Progress Report

Improving Livelihoods through Integrated Watershed Management Approach at UltraTech (APCW) – ICRISAT Watershed

February 2019 to September 2019

Submitted to
UltraTech (APCW) Cements Limited,
Tadipatri, Anantapur District,
Andhra Pradesh

ICRISAT DEVELOPMENT CENTER

ICRISAT
INTERNATIONAL CROPS RESEARCH INSTITUTE FOR THE SEMI-ARID TROPICS

A Grant-in-Aid Proposal

Improving Livelihoods through Integrated Water Resources Management at Tadipatri, Anantapur

Submitted to

UltraTech Cement, Tadipatri, Anantapur

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Project Duration	:	Five Years
Project Start	:	February 2019
Project Completion	:	January 2024

Contents

1. Introduction

UltraTech Cements Limited (Andhra Pradesh Cement Works, APCW) has adopted an integrated watershed management program with the help of ICRISAT Development Centre (IDC), International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), to address water scarcity, land degradation, and crop productivity in order to improve rural livelihoods. In February 2019, the watershed project was started with an MoU for two villages (CSR villages of UltraTech Cements) – Patnikota (latitude 15° 085′ N and longitude 78° 063′ E) of Kolimigundla mandal, Kurnool district, and Ankireddypalli (later changed to Ayyavaripalli, latitude 15° 024′ N and longitude 78° 004′ E) of Tadipatri mandal, Anantapur district of Andhra Pradesh State (Figure 1).

Patnikota village is located about 25 km (Northeast) upstream of the UltraTech cement plant. Patnikota village has a population of 2700 under 630 households. Farmers grow castor, pigeonpea, cotton and pulses (black gram and green gram) in the rainfed areas of the village; and sweet orange, papaya and pomegranate in the irrigated areas. The hydrological watershed area that rainfall contributes towards Patnikota village is around 3500 ha, which has been named as UltraTech-ICRISAT Watershed (Figure 2). The average annual rainfall in the watershed area is around 615 mm. The watershed area is characterized by undulating topography with more than 20% slope. The major soils in the watershed are sandy gravel (40%), alfisol (red soil - 30%), and vertisol (black soil - 30%) with medium to low water-holding capacity. Of the total watershed area, 40% is under agricultural use and the rest is wastelands and non-agricultural land. Of the total agricultural area, 50% is under rainfed condition, and 50% is irrigated.

Ayyavaripalli village is located five km downstream (Southwest) to the UltraTech cement plant. Ayyavaripalli village has a population of 1000 and 250 households. Farmers grow pigeonpea, cotton, and black gram in the rainfed areas, and paddy and groundnut in the irrigated areas of the village. The hydrological watershed area that gets rainfall and contributes to Ayyavaripalli village is around 2750 ha, and has been named as Ayyavaripalli Watershed (Figure 2). The Ayyavaripalli watershed area is characterized by plain topography with less than 2% slope. The major soils in the watershed are black with medium to high water-holding capacity. Of the total watershed area, 70% is under agricultural use and the rest is wastelands and non-agricultural land. Of the total agricultural area, 50% is rainfed and 50% irrigated.

However, of the two watersheds identified for watershed activities, Patnikota watershed has been selected for implementing the integrated watershed management approach, and Ayyavaripalli watershed for only productivity enhancement demonstrations.

Figure 1. At the MoU signing between UltraTech Cements (APCW Plant Head, Mr MSRK Prasad) and ICRISAT (Director General Dr Peter Carberry) for the Integrated Watershed Management Approach in February 2019.

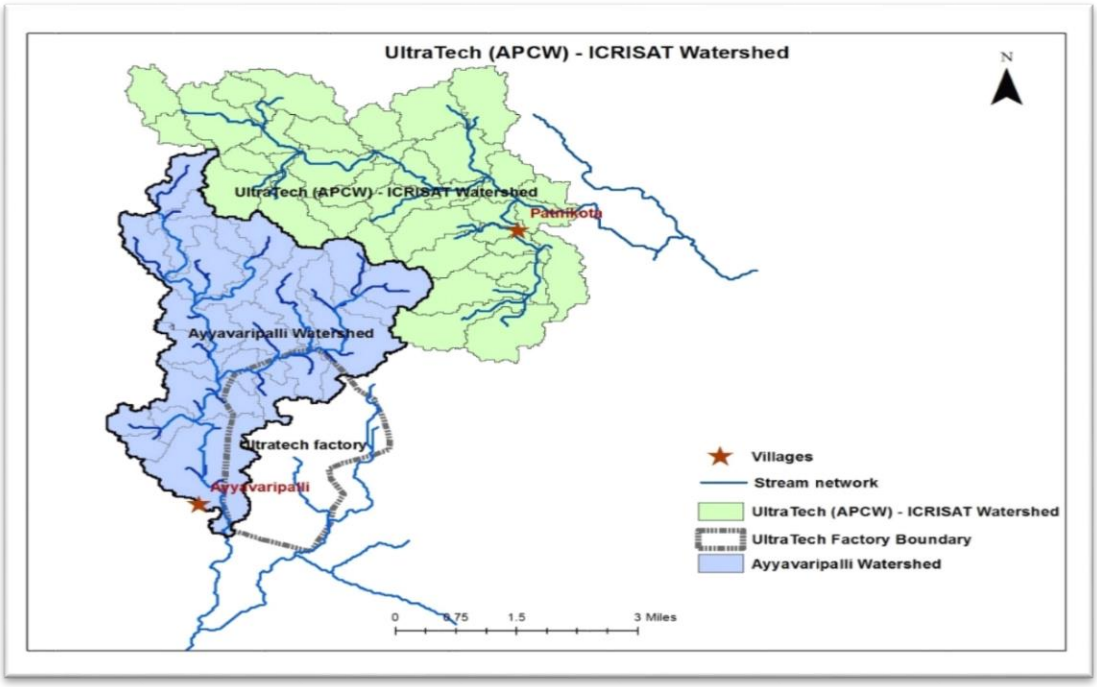


Figure 2. Map of the two watersheds near the UltraTech Cements plant, Tadipatri mandal, Anantapur district of Andhra Pradesh.

2. Goals and Objectives

The overall goal of the initiative is to increase the availability of water resources and improve agricultural productivity so as to boost the livelihoods of the rural poor in the watersheds on a sustainable basis by enhancing the impact of interventions through an integrated watershed management approach.

