Annual Progress Report-2015-16
(January 2015 – March 2016)

AP Primary Sector Mission (Rythu Kosam)
Agricultural Transformation in Andhra Pradesh:
Equitable, Scientific, Prosperous and Climate Smart Agriculture for Primary Sector

Submitted to

Government of Andhra Pradesh

ICRISAT DEVELOPMENT CENTER

ICRISAT
INTERNATIONAL CROPS RESEARCH INSTITUTE FOR THE SEMI-ARID TROPICS

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Executive Summary

As part of the Andhra Pradesh Swarnandhra vision 2029, the honorable Chief Minister Sri N Chandrababu Naidu has committed to transform the Primary Sector Mission, the agriculture and allied sectors through a new strategy and then to operationalize it in a phased manner. This is a mission mode project later named as “Rythu Kosam” to address the declining agricultural sector share in GSDP during the last decade and to improve the livelihoods of smallholder farmers by increasing agricultural productivity through science led development. The objectives of the mission are a) increase productivity of the primary sector; b) mitigate the impact of droughts through water conservation and micro irrigation; c) post-harvest management to reduce wastage and; d) establish processing, value addition capacity and the supply chain of the identified crops. In this context, ICRISAT has worked for preparing the strategy paper for the Primary Sector Mission in consultation with the concerned departments to achieve the above objectives. This was released by the Honorable Chief Minister Sri N Chandrababu Naidu on 6th October 2014, at Vijayawada, Andhra Pradesh.

In the ‘Rythu Kosam’ initiative, a 2-pronged strategy is adopted – (i) scaling out proven technologies in large area, and (ii) establishing pilots for testing innovations for sustaining growth in future. Pilot sites (~10000 ha in each district) are established as learning centers & field laboratories for testing innovations in all 13 districts of Andhra Pradesh covering 142000 ha cropped area in 265 villages across 36 blocks/mandals. The pilot sites were identified based on the district’s representativeness in terms of soils, topography, rainfall, major crops and socio-economic conditions in consultation with all line departments in April 2015. Baseline survey of >5000 farmers is done in pilots for benchmarking, identifying constraints, potential opportunities and interventions required (Reports are prepared).

Before rainy 2015 season, soil health mapping of pilots was done through collecting about 5,400 soil samples across 13 pilots by following stratified sampling method to collect representative samples for topography, soil color, texture, crops and cropping systems and holding sizes. The samples were analysed in state-of-the-art laboratory at ICRISAT. The results revealed widespread multinutrient deficiencis in farmers’ fields - available zinc (52% deficient fields), boron (33%) and sulphur (49%) elements. Similarly, other significant deficiencies found in the pilot districts are calcium (30%) phosphorus (24%) and about 59% fields had low levels of organic carbon. During 2015-16, soil test-based fertilizer recommendations were developed village wise and disseminated to farmers. The crop cutting experiments in pilots recorded yield benefits of 10% to 30% due to soil test-based balanced fertilization. As such in the state, widespread nutrient deficiencies are corrected thru balanced fertilization in ~7.5 lakh ha.

For soil organic carbon building, evaluated/demonstrated microbial consortia culture for composting on-farm wastes by >1000 farmers across pilots in 13 districts. Also promoted biomass generation through N-rich *Gliricidia* in the villages/farms where there is scarcity of biomass for recycling. Shredder machines on sharing basis are piloted across all 13 pilot sites for chopping hardy biomass for accelerating decomposition. Aquasap (a 100% organic extract/fertilizer from sea weeds used as foliar application) is demonstrated and evaluated by400 ‘Aquasap’ foliar application trials across pilots which showed yield increase of 10%-30% in crops like groundnut, paddy, pigeonpea, tomato, potato, onion and chillies.

High-yielding and climate smart crop varieties were evaluated during 2015-16 which recorded higher crop yields over local ones by 12%-64% in groundnut (ICGV 91114, K 9, Kadiri haritha), 57% in foxtail millet (Suryanandi), 42% in maize (Bioseed9200) and 29% in pearl millet (ICTP8203).

To develop an integrated seed value chain in the pilot site villages, a seed consortium with ICRISAT and partners was formed for the Rythu Kosam. Based on the strengths of the partners, a ‘Seed Consortium’ was formed under the chairmanship of Commissioner of Agriculture, AP state, and the responsibilities were delineated to partners for achieving seed production targets. The following institutions were taken on board as consortium partners on 9 June 2015: 1. State Agriculture University (ANGRAU); 2. Public sector seed company (APSSDC); 3. NGOs, KVKs; 4. Department of Agriculture.During 2015-16, foundation seed production was undertaken in farmers’ fields - a total of 5440 q groundnut seed in 335 farmers’ fields (210 ha land); 1720 q pigeonpea seed in 130 farmers’ fields (110 ha land) and; 37 q black-gram seed in 36 farmers’ fields (40 ha land).

For women mainstreaming and enhancing familt nutrition, small scale vegetable cultivation or kitchen gardening is promoted with about 600 women farmers. Livestock-based livehoods which are in the domain of women are promoted through demonstrations of high-yielding cultivars of sorghum. To reduce drudgery and promote on-farm efficiency, demonstrated and promoted on-farm mechanization - tropicultor-cum-seed drill; easy planter for transplanting vegetables; shredder machines for chopping the biomass. PPP collaborations with ‘Kubota India’, ‘John Deere’ for establishing machine hiring centers are under consideration.

For *in-situ* moisture conservation, broad bed & furrow landform system isdemonstrated/evaluated in about 70 ha in Kurnool, Prakasam, Vizianagaram, East Godawari districts.

For addressing post-harvest issues, piloted/demonstrated processing through solar drying in Vizianagaram, East Godavari, Visakhapatnam, Chittoor and Guntur districts by entering into PPP collaborations with ‘Science for Society’.

Technical support and capacity building at state & district/pilot level is provided regular basis. State level workshops are organized for primary sector – team building, sensitization for district coordinators, planning, action plans preparation, strategies to minimize input costs during across sectors like agriculture, horticulture and animal husbandry. The field staff (scientific officers, research technicians) posted in respective pilots as per directions form district-in-charge scientists provided day to day technical support.

Background

1.1. Why?

The agriculture sector in the newly formed Andhra Pradesh state, popularly known as the "rice bowl of India" is in crisis. Andhra Pradesh has a total cultivated area of 6.35 million ha covering rice, oilseeds, pulses, cotton, maize, tobacco, vegetables, fruits, oil palm and others. The productivity of major crops is stagnant in recent years. The cost of cultivation has increased over the last decade, while farmers' income is not in tune with it. Increased labor cost, out-migration to nearby urban areas and inflationary pressures have added to the miseries of farmers' livelihoods[1]. Another evidence of emerging crisis is the "Crop holiday" practiced by the farmers of East Godavari district in an area of 34,020 ha during *kharif* (rainy season) of 2011 (GoAP 2014a). Even cloud seeding in some districts (of united Andhra Pradesh) during 2004-09 by incurring expenditureof ₹127 crores could not yield any tangible results. Further, distress sale of commodities, absence of adequate storage and processing facilities and non-remunerative prices added to miseries of farmers over the years.

To convert this crisis into an opportunity, the honorable Chief Minister, Government of Andhra Pradesh (GoAP), Sri Chandrababu Naidu has committed to transform the primary sector and set the aspirational goal of making Andhra Pradesh one of the three best states in India through the SwarnAndhra Vision by 2022. As part of the Vision 2029, announced during the District Collectors' Conference held on 7 August 2014 in Vijayawada, the Chief Minister stressed on: (a) increasing productivity of the primary sector; (b) mitigating the impact of droughts through water conservation and micro-irrigation; (c) post-harvest management to reduce the wastage; and (d) establishment of processing, value addition capacity and supply chain of the identified crops.

Hence, GoAP has decided, first to design a strategy to transform the agriculture and allied sectors, and then to operationalize it in a phased manner. For this, GoAP, through its Department of Agriculture (DOA) had requested the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) to prepare a strategy plan for transforming agriculture in Andhra Pradesh during the next five years (2014-2019).

The International Crops Research Institute for the Semi-Arid Tropics, which is amember of the CGIAR Consortium, has its headquarters at Patancheru, India and is associated with the development of agriculturein the semi-arid tropics of Asia and Africa, including in the state of Andhra Pradesh. ICRISAT's vision is a prosperous, food-secure and resilient dryland tropics and its mission is to reduce poverty, hunger, malnutrition and environmental degradation in the dryland tropics.ICRISAT has been asked to provide technical support to the GoAP to help prepare and facilitate the execution of the strategy for transforming the agriculture in Andhra Pradesh: Prosperous, Climate smart and Scientific.

[1] GOAP (2014a), Agricultural Budget Speech (p.2) reports that farmersuicides increased from 310 persons during 1994-2003 to 1943 persons during 2004-14.

1.2. Goal

The overall purpose of this collaboration between GoAP and ICRISAT is to transform the agriculture in the state through science-led development and provide technical guidance and support for effective execution through planning, monitoring, evaluation and undertaking needed capacity building/development initiatives to make the Primary Sector Mission successful.

1.3. Objectives of the Program

The specific **objectives**of the program (GoAP and ICRISAT) are:

1. To prepare the Strategy paper for the Primary Sector Mission (PSM) in consultation with the concerned departments of the government of Andhra Pradesh. To facilitate finalization of the strategy and launching of the mission in cooperation with the DOA.
2. To form the consortium for implementing the PSM and undertake team building measures to form an effective consortium.
3. Designing and guiding the holistic strategy for effective execution by the departments through facilitating the convergence through participatory research for development. The "Sites of learning" can be established in the districts to operationalize the holistic strategy.
4. Provide technical backstopping for execution through advisory role as well as participate in monitoring and evaluation to suggest the mid-course corrections during the strategy implementation.
5. Bring in the international expertise from other relevant CGIAR Centers in the consortium of international organizations along with the regional and national research institutions through catalyzing the academic and research partnerships to benefit the farmers through development research.
6. To facilitate detailed plan preparations for operationalizing the mission annually by providing guidance and technical support to the Mission Coordinator.
7. To establish pilot sites of learning in 13 districts (10,000 ha each) to operationalize the convergence of primary sector for increasing the productivity, profitability and sustainability through science-led development and climate smart agriculture.
8. To assist in developing capacity/skill development strategy and train master trainers in different sectors.
9. To develop quality assurance system for the soil analytical laboratory in the state and undertake capacity development for the soil analytical laboratory staff and undertake complete nutrient profile analysis including micro and secondary nutrients as a business model.
10. To assist in Public Private Partnership (PPP) mode guidelines and mobilize private entrepreneurs by assisting in identifying advisors for preparing Detailed Project Reports (DPR) and organize Global Investors Meet (GIM).
11. To develop and assist in developing weekly monitoring on-line schedules and facilitate effective monitoring evaluation and delivery systems for successful implementation of the PSM in the state.
12. To undertake documentation and preparation of case studies and lessons learnt for refinement of the primary sector mission.

1.4. Expected Outputs

1. An innovative strategy for transforming agriculture in the state of Andhra Pradesh through equitable, scientific, prosperous and climate smart agriculture will be available.
2. A suitable consortium of different line departments of government, State Agricultural Universities, and international institutions will be established for guiding and efficient execution of the primary sector mission in the state of Andhra Pradesh.
3. The first important output from this initiative will be the establishment of 13 pilot sites of learning in the districts, which can be effectively used for dissemination and capacity development for operationalizing the PSM, demonstrating a minimum of 25% increase in crop productivity.
4. Effective convergence model for enhancing primary sector productivity through increased efficiency of resource use will be established and primary sector mission will be operationalized in 13 districts.
5. Appropriate monitoring and evaluation systems developed for effective implementation of the mission in the state.
6. The state would be able to mobilize resources from corporate houses for primary sector development through effective preparation of DPRs as well as conduct of global investors meet in the state.
7. Drought proofing of drought prone districts and diversification with high-value crops will enable the smallholder farmers to increase profits and improve livelihoods through scaling-up interventions demonstrated at pilot sites of learning.
8. Establish quality standards (internal and external) and functioningsoil labs as a business model.
9. ICRISAT will assist the mission coordinator in planning as well as developing execution strategies and monitoring mechanisms for the success of the PSM.
10. ICRISAT will also undertake team building exercises for different consortium partners
11. Assist the mission director to develop monitoring and evaluation systems as well as integrators to track the progress and prepare the annual plans for the mission. Provide guidance for outsourcing detailed project report preparations for the public private partnerships associated with PSM during the period.
12. Well documented case studies will be exemplars of convergence model not only for the other sectors in the state but also for the country to effectively converge sub-sectors in the primary sector to benefit smallholder farmers.
13. Livelihoods of smallholder farmers in the first five years will be improved through increasing incomes at pilot sites by 100% and through capacity development and dissemination at other sites to the extent feasible. The spillover will effectively benefit all the remaining farmers in 13 districts.

