Chapter – 2

Project Design

1. PDO:

   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 in the State. 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 under the project are:

   (a) sustainable and efficient use of water resources by retro-fitting the Four Waters Concept in the catchment areas, where ever feasible, including rain water harvesting, 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.

2. Project Beneficiaries:

   Primary beneficiaries are small and marginal farmers with an actual or potential commercial outlook, brought together through collective action towards achieving economies of scale, e.g. Multi Task Groups (MTGs), User Groups (UGs), Multi Task Association (MTAs), Ground Water Management Committees (GWMCs), Water Users Associations (WUAs), Livestock Groups/Herders as well as Farmer Producer Organizations (FPOs). In addition, secondary beneficiaries will comprise other farmers obtaining better access to water through improved water harvesting, ground water recharge and/or better water distribution at the tail-end of command areas, as well as agricultural labourers through increased wages. In addition, other stakeholders consist of private sector partners (i.e. agro processors and agro industries, wholesalers, traders participating through value chains); public institutions (i.e. the eight line departments of GoR); and Partner Agencies (including Aravali, State Agricultural Universities and Veterinary University-RAJUVAS); and Service Providers for community mobilisation activities (a range of NGOs).

   The project targets to sustainably increase the productivity of natural resources and farmer income through efficient water management, crop management and animal husbandry practices as well as improved produce marketing. Project activities will be undertaken in about seventeen areas, falling in 17 districts of the State including three canal command areas, three watershed areas, three ground water areas, five canal command-catchment areas and remaining three areas are yet to be selected. Total project area under all the projects could be around 200,000 ha. The project will directly benefit the farmers, beneficiaries in-directly dependent on agriculture and allied activities, predominantly small and marginal land holders, livestock herders, land less labourers etc. by sustainably increasing their income levels.

3. PDO Level Results Indicators:

   Key performance indicators (KPIs) will measure (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 (f) farmer satisfaction with project deliverables.

   Key Intermediate Level Indicators will measure (a) Increase ground water recharge; (b) Reduce siltation; and (c) Increase efficient use of conserved moisture.
4. **Geographical boundaries:**

   i. Following the Four Waters Concept, the project area shall comprise of catchment and command area integrating the conservation of rain water, surface water, ground water and soil moisture.

   ii. Boundaries for project interventions shall be around the command areas and potential streams, drainage lines & other areas of the upper catchments complying with the overarching principles of Four Waters Concept.

5. **Broad parameters under Project Re-structuring:**

   To address implementation delays, simplifying the implementation arrangements, reducing the dependence of the consultancies; and implementation of project activities by the participating line departments, it was decided to re-structure the project. The key parameter proposed by Government of Rajasthan for the proposed restructuring, includes changes in implementation arrangement and modification of design and consists of the following:-

   a. **Inclusion of Four Waters Concept in the project design:** The project was designed around the clusters, to demonstrate the water resource management interventions, with respect to dominant form of water availability in the given cluster. The aim was to balance the different forms of water, while considering the interaction of the linked sectors of agriculture and energy. The *four waters concept* is essentially optimizing the use of rainfall, surface water, ground water and soil moisture. These forms of water have been very well considered while conceptualizing the project and the project would further focus at retro-fitting this concept, where ever possible. Following the four waters concept, the project area shall comprise of catchment and command area, integrating the conservation of rain water, surface water, ground water and soil moisture. Boundaries for project interventions shall be around the command areas and potential streams and drainage line areas of the upper catchments, complying with the overarching principles of four water concept.

   b. **Project interventions to have a larger focus on southern-eastern districts of the State:** Of the approximate twenty clusters to be supported under the RACP, a total of 12 had been finalized, based on the RACP’s water principles and taking into consideration production parameters, and opportunities for development of commodity specific value chains. These clusters covered eight of the ten Agro-Climatic Zones (ACZ) of the state and had six clusters under surface irrigation system, three under watershed and three under groundwater. As part of the project restructuring, project would like to include additional areas with a specific focus on southern districts of the state, where the principles of Four Waters Concept can be better applied.

**Project Districts and Geographies:**

The proposed area of operation of RACP is proposed to be in 17 districts, with major focus on areas of eastern parts of Aravali and southern districts. The existing 12 clusters of RACP are being retro-fitted as per the Four Waters Concept to include the upper catchments where ever feasible.

**Table No.1 Southern-eastern Project Districts:**

<table>
<thead>
<tr>
<th>District</th>
<th>Project areas</th>
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</thead>
<tbody>
<tr>
<td>Chittorgarh</td>
<td>Orai and Bassi command areas and upper catchments.</td>
</tr>
<tr>
<td>Pratapgarh</td>
<td>Jakham LMC command areas and upper catchments.</td>
</tr>
<tr>
<td>Bundi</td>
<td>Gudha command areas and upper catchments.</td>
</tr>
<tr>
<td>Kota</td>
<td>Sangod catchment and irrigated area / tank systems.</td>
</tr>
<tr>
<td>Jhalawar</td>
<td>Ahoo command areas and upper catchments.</td>
</tr>
<tr>
<td>Banswara</td>
<td>Bulandi command areas and upper catchments.</td>
</tr>
<tr>
<td>Tonk</td>
<td>Area to be identified</td>
</tr>
</tbody>
</table>
Baran | Area to be identified  
Dholpur | Area to be identified  
Alwar | Bansur catchment along with the tank system to be identified.  
Jaipur | Mokhampura along with the tank system to be identified/re-visited.  
Ajmer | Pisangan catchment and irrigated area / tank systems (to be determined)  
Sawai Madhopur | Bonli catchment and irrigated area / tank systems (to be determined)

Table No.2 North-western Project Districts:

<table>
<thead>
<tr>
<th>District</th>
<th>Project area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sri Ganganagar</td>
<td>Z-distributary command areas.</td>
</tr>
<tr>
<td>Bikaner</td>
<td>Phoolasar distributary command areas.</td>
</tr>
<tr>
<td>Jaisalmer</td>
<td>Kheruwala distributary command areas.</td>
</tr>
<tr>
<td>Nagaur</td>
<td>Ladnu - Pilot taken under desert geography through Index Catchment approach</td>
</tr>
</tbody>
</table>

c. **Project to take specific investment activities in an integrated manner so as to roll out activities immediately:** This is critical, given the time lapse of more than 24 months, now it has been decided to follow illustrative activities under water use efficiency and market led technology transfer, which need to be fine-tuned for each of the project locations as per need.