The initiative's specific objectives are to:

- Enhance water availability in the watershed through rainwater harvesting and recharging of wells, to demonstrate that science-based interventions can increase water availability;
- Enhance agricultural productivity through Good Agricultural Practices (GAP);
- Establish a model village that demonstrates increased productivity and improved livelihoods; and
- Build the capacity of farmers, women, and youth in the watershed.

3. Participatory Rural Appraisal

Participatory Rural Appraisal (PRA) is an integral component of watershed management. PRA is a process of understanding people, their resources, and their socio-economic conditions. It is also a process for exploring their problems, their aspirations, and potential, in partnership with the people. PRA is an important approach for decentralizing decision making and to create ownership among farming communities (primary stakeholders). It provides opportunities for analyzing the resource base, problems, developmental opportunities, primary stakeholders' rich experience, and the expertise of technical experts (service providers) in joint meetings. Triangulation further provides opportunities to improve the initial development plan and create interest among primary stakeholders. PRA has been carried out in Patnikota village and the key observations made during PRA are as follows (Figure 3):

i. Agriculture-based livelihoods: In both villages agriculture is the major source of income, followed by mining and factory work. Agriculture is predominantly rainfed and subsistence in nature in both the watersheds. The average productivity level of major crops grown in the watershed is very low and needs attention (Table 1). Agriculture can provide 50 person days of work per family in both the villages, and the average wage rate per head is INR 300-350 per male and INR 200-300/female, based upon the specific activity.

Table 1. Major crops and their yields (farmers' survey) in the watersheds.

UltraTech–ICRISAT Watershed (Patnikota)		Ayyavaripalli Watershed	
Crop	**Yield (q/acre)**	**Crop**	**Yield (q/acre)**
Paddy	10-12	Paddy	20-25
Cotton	8-10	Cotton	5-6
Castor	4	Vegetables	4-5 (tons)
Pigeonpea (intercropping)	2-3	Pigeonpea (intercropping)	2-3
Sorghum (fodder)	100		
Pomegranate	3-4 (Tons)		
Chickpea (rabi)	5		
Sweet orange	3-4 tons (below 5 yrs) 6-8 tons (above 5 yrs)		

ii. Industry-based livelihoods: According to observations, in both the villages many men and women work as employees in the UltraTech cement factory. In addition to factory employment, Patnikota village is a leading slab stone mining area with nearly 50 Slab/polishing industries. The major issues with the polishing industries is interrupted electricity supply and labour shortages. Nearly, 300 households (hh) in Patnikota village participate in loading and unloading activities at the slab industry and mining sites. About 50 tractors are operating in the mining industry providing livelihood to nearly 100 hh in the village. Other than tractors, 20 lorries are operating in the village giving livelihood for 10 persons per lorry for 200 days.

iii. Livestock: Nearly 20 households (hh) in Patnikota village have small ruminants, ranging from 50-100 per hh. Availability of fodder is a major constraint in Patnikota village for livestock development. Dry fodder (paddy straw) costs around INR 15000 – 40000 per lorry load depending upon the season. Open grazing is the major source of fodder. Majority of the farmers in Ayyavaripalli village keep buffaloes as milch animals. The average milk yield per animal is 5-6 liters per day.

iv. Limitations: During PRA, farmers identified ten important issues/problems that need to be tackled in the villages and prioritized them in sequential order (Table 2). The biggest problem identified was water scarcity during the post-monsoon season. The dug wells were drying as soon as the monsoon receded and groundwater levels in bore wells are declining year by year. All the farmers strongly agreed on developing water resources that support drinking water and supplemental irrigation for the crops during non-monsoon seasons.

Table 2. Major problems in the village along with farmer ranking.

No.	Problems	Rank
1.	Acute water scarcity	I
2.	Low productivity of crops	II
3.	Acute shortage of fodder	III
4.	Low fertility of soil	IV
5.	Soil erosion and runoff	V
6.	Insect pest and disease attacks on crops	VI
7.	Lack of marketing facilities	VII
8.	Limited electricity for polishing industries	VIII
9.	Unemployment of landless people	IX
10.	Lack of expertise in allied enterprises	X

Figure 3. Conducting PRA at Patnikota village by Dr D Moses, Visiting Scientist, IDC-ICRISAT.

v. SWOT analysis: SWOT (Strength, Weaknesses, Opportunities and Threats) analysis was the framework used to evaluate the condition of the two villages and then to develop strategic planning. The analysis assesses key internal and external issues, as well as current and future potential (Table 3).

Table 3. Major SWOT parameters in the village.

Strength (S)	**Weakness (W)**
Farmers' awareness of the watershed management program	Undulating topography in hilly terrains
Active participation by the farmers	High intensity rainfall during rainy season causes soil erosion
Diverse income sources	Deforestation and fragile geology
Early adopters	Resource-poor farmers
Opportunities (O)	**Threats (T)**
Potential for crop diversification	Mining zone – reason for poor soil health
Scope of runoff water harvesting and management	Migration to urban areas by youth
Existence of a drain system for water harvesting structures	Poor water retention due to fragile soils

4. Baseline Survey

Based on the insights gained from the PRA analysis a detailed baseline survey was initiated to study major socio-economic and biophysical constraints to sustainable crop production and livelihoods of the villagers in the watershed. The baseline information helps to identify, test and scale up any of the interventions in the watershed. The detailed objectives of the baseline survey are given below.

- Capture the present demographic and socio-economic profile of the watershed area;
- Capture the existing cropping pattern, various agricultural practices, and fertilizer utilization patterns in the watershed area; and
- Analyze the consumption pattern of food grains.

The baseline survey was planned according to small, medium, large, and landless farmers in Patnikota village. The survey findings are useful for identifying suitable interventions, as well as monitoring and evaluation during the project period. The baseline survey also acts as the basis for the impact assessment study upon project completion. Totally 45 samples are planned – 10 from each farming category, and 15 from the landless farming category. The baseline survey was completed in September 2019, data will now be analyzed and a report put out at the earliest.

5. Climate Monitoring and Awareness in the Watershed

Historical daily rainfall data from 2009 to 2018 collected at the UltraTech cement factory has been analyzed in order to understand temporal pattern of rainfall in and around the factory. Currently the same data is being used for understanding the watershed as it is located near the factory. The average annual rainfall in this area is 614 mm, with 388 mm as lowest and 871 mm as the highest annual rainfall. Of the total rainfall, 65% occurs during the monsoon season (June to October) and the remaining 35% during the non-monsoon season. The annual rainfall was found to be declining at the rate of 13 mm per year in the watershed (Figure 4). It was also observed that the average number of rainfall events per year is 34. Since the last five years, the intense rainfall events which create floods are found to be increasing, and low rainfall events, which are useful for crop growth in the watershed are decreasing (Figure 5). Taking all rainfall events into account, 20% are low (below 10 mm), 45% are medium (10-30 mm), and 35% are high (>30 mm) (Figure 6). Based on the daily moisture availability, a weekly soil moisture calendar was created and displayed at prime locations in the village where farmers gather for discussions in their free time (Figures 7 & 8).