1.5. ICRISAT's Role

1. ICRISAT will coordinate the GoAP-CGIAR project and provide guidance, logistical and technical support for undertaking different interventions for enhancing the systems productivity through science-led climate smart and prosperous agriculture in the districts of Andhra Pradesh and also for operationalizing holistic primary sector mission strategy.

2. ICRISAT scientists will liaise with the Department of Agriculture (DOA) and other line departments as well as with the staff working at the thirteen districts in the state.
3. The pilot sites will be operationalized and necessary technical human resources will be located in the pilot districts. In addition, specialized scientific officers to undertake specific interventions of each of the CG institutions will be provided by ICRISAT.
4. The Project Coordinator will coordinate the activities of all the centers, data collection and reporting to the State Coordination Committee (SCC) and the nodal department.
5. Provide soil test-based nutrient recommendations for the selected crops including horticultural crops to be tested in the pilot sites by all the partners based on the soil mapping to be done under primary sector mission (PSM) GOAP-ICRISAT initiative.
6. Develop fertigation schedules for horticulture crops based on the soil test analysis for each pilot district.
7. Assist in developing skill development strategy necessary for successful implementation of the mission to undertake training of trainers at each district in different sectors
8. Undertake team building exercises with different consortium partners.
9. Coordinate monitoring and evaluation by adopting participatory approach and recording yields of controlled and untreated plots along with Department of Agriculture, SAUs staff and lead farmers.
10. Provide detailed reports at half yearly interval after completion of the trials in each season,*kharif* and *rabi*.
11. Document the process of implementing the programs and successful case studies emerging from this initiative.
12. Converge productivity enhancement initiative from Bhoochetana into the sites of learning.
13. Coordinate capacity building of different actors in the area of convergence and collective action for enhancing the impact of the initiative.
14. Enhance livelihood opportunities and increase agricultural production in watersheds through sustainable intensification.
15. ICRISAT will facilitate the program through participation of ICRISAT team members at district and state level co-ordination committees.
16. ICRISAT will continuously communicate with different consortium partners regarding the status of work as well as required help for the project in due course.

1.6. Strategies Adopted

a. **Strategy plan for the program implementation prepared:** The deliberations of the meeting organized by Department of Agriculture with all concerned Principal Secretaries, Commissioners, Directors and other senior officers from the State Agricultural Universities, research institutions on 25 August 2014 and fruitful discussions with the Special Chief Secretary, Planning Department have led to the developmentof a strategy plan on the primary sector,which was submitted to GoAP on 16 September 2014.

b.Holistic strategy: The first and foremost strategy is to adopt science-led development approach by bringing the scientific developments of state, national and international expertise and experiences to benefit the sector, state and the farmers.

In order to achieve the efficiency, the principle of synergy of primary sector actors through integration approach was proposed by discarding the traditional sectoral/ compartmental approach as in the holistic and integrated approach as shown inFigure 1.6.1. The sites of learning – pilot sites – were established to operationalize the holistic approach in all the districts of AP.

Another major change to be made in the strategy is to bring in the participation of stakeholders by giving up the top down hierarchical strategy.

Sites of learning: A pilot site in each district to be established with the support of all line departments in each district of the state of Andhra Pradesh to operationalize the holistic approach.

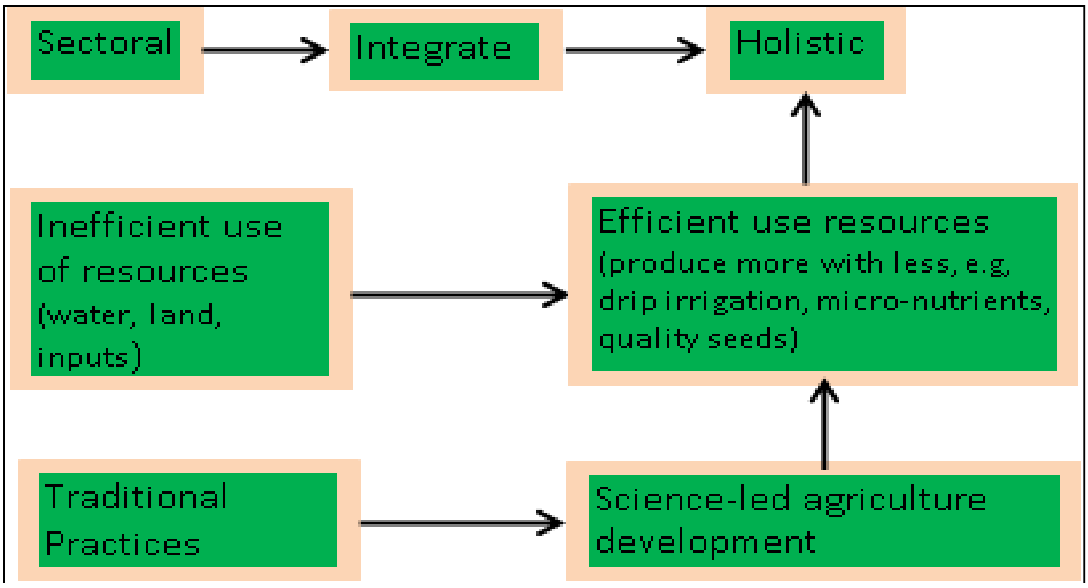


Figure 1.6.1. A schematic diagram of holistic approach.

c. Consortium Approach: Consortium of international organizations, regional and national research institutions catalyzes the academic and research partnerships to benefit the farmers through development research.

The International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) has formulated a consortium (as shown in Figure 1.6.2) consisting of all relevant departments of the state government, knowledge institutions, both public and private universities, state and national level research organizations and other relevant organizations. This consortium approach would enable development of primary sector to enhance productivity, profitability through value addition to the farmer community of Andhra Pradesh. This would also enable to bring in the best practices at the global level and relevant scientific knowledge to answer both the existing and the futuristic issues of the primary sector development in the state of Andhra Pradesh.

For this, ICRISAT has been conducting many workshops and capacity building programs with all the line departments, private companies, entrepreneurs, progressive farmers, state university scientists and researchers to make consortiums of different sectors and toharness their technical and financial capacities for developing the primary sector.

Figure1.6.2. A schematic diagram of consortium approach.

d. **IMOD Strategy:** ICRISAT has adopted the Inclusive Market-Oriented Development (IMOD) strategy for enhancing the productivity and profitability by ensuring that markets benefitsmall and marginal farmers. ICRISAT will assist the GoAP to adopt the IMOD strategy andensure benefits for smallholder farmers as shown in Figure 1.6.3.

Productivity Enhancement: The IMOD strategy moves smallholder farmers through incremental productivity enhancement from subsistence agriculture to marketable surplus.

Formation of FPOs: Once the profits and productivity are increased, farmers are linked to markets as well as with increased investments in agriculture the farmers move away from dependency on social schemes to self-reliance and produce what markets need and participate actively in the market operations and derive the benefits. For enhancing profits for the farmers in the value chains, Farmers Producers Organisations (FPOs) will be formed with the help of SERP (Society for Elimination of Rural Poverty), NABARD (National Bank for Agriculture and Rural Development), Non Govermental Organizations (NGOs) and GoAP.

Adoption of 4 ICEs: Through adoption of innovative strategy of 4 ICEs as indicated below in Table1.6.1 the primary sector will be transformed through scientific development to increase production, productivity as well as profitability for the farmers as well as the state through sustainable intensification.

Figure 1.6.3: A schematic diagram of IMOD (ICRISAT).

Table1.6.1. Strategy: Mission Mode: Four ICES		
I	**C**	**Es**
Innovate	**C**onvergence	**E**fficiency
Inclusive	**C**ollective	**E**quity
Intensive	**C**onsortium	**E**nvironment Protection
Integrated	**C**apacity building	**E**conomic gain

e. Technical backstopping: Provide technical backstopping for execution through advisory role as well as participate in monitoring and evaluation to suggest the mid-course corrections during the strategy implementation.

1. ICRISAT will be introducing the best improved varieties of major crops in all the pilot sites such as paddy, groundnut, pigeonpea, sorghum, pearl millet, pulses, and vegetablesand also other varieties tested in ICRISAT watershed.
2. ICRISAT will be introducing the best soil and water management practices already tested and scaled up in different states such as Broad Bed and Furrow (BBF) cultivation method, Zero tillage, etc.
3. ICRISAT will be introducing the best management practices for improving soil organic content such as Gliricidia plantation on bunds, green manure applications, etc.

f.Partners: To bring good and best practices into the pilot sites a consortium of partners are formed consisting of state agricultural universities like Acharya NGRanga Agricultural Univresity (ANGRAU), YSR Horticultural University (YSRHU), agriculture and allied sectors of the state namely Department of Agriculture (DOA), Horticulture(DoH), Sericulture, Animal husbandry, Fisheries, Watershed Management Agency, Irrigation, Groundwater, Marketing and Information &Communication technology.Similarly, CG Centers such as International Rice Research Institute (IRRI), Internation Food Policy Research Institute (IFPRI), International Water Management Institute (IWMI), International Maize and Wheat Improvement Centre (CIMMYT) and International Crops Research Institute for the Semi-Arid Tropics (ICRISAT)have joined together to make available and evaluate the best technology and practices through the consortium approach.

2. District-Pilot Site Profiles

2.1 Identification of Pilot Sites across Districts

The 'Rythu Kosam' initiative has adopted a 2-pronged strategy of scaling out proven technologies in large area, and establishing pilots for testing innovations for sustaining growth in future. In order to integrate, innovate, intensify ensuring inclusivity, pilot site of ~10,000 ha is established in each district (Table 2.1.1). The pilot site provides an on-farm field laboratory to test and evaluate, technological, institutional, policy innovations and fine-tune as needed before scaling-up in the districts. In the marketing parlance, pilot areas are test markets for innovations which will be demand driven, impact oriented with measurable indicators. The pilot sites were identified based on the district's representativeness in terms of soils, topography, rainfall, major crops and socio-economic conditions in consultation with all line departments in.

Table 2.1. Distribution and coverage of pilot sites under AP Primary Sector Mission.

District	No.of mandals	No. of villages	No.of households	No.of population	Pilot site cropped area (ha)	Livestock population (no.)	Fisheries area (ha)
Chittoor	2	18	6762	31317	9001	93412	0
YSR Kadapa*	4	13	11246	46745	10314	146771	0
Anantapur*	3	14	5019	13556	12411	20,000	0
Kurnool	2	10	6864	26736	10299	24057	0
Nellore	3	11	9469	33876	11780	39915	367
Prakasam	4	28	20899	86722	8500	225550	3898
Guntur #	4	18	17634	63202	12987	19980	217
Krishna *	3	27	22805	76762	15182	60240	260
West Godavari**	2	12	23155	84044	12803	25400	1022
East Godavari	3	26	17487	67843	10470	146939	2163
Visakhapatnam	3	23	21673	33411	10516	31232	360
Vizianagaram #	2	23	8753	35976	8494	32555	451
Srikakulam #	3	44	20721	85581	9914	126595	154
Total	**38**	**267**	**192487**	**685771**	**142671**	**992646**	**8892**

*** one mandal and eight villages commonly covered under both agriculture and fishery sub-sectors*
 # one mandal commonly covered under both agriculture and fishery sub-sectors
** minor changes carried out during baseline survey*

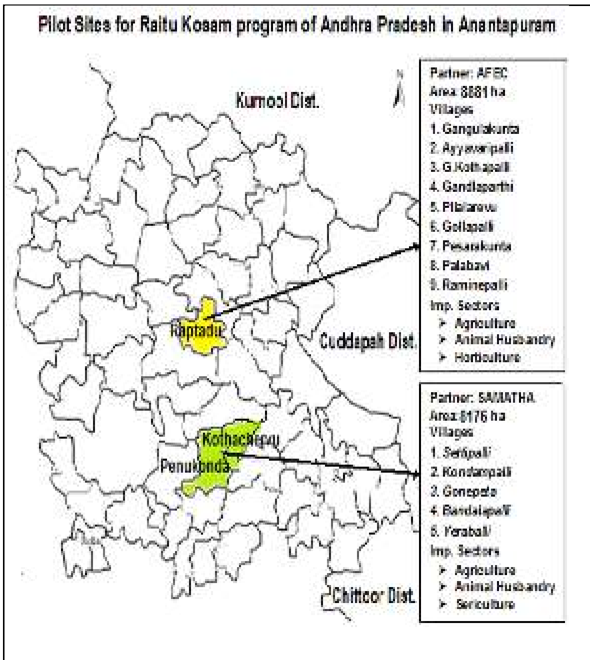
Overall, the entire primary sector mission pilot sites covers 267 villages (both agril. and fishery) under 38 mandals in 13 districts of the state. Approximately 0.192 million farmer households are directly targeted for mission interventions across 13 pilot sites. A total population of 0.685 million are covered initially during 2015-16 cropping season. About 0.142 million ha of cropped area (including agril. and horticultural crops) has been covered across 13 pilot sites corresponding to 13 districts in the state. Nearly 0.99 million population of livestock animals are also covered for wide range interventions in under selected mandals in the mission pilot sites. Roughly 8892 ha of fishery area (including both prawns and fish cultivation) are also covered under mission interventions. In nut shell, the cumulative pilot site area represents about 1.75 per cent of the total cropped area in the state. Approximately about 1.4 per cent of the total state's population also being covered in these pilot sites.