**Improved Water use efficiency Component:** Under the command system, canal rehabilitation and modernization will be taken up. This will include, among others, cross regulators, rehabilitation of existing defunct structures, rationalization of outlets, modern reservoir and canal monitoring systems and SCADA. Strengthening of Water Users Associations (WUAs); and modernizing the systems with real time roster plan will also be taken up. For the Upper Catchment Systems, which are vulnerable to soil erosion, structural works in first order & second order streams, percolation tanks, sunken ponds, continuous contour trenches for soil moisture conservation; staggered & box pit trenched on sloping lands; contour bunding; field bunding; farm ponds; earthen structures; and diversion drains will be taken up.

**Technology transfer and Market led advisory services Component:** Under this, GoR will take the responsibility of undertaking regular agriculture and horticulture department activities, that are aligned with the project development objectives of RACP. RACP will focus on innovative activities of market led technology transfer, which would include among others, commodity focused Farmer Common Service Centers, that will focus on market led production activities, primary processing, aggregation and marketing, ICT based demand driven participatory extension system on the lines of “e-velanmai” under the Bank funded TNIAMWARM project through PPP approach; Specific demonstrations linked to Value Chain commodities identified in the project areas and supporting large scale adoption and documentation of improved technologies by the farmer.

**Livestock Support Services for Small Ruminants (Goats):** Project would support the formation of Small Ruminants Producers Groups. Capacity building and other productivity enhancement interventions focused on these groups, which will include among others, feeding and nutrition management, breed improvement and health. To address the constraint of quality bucks in the State, project will pilot, in select locations, the concept of breeder multiplier herds, through progressive goat breeders. To improve the access to the market, project will support the creation of Rural Haats in select locations. RACP will pilot PPP models with Agri-business companies, for value added goat products. Project will also develop Resource Technology Centers (RTCs) for extension and emergency animal health support.

d. **Implementation Arrangements through line departments:** Implementation would be through line departments with additional support from consultants, as per need. Project will retain the
Project Design

Project Management Unit (PMU) and District Project Management Unit (DPMU) structure; planning and implementation by line departments; and individual line department activities to converge at DPMU level. For this implementation arrangement to be successful, participating line departments will provide dedicated manpower to the PMU, Project Implementation Unit (PIU) and DPMU. The Project will take additional manpower, as per the needs, from market. Community mobilization, formation of Producer Groups and Producer Organization would be done through service provider / NGOs. The Society structure will be retained to give operational flexibility to the project. The requirements for procurement and financial assessment of the new departments that would be directly implementing the program under the restructured approach will be finalized at the project level. The issues associated with staffing, delegation of procurement and financial decisions, record keeping and documentation etc. would be covered in subsequent chapters. Further, all procurements by Water Resources Department (WRD) will be done using e-Procurement.

e. Two additional activities have been included for market linkages, over and above the existing activities under this component; viz., Market Information and Intelligence Services and Warehouse Receipt Development and Virtual markets.

f. Working on PPP models in potential sectors/components.

6. Participating line departments:

The overall responsibility of the project execution will rest with the Department of Agriculture, GoR and other line departments directly involved in the project are Horticulture, Animal Husbandry, Water Resources, Ground Water, Watershed Development and Soil Conservation, Rajasthan State Warehousing Corporation, Marketing Department and for research support State Agricultural / Veterinary Universities.

7. Project life cycle at cluster level:

At present, the scheduled completion date of the project is April end, 2019. Assuming the date of start of re-structured mode of operation of the project after completing all the requisite requirements after project re-structuring from 1st October, 2014, project's life cycle under re-structured mode would be of 55 months. The 55th Month i.e. April, 2019 is kept reserved for the other project completion related activities.

The project duration would be 54 months, which will comprise of 6 months for CACP preparation and remaining 48 months for implementation of project activities. Out of 48 months, last 6 months would focus on project consolidation, exit protocol, sustainable and management activities.

The project envisages intensive innovative investments in 17 clusters of Rajasthan. In addition to an overall phasing of the clusters, the project will prepare a detailed Cluster Agricultural Competitiveness Plan (CACP) for each of the selected clusters centered on the key components of the project (i.e. water & agriculture, markets & value chains, farmer organizations). The CACP will have a defined objective and will include baseline surveys and proposed interventions and their monitoring in Community level Institutional Development, Water Conservation and Resource Management, Climate Resilient Agriculture, and Value Chain Development. The CACP planning process will result in a detailed project report for the selected cluster. CACPs are prepared through a participative process involving a broad range of stakeholders, including private sector.

For each cluster there is a sequence in which the activities will be rolled out, each stage converging into the next. For example initial investments in water resource management will allow for demonstration of packages of agricultural practices using different water usage practices. These demonstrations will be converted to best practices training programs that will be taken up in the next phase for wider adoption in the cluster and then for value chain development. Simultaneously, community level organizations for managing water resources and commodities will be mobilized to take over these activities over time.

The sequencing of the multiple set of interventions in different areas falls into four distinct stages. The first stage focuses on preparation of the detailed CACP. This plan, including baseline surveys,
mapping, stakeholder consultations etc. will be executed by the concerning line department (to which the project component / sub component is related with) and will be carried out over a period of 6 months (0-6 months). The 6 months' time proposed to be utilized in the preparation of CACP (combination of various plans/sub plans of activities of different line departments) would considerably be reduced since most of the line departments are having basic data either developed manually or by using high science tools, demographic data with them.

Using the CACP as a base, interventions around training, demonstrations, and micro-pilots will be initiated immediately in the project area. Once the CACP is prepared and approved from the competent level of authority, implementation of CACP will be initiated and completed over the next 48 months. The last 6 months out of 48 months of the project cycle shall focus on consolidating all these interventions and making sustainable through full integration with existing government schemes, farmer to farmer replication and scaling up strategies for spreading over the agro-climatic zone.