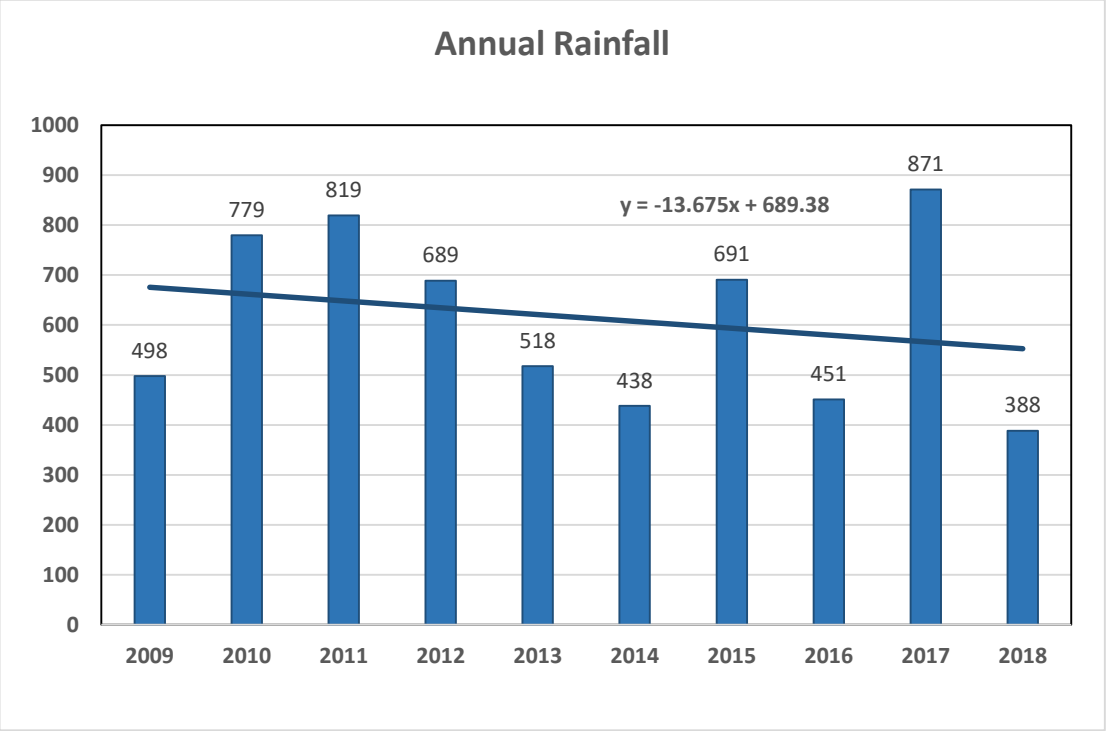


Figure 4. Trends of annual rainfall in the watershed.

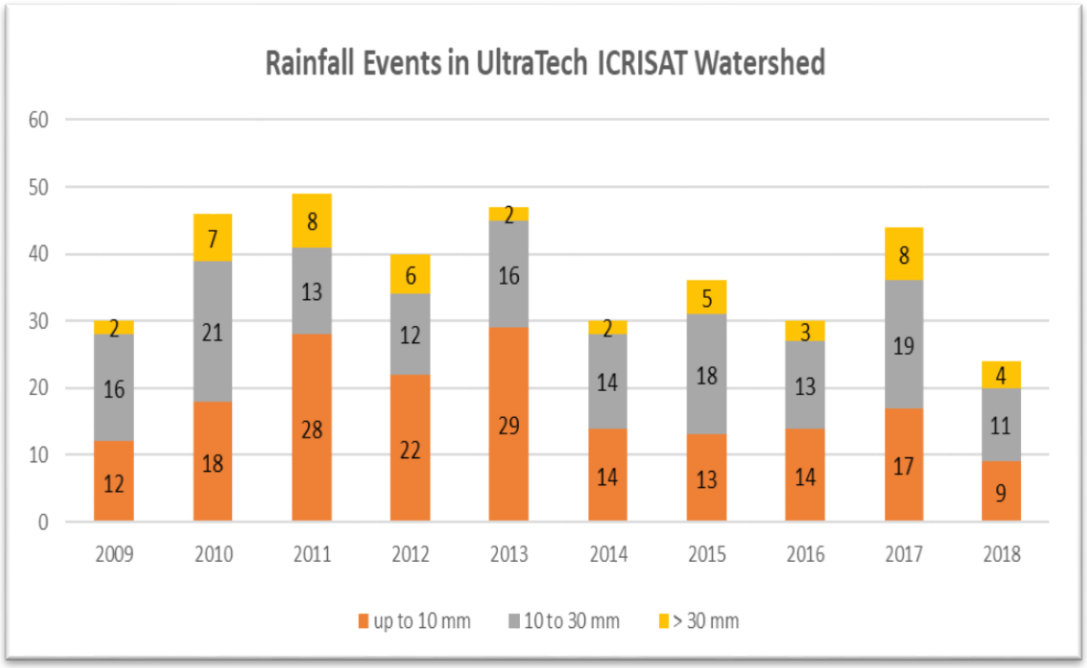


Figure 5. Variability in rainfall – low, medium, and high rainfall events in the watershed.