The district and pilot profiles are described as under;

2.2. Anantapur

District Profile: Anantapur has the largest geographical area (1.913 million ha) among all the districts of Andhra Pradesh and it lies between 13°40′ and 15°15′ North latitudes and 76°50′ and 78°30’ East longitudes. The district has a population of 4.08 million with 7.79lakh households. There are about 0.8 million farmers and 0.67 million agricultural laborers in the district. It has a total cropped area of 1.18 million ha with groundnut grown as the major crop (on 0.85 million ha). Horticulture is on 0.14 million ha (sweetlime, mango, pomegranate, vegetables). Among animals, the cattle population is 1.1 million (60% cows and 40% buffaloes), sheep 2.8 million, goats 0.7 million and poultry 1.8 million. The barren and uncultivable area is 0.18 million ha and the forest cover is 0.10million ha. The annual average rainfall is 553 mm which is often erratic. Soils are mainly light red with low-water holding capacity. The district is drought prone and often suffers from low rainfall. The social and economic status of people in general is poor.

Pilot site:



ICRISAT along with district administrators (Collector and Chief Planning Officer) and officials of the line departments have identified two areas in Anantapur as pilot sites to showcase technological interventions for a double digit growth in primary sectors (Figure 2.2.1). The pilot site-1 is in Raptadu mandal comprising nine villages representing an area of 8,881 ha and the pilot site-2 is across Penukonda-Kothachervu mandals comprising five villages representing an area of 8,176 ha (Figure 2.1.1). The total number of households is 2,727 with a population of over 13,110 in pilot-1 and is 2144 with over a population of 9,529 in pilot site-2. Large farmers (> 5 ha) are relatively more (about 50%) in pilot site-1 while small (<2 ha and medium farmers (2-5 ha) are more (about 95%) in pilot site-2.

Figure 2.2.1. Pilot Site for Rythu Kosam Program of Andhra Pradesh in Ananthapuram.

In both the sites, crops are normally grown over 5,000 ha and groundnut is the main crop (90%). Other crops like foxtail millet, pigeonpea and sorghum are also grown. Irrigation is used in less than 5% area and it is mainly used for raising horticulture crops - orange, mango, grapes and tomato – which are seen grown in some of the cultivated areas. Some sericulture is also there in an irrigated area of pilot site-2 (2-3% area). There is fairly a good population of animals at both sites – cattle (3,829), buffaloes (3,137), sheep and goats (0.1 million), which form a major source of income for many farmers and landless laborers (5-10% population). The productivity from all the sectors is very low due to erratic rainfall and no other good source of water.

2.3. Chittoor

District Profile: Chittoor district is located in the extreme south of Andhra Pradesh, between 12˚37' - 14˚ North latitudes and 78˚3' - 79˚55' East longitudes. The district is spread over 15,152 km^2. Thirty percent of the total land area is covered by forests in the district. Mango and tamarind groves surround the city of Chittoor. The district is broadly divided into three revenue divisions (Chittoor, Tirupati and Madanapalle) and 66 revenue mandals. The district receives an annual rainfall of 918 mm. On an average, the district receives 438 mm of rainfall through the Southwest monsoon (from June to September) and 396 mm from the Northeast monsoon (from October to December). The soils in the district are red loamy (57%), red sandy (34%) and the remaining 9% is covered by black clay, black loamy, black sandy and red clay (Figure 2.3.1a).The total geographical area of the district is 1.52million ha. Nearly 23.4% of that is net areasown including fish and prawn culture. The area sown more than once was only 0.05million ha. The forest area in the district is about 0.45 million ha,which accounts for 29.8% of the total geographical area. Nearly 37% of total area sown in the district is under groundnut crop. Rice occupies nearly 12% of total area sown. Total food crops occupy 57% of the cropped area and non-food crops 43% of the cropped area. The productivity levels of major crops during 2012-13 are indicated in the Figure2.3.1 b: paddy (3.6 tons ha^{-1}), ragi (0.93 tons ha^{-1}), groundnut (0.843 kg ha^{-1}), sugarcane (8.988 tons ha^{-1}) and mango (8.84 tons ha^{-1}).

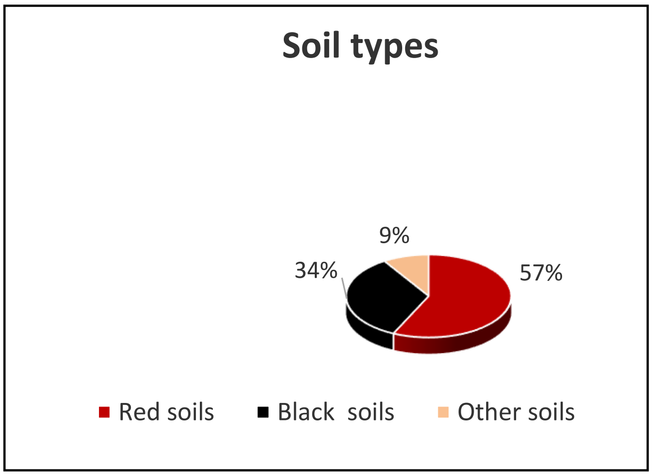


Figure 2.3.1a. Major soil types in Chittoor.

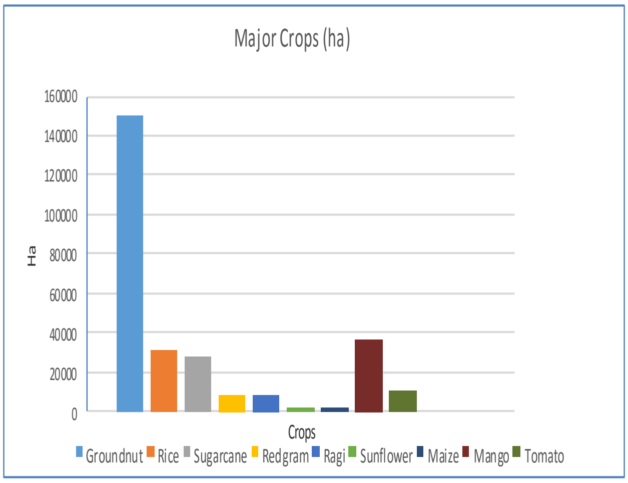


Figure 2.3.1b. Major crops in Chittoor.

As per 2007 census, the district owns 1.1 million cattle, 0.13 million buffaloes, 1.12 million sheep and 0.44 million goats. The district also has a poultry population of 14.39 million during 2007 census. The district also produced 2,133 tons of inland fish and prawns during 2012-13. However, nearly 17,750 fishermen are members of the fishing community, involvedin fishing and marketing activities.

Pilot site: Under Andhra Pradesh primary sector mission, the district pilot site has been identified with two mandals, ie, Venkatagirikota (V. Kota) and Santipuram covering a total of eighteen villages(Figure 2.3.2).The total area of both pilot sites is 10,385 ha. The pilot site at V.Kota and Santipuram has mostly red soils with mean annual rainfall of 733 mm and 813 mm. In both the mandals 92% of the farmers have less than 2 ha of operational land.

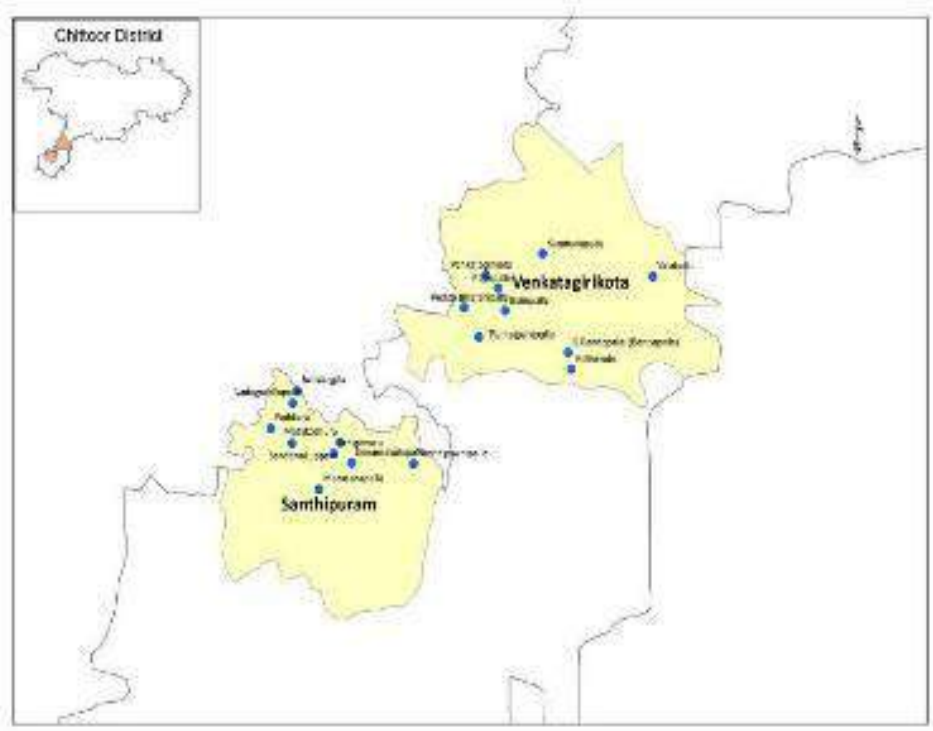


Figure 2.3.2. Map of pilot sites in Chittoor.

Approximately 15,000 people and 3200 households exist in the 11 selected villages of Santipurammandal. Around 43% of the total geographical area of these villages is under crop cultivation. Groundnut, mango and vegetables are dominant crops in the two pilot site mandals. Sheep (5,781) and cattle (4,201) are major contributors of total livestock population in selected villages. Another 61,000 poultry also exists in these villages. In V.Kota mandal, nearly 16,468 population and 3,500 households exist in the selected pilot site of the mandal. Sheep (6,718) and cattle (6,269) are the major contributors of the total livestock population in the seven villages.

2.4. East Godavari

District Profile: East Godavari is situated on the northeast of Andhra Pradesh, lies in between 16.30° to 18.20° N latitudes and 81.3° to 82.3°E longitudes, and covers a total geographical area of around 10,807 km^2.The land use details of the district are shown in Table 2.4.1.

The major soils in the district are alluvial, red sandy and loamy soils. The average annual rainfall is around 1,200 mm and the annual rainfall varies from 770 mm to 1,850 mm. The major rivers flowing in the district are Godavari and Yeleru. The Thandava and Pampa river channels supply water for drinking and cultivation.

The district has a population of 5.15 million as per 2011 census with seven revenue divisions namely Kakinada, Rajahmundry, Peddapuram, Ramachandrapuram, Rampachodavaram, Etipakaand Amalapuram. The district is topographically divided into three divisions – agency, upland and delta agro ecological regions.East Godavari is famous for agriculture because of fertile lands which are adequately irrigated throughout the year. Being the largest part of the rich Godavari delta, agriculture and aquaculture are major parts of the economy for this district. It is the home of two major fertilizers and one of the largest oil and gas hubs in India.

The principal crops in the district are paddy (52%), coconut (11%), cotton (10%), cashewnut (7%), sugarcane (6%), mango (3%), plantation crops (3% each) and the remaining are different vegetable cultivation areas (<5%) as shown in Figure 2.4.1. Major growth engines are indicated in Table 2.4.2.

Table 2.4.1. Landuse details of the district.