Planning and implementation of CACP requires innovative strategies that are able to provide a balance between supply driven planning, considered during the conceptualization stage and subsequent demand driven planning & implementation that may arise at a later stage. The implementing agency should be able to involve both supply driven planning & implementation methodology with demand driven planning & implementation methodologies at the time of the implementation. Implementation of CACP will be an evolving process, which will require continuous review of planning & implementation strategies and incorporating these changes on continuous basis into future implementation arrangements. It is envisaged that the CACP preparation and implementation will need a dedicated team of experienced professionals who can handle the entire cycle starting from value chain identification to supporting the communities in implementation of identified solutions. Such skill, which is present in the concerning line departments, can be easily made available to the project or otherwise will be hired from the market (like companies, NGOs etc.), if so required.

The whole design of RACP is based on the fact that State has serious problem of availability of water for agriculture and also for human and animals. The project design therefore includes interventions which will result in efficient use of water in agriculture, water conservation and diversion of saved water from command areas for use of other purposes. While tackling the problems of efficient use of water on one hand and conservation of water on the other, supportive programmes like promoting change in cropping pattern and introducing crops having comparatively less water requirement have been considered so as to maintain sustainability of agriculture and also to incentivize agriculture production with minimum water and dissemination of appropriate technologies under the project. Likewise the farmers have to have access to market and marketing information and therefore project design also includes the interventions of technology transfer and market led advisory services, developing alternative markets and value chains and market information dissemination to farmers. The whole RACP is designed taking into account the need of the local community and its planning is based on participative approach. In implementation of the project also the community involvement has been planned through public private partnership involving private players where higher level of investment and managerial skills are required. Thus, RACP project design revolves around water, agriculture and markets. All the components and sub components of the project are integrated to achieve all end to end approach.

8. Project Components:

The RACP has four components:

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 Evaluation.
The Project proposes to improve the productivity and quality of produce in agriculture and allied sector by various interventions proposed under Component 1. The objective of better and reasonable returns to the farmer for his produce can be achieved if the farmer access to the markets is improved. Various interventions in the component 1, 2, 3 & 4 are given below:

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<td>A. Improved of water-use efficiency</td>
<td>A. Agri-business Promotion Facility (ABPF)/ Agribusiness Incubator</td>
<td>A. Farmer groups &amp; participatory planning</td>
<td>A. Project management</td>
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<tr>
<td>A-1 Catchment Area Development</td>
<td>B. Market Infrastructure, Information and Intelligence Services</td>
<td>B. Institution strengthening</td>
<td>B. M&amp;E, convergence</td>
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<tr>
<td>A-2 Command Area Development</td>
<td>C. Warehouse Receipt Development and Virtual markets</td>
<td>C. Production risk management tools</td>
<td>C. Production risk management tools</td>
</tr>
<tr>
<td>B. Technology transfer and marketed advisory services (Agriculture and Horticulture)</td>
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<tr>
<td>B1: Setting up Farmer Common Service Centers</td>
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<td>B2: Setting up Centers of Excellence</td>
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<td>B3: Use of Information and Communication Technology (ICT) for Farmer Advisory Services</td>
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<td>B4: Promoting Adoption and Documentation of Improved Technologies</td>
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<tr>
<td>C. Livestock Strengthening and Management</td>
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</tbody>
</table>

Component - 1. Climate Resilient Agriculture:

Component 1-A. Improved water-use efficiency:

1. The project aims to support the Government of Rajasthan in achieving the goals of its Water Sector Policy adopted in 2010. In doing so, a set of guiding principles on sustainable water management practices under the project are envisaged under project design and implementation process, and ultimately for ensuring the success of the project in achieving its development objectives. The aims and guiding principles vary for different forms of water sources, i.e. canal (or surface) water, ground water and watersheds.

2. Since, the proposed area of operation of RACP would be 17 districts, with major focus on pilot areas of eastern parts of Aravali and Southern districts. The existing 12 clusters of RACP will be retro-fitted as per the Four Waters Concept to include the upper catchments where ever feasible. As far as component design of RACP is concerned, the interventions suggested in the Four Waters Concept would be subsumed suitably under this sub component.

3. For enable the retro-fitting of the Four Waters Concept, project would seek the support of leading partners in this area and also the experience and support of respective line departments i.e. Watershed Development & Soil Conservation, Water Resources, Ground Water, Agriculture and Horticulture Department etc.

4. The activities and the number of structures mentioned are only suggestive, and would vary depending upon the hydrogeology of the watershed/project area. Based on the Four Waters Concept, this component will focus on promoting sustainable water use for Agriculture and improved water use efficiency. Project may use the readily available type designs and ready
reckoner tables with suitable modifications as needed as the guidelines for interventions in the project areas.

5. To develop the catchment and micro command areas on pilot basis, the approach of ‘Four Waters Concept’ would be adopted in project areas including the new project areas to be identified in Jhalawar, Banswara, Baran, Tonk and Dholpur districts as per location specific requirements, technical suitability and applicability in addition to other suitable location specific interventions. Project areas selected as Z-distributary, Phoolasar, Kheruwala and Ladnu will be developed as per the existing approach of RACP.

6. To achieve the project development objective, the execution of activities would be done in an integrated manner so that maximum benefits per unit of water are achieved by the farmers.

A-1: Catchment Area Development:

The catchment area of existing and proposed watershed project clusters, ground water clusters and potential catchment areas of surface water clusters would be covered under this sub component.

