking up with 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 the new technology initial 1-2 days field training & hand holding support and all 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	900	0	450	450

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	720	100	400	220

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

Activity	Total Requirement (KG)	Year Wise requirement		
		Ist year	II year	III Year
Feed Supplement	45000	0	22500 Buck & Goat	22500 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 have 3 Veterinary hospitals (Pushkar, Pisangan and Sardhana) and 9 sub centres (Kadel, Govindgarh, Bandwara, Jethana, Nand, Rampura dabla, Dantela, Picholia and Kalesar). But available infrastructure is not sufficient to provide effective services to the livestock owners. Additionally 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 Pisangan cluster

RTC "A" Grade:- Kadel with Rural Haat

RTC"B" Grade;- 1. Devnagar 2. Pisangan

Project will support building construction and procurement of basic furniture, equipment's and recurring expenditure during project period for effective functioning of RTCs. RTC will have 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. 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. 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 and provide services at the village level itself. The health camps will be organized for vaccination; deworming, etc. **at least once in a month in each gram Panchayat**. The cluster covers 12 Gram Panchayats so 12 Animal Health Camps per month will be organised.
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 (PashuPalakGoshti) 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 including 2015-16	II year	III Year
Animal health Camps (One per GP per month)	876	372	252	252

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 the 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

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 professional 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. It is found that **17 villages** of project cluster do not have travis installed for animal inspection so 17 travis will be procured and installed with project support.

Animal husbandry management and advisory support

Distribution of Feeding and water troughs to MTG members

It is observed that there 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(No)	Year Wise requirement		
		Ist year	II year	III Year
Feeding & Water Trough	900	100	400	400

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.

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

Project will support construction of goat house for one (20 goats+1Buck) Unit with 220 Sq Feet floor space. The design will be prepared by utilising the local material to reduce cost.

As referred from the NREGA guidelines the goat house for 20 goats cost Rs 66000 per house, the same low cost houses may be supported in the project. Goat farming is primarily adopted by poor and small holders' farmers and their capacities to create asset is always limited. Project may support 75 percent of goat house cost and remaining 25 percent cost will born by the beneficiary.

Activity	Total Requirement(No)	Year Wise requirement		
		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 MTG (Goat) will be organised 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 identify 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 level 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 hectare. Their entire livelihood depends on wage labor & 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 behaviour and preference and can be broadly categorized in two 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)/NGO/FPC with the technical guidance of ABPF will initiate the goat marketing operation at Rural Haat and simultaneously build capacity of the Farmer Produce Company (FPC) & PRIs. The FPC will arrange to operate Rural Haat on sustainable basis with the support of TRA/NGO/FPC etc. ABPF/Market Resource Agency/NGO in consultation with PMU/PIU/DAH will finalize the SOP (standard operating procedures) of Rural Haat functioning. . 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 issue was discussed with the community, PRIS, local department of animal husbandry officials and "Kadel" 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 project as per World Bank procurement guidelines.

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. The facility will be integrated to provide services of Common facility centres for agriculture and horticulture activities.

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	1350	0	1350	0

a) Goat Milk Value chain and Clean milk production

Ajmer and Pisangan cluster in particular has substantial goat milk production and strengthening goat milk value chain will provide remunerative price to the small goat rearer. Value addition demands high quality milk and project proposed to support this practice in a coherent manner for adoption at the large scale. Good quality raw milk must be: a. Free from debris and sediment. b. Free from off-flavours. c. Low in bacterial counts. d. Normal composition and acidity. e. Free of antibiotics and chemical.

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.

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 the professional staff engage in project implementation at national level institute in relation to goat development.

In each village all the members of the MTG will be given Goat management 3 Days training at RTC/GP/Village level. The training will use **FFS (Farmer Field School)** model with partner organisation ARAVALI This will cover General Management, Breeding, feeding esp. fodder development and Goat marketing esp. synchronisation as per the market demand.

Activity	Total Requirement (No)	Year Wise requirement		
		Ist year	II year	III Year
MTG Goat Management Training	1350 MTG Members	0	600	750

Professional Training

It is observed that the knowledge of the veterinary professionals in the project cluster is also limited for goat management practices especially for latest development for feed and breeding.

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 for rearing quality animals and showcasing the 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.1035 lacs to be incurred as tentative investments to be implemented in Pisangan cluster. The tentative Action Plan & Cost Estimates for Pisangan cluster is being summarized as under:

Table 20 Investments and Cost Estimates under the Livestock Subcomponent under RACP

Items	UNIT	Unit cost (Rs. In lac)	Assistance (Rs. In lac)	Physical	Total Financial (Rs. In Lacs)		
					Farmer Share	Project Cost	Total Cost
Climate Resilient Agriculture							
Livestock Strengthening and Management							
DISTRIBUTION OF BUCKS	No.	0.100	0.075	500	12.5	37.5	50

Items	UNIT	Unit cost (Rs. In lac)	Assistance (Rs. In lac)	Physical	Total Financial (Rs. In Lacs)		
					Farmer Share	Project Cost	Total Cost
(FARMERS)							
DISTRIBUTION OF GOATS (WIDOWS & DISABLED) (One UNIT OF 4 GOATS)	No.	0.32	0.320	150	0	48	48
GOAT INSURANCE(8% PER ANNUM) OF UNITS RECEIVING IMPROVED BUCKS AND DOES	No.	0.008	0.006	1100	2.2	6.6	8.8
Veterinary Health Camp support (one camp Per GP Per month)	No.	0.05	0.050	876	0	43.8	43.8
ESTABLISHMENT OF REGIONAL TECHNOLOGY CENTER (RTC)							0
A- GRADE	No.	60	60.000	1	0	60	60
B- GRADE	No.	30	30.000	2	0	60	60
Vehicle for emergency animal health services	No.	10	10.000	1	0	10	10
Operating cost of RTC including POL for Vehicle	No.	3.6	3.600	6	0	21.6	21.6
link worker/MF honorarium (One per Gram Panchayat)	No.	0.36	0.360	42	0	15.12	15.12
Azolla Demonstration	No.	0.065	0.065	900	0	58.5	58.5
HOUSING SUPPORTS	No.	0.66	0.495	90	14.85	44.55	59.4
FEEDING & water TROUGHS DISTRIBUTION	No.	0.05	0.038	900	11.25	33.75	45
Travis installation in project villages (one per village)	No.	0.15	0.150	17	0	2.55	2.55
DISTRIBUTION OF CHAFF CUTTER	No.	0.08	0.060	720	14.4	43.2	57.6
ANIMAL IDENTIFICATION							0
TAGS	5000 Nos	0.00018	0.00018	5000	0	0.9	0.9
NEEDLE	5000 Nos		0.000		0	0	0
TAG APPLICATOR	5000 Nos	0.015	0.015	10	0	0.15	0.15
Weighing Balance	No.	0.01	0.010	1350	0	13.5	13.5
Feed Supplement Distribution	No.	0.00126	0.001	45000	0	56.7	56.7
ICT Support for LLW/MF	No.	0.1	0.100	21	0	2.1	2.1
ILD centre	N0	10	10.000	10	0	100	100
Sub Total					**55.2**	**658.52**	**713.72**
Market & Value Chain							
FORMATION OF MTG (Goat)	No.	0	0	90	0	0	0
ESTABLISHMENT OF RURAL HAAT	No.	200	200	1	0	200	200
Clean Milk Production	No.	0.01	0.01	2700		27	27
Goat Milk Collection & Value Add	No.	25	25	1		25	25
Sub Total					**0**	**252**	**252**
Farmers Organization & capacity Building							
MTG members Goat Management	No.	0.02763	0.02763	1350	0	37.3005	37.3005
MTG members Refresher Goat Management	No.	0.00545	0.00545	1350	0	7.3575	7.3575
LLW training	No.	0.075	0.075	21	0	1.575	1.575
Professional staff training	No.	0.075	0.075	20	0	1.5	1.5
Goat Exhibition/Seminar	No.	0.5	0.5	2	0	1	1
Sub Total					**0**	**48.733**	**48.733**

Items	UNIT	Unit cost (Rs. In lac)	Assistance (Rs. In lac)	Physical	Total Financial (Rs. In Lacs)		
					Farmer Share	Project Cost	Total Cost
Project Management & M&E							
Operating expenses of DD Office	No.	0.6	0.6	3	0	1.8	1.8
District Goat Development Plan Consultation (One at each District)	No.	2	2	0	0	0	0
Vehicle on Hire for Cluster /POL	No.	1.8	1.8	3	0	5.4	5.4
Incentive for different project activities (Rs 1500 per capm)	No.	0.015	0.015	876	0	13.14	13.14
Sub Total					**0**	**20.34**	**20.34**
TOTAL					**55**	**980**	**1035**

** 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

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

5.3.1. Value chain studies of identified commodities in the cluster

As discussed in Chapter 3, following commodities are selected for the value chain intervention in the cluster: Bajra, Barley and Guar along with fruits and vegetables. 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 and Barley**

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

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

2. **Guar**

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

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

3. **Goat milk**

As mentioned in the situational analysis of goat value chain section that the estimated milk production in the cluster is 4837 litres per day. The highest milk producing villages in the cluster are Bisalwa, Neemuchana, Buteri, Gyanpura, Khohri, Manchi and Bas karnawat and all these villages have more than 200 litres per day of milk production estimates. The cluster has scope for establishing at least 2 small milk processing unit. As mentioned in the situational analysis section, the capacity of small milk processing unit can be 500 litres per day and following activities will be performed:

- Milk collection (weighing scale, milk testing equipment and other utensils)
- Chilling section/ chiller
- Solar panel for CIP (Cleaning in process)
- Sterilization and packaging

The unit is suitable for the following milk products

- Packaged sterilized milk (Tetra pack)
- Sterilized flavoured milk (few additional machine will be required with some small investment)

The unit will be under administration of FPC of goat rearer as mentioned in previous section.

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

- Scouting of technologies and business ideas for identified commodities

- Incubation services to agri entrepreneurs
- Management and business training to FCSC and producer company personnel
- Facilitating reforms in agri policies

5.3.3. Value chain cost estimate

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

FPC registration and related licenses

Registration fees along with the fees of the facilitator can be budget under this amount. This component can also cover the fees to apply for other licenses as well like electricity, procurement etc. 100% assistance is required from the project as it is just the starting of the FPC hence there would be no other source of cash inflow for the unit.

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

Human Resource

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

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

Office infrastructure

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

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

Common Facility

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

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

S. No.	Name of sub-component /	Unit	Unit cost	Assistance (%)	Amount of Assistance	Phy.	Financial		
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 21 Capital expenditure for the common facilities

#	Suggested value chain interventions in the cluster	Amount (Rs.)
1	**Bajra and Barley cleaning and grading unit (2 TPH)**	
	Shed construction (1000 sq ft @ Rs. 700/sq ft)	700,000
	Grains cleaning machine 2 TPH	1,200,000
	Weighing scales, bag sealing machines	20,000
	Warehouse (200 MT)	1,080,000
	Electricity/Generator	35,000
	Total	**3,035,000**
2	**Pack house (2 TPH)**	
	Shed construction (1000 sq ft @ Rs. 700/sq ft)	700,000
	Vegetable Cleaning and Grading Machines (Grading Tables, Water Tank, Washing Tank)	500,000
	Pre cooling chamber (5 MT)	500,000
	Vehicle (2 MT capacity)	750,000
	Total	**2,450,000**
3	**Guar cleaning and grading unit**	
	Shed construction (1000 sq ft @ Rs. 700/sq ft)	700,000
	Cleaning and grading unit (1 TPH)	700,000
	Warehouse (200 MT) (1200 sq ft @ Rs. 900/ sq ft)	1,080,000
	Vehicle (1.5 MT)	600,000
	Total	**3,080,000**

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 22 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 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 23 Profitability indicators on proposed value chain units

Particulars	Guar cleaning and grading unit (Rs.)	Bajra and Barley CnG (Rs.)	Vegetable Pack house (Rs.)	Goat milk chilling unit (Rs.)
Revenue	2,438,400	1,536,000	1,152,000	4,015,000
Total Revenue	**2,438,400**	**1,536,000**	**1,152,000**	**4,015,000**

Particulars	Guar cleaning and grading unit (Rs.)	Bajra and Barley CnG (Rs.)	Vegetable Pack house (Rs.)	Goat milk chilling unit (Rs.)
Fixed Cost (HR, other fixed cost)	412,000	383,000	214,400	221,000
Variable Cost	144,000	360,000	180,000	3,016,798
Total Operational Expenses	**556,000**	**743,000**	**394,400**	**3,237,798**
Earning Before Interest, Depreciation, Taxes and Amortization (EBITDA)	**1,882,400**	**793,000**	**757,600**	**777,202**
Depreciation	219,000	268,500	210,000	142,388
Amortization	0	-	-	-
Earnings Before Interest and Taxes (EBIT)	**1,663,400**	**524,500**	**547,600**	**634,815**
Interest Expense	0	-	-	177,734
Earnings Before Taxes (EBT)	**1,663,400**	**524,500**	**547,600**	**457,081**
Tax (@ 30%)	165,600	157,350	164,280	137,124
Earnings After Taxes (EAT)	**1,497,800**	**367,150**	**383,320**	**319,957**
Financial Indicators				
Net Present Value (@ discount rate 10%)	**3,490,492**	132,293	346,027	897,873
Internal Rate of Return	44.80%	51.50%	14.99%	25.50%
Payback period in years (Equity)	0.64	1.13	1.03	1
Payback period in years (Total)	2.06	3.91	3.48	3
Breakeven point	43.96%	45.45%	19.39%	17.54%

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 per year

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 Pisangan cluster, there are majorly two water saving activities taking place viz activities of Ground water department and the micro-irrigation system (MIS) activities of Agriculture and Horticulture department. Both these activities save water up to the extent of 3.20 mcm and 10.53 mcm per year respectively. When the investment per unit of water saved is calculated, it is found that MIS activities are able to conserve more water at lower investment of Rs 1.01 crore per mcm of water. Thus, it could be said that in Pisangan, MIS activities like installation of drips and sprinklers in the agricultural and horticultural crops can be economic means of saving water in span of a year.

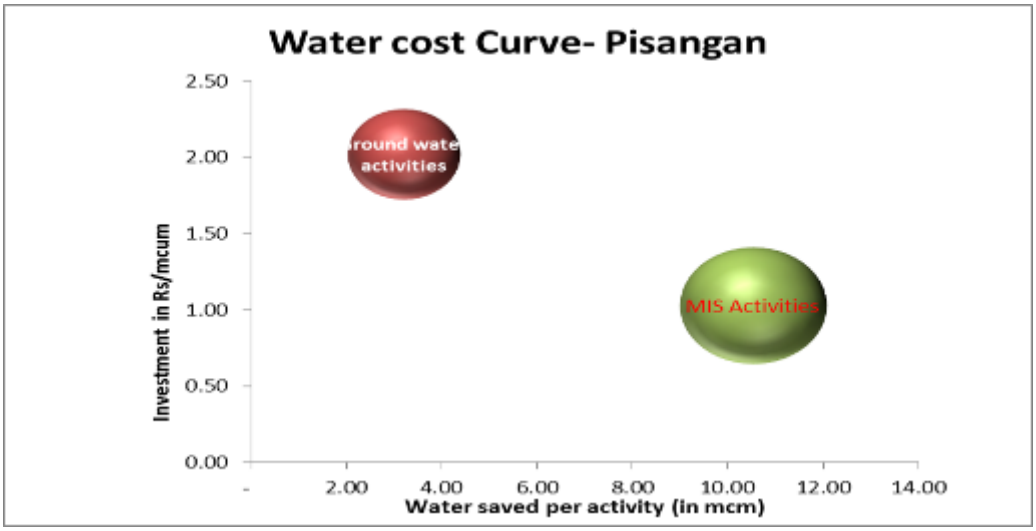


Figure 7 Investment (Rs crore/mcm) v/s Water saved (mcm) per year

Table 24 Investment (Rs. crore/mcm) verses Water saved (mcm) per year

Activities undertaken to save water	Water saved - in mcm	Investment- Rs/mcm	Total investment- Rs crore
Ground water management	3.20	2.02	6.47
MIS Activities	10.53	1.03	10.84

Chapter – 6: Ground Water Resources Management

6.1 Description of Ground water cluster

The Pisangan groundwater cluster of RACP is located in Panchayat Samite Pisangan, Ajmer district and is situated centrally in the Rajasthan State. The water bearing formation (Aquifer) of the Cluster area is Alluvium followed by Schist. There are 44 no. of villages situated in 22 Gram Panchayats and one Pushkar town in the Project area. Out of 44 villages, 5 villages have 100 % village area covered in Cluster and 39 villages have partial area covered in the Cluster.

The area of Pisangan groundwater cluster is in the vicinity of Aravalli Mountains and part of the Luni river basin. The undulating topography, high wind velocity & varying intensity of rainfall are causing moderate to severe erosion in the area.

\The Pre-Monsoon depth to water varies from 21.82 mts to 25.24 mts below ground level and Post-monsoon depth to from 20.20 mts to 23.64 mts. During Pre-monsoon period in the long term, declining trend of ground water levels of 0.35 m/year has been observed whereas declining trend of 0.36 m/year in groundwater levels of Post-Monsoon period has been noticed in the Cluster Area. Indiscriminate ground water development has led to substantial ground water level declines both in hard rocks and alluvial areas threatening sustainability of this resource. This has destabilized the aquifer system and resulted in unsustainable development. Increased groundwater draft to meet the increased demand of agriculture sector is the main cause for declining trend of Ground Water levels. (**See: water Level sheet of Annexure 6.1.**

Present practice of groundwater development by individual farmer has resulted in inequity as well as unsustainable management of groundwater resources. Since groundwater occurs in an aquifer and is not confined to the land holdings of the individual farmer, it is imperative that for sustainable use, groundwater resources are managed by communities in an aquifer instead of an individual well owner.

6.2 Objectives of the Ground Water Resource Management in groundwater Cluster

The main objective of the Pisangan Ground Water cluster is to achieve sustainability of ground water resource and enhancement of agricultural productivity. Both these activities will be under taken in consultation with the communities under close supervision of Ground Water Department, Agriculture, Horticulture and concerned project authorities.

Sustainable water management: The sustainable Ground Water management means the annual water extractions from the Aquifer is limited to the annual ground water recharge. To achieve the sustainability of the ground water resources all the activity will be take place through community based approached with public support striving to reach a situation over a meaningful period of time in which the annual water extraction from this aquifer is limited to the annual ground water

recharge. With this objective we will have to undertake runoff surplus estimation in the account and ground water resource estimation to calculate the extent of available water resources in the cluster. Simultaneously we will also determine the demand and uses of water resource for the various sectors e.g. agriculture, domestic, cattle and industrial with the priority as per mentioned in the state water policy. This estimation will help in identification for opportunities of water savings and increasing water productivity; support the decision process for water allocation; and general water audits etc.

Agricultural productivity enhancement: Implementation Agency of Agriculture and Horticulture department to prepare a detailed agricultural productivity enhancement plan for Pisangan groundwater cluster on the basis of available annually Sustainable Ground Water resource for Agriculture purposes with an objective to increase agriculture and water productivity of suitable agriculture and horticulture crops, improve water use efficiency, provide options for shifting to low water requiring crops and reduce water foot print of agriculture in the Pisangan cluster. The well wise agriculture data has to be collected during detailed hydrogeological investigation survey to know the exact crop wise area under irrigation, and quantity of water requirement of the particular crop. It will help us to determine the exact area under cultivation for different crops during Rabi, Kharif and Zaid seasons and accordingly the water requirement for each crop will be estimated. It will also help in preparing the crop water budgeting. The other objectives are as below:

- To promote the socio-economic development of the village community through optimum utilisation of groundwater resources,
- To conserve, harvest rainwater and surplus water to create surface water sources and to recharge groundwater,
- Help farmers to get more rupees per unit of water in compensation for farmers using fewer units of water
- To 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
- To improve the economic and social conditions of the poor and disadvantaged sections of the community by employment generation and enhancing the income of individuals by adopting alternate enterprise.
- Restoration of ecological balance,

One of the major strengths of the RACP is that one dedicated Consultancy (technical) Agency for preparation & implementation of Ground Water Management Sub Plan & 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.

Thus, community-based approaches with public support will striving to reach a situation over a meaningful period of time in the Cluster area in which the annual water extraction from this aquifer is limited to the annual ground water recharge. Ground Water Management activities may save water in Agriculture sector, increase 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.

6.3 Water Budgeting

The water budget is a basic tool that may be utilised to evaluate occurrence and movement of water through the natural environment**.** Cluster 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 cluster is necessary to work out 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.

6.3.1 **Supply:**

The details are as below:

a) **Yield of Rainfall:** Average Annual Rainfall for last 10 years is 509 mm. Total rain fall availability in the cluster area is calculated on 509 mm Average Rain fall * Cluster area = **161.99MCM**.

b) **Yield of Effective Rain / Run off Estimation:** Rainfall and runoff available constitute the major sources of water for harvesting and recharge to ground water. For proper evaluation of water availability, a thorough understanding of rainfall and runoff is essential. Collection and analysis of hydro meteorological and hydrological data have an important role to play in the assessment of water availability for planning. Runoff Estimation based on Land Use and Treatment are frequently used in water conservation for estimating the peak rate of runoff and runoff yield. The process to estimate runoff may be summarized as under:

Pisangan Ground Water Cluster area classifies based on inputs received from Revenue Record, GIS layers, and watershed expert exercise. The basis of the criteria is presented below:

a) **Good Catchment** – Where maximum runoff & minimum infiltration like hillocks, Built-up etc.

b) **Average Catchment** – Cultivated land, forest land with vegetation.

c) **Bad Catchment** - Where runoff is Minimum and infiltration is Maximum e.g. Sandy soil.