SNo	CATEGORY (Areas in ha)	2013-14
1	Total geographical area	1080700
2	Forests	323244
3	Barren & uncultivable land	78089
4	Land for non-agricultural	144071
5	Cultivable waste	16843
6	Permanent pastures	20455
7	Tree crops & groves	8387
8	Other fallow lands	46455
9	Current fallows	19959
10	Net Area Sown	416876
11	Total Cropped Area	652361
12	Area Sown More than Once	235485
13	Fish & Prawn Culture	6321

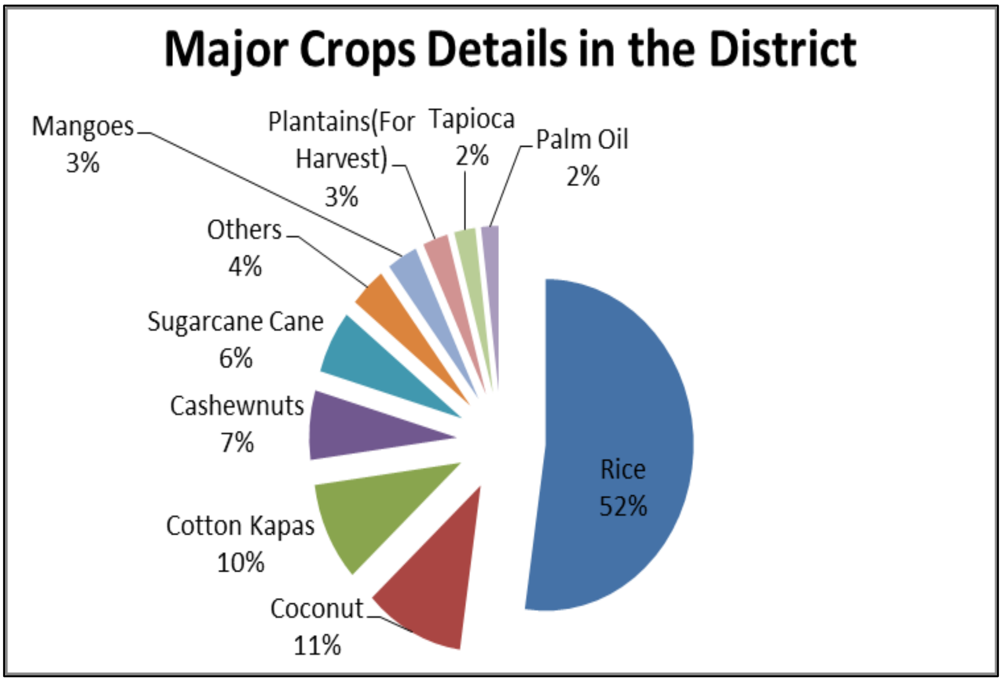


Figure 2.4.1. Major crops and their proportions in the East Godavari district.

Table 2.4.2.Selected growth engines and comparison statement of Area, Yield, Production and GVA - 2014-15 & 2015-16 for East Godavari.											
S.No	Name of the Crop	2014-15			GVA ₹(Cr)	2015-16			GVA ₹(Cr)	% GVA
		Area (ha)	Yield (tons)	Production (tons)		Area (ha)	Yield (tons)	Production (Mts)		
1	Paddy	395364	5.891	2329063	3168	413458	6.481	2679621	3645	15
2	Jowar	2060	1.037	2136	3	1842	1.160	2137	3	0
3	Bajra	58	1.183	69	0	60	1.183	71	0	0
4	Maize	13256	8.288	109866	144	16571	8.224	136280	179	24
5	Ragi	432	0.750	324	1	430	0.750	323	0	0
	Coarse Grain	411170	17.149	2441484	3316	432361	17.799	2818431	3827	39
6	Redgram	2164	0.600	1298	6	2200	0.60	1320	6	0
7	Greengram	1432	0.677	969	4	1500	0.524	786	4	0
8	Blackgram	15242	0.741	11294	49	19228	0.742	14267	62	27
	Total Pulses	18838	2.018	13561	59	22928	1.866	16373	72	27
Total Foodgrains		430008	19.167	2455046	3375	455289	19.665	2834804	3899	66
9	Groundnut	153	1.744	267	1	149	2.452	365	1	0
10	Sesamum	3295	0.222	731	3	3450	0.222	766	4	33
	Total Oilseeds	3448	1.966	998	4	3599	2.673	1131	5	-33
11	Cotton	22433	3.3235	74557	280	22500	3.805	85613	321	15
12	Sugarcane	14728	96.00	1413888	240	13425	96.00	1288800	219	-9
13	Tobacco	3394	2.832	9612	31	3400	3.068	10431	33	6
	Other crops	40555	102.6	1498057	551	39325	102.880	1384844	573	12
Total Cropped Area		474011	120.777	3954078	3934	498213	122.218	42219648	4477)	111

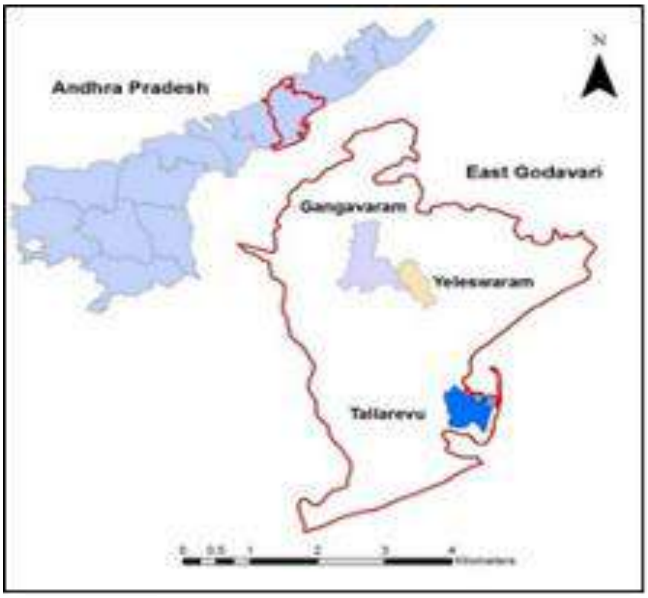


Figure 2.4.2. Pilot site map of East Godavari

Pilot Site: The pilot site is divided into three parts that spreads acrossthree agro-ecological zones of East Godavari district, ie, seven villages in Gangavaram mandal of agencyzone and nine villages in Yeleswaram mandal of upland land zone and ten villages in Tallarevu mandal (inland fisheries) of delta zone (Figure 2.4.2; Table 2.4.3). The total geographical area of the pilot site is about 15,870 ha including 4,052 ha of agricultural land, 3,634 ha of horticulture area and 2,203 ha of fisheries. The total population of the pilot site is 67,843 with 1,487 households. Total animal population in the pilot site is 20,303 with low milk yield capacity due to fodder scarcity andpoor managementpractices.The pilot site in thedistrict also containsthe major growth engines such as paddy (both Gangavaram and Yeleswaram), cotton (both Gangavaram and Yeleswaram), sugarcane (Yeleswaram), cashewnut (Gangavaram), banana (Yeleswaram) and vegetables in both mandals for applying new interventions and then promoting further as per agro ecological region.

The pilot site receives around 1100-1170 mm average annual rainfall, of which around 90% rains are received during southwest monsoon (June-September) season and around 10% rains during northeast monsoon (October-December) season.The potential evapo transpiration (PET) is around 1700 mm-1715 mm in the pilot sites.The major constraints in the pilot site include low productivity, low income and low resource use efficiency along with low seed replacement rate of agriculture and horticulture crops. The consortium will address these constraints with the following interventions: 1) Recommending soil-test based micronutrient application for all crops; 2) Improved seed/varietal replacement to fill the yield gaps with new plantation methods (PPP mode); 3) Crop diversification with pigeonpea, groundnut and finger millets; 4) Introduction of Broad-Bed and Furrow (BBF) method for increasing the soil moisture availability and to enhance the crop yields; Integrated pest management (IPM); 5) Tissue culture and IPM in banana; 6) Introducing micro irrigation in horticulture and vegetable crops; 7) Introducing multi-purpose maize hybrid for fodder production and 8) Rejuvenating cashewnut crop area with grafting and micro irrigation.

Table 2.4.3. General and crop details of pilot villages of East Godavari district.

S No	Mandal	Village	Geo Area (ha)	Total *kharif* area (ha)	Total *rabi* area (ha)	No of HH	Population	*Kharif* area (ha)		*Rabi* area (ha)	
								Agriculture	Horticulture	Agriculture	Horticulture
1	Ganga-varam	Amudalabanda	887	618		132	445	100	518		
2		Kusumarai	656	307		162	492	80	227		
3		Rajampalem	334	321		56	178	85	236		
4		Gangavaram	1319	477		560	2331	150	327		
5		Lakkonda	866	592		249	842	90	502		
6		Goragommi	427	392		122	455	90	302		
7		Pandrapottipalem	413	327		50	158	75	252		
		Total	4902	3034		1331	4901	670	2364		
		Percentage		62				22	78		
1	Yeles-waram	Marriveedu	1228	504	136	848	3770	327	177	91.90	44.53
2		J Annavaram	1556	674	112	943	3255	315	359	83.40	28.74
3		Ramanayyapeta	1257	97	155	458	1592	92	5	126.72	28.34
4		E L Puram	362	264	121	490	1749	165	99	100.00	21.46
5		Lingamparthy	1601	1075	693	2704	10201	756	319	558.30	134.82
6		Yeleswaram	1498	764	465	8212	32957	583	181	340.89	123.89
7		Peravaram	354	318	310	759	2957	245	72	226.72	83.00
8		Bhadravaram	318	277	302	677	2464	222	55	217.81	84.21
9		Siripuram	792	680	489	1065	3997	677	3	474.90	14.57
		Total	8968	4652	2784	16156	62942	3382	1270	2220.65	563.56
		Percentage		52	31			73	27	80	20

2.5. Guntur

District Profile: Guntur district has total area 11.39 lakh ha lies between the north latitudes of 15.18to16·50 degreesand east longitudes of 70.10 to 80.55 degrees. The mean annual rainfall of the district is 881 mm (<750-1000 mm). The district has 72% black soils and 17% red soils and 9% sandy soils. The major crops grown in the district are Paddy, Maize, Sorghum, Black Gram, Green Gram, Pigeon pea, Ground nut, Chick pea, and Sesame. The major horticulture and vegetable crops includes Chillies, Banana, Turmeric, Betel Leaves, Tomato, Bhendi, Brinjal, Cucumber, Jasmine, Crossandra, Sapota and Papaya. Out of the total cultivated area 53 per cent irrigated and 22 percent is rain fed. Livestock is an important part of the farming system. Being a coastal district fish and shrimp farming are also very important.

The major soil types are - Black cotton soils 0.4 million ha (72% total), red soils 0.1 million ha (17%), coastal sandy soils0.06 million ha (9%) and alluvial soils 0.01 million ha (2%).
Average Rainfall: 881mm

- Annual normal rainfall below 750 mm-11 mandals
- Annual normal rainfall between 750 and 1000 mm-41 mandals
- Annual normal rainfall above 1000 mm-5 mandals

Major crops grown in the district are paddy, cotton, chillies, red gram, sesame, castor, soybean, maize, green gram, black gram, groundnut, tobacco and fodder crops. The average productivity levels in tons $ha^{-1}$are paddy: 5.3, maize:8.0, blackgram: 1.0, red gram: 1.3, chillies: 4.3, cotton lint: 0.643. As per 2007 census, the total cattle population in the district is0.1 millionfollowed by buffaloes (1.2 million), sheep (0.7 million) and goats (0.2 million). Overall, a total livestock population of 2.35 million exists in the district. Nearly 30,635 fishermen are engaged in various production and marketing activities in the district. Nearly 33,038 tons of inland fish and prawns and 33,348 tons of marine fish and prawns are produced in the district during 2012-13.

The Guntur District Domestic Product (DDP) for 2014-15 for Agricultureis₹7200crores, Horticulture ₹ 5602 crores, Livestock₹4424crores and Fisheries ₹1293crores.The specific growth engines for the district are given in the Table 2.5.1 below.

The major constraints affecting crop productivity are poor soil health, zinc deficiency, lack of efficient irrigation facilities, improper drainage facilities, less degree of farm mechanization, failure to take water to tail end areas, pests, diseases, etc.

Pilot Site: Guntur pilot site covers seventeen villages across three mandals (Figure 2.5.1; Table 2.5.2) spread over geographical area of about 15,000 ha with crop area of 12,987 ha (8,226 ha agriculture, 4,761 ha horticulture and 200 ha fisheries). The livestock population in the pilot villages is about 0.1 million breedable cattle and buffaloes (with ~7,900 animals in milk), and 6,800 sheep and goat. The Guntur pilot site has human population of about 63,200 with

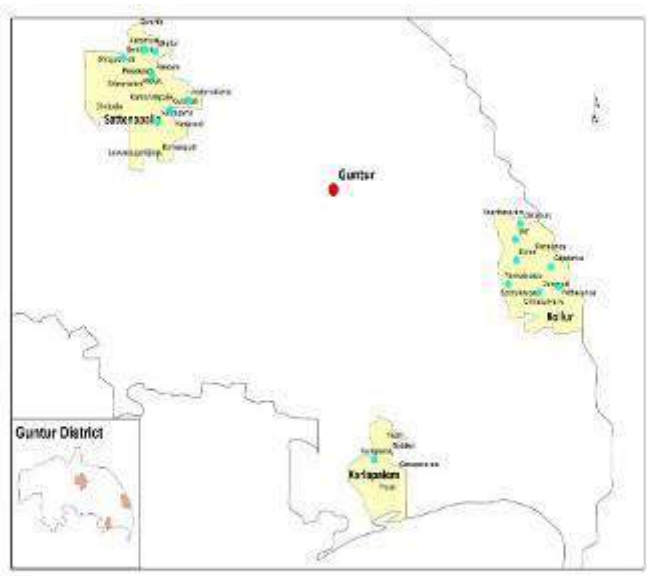


Figure 2.5.1. Pilot site map of Guntur district

about 17,630 operational holdings. Major constraints identified are low crop and livestock productivity. The consortium will address the constraints and harness the potential for improving productivity of different systems and gross value addition (GVA) through several innovations such as soil test-based fertilizer practices; improved crops and varieties; developing seed systems; recycling on-farm wastes for soil fertility; expanding area under high value agriculture; low cost water conservation practices; enhancing efficient water use through micro-irrigation; strengthening livestock (milk/ meat /fisheries/ egg) based enterprises through improved fodder production/ processing, deworming/ vaccination/ AI; capacity strengthening in best practices, etc.