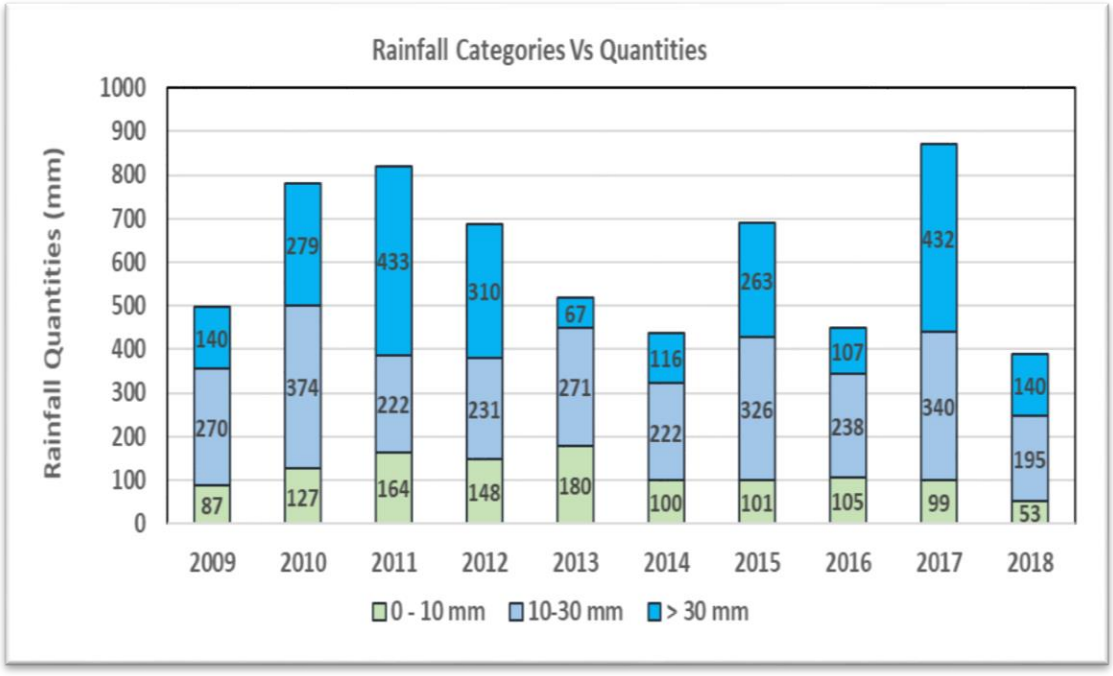


Figure 6. Proportion of low, medium, and high rainfall events in annual rainfall in the watershed.

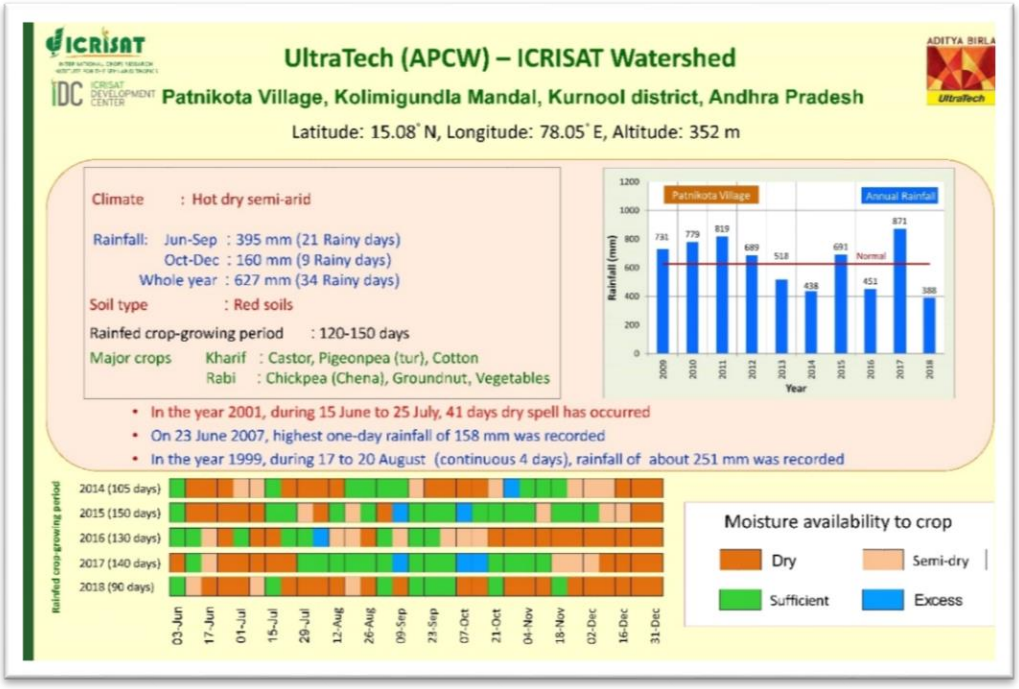


Figure 7. Information on annual rainfall along with the weekly soil moisture calendar displayed in the watershed.

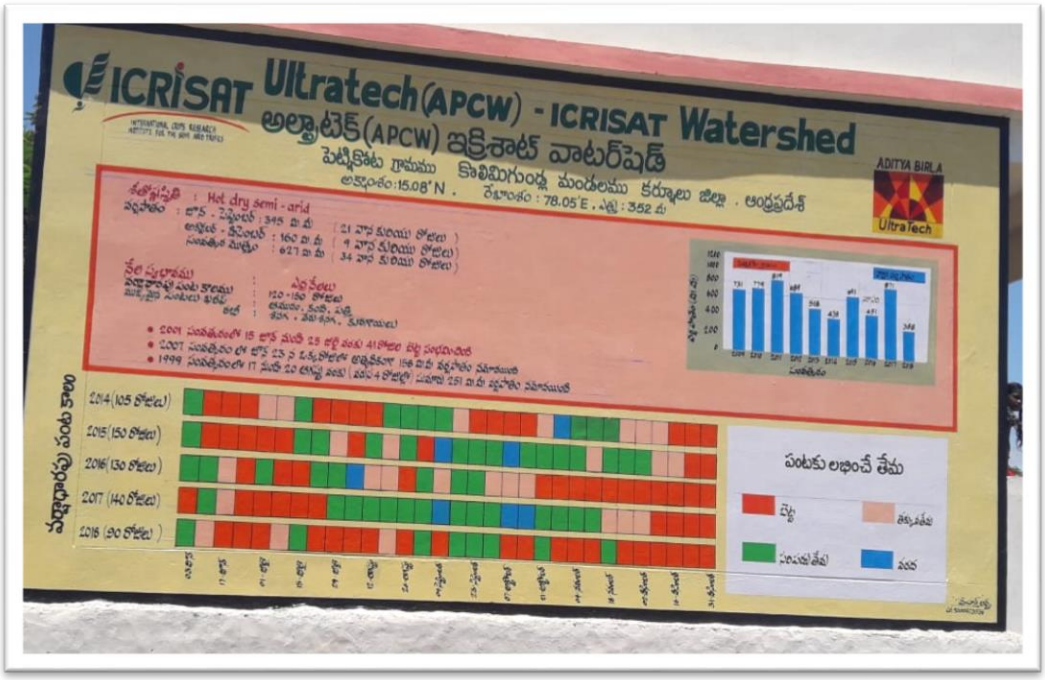


Figure 8. Wall writing (in the local language) with template on climate variability and weekly soil moisture availability in the watershed.