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

#	Catchment	Area (Ha)
1	Good Catchment	431.64
2	Average Catchment	27372.2
3	Bad Catchment	4020.53
	Total	**31824.37**

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

Rating oftCatchment	Char Characteristics	Yield of runoff from catchment per ha (cum)	Area (in Hectare)	Expected Yield (in MCM)
Good	Runoff is maximum & infiltration is minimum like hillocks, plateau etc.	845.25	431.64	0.3648

Average	Runoff is medium like cultivated land, forest land with vegetation	630.00	27372.2	17.2444
Bad	Runoff is minimum and infiltration is maximum e.g. Sandy soil	420.00	4020.53	1.6886
Total			**31824.37**	**19.2978 MCM**

Estimation of water-storage in existing water harvesting structures situated in Cluster Area:-

S. No.	Type of Structure	Nos.	Storage Capacity (In Cum)	Storage Capacity (% of Total Surface Runoff)
1	Farm Ponds	13	17408.5	7.96%
2	Check dam	1	120	
3	Village ponds (Talab)	30	573800	
4	Pushkar lake	1	945000	
	TOTAL		**1536328.5 Or say 1.5363 MCM**	

The table above reveals that a total of **1.5363 mcm** water was already being harvested through Village ponds and other structures from expected yield **19.2978 MCM** in the cluster area. Presently, the balance runoff **17.7615 MCM** is to be harvested to cater the requirement of crops to be grown in the area.

Estimated collective storage Capacity of the proposed Conservation/recharge structures

S. No.	Activity	Description	Quantity in No.	Storage Capacity (Cum)	Total Storage Capacity (Cum)
1	Farm Pond type-I Farm Pond type-II Farm Pond type-III	To Harvest surplus runoff in dug out ponds and recycling the same for providing supplemental irrigation to Kharif crops or pre-sowing irrigation to Rabi crops and proved to be the most successful technologies for adoption. Farm ponds would help the farmers for on farm water management by using stored water for tackling the drought or dry spells during the season.	5 50 120	2314 1073 648	11570 53650 77760
	Grand Total				142980 **Say 0.1429 mcm**

Remaining Runoff still untapped

Expected Runoff Yield of Water in MCM	Present storage capacity in MCM	Balance Runoff to be utilized in MCM	Estimated Collective Storage Capacity of the Proposed Structures in MCM	Remaining Runoff (Still Untapped) in MCM
1	2	3 = (1 – 2)	4	5 = (3 – 4)
19.2978	**1.5363**	**17.7615**	**0.1429**	**17.6186**

100%	7.96 %	92.03%	0.74 %	91.30 %

Above table clearly shown that only **0.1429 MCM** rain water is proposed to be harvested and rest **17.6186 MCM (91. 30%)** rain water is still to be untapped and allowed to flow to lower areas beyond the cluster.

6.3.2 Ground Water Resource Assessment

Ground water has an important role in meeting the water requirements of agriculture, industrial and domestic sectors in India. Ground water is annually replenished resource but finite resource and part of the water cycle. Groundwater resources in the aquifer gets seasonally recharged and discharged through rainfall and other sources which are reflected in the water level fluctuations and below this zone of water level fluctuations, the aquifers remain perennially saturated. Technically, the dynamic ground water refers to the quantity of ground water available in the zone of saturation, which is replenished annually. The excessive withdrawal of groundwater may lead to depletion of groundwater storage which may have serious social, economic and environmental consequences; therefore, historically there has always been an attempt to define the exploitable quantity of groundwater resources i.e. the volume of groundwater which is authorized for withdrawal. Hence, the sustainable development of ground water resources warrants precise quantitative assessment based on reasonably valid scientific principles.

6.3.2.1 Previous Assessments

Groundwater resources assessment is carried out to estimate the degree of groundwater use in context to its availability, annual groundwater recharge and its utilization. The assessment is based on the status of groundwater utilization and long term water level trend within block wise potential Zone. The existing methodology is known as Groundwater Estimation Methodology (GEC, 1997). The governing principle behind the methodology is the water balance approach. The approach involves estimation of annual groundwater recharge and quantification of groundwater extraction. The assessment units are categorized based on the percentage of groundwater withdrawal to net groundwater availability and a long term water level trend.

The main hydrogeological units in the Pisangan block are Alluvium, and schist. There is a significant decline in long term water levels in whole of the Pisangan Block. The stage of ground water development in Pisangan alluvium zone as per Assessment report 2013 is **246.79%.**

Assessment Unit	Potential Zone area in Sq. Km.	Net Annual Ground water Availability (MCM)	Existing Gross Groundwater Draft for All Uses (MCM)	Net Groundwater Availability for future Irrigation Development (MCM)	Stage of Groundwater Development (%)
Alluvium	240. 67	20.27	49.09	Nil	246.79%

Source: Ground Water Resource Assessment 2013, Ground water Department

6.3.2.2 Ground Water Assessment of Pisangan Ground water Cluster:

Ground Water annual availability and annual utilization is assessed in the aquifer to estimate availability of sustainable Ground water Resources for agricultural purposes within the cluster on the basis of GEC-97 guidelines and amendments from time to time. The Annual Ground Water Draft of the entire cluster for 2016-17 has been estimated **52.8269 MCM**. Agriculture sector remained the predominant consumer of ground water resources. About 88% of total annual ground water draft i.e. **46.4705 MCM** is for irrigation use. Only 6.3565 MCM is for Domestic & livestock use which is about 12% of the total draft. The detailed Assessment of Ground Water Resource is attached with **Annexures 6. 1.**

GROUND WATER POTENTIAL OF PISANGAN CLUSTER AREA, BLOCK PISANGAN, AJMER DISTRICT AS ON 30.06.2017

Cluster Area	Water bearing Formation	Net Ground Water Availability in MCM	Existing Gross Ground Water Draft for Irrigation (mcm)	Existing Gross G.W. Draft for Dom. & Ind. Use	Existing Gross Ground Water Draft for All Uses (mcm)	Allocation for Dom. & Industrial Requirement for next 25 Years (year 2041) (mcm)	Net G.W. Availability for future Irrigation Development	Stage of Ground Water development (%)
1	2	3	4	5	6	7	8	9
318.25	**Alluvium followed by Schist**	**24.2421**	**46.4705**	**6.3565**	**52.8269**	**10.0341**	**Nil**	**217.91**

The findings of the ground water resources assessment guide the planners and stakeholders to take appropriate management measures for optimal utilization and sustainability of the Ground Water Resource. Sustainable groundwater management system has to recognize Water bearing Formation (aquifer) as a groundwater unit. Hence, the sustainable development and management of groundwater resources in an aquifer could be achieved through community participation. For this, all primary stakeholders in an aquifer have to collectively manage the groundwater resources through prioritize utilization of groundwater by different sectors like drinking water, agriculture, and industry, and allocate the available resources to each user sector for sustainable development. This requires regulating the demand particularly for agriculture sector. For this scientifically-designed, continuing measurement will be undertaken to observe of the groundwater situation.

Total Annual Sustainable Availability of water

S.No.	Yield of Rainfall (MCM)	Expected Runoff Yield of Effective rain (MCM)	Annually Sustainable Ground Water availability for Agriculture Purposes in MCM	Existing & Proposed Water storage in surface water structures in MCM Water e	Total Annual Sustainable Availability of water in MCM
1.	**161.99**	**19.2978**	**24.2421**	**1.68**	**25.9221**

Gap between supply and demand

S.No.	Supply (in MCM)	Existing Water storage in surface water structures in MCMe	Proposed Rain water storages in farm pond in MCM	Total Supply available in MCM	Total demand in MCM	Gap (in MCM)
1	**24.2421**	**1.53**	**0.14**	**25.9121**	**56.5041**	**(-) 30.5920**

6.3.2.3 Crop Water Demand

The present total demand is **56.5041 MCM** and it should be reduced to **25.9221 MCM** for Sustainable annual Ground Water availability. The gap can be achieved through **changes in ground**

water extraction rates through efficient on farm water usages by installation of water efficient technologies for irrigation (**Drip & Sprinklers** etc) for Agriculture & Horticulture crops, Promotion of high value agriculture and Promotion of crops introduced and/or supported as part of improved crops rotation and management practices with lower water requirements**.**

6.4 Proposed Activities for Ground water Management

6.4.1 Studies/Field Surveys

Ground water management is the foremost challenge being faced today by the organizations dealing with ground water in India. Indiscriminate ground water development has led to substantial ground water level declines both in hard rocks and alluvial areas threatening sustainability of this resource. Long-term decline of ground water levels is being observed in cluster area and water levels are declining in Alluvium followed by Schist formation. Implementation of Ground Water Management Sub Plan will be undertaken in the Cluster area as per proposed action plan.

The activities/interventions presented below have been selected and proposed based on the outcomes of (i) the detailed Hydrogeological Survey and Geophysical investigation carried out in each project village to demarcate & delineate the aquifer boundary by Consultancy Agency under technical supervision of Ground Water Department (ii) Water budgeting carried out for the cluster area (iii) Information gathered through GIS based thematic layers.

Total **3019 running wells** are operating in the cluster area. **831 wells** are used in irrigation with **Sprinkler**, **252 wells** are used in irrigation with **Drip system** and **1688 wells** are used in the irrigation by flood Irrigation method and these wells are required to be converted in to MIS system. The details are given in **Annexure 6.5.**

Energy source of wells & Irrigation device used in field

S. No.	Total No. of running wells	Energy Source of Wells			Irrigation Device used in Field		
		Well operated by Diesel Engine	Well operated by Electric Motor	Well operated by Solar Pump	Device used for watering in Field by Sprinkler	Device used for watering in Field by Drip	Device used for watering in Field by Flood Irrigation
1	3109	167	2893	49	831	252	1688

6.4.2 Construction of Piezometer, Observation Wells and Procurement of DWLR (Digital Water level recorder):

Piezometers & Observation Wells are constructed to record the response of groundwater regime to the natural and artificial recharge and discharge conditions. For implementation of the observation network of monitoring water levels & impact assessment, twenty Piezometers (34) and Six (6) Observation wells of large dia are proposed with the provision to install DWLR's. Carry out aquifer performance test for safe yield or Aquifer parameters before installation of DWLR. The Piezometers are usually of small diameter (125 mm) so as to accommodate the water level measuring device. In unconsolidated formations, piezometers are provided with screens tapping the zone of saturation; where as in the consolidated rocks, piezometers are left open ended (uncased) beneath the loose soil/loose over-burden where the hole has to be provided with a casing. Collection of drill cutting during drilling of Piezometers & Observation wells, design of assembly, preparation of lithology & BDR report etc will be undertaken during implementation of Sub Plan. Carry out aquifer recharge test to understand the capacity of artificial recharge to the aquifer in the cluster

Area. The total investment of above both activities will be **100.00 Lakhs**. The list of Piezometer & Observation Wells is attached as **Annexure 6.2 & 6.3.**

The principal objectives in regards to the construction of Piezometers and observation wells are as below:

a) To monitor the water levels and water quality of aquifer
b) To understand the relationship between different water bearing zone of aquifers
c) To understand the hydraulic characteristics of the aquifer.
d) To evaluate groundwater regime characteristics
e) To understand the regional flow characteristics
f) To refine groundwater resources assessment

6.4.3 Installation of Automated Weather Station

Two existing weather station rain gauge (Pushkar and Pisangan) have been identified in cluster. Weather monitoring Stations would help in keeping track of different climatic behaviour's including temperature, humidity, rain, wind speed and wind direction. Weather Monitoring System can be either wired or wireless one. In case of wireless communication, the connectivity will be more convenient and user friendly and weather monitoring would not require physical presence of the person at the location.

Proposed automatic weather station (AWS) is an automated version of the traditional weather station, either to save human labour or to enable measurements from remote areas. An AWS will typically consist of a weather-proof enclosure containing the data logger, rechargeable battery, telemetry (optional) and the meteorological sensors with an attached solar panel or wind turbine and mounted upon a mast.

The scope of cost effective automatic weather station design, that can measure the real time wind speed, wind direction, temperature, humidity and rain detection, study rainfall data, intensity & behaviour of rainfall in the cluster and gives that information on the LCD and also can be sent through the serial port to personal computer. Power for the proposed system is supplied through solar power panel so proposed system is eco-friendly.

The total investment on these activities would be around Rs. **4.00 lakhs**. Design and photograph of Automatic Weather Station locations is given below in **Fig.2 & Table No.6.**

Figure 8 Photograph of Automatic weather Station

Table 25 Proposed Location of Automatic Weather Station

S.No.	X	Y	Name of Village	Name of Building
1	454419	2930604	Ganahera	Atal Seva Kendra

6.4.4 Monitoring Activities

6.4.4.1 Demand Control Activities

a) Installation of Water Meter

The increased demand of water has led to increased extraction of ground water. Installing meters on farmer well / Tube well and drinking well / Tube well is one of the most significant aims for monitoring withdrawal from Aquifer and reducing Ground Water Extraction rate for water savings**.**

i. A village wise detailed plan to work with community/stakeholders on acceptance of registration of all ground water withdrawal units to GWMC with the support of Multi Task Groups (MTGs) will be part of Ground Water Management Sub Plan and this plan will implemented in the Cluster area

ii. To measure the extraction of Ground water withdrawal from all running withdrawal units in Pisangan Ground water cluster have been identified. The total number 3000 water meter or as per requirement will be installed on groundwater abstraction unit within the Pisangan ground water cluster. A village wise detailed plan to work with community and stakeholders on acceptance of installation of water meter on wells/tube wells in their fields. The total investment of this activity will be **450.00 Lakhs.** The list of farmers for installation of water meter on wells/tube wells is given in **Annexure 6.4.**

b) Crop Water Budgeting: Following activities will be undertaken for Crop Water Budgeting**.**

i. Collection of data from 100% running ground water extraction unit on yield of wells, area irrigated by the wells, area irrigated under flood, drip and sprinkler irrigation, cropping patterns, water demand for agriculture, crop area and production, major crops including vegetables, Flowers and Fruits, scope and potential of crop diversification during different seasons.

ii. Conducted crop water budgeting exercise (CWB) on excel program at farmer level on an annual basis so as to match the water resources availability with the Kharif, Rabi & Zaid season crop plan and requirements for perennial crops based on the sustainable groundwater availability for very year;

iii. regarding motivation of the farmers to prepare farmer level crop water budgeting (CWB) plan with existing cropping pattern as well as the proposed diversified cropping pattern considering present sustainable ground water availability for agriculture & crop water requirement and irrigation scheduling;

iv. Sharing the results of the crop water budgeting exercise to the community on a regular basis regarding adoption of the decisions taken during the Kharif, Rabi & Zaid season crop on yearly basis changes in the irrigation practices (scheduling,

irrigation methodology, usages of water saving and conservation practices); informed about the water saved through CWB (both projected and actual).

c) **Trainings:** Followings identified training needs among the community and other stakeholders which should be carried out on regular basis. The total investment of this activity will be 21.32 Lakhs**.** A village wise detailed plan to enhance the capacity of Community with the trainings, mobilization, exposures visits. The objectives of the orientation program to enhance the capacity of Community to switch over from flow irrigation method to more efficient pressure irrigation methods like sprinkler and drip which saves more than 50% of irrigation water demand, enhance the capacity of the Community Based Organizations to prepare Groundwater Use Plan for allocation of groundwater for different purposes and regulates withdrawal of groundwater in the aquifer and enhance the capacity of Community Based Organizations to become self- by adopting Social Regulation even after the project period .

i. Mass awareness cum Orientation program to the farmers/stakeholders & Enhancement the capacity of community: Regular motivations with the assistance of District Coordinator (Ground Water) attached with the PIAs, NGO engaged in cluster area and Community Resource Person (**CRP**) to be attached with Ground Water management Committee (**GWMC**) to become self-by adopting Social Regulation even after the project period will be part of Ground Water Management Sub Plan and this plan will implemented in the Cluster area so that community leads in Ground Water Resource Management as well as agriculture production management.

ii. Orientation & Capacity Building of MTGs/GWMC /Progressive farmers

iii. Exposure visits of MTGs leader & co-leaders /Progressive farmers / Community Resource Person (CRP) attached with GWMC/ Ground Water functionaries i.e. District Coordinators to modal sites.

6.4.4.2 Monitoring Activities

a) Monthly water levels Monitoring: Monthly water levels Monitoring from the representative Ground Water Monitoring Stations and Piezometers throughout the project period and prepares monthly hydrographs, water table elevation maps including Pre, Post- Monsoon & Post Irrigation period and analyse the data & prepare database on GIS environment. Ground water Department will undertake this activity with the support of District Coordinator (Ground Water) attached with the PIAs. These data will be put to use for various further strategy-designing purposes. The list of representative Ground Water Monitoring Stations is attached as **Annexure 6.2 & 6.3.**

b)Collection of one water samples from each Ground Water monitoring station selected for monthly water level monitoring during pre-monsoon survey i.e. May every year and Post monsoon survey i.e. October every year and evaluate chemical data for impact assessment and prepare data base and various chemical quality maps. Ground water Department will undertake this activity with the support of District Coordinator (Ground Water) attached with the PIAs.

c) Analyses of the water samples compilation of data, prepare maps and submit separate report of each cluster (**Two times in a year**). Ground Water

Department will undertake this activity with the support of Regional chemical Laboratory Jaipur. These data will also be provided to Agriculture and Horticulture department to & correlate with crops and suggest its relation to crop production & soil held correlate the nutritional and fertilization aspects, Irrigational technology aspects, soil structure, flora & fauna etc. and suggest its relation to crop production & soil held.

d) Measurement and collection of Ground Water withdrawal data from the Individual farmers for Kharif, Rabi & Zaid season and from wells/DCB/Tube wells using for drinking & domestic purposes and Village wise details of Sprinkler & Drip system used in watering for Agriculture & Horticulture crops, data on area irrigated by the wells, cropping pattern, irrigation practices (flood irrigation, drip, sprinkler etc.), water demand for agriculture & Horticulture crop, crop area, production and Productivity of major crops including Vegetables, Flowers and Fruits during Kharif, Rabi & Zaid seasons in cluster area. (Three times in a year). Ground water Department will undertake this activity with the support of District Coordinator (Ground Water) attached with the PIAs and Community Resource person (CRP) to be attached with Ground Water Management Committee (GWMC).

e) Inventory of 100% of existing water utilization related assets (dams/head works, canals, tanks, ponds including their water storage / delivery / extraction capacity (**Yearly after Monsoon**). Ground water Department will undertake this activity with the support of District Coordinator (Ground Water) attached with the PIAs and NGO working in the cluster area.

f) Annual Water balance (Rain water, Run off, Crop Water Budgeting & Ground Water Resource Estimations as per GEC 97 guidelines (Annually).

6.5 Physical & Financial outlays for Interventions under Pisangan GW cluster

S. No	Activities	Total	
		Physical.	Financial
I.	**Climate Resilient Agriculture (Improved Water Use Efficiency)**		
1	Preparation of Ground Water Management Sub Plan and Data Management on GIS platform as per ToR including Detailed Hydrogeological Survey, DGPS survey on 100% Ground Water Extraction Structure, Procurement of thematic Layers for three clusters approximate area 75000 ha and Land Cover and Land use thematic layers for year 2016 to 2018 after on board of Consultancy Agency and Implementation of Ground Water Management Sub Plan and Data Management on GIS platform as per ToR	1	90.34
2	Construction of Piezometers for monitoring purpose either Departmental Rigs or Out Source Agency including Civil Works	34	34.00
3	Construction of Observation wells for impact assessment purpose either Departmental Rigs or Out Source Agency including Civil Works	6	6.00
4	Procurement of DWLR & its Installation on piezometers & observation wells	40	60.00
5	Procurement of Digital complete weather station and its installation with civil Works	1	4.00
6	Procurement and Installation of Handheld GPS	3	1.41
7	Procurement and Installation of Electronic Water Level Sounder	2	0.54
8	Procurement of Water sample Bottles, Chemicals, Chain Tong	Ls	0.28

S. No	Activities	Total	
		Physical.	Financial
9	Procurement of Water Meter & its Installation at different locations in Pisangan cluster area.	3000	450.00
	Sub Total-I		**646.57**
II	**Markets and Value Chains**		
III	**Farmer organization & Capacity building**		
1	Community Mobilization , Trainings and Exposures Visit to District level officers, PRIs, Community and Community Based Organizations, Progressive farmers, District Coordinators (GW), field staff including exposure visits inside State and outside State through IMTI	Ls	21.53
	Sub Total-III		**21.53**
IV	**M & E and Project Management**		
1	Operating costs including photo state, computer typing & printing, fax, Machine with man (PIU), mobility (hired taxi/POL), TA for PIU (HQ) & District unit (PIAs)	Ls	11.31
	Sub Total-IV		**11.31**
	Grand Total		**679.41**

6.6 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. The list of farmers with all the details including longitude and latitude, where the work / structures are proposed to be collected, geo tagged before start of implementation.

Site specific designs of farm ponds which includes detailed cost table indicate the break-up of cost on labour and material, locations, time period with technical write-up and detailed cost-tables based on sufficient reasoning and satisfactory ground to justify the estimated amounts for each activity proposed and other implementation arrangements of proposed Farm ponds in the individual farm to augment the available surplus Rain water with or without lining in order to strike the optimum water availability in Rabi season with regard to the existing water resources commitment of the downstream will be part of Ground Water Management Sub Plan and this plan will implemented in the Cluster area.