The details of major crops and area in the pilot sites are given in Table 2.5.2. The details of livestock population are given in Table 2.5.3 and the details of number of households and population is given in Table 2.5.4.

Table 2.5.1. Guntur district specific growth engines with area (*kharif*+ *rabi*), production and Gross Value Added (GVA) for 2013-14.

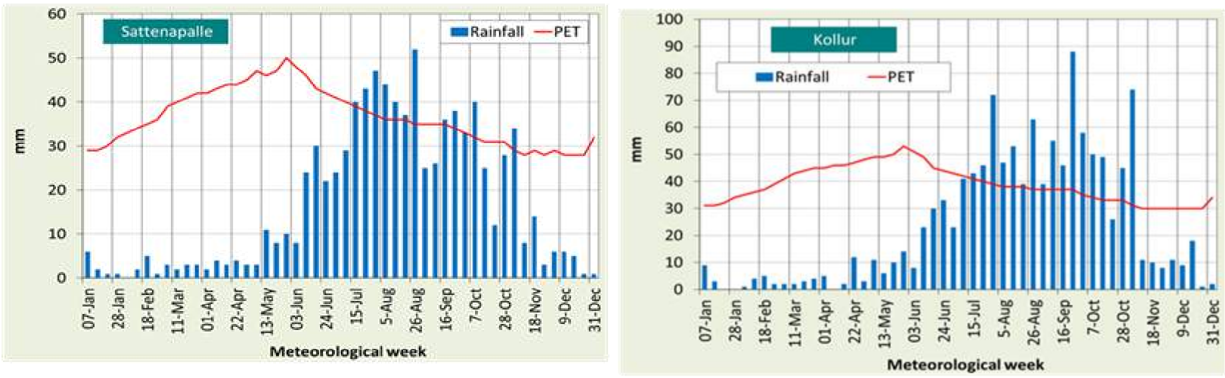
S.No	Sector	GrowthEngines	Area(ha)	Production (tons)	GVA (₹crores)
A) Agriculture & AlliedSector					
1	Agriculture	Paddy	328167	1644006	2126
2		Cotton(Kapas)	193207	383709	1627
3		Maize	87065	648244	786
4		Tobacco	6435	21523	230
5		BlackGram	36991	40227	192
6		GreenGram	30101	26372	147
7		Jowar	13761	82385	115
8		RedGram	13871	17464	65
9		Groundnut	5199	17746	61
10		Bengalgram	9507	21676	61
11		Sesamum	6804	4679	37
Agriculture Total					5998
12	Horticulture	Chillies	64813	332309	2128
13		Banana	5574	211734	417
14		Tomatoes	13464	269288	404
15		BetelLeaves	464	13881000	211
16		Turmeric	5276	36858	188
17		Bendi	2433	36502	70
18		Brinjal	2145	42890	67
19		Sapota	3305	33054	53
20		Jasmine	262	1310	35
21		Cucumber	1385	27706	34
22		Crossandra	200	640	28
23		Papaya	311	24864	24
Horticulture Total					4342
24	Livestock	Milk		976781	2171
25		Meat		52029	569
26		Egg (LakhNo)		9538	194
Livestock Total					3186
27	Fishing	Prawn		17321	490
28		InlandFish		27237	193
29		MarineFish		26818	193
Fisheries Total					876
Agriculture & AlliedSector					14722

Table 2.5.2. Details of crops and area in pilot site in Guntur district.			
S.No	Mandal Name	No. of villages covered	Crops and area in ha in parentheses
1	Kolluru	9	Paddy (3444), maize (3619), horticulture (1337)
2	Sattenapalli	8	Cotton (2907), chillies (2132) &fish farming (15)
3	Karlapalem	2	Shrimp farming (Fisheries) (300)
4	Tullur	1	Cage farming (Fisheries)

The pilot site receives an annual rainfall, of around 850-1200 mm with an annual PET of 1900mm-2017mm (Figure 2.5.2).

Guntur district, Sattenapalli mandal

Guntur district, Kollur mandal



Element	Kharif	Rabi	Annual
PET (mm)	766	721	1901
Rainfall (mm)	695	109	858

Element	Kharif	Rabi	Annual
PET (mm)	810	768	2017
Rainfall (mm)	969	184	1219

Source of data: IMD, Pune and DES, AP

Figure 2.5.2. Rainfall data in Guntur pilot site 30 years average.

Table 2.5.3. Livestock population in pilot sites of Guntur district 2014-15.										
Livestock				2014-15						
S No	District	Mandal	Village	Cattle	Buffalo	Sheep	Goat	Milk kg/year	Meat kg/year	Egg no/year
1	Guntur	Kollur	Kolluru	83	2229	938	151	1726918	31291	6754189
2	Guntur	Kollur	Ravikampadu	3	394	0	23	305252	486	9028
3	Guntur	Kollur	Ipuru	80	869	68	0	673258	636	3128
4	Guntur	Kollur	Chilumuru	31	349	0	0	270388	377	11061
5	Guntur	Kollur	Donepudi	18	680	147	23	526830	1792	13688
6	Guntur	Kollur	Gajullanka	6	567	132	10	439283	1386	8184
7	Guntur	Kollur	Potharlanka	51	400	120	30	309900	1459	11101
8	Guntur	Sattenapalli	Nandigama	163	1393	1224	159	1079227	20688	22104
9	Guntur	Sattenapalli	Gudipudi	48	1648	492	0	1276788	14226	7750
10	Guntur	Sattenapalli	Panidem	124	1079	964	60	835955	16600	26558
11	Guntur	Sattenapalli	Pedamakkena	192	634	684	70	491192	10800	8592
12	Guntur	Sattenapalli	Bhatluru	51	530	363	138	410618	7638	11712
13	Guntur	Sattenapalli	Kattamuru	74	956	500	0	740661	11220	4800
14	Guntur	Sattenapalli	Rentapalla	186	735	548	164	569441	12069	9984
			Total	1110	12463	6180	828	9655709	130668	6901879

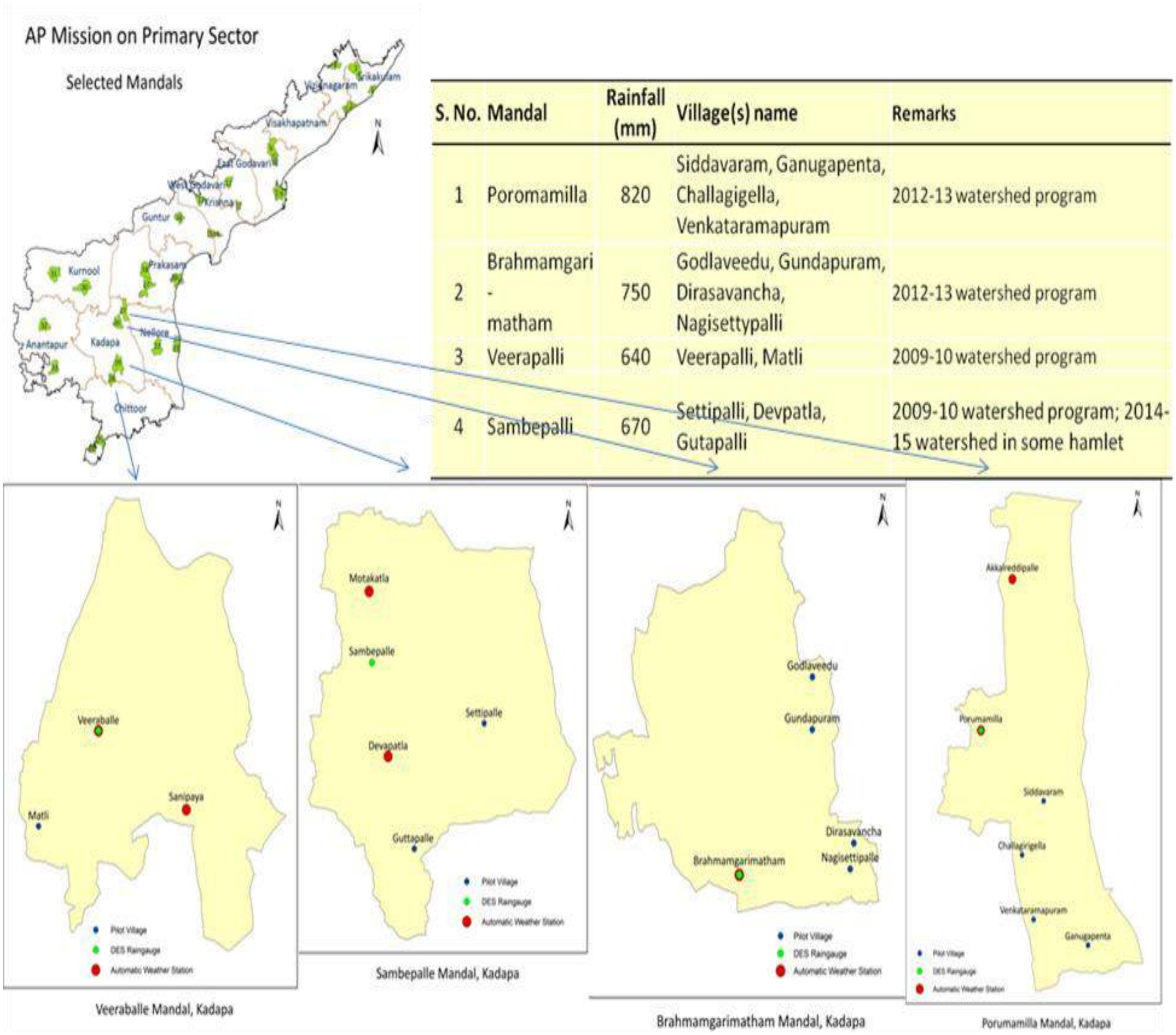
Table 2.5.4. Households and population data of pilot site in Guntur district.			
Mandal	**Village**	**Households**	**Population**
Kollur	Kolluru	4637	16088
Kollur	Ravikampadu	361	1165
Kollur	Ipuru	802	2892
Kollur	Chilumuru	838	3166
Kollur	Donepudi	1366	4356
Kollur	Gajullanka	518	1806
Kollur	Potharlanka	835	2380
Sattenapalli	Nandigama	1615	6624
Sattenapalli	Gudipudi	1568	5471
Sattenapalli	Panidem	1412	5222
Sattenapalli	Pedamakkena	897	3314
Sattenapalli	Bhatluru	553	2137
Sattenapalli	Kattamuru	856	3273
Sattenapalli	Rentapalla	1376	5308
Total		17634	63202

2.6. Kadapa

District Profile: Kadapa district has a geographical area of 1.536 million ha and is home to 2.5 million people. It is at 136 m altitude within geographic coordinates of 13^0 43' & 15^0 14' N (latitude) and 77^0 55' & 79^0 29' (longitude). About 72% of the population depends on agriculture and allied activities. The annual rainfall in the district is about 700 mm and predominant soil types are black and red. The net cropped area of the district is about 0.35 million ha (0.2 million ha *kharif*; 0.1 million ha *rabi*) (2013-14 data) and important agricultural crops include groundnut, paddy, cotton, pigeonpea, sunflower, bengalgram, sesamum. Important fruit crops include mango, banana, papaya, orange, lemon; while vegetable crops include chillies, onion, tomato. Among medicinal plants, coriander is an important crop. Livestock based activities are significant and livestock population in the district is – 0.1 million cattle, 0.4 million buffaloes, 1.3 million sheep and 0.4 million goats, 1.1 million backyard poultry birds, 0.3 million commercial farm birds (2012 census).

About 25,660 ha reservoir and tank area is under fisheries sector. Sericulture related activities cover about 240 ha area. As such current gross value from agriculture in Kadapa is ₹5708 crores and the per capita income in the district is₹70,820. Poor income from agriculture sector is mainly because of low crop productivity levels in the district. For example, crop productivity is 2.9 tons ha^{-1} in paddy, 0.99tons ha^{-1} in groundnut, 0.85 tons ha^{-1} in sunflower, 0.75tons ha^{-1} in bengal gram, 8.2 tons ha^{-1} in mango, 30.0 tons ha^{-1} in banana 19.0 tons ha^{-1} in tomato, 17.0 tons ha^{-1} in onion, etc. The major constraints for realizing high yield include water scarcity, soil fertility degradation, low yielding varieties and lack of good agricultural practices. Similarly, low-yielding cattle and buffaloes with fodder scarcity, improper healthcare and feeding schedule are responsible for poor livestock yield. The current Gross Value Added (GVA) of the district is ₹26,488 crores, and with growth engines and natural growth the target is to take it to ₹31,785 crores during 2015-16.