An automatic weather station with a data logger was installed in Patnikota village to collect daily rainfall and temperature data, to understand daily temporal variation in rainfall and temperatures in the watershed (Figure 9).

Figure 9. Rain gauge installation in the Patnikota watershed.

6. Balanced Soil Health Management

Declining soil health is often cited as one of the reasons for stagnating or declining yields. Soil health management is a well-recognized practice all over the world, which takes care of low, high or disproportionate applications of fertilizers or nutrients in farmers' fields. The imbalanced and sole use of high NPK fertilizers along with the declining use of organic manures since the last few decades have resulted in degradation in secondary micronutrients and low carbon (C) levels. The deficiencies will get further aggravated when we attempt to increase crop productivity without resorting to proper soil fertility management practices. Soil testing is the first step towards addressing the judicious use of fertilizer in the farmer's field. Fertilizer recommendations based on soil tests will maintain soil health and also reduce the cost of cultivation for farmers. The soil testing and soil health management programs are being given adequate importance in Indian agriculture so as to sustain crop production and balanced fertilization. Plant nutrition, along with other management practices viz., improved cultivars, pest and disease management, soil and moisture conservation, water management, weed control, and inter-cultural cropping systems, have a decisive effect on crop yields.

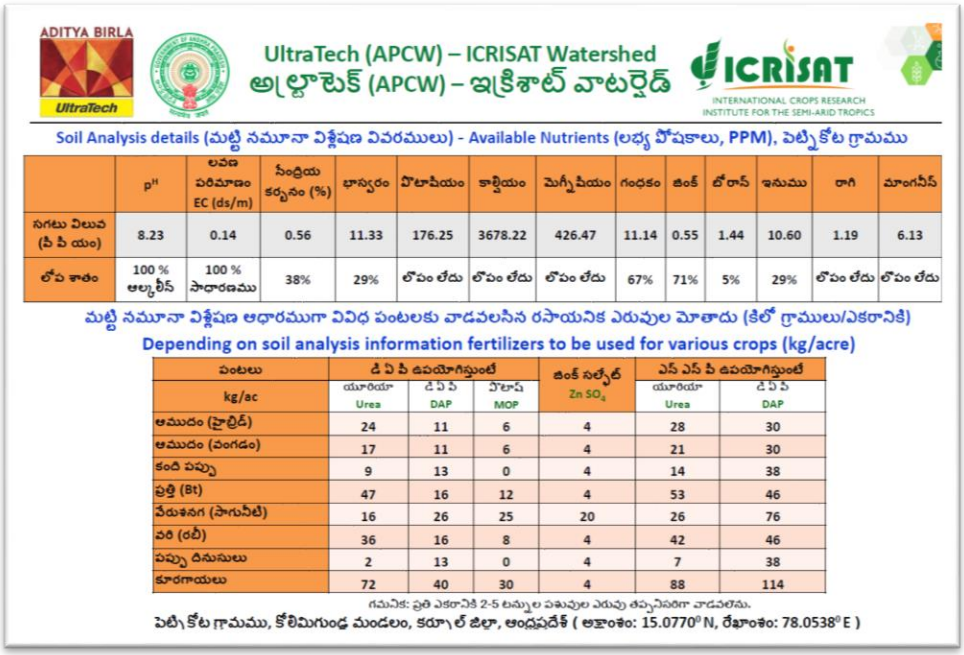
Soil samples collected from individual farmers' fields have been analyzed to understand the soil nutrients status in the UltraTech-ICRISAT Watershed (Figure 10). The soils were analyzed in an international standard soil laboratory at ICRISAT, Hyderabad. The soil health condition in Patnikota village showed deficiencies of micronutrients and secondary ones such as zinc, sulphur, and organic carbon, along with nitrogen (N), phosphorus (P), and potassium (K). Based on the soil test results, fertilizer recommendations (urea, DAP, potash and zinc) for major crops, such as castor, pigeonpea, cotton, groundnut, paddy, pulses and vegetables were given to all individual farmers who had contributed their soils for the soil analysis, through soil health cards (Figures 11 & 12).

A mean was calculated from all the soil collected and a separate fertilizer recommendation for major crops was given at the watershed level (Figure 13). It was observed that soils (100%) in the watershed are alkaline, 71% of samples showed deficiency of zinc, 67% of samples showed deficiency in sulphur, 38% showed deficiency in organic carbon, and 29% showed deficiency in phosphorous and iron. No deficiency of potash, calcium, magnesium, Copper and manganese was observed in soil samples (Figure 11). The village level fertilizer recommendation was put up as wall writings in the village corner points, where farmers gather daily for their interactions (Figure 14). Farmers' meetings were conducted to share the soil health information and fertilizers recommendations disseminated through wall writings in the village. Soil health cards were distributed to farmers under the chairmanship of Plant and HR heads of UltraTech Cements.

Figure 10. Collection of soil samples from farmers' fields in Patnikota village.

Figure 11. The Soil Health Card (SHC, front page) printed for individual farmers.

Figure 12. The back page of the Soil Health Card printed for individual farmers.



UltraTech (APCW) – ICRISAT Watershed
అల్ట్రాటెక్ (APCW) – ఇక్రిశాట్ వాటర్‌షెడ్

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Soil Analysis details (మట్టి నమూనా విశ్లేషణ వివరములు) - Available Nutrients (లభ్య పోషకాలు, PPM), పెట్నికోట గ్రామము

	pH	లవణ పరిమాణం EC (ds/m)	సేంద్రియ కర్బనం (%)	భాస్వరం	పొటాషియం	కాల్షియం	మెగ్నీషియం	గంధకం	జింక్	బోరాన్	ఇనుము	రాగి	మాంగనీస్
సగటు విలువ (పి పి యం)	8.23	0.14	0.56	11.33	176.25	3678.22	426.47	11.14	0.55	1.44	10.60	1.19	6.13
లోప శాతం	100 % ఆల్కలీన్	100 % సాధారణము	38%	29%	లోపం లేదు	లోపం లేదు	లోపం లేదు	67%	71%	5%	29%	లోపం లేదు	లోపం లేదు

మట్టి నమూనా విశ్లేషణ ఆధారముగా వివిధ పంటలకు వాడవలసిన రసాయనిక ఎరువుల మోతాదు (కిలో గ్రాములు/ఎకరానికి)

Depending on soil analysis information fertilizers to be used for various crops (kg/acre)

పంటలు	డి ఏ పి ఉపయోగిస్తుంటే			జింక్ సల్ఫేట్	ఎస్ ఎస్ పి ఉపయోగిస్తుంటే	
kg/ac	యూరియా Urea	డి ఏ పి DAP	పొటాష్ MOP	$ZnSO_4$	యూరియా Urea	డి ఏ పి DAP
ఆముదం (హైబ్రిడ్)	24	11	6	4	28	30
ఆముదం (వంగడం)	17	11	6	4	21	30
కంది పప్పు	9	13	0	4	14	38
పత్తి (Bt)	47	16	12	4	53	46
వేరుశనగ (సాగునీటి)	16	26	25	20	26	76
వరి (రబీ)	36	16	8	4	42	46
పప్పు దినుసులు	2	13	0	4	7	38
కూరగాయలు	72	40	30	4	88	114

గమనిక: ప్రతి ఎకరానికి 2-5 టన్నుల పశువుల ఎరువు తప్పనిసరిగా వాడవలెను.