1. Watershed clusters:
   a. "Four Water Concept" is evolved by integrating the "Four Waters", viz. rain water (which is the source for the other three waters), underground water (available under water table conditions), surface water (which is the water that flows in the streams, rivers and gets stored in the lakes and reservoirs) and the soil moisture [the water content in the soil what they call it as unsaturated zone (vadose zone/phreatic zone) that means between ground level up to water table level] as fourth important water.

   b. Technical aspects of watershed pertaining to five sciences and technology departments (Irrigation, Agriculture, Watershed Development and Soil Conservation, Ground Water and Geo-Engineering) are integrated in this concept. It is learnt that the results were encouraging, since the benefits due to this technology are three times more & recharge ten times more as compared to the conventional technology.

   c. This technology emphasizes on water spreading techniques to facilitate recharge to ground water in the upper areas of watershed, through mini percolation tanks instead of the conventional check dams in the main valley recharged through gully percolation tanks, sunken pits; cover crops to prevent soil moisture evaporation; methods for keeping open dug wells full of tapping this water for irrigation (instead of bore wells in hard rock areas); making the main stream perennial, and divert surface flows for irrigation (2 or 3 crops) by mean of low cost structures; sub-surface dams to conserve the recharged ground water etc. The focus is more on soil work, little use of rubbles as required. Conventional Check dams/stop dams etc. constructed with cement mortar; which constitutes higher costs/investments are discouraged. Since, the Four Waters Technology is simple and with little training and capacity building to the communities/beneficiaries, the field activities can be better executed and maintained with adequate people's participation.

   d. As per experience of Shri Hanumantha Rao, retired Engineer in Chief, Govt. of Andhra Pradesh, who has evolved the concept of Four Waters, in red soil areas, about 10% rain fall is being recharged as ground water, 25% goes as runoff generated out of rainfall and remaining 65% of rain water remains as soil moisture in the soil horizon/strata. Out of this soil moisture, the evaporation during summer is more severe. The rate of evaporation in summer ranges from 16-20 mm per day viz-a-viz about 2 mm per day in winters. With a view to natural streams to become perennial, it is felt necessary that soil remains moist even during summer and get saturated, percolation starts taking place during monsoon season, thus causing base flows into the streams. As the soil moisture shares the major part of rain water and which is presented in soil texture; is being utilized by the plants to grow upto the depth of root zone. Still, majority of soil water is being evaporated during the summer season at a very steady rate that is often un-noticeable. Our efforts should be emphasized more on managing the soil moisture and preventing it to be getting evaporated. Soil surface during summer should be
kept covered as far as possible with vegetation grown and spread along the ground surface. Mulching is a useful activity to prevent evaporation during summer. Cultivation of green manure crops during pre-kharif and cover copping would be quite useful. The varieties could be sowing of guar, sun hemp, dhenga etc. Dried organic matter should be ploughed during kharif and little / basal dose of $P_2O_5$ could be applied.

e. But, its major un-utilized portion evaporates during summer season due to non-vegetation leaving the soil dried and again creating the demand of water for the coming monsoon period. During discussion on this concept, it could be seen that it is more applicable in red soils, clay soils, black cotton soils etc. and for the good catchment areas.

f. By suitably treating the catchment areas of 1st order, 2nd order & 3rd order streams of watersheds with the conventional methods i.e. construction of Continuous Contour Trenches (CCT), Sunken Pits in gullies, Mini Percolation Tank (MPT) & Check Dams, the depth of soil moisture may be increased, which will be helpful in due course for improving the water table.

g. It is learnt that when the Four Waters Concept is followed, following results were achieved:
   i. Main stream in the watershed of 500 hectares becomes perennial and surface water gravity irrigation can be done through rough stone diversion structures.
   ii. Rainfall runoff or flood flow in the stream will be less turbid (clear water) than the earlier muddy flows. This indicates the success of soil conservation works executed.
   iii. All the dug wells in the watershed, including the upper catchment areas will have ground water in summer as compared to the earlier phenomenon of dug wells getting dried up by the end of December.
   iv. Essential water requirements would be available in the watershed even during drought years.
   v. 30% of rainfed lands can be given irrigation for one Rabi I.D. crops in normal years (existing is about 7%)

h. These works relate mainly to Mini Percolation Tanks (MPTs) (30-40 numbers) in a watershed, sunken gully pits, Continuous Contour Trenches (CCTs) along contours, Boundary Bunds, Contour Bunds, Percolation Tank at head of Gully and Sub Surface Dams. Vegetative Crops (Green manure) during Rabi and post Kharif seasons, Tree Plantation in all un-cultivated lands and on all boundaries of field, vegetative cover for Gully Slopes etc. This technology does not stand alone and this has to be adopted with total people's participation. When the above concept is adopted, rain-fed agriculture productivity would increase by three fold and the crops in Kharif season can withstand drought spells of 25 days duration. 35% of cultivated area can be brought underground water irrigation.

i. Following structural and vegetative activities need to be performed under "Four Waters Concept" in order to achieve the full-fledged development of the given catchment area.

**A. Structures (Engineering):**

1. Mini Percolation Tanks (MPTs)-30 to 40 per watershed in the first and second order streams. Big percolation tanks in third and fourth order streams if feasible.

2. Check Dams in second and third order streams with earthen dam in center and surplus weir on side-(No check Dam in the main stream and no cement structure in the stream course). The earthen bund check dams should not be constructed in the main stream where maximum flood discharge will be very high.

3. Sunken pits in gullies in first and second order streams.

4. MPTs at head of gullies & upstream of sunken pits and drainage line treatments.

5. Continuous Contour Trenches (CCTs) strictly along contour, with side slope for cut section with MPTs at gully junctions.

7. Diversion drains and sump, for recharging open dug wells.

8. Sub surface dams at the downstream of the watershed.

9. Rubble stone diversion weir on the main stream, for gravity irrigation.

10. Restoring and de-silting very small tanks lying within the watershed.

B. Vegetative:

1. Green Manure Crops before the main Kharif season crops.

2. Cover crops in rain-fed lands during post Kharif for Rabi season crops & dry period.

3. Tree plantation on all un cultivated lands to develop a three tier canopy.

4. Trees on all boundary bunds of rain-fed lands with a small trench on either side, to prevent tree roots spreading horizontally or competing with crops.

5. Vegetative cover (Agave) for gully slopes.

6. Raising pastures in selected common lands.

7. Tree plantation on slopes and banks of gully.


9. Agro Forestry including block plantation, shelter belts, sand dune stabilization etc. wherever needed.

j. In addition to the existing activities in watershed areas, the Four waters concept would be followed consisting of Structural and vegetative works. The allocations and utilizations of water resources within the Watershed area for various uses would be limited to the amount of total annual available water for the watershed, and without adversely affecting the present commitments / usage of the water flows to the downstream watersheds.