Pilot Site: ICRISAT along with line departments has selected thirteen villages across four mandals spread over a geographical area of about 39,370 ha (9,700 ha agriculture, 1,240 ha horticulture and 170 ha fisheries) to be developed as pilot sites of learning (Figure 2.6.1). The livestock population in pilot villages is about 9,500 breedable cattle and buffaloes (with ~5,100 animals in milk), and 91,200 sheep and goat. The Kadapa pilot site has a population of about 46,700 with about 11,200 operational holdings. Major constraints identified are low crop and livestock productivity. Multiple nutrient deficiencies (20-95% in Zn, 0-92% in B, 0-100% in S, 0-87% in Ca, 0-47% in P 8-100% in org C) are identified as major stumbling blocks for higher yields. In pilot sites, the consortium will address the constraints and harness the potential for improving productivity of different systems and GVA increase through several innovations such as soil test-based fertilizer practices; improved crops and varieties; developing seed production; recycling on-farm wastes for soil fertility; expanding high value agriculture; low cost water conservation; enhancing efficient water use through micro-irrigation; strengthening livestock (milk/meat/fisheries/egg) based enterprises through improved fodder promotion, silage, sheep/goat chick distribution, release of fish seedlings, deworming/vaccination, AI; capacity strengthening in best practices.



S. No.	Mandal	Rainfall (mm)	Village(s) name	Remarks
1	Poromamilla	820	Siddavaram, Ganugapenta, Challagigella, Venkataramapuram	2012-13 watershed program
2	Brahmamgari - matham	750	Godlaveedu, Gundapuram, Dirasavancha, Nagisettypalli	2012-13 watershed program
3	Veerapalli	640	Veerapalli, Matli	2009-10 watershed program
4	Sambepalli	670	Settipalli, Devpatla, Gutapalli	2009-10 watershed program; 2014-15 watershed in some hamlet

Figure 2.6.1. Details of pilot sites in Kadapa district

The planned targeted increase in GVA at pilot site is₹20 crores from current ₹ 110 crores to ₹130 crores by the end of 2015 (Table 2.6.1).

Table 2.6.1. Sector-wise summary of Gross Value Added(GVA) during 2014 and 2015 (targeted).					
Sector	**2014 Production**	**2014 GVA ₹(cr)**	**2015 Production**	**2015 GVA ₹(cr)**	**Increase in GVA ₹(cr)**
Agriculture		52.1		61.3	9.20
Paddy	6897	15.17	8317	18.30	3.12
Cotton	219	0.93	274	1.17	0.23
Groundnut	7796	35.08	8925	40.16	5.08
Redgram	128	0.87	246	1.67	0.80
Milk	5565885	18.4	6679062	22.1	3.70
Meat	465657	17.9	534212	20.5	2.60
Egg	1723800	0.52	1896180	0.57	0.05
Fisheries	0	0	18000	0.09	0.09
Vegetable	7600	6.08	12800	10.2	4.12
Rejuvenation of hort plantations	7776	15.55	7956	15.91	0.36
Total		110.6		130.7	20.1

* Production - Tons in Agril, Vegetable and Horticulture; kg in Meat, Fisheries; liter in milk and no. in eggs

2.7. Krishna

District Profile: Krishna district is one of the agriculturally productive coastal districts of Andhra Pradesh with its head quarters at Machilipatnam named in the year 1859 as Krishna District after holy River Krishna. Krishna district is located on the east coast of India between latitudes of 15 °43'N and 17° 10'N and between longitudes of 80° E and 81°33' E covering an area of about 8,727 km^2. It accounts for 3.17% of the total geographical area of the state. The district is surrounded in the Eastern and Southern side by the Bay of Bengal, Guntur and Nalgonda on the western and Khammam and West Godavari district on the northern side.The only major river in the district is Krishna, and the other riverlets include Muneru, Tammileru and Budameru. This district shares with the West Godavari district one of the large fresh water lakes on the east coast, namely, Kolleru. The total population of the district is 4.218 million with a literacy percentage of 60.65 out of which 29.63% is under the agricultural sector. The district falls under the tropical climatic zone and experiences extreme hot summer and severe winter. Summer temperatures rise even upto 50˚C while cold waves in the uplands of the district are as low as 8˚C to 10˚C.

The rainfall of the district is influenced by both the southwest and northeast monsoons. Total normal rainfall of the district is 1,034 mm and 67% (686 mm) of this is contributed from southwest monsoon, 24% (250 mm) is contributed by northeast monsoon, while remaining 8 % (98 mm) is shared by winter and summer showers.

Frequent cyclones of different intensities and tidal storms are natural calamities affecting the central tracts of Krishna particularly causing deterioration of groundwater quality in the coastal aquifers.

There are four types of soils in the district, black cotton soils (57.6%), sandy clay loams (22.3 %), red loamy soils (19.4 %) and sandy soils (0.7 %). Sandy soils form a fringe along the coast but black cotton soils occur most extensively in almost all mandals while the sandy clay loams are seen along the rivers and streams. The total cultivated area under different soil types is 0.436 million ha.

The cultivable land in the district is mostly under occupation by small, marginal and tenant farmers. The category wise number and area of operational holdings in the district (Table 2.7.1).

Table 2.7.1. Category wise number and area of operational holdings in Krishna district.

S. No.	Category	Holdings		Area	
		No. of holdings	% of total	Area (ha)	% of the total
1	Marginal farmers	388671	69.46	173286	31.48
2	Small farmers	106010	18.95	145851	26.50
3	Other farmers	63810	11.40	213214	38.74
4.	Large Farmers	1041	0.19	18046	3.28
	Total	559532	100.00	550397	100.00

The district is divided into four Revenue Divisions, ie, 1. Machilipatnam 2. Vijayawada 3. Gudiwada and 4. Nuzvidu. The agroclimatic conditions are different in four divisions of the district. Machilipatnam and Gudiwada are located in high rainfall zone covered under KE Canal irrigation, Vijayawada and Nuzvidu divisions are located in moderate rainfall zone covered under Krishna Eastern Canal and Nagarjuna Sagar Project. The area of irrigation in Krishna district is about 0.34 million ha, which is 74.7% of the total cropped area. The area irrigated by different sources is given below in Table 2.7.2.

Table 2.7.2. Area irrigated by different sources in Krishna district.

S. No.	Source	Area irrigated (M ha)	Area irrigated more than once (M ha)
1	Canals	0.2	0.18
2	Tanks	0.03	0.003
3	Well	0.03	0.014
4	Others	0.01	0.005
	TOTAL:	0.3	0.20

The cropping pattern of the district varies due to the existence of different agroclimatic conditions, which includes the following major cropping patterns listed in Table 2.7.3 below.

Table 2.7.3. Crop pattern in Krishna district.

Season	Condition	Cropping pattern
Kharif &*Rabi*	I. Irrigated: (i) One year rotation	Paddy Paddy- Paddy, Paddy-Pulse, Paddy-Sugarcane
	(ii) Two year rotation	Sugarcane (Plant) – Sugarcane (Ratton)
	II. Irrigated – Dry	Pulses- Tobacco, Pulses – Groundnut Pulses – Pulses, Maize- Pulses, Chilli – Fallow Vegetables – Vegetables, Turmeric – Fallow
	III. Rainfed	a) Redgram b) Chillies c) Cotton

Pilot Site:

The Rythu Kosam-AP Primary sector pilot site in Krishna district has been selected in three mandals namely Ghantasala, G. Kondur and Machilipatnam (Figure 2.7.1; Table 2.7.4). Ghantasala mandal consists of 10 revenue villages, G. Kondur consists of 14 revenue villages and Machilipatnam consists of three villages covering a total of 27 villages in the upland and delta regions as listed in Table 2.6.5. The total geographical area of the pilot site is about 18,103 ha with a cultivable area of 15,182 ha covering agriculture, horticulture and animal husbandry in Ghantasala and G. Kondur mandals and fisheries in 600 ha in Machilipatnam mandal. Ghantasala and Machilipatnam mandals fall under the delta region while G. Kondur mandal falls under the upland area. The major crops grown in the G. Kondur mandal includes cotton, paddy, chillies, vegetables and mango.

Figure 2.7.1. Map of Krishna pilot **sites**

In Ghantasala mandal the major crops grown include paddy, sugarcane, pulses and maize. Machilipatnam mandal consists of inland, marine water and prawn cultivation.

Table 2.7.4. Details of pilot site mandals sector wise in Krishna district.

Sector	Mandal /Crops	Villages
Agriculture, Horticulture & Animal Husbandry	Ghantasala (10 villages) (Paddy, maize, pulses, sugarcane)	Srikakulam, Teluguravupalem, Kodali, Kothapalli, Ghantasala, Tadepalli, Chitturpu, Chinnakallepalli, Vemulapalli, , Daliparru
	G. Kondur (14 villages) (Cotton, paddy, chillies, tomato, mango)	Kavuluru,(Kadimpotavaram*), Velagaluru, H. Mutyalampadu, Aatkuru, Pinapaka, G.konduru, Gaddamanugu, Chevuturu, Ch. Madhavaram, Munagapadu, Venkatapuram, Gururajupalem, Koduru, Vellaturu **hamlet not revenue village*
Fisheries	Machilipatnam(3 villages) (Fish and prawn)	Bandar west, Kona, Chinnapuram

The average rainfall in the selected pilot sites ranges between 910 mm to 1076 mm annually.Higher temperatures are commonly recorded in the region due to which the annual Potential Evapo Transpiration (PET) of these mandals is approximately 1811mm-1807mm (Figure 2.7.2).

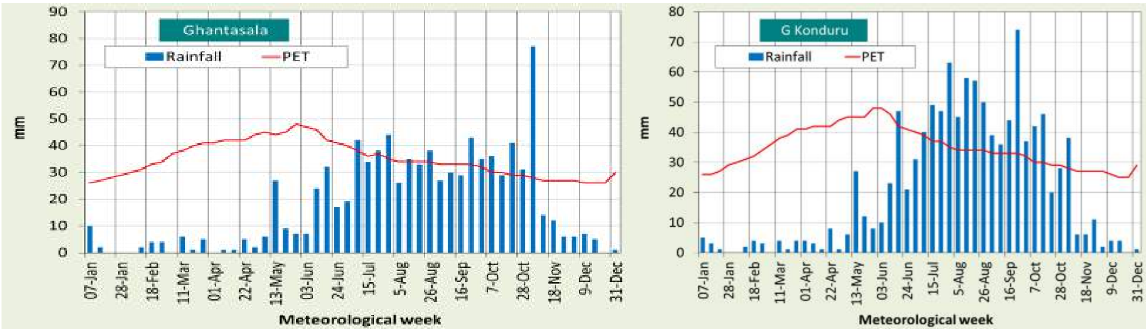


Figure 2.7.2. Rainfall and PET pattern in Ghantasala mandal.

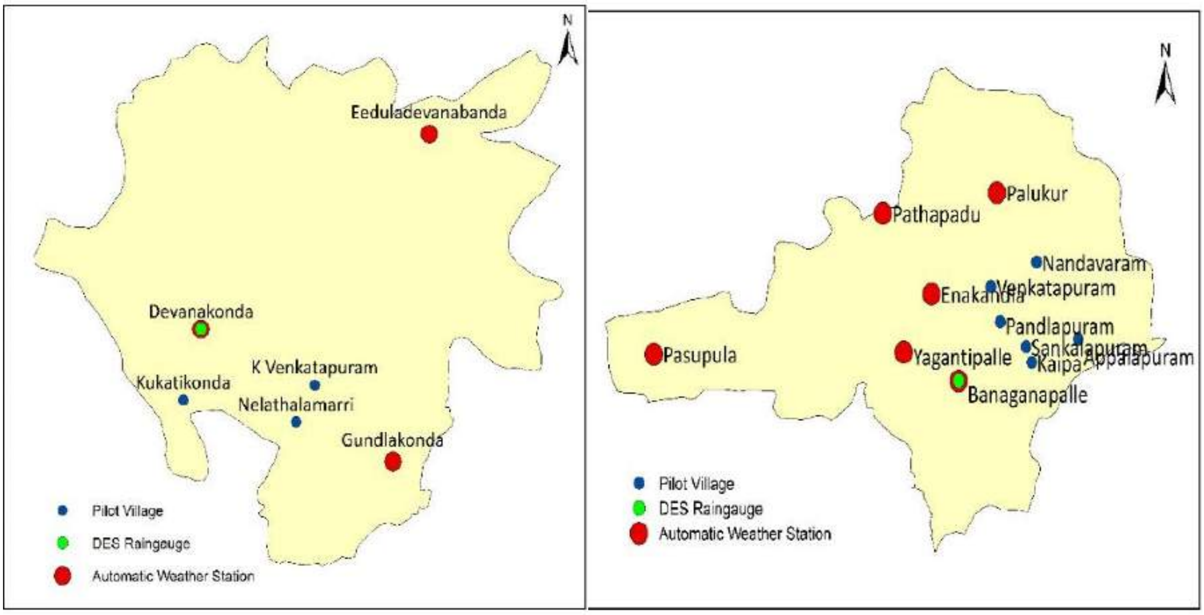
The major growth engines identified in the pilot site area include paddy, cotton, maize, sugarcane and black gram for agriculture sector, mango, tomatoes and chillies for horticulture sector, milk, meat and eggs for livestock sector and prawn, marine and inland fish for fishery sector. Major constraints identified in the pilot site are soil test based fertilizer application, low organic content in the soils, lack of replacement of high yielding varieties for pest and disease resistance/tolerance and lack of adoption of high density plant populations in agricultural and horticultural crops. The consortium will address the constraints and harness the potential for improving production and productivity of different sectors through the different interventions.