పెటి\కోట గ్రామము, కోలిమిగుండ్ల మండలం, కర్నూ\ల్ జిల్లా, ఆంధ్రప్రదేశ్ (అక్షాంశం: 15.0770° N, రేఖాంశం: 78.0538° E)

Figure 13. Mean soil health information calculated from the soil samples collected from Patnikota village.

Figure 14. Mean data of soil health information disseminated through wall writings in Patnikota village.

Figure 15. Farmers' soil health cards were released by Shri. Keshav Nooguri (Unit Head), Shri. MSRK Prasad (FH-HR Head), Shri. Ch. Anjan Prakash (HoD, CSR) and Shri. GS Ravikumar (HoD, ER) of UltraTech Cements, Tadipatri, A.P.

Figure 16. Distribution of farmers' soil health cards by Shri. Papi Reddy, President-Patnikota village.

7. Soil and Water Conservation Measures

Managing water resources is considered to be an effective method to reduce water stress in a watershed during the non-monsoon season – by recharging groundwater with rain water during the monsoon season. A watershed is defined as a hydrological area in which all rain water flows to a common point or outlet. Water travels from head water to the downward location and meets with other similar streams in the downstream area until it reaches a bigger stream or river. A water balance approach accounts for various hydrological components at the watershed scale. Water balance components are described in a simplified form as:

$$P = Ro + GWR + Et + \Delta S \text{ – Equation (1)}$$

Where P is the precipitation (Rainfall), Ro is Runoff, GWR is groundwater recharge, Et is Evapotranspiration (Evaporation + Transpiration) and Δ S is change in storage. Rainfall shows the source of water in the watershed, which will be partitioned into various hydrological components depending on topographic features, soil properties, land use cover and various land and water management practices as shown in Equation (1). Evaporation is non-productive water loss to atmosphere but water flow through transpiration of biomass. Thus ET component can be estimated inversely by balancing the above equation. But separating evaporation and transpiration component from ET is the most challenging task. Rainfall and runoff component can be measured by installing rain gauge and runoff recorder, respectively. Groundwater recharge can be measured by water table data in different wells. A rain gauge had already been installed for measuring daily rainfall in the Patnikota watershed and a runoff gauging instrument will be installed at the earliest. The major groundwater dug and bore wells in the village and in farmer's fields were mapped for monitoring the groundwater levels in the watershed. A groundwater level recorder will be used for measuring water levels in the watershed.

Land and water intervention activities alter the water balance. It reduces runoff losses and increase groundwater recharge. The watershed development program promotes reducing the runoff from the watershed by harvesting rainwater through water conservation structures, such as percolation tanks, check dams, earthen dams, check walls, sunken pits, gully control structures, etc. The rainwater harvested into groundwater storage can be utilized for drinking, and supplemental irrigation during the rabi season. There are two major streams that are flowing in and around Patnikota village (Figure 17). During reconnaissance survey, it was observed that there were a few existing, but broken, check dams that had been constructed by various government organizations. A demand-oriented approach, in which

demands/requests by villagers or the watershed community for harvesting rain water, were followed for constructing water harvesting structures.

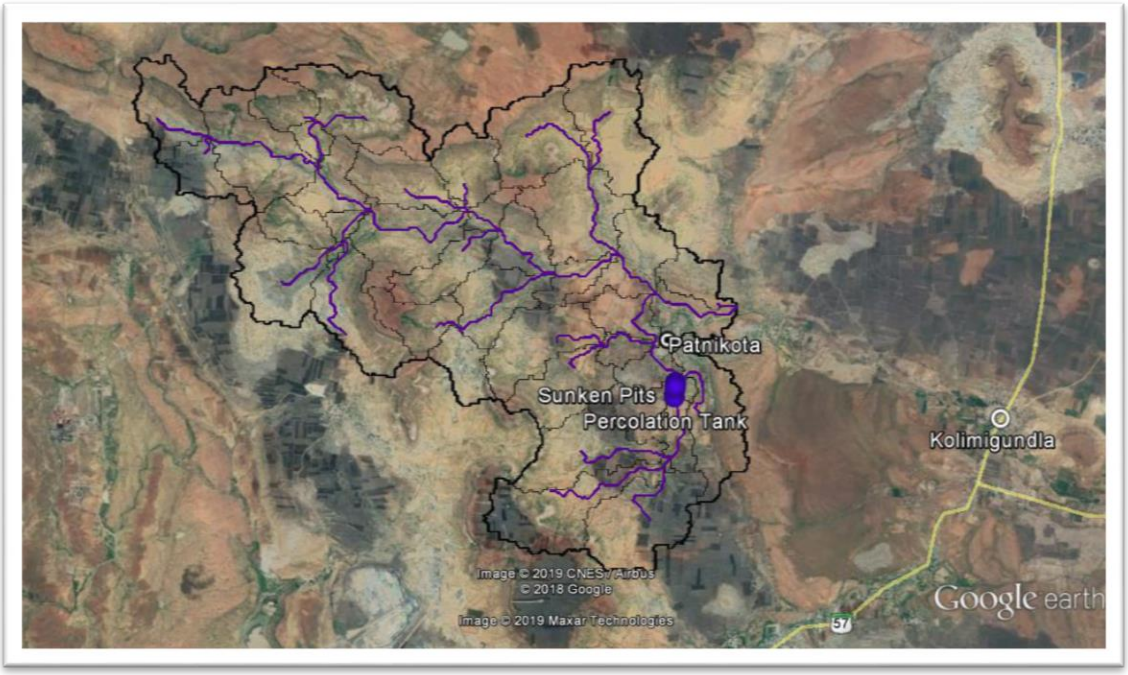

Figure 17. Spatial distribution of streams and water conservation structures created in the watershed.