2. Ground water clusters:

a. In the case of groundwater, the aim is to reach sustainability of the water source (i.e. the aquifer) through the RACP. The annual water extraction of water from the ground aquifer, over the long term, would be limited to the annual replenishable ground water recharge. For this the RACP would promote community based management of ground water on an aquifer basis and would implement (a) an accurate measurements of ground water extraction in the aquifer, (b) ground water budgeting (c) efficient use of ground water and (d) introduction of alternate crops requiring less water and giving equal or higher income.

b. Groundwater is a natural resource whose occurrence and distribution are more easily identified within the boundaries of a Hydrological Unit. Although in India decisions about its use are in the hands of individuals who own the land where it occurs, it is a typical common property resource and as such, its sustainable management requires cooperative management and shared benefits. In technical terms, sustainable management of groundwater means extracting only the water received by an aquifer through natural annual rainfall recharge and other artificial recharge structures, existing or proposed to be constructed. Over-exploitation occurs when extraction exceeds recharge. Collection of rainfall data and measurement of well discharge and water levels are necessary for the assessment of the quantities that can be extracted on an annual basis.

c. Over exploitation of groundwater particularly in hard rock areas, caused steady decline in its level and most of the dug wells and high numbers of deep bore wells have gone dry, affecting all the stake holders. It is being increasingly realized widely that unless some effective steps
are taken to conserve and manage ground water, the very livelihood of numerous farmers may jeopardized.

d. For supply side interventions, induced recharge through open well, check dams and percolation tanks and induced recharge through gravity and injection wells and other suitable recharge structures will form the core activities to augment recharge of aquifer. Demand side approach will focus on IEC activities including but not limited to awareness among farmers to understand their ground water system adequately so that they could make informed decisions about their water use.

e. Four Waters Concept will be retro-fitted in ground water clusters where ever feasible.

3. Production and Management aspects:

a. Farm families will be enabled for adoption of alternative agricultural practices suiting the availability of harvested / conserved / ground water.

b. Community based institutions established for alternative management of water resources with equal representation/ participation of men and women, demand side of ground water management and building capacities of users to adopt a more environmentally and economically sustainable agriculture and horticulture by involving vermi-compost, green manuring, bio-fertilizers, mulching, border crops, proper spacing, inter-cropping, use of botanical extracts, alternate furrows, ridges and furrows and improved irrigation methods. The ultimate aim would be modifying cultivation practices and reducing cost of external inputs.

c. Emphasis will be also be on empower farmers with knowledge and skills to crop water budgeting, rain water harvesting, measure recharge and draft of ground water, sensitize farmers on the need for collective action, sharpen farmers’ ability to make critical and informed decisions on crop water budgeting, crop plans and sensitize farmers on new ways of thinking. Presently, farmers are using sprinkler but there is no measurement of how much volume of water is used, R&D study will help farmers understand the total number of pumping hours from water source required to achieve application of the desired depth (volume) of water to a particular field or crop.

d. Overall strategy will help farmers in making informed individual decisions on which crops to grow and respective acreages based on the availability of conserved / harvested / ground water, with beneficial impact on sustainable use of a commonly shared resource. Gender main streaming and equity in women’s participation in various activities such as resource utilization, training & capacity building will be ensured.

e. Farmers will be encouraged to adopt scientific water management through education and training in improved farm practices. Support shall be provided to SAUs to carry out research & develop technology for increasing irrigation efficiency and development of packages for less water requiring crops.

4. This component supports climate-resilient approaches that allows for the sustainable use of the natural resource base (primarily water) through agricultural and livestock production systems aiming to increase long term productivity and farm incomes in an environment marked by increased climate and, in particular, rainfall variability. More specifically, this component will support measures that improve: (a) harvest, capture, collection, delivery and distribution of water for agriculture and livestock purposes in canal catchment and surface water irrigated canal command areas, ground water sources and rainfed areas; (b) on-farm water use efficiency; (c) soil moisture and fertility improvements; (d) sustainable intensification and diversification of farm production; and (e) integrated crop and livestock farming systems.

A-2: Command Area Development

Canal Irrigated clusters:

1. The State’s water resources are scarce and that the state’s future development and prosperity depends largely on sustainable and efficient allocation and utilization of its scares water
resources. To achieve the objectives in the water sector, the Government of Rajasthan (GoR) is implementing a number of initiatives in the water sector under its various programs, including under Bank financed Rajasthan Water Sector Restructuring Project. These include: (i) involvement of legally empowered water users associations in the irrigation system management, (ii) establishment of a new State Water Resources Planning Department for multi-sectoral planning and management of water resources, and (iii) adoption of revised state water policy, 2010. In addition to above, GoR, inter-alia, is making substantial provisions on water investments under the Rajasthan Agricultural Competitiveness Project (RACP) for sustainable as well as efficient use of its water resources, to achieve the above mentioned objectives in the water sector especially in Canal Water Management and Ground Water Management.

2. Under the command system, canal rehabilitation and modernization will be taken up. This will include, among others, cross regulators, rehabilitation of existing defunct structures, rationalization of outlets, modern reservoir and canal monitoring systems and SCADA. Strengthening of Water Users Associations; and modernizing the systems with real time roster plan will also be taken up.

3. For the Upper Catchment System, structural works in first order and second order streams, percolation tanks, sunken ponds, continuous contour trenches for soil moisture conservation; staggered and box pit trenched on sloping lands; contour bunding; field bunding; farm ponds; earthen structures; and diversion drains may be taken up by retro-fitting the Four Waters Concept. (One of the focus areas in upper catchment would on those locations which are vulnerable to soil erosion)

4. Canal irrigated areas, with typically very low water use efficiencies and outdated irrigation management practices, are the only areas with in Rajasthan where major savings in water are potentially possible for diversion to other, non-agricultural water uses, through appropriate system improvements, and adoption of modern management practices/instruments and policy interventions. The objective under canal irrigated clusters is to demonstrate the feasibility of agriculture water savings for use outside of the sector. In case of canal irrigated clusters, therefore, the focus will be to reduce the water footprint in agriculture (without reducing the present entitlement of the farmer, or the area under irrigation or the cropping intensity) through improving the water use efficiencies at all levels of the system, and using the water thus saved to other sectors of water uses (such as drinking water).

In addition to the existing activities in canal command areas, the Four Waters Concept would be retrofitted in upper catchment areas of irrigation projects as per feasibility.