2.8. Kurnool

District Profile: Kurnool district lies between the north latitudes of 14˚ 54’to 16˚18’and east longitudes of 77˚ 24’ to 79˚ 40’. The total population of the district is 40.53 lakh. The density of population is 230 persons per sq. km. The sex ratio between male and female population is 1:0.98. The literacy rate for male is 70.1% and for female it is 49.8%. The rainfall of the district is influenced by both the south-west and north-east monsoons. The normal annual rainfall of the district is 670 mm. The district has good black soils having a share of 75 per cent. Red soils and other soils make up the remaining one-fourth of the area. The major crops grown in the district are Rice, Sorghum, Groundnut, Cotton, Bengal gram, Sun flower, Castor and Red gram. The major horticulture and vegetable crops includes Mango, Sweet Orange, Tomato, Onion, Coriander, Brinjal and other high value crops. Out of the total cultivated area 70 per cent are rainfed and remaining 30 per cent are irrigated by canal, tube well and open wells. Livestock is an important part of the farming system. The current fish production is very low. The district has developed as a good seed production center because of the ideal combination of irrigation, low humidity, good soils and skillful farmers. Many seed companies have established offices in the district and are organizing seed production of many crops.

The rainfall in the district is quite low and uncertain. Droughts occur at a regular frequency due to shortfall in rains. The district is also prone to flash floods caused by Handri and other minor rivers and streams. Two third of the cropped area is completely dependent on rainfall and crop failures are quite common. One-fourth of the soils are light textured and they retain low moisture. Part of the black soil areas are shallow and cannot sustain good crops unless rainfall is good and well distributed. Even the command areas under irrigation projects do not receive irrigation water every year, particularly in the tail end areas. There are problematic soils in considerable area which needs heavy investments for reclamation. The water quality from irrigation sources is not very good as it often contains high levels of salt concentration. A lot of labor force migrates to other places. The availability of labor is limited and wage rates are higher relative to their productivity levels. Farmers often receive jolts when they market their produce, particularly in case of onion, tomato and coriander. Limitation of irrigation water is constraining the development of sericulture, horticulture and fisheries. Irrigation from canals is uncertain because of the control of Karnataka on the reservoirs from which they originate. The productivity of livestock is quite low in the district due to lack of permanent pastures and inadequate area under fodder crops. Due to all these weaknesses, agriculture in the district still remains a gamble with the monsoon and its viability is constantly under threat. The threats to agriculture and allied sectors come from many sources. In spite of all these issues the primary sector in the district has huge potential to grow at much faster rate.

Pilot Site: In Kurnool district two pilot sites one in Devanakonda and second in Banaganapalle mandal (Fig 2.8.1). These have been selected after visiting several sites along with Kurnool district officials and considering several key parameters.



Devanakonda Mandal, Kurnool

Banaganapalle Mandal, Kurnool

Figure 2.8.1. Selected pilot sites in Kurnool district.

The name of villages and their latitude, longitude of two selected pilot sites in Kurnool district are given in Table 2.8.1.

Table 2.8.1. Village names, latitude & longitude, soil types of pilot sites in Kurnool					
S.No	Mandal	Villages	Latitude (°)	Longitude (°)	Remarks
1	Devanakonda	Nelathalamarri Kukatikonda K Venkatapuram Devanakaonda	15.49580 15.50610 15.51308 15.53750	77.60211 77.54431 77.61173 77.56130	This site is having Red soils second most predominant soil in Kurnool with 2.5 lakh ha (Covering 25% area)
2	Banaganapalle	Kaipa Sankalapuram Appalapuram Pandlapuram Vankatapuram Nandavaram	15.32113 15.32950 15.33365 15.34308 15.36222 15.37562	78.27688 78.27311 78.30885 78.25545 78.24902 78.28033	This site is having black soils most predominant soil with 7.6 lakh ha in Kurnool (Covering 75% area)

Total households at both pilot sites are about 6864 with total human population of 0.0026 million. Most of the farmers are small and marginal farmers with low land holding. The total area of both pilot sites is 10,299 ha. Only 15% of the total area of the pilot sites is irrigated while the remaining 85% area is rainfed. Major crops grown at the pilot sites are groundnut, rice, sorghum, Bengal gram, cotton, vegetables and other horticulture crops. Some of the major constraints to primary sector at the pilot sites are low rainfalls and frequent moisture stress, poor soil health, lack of knowledge and skill about improved technologies, poor economic conditions and poor infrastructure. The soils at Devanakonda pilot site are deficient in zinc (83%), sulfur (68%), boron (59%), and calcium (50%), and the Banaganaplle pilot site in zinc (79%), phosphorus (49%) and sulfur (42%).

In consultation with the various government line departments (Agriculture, Horticulture, Animal Husbandry, Micro Irrigation & others) and using the available primary and secondary data from the pilot sites, the double digit growth plans for various primary sectors have been prepared (Table 2.8.2). For agricultural sector the Gross Value Added (GVA) for year 2015-16 is projected at ₹28.19 crores from ₹23.80 crores during 2014-15 representing growth rate of 18.44%. For horticulture andvegetable sectors, the total projected GVA is ₹9.87 crores during 2015-16 from ₹7.95 crores during 2014-15 representing growth rate of 24.26%. For livestock sector, projected GVA is ₹11.79 crores during 2015-16 from ₹9.69 crores during 2014-15. For all primary sector overall GVA is projected to increase by 21.7% during 2015-16 compared to 2014-15.

Table 2.8.2. Kurnool-pilot site specific growth engines with area (*kharif* + *rabi*), production and GVA.

Sector	Commodity	2014-15			2015-16			Increase in values			Increase in %		
		Area (ha)	Production (T or No.)	Gross Value (₹ crore)	Area (ha)	Production (T or No.)	Gross Value (₹ crore)	Area (ha)	Production (T or No.)	GVA (₹ crore)	Area	Production	GVA
Agriculture	Cotton	2471	2008	7.53	2471	2290	8.59	0	282	1.06	0	14.0616	14.06
	Groundnut	1580	1112	3.99	1580	1400	5.03	0	289	1.04	0	25.96	25.97
	Paddy	1221	2540	3.94	1221	2950	4.57	0	410	0.64	0	16.14	16.14
	Black gram	1052	425	2.55	1052	520	3.12	0	95	0.57	0	22.35	22.35
	Sorghum	1138	936	1.59	1138	1160	1.97	0	224	0.38	0	23.88	23.87
	Bengal gram	700	517	1.73	700	580	1.94	0	64	0.21	0	12.29	12.31
	Pigeonpea	507	224	1.11	507	280	1.39	0	56	0.28	0	25	25
	Castor	295	287	1.00	295	335	1.17	0	48	0.17	0	16.72	16.78
	Sunflower	71	47	0.15	71	54	0.17	0	7	0.02	0	14.89	14.89
	Millet	67	80	0.11	67	90	0.12	0	10	0.01	0	11.94	11.43
	Safflower	40	20	0.07	40	23	0.08	0	3	0.01	0	15	15
	Maize	8	30	0.04	8	33	0.04	0	3	0.00	0	10	10
	Total	9150	8226	23.80	9150	9715	28.19	0.00	1489	4.39	0.00	18.11	18.44
Horticulture	Onion	272	3568	4.14	304	4500	5.22	32	932	1.08	12	26.12	26.12
	Chilies	85	323	1.68	94	393	2.04	9	70	0.37	10	21.75	21.75
	Tomato	93	789	1.11	93	980	1.37	0	191	0.27	0	24.21	24.16
	Brinjal	29	283	0.45	32	360	0.58	3	77	0.12	11	27.21	27.21
	Ridge gourd	23	93	0.05	23	115	0.06	0	22	0.01	0	23.66	23.66
	Guar	155	103	0.47	155	120	0.54	0	17	0.08	0	16.22	16.22
	Lady's finger	5	15	0.04	5	17	0.04	0	2	0.00	0	12.00	12.00
	Coriander	16	3	0.02	16	4	0.03	0	1	0.00	0	15.15	14.00
	Total	678	5177	7.946	722	6489	9.874	44.00	1312	1.93	6.49	25.34	24.26
Livestock	Milk (MTS)		2197.95	4.84		2665.79	6.05		467.8	1.21425		21.29	25.09
	Meat (MTS)		124.34	1.87		143.2	2.15		18.86	0.28		15.17	15.17
	Eggs (Nos in lakhs)		99.5	2.98		119.7	3.59		20.19	0.61		20.3	20.3
	Total			9.69			11.79			2.1			21.7
Sub-total													
Agriculture		9150.00	8225.60	23.80	9150.00	9714.90	28.19	0.00	1489.3	4.39	0.00	18.11	18.44
Horticulture		678.0	5177.0	7.9	722.0	6489.0	9.9	44.0	1312.0	1.9	6.49	25.3	24.26
Livestock				9.69			11.79	0	0	2.1			21.7
Grand Total				41.43			49.851			8.42			20.31

2.9. Nellore

District Profile: Nellore district has a total geographical area of 1.316 million ha out of which 41.3% is under cultivation while 18.7% is under forest cover. The rest is distributed among barren and uncultivable land (13.8%), land put into non agricultural uses (16.5%). Total population of the district is 2.66 million with working population of 1.03 million and having literacy rate of 78.58%. Out of the cultivable area, the net area sown forms 23.8% while cultivable waste and fallow (current and old) land constitute 11%.The district has varied climatic conditions. The year may be divided into four seasons. The summer season from March to May is followed by the southwest monsoon season, which extends up to the end of September, October and November constitute the retreating monsoon or post monsoon season. The period from December to February is the northeast monsoon season. The normal rainfall of the district is 1080 mm. The district receives bulk of its rainfall from northeast monsoon during the period September to December. The rainfall is generally uniform throughout the district.

Agriculture is the main occupation of the people of the district. Rice is the staple food of the people and paddy is the principal food crop followed by bajra, jowar and ragi; other crops like tobacco, groundnut, chillies, sesamumand sugarcane are also cultivated. The net area irrigated forms 69.4% of the net area sown and the rest is under dry crops depending upon the monsoon. Based on the available agricultural produce, a variety of agro based industries such as rice bran oil plants, sugar factories, rice and parboiled rice mills have come up. Among horticultural crops, citrus occupies an important place. Other important fruit varieties raised in the district are mango, papaya, guava and sapota.

As regards marine resources, Nellore district has a long coastline with farmers involvedwidely in aquaculture, mainly cultivating 'Scampi'. Fish is also available in plenty and good number of aqua processing plants, feed mills and ice plants exist in the district. Sericulture sector is very limited and animal husbandry sector is based on primarily milk, meat and egg.

The analysis of last three year subsector-wise District Domestic Product (DDP) at current prices showed that Nellore district is ranked middle in Industry and Service sectors while Primary sector contributes poorly (Figure 2.9.1). The state had identified growth engines in each of the sectors. Forty-one growth engines contribute 79.40% (₹21,469 crores GVA) in total DDP of ₹27,039 crores. In Agriculture and allied sectors, twenty six growth engines contribute 87.71% (₹7,534 crores GVA) in total Agriculture sector DDP of ₹8,590 crores. In Industry sector, six growth engines contribute 99.58% (₹5,736 crores GVA) in total Industry sector DDP of ₹5,760 crores. In service sector, nine growth engines contribute 64.62% (₹8,199 crores GVA) in total Service sector DDP of ₹12,688 crores.