Six water harvesting structures were constructed (one percolation tank and five sunken pits) in the watershed (Figure 18). A percolation tank with a capacity of around 2000 m^3 (Area = 1000m^2 and Depth = 2.0 m) was constructed on a major stream that flows just beside Patnikota village. In addition to the percolation tank, five sunken pits with a capacity of around 240 m^3 each (Area = 200 m^2 and Depth = 1.2m) with a total capacity of 1200 m^3 was built on the same stream. So total storage capacity of 3200 m^3 was created, which has already harvested 9500-10,000 m^3 of surface runoff (up to 20 September) and is expected to harvest about 10,000 m^3 (from September to December 2019) in the current year (Table 4).

Table 4. Details of rain water harvested through different structures in the watershed.

No.	Name of the Structure	Capacity (m^3)	No filling happened so far	Total rain water harvested so far (m^3) (90% of GWR and 10% Et)
1.	Sunken pits	1200	4	4320
2.	Percolation tanks	2000	3	5400

Figure 18. Google Earth image showing sunken pits and percolation tank created on a stream in the watershed.

Figure 19. Percolation tank created on a stream in the watershed – before and after rain.

Figure 20. Sunken pits created on a stream in the watershed – a) before rain; and b) after rainfall.

8. Participatory Research & Development (PR&D), Integrated Pest Management (IPM) and Integrated Nutrient Management (IPM) Trials

Selection of suitable crops and cultivars for the Kharif season has been carried out through the Participatory Research and Development (PR&D) approach in order to analyze their yields in the watershed (Figure 21). Improved crop cultivars, such as castor (DCH 519), black gram (PU31) and pigeonpea (Asha, 87119), suitable to the soils were supplied to farmers in the watershed (Figure 22). Many farmers came forward to participate in identifying suitable varieties of pigeonpea, castor and black gram

seeds along with their local varieties. Nearly 368 acres of cultivable land held by 125 farmers has been covered with improved seeds during the kharif 2019 season. Of this, 170 acres of farmers' fields were covered with improved pigeonpea seed, 160 acres with hybrid castor, and 38 acres with black gram crops in both the villages (Table 5).

Table 5. Details of improved seed distributed in both the villages.

	Patnikota Watershed				Ayyavaripalli Village			Total
	Pigeonpea	Castor	Black gram	Total	Pigeonpea	Castor	Total	
Area (Acre)	138	151	38	327	32	9	41	368
Farmers (nos.)	47	32	6	85	33	7	40	125

Figure 21. A meeting with farmers under the Participatory Research & Development approach in a) Patnikota; and b) Ayyavaripalli villages.

All the farmers are in regular contact with our research team for support on pests and diseases that occur during crop cultivation. Currently, both seed germination and crop condition are very good in both the villages (Figure 23, 24 & 25). Farmers will be educated on pest management strategies and the use of yellow sticky traps and pheromone traps. Installation of these traps will allow farmers to monitor pest activity regularly, so that indiscriminate use of pesticides can be avoided and spraying of insecticides can be taken up only when pest levels go over the threshold. This is an eco-friendly option and involves species that do not harm beneficial fauna in the ecosystem.

Figure 22. Distribution of improved seeds to farmers at: a) Patnikota; and b) Ayyavaripalli villages.

Figure 23. Germination test conducted – a) before; and b) after seeds sown.

Figure 24. Pigeonpea crop sown in farmers' fields (a & b) in the watershed.

Figure 25. Growth of a) castor; and b) black gram crops in the watershed.

9. Exposure Visits of CSR Team and Watershed farmers

The CSR team of UltraTech Cements, Tadipatri, Anantapur district of Andhra Pradesh, was invited for an exposure visit to ICRISAT headquarters at Patancheru. The team interacted with scientists and the Theme Leader, Dr Sreenath Dixit, ICRISAT Development Centre, and also visited the ICRISAT Science Centre (Figures 26 & 27). Furthermore, the team visited various research and field activities within ICRISAT, such as Broad Bed and Furrow fields, Heritage Watershed, Meteorological Station, Transplanted Pigeonpea cultivation, vermi and aerobic compost units, waste water treated wet lands, soil laboratories, etc. (Figure 28). They also visited the Kothapalli Watershed (Adharsha Watershed), to understand the impact of watershed activities on farmers' livelihoods and enhancement of farmers' incomes (Figure 29).

Figure 26. CSR team interactions with the Theme Leader, IDC Huddle Space, ICRISAT (a & b).

Figure 27. CSR Team's exposure visit to the ICRISAT Science Centre (a & b).

Figure 28. The CSR Team's visit to: a) Waste water wetlands; and b) Meteorological Station within ICRISAT.

Figure 29. Their exposure visit to Kothapalli Watershed, Rangareddy district, Telangana State.

The CSR team also visited the RECL-ICRISAT watershed, located at Penukonda mandal of Anantapur district in Andhra Pradesh. The team interacted with the local NGO and also with the farmers there in order to understand the various activities carried out since inception of the project. The team also visited various activities, such as bore well recharge pits, open well recharge pits, loose boulder structures, check dams, and productivity enhancement activities in various crops on several farmers' fields (Figure 30).

Figure 30. CSR Team visits: a) Bore well recharge pit; b) Open well recharge structure; c) Loose boulder structures; and d) Pigeonpea crops with drip irrigation system at RECL-ICRISAT watershed, Penukonda, Anantapur, A.P.

An exposure visit was conducted for the farmers from the Patnikota watershed to RECL-ICRISAT watershed. The farmers also observed various activities in order to learn about improved methods of cultivation, best agricultural practices, soil and water conservation, crop demonstration trials, etc. Nearly 25 farmers participated in the exposure visit (Figure 31).