6.7 Implementation Arrangement for all the planned activities

Planning and implementation of the project activities is being undertaken by the Consultancy Agency under the supervision of PIA of line department i.e. that of Ground Water Department with the technical support of 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 Ground Water 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 (Ground Water) has been deputed with the PIA, the In-Charge, PIA and his office has been designated by the department for implementation of the Ground Water Management activities in the cluster. This is with the support of PRIs and field level Consultancy Agency & 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 Consultancy Agency has been deployed in the cluster to support implementation of Ground Water Management Sub Plan in the cluster. In addition to the Team Leader, Ground Water Specialist, Watershed Engineer & GIS Expert is with the Consultancy Agency to support field level activities in the cluster. As per the operational guidelines issued under the project, the Multi Task Groups, Ground Water Management Committee 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 deployed with the NGO to support related activities 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 Pisangan Cluster):-

Project Area covers an area of 31825-hectare (ha) comprising twenty-three (23) Gram Panchayats and forty-four (44) villages. Cluster village has population of 78883 of which 40411 are males while 38472 are females as per field survey by NGOs. In cluster schedule cast 14737 and schedule tribe 241. Cluster had household of 14981 of which small farmer 3895, marginal farmer 8539 large farmer 599, BPL 749 and remaining farmers are landless.

Consultation held - Key social issue of the Cluster

Major issues in the Pisangan 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
- Livestock Management
- Value chain development activities

Environment Management Plan for Crop Intensification/Water management /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.

Details can be referred in Annexure 7.2.

Chapter – 8: Procurement, Financial Management and 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 GWMCs/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, GWMCs have been formed and Farmer Producer's Companies (FPCs) are to be formed. The related activities are to be performed by these GWMCs/FPCs/Individual Beneficiaries (IBs). A Community Resource Person (CRP) is being deployed with each of the GWMCs 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 GWMCs/FPCs/IBs shall be carried out by the Bank. (This shall be completed by assessing a representative sample of GWMCs/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 GWMCs/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.5840.19 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 26 Consolidated Investment Plan

#	Department	Components (Rs. Lakh)				
		Climate Resilient Agriculture	Market & Value Chains	Farmer's Organization and Capacity Building	Project Management and M&E	Total
1	Ground Water	646.57	-	21.53	11.31	679.41
2	Agriculture	1,367.01	232.00	159.91	10.27	1,769.19
3	Horticulture	2,309.80	-	36.00	11.00	2,356.80
4	Animal Husbandry	713.72	252.00	48.73	20.34	1,034.79
	Total	**5,037.10**	**484.00**	**266.17**	**52.92**	**5,840.19**

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.5840.19 lakh** likely to be incurred in the cluster to make the farmer and cluster competitive and to maximize water as well as agricultural productivity in the cluster.

8.2.1. Consolidated Investment Plan – by nature of expenditure:

Investments related to improvement of water use efficiency, transfer of technology and market led advisory services, livestock strengthening, market infrastructure and value chain development an estimated total amount of **Rs.5840.19 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 27: Consolidated Investment Plan – by nature of expenditure

Type of Expenditure/ Line Dept.	Ground Water	Agriculture	Horticulture	Animal Husbandry	Total
Goods	516.23	861.85	1669.81	453.80	**3501.69**
Works	40.00	2.22	0.00	320.00	**362.22**
Consultant Services	90.34	138.16	0.00	100.00	**328.50**
Operating Costs	11.31	17.78	11.00	57.06	**97.15**
Training	21.53	23.75	36.00	48.73	**130.01**
Grants	0.00	266.00	0.00	0.00	**266.00**
Beneficiary Contribution	0.00	459.42	639.99	55.20	**1154.61**
Total	**679.41**	**1769.19**	**2356.80**	**1034.79**	**5840.19**

Note:

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

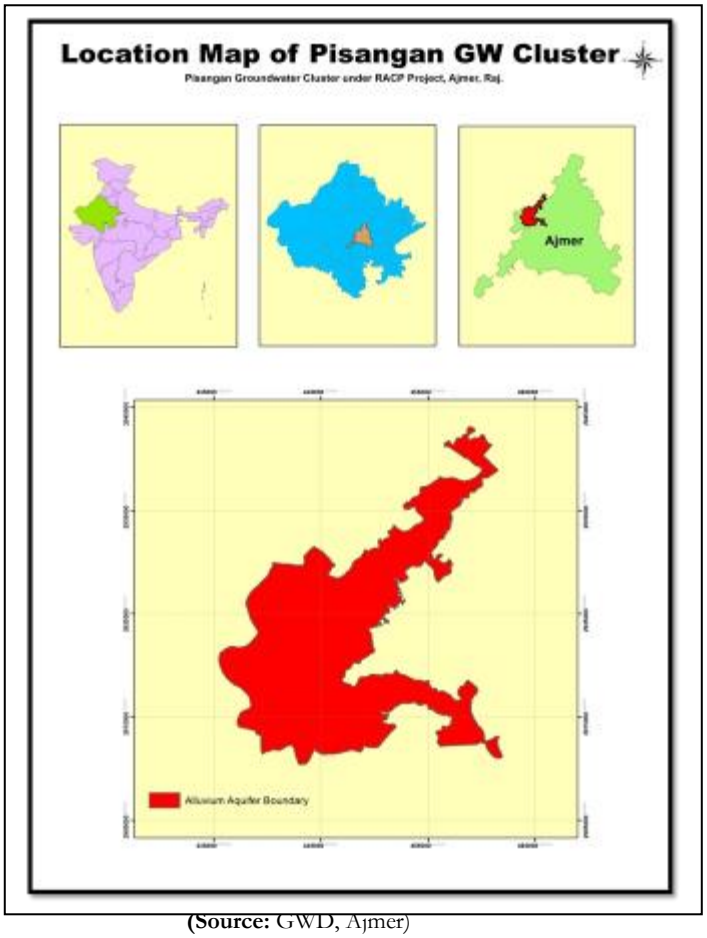
Table 28 Gram Panchayat and Village wise area in Pisangan Cluster

S. No.	Panchayat Name	Village Sr. No.	Village Name	Total area of Village in ha	Area falls under boundary in Ha	Area falls under boundary in %
1	Pisangan	1	Pisangan	4225.00	2025.33	48
2	Bhatsuri	2	Naad	1091.00	921.29	84
		3	Hanumantpura	141.27	141.27	100
3	Kalesara	4	Kalesara	2061.00	1982.93	96
		5	Sarsadi	393.00	341.04	87
4	Dantra	6	Dantra	1210.37	1210.37	100
		7	Liyalikhera	706.00	467.14	66
5	Budhwara	8	Budhwara	2195.00	2101.43	96
		9	Nuriyawas	825.00	608.07	74
6	Rampura Dabla	10	Rampura Dabla	1067.32	1067.32	100
		11	Fatehpura	189.54	189.54	100
		12	Sethen	840.00	830.44	99
7	Govindgarh	13	Govindgarh	2719.00	638.46	23
8	Jaswantpura	14	Jaswantpura	1570.70	1570.70	100
9	Picholiya	15	Picholiya	2110.00	1679.80	80
10	Bhanwta	16	Bhanwta	1417.00	1068.45	75
11	Dodiana	17	Dodiana	1130.00	915.30	81
		18	Nathuthala	486.00	437.93	90
12	Bhagwanpura	19	Bhagwanpura	989.00	956.20	97
		20	Surajkund	970.00	650.00	70
		21	Sawaipura	393.00	61.58	16
		22	Motisar	561.00	283.00	59
13	Dumara	23	Dumara	631.00	241.32	15
		24	Aamba Masiniya	1275.00	570.96	45
14	Ganahera	25	Ganahera	878.00	594.65	68
		26	Chawandiya	514.00	429.25	84
15	Kadel	27	Kadel	508.00	110.56	22
		28	Dungariya Khurd	631.00	432.04	68
		29	Guda	905.00	289.52	32
		30	Rewat	510.00	214.15	42
		31	Majewala	821.00	320.64	39
17	Nand	32	Nand	1718.00	1392.75	81
		33	Rampura Nand	373.00	351.82	94
		34	Leswa	1375.00	1336.20	97

S. No.	Panchayat Name	Village Sr. No.	Village Name	Total area of Village in ha	Area falls under boundary in Ha	Area falls under boundary in %
18	Pushkar	35	Pushkar(M)	1464.00	215.65	15
		36	Pushkar(R)	848.00	218.89	26
19	Khori	37	Khori	540.00	319.39	59
		38	Kanwlai	570.00	234.33	41
20	Saradhna	39	Saradhna	2512.00	1549.78	62
21	Tilora	40	Tilora	1198.00	452.24	38
		41	Kishanpura Goyla	1518.00	1190.98	78
22	Devnagar	42	Devnagar	1069.00	598.99	56
		43	Banseli	504.00	410.96	82
23	Miyapur	44	Miyapur	783.00	202.00	55
	Total			**48435.21**	**31824.67**	

(Source: GWD, Cluster)

Figure 9: The Location map of Pisangan cluster



(Source: GWD, Ajmer)

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

Table 29 Area (in ha %) of Agricultural Crops in 2006-07 & 2015-16, increase / decrease over 10 years in State & Ajmer district

Crops	State							Ajmer							Increase (+) / decrease (-) in Productivity
	2006-07		2015-16		Deviation over 10 years		Average last 10 Years	2006-07		2015-16		Deviation over 10 years		Average last 10 Years	
	Area	%	Area	%	Area	%		Area	%	Area	%	Area	%		
Bajra	4910409	27.78%	4044591	22.88%	-865818	-4.90%	**4739211**	86479	19.66%	61248	13.92%	-25231	-5.74%	**77664.1**	1.64%
Jowar	662055	3.74%	631170	3.57%	-30885	-0.17%	**641570.1**	149417	33.97%	147324	33.49%	-2093	-0.48%	**141166.1**	22.00%
Guar	2807913	15.88%	4786781	27.08%	1978868	11.19%	**3670753**	6285	1.43%	32883	7.48%	26598	6.05%	**17709.9**	0.48%
Maize	1032079	5.84%	866541	4.90%	-165538	-0.94%	**1007972**	36017	8.19%	26406	6.00%	-9611	-2.18%	**32329.8**	3.21%
Groundnut	306037	1.73%	516850	2.92%	210813	1.19%	**387853**	3301	0.75%	2366	0.54%	-935	-0.21%	**2514.7**	0.65%
Cotton	349602	1.98%	447649	2.53%	98047	0.55%	**390183.1**	5612	1.28%	14403	3.27%	8791	2.00%	**10116.6**	2.59%
Moong	759454	4.30%	1363989	7.72%	604535	3.42%	**1001942**	71117	16.17%	89006	20.23%	17889	4.07%	**88251.9**	8.81%
Wheat	2564840	14.51%	3108973	17.59%	544133	3.08%	**2851322**	30011	6.82%	42294	9.61%	12283	2.79%	**41492.1**	1.46%
Barley	232271	1.31%	256029	1.45%	23758	0.13%	**281434.6**	8809	2.00%	17597	4.00%	8788	2.00%	**18014**	6.40%
Cumin	149816	0.85%	511078	2.89%	361262	2.04%	**324727.6**	5516	1.25%	7751	1.76%	2235	0.51%	**7695.8**	2.37%
Mustard	3099570	17.53%	2532330	14.32%	-567240	-3.21%	**2561288**	19785	4.50%	39309	8.94%	19524	4.44%	**28779**	1.12%
Gram	1010754	5.72%	941950	5.33%	-68804	-0.39%	**1297770**	7966	1.81%	19690	4.48%	11724	2.67%	**59063.7**	4.55%

(Source: Agriculture department, Ajmer)

Table 30: Area (in ha) of Agricultural Crops in the State

Crops	2006-07	2007-08	2008-2009	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	Average of last 10 Years
Bajra	4910409	5077396	5206162	5168502	5519448	4986783	3988912	4412998	4076909	4044591	**4739211**
Jowar	662055	625646	576744	718457	726916	553754	680375	579615	660969	631170	**641570.1**
Guar	2807913	2909719	3318184	2581273	2980946	3094163	4533270	5070076	4625206	4786781	**3670753.1**
Maize	1032079	1050663	1053878	1096231	1147191	1039135	986158	916391	891457	866541	**1007972.4**
Moong	759454	1059587	886019	922885	1049490	1272228	791851	1019970	893947	1363989	**1001942**
Groundnut	306037	276345	324209	326032	349331	414671	402252	461979	500824	516850	**387853**
Cotton	349602	369179	385659	444540	335871	131443	523040	522724	392124	447649	**390183.1**
Wheat	2564840	2591804	2294848	2394215	3036141	2935341	3063202	3205604	3318248	3108973	**2851321.6**
Barley	232271	249189	286950	223406	327991	278016	307911	309281	343302	256029	**281434.6**
Cumin	149816	215474	169142	203855	110637	467977	495691	488823	434783	511078	**324727.6**
Mustard	3099570	2458197	2738014	2212339	2489906	2441254	2424956	2782539	2433778	2532330	**2561288.3**
Gram	1010754	1231273	1259428	884358	1783281	1433928	1252908	1923501	1256323	941950	**1297770.4**

(Source: Agriculture department, Ajmer)

Table 31: Area (in %) of Agricultural Crops in the State

Crops	2006-07	2007-08	2008-2009	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	Average last 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%
Jowar	3.74%	3.66%	3.29%	4.23%	3.96%	3.07%	3.89%	3.17%	3.74%	3.57%	3.63%
Guar	15.88%	17.02%	18.91%	15.21%	16.25%	17.16%	25.94%	27.75%	26.16%	27.08%	20.76%
Moong	4.30%	6.20%	5.05%	5.44%	5.72%	7.05%	4.53%	5.58%	5.06%	7.72%	5.67%
Maize	5.84%	6.15%	6.00%	6.46%	6.25%	5.76%	5.64%	5.02%	5.04%	4.90%	5.70%
Groundnut	1.73%	1.62%	1.85%	1.92%	1.90%	2.30%	2.30%	2.53%	2.83%	2.92%	2.19%
Cotton	1.98%	2.16%	2.20%	2.62%	1.83%	0.73%	2.99%	2.86%	2.22%	2.53%	2.21%

Crops	2006-07	2007-08	2008-2009	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	Average last 10 Years
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%
Cumin	0.85%	1.26%	0.96%	1.20%	0.60%	2.59%	2.84%	2.68%	2.46%	2.89%	1.84%
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, Ajmer)

Table 32: Cropping Pattern (%) for 10 Years (2006-07 to 2015-16) at the District

Crops	2006-07	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015	2015-16	Average of last 10 Years
Bajra	86479	83559	83304	85338	94322	74554	70488	67906	69443	61248	**77664.1**
Jowar	149417	136794	143298	147086	160379	116289	135097	138621	137356	147324	**141166.1**
Guar	6285	13812	10038	8634	6375	5347	19915	44540	29270	32883	**17709.9**
Moong	71117	94831	73996	78976	83408	131894	93501	79263	86527	89006	**88251.9**
Maize	36017	35762	35740	35274	35419	32424	29479	29443	27334	26406	**32329.8**
Groundnut	3301	2327	2629	2390	2030	2665	2765	2590	2084	2366	**2514.7**
Cotton	5612	5133	6328	6450	3281	11665	17738	15278	15278	14403	**10116.6**
Wheat	30011	21909	16605	8761	64322	46550	66027	56000	62442	42294	**41492.1**
Barley	8809	7225	7878	3933	42326	17419	25897	24526	24530	17597	**18014**
Cumin	5516	5598	2723	1527	7586	13138	13360	11291	8468	7751	**7695.8**
Mustard	19785	13048	21662	2857	24761	26943	40971	52595	45859	39309	**28779**
Gram	7966	3689	20783	158	111133	87692	90065	167018	82443	19690	**59063.7**

(Source: Agriculture department, Ajmer)

Table 33: Area (in %) of Agricultural Crops in the District

Crops	2006-07	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015	2015-16	Average of last 10 Years
Bajra	19.66%	19.80%	19.71%	20.46%	20.67%	16.60%	15.52%	14.83%	15.79%	13.92%	17.65%
Jowar	33.97%	32.41%	33.91%	35.27%	35.15%	25.90%	29.74%	30.27%	31.22%	33.49%	32.09%
Guar	1.43%	3.27%	2.38%	2.07%	1.40%	1.19%	4.38%	9.73%	6.65%	7.48%	4.03%
Moong	16.17%	22.47%	17.51%	18.94%	18.28%	29.37%	20.58%	17.31%	19.67%	20.23%	20.06%
Maize	8.19%	8.47%	8.46%	8.46%	7.76%	7.22%	6.49%	6.43%	6.21%	6.00%	7.35%
Groundnut	0.75%	0.55%	0.62%	0.57%	0.44%	0.59%	0.61%	0.57%	0.47%	0.54%	0.57%
Cotton	1.28%	1.22%	1.50%	1.55%	0.72%	2.60%	3.90%	3.34%	3.47%	3.27%	2.30%
Wheat	6.82%	5.19%	3.93%	2.10%	14.10%	10.37%	14.53%	12.23%	14.19%	9.61%	9.43%
Barley	2.00%	1.71%	1.86%	0.94%	9.28%	3.88%	5.70%	5.36%	5.58%	4.00%	4.09%
Cumin	1.25%	1.33%	0.64%	0.37%	1.66%	2.93%	2.94%	2.47%	1.92%	1.76%	1.75%
Mustard	4.50%	3.09%	5.13%	0.69%	5.43%	6.00%	9.02%	11.48%	10.42%	8.94%	6.54%
Gram	1.81%	0.87%	4.92%	0.04%	24.35%	19.53%	19.83%	36.47%	18.74%	4.48%	13.43%

(Source: Agriculture department, Ajmer)

Table 34 Area (ha), Production in Kg & Productivity in Kg/ha, deviation over last 10 Years in State & District and Area, Production in % & increase (+)/Decrease (-) in Productivity in kg/ ha of District over State

Crops	Details	State				Ajmer				% area & Production, increase(+)/decrease (-) in Productivity in Kg/ha
		2006-07	2015-16	Deviation over last 10 Years	Average (Upto 10 Years)	2006-2007	2015-2016	Deviation over last 10 Years	Average (Upto 10 Years)	
Maize	Area	1032079	866541	-165538	**1007972.4**	36017	26406	-9611	**32329.8**	3.21%
	Production	1117941	1141696	23755	**1576935.4**	36979	17624	-19355	**29585.8**	1.88%
	Productivity	1083	1318	235	**1564.3**	1027	667	-360	**913.4**	-650.9
Groundnut	Area	306037	516850	210813	**387853**	3301	2366	-935	**2514.7**	0.65%
	Production	399509	1048718	649209	**684356.8**	1217	3440	2223	**2430.5**	0.36%
	Productivity	1305	2029	724	**1723.2**	369	1454	1085	**999.4**	-723.8
Cotton	Area	349602	447649	98047	**390183.1**	5612	14403	8791	**10116.6**	2.59%
	Production	746798	1214398	467600	**1001323.3**	11928	37841	25913	**23514.4**	2.35%
	Productivity	363	461	98	**443.4**	361	447	86	**364.3**	-79.1
Jowar	Area	662055	631170	-30885	**641570.1**	149417	147324	-2093	**141166.1**	22.00%
	Production	367816	344269	-23547	**828508.1**	87848	45202	-42646	**75146**	9.07%
	Productivity	556	545	-11	**589.2**	588	307	-281	**537.2**	-52
Bajra	Area	4910409	4044591	-865818	**4739211**	86479	61248	-25231	**77664.1**	1.64%
	Production	3440400	3211656	-228744	**4220252.1**	70023	47211	-22812	**75971.4**	1.80%
	Productivity	701	794	93	**894**	810	771	-39	**984.9**	90.9
Guar	Area	2807913	4786781	1978868	**3670753.1**	6285	32883	26598	**17709.9**	0.48%
	Production	658426	2223474	1565048	**1660745.2**	4119	10465	6346	**9439.2**	0.57%
	Productivity	234	465	231	**430.2**	655	318	-337	**533.2**	103
Mustard	Area	3099570	2532330	-567240	**2561288.3**	19785	39309	19524	**28779**	1.12%
	Production	3766923	3257987	-508936	**3269315.2**	15810	47433	31623	**32492.9**	0.99%
	Productivity	1215	1287	72	**1267.4**	799	1207	408	**1028.3**	-239.1
Gram	Area	1010754	941950	-68804	**1297770.4**	7966	19690	11724	**59063.7**	4.55%
	Production	872559	840341	-32218	**1022230.1**	4858	16423	11565	**51543.6**	5.04%
	Productivity	863	892	29	**779**	610	834	224	**719.8**	-59.2
Moong	Area	759454	1363989	604535	**1001942**	71117	89006	17889	**88251.9**	8.81%
	Production	271112	596850	325738	**408775.8**	38287	45988	7701	**34504.4**	8.44%
	Productivity	357	438	81	**398.2**	538	517	-21	**395.4**	-2.8
Wheat	Area	2564840	3108973	544133	**2851321.6**	30011	42294	12283	**41492.1**	1.46%
	Production	7755883	10468161	2712278	**8721618.8**	84048	116787	32739	**121104.6**	1.39%
	Productivity	3024	3367	343	**3225.6**	2801	2761	-40	**2794.4**	-431.2
Barley	Area	232271	256029	23758	**281434.6**	8809	17597	8788	**18014**	6.40%
	Production	591582	766379	174797	**798120.9**	18989	43542	24553	**44603.8**	5.59%
	Productivity	2547	2993	446	**2818.7**	2156	2474	318	**2411.7**	-407

Crops	Details	State				Ajmer				% area & Production, increase(+)/decrease (-) in Productivity in Kg/ha
		2006-07	2015-16	Deviation over last 10 Years	Average (Upto 10 Years)	2006-2007	2015-2016	Deviation over last 10 Years	Average (Upto 10 Years)	
Cumin	Area	149816	511078	361262	**324727.6**	5516	7751	2235	**7695.8**	2.37%
	Production	23666	200848	177182	**123788.6**	805	2646	1841	**2601.4**	2.10%
	Productivity	158	393	235	**334.7**	143	341	198	**304.4**	-30.3
Tarameera	Area	112107	16792	-95315	**206125**	22222	729	-21493	**15419.2**	7.48%
	Production	38691	7279	-31412	**86583.6**	662	284	-378	**7605.3**	8.78%
	Productivity	345	433	88	**412.3**	298	390	92	**464.9**	52.6