Component 1-B: Technology transfer and market led advisory services (Agriculture & Horticulture)

Concerning line departments of Government of Rajasthan will take the responsibility of undertaking regular agriculture and horticulture department activities, which are aligned with the project development objectives of RACP in the selected cluster area. RACP will focus on innovative activities of market led technology transfer, which would include among others, commodity focused Farmer Common Service Centers managed and operated by Farmers Producers Organizations, that will focus on market led production activities, primary processing, aggregation and marketing, on the lines of the Bank funded MACP; ICT based demand driven participatory extension system on the lines of “e-velanmat” under the Bank funded TNIAMWARM project through PPP approach; Specific demonstrations linked to Value Chain commodities identified in the project areas (in collaboration with agribusiness companies and technical support from Universities); and supporting large scale adoption and documentation of improved technologies by the farmer.

B-1: Setting up Farmer Common Service Centers:

This sub-component aims to provide alternative marketing channels in addition to the existing regulated wholesale (APMC) markets and link farmers to the alternative markets for capitalizing on the emerging agricultural marketing opportunities. The focus of this activity is on organizing farmers into commodity groups and larger producer organizations (POs); developing their capacity and skills
for marketing by accessing wider markets; and investment support to the POs for the establishment of farmer common service centers (FCSCs) as is being done in the World Bank funded Maharashtra Agricultural Competitiveness Project (MACP). The FCSC is a small scale aggregation place owned, managed and operated by the producer organization. The project will finance ‘productive’ demand-driven investments on a grant basis to the producer organizations for establishing these common service centers.

The mobilization of producer groups and producer organizations, and establishment of common service centers will be carried out by suitably qualified service providers since the required skills are not available in the Government Departments. Producer organizations will be able to undertake various activities such as bulk purchases of inputs for delivery to individual members, aggregation of agricultural produce, grading, packing, quality control and marketing. The benefits to the farmer members of producer organizations are expected to be higher farmer prices through a combination of larger critical mass of saleable produce thereby providing economies of scale, savings in transaction costs and strengthened negotiation positions, coupled with the value addition achieved through primary grading and packing.

Establishment of two types of common service centers is planned. One group of common service centers (about 100) is planned to be established for cereal, pulse and oilseed producing areas, and will provide cleaning, grading, aggregating and packing facilities for cereal, pulse and oilseed producers. Second group of another about 100 common service centers are planned to be established in high value vegetable, fruit, spice, medicinal and aromatic crop producing areas, and will provide cleaning, grading, and packing services for the high value crops.

**B2: Setting up Centers of Excellence:**

The objective of this sub component is to disseminate full-fledged technology for farmers for getting benefit out of it. It will help to develop the recipe and value addition of the commodities as well as training of farmers and entrepreneurs for commercialization and creation of suitable environment. The Centre of Excellences focusing prominent commodity of the area will be established under the Rajasthan Agricultural Competitiveness Project (RACP) in collaboration with private agri-business companies under PPP approach for market led technology transfer and production processes.

**B3: Use of Information and Communication Technology (ICT) for Farmer Advisory Services:**

The project will support adapting to selected project areas e-Velanmai model of extension/technology transfer developed by Tamil Nadu Agricultural University Coimbatore under the World Bank funded Tamil Nadu Irrigated Agriculture Modernization and Water-Bodies Restoration and Management (TNIAMWARM) Project. This is an ICT based demand-driven participatory extension system for providing timely agro-advisory services by the State Agricultural University scientists and extension workers to the farmers using ICT tools (internet, computer, digital camera, mobile phone, etc.) on need and/or regular basis. Five essential components of this technology transfer model are:

i. Farmers who are enrolled as members of e-Velanmai scheme

ii. Expert team(s) of scientists formed at the State Agricultural University

iii. Field Coordinators/Research Fellows (extension services) for training & capacity building of farmers

iv. ICT tools to link farmers and experts

v. Information about agricultural and natural resource management problems (data) collected from farmers for advice

Other need-based components include the technical message delivered by the experts to solve agricultural problems faced by the farmers, and the follow up actions on the advice adopted by the farmers.
B4: Promoting Adoption and Documentation of Improved Technologies:

This sub-component aims to raise productivity of selected field, vegetable, fruit, spice, medicinal and aromatic crops and improve water use efficiency in the project areas by promoting large scale adoption of improved and integrated crop husbandry and natural resource management practices by the farmers. Unlike the present practice of organizing narrowly tailored demonstrations (e.g., only on a new variety or a single package of practice like fertilizer application or weedicide dose) as is normally being done under various ongoing Government of India/Rajasthan schemes like Rashtarya Krishi Vikas Yojna and National Food Security Mission, RACP will support integrated crop management (ICM) demonstrations encompassing the complete package of practices for a particular crop from land preparation to harvesting of the crop [including use of seed of improved high yielding varieties/hybrids, seed treatment, optimum plant population, soil test based application of fertilizers (including use of organic manures, bio-fertilizers and micronutrients), weed control, integrated pest management (including use of bio-pesticides, and bio-rational pesticides), efficient methods of on-farm water management, carrying out all cultural practices at the optimum stage of crop, etc.] in each individual on-farm demonstration. Special attention will be paid to include all high payoff interventions and low cost methods for improving on-farm water use efficiency such as alternate furrow irrigation, paired row irrigation, use of crop residues as mulches for reducing evaporation loss, etc. as an integral part of each individual ICM demonstration. Farmer trainings will also be linked and fully integrated with ICM demonstrations, with each demonstration having about four training sessions from preparation of land to the field day organized shortly before harvesting of the crop for showing the actual impact of adopting all integrated crop management practices on crop stand as compared with the farmer practice control to large number of farmers in project villages.

Demonstrations will be conducted on various cereal, pulse, oilseed, vegetable, fruit, spice, medicinal and aromatic crops grown in the area with a clear thrust on popularizing high payoff interventions and improving water use efficiency. Some additional demonstrations will be conducted for promoting resource conservation technologies, and for popularizing climate smart agricultural practices in Rajasthan. The project will also support post-harvest management demonstrations for promoting farm level cleaning, grading, aggregating, packing and value addition to the agriculture and horticulture produce. A broad menu of interventions for agriculture and horticulture has been developed. High pay-off interventions will be selected from this menu depending upon agro-ecological conditions and emerging marketing opportunities in a geographical setting.