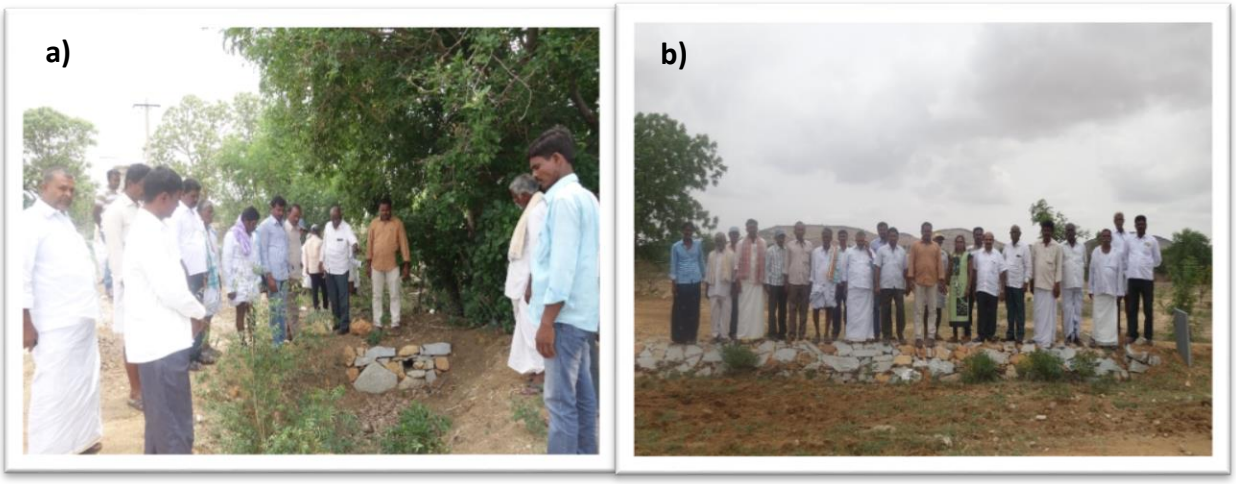

Figure 31. Farmers' exposure visit to RECL-ICRISAT watershed at Penukonda, Anantapur, AP (a & b).

10. Capacity Building and Income-generation Activities

i. Patnikota watershed: With a view to providing skills that will aid in generating better incomes while supporting agricultural value chains (inputs, outputs and by-products), a training class in baking was provided to 25 young and married women in the watershed on baking biscuits, breads, puffs, cakes, etc. (Figure 32). Mr. Nagabhushanam, from Rajahmundry, A.P, who has 20 years of experience in training women's groups in baking products offered these classes for one week in the watershed. Importance was given to millet-based baked goods so as to improve nutritional levels in women and children. During the training program classes were organized on baking items such as breads, cakes, sweet and salt biscuits, dil pasand, egg and curry puffs, etc. The trainees were supported with all materials required for a month so that they could have hands-on experience along with knowledge on quality, hygiene, safety, and taste. The program increased the confidence levels in these trainees, and made them think confidently about earning extra income during their free time at home.

ii. UltraTech CSR villages: The success of the aforementioned training program led to another similar kind of program for women in CSR villages at Vikas Centre of UltraTech cements. A three-day training program under the leadership of Plant and Unit heads, UltraTech Cements, was conducted by Food and Housing Services (FHS), of ICRISAT, who have expertise in international standards of baking and cooking. The training was not only on millet-based baked products but also with millet-based kitchen products. Millet-based kitchen products (sorghum, pearl millet, ragi, etc.) are easy to cook at home with available household utensils. Nearly 40 women attended this program from CSR villages near the plant (Figure 33).

The trainees were supported for a month by the CSR wing through which training with hands-on experience was provided.

Figure 32. Training program on making different kinds of baked products at Patnikota Watershed.

Figure 33. Training program on making different kind of millet-based kitchen and baked products at Vikas Centre, UltraTech Cements campus.

11. Activities, Milestones and Impact for the Period - February 2019-September 2019

No.	Line items	Description	Work done	Outputs
1	Knowledge-based Entry Point Activity (KB-EPA) will be taken up in both villages	1. Identifying location for water harvesting structures as per local need and suitability of the site; 2. Soil sampling and knowledge dissemination.	• Identified locations for sunken pits and percolation tank; • Soil samples collected, analyzed and soil health cards distributed to the farmers.	Knowledge dissemination on climate variability and soil health was carried out through wall writings.
2	Participatory Rural Appraisal (PRA) & Baseline Survey	Survey will be conducted in the first year	• PRA has been completed; • Baseline survey completed.	Key issues identified from PRA; Survey analysis will be prepared as a report by the end of the first year.
3	Formation of Community-based Organizations (CBOs)	1. Watershed User and Labour Group; 3. Linking SHGs	• Creating watershed labour and water users groups are under processing.	Linking SHGs has been completed and baking training program has been carried out.
4	*In-situ* moisture conservation measures	1. Broad Bed and Furrow; 2. Conservation furrows; and 3. Ridge and Furrow will be demonstrated and trials will be conducted every year.	• Introduction of Broad Bed and Furrow and conservation furrows will be demonstrated using Tropicultor in rabi season.	• Crops will withstand long dry spells and their yield will increase by about 10-15%.
5	*Ex-situ r*ainwater harvesting through low-cost structures	Planning, designing and monitoring of construction of ex-situ water harvesting structures, such as check dams, gulley control structures, farm ponds, etc., as per runoff estimation.	• Constructed 5 sunken pits and 1 percolation tank.	• About 3200 m^3 of storage capacity created, which harvested about 9500 m^3 of rainwater and is expected to harvest another 10000 m^3 of rainwater this year in the watershed.
6	Establishment of hydrological gauging stations	1. Rain gauge will be installed for rainfall monitoring; 2. Runoff monitoring using auto loggers will be installed; 3. Groundwater levels also will be monitored in selected wells.	• Rain gauge has been installed in the watershed; • Groundwater levels are being monitored using GWL indicators.	• Rainfall variability and rainy days will be analyzed; • Increase in groundwater levels will be monitored in the watershed.

7	Participatory Research and Development Selection of Crops and Cultivars along with participatory evaluation	Undertake farmer's participatory field experiments using well-tested crop cultivars in limited farmers' fields, which minimize the risk of crop failure.	• Nearly 120 farmers came forward to participate in the research and development demonstrations.	• Introduced improved crop cultivars of pigeonpea, castor and black gram on 370 acres.
8	PR&D, INM and IPM trials	•	• Yellow sticky traps; pheromone traps; neem oil and benzoate applications promoted in the village.	• Reduce cost of cultivation, and pollution arising from use of pesticides.
9	Capacity development & preparing training materials	1. Vermicomposting and aerobic compost making; 2. Gliricidia nursery raising; 3. Fodder management training; 4. IPM/INM/weed management trainings; 5. Backyard poultry demonstrations; 6. Kitchen gardening activity.	• Promoting kitchen garden (150 HH); • Baking program for 80 women; • Other trainings are in progress.	• Improved nutrition and encouragement for increasing their income; • Increasing ecological balances in the watershed.
10	Field Days	1. Exposure visit to nearest watershed in Anantapur or in Kurnool; 2. Fields days every year.	• Exposure visits have been completed	• Exposure to different best agricultural practices, and interactions with the best farmers in other watersheds.