(Source: Agriculture department, Ajmer)

Table 35 Area (ha), Production in Kg & Productivity in Kg/ha in State

Crops	Details	State										
		2006-07	2007-08	2008-2009	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	Average (Upto 10 Years)
Maize	Area	1032079	1050663	1053878	1096231	1147191	1039135	986158	916391	891457	866541	**1007972**
	Production	1117941	1954358	1831110	1144716	2061424	1644881	1858202	1463780	1551246	1141696	**1576935**
	Productivity	1083	1860	1737	1044	1797	1583	1884	1597	1740	1318	**1564.3**
Groundnut	Area	306037	276345	324209	326032	349331	414671	402252	461979	500824	516850	**387853**
	Production	399509	477356	540300	354458	686817	800633	623729	900928	1011120	1048718	**684356.8**
	Productivity	1305	1727	1667	1087	1966	1931	1551	1950	2019	2029	**1723.2**
Cotton	Area	349602	369179	385659	444540	335871	131443	523040	522724	392124	447649	**390183.1**
	Production	746798	862211	723431	903298	857002	366106	1527919	1527801	1284269	1214398	**1001323**
	Productivity	363	397	410	345	434	473	497	497	557	461	**443.4**
Jowar	Area	662055	625646	576744	718457	726916	553754	680375	579615	660969	631170	**641570.1**
	Production	367816	394746	333003	104192	508877	410114	420392	356672	5045000	344269	**828508.1**
	Productivity	556	631	577	145	700	741	618	616	763	545	**589.2**
Bajra	Area	4910409	5077396	5206162	5168502	5519448	4986783	3988912	4412998	4076909	4044591	**4739211**
	Production	3440400	4223266	4294938	2034875	6117800	6434880	3870673	4117910	4456123	3211656	**4220252**
	Productivity	701	832	825	394	1108	1290	970	933	1093	794	**894**
Guar	Area	2807913	2909719	3318184	2581273	2980946	3094163	4533270	5070076	4625206	4786781	**3670753**
	Production	658426	1243733	1261067	201125	1540544	1846609	2026671	2861835	2743968	2223474	**1660745**
	Productivity	234	427	380	78	517	597	447	564	593	465	**430.2**
Mustard	Area	3099570	2458197	2738014	2212339	2489906	2441254	2424956	2782539	2433778	2532330	**2561288**
	Production	3766923	2196676	3465942	2912294	3883300	2950312	3759937	3620846	2878935	3257987	**3269315**
	Productivity	1215	957	1266	1316	1560	1209	1380	1301	1183	1287	**1267.4**
Gram	Area	1010754	1231273	1259428	884358	1783281	1433928	1252908	1923501	1256323	941950	**1297770**
	Production	872559	574157	981135	534630	1600718	989986	1277303	1640387	911085	840341	**1022230**
	Productivity	863	466	779	605	898	690	1019	853	725	892	**779**
Moong	Area	759454	1059587	886019	922885	1049490	1272228	791851	1019970	893947	1363989	**1001942**

Crops	Details	State										
		2006-07	2007-08	2008-2009	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	Average (Upto 10 Years)
	Production	271112	416538	373364	43981	652228	647177	234749	391199	460560	596850	**408775.8**
	Productivity	357	393	421	48	621	509	296	384	515	438	**398.2**
	Area	2564840	2591804	2294848	2394215	3036141	2935341	3063202	3205604	3318248	3108973	**2851322**
	Production	7755883	7124921	7287016	2384808	10424350	10160427	10766607	11020139	9823876	10468161	**8721619**
Wheat	Productivity	3024	2749	3175	3133	3433	3461	3515	3438	2961	3367	**3225.6**
	Area	232271	249189	286950	223406	327991	278016	307911	309281	343302	256029	**281434.6**
	Production	591582	539049	878382	619766	934651	789153	957824	942032	962391	766379	**798120.9**
Barley	Productivity	2547	2163	3061	2774	2850	2839	3111	3046	2803	2993	**2818.7**
	Area	149816	215474	169142	203855	110637	467977	495691	488823	434783	511078	**324727.6**
	Production	23666	66359	42728	80531	114925	177835	176347	233819	120828	200848	**123788.6**
Cumin	Productivity	158	308	253	395	348	380	356	478	278	393	**334.7**
	Area	112107	38109	100120	97542	1188738	60994	109785	296459	40604	16792	**206125**
	Production	38691	10327	13586	35910	486366	25979	54634	176292	16772	7279	**86583.6**
Tarameera	Productivity	345	271	365	368	409	426	498	595	413	433	**412.3**

(Source: Agriculture department, Ajmer)

Table 36 Area (ha), Production in Kg & Productivity in Kg/ha in District Ajmer

Crops	Details	Ajmer										
		2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015	2015-2016	Average (Upto 10 Years)
	Area	36017	35762	35740	35274	35419	32424	29479	29443	27334	26406	**32329.8**
	Production	36979	38153	25704	2131	53352	38437	24734	32513	26231	17624	**29585.8**
Maize	Productivity	1027	1067	719	60	1506	1185	839	1104	960	667	**913.4**
	Area	3301	2327	2629	2390	2030	2665	2765	2590	2084	2366	**2514.7**
	Production	1217	2536	1755	278	2865	3624	2297	3470	2823	3440	**2430.5**
Groundnut	Productivity	369	1090	668	116	1411	1360	831	1340	1355	1454	**999.4**
	Area	5612	5133	6328	6450	3281	11665	17738	15278	15278	14403	**10116.6**
	Production	11928	12723	10948	4494	5689	22092	34977	47226	47226	37841	**23514.4**
Cotton	Productivity	361	421	294	118	295	322	335	525	525	447	**364.3**
	Area	149417	136794	143298	147086	160379	116289	135097	138621	137356	147324	**141166.1**
	Production	87848	63174	76740	2375	121578	89363	104895	83062	77223	45202	**75146**
Jowar	Productivity	588	462	536	16	758	768	776	599	562	307	**537.2**
	Area	86479	83559	83304	85338	94322	74554	70488	67906	69443	61248	**77664.1**
	Production	70023	82062	81596	6464	128399	95330	76018	83569	89042	47211	**75971.4**
Bajra	Productivity	810	982	979	76	1361	1279	1078	1231	1282	771	**984.9**
	Area	6285	13812	10038	8634	6375	5347	19915	44540	29270	32883	**17709.9**
	Production	4119	7400	4536	42	5471	3575	11377	30025	17382	10465	**9439.2**
Guar	Productivity	655	536	452	5	858	669	571	674	594	318	**533.2**

Crops	Details	Ajmer										
		2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015	2015-2016	Average (Upto 10 Years)
	Area	19785	13048	21662	2857	24761	26943	40971	52595	45859	39309	**28779**
	Production	15810	12022	13895	1599	38618	29432	61185	72205	32730	47433	**32492.9**
Mustard	Productivity	799	921	641	507	1560	1092	1469	1373	714	1207	**1028.3**
	Area	7966	3689	20783	158	111133	87692	90065	167018	82443	19690	**59063.7**
	Production	4858	2339	9456	65	92407	66645	106751	178028	38464	16423	**51543.6**
Gram	Productivity	610	634	455	411	831	707	1185	1066	465	834	**719.8**
	Area	71117	94831	73996	78976	83408	131894	93501	79263	86527	89006	**88251.9**
	Production	38287	30141	20891	1554	62759	43251	27347	39979	34847	45988	**34504.4**
Moong	Productivity	538	318	282	20	752	328	292	504	403	517	**395.4**
	Area	30011	21909	16605	8761	64322	46550	66027	56000	62442	42294	**41492.1**
	Production	84048	52373	37499	21653	207905	146725	219014	193073	131969	116787	**121104.6**
Wheat	Productivity	2801	2390	2258	2472	3232	3152	3317	3448	2113	2761	**2794.4**
	Area	8809	7225	7878	3933	42326	17419	25897	24526	24530	17597	**18014**
	Production	18989	14843	18410	8653	95624	47441	83940	66304	48292	43542	**44603.8**
Barley	Productivity	2156	2054	2337	2200	2259	2724	3241	2703	1969	2474	**2411.7**
	Area	5516	5598	2723	1527	7586	13138	13360	11291	8468	7751	**7695.8**
	Production	805	1672	799	418	2235	5917	7260	3316	946	2646	**2601.4**
Cumin	Productivity	143	299	293	274	295	450	543	294	112	341	**304.4**
	Area	22222	1457	14105	2321	91266	6994	3295	9274	2529	729	**15419.2**
	Production	662	549	3676	405	54655	3351	1946	9326	1199	284	**7605.3**
Tarameera	Productivity	298	377	261	174	599	479	591	1006	474	390	**464.9**

(Source: Agriculture department, Ajmer)

Annexure 2.3 Farmers' category wise Cultivated Area in Pisangan Cluster

Table 37. Farmers' Category-wise Cultivated Area in Pisangan 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	599	1496	8794	10290	3056	1852	31	5351
2	Small farmer	4295	3242	4696	7938	2357	1429	24	4128
3	Marginal farmer	9439	3574	4814	8388	2491	1510	25	4362
4	Landless person	648	-	-	-	-	-	-	-
5	No. of BPL households	749	275	674	949	280	171	3	495
	Total (1to 4)	**14981**	**8312**	**18304**	**26616**	**7904**	**4791**	**80**	**13841**
	Category wise Cultivated Area in Pratapgarh (Jakham-Catchment) Cluster in %								
1	Large farmer	4.00%	5.62%	33.04%	38.66%	11.48%	6.96%	0.12%	20.10%
2	Small farmer	28.67%	12.18%	17.64%	29.82%	8.86%	5.37%	0.09%	15.51%
3	Marginal farmer	63.01%	13.43%	18.09%	31.51%	9.36%	5.67%	0.09%	16.39%
4	Landless person	4.33%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
5	No. of BPL households	5.00%	1.03%	2.53%	3.56%	1.05%	0.64%	0.01%	1.86%
	Total (1to 4)	**100.00%**	**31.23%**	**68.77%**	**100.00%**	**30.75%**	**18.64%**	**0.31%**	**53.86%**

(**Source:** Compiled during the Field Survey)

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

Table 38: Area in ha, Cropping Pattern (%), Increase/Decrease trend in last 10 years, Average area and % Area in Pisangan cluster of District Average

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	Jowar	3808	14.31%	4677	17.57%	869	3.26%	**3705.88**
2	Bajra	4709	17.69%	4692	17.63%	-17	-0.06%	**4058.64**
3	Moong	1589	5.97%	2530	9.51%	941	3.54%	**2095.73**
4	Guar	2931	11.01%	3611	13.57%	680	2.56%	**2726.64**
5	Maize	60	0.23%	63	0.24%	2	0.01%	**64.18**
6	Groundnut	840	3.16%	783	2.94%	-58	-0.22%	**602.18**
7	Cotton	23	0.09%	37	0.14%	14	0.05%	**21.11**
	Total Area	**13961**	**52.46%**	**16393**	**61.59%**	**2431**	**9.14%**	**13274.36**
B.	**Rabi**							
1	Wheat	2224	8.35%	2986	11.22%	763	2.87%	**2095.54**
2	Barley	844	3.17%	3776	14.19%	2932	11.02%	**1077.80**
3	Gram	59	0.22%	110	0.41%	51	0.19%	**89.35**
4	Mustered	395	1.48%	581	2.18%	186	0.70%	**355.54**

S. No.	Crops	2006-07		2015-16		Increase (+) / decrease (-) over last 10 Years		Average of 10 Years
		Area (ha)	%	Area (ha)	%	Area (ha)	%	
5	Cumin	437	1.64%	662	2.49%	225	0.85%	**471.66**
6	Taramira	179	0.67%	196	0.74%	17	0.07%	**145.00**
	Total Area	**4138**	**15.55%**	**8312**	**31.23%**	**4175**	**15.68%**	**4234.88**
	G.Total	**18099**	**68.00%**	**24705**	**92.82%**	**6606**	**24.82%**	**17509.24**

(Source: Agriculture Department, Ajmer)

Table 39: The Status of Cropped area in ha and Cropping Pattern in % of Agricultural Crops in Pisangan 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	Jowar	3808	4165	4280	3928	4274	3595	4396	3843	4489	4677	**3705.883**
2	Bajra	4709	4805	4661	4624	4806	4447	3333	2944	4898	4692	**4058.638**
3	Moong	1589	1746	1762	1689	1684	2668	1989	1760	5529	2530	**2095.728**
4	Guar	2931	3117	3016	2868	2474	2605	2649	3031	3612	3611	**2726.638**
5	Maize	60	70	79	52	82	75	83	82	79	63	**64.179**
6	Groundnut	840	382	790	777	550	726	375	360	815	783	**602.178**
7	Cotton	23	22	24	24	22	19	18	18	21	37	**21.112**
	Total Area	**13961**	**14307**	**14612**	**13961**	**13892**	**14134**	**12844**	**12038**	**19443**	**16393**	**13274.36**
B.	**Rabi**											
1	Wheat	2224	2213	2177	2070	2188	1967	2078	2191	2940	2986	**2095.535**
2	Barley	844	894	877	815	867	702	853	830	1172	3776	**1077.8**
3	Gram	59	66	157	100	231	24	68	75	70	110	**89.3475**
4	Mustered	395	397	416	338	364	307	403	257	500	581	**355.5365**
5	Cumin	437	483	457	496	563	431	595	520	668	662	**471.6649**
	Total Area	**4138**	**4226**	**4261**	**3982**	**4419**	**3598**	**4065**	**3937**	**5475**	**8312**	**4234.882**
	G. Total	**18099**	**18533**	**18874**	**17944**	**18312**	**17732**	**16909**	**15975**	**24918**	**24705**	**17509**

(Source: Agriculture department, Ajmer)

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

Table 40: Area in ha, Cropping Pattern (%) of horticultural crops, Increase/Decrease trend in last 10 years, Average area and % Area in District of State Average

Crops	State							Ajmer							% area & Production, increase (+)/decrease (-) in Productivity in Kg/ha
	2011-12		2015-16		Deviation over 10 years		Average of last 05 Years	2011-12		2015-16		Deviation over 10 years		Average of last 05 Years	
	Area	%	Area	%	Area	%		Area	%	Area	%	Area	%		
Anola	1740	0.010%	1656	0.009%	-84	-0.0005%	**1651**	230	0.052%	330	0.075%	100	0.023%	**264.2**	16.00%
Lemon	2701	0.015%	2891	0.016%	190	0.001%	**2841**	62	0.014%	84	0.019%	22	0.005%	**74**	2.60%
Chilly	12722	0.072%	12318	0.070%	-404	-0.002%	**10809**	41	0.009%	270	0.061%	229	0.052%	**129.4**	1.20%
Pea	12516	0.071%	14219	0.080%	1703	0.010%	**12927.4**	0	0.000%	736	0.167%	736	0.167%	**435**	3.36%
Okra	3743.21	0.021%	3282	0.019%	-461.21	-0.003%	**3695.242**	207	0.047%	177	0.040%	-30	-0.007%	**241.8**	6.54%
Tomato	17645.79	0.100%	20507	0.116%	2861.21	0.016%	**17465.56**	746.5	0.170%	1065	0.242%	318.5	0.072%	**968.5**	5.55%
Cole crop	10272.18	0.058%	13857	0.078%	3584.82	0.020%	**11455.24**	1214	0.276%	2289	0.520%	1075	0.244%	**1647.4**	14.38%

(Source: Horticulture department, Ajmer)

Table 41: Area in ha, Cropping Pattern (%) and Average of last 5 Years of horticultural crops in Rajasthan State and Ajmer District

Crops	State						Ajmer						% area & Production, increase (+)/decrease (-) in Productivity in Kg/ha
	2011-12	2012-2013	2013-2014	2014-2015	2015-16	Average of last 05 Years	2011-12	2012-2013	2013-2014	2014-2015	2015-16	Average of last 05 Years	
Anola	1740	1637	1613	1609	1656	**1651**	230	223	269	269	330	**264.2**	16.00%
Lemon	2701	2683	2929	3001	2891	**2841**	62	54	85	85	84	**74**	2.60%
Chilly	12722	10619	8715	9671	12318	**10809**	41	107	113	116	270	**129.4**	1.20%
Pea	12516	10740	13600	13562	14219	**12927.4**	0	565	355	519	736	**435**	3.36%
Okra	3743.21	4017	3953	3481	3282	**3695.242**	207	268	245	312	177	**241.8**	6.54%
Tomato	17645.79	15505	17151	16519	20507	**17465.558**	746.5	736	1090	1205	1065	**968.5**	5.55%
Cole crop	10272.18	10611	10906	11630	13857	**11455.236**	1214	1198	1769	1767	2289	**1647.4**	14.38%

(Source: Horticulture department, Ajmer)

Annexure 2.6: Area and Cropping Pattern of horticultural crops in Pisangan cluster

Table 42: Crop wise area (in ha) of Horticultural crops in Pisangan Cluster

S. No.	Season/Crop	Area (ha)	Cropping intensity/pattern (%)
A.	**Vegetables**		
1	Tomato	271	1.37%
2	Chilly	4.07	0.07%
3	Okra	42	0.21%
4	Cole Crops	1225	6.19%
5.	Pea	446.00	2.26%
	Total Vegetables	**2109.00**	**10.66%**
B.	**Fruits**		
1	Lemon	51.00	0.26%
2	Aonla	212.00	1.07%
	Total Fruits	**263.00**	**1.33%**
	Total Horticulture	**2372.00**	**11.99%**

(Source: Horticulture department, Pisangan)

Annexure 2.7: Average Annual Rainfall in the last decade in Pisangan cluster

Table 43: Average Annual Rainfall in the last 10 years (decade) in Pisangan

S. No	Year	Average Annual Rainfall (mm)
1	2006	**393.00**
2	2007	**361.00**
3	2008	**127.00**
4	2009	**819.00**
5	2010	**582.00**
6	2011	**607.00**
7	2012	**421.50**
8	2013	**676.00**
9	2014	**434.50**
10	2015	**667.50**
	Total	**5088.50**
	Average	**508.85**
	Say	**509**

(Source: Water Resource department, Ajmer)

Annexure 2.8: Approach to study ground water occurrence

To study about ground water occurrence & its movement, the various lithological units have been classified on the basis of their degree of consolidation and related parameters. Basalt is the only Aquifer in Pisangan Cluster. The availability occurrence and movement of Ground water depends upon the topography, structures, geomorphology and hydrologic properties of water bearing formation. Ground water occurs under Water table conditions but confined conditions are also common. Wide variety of lithological material forms aquifers in the district. **The main water bearing formation i.e. the Aquifer in the cluster is Alluvium followed by Schist**. The quality of ground water in the area is almost potable and suitable for domestic and agriculture purposes.

Indiscriminate ground water development has led to substantial ground water level declines both in hard rocks and alluvial areas threatening sustainability of this resource. This has destabilized the aquifer system and resulted in unsustainable development.

The Pre-Monsoon depth to water varies from 21.57 mts to 25.24 mts below ground level and Post-monsoon depth to from 20.20 mts to 23.64 mts Increased groundwater draft to meet the increased demand of agriculture sector is the main cause for declining trend of Ground Water levels. (See water Level sheet of **Annexure 6.1.**

Present practice of groundwater development by individual farmer has resulted in inequity as well as unsustainable management of groundwater resources.

Since groundwater occurs in an aquifer and is not confined to the land holdings of the individual farmer, it is imperative that for sustainable use, groundwater resources are managed by communities in an aquifer instead of an individual well owner.

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 Pisangan Cluster is done on non-command areas for monsoon and non-monsoon seasons and consolidated as Net Annual Ground water Availability in the Cluster area.

Ground water potential of Pisangan cluster area block Pisangan, Ajmer district has been estimated as on 30.06.2017 on the basis of GEC-97 Guidelines. Net Annual Ground water Availability as on 30.06.2017 was **24.2421 MCM**. The details are given in **Annexure 2.14.**

Stage of Ground Water Development: Stage of ground water development in the Pisangan Cluster area as on 30.06.2017 is **217.91 %** which indicates Cluster area are coming under Over-Exploited Zone. The scope of ground water development for Irrigation purposes is already exhausted. The Draft for irrigation should be reduced to **15.8780 MCM** bringing a balance between water recharge and extraction over time for Sustainable Ground Water availability. (**See: Annexure-2.14**)

Efficient use of ground water on farm water usages through:

- Demonstration of water efficient technologies for irrigation (Drip & Sprinklers etc.)
- Promotion of high value agriculture.
- Promotion of crops introduced and/or supported as part of improved crops rotation and management practices with lower water requirements.

For monitoring of impact assessment of Investments proposed in the Cluster area, 40 Piezometers & Observation wells or as per Site Specific requirement with installation of Digital Water Level Recorder (DWLR-Telemetric) is proposed to be constructed..