In view of the importance of seed in increasing crop productivity and the low seed replacement rates in Rajasthan, 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. Support will also be provided for promoting production of hybrid seed of Bajra by the farmers.

The project will also support adaptive trials for testing of promising crop husbandry practices and on-farm water management technologies which are at an advanced stage of development by the State Agricultural Universities in Rajasthan and require on-farm testing, refinement and validation.

In a major deviation from the present approach of assessing demonstrations only in terms of completing the physical targets of organizing demonstrations, the success of demonstration program will be assessed in terms of adoption of the demonstrated technologies by the farmers in the years following the year in which the demonstrations are organized. This will involve following steps:

i. Organizing training and sensitization sessions in the villages before sowing of the crop in the year following the year in which demonstration was organized and encouraging them to adopt the technologies which were demonstrated in the previous year

ii. Providing adoption support in terms of supply of critical inputs like seed on cost sharing basis to the farmers provided they give an undertaking to adopt the package of demonstrated practices.

iii. Providing training and technical backstopping to the adopter farmers
iv. Tracking and documentation of adoption of demonstrated technologies by the adopter farmers in terms of their number, area on which adopted and gains in productivity achieved vis-à-vis baseline yield before adoption. The focus will be on promoting adoption of high payoff interventions (and not necessarily the complete package of demonstrated technologies) by large number of farmers

v. Comparison of gains in productivity achieved in the demonstration plots and by the adopter farmers in the following years. Although the yields of adopter farmers are expected to be lower than the demonstration plots (because of provision of all inputs and intensive technical support), the demonstration program will be regarded as successful if large number of farmers adopt critical technologies over substantial area.

Component 1-C. Livestock Strengthening and Management:

Goat and sheep rearing holds considerable scope in rainfed areas and these enterprises provide safety net for poor in case of crop failures; therefore, the project will aim to demonstrate how productivity and income can be enhanced for small ruminants’ farmers. The focus of this sub-component is on small ruminants because of their potentially significant contribution to income of smallholder farmers operating in difficult climatic conditions. Productivity is low, however, and although goat meat prices have nearly doubled in the last 2 years in the major Indian urban markets, traders are capturing most of the margins as farmers lack information and organization. The project will support improved productivity and incomes from goat meat production in cluster areas by (a) improving market access and value addition; (b) adopting climate smart practices focused on breeding, animal health and feeding and other husbandry practices such as stall-feeding, better use of crop residues, fodder storage and improved grazing land and silvi-pasture on private and common property; and (c) building capacity of farmers and strengthening Animal Husbandry Department (AHD) staff to backstop delivery of technical services and advice to farmers. Small local support units (Resource Technology Center) will be built to support farmer training and access to services.

This would be achieved by:

I. Improving productivity through breeding, feeding, animal health,

II. Developing organized livestock markets and livestock group marketing approaches to improve market access and value addition;

III. Capacity building supporting farmer advisory and training of the farmers, training of existing AHD and NGO and establishment of small local support units (called Rural Technology Centers).

IV. Establishing silvi-pasture plantations on private and common land as well as fodder processing and storage facilities, so that nutrition is made available for livestock round the year.

V. Strengthening the Animal Husbandry Department’s capacity to locally deliver cost-effective livestock support services such as animal health and nutrition and to provide market linked advisory services and

Productivity enhancement will focus on a) breed improvement through supply of improved bucks; castration of the marketable surplus to increase average daily gain (productivity); and advisory to ensure breeding cycle coincides with market demand and resources availability, b) improved feeding through advisory support to improve nutrition and better use of local resources; improving availability through improved & expanded fodder and silvi-pasture development on both farmer owned and common property lands, and simple storage, production and processing to include fodder banks, feed blocks and chaffing; c) animal health services that are adequate, targeted and timely provided largely through animal health camps supported by the AHD via mobile vans and Rural Technology Centers; d) husbandry and management advisory support to encourage housing and manger/stall feeding to improve feed utilization, reduce disease exposure and promote hygienic practices. The project will also provide pregnant goats to a few (60-100) widows in each cluster who are the most vulnerable of the poor.
Capacity building encompasses a) farmer training and ongoing skills and knowledge development and exposure visits b) training of workers engaged by the NGO and AHD staff to deliver technical services and advice c) building and equipping 3-4 Rural Technology Centers per and staffed by a livestock assistant and 1 veterinarian for every 4 RTCs to be hired by the DPM/NGO. Each RTC will cover 8-10 villages (200-250 farmers/and 3000-4000 goats as well as other livestock) and will serve a central role for both productivity enhancement components. The RTC facility will also support agriculture activities the market access and within the cluster and beyond RACP will backstop other livestock activities such as artificial insemination of cattle/buffalo.

Component 2: Markets and Value Chains:

Promotion of processing, value addition and marketing is essential for bringing higher economic returns to the farming community. The major challenges are supply chain infrastructure and institutional gaps, inadequate link between production and processing, seasonability of operations, low capacity utilization and lack of product development and innovation. Federating farmers in to producer organisations and forging of a healthy farmer-industry partnership can ensure assured market at pre-determined prices, increased investment in technology and inputs, increased productivity and returns to the farmers.

Therefore, for bringing higher economic benefits and insulating farmers from distress sale, RACP design includes federating farmers initially into farmer producer groups and finally into farmer producer organization (FPO). The FPO will be work for input management, technology transfer, cleaning, grading, packaging and marketing of their produce.

Component 2-A: Agri-business Promotion Facility (ABPF)/ Agribusiness Incubator:

ABPF under the Project envisages improvement of the existing market infrastructure and help in development of policies and development of value chain. Agribusiness activities will be related to agriculture and allied production, per se, creating backward linkages, e.g. providing quality inputs, and forward linkages, e.g. pulse/seed/spices handling unit to clean, grade and pack. ABPF will work in close association with PMU of the Project.