Annexure 2.9 SRR in Ajmer district & Rajasthan

Table 44: Seed Replacement Rate (SRR) in the State and Ajmer

Crop	Rajasthan						Ajmer					
	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 (%)
Maize	9.16	0	54.93	8.91	91529	51.37	0.29	635	10.95	0.26	949	17.84
Bajra	44.13	105614	59.83	40.76	94439	57.92	0.68	2176	80	0.69	1545	55.98
Groundnut	4.62	28041	4.05	50.10	65348	8.70	0.03	251	5.58	0.02	365	12.17
Wheat	32.06	1022634	31.90	33.18	1082866	32.63	0.56	10997	19.64	0.62	13254	21.23
Mustard	2.78	90171	81.02	2.43	87925	90.32	0.53	1356	64.45	0.45	1913	100.00
Gram	19.23	170104	11.79	12.56	171839	18.24	1.67	6224	4.97	0.83	5456	8.79
Barley	3.09	115195	37.25	3.43	132971	38.73	0.24	4999	20.38	0.25	4792	19.54

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

Annexure 2.10 SRR in Pisangan Cluster

Table 45: Seed Replacement Rate (SRR in %) in the Pisangan Cluster from 2011-12 to 2015-16

S. No.	Crop	2011-12			2012-13			2013-14			2014-15			2015-16		
		Area		Seed Replacement Rate (SRR) (in %)	Area		Seed Replacement Rate (SRR) (in %)	Area		Seed Replacement Rate (SRR) (in %)	Area		Seed Replacement Rate (SRR) (in %)	Area		Seed Replacement Rate (SRR) (in %)
		Total Sown	Sown under Certified Seed		Total Sown	Sown under Certified Seed		Total Sown	Sown under Certified Seed		Total Sown	Sown under Certified Seed		Total Sown	Sown under Certified Seed	
1	Jowar	3594.8	412.7	11.48%	4396.0	669.9	15.24%	3843.0	636.0	16.55%	4488.6	897.7	20.00%	4677.1	1122.5	24.00%
2	Bajra	4446.6	3651.1	82.11%	3333.4	2782.4	83.47%	2944.3	2524.7	85.75%	4898.3	4408.5	90.00%	4691.7	4410.2	94.00%
3	Moong	2667.9	516.2	19.35%	1989.3	422.1	21.22%	1760.2	402.7	22.88%	5528.8	1326.9	24.00%	2530.2	676.8	26.75%
4	Wheat	1966.6	673.6	34.25%	2077.6	750.2	36.11%	2190.5	832.2	37.99%	2940.1	1218.7	41.45%	2986.4	1447.8	48.48%
5	barley	702.5	267.3	38.05%	852.8	331.3	38.85%	830.3	334.2	40.25%	1171.5	479.7	40.95%	3776.3	1552.8	41.12%
6	Mustard	306.9	216.4	70.50%	403.3	304.7	75.55%	256.7	200.4	78.05%	499.8	397.6	79.55%	581.4	478.1	82.22%

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

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

Table 46: The Area Covered and Technical Grade Material (TGM) used under Plant Protection Measures during 2014-15 (Method of Plant Protection)

State/District	Season	Cereals	Pulses	Food Grains	Oilseed	Sugarcane	Cotton	Guar	Others
Rajasthan	K	4049	1277	5326	1856	16	775	1242	445
	R	2862	1160	4022	2289	0	0	0	690
	K&R	6911	2437	9348	4145	16	775	1242	1135
Ajmer	K	221	52	273	26	0	28	1	21
	R	48	43	91	21	0	0	0	5
	K&R	269	95	364	47	0	28	1	26
Rajasthan	K	26.34%	8.31%	34.65%	12.08%	5.04%	0.10%	8.08%	2.90%
	R	30.75%	12.46%	43.21%	24.59%	0.00%	0.00%	0.00%	7.41%
	K&R	28.00%	9.88%	37.88%	16.80%	0.06%	3.14%	5.03%	4.60%
Ajmer	K	1.44%	0.34%	1.78%	0.17%	0.00%	0.18%	0.01%	0.14%
	R	0.52%	0.46%	0.98%	0.23%	0.00%	0.00%	0.00%	0.05%
	K&R	1.09%	0.38%	1.48%	0.19%	0.00%	0.11%	0.00%	0.11%

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

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

Table 47: The Area (in 000ha) 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
Ajmer	K	265	15	34	26	3	6	349	16
	R	70	8	14	10	11	4	117	10
	K&R	335	23	48	39	14	10	466	26
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%
Ajmer	K	64.75%	3.66%	8.31%	6.35%	0.73%	1.47%	85.27%	3.91%
	R	28.49%	3.26%	5.70%	4.07%	4.48%	1.63%	47.63%	4.07%
	K&R	51.15%	3.51%	7.33%	5.95%	2.14%	1.53%	71.15%	3.97%

(K – Kharif, R – Rabi & T – Total)

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

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

Table 48. Crop Water Requirement of Agricultural and Horticultural Crops in Pisangan

Name of crop	Area in Ha	Requirement of water for crops per ha (In cum)	Present Crop Water Requirement in cum	Proposed Area (ha)	Proposed Crop Water Requirement in cum	Additional Crop Water Requirement in Cum
Kharif						
Sorghum	4145	1000	4145481.8	1500	1500000	-2645481.8
Peal millet	4392	1000	4391977	6509	6508570.1	2116593.1
Green gram	2295	1000	2294655	3213	3212517	917862
Guar	2992	1000	2991529	2842	2841952.6	-149576.45
Maize	73	1000	72528	76	76154.4	3626.4
Groundnut	640	5000	3198225	400	2000000	-1198225
Cotton	23	6000	137436	19	116760	-20676
Total	**14559**		**17231832**	**14559**	**16255954**	**-975877.75**
Wheat	2303	5000	11516470	1500.00	7500000	-4016470
Barley	1163	2500	2907710	1626.73	4066814	1159104
Gram	96	2500	240446.25	100.00	250000	9553.75
Mustard	396	3000	1187601	800.00	2400000	1212399
Cumin	531	3000	1593635.7	478.09	1434272.1	-159363.57
Taramira	152	1000	151760	136.58	136584	-15176
Total	**4641.40**		**17597623**	**4641.40**	**15787670**	**-1809952.82**
Grand Total	**19200.1172**	**-**	**34829455**	**19200.054**	**32043624**	**-2785830.57**
Vegetables						
Tomato	85	8000	680000	125	1000000	320000
Okra	20	8000	160000	65	520000	360000
Chilly	45	8000	360000	110	880000	520000
pea	180	8000	1440000	202	1616000	176000
Cole Crops	215	8000	1720000	285	2280000	560000
Total Vegetables	**545**	-	**4360000**	**787**	**6296000**	**1936000**
Fruits						
Aonla	120	9000	1080000	128	1152000	72000
Lime	22	8000	176000	30	240000	64000

Name of crop	Area in Ha	Requirement of water for crops per ha (In cum)	Present Crop Water Requirement in cum	Proposed Area (ha)	Proposed Crop Water Requirement in cum	Additional Crop Water Requirement in Cum
Total Fruits	**142**		**5616000**	**158**	**7688000**	**2072000**
Flowers						
Rose	185	9000	1665000	245	2205000	540000
Total Horticulture	**872**	-	**11641000**	**1190**	**16189000**	**4548000**
Grand Total	**20072.117**	-	**46470455**	**20390.054**	**48232624**	**1762169.43**

(Source: Agriculture Department & GWD DPR, Pisangan)

Annexure 2.14 Data to calculate ground water status of Pisangan cluster

The principal source of recharge to ground water is rainfall. Monthly monsoon and non-monsoon rainfall (mm) from the year 1996 to 2016 of the District Ajmer are attached in the excel sheets with the CACP report of Pisangan. (**See: Annexure-6.1**)

It also includes the following-

a. Ground water level of the cluster
b. Ground water extraction status
c. Ground water level trends
d. Ground water resource estimation
e. Seepage data, etc.

Annexure 2.15 Supporting institutions and service providers in Ajmer

Table 49: Supporting institutions and service providers in Ajmer

S.No.	Type of assistance	Name and address of agencies
1	Provisional Registration Certificate (EM-1) & Permanent Registration Certificate (EM-II) and PMEGP Scheme	District Industries Centre, Ajmer
2	Identification of Project Profiles, Techno-economic and managerial consultancy services, market survey and economic survey reports	MSME-Development Institute, Govt. of India, Ministry of MSME, 22 Godam Industrial Estate, Jaipur
3	Land and Industrial shed	RIICO, Ajmer
4	Financial assistance	RFC & Nationalized Banks
5	For Raw material under Govt. supply	RSSIC
6	Plant and Machinery under hire/purchase basis	NSIC
7	Power/ electricity	Ajmer Vidyut Vitran Nigam Ltd., Ajmer
8	Technical know-how	MSME-Development Institute, Govt. of India, Ministry of MSME, 22 Godam Industrial Estate, Jaipur
9	Quality &Standard	Bureau of Indian Standards, Jaipur Directorate of Marketing Inspection, Jaipur
10	Marketing/Export Assistance	NSIC, RSSIC

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

Table 50 Number of Household and Household Enterprises owing Animal/Poultry Birds in Pisangan Cluster

S. No.	Village	Cattle	Buffaloes	Goats	Sheep	Pigs	Backyard Poultry	Poultry Farm & Hatcheries
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1	Ambamaseena	74	89	147	28	0	0	0
2	Bhagwanpura	84	126	155	11	0	0	0
3	Banseli	220	240	125	28	3	2	0
4	Bhanwta	399	479	326	30	3	4	0
5	Budhwara	394	260	294	45	0	3	0
6	Dantra	192	150	133	21	2	6	0
7	Doomara	60	67	65	4	0	0	1
8	Chawandiya	85	72	69	40	0	0	0
9	Devnagar	121	118	89	14	0	0	0
10	Doongariya Khurd	85	82	76	60	0	0	0
11	Dodiyana	102	384	146	9	0	0	0
12	Fatehpura	64	79	27	3	0	0	0
13	Gangara	38	47	47	4	0	0	0
14	Gudha	229	285	304	31	0	5	0
15	Govindgarh	254	271	466	14	7	5	0
16	Hanwantpura	31	49	30	1	0	0	0
17	Jaswantpura	142	181	242	13	1	0	0
18	Kawalai	89	72	181	41	0	1	0
19	Kalesara	325	750	450	588	83	105	0
20	Kadal	151	146	94	99	0	0	0
21	Kishanpura Goyla	223	235	480	10	1	5	0
22	Khori	92	73	204	9	0	0	0
23	Leswa	295	400	350	15	12	8	102
24	Lyali Khera	48	102	154	7	0	0	0
25	Motisar	110	206	171	10	4	3	0
26	Majhewla	60	85	122	56	1	8	0
27	Miyapur	81	80	171	4	0	0	0
28	Nad	71	116	75	6	0	0	0
29	Nand	371	406	297	35	3	7	0
30	Nathoothala	137	110	120	6	0	0	0
31	Nooriyawas	148	161	303	17	0	5	0
32	Pushkar (M)	65	133	26	2	0	0	0
33	Pushkar ®	193	219	221	29	7	7	0
34	Peesangan	777	377	1002	20	44	27	0
35	Picholiya	216	344	478	13	10	6	0
36	Rampura Nand	79	103	61	17	0	5	0
37	Rampura Dabla	51	140	105	15	3	1	0

S. No.	Village	Cattle	Buffaloes	Goats	Sheep	Pigs	Backyard Poultry	Poultry Farm & Hatcheries
38	Rawat	176	158	133	58	0	0	0
39	Saradhana	51	62	154	23	0	0	0
40	Sarsari	318	309	152	352	0	27	0
41	Sawaipura	106	106	160	1	0	0	0
42	Sethan	62	76	68	7	0	1	0
43	Surajkund	133	170	224	3	0	0	0
44	Tilora	59	54	51	9	0	0	0
TOTAL		**7061**	**8172**	**8748**	**1808**	**184**	**241**	**103**

(Source: Animal Husbandry department, Pisangan)

Annexure 2.17 Goat Population profile of Pisangan cluster

Table 51 Goat Population profile of Pisangan 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	Ambamaseena	166	129	295	251	332	520	0	1103	1398
2	Bhagwanpura	187	125	312	179	238	233	0	650	962
3	Banseli	53	26	79	59	103	85	31	278	357
4	Bhanwta	229	35	264	242	497	519	353	1611	1875
5	Budhwara	44	35	79	147	799	103	14	1063	1142
6	Dantra	49	39	88	121	189	105	2	417	505
7	Doomara	17	15	32	23	188	31	2	244	276
8	Chawandiya	79	77	156	70	910	20	37	1037	1193
9	Devnagar	24	23	47	33	53	84	37	207	254
10	Doongariya Khurd	76	84	160	54	974	26	45	1099	1259
11	Dodiyana	85	12	97	187	425	91	0	703	800
12	Fatehpura	9	11	20	13	24	17	7	61	81
13	Gangara	37	28	65	85	117	254	0	456	521
14	Gudha	318	63	381	434	696	279	87	1496	1877
15	Govindgarh	351	30	381	367	454	494	0	1315	1696
16	Hanwantpura	0	2	2	15	70	0	0	85	87
17	Jaswantpura	108	10	118	219	223	305	0	747	865
18	Kawalai	88	54	142	121	176	163	88	548	690
19	Kalesara	32	38	70	118	149	113	0	380	450
20	Kadal	24	56	80	8	937	12	16	973	1053
21	Kishanpura Goyla	381	66	447	351	704	420	199	1674	2121
22	Khori	75	0	75	121	220	236	239	816	891
23	Leswa	121	31	152	425	547	708	0	1680	1832
24	Lyali Khera	167	13	180	242	451	0	0	693	873
25	Motisar	105	47	152	226	358	8	3	595	747
26	Majhewla	59	43	102	87	134	82	37	340	442
27	Miyapur	105	71	176	128	191	307	0	626	802
28	Nad	7	5	12	65	106	1	0	172	184
29	Nand	152	7	159	239	407	207	0	853	1012
30	Nathoothala	68	7	75	133	367	49	1	550	625
31	Nooriyawas	16	5	21	161	1105	297	63	1626	1647
32	Pushkar (M)	44	10	54	66	70	85	0	221	275
33	Pushkar ®	76	79	155	103	131	263	167	664	819
34	Peesangan	555	269	824	478	1198	792	214	2682	3506
35	Picholiya	743	204	947	758	1032	1008	0	2798	3745
36	Rampura Nand	30	22	52	49	66	73	42	230	282
37	Rampura Dabla	30	23	53	68	94	119	54	335	388

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		
38	Rawat	132	196	328	132	1348	21	56	1557	1885
39	Saradhana	410	2	412	170	398	176	0	744	1156
40	Sarsari	19	3	22	33	55	42	0	130	152
41	Sawaipura	381	0	381	407	541	486	0	1434	1815
42	Sethan	30	20	50	54	76	96	56	282	332
43	Surajkund	220	5	225	282	380	369	0	1031	1256
44	Tilora	39	7	46	58	88	49	28	223	269
TOTAL		**5941**	**2027**	**7968**	**7582**	**17621**	**9348**	**1878**	**36429**	**44397**

(Source: Animal Husbandry department, Ajmer)

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 Pisangan

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

Table 52: Parameters for prioritization of Value chain commodities in Dooni cluster

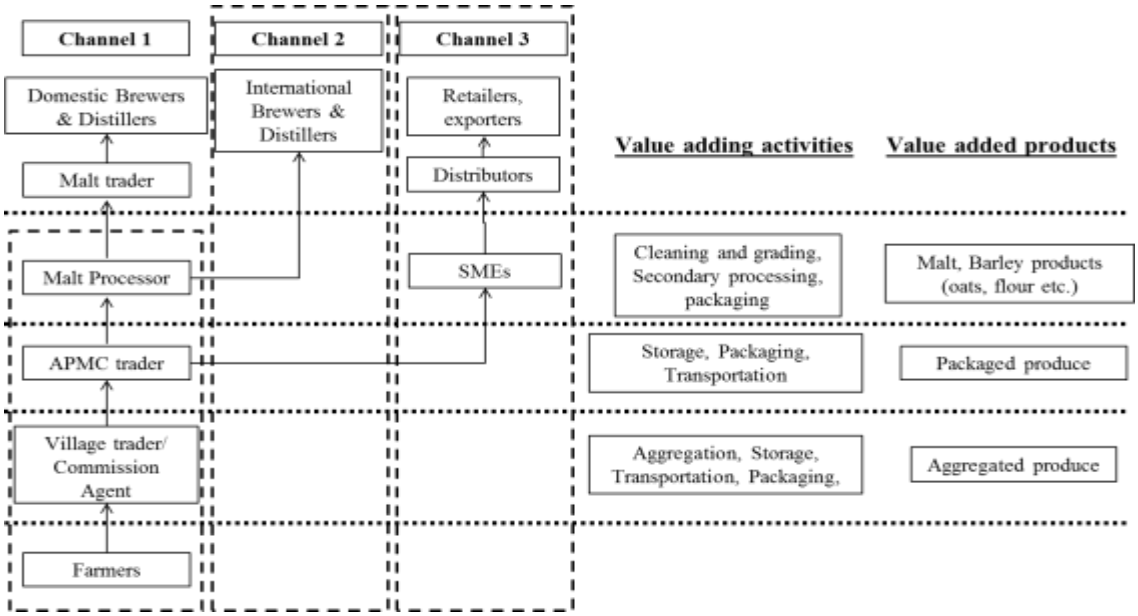
#	Parameters	Weightage	Guar	Green gram	Barley	Bajra	Groundnut	Wheat
A.	**Existing size**	**30**	**25.3**	**17.4**	**17.8**	**28.5**	**2.8**	**26.4**
1	Cropped Area of the crop in the cluster (in acre)	10	7.7	5.4	8.0	10.0	1.7	6.4
2	Crop Production in the cluster (in quintals)	10	7.6	2.0	4.4	8.5	0.1	10.0
3	Crop Productivity (cluster level compared to national's average)	10	10.0	10.0	5.4	10.0	1.0	10.0
B.	**Potential for Value addition within Rajasthan (implying scope for increased value addition for local farmers and processors)**	**45**	**29.0**	**26.3**	**30.9**	**19.4**	**32.5**	**24.5**
4	Price spread in Rs/Qtl (Price paid at APMC mandi-realization by farmer at farm level)	5	3.2	4.4	1.6	1.6	5.0	1.8
5	Price spread in Rs/Qtl (Price paid by customer at retail level- realization by farmer at farm level)	5	4.7	2.5	5.0	5.0	1.1	1.7
6	Net profit in production (Rs per acre)	5	1.0	1.0	2.8	2.8	5.0	3.6
7	Scope for processing in the state	10	6.0	6.0	8.0	4.0	10.0	5.0
8	Scope for value addition (Primary/ secondary/ tertiary processing)	10	4.0	6.0	8.0	6.0	10.0	8.0
9	Growth in market demand 5 year	10	10.0	6.3	5.6	0.0	1.4	4.5
C.	**Risk assessment**	**10**	**7.1**	**9.2**	**10.0**	**8.5**	**8.9**	**7.0**
10	Price Volatility (last 5 years; due to monsoon, due to adverse agronomical conditions	10	7.1	9.2	10.0	8.5	8.9	7.0
D.	**Others (Environmental & Social Parameter)**	**15**	**15**	**15**	**10.5**	**15**	**0**	**6**
11	Water requirement	15.0	15.0	15.0	10.5	15.0	0.0	6.0
Total		**100.0**	**76.5**	**67.9**	**69.2**	**71.4**	**44.2**	**63.9**

Source: Data analysis by ABPF- Grant Thornton

Appendix 3.3 Current marketing chain of Value chain crops

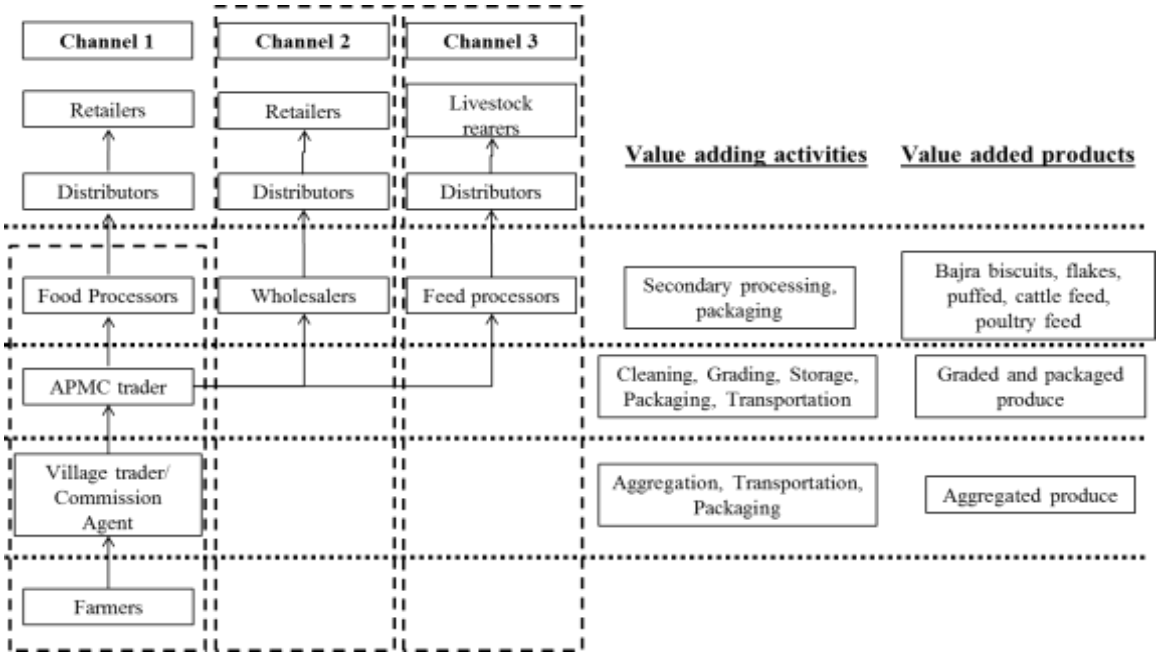
- **Barley**

Figure 10: Current structure of marketing chains - Barley



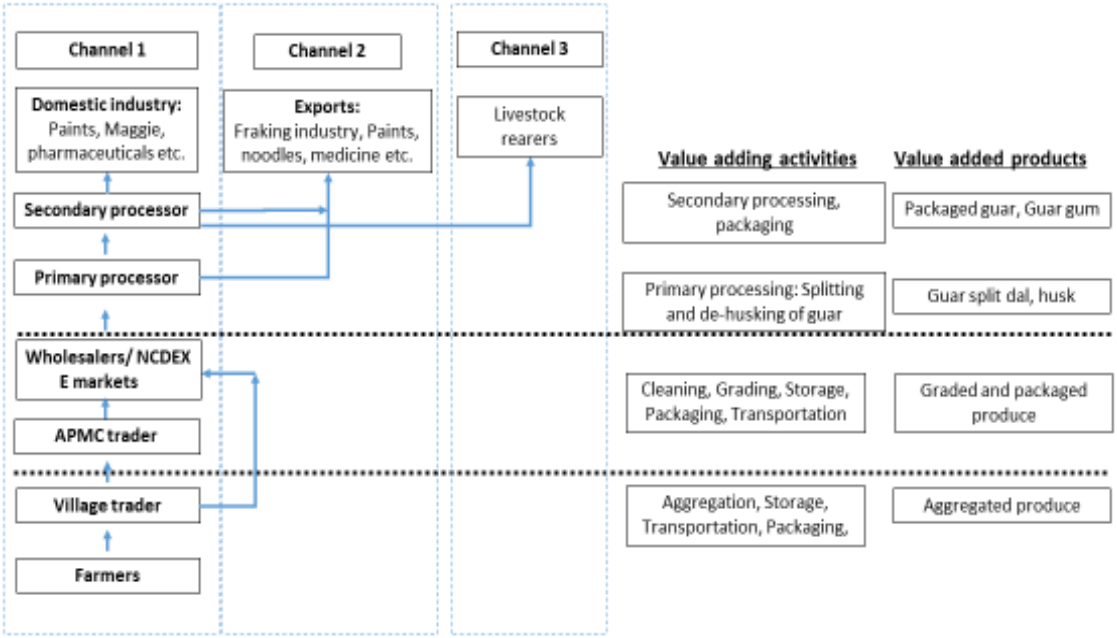
- **Bajra**

Figure 11: Current structure of marketing chains - Bajra



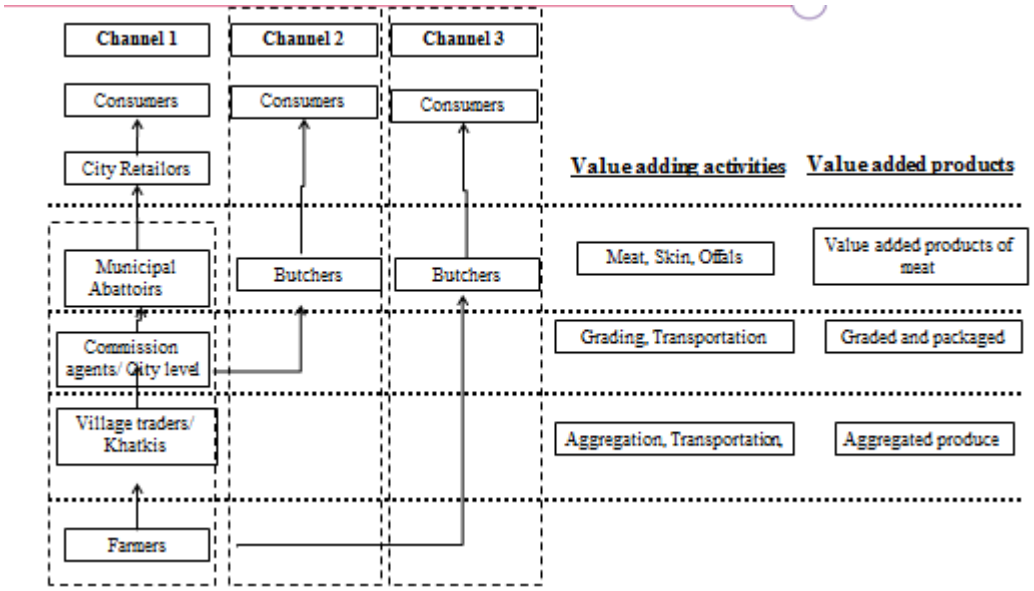
- **Guar**

Figure 12: Current structure of marketing chains - Guar



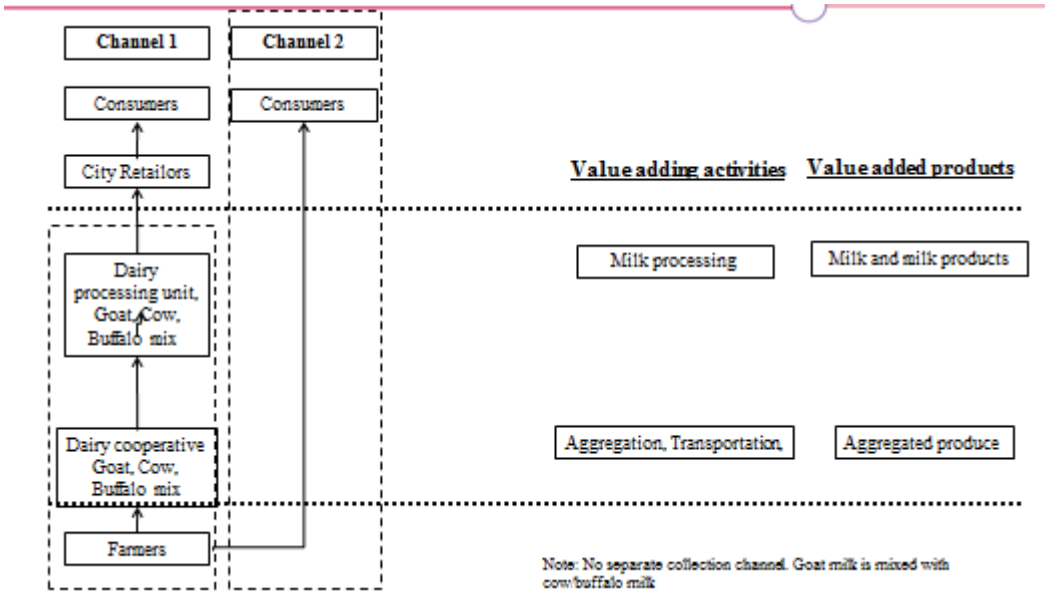
- **Goat Meat**

Figure 13: Current structure of marketing chains of Goat Meat



- **Goat Milk**

Figure 14: 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:

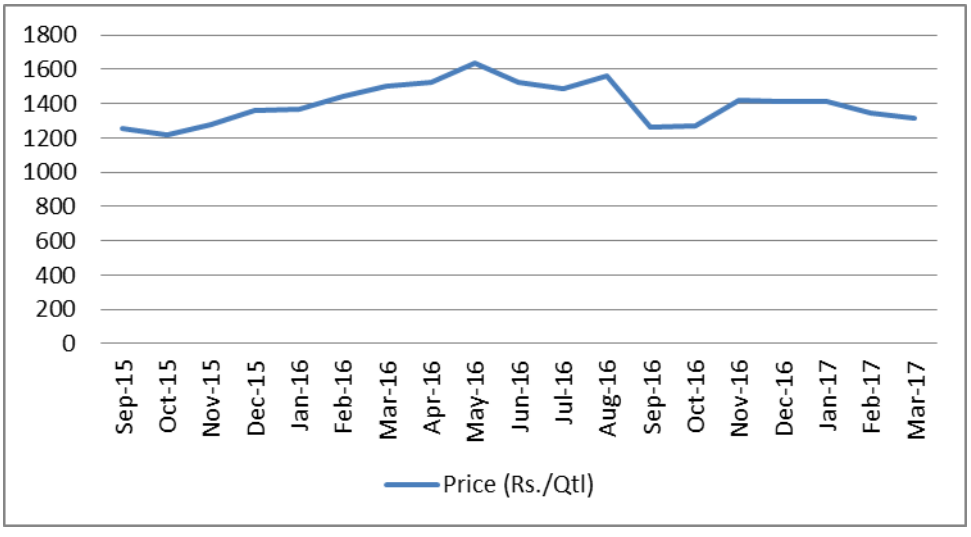
Bajra

Table 53: Price trend of Bajra in mandi

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 15: Price trend of Bajra in mandi



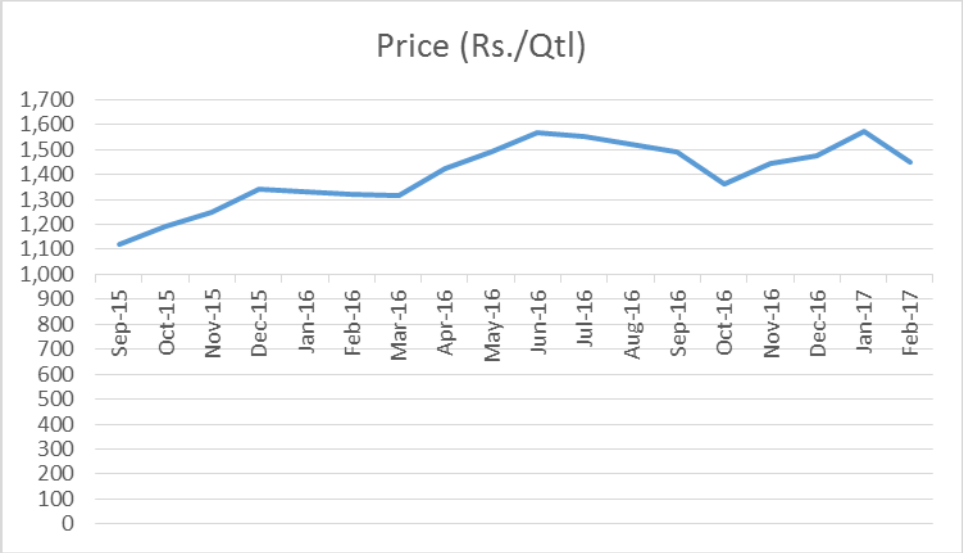
Barley

Table 54: Price trend of Barley in mandi

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

Barley crop is gaining price season over season considering the growth in demand of millet crops because of their nutritional value. Price range of Barley in past 3 seasons was from Rs. 1100 to Rs. 1600.

Figure 16: Price range of Barley in mandi



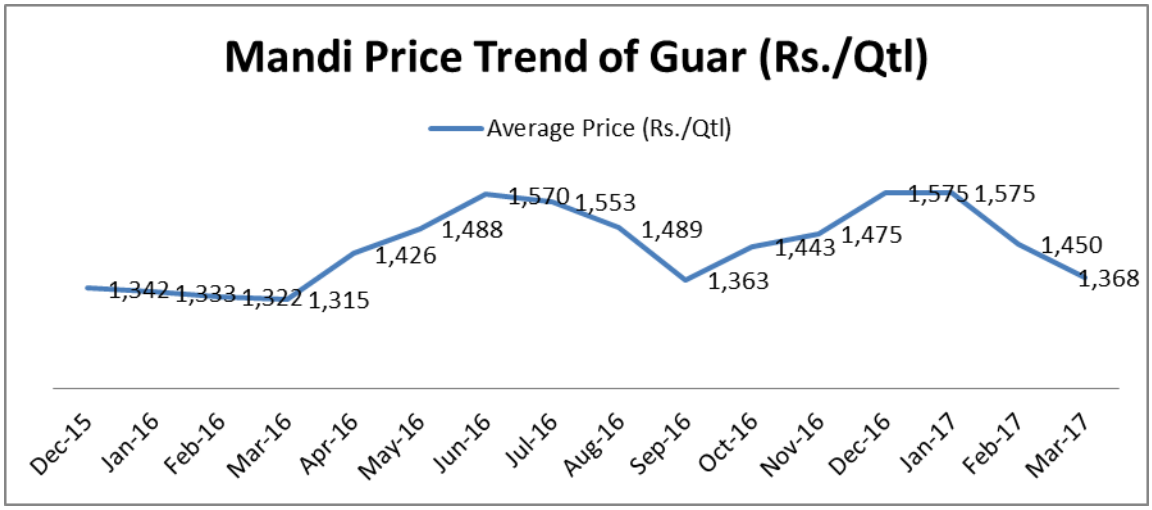
Guar

Table 55: Price trend of Guar in mandi

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

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

Figure 17: Price trend of Guar in mandi



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

Barley

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

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

Guar

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

Appendix 3.6 Economic Analysis of Selected Value Chain Crops

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

Table 56: Cost of economics of commodities

#	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	Barley	13,100	14	1,400	19,600	11,500
3	Guar	6,800	3.86	2,900	4,394	5908

Appendix 3.7 Livestock Population and Fodder Requirement of Pisangan cluster

Table 57: Livestock population and Fodder Requirement of Pisangan cluster

S. No.	Description of animals	Population in No.	Yield (milk/mutton/ Wool)	Units	Dry Matter Requirement per animal (KGPD)	Total requirement per year in M.T.
1	Cattle (Indigenous)	22490	2.537	Lit/day	7	57462
2	Cattle (CB)	3110	0		7	7946
2	Buffaloes	32230	4.095	Lit/day	7	82348
3	Goat	44397	0.50 – 0.75	Lit/day, kg/no.	1.2	19446
4	Sheep	38345	0.50 – 0.75/ 1-2	Lit/day, kg/Yr.	1.2	16795
7	Piggery	1195			3.5	1527
	Total Livestock	**142034**				**185524**

(Source: Animal Husbandry Department, Pisangan)

Table 58: Fodder availability in Pisangan Cluster (Qty. in MT)

Name of crop	Proposed Area (ha)	Productivity (Kg/ha)	Production (in MT)
Kharif			
Sourgum	1500	6000	9000.00
Peal millet	6509	6000	39051.42
Green gram82578	3213	3000	9637.55
Guar	2842	3000	8525.86
Maize	76	6000	456.93
Groundnut	400	4000	1600.00
Cotton	19	0	0.00
Total	**14559**		**68271.76**
Wheat	1500.00	5000	7500.00
Barley	1626.73	**4000**	6506.90
Gram	100.00	**3000**	300.00
Mustard	800.00	0	0
Cumin	478.09	0	0

Name of crop	Proposed Area (ha)	Productivity (Kg/ha)	Production (in MT)
Taramira	136.58	0	0
Total	**4641.40**		**14306.90**
Grand Total			**82578.66**

(Source: Agriculture Department, Pisangan)

Annexure-5.1: Operational and Implementation Arrangements in Agriculture

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. 1.10,1.00 and 0.20 lacs respectively. The project assistance up to 75% is proposed to be provided to the beneficiaries.

D. Pipe line for piped conveyance of irrigation water:

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

g. Innovative Activities/ INM/ IPM

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

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

This activity pertains to creation of model information infrastructure at cluster level to support the beneficiaries for all the agricultural related problems along with the marketing support. The theme is to revitalize the existing extension system compatible with the modern techniques and farmers friendly software to support the farmers and grass root level staff on pilot basis. The KSK (Krishi Sewa Kendra) at cluster level will act as the problem solution/ technical back up and information centre, strengthened with IT and interlinked with the team of experts through software application. Efforts will be made for real

time problem solution through IT enabled system. The KSK will also be strengthened with the literature, especially, related to potential threats led/ Pro-P based to support the grass root level staff for the precise identification and solution of major crop threats. The provision of technical back up from the experts at higher level has also been kept. Formation of a core team at project level to visualise and implementation monitoring of the ICT activities will be the axis of this activity.

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

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

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

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

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

ICT core team will assemble quarterly to review and monitor the progress of the activity. Expert at level I will be AS, AAO, AO, ARO and AD of concerned area. Expert panel for field problem solution at the level II and III will be finalised at PMU level. These will be provided excess to the software application where field problems in the form of text/ photo/ video will be uploaded by the farmer or KSK (which could not be solved at KSK level). The same may be got analysed by the panelled expert and online solution of the problem will be communicated. For each solution the honorarium will be provided to concerned expert. There should not be any repetition of problem/ solution. In some complex cases field visit may also be made. The main discipline of the experts will be Agronomy, Horticulture, Plant Breeding, Entomology, Plant Pathology, Nematology, Soil Science, Prop-P, Fertigation, Irrigation, Agribusiness, Post-Harvest Management etc. The honorarium in the range of Rs.200- 1000 will be provided to the different level of experts for providing the solutions of the farmers' problem. However, the honorarium will be decided at competent level.

d. Digital instruments to field coordinator/ staff–

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

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

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

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

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

Farmer Organization and Capacity Building

Capacity Building

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

Field days, exposure visits, orientation, capacity building-

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

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

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

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

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

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

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

Procurement of inputs for technology demonstrations

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

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

Procurement of Planting Material of Fruit Plants and Inputs

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

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

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

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

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

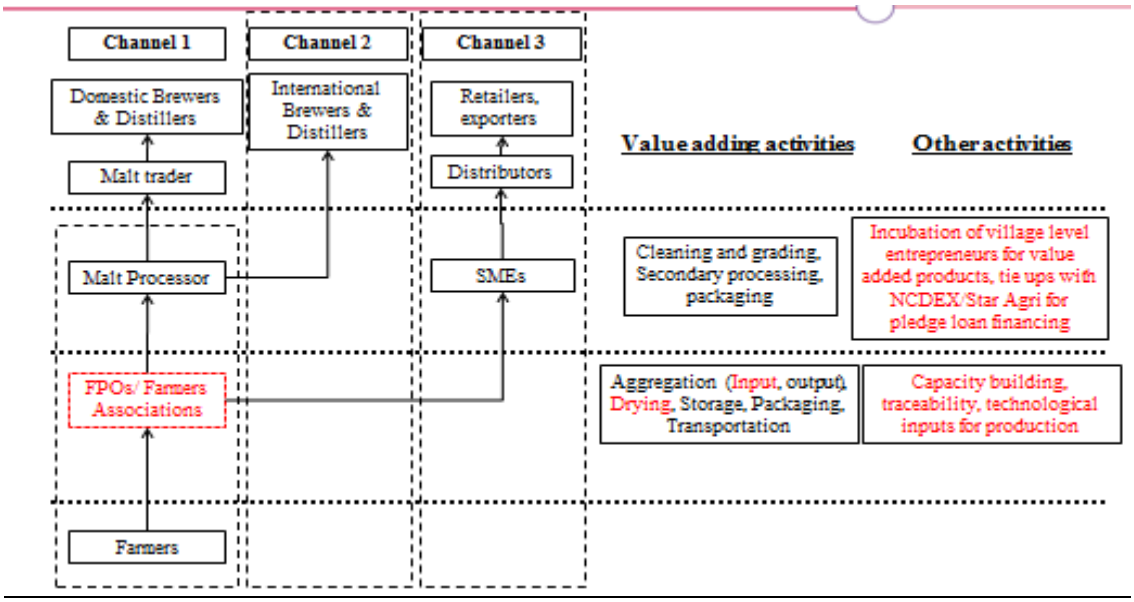
The requirement of planting material is very small and cluster specific according to selected value chain crop. Most of the planting material is imported from other State like Gujrat, Maharashtra, and Uttar Pradesh etc. Planting material is very soft and succulent and intend to high motility during transport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

Annexure 5.3: Post intervention value chain map

1. Barley

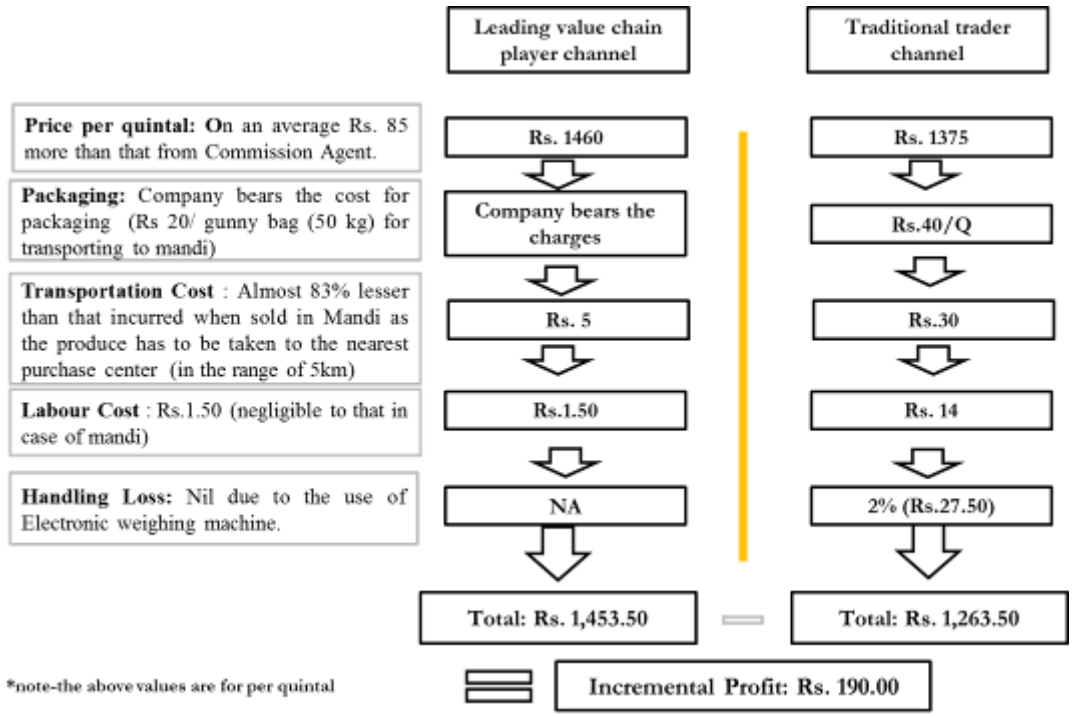
The intervention plan of Barley may be broadly considered in the context of activities and stakeholders in three stages- Production stage/ Cultivation by producers/farmers, post-harvest stage and the processing stage. In the context of shift towards barley production to greater extent, the production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

Figure 18: Scope of interventions in value chain of Barley



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

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

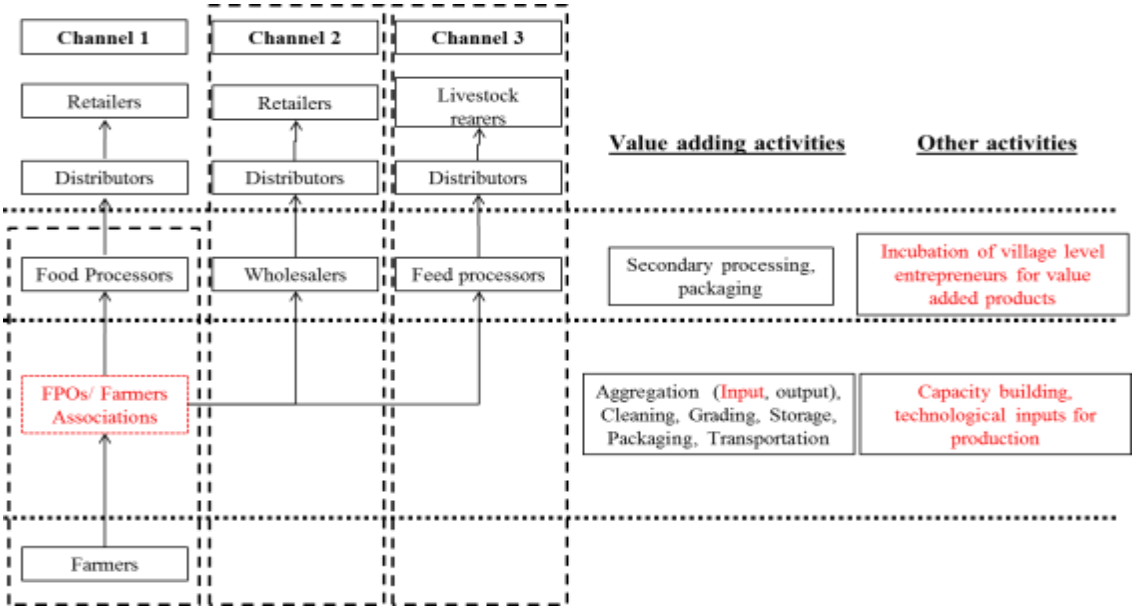


2. Bajra

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.