Component 2-B. Market Infrastructure, Information and Intelligence Services:

The availability of market information services through Kiosk, SMS, future pricing, etc. will help farmers reap higher benefits by improve the productivity and quality of the agricultural produce mainly through technology dissemination, integrated farming system approach, training and capacity building of farmers, market information and intelligence. Farmer will be provided market information about arrivals, prices, and quality standards of various commodities, not only from one market area, but from other market areas in the country and if possible from various countries of the world. This will enable the farmer in the clusters to have increased access to the markets and will be able to get better prices. This sub component added under re-structured mode of the project, wherein:

i. Though abundant information is available, however information accuracy, reliability, consistency, standardization and timely accessibility are the major challenge.

ii. Market Information and Intelligence Services (MIIS), will be set up under PPP approach, if possible covering both agricultural and livestock commodities.

iii. Project will support for solution building (building a ecosystems comprising of processes, systems, resources, quality checks, analytical tools, etc.) and solution access (through a combination of ICT enabled platforms and traditional dissemination approach – SMS services, dynamic and real time market information displays, commodity outlook reports) e.g. Large scale successful pilot under Bank funded NAIP.

Component 2-C: Warehouse Receipt Development and Virtual Markets:

Often, it has been experienced that at the grass root level, farmers are not fetching requisite prices of their produce from the markets. This may be because of prevalence of various market forces into action and poor capacity or holding of the farmers to keep their produce for times having potential for good
returns. Therefore, this is new sub component introduced under re-structured mode of the project, wherein following activities will be taken up:

1. Improving **price risk management services** for farmers in conjunction with commercial banks, warehouse companies and electronic commodity exchanges.

2. **Farmer Producer Organizations** linked with the accredited warehouses of State Warehousing Corporation for the purposes of warehouse receipt financing and / or electronic spot trading.

3. Activities which may be financed - modernization and upgrading of select state warehouses corporation's warehouses, setting up of commodity testing laboratories, purchase of computers and commodity exchange ticker displays, grading and sorting facility and electronic weighing machines in these warehouses.

4. Tie up with electronic spot market.

**Component-3: Farmer Organizations and Capacity Building:**

There will be multi levels of farmer groups and producer groups, producers organizations namely multi task groups, user groups, livestock groups of small ruminants, value chain groups etc. Major emphasis would be creating awareness amongst the CBOs and farmers groups and developing their capabilities and skills to perform various tasks apart from knowledge improvement. A separate Training and Capacity Building Manual will be prepared. Series of structured trainings and capacity building activities will be planned for all the stake holders. Exposure visits to the successful sites will also be planned both within the state and outside the state. It would be project's mandate to ensure that the capacities of the farmers organizations/groups and CBOs would be developed and enhanced to the extent that after the expiry of the project, they or organization should be able to sustain the project outcomes.

For sustainable agriculture promotion farmer groups/farmers field school will works on promotion of water conserving and cropping practices including diversification. For value chain development, producer groups and FPO established will be responsible for end to end value chain for the commodity identified. One of the essential components of value chain development directed at higher farmer income is the benefits that arise from economies of scale through collective organization-wholesale purchase of inputs, seed production and distribution, bulk storage in marketing, sorting, grading and other post-harvest practices. Under this component, various activities under the sub components as mentioned below will be under taken.

**A. Farmer groups & participatory planning**

**B. Institution strengthening**

**C. Production risk management tools**

**Component 4: Project Management, Monitoring and Evaluation:**

This component aims at improving the efficiency of implementation of project activities and periodically reviewing the output and outcome of the project interventions. Financial and physical progress and its review form an integral part. For implementation of project, different structures have been proposed including formation of RACP Management and Implementation Society, constitution of General Body and Executive Committee at State level and DLIC at the district level. PMU at State level and DPMU at district level will be responsible for supervision and management of the project activities. PIU of participating line departments shall be responsible for planning and implementation of project activities relating to their domain. The details of monitoring and evaluation, project management are detailed in separate chapters.

The fund flow arrangement in the project would be largely based on the electronic fund transfer to separate Bank accounts to be operated by designated authorities. The fund flow arrangement of the project has been spelt out in chapter on Financial Management, wherein the stages of fund disbursement and the roles of Drawing Disbursing Officers (DDOs) have been defined.
The project implementation will be closely monitored by Project Executive Committee under the chairmanship of Additional Chief Secretary, Agriculture, GOR under the overall guidance and policy support of Project Steering Committee headed by the Chief Secretary of the State. At the PMU level, separate M & E specialist, MIS specialist has been placed and shortly a separate M & E agency will be put in place.

The actual implementation of the project will be attended to by the “Rajasthan Agricultural Competitiveness Project Management and Implementation Society” a special purpose vehicle to be established for this purpose. This society will be headed by Chief Secretary and have full time Project Director. Project Director, RACP will the Member Secretary of the Steering Committee and Executive Committee of RACPMIS. Each of line departments involved in the project will have dedicated Project Implementation Unit (PIU), who shall be responsible for the planning and implementation of project activities related to their department in the cluster areas where potential exists. Details about implementation arrangements are summarized in the Chapter - 8 of Project Implementation Plan (PIP).

**Rolling out project activities in Mokhampura Cluster:**

It is pertinent to mention here that lot of project activities have been initiated / completed in the Mokhampura project area, which include:

1. The Detailed Project Report (DPR) and Operational Guidelines have been prepared and identification of potential sites for project interventions is completed. The NGO is on board and fully functional in Mokhampura cluster for community mobilization. Social Mapping exercise of the project area has been completed and beneficiaries of the project area have been sensitized for project interventions. The NGO has already formed more than 80 Multi Task Groups (MTGs) and also identified 27 Community Resource Persons (CRPs). Baseline survey is under progress; more than 400 forms have been completed; the remaining likely to be completed by end of August, 2014.

2. As per proposed Annual Action Plan 2014-15, an expenditure of Rs. 1275.00 lacs is likely to be incurred for the approved activities like formation of groups, capacity building, construction of field bunds and farm ponds, layout of on-farm demonstration of Agriculture and Horticulture crops and livestock interventions etc.

Project activities in Mokhampura Cluster will be rolled out immediately by adopting the in-house implementation strategy through dedicated District Project Management Unit (DPMU), Jaipur-I under the direct supervision and control of PMU, RACP. The experts in the DPMU, Jaipur-I have been engaged from the open market through the man power agency.
## Broad CACP Cycle

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