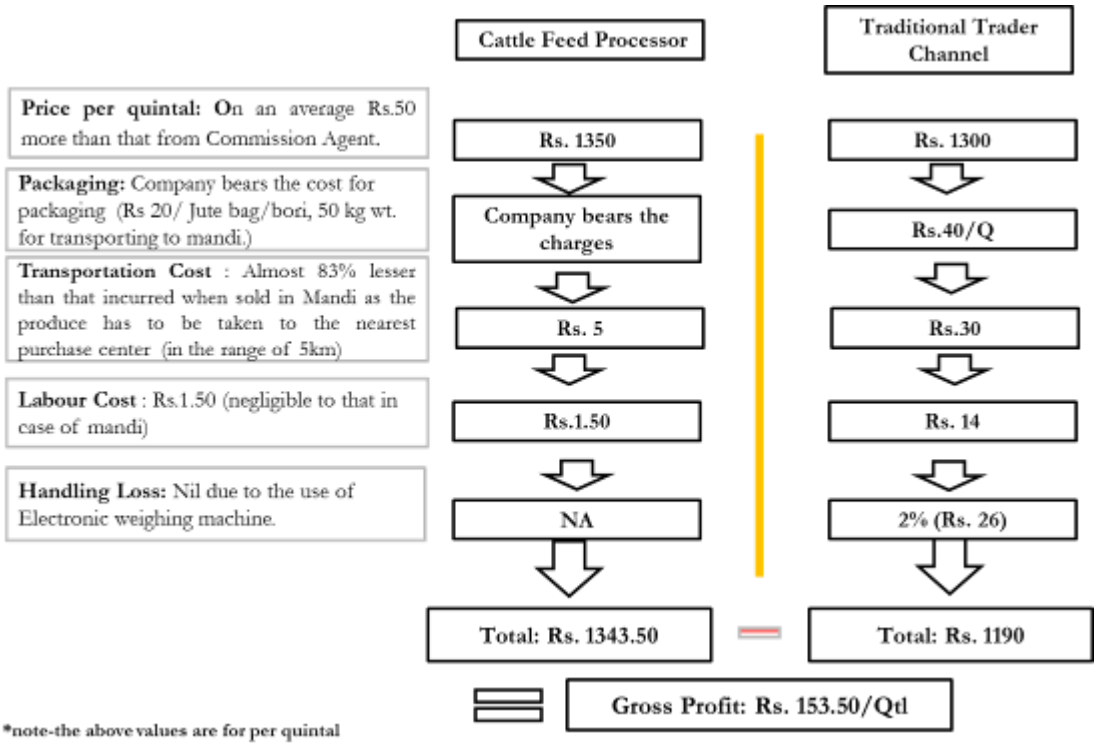
The unavailability of HYV of bajra for farmers is a critical constraint experienced by farmers. In this context, a seed production programme need to be launched availing the services of players Raj seeds. Also, limitation in terms of threshers and harvester combines are apparent. At the post-harvest 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 20: 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 21: Value chain difference between the incremental profits realized by farmers



3. Guar

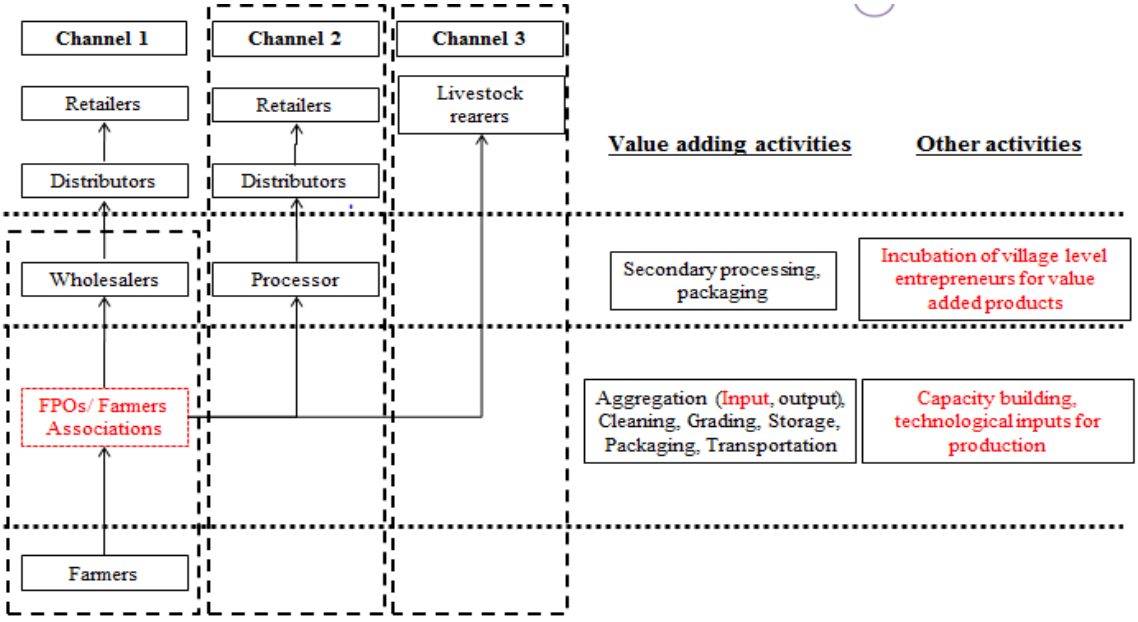
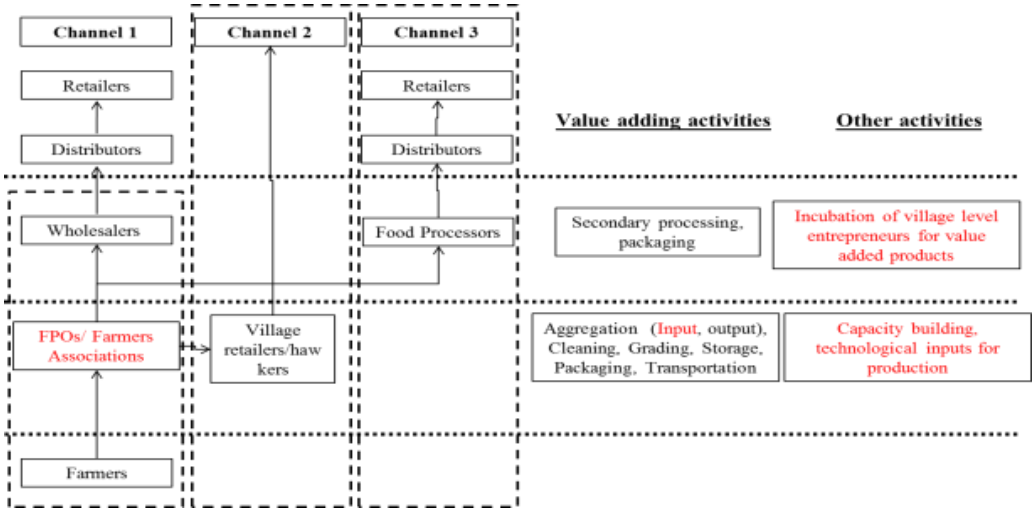


Figure 22: Indicative post-intervention value chain map of Guar

4. Vegetables

Based on the consultation and potential in the cluster, there is a scope for intervention to enhance the prevalent value chain model. The below model present shows the possible interventions in vegetables, along with additional activities involved.

Figure 23: Scope of interventions in value chain of vegetables



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.

5. Goat

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

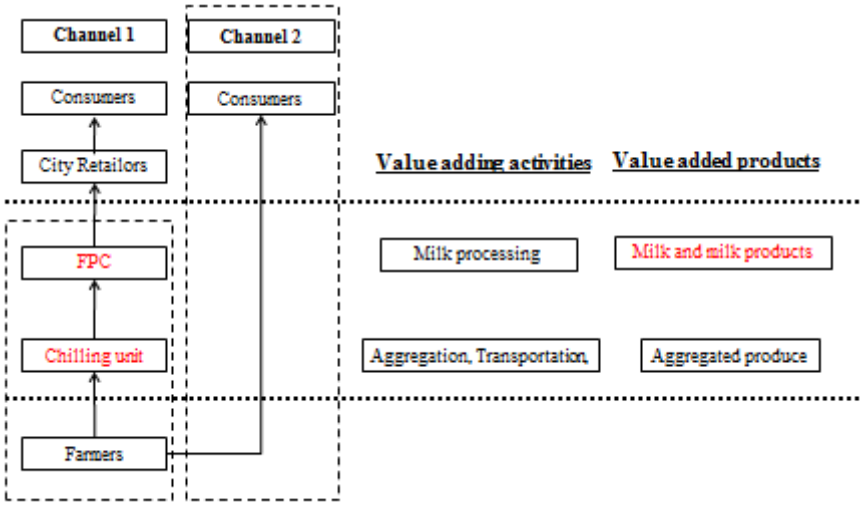


Figure 24 Indicative Post intervention value chain map of Goat milk

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

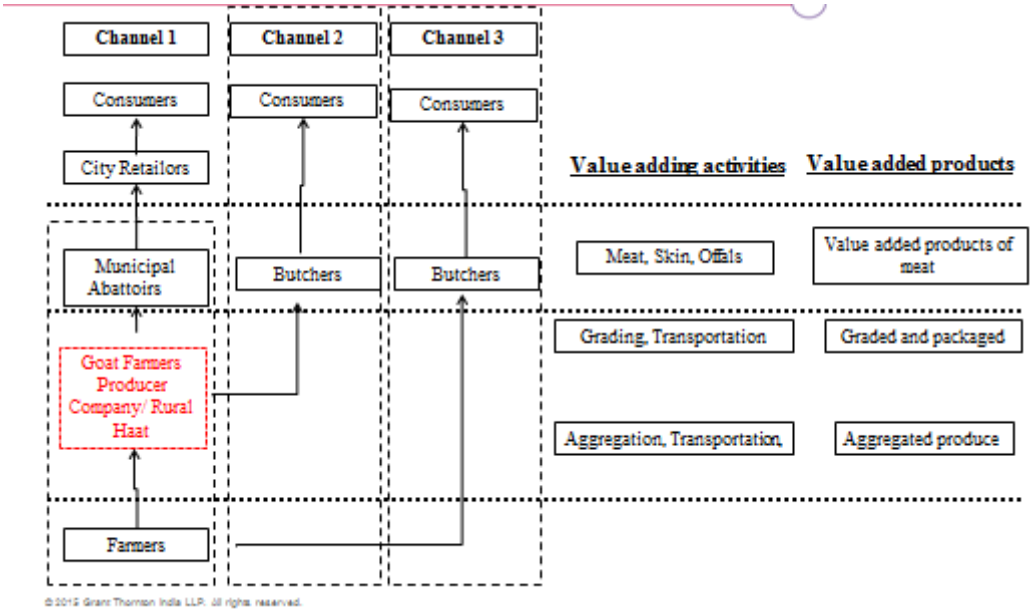


Figure 25 Indicative Post intervention value chain map for goat meat

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)

#	Name of Component	Name of sub-component
		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

Vegetable pack house

Vegetable Pack house	Y1	Y2	Y3	Y4	Y5
Service (@ Rs. 300/MT)	1,152,000	1,285,200	1,428,840	1,583,631	1,662,813
Total Revenue	**1,152,000**	**1,285,200**	**1,428,840**	**1,583,631**	**1,662,813**
Fixed Cost (HR, other fixed cost)	214,400	225,120	236,376	248,195	260,605
Variable Cost	180,000	191,250	202,500	213,750	213,750
Total Operational Expenses	**394,400**	**416,370**	**438,876**	**461,945**	**474,355**
Earning Before Interest, Depreciation, Taxes and Amortization (EBITDA)	**757,600**	**868,830**	**989,964**	**1,121,686**	**1,188,458**
Depreciation	210,000	210,000	210,000	210,000	210,000
Amortization	-	-	-	-	-
Earnings Before Interest and Taxes (EBIT)	**547,600**	**658,830**	**779,964**	**911,686**	**978,458**
Interest Expense	-	-	-	-	-
Earnings Before Taxes (EBT)	**547,600**	**658,830**	**779,964**	**911,686**	**978,458**
Tax	131,356	180,056	229,775	281,020	310,701
Earnings After Taxes (EAT)	**416,244**	**478,774**	**550,189**	**630,667**	**667,757**

Guar cleaning and grading unit

Figures in Rs.

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

Bajra and Barley cleaning and grading unit

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 to 6.5: related to Ground Water Management are being attached separately in MS Excel in soft copy.

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

1. Stakeholder Consultations

Major issues in the cluster that identified after consultation with the Sarpanch Sh. Ram Chandra Lamba from – Pisangan, Sh. Kailash Sharma, Picholia and farmers Women group, SC groups, field NGOs, representative of PRIs and group consultations during field visit with, are summarized below.

Field level and stakeholder consultations were organised in the cluster to get communities willingness and know actual problems and scenario of area.

- A meeting was organised on date 08.08.2016 at village Pisangan, Cluster Pisangan. This meeting was organised in the presence of Sarpanch Sh. Ram Chandra Lamba, women and farmers. During the discussion NGO team came to know about the Ground Water is over drafted as entire Pisangan Cluster is notified. Only 05-10 % farmers have water sources at their farms rest of the community dependent upon rainwater for agriculture. As monsoon is uncertain in the entire state, these community suffers. Community should know about micro irrigation, rain water harvesting systems to avoid these problems.

- A meeting was organised on date 10.09.2016 at Gram panchayat Bhawan of village Kalesara, Cluster Pisangan. This meeting was organised in the presence of Smt. Vimla Sain sarpanch and farmers. During the discussion NGO team came to know about the Lack of improved agriculture and animal husbandry techniques amongst community. It was suggested that community must be aware on micro irrigation, improved seeds & technology in agriculture. Also, it was suggested that improved breed of livestock must be introduced to the community to improve livestock.

i. Field consultation

Date	Cluster	Village(GP)	Place	Finding during consultation
08.08.16	Pisangan	Pisangan	Pisangan	➢ Ground Water is over drafted as entire Pisangan Cluster is notified.
10.09.2016	Pisangan	Kalesara	Kalesara	➢ Agriculture is depended upon rain water.
06.09.2016	Pisangan	Dantara	Dantara	➢ High level of fluoride in ground water, leads to drinking water and irrigation issues,

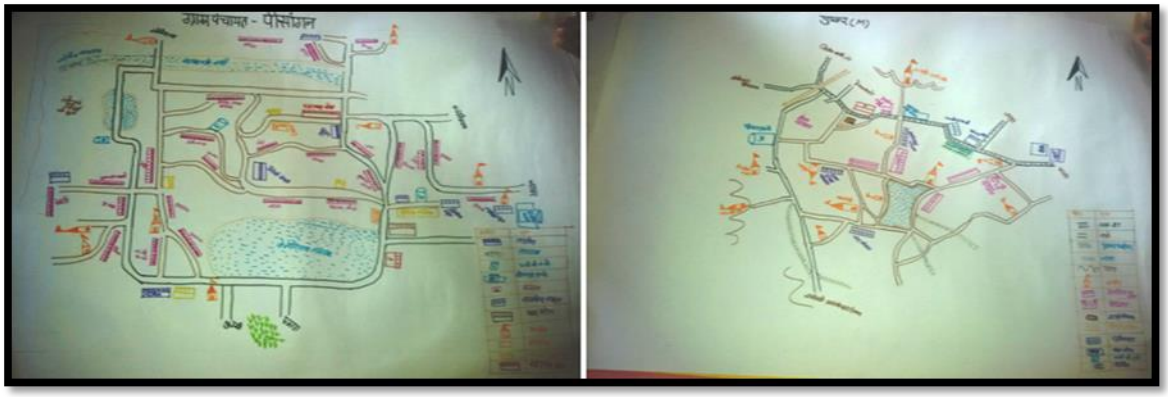
05.09.2016	Pisangan	Rampura Dabla	Rampura Dabla	dependency on rain water ➢ Lack of improved agriculture and animal husbandry techniques ➢ Lack of breed improvement and livestock health care services ➢ Women mentioned that though they do most of the work in agriculture except for ploughing and selling, they have no role in decision making regarding purchase of inputs or selling of produce ➢ Farmer face problem in market linkage
07.09.2016	Pisangan	Jaswantpura	Jaswantpura	
09.09.2016	Pisangan	Picholiya	Picholiya	

- Goat rearing women, widow, divorce, disabled and schedule cast farmer not able to take benefit of Drip and Mini sprinkler due to problem of farmer contribution.
- Farmer are not affected as land accusation, displacement, through water harvesting works.
- Women are not recognized as farmers in their own right.
- Lack of timely supply of agriculture inputs including seed and fertilizers.
- Lack of breed improvement and livestock health care services.
- Outreach of extension services very low in villages.
- 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.

ii. Main finding during PRA exercise in Pisangan cluster: -

Participatory Rural Appraisal (PRA) was conducted in 49 villages of Pisangan cluster. This activity was executed to get communities participation, environment building and sensitise them about their area.

A PRA meeting was organised on date 03.08.2016 and 08.08.2016 at village Pisangan Cluster Pisangan. This meeting was organised in the presence of women and farmers. PRA exercise begin awareness of community with project objectives then social mapping. During the discussion NGO team came to know about Agriculture is depended upon rain water. Ground Water level is below 300 ft. and not usable.
A PRA meeting was organised on date 05.07.2016 at village Dantara Cluster Pisangan. This meeting was organised in the presence of women and farmers. PRA exercise begin awareness of community with project objectives then social mapping. During the discussion NGO team came to know about Ground Water level is below 100-150ft. Casteism can easily be seen in this Panchayat. Farmer community is aware about Horticulture.



Cluster	GP	Village	Date
Pisangan	Pisangan	Pisangan	03-08-2016] 08-08-

Cluster	GP	Village	Date
			2016
	Batsuri	Naad	24-06-2016] 26-09-2016
		Hanuwantpura	25-06-2016] 26-09-2016
	Kalesara	Kalesara	30-06-2016] 10-09-2016
		Sarsari	26-06-2016] 19-09-2016
	Dantara	Dantara	05-07-2016] 06-09-2016
		Lyalikhera	04-07-2016] 06-09-2016
	Budhwara	Budhwara	02-07-2016] 06-09-2016
		Nuriyawas	02-07-2016] 19-09-2016
	Rampura Dabla	Rampura Dabla	01-07-2016] 05-09-2016
		Fatehpura	01-07-2016] 05-09-2016
		Senthan	28-06-2016] 05-09-2016
	Govindgarh	Govindgarh	29-06-2016] 20-09-2016
	Jaswantpura	Jaswantpura	04-07-2016] 07-09-2016
	Picholiya	Picholiya	28-06-2016] 22-09-2016
		Gadi Gujaran	28-06-2016] 08-09-2016
	Bhanwata	Bhanwata	03-07-2016] 17-09-2016
	Dodiyana	Dodiyana	06-07-2016] 07-09-2016
		Nathuthala	03-07-2016] 16-09-2016
	Bhagwanpura	Bhagwanpura	16-07-2016] 10-09-2016
		Surajkund	15-07-2016] 21-09-2016
		Sawaipura	16-07-2016] 20-09-2016
		Motisar	27-09-2016
	Dumara	Dumara	11-07-2016] 07-09-2016
		Amba Mashinia	09-07-2016] 15-09-2016

Cluster	GP	Village	Date
	Ganahera	Ganahera	25-07-2016] 23-09-2016
		Chawandiya	23-07-2016] 26-09-2016
	Kadel	Kadel	22-07-2016] 24-09-2016
		Dungariya Khurd	22-07-2016] 23-09-2016
		Guda	23-07-2016] 26-09-2016
		Rewat	23-07-2016] 23-09-2016
		Majewala	23-07-2016] 25-09-2016
	Kanas	Kanas	22-07-2016] 26-09-2016
		Nedliaya	21-07-2016] 03-09-2016
		Lila Sewadi	20-07-2016] 26-09-2016
	Nand	Nand	28-07-2016] 21-09-2016
		Rampura Nand	19-07-2016] 22-09-2016
		Leswa	18-07-2016] 21-09-2016
	Pushkar	Pushka Main	02-07-2016] 24-09-2016
		Pushkar Rural	27-07-2016] 24-09-2016
	Khori	Khori	21-07-2016] 24-09-2016
		Hokran	21-07-2016] 26-09-2016
		Kanwlayi	20-07-2016] 26-09-2016
	Saradhana	Saradhana	18-07-2016] 07-09-2016
	Tilora	Tilora	22-07-2016] 21-09-2016
		Kishanpura Golya	20-07-2016] 22-09-2016
	Devnagar	Devnagar	20-07-2016] 29-09-2016
		Banseli	22-07-2016] 29-09-2016

a. The safety provision should be taken for reacharge structures to protect any domestic animals, wild animals and human specially children through wire fencing around rain water harvesting structures

b. The villagers identified that the new infrastructure would be created for water management (anicut and harvesting structures etc.) which would provide sufficient water for agriculture production.
c. In Pisangan cluster, Agriculture and animal husbandry are the main source of livelihood for majority of population residing in the Project Area. Most of the villages are in Cluster area connected market Pisangan, Pushkar and Ajmer nearby project area.

iii. IEC activity at Pisangan cluster under RACP

Findings of IEC Activities After Installation of Display Board at GP/Village Level, pamphlet distribution, Kala Jatha, and village meetings it was observed that community got more aware about the project activities. It increased communities' participation in the project. Involvement of Schools and children through school rally empowered the IEC programme.
The consultations with participant are carried out through Information, Education and Communication (IEC) activities like display board, pamphlet distribution and awareness campaign on activities and benefits for preparing of CACP under RACP. The detail of IEC activities are given as bellow in table.

S. N.	GP	Villages	Pamphlet Distribution	Kala Jatha	Date	Rallies	Date	Standees	Display Board
1	Pisangan	Pisangan	√	√	17-10-2016	√	14-10-2016	08 Standees	10 Display Boards - Prompt Locations at Cluster Pisangan
2	Bhatsuri	Naad	√	√	18-10-2016	√	13-10-2016		
		Hanumantpura	√						
3	Kalesara	Kalesara	√	√	18-10-2016	√	12-10-2016		
		Sarsadi	√						
4	Dantra	Dantra	√	√		√	15-10-2016		
		Liyalikhera	√						
5	Budhwara	Budhwara	√	√	20-10-2016	√	15-10-2016		
		Nuriyawas	√						
6	Rampura Dabla	Rampura Dabla	√	√	19-10-2016	√	14-10-2016		
		Fatehpura	√						
		Sethen	√	√	18-10-2016				
7	Govindgarh	Govindgarh	√	√	20-10-2016	√	14-10-2016		
8	Jaswantpura	Jaswantpura	√	√	20-10-2016	√	14-10-2016		
9	Picholiya	Picholiya	√	√	20-10-2016	√	14-10-2016		
		Gadi Gujran	√						
10	Bhanwta	Bhanwta	√	√	19-10-2016	√	15-10-2016		
11	Dodiana	Dodiana	√	√	19-10-2016	√	15-10-2016		
		Nathuthala	√						
12	Bhagwanpura	Bhagwanpura	√	√	21-10-2016	√	14-10-2016		
		Surajkund	√	√	21-10-2016				
		Sawaipura	√						
		Motisar	√	√	21-10-2016				
13	Dumara	Dumara	√	√	21-10-2016	√	15-10-2016		
		Aamba Masiniya	√				06-10-2016		
14	Ganahera	Ganahera	√	√	23-10-2016	√			
		Chawandiya	√	√	24-10-2016				
15	Kadel	Kadel	√	√	22-10-2016	√	04-10-2016		
		Dungariya	√	√					

S. N.	GP	Villages	Pamphlet Distribution	Kala Jatha	Date	Rallies	Date	Standees	Display Board
		Khurd							
		Guda	√						
		Rewat	√						
		Majewala	√	√					
16	Kanas	Kanas	√	√		√	05-10-2016		
		Nedliya	√	√					
		Lila Sevdi	√						
17	Nand	Nand	√	√	23-10-2016	√	06-10-2016		
		Rampura Nand	√						
		Leswa	√	√	23-10-2016				
18	Pushkar	Pushkar(M)	√	√	23-10-2016	√	06-10-2016		
		Pushkar(R)	√						
19	Khori	Khori	√	√		√	04-10-2016		
		Hokaran	√						
		Kanwlai	√	√					
20	Saradhna	Saradhna	√	√	21-10-2016	√	15-10-2016		
21	Tilora	Tilora	√	√		√	04-10-2016		
		Kishanpura Goyla	√						
22	Devnagar	Devnagar	√	√		√	04-10-2016		
		Banseli	√	√					
	32			**22**		**22**			

2. Socioeconomic Profile (based on CACP baseline data)

Project Area covers an area of 31824-hectare (ha) comprising twenty-three (23) Gram Panchayats and forty-four (44) villages.

Cluster village has population of 78883 of which 40410 are males while 38473 are females as per field survey by NGOs. In cluster schedule cast14737and schedule tribe 241. Cluster had household of 14981 of which small farmer 3895, marginal farmer 8539 large farmer 599, BPL 749 and remaining farmers are landless.

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

Population Details (according baseline data)

Male	Female	Total	SC	ST
40411	38472	**78883**	14734	242

Household Details as per Cluster Boundary

BPL household	Land Less	Small Farmer	Marginal Farmer	Large Farmer	Total household	SC household	ST household
749	648	4295	9439	599	**14981**	2107	117

Category wise Cultivated Area in Pisangan Cluster

The cluster is recognized only marginal farmers. These marginal farmers have more than 1 – 1.5 H hectare land (Not recognize semi medium and medium farmer in the RACP Project) which have low productivity through adverse climatic condition like drought, low fertility of soil and desertification. These marginal farmers are considered due to low income.

S. No.	Category of	Total Households	Cultivated Area (ha)			Category wise Cultivated Area (ha)			
			Irrigated	Rainfed	Total	General	SC	ST	OBC
1	Large farmer	599	1496	8794	10290	3056	1852	31	5351
2	Small farmer	4295	3242	4696	7938	2357	1429	24	4128
3	Marginal farmer	9439	3574	4814	8388	2491	1510	25	4362
4	Landless person	648							
5	No. of BPL households	749	275	674	949	280	171	3	495
	Total (1to 4)	**14981**	**8312**	**18304**	**26616**	**7904**	**4791**	**80**	**13841**

Village wise household detail

No of villages	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		
44	Pisangan	1333	58	382	840	53	94	187	10	1041	67	40
	Naad	133	6	38	84	5	9	19	1	104	7	4
	Hanumantpura	96	4	28	60	4	7	14	1	75	5	3
	Kalesara	485	21	139	306	19	34	68	4	379	24	15
	Sarsadi	154	7	44	97	6	11	22	1	120	8	5
	Dantra	569	25	163	359	23	40	80	4	445	28	17
	Liyalikhera	156	7	45	98	6	11	22	1	122	8	5
	Budhwara	660	29	189	416	26	46	93	5	516	33	20
	Nuriyawas	283	12	81	178	11	20	40	2	221	14	8
	Rampura Dabla	350	15	100	221	14	25	49	3	273	18	11
	Fatehpura	173	7	50	109	7	12	24	1	135	9	5
	Sethen	223	10	64	141	9	16	31	2	174	11	7
	Govindgarh	278	12	80	175	11	20	39	2	217	14	8
	Jaswantpura	356	15	102	224	14	25	50	3	278	18	11
	Picholiya	650	28	186	410	26	46	91	5	508	33	20
	Bhanwta	604	26	173	381	24	42	85	5	472	30	18
	Dodiana	344	15	99	217	14	24	48	3	269	17	10
	Nathuthala	295	13	85	186	12	21	41	2	230	15	9
	Bhagwanpura	328	14	94	207	13	23	46	3	256	16	10

No of villages	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		
	Surajkund	231	10	66	146	9	16	32	2	180	12	7
	Sawaipura	34	1	10	21	1	2	5	0	27	2	1
	Motisar	145	6	42	91	6	10	20	1	113	7	4
	Dumara	96	4	28	60	4	7	14	1	75	5	3
	Aamba Masiniya	202	9	58	127	8	14	28	2	158	10	6
	Ganahera	711	31	204	448	28	50	100	6	555	36	21
	Chawandiya	333	14	95	210	13	23	47	3	260	17	10
	Kadel	128	6	37	81	5	9	18	1	100	6	4
	Dungariya Khurd	109	5	31	69	4	8	15	1	85	5	3
	Guda	29	1	8	18	1	2	4	0	23	1	1
	Rewat	85	4	24	54	3	6	12	1	66	4	3
	Majewala	50	2	14	32	2	4	7	0	39	3	2
	Nand	364	16	104	229	15	26	51	3	284	18	11
	Rampura Nand	229	10	66	144	9	16	32	2	179	11	7
	Leswa	345	15	99	217	14	24	49	3	270	17	10
	Pushkar(M)	1114	48	319	702	45	78	157	9	870	56	33
	Pushkar(R)	60	3	17	38	2	4	8	0	47	3	2
	Khori	195	8	56	123	8	14	27	2	152	10	6
	Kanwlai	121	5	35	76	5	9	17	1	95	6	4
	Saradhna	983	43	282	619	39	69	138	8	768	49	29
	Tilora	168	7	48	106	7	12	24	1	131	8	5
	Kishanpura Goyla	645	27	185	406	26	45	91	5	504	32	19
	Devnagar	328	14	94	207	13	23	46	3	256	16	10
	Banseli	587	25	168	370	23	41	83	5	459	29	18
	Miyapur	219	9	63	137	9	15	31	2	171	11	7
	Total	**14981**	**648**	**4295**	**9439**	**599**	**1053**	**2107**	**117**	**11704**	**749**	**449**

3. Consultation and Participation

Socioeconomically disaggregated baseline: - The Baseline data are documented the existing status of farmers and estimate the resource dependency of the village common lands. CACP is included a summary of socioeconomic baseline, consultations held with various socioeconomic groups and their key concerns and a social strategy.

4. Beneficiary Targeting and Social Inclusion

Ensuring Targeting, Inclusion, Participation and Access of small and marginal farmers, tribal 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 priorities 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.

5. Gender and Women's Empowerment

Recognition of women as farmers across the project structures are benefiting under project activities like goat rearing, 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.

Women participation was active during CACP planning, as there are special and separate interventions in the project to empower women. Pisangan CACP proposes separate livelihood activities to increase women leadership, Multi Task Group (MTG)– goat is comprised of 100% women membership. There 90 MTG-goat in Pisangan cluster. During the formation of multi task association women participation was also involved, the Executive Committee of GWMCs have 2-3 MTG goat members.

Participation of women's in CACP planning as beneficiaries of individually targeted assets;

As members of MTGs 130 women has been benefitted by project

1. As participants in training program;
2. Individual beneficiaries by project

- ✓ Distribution of bucks for livestock breed improvement
- ✓ Distribution goats to widow/handicapped/ single women for livelihood generation
- ✓ Distribution of Chaff Cutters

6. Tribal Development

Tribal community is not 0.3% of total population of Cluster.

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

S. N.	Major Activity	Sub Activity	Unit / No. of Activity	Average land require/ activity	GP/common/ private/other land	Social Impact	Mitigation
1	**Ground water**	Farm Pond	100	As per plan	Owen Land	The risk of use of the piezometer / Observation wells for personal benefits by withdrawing of ground water from the structures.	Close monitoring of water use and distribution arrangements by CBOs, CRPs and NGO.
		Piezometer	40	As per plan	Common Land		
		Water metre	3000	As per plan	Owen land /Public land		
		DWLR(Tele metric	40	As per plan	Common Land		
2	Agriculture	Drip Irrigation System with Automation	20 H	Owner Land	Own land	The risk of exclude in farmer selection specially women and SC for benefit distribution Risk of resource- farmers being further indebted to moneylenders. Increased perishability, and challenges in marketability of produce	Ensuring for benefit for SC and Women on basis of cluster population parentage. Facilitate for market oriented agriculture comprising high-value and high-risk crops. Promote establishment of grain banks with exclusive membership of farmers.
		Mini Sprinkler	20 H	Owner Land	Own land		
		Soil Test	700 Nos.		Own land		
		Seed Production	200 H				
		Crop Demo	700 Nos.		Own land		
		Drip Irrigation System			Own land		
		Mini/ Micro Sprinkler Irrigation System	100H		Own land		
3	Horticulture	Vegetable Cultivation	100 h	As per OG	Own land	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
		Solar Pump Program	40	As per OG	Own land		
		Post-Harvest Management	2	As per OG	Own land		
		Horticulture Mechanization	2	As per OG	Own land		
		Green house	30000 Sqm	As per OG	Own land		
4	Animal Husbandry	Buck Distribution	300 nos.	Not applicable	Not applicable	The risk of exclude poorest women of SC, widow, disabled for getting the benefit of activities	Identification of women household headed, and SC farmers, and their prioritized inclusion in all project benefits.
		Goat Distribution	50 nos.	Not applicable	Not applicable		
		Chaff Cutter Distribution	350 nos.	Not applicable	Own Land		
		Feed Supplement		Not applicable	Not applicable		

S. N.	Major Activity	Sub Activity	Unit / No. of Activity	Average land require/ activity	GP/common/ private/other land	Social Impact	Mitigation
		Rural Technology Canters (RTCs)		To be finalized	Not applicable	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	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 resource.
		Feeding & Water Trough	350 nos.	Not applicable	To be finalized		
5	Market & value chain	FPC	2	To be Finalised	Proposed Gram panchayat land	It is expected that sufficient land would be available with the Gram Panchayat for establishment and/or construction of common use facilities proposed under the project. Loss of control of women over farm production with commercialization-on and formalization of markets – further disempowerment of women in the household economy	Land-based interventions would be located only in those areas where such land is readily available and voluntarily offered by the Gram Panchayat. The procedure for obtaining a "no objection certificate" from the Gram Panchayat. A screening format for all land-based interventions is also appended. Form and strengthen exclusive women farmers' groups for collective enterprise development.
		FCSC	1	To be finalised	Proposed Gram panchayat land		
6	Farmers' organization and capacity	Formation of MTGs	1267*	Not applicable	Not applicable	Risk of exclude of women/SC/BPL farmer in MTGs	Priority of memberships & leadership of women/SC/BPL farmer in

S. N.	Major Activity	Sub Activity	Unit / No. of Activity	Average land require/ activity	GP/common/ private/other land	Social Impact	Mitigation
	building	Formation of FPC	2	Not applicable	Not applicable	Risk of exclude of Women/SC/BPL farmer in MTGs	MTGs/GWMC/FPC All household data collection of cluster area. Equitable distribution of project benefits between women and men of categories wise percentage
		Socio economic Data collection	15000*	Not applicable	Not applicable	Risk of exclude of Women/SC/BPL farmer in MTGs	
		Identification of Beneficiary	3500*	Not applicable	Not applicable	Risk of exclude of women, SC/BPL from beneficiary selection for Project activities	
		Capacity building & Training	4	Not applicable	Not applicable	Risk of exclusion of women from training for technological interventions	

8. 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.

9. Key Social Indicators

The key social indicators are given below in table: -

Please add the main social indicators as

75 % of SC, ST, small and marginal and women farmers as beneficiaries of individually targeted assets/services and demo activities

60 % of MTGs, FPCs members and leaders from SC, ST, small, marginal and women farmers

75 % of trainees from SC, ST, small, marginal and women farmers

Major activity	Sub activity	Social indicators
Ground Water	construction of Farm Ponds, anicut, Nadi and Medbandi	Focus will be on rain water harvesting
Agriculture	MIS, Diggies, Soil testing, Demonstrations, PHM technologies, Seed Production	Increase in farm production n and productivity because of improved seed management and cultivation practices.
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.
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.
Farmers' organization and capacity building	Capacity building Socio economic Data collection Identification of Targeting and Beneficiary MTGs (Multi Task Groups) GWMC (Ground Water Management Committee) FPC (Farmer Producer Company) Training on Social Management Plan	Community will aware about RACP Project. Ensuring community participation. Project goal be achieved. Analyses the findings by different socio-economic groups. Cluster's all community will be benefited

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

Annexure 7.2 Environment Management Plan (EMP)

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

- Crop intensification
- Water Management
- 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 disease infected leading to pest attack and crop loss or increased use of chemical pesticides	Use of seeds of good quality that are pests & disease free determines crop performance to a large extent. Therefore, Seeds when purchased should be only from certified sources and should be used well within the expiry date.		% of farmers has access to certified seed.	
			Genetically modified seeds may	In case of selection of Genetic Modified varieties guidance should			

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**
			be used that are not approved for use in Rajasthan	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 Deterioration of nutrient content of soil due to intensive cropping Increased and imbalanced use of chemical fertilizers	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 bio-fertilizers 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.
	Pest & Disease Management		Increased chemical pesticide use Increased incidence of pests if the same crop is promoted repeatedly Safety issues in storing and using chemical pesticides	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 bio-pesticides / bio-control agents /pheromone traps for distribution.	% 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.
	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	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	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.

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**
			Cropping pattern may be leading to unsustainable use of available water	➢ 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.			
	Storage & Handling of Agri-inputs		Poor storage, handling can lead to spills and leaks of fertilizers and pesticides leading to contamination of soil and water	The following precautionary principles shall be followed an existing storage facility: ➢ Bagged fertilizer must be handled in a manner to prevent fertilizer from escaping to the environment. ➢ Spills should be cleaned up immediately to avoid the potential for soil and groundwater contamination.	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.
			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 Ground 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.

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	Ground Water Recharge Structures and installation of weather stations, piezometer, Bore well etc.:-	Top soil removal	Medium	Soil removed during the process of digging water harvesting storage structures should be used to build bunds and top soil should be spread over the rest of the farm.	At the time of CACP. At the time of sanction of individual structure for implementation	% of trees actually planted as compared to number of trees to be taken up under compensatory planting. % 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.
		Cutting of trees		As far as possible, these structures should be sited where there are no trees. If tree cutting is unavoidable, then compensatory planting in the ratio of 1:10 should be carried out and the beneficiary group made responsible for maintaining it with at least 90% survival till 3 years.			
		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 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			

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**
				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 extracted.		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 water harvesting & storage structure 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. • 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			
		• Soil erosion • Air Pollution •Noise Pollution •Public health and occupational safety.	low	• Proper drilling procedures. • Refilling of excavated areas . • Ensure good working exhaust systems. • Provide dust masks to drilling personnel. • Servicing of vehicles in the garage. • Provide sound reduction equipment to workers. • Training of machine operators		% contractor, worker have awareness on these mitigation measures	% of bore wells (drilled) where minimum distance of 250 m is maintained.

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
				• Personnel to wear Ear muffs • Ensure waste water management. • Provide overall, helmets, safety • Boots earmuffs, nose masks and gloves to workers. • Provide warning signs. • Welding gear provision • Provide a standby vehicle as an ambulance in case of an emergency. • Bore wells (drilled) should be maintained minimum distance of 250 m.			

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 and increased grazing pressure on existing pastures.
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) 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 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			

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**
				• 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 conducting animals health camps should be disposed of after treating 10% Sodium 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.	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 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 awareness on banned medicines and ill effects of antibiotics and growth promoters.	

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**
	Goat shade and Manure Management	Congested and improperly 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.		The sheds must have enough space and 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.	At the time of CACP. At the time of preparation of the Livestock Management Plan	% of goat herd owner has aware shade and manure management.	% of goat herd owner adopted 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 workers. Use of energy from renewable sources will encourage high emissions.		• Water used in conveying materials, facility cleanup, or other non-ingredient uses will be reduced, which in turn will reduce the wastewater volume from food-processing facilities. • Sanitizers or anti-microbials in wash water and other processing water may be useful in reducing pathogens on the surface of produce and/or reducing pathogen build-up in water. Chlorine is a commonly used anti-microbial. • Typically, pathogens, suspended solids, dissolved solids, nitrogen, and phosphorus are removed in advanced wastewater treatment. • The following is a listing of some technologies being used in advanced wastewater treatment. A .Membrane applications 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		% 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**
				following: A. Using the food by-product as an animal feed. B. Composting or land spreading the food by-product. • Noise protective equipment should be provided to the operator of machines. Silencer should be attached to the equipment to reduce noise from the equipment to surrounding areas. • Use energy efficient equipment for processing (such as steam boilers).			
	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			

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**
				Warehouse Manual published by the Department of Food & Public Distribution, Ministry of Food & Consumer Affairs, GoI under operationalization of the Warehousing (Development & Regulation) Act, 2007.			
		Environment pollution may be generated During 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 will make arrangements to minimize dust pollution through provision of wind screens/barriers, water sprinkling/mist fine spray arrangement			

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 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.
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

Relevant Acts/Rules	Provision	Relevance to RACP Project
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
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.

Relevant Acts/Rules	Provision	Relevance to RACP Project
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

Provide 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	2 hrs 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	3 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	5 days including 3 days 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	5 days including 3 days 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.