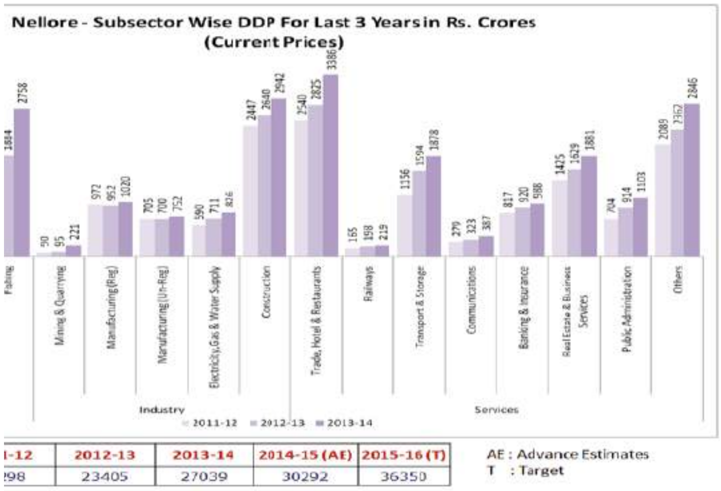


Figure 2.9.1. Subsector wise District Domestic Produce (DDP) for Nellore 2011-2013

Pilot Site: ICRISAT along with district administrators (District Collector, Chief Planning Officer) and line department officials have identified pilot site (Figure 2.9.2) comprising three mandals viz., Indukurpet mandal (Jagadevipeta, Gangapatnam, Mypadu village); TP Gudur mandal (Peduru, Varigonda, TPGudur I, TPGudur II village) and Podalakur mandal (Aldurthi, Kanuparthi, Mogaluru, Marripalli village). The criteria adopted for selecting pilot sites are: representative site for the district in terms of AEZ and systems, good potential for impact to bridge the gaps, accessibility, willingness to adopt new and presence of suitable institutions. The pilot site has 14,371 ha of geographical area and ~8800 ha of net sown area comprising agriculture-6600 ha, horticulture-1643 ha, fisheries-475 ha and sericulture-25 ha (Table 2.9.1). The total number of households in the pilot villages is about 11,242 and the population is 40,408. The overall literacy rate is about 62.87 with male literacy rate of 68.93% and female literacy rate of 56.82%. Annual rainfall of selected mandals is between 1050-1150 mm, of this 30-40% rain is received during *kharif* season (May-Sep) whereas 65-70% rainfall, ie, N-E rain is received during September - January.

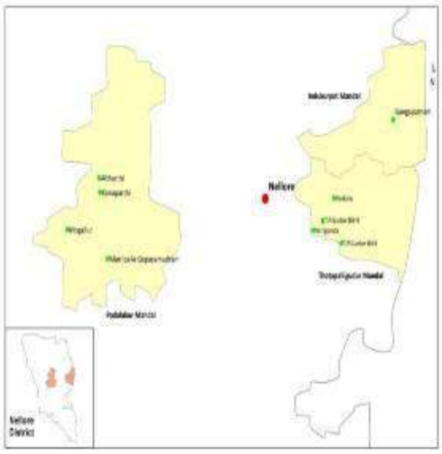


Figure 2.9.2. Map of pilot sites

Major constraints identified to be addressed are soil degradation and soil health management. Apart from this, low cropping intensity, mono cropping, low mechanization, depleting groundwater table are serious issues in the agriculture sector. Due to higher temperature, annual potential evapotranspiration (PET) of these mandals is very high. Due to moderate to higher rainfall occurrence and inflow of surface water to the district, groundwater availability in Indukurpet and TP Gudur mandal is good whereas in Podalakur mandal, there is serious problem of groundwater depletion. Poor drainage, high salinity and flooding is the major issue bringing paddy yield lower compared to upland areas. As regards dairy sector, indigenous and low milk yielding cattle, non-availability of nutritious fodder are the main issues. The fishery sector in the district ranks number 1 in the country; however, it is facing a number of serious issues such as unavailability of quality fish seed, technical knowledge, and storage structures.

Table 2.9.1. Details of pilotsites in Nellore district.

Name of the Situation	Mandals	Village	Geographical Area (ha)	Village identified with area (ha)							
				Cultivable land	Net Area Sown			Horti culture	Fisheries	Seri culture	No. of HH
					Kharif	*Rabi*	Total				
Coastal situation (3680 ha)	Indukur pet	Lebur Bit II (Jagadevi peta)	1333	1052	856	196	1052	519	48	--	1452
		Ganga patnam	2347	961	455	170	625	118	231	--	2063
		Mypadu	2224	947	643	304	947	69	108	-	1773
ID Situation (4159 ha)	T.P. Gudur	Peduru	992	816	631	55	686	16	17	--	1170
		Varigonda	1332	880	25	654	679	2	45	--	1583
		T.P.Gudur I	879	510	11	437	448	0	2	--	668
		T.P.Gudur II (Papi reddy palem)	956	613	53	418	471	2	24	--	1045
Dryland (4308 ha)	Podalakur	Aldurthi	1461	1129	384	117	501	366	0	--	278
		Kanuparthi	1297	992	382	206	588	220	0	--	495
		Mogaluru	1145	593	258	219	477	244	0	--	480
		Marripalli (Gopasamudram)	405	308	82	44	126	87	0	--	235
Total			14371	8801	3780	2820	6600	1643	475	10	11242

The consortium will address the constraints and harness the potential for improving production and GVA (Table 2.9.2) of different systems through several innovations in agriculture,soil test-based application of deficient nutrients including secondary- and micronutrients (3000 ha) particularly in dryland areas such as in Podalakur mandal wherein S (78%) and Zn (68%) are severely deficient and in coastal mandals where there is some deficiency of Zn (16-29 %).Introducing improved crop varieties, crop intensification by bringing fallows under cultivation, mechanization through custom hiring centers (CHCs)recycling of on-farm wastes to make quality composts –pilot and capacity building (CB) in best agricultural practices are some of the other activities.

Table 2.9.2. Nellore - District specific growth engines with area (*kharif* + *rabi*), production and Gross Value Added (GVA) for 2013-14.

S.No	Sector	Growth Engines	Area (ha)	Production (tons)	GVA (₹crores)
A) Agriculture & Allied Sector					
1	Agriculture	Paddy	224893	1366662	1767
2		Sugarcane	7835	1239040	185
3		Groundnut	15069	44931	154
4		Tobacco	11267	8878	95
5		Black Gram	11400	9388	45
6		Cotton (Kapas)	6785	8672	37
7		Bengal Gram	7429	9680	27
8		Green Gram	5008	4421	25
9		Maize	1917	13064	16
Agriculture					2779
10	Horticulture	Lemon	17000	255000	426
11		Tomatoes	4935	98691	148
12		Betel Leaves	309	9244000	141
13		Mango	11630	104671	124
14		Batavia	6560	88561	69
15		Banana	816	25764	51
16		Chillies	1218	5186	33
17		Sapota	1281	12810	21
18		Guava	704	10556	19
19		Brinjal	389	7770	12
20		Cucumber	444	8880	11
Horticulture					1256
21	Livestock	Milk		558696	1104
22		Meat		17030	240
23		Egg (Lakh No)		1467	26
Livestock					1561
24	Fishing	Prawn		69129	1907
25		Inland Fish		50437	349
26		Marine Fish		71751	503
Fishing					2758
Agriculture & Allied Sector					8590

With regard to horticulture, the interventions are bringing new areas under vegetable cultivation, convergence for Micro Irrigation (MI) and microand secondary nutrients, rejuvenation of existing plantations along with micro and secondary nutrients and capacity building. In dairy sector, for increasing the milk, the interventions are promotion of fodder (dual purpose maize, mulit cut sorghum, bajra, fodder grasses), silage making units cross all villages, regular health camps – deworming/vaccination of livestock; AI of livestock, concentrated feed for six months and capacity building forfarmers. As regards meat, focus is on deworming, sheep and goat distribution, capacity building. For eggs, vaccination and deworming, chick distribution unit in eleven pilot villages and capacity building. For the fishery sector, the interventions designed are expansion of area through revival of brackish water aquaculture and scampi culture and production of mangrove crab farming. It also comprises mechanization of aquaculture through providing solar pump sets, solar lights and aerators as well as stocking of fish seed in tanks and reservoirs under RKVY and sea weed culture promotion on experimental basis.

2.10. Prakasam

District profile: Prakasam district (Figure 2.10.1; Table 2.10.1) covers an area of 1.714 million ha comprising 56 mandals that includes 1,041 gram panchayats and organized into 12 agricultural sub-divisions. The district lies between 14.57 ° - 16.17 °N; 78.43 ° - 80.25 °E. The district has a coastline of 102 km. The literacy rate in the district is 33% and 58% of the population are working, out of which 43% are engaged in agriculture sector. The land use pattern, soil types and irrigation source of the district. The rainfall in the district is influenced by both southwest and northeast monsoons. Total average normal rainfall of the district is 872 mm. The contribution from southwest monsoon (June-September) is 388 mm and from northeast monsoon (October- December) 393 mm, and the remaining 90 mm is received in winter and summer. The district has four major soils; red soils constitute 51.3%, while black soils account for 40.8% and remaining is sandy loam and others. The major crops grown in the district are rice, pulses, cotton, oilseeds, maize, chillies and horticulture crops. Cropping intensity is 106%. Average productivity levels of major crops: sorghum 0.82 tons ha^{-1}, pearl millet 1.82tonsha^{-1}, black gram 0.72tons ha^{-1}, pigeonpea 0.55 tons ha^{-1}, green gram 0.55tons ha^{-1}, cowpea 1.54tons ha^{-1}, chickpea 1.32 kg ha^{-1} and maize 4.08 tons ha^{-1}.

The bovine population of the district is 0.994 million. Prakasam district is one of the leading districts for milk production in the state. There are 25 private milk chilling centers functioning in addition to district milk producers’ co-operative union with a milk products factory at Ongole. The district has 0.10million sheep and 2.4 million goat population.

The main occupation of the fishermen is marine and inland fishing and shrimp culture. There are 84 Fishermen Co-operative Societies functioning in the district. There are 160 tanks and 8 reservoirs where fish seed can be stocked. The annual fish production is about 4948 tons and the fisheries sector is contributing 2.38% to the district income in Prakasam district. There is 5,173 ha area under brackish water ponds and 957 ha area under fresh water tanks in the district. At present, an area of 400 ha is under mulberry cultivation in the district. The district DDP for 2014-15 (₹ crores): Primary- ₹12,833, Industry-₹7,897, Services-₹15,190 and total is₹35,920. Average growth rate (2007-2012) of all thse sector sectors is 19.73%.

Table 2.10.1. Demographic profile of Prakasam district.	
Parameters	**Details**
Geographical area (ha)	1.762 million
Population (nos.)	3.40million (1.72M male, 1.68 M female)
Households (nos.)	0.86 million
Population density (persons/ km^2)	193
Sex ratio (female per 1000 male)	981
Literacy rate (%)	33 women; 58 men

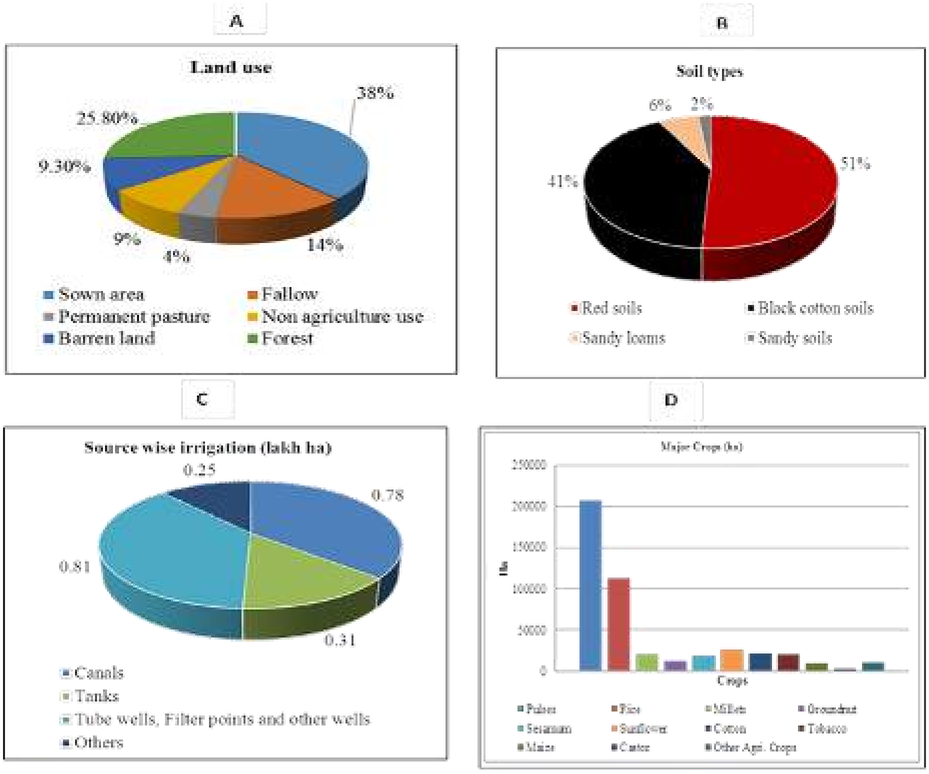


Figure 2.10.1. Details of A: Land use pattern, B: Soil types, c: Source of irrigation, D: Major crops in Prakasam district.

Pilot site: Based on the standard criteria pilot sites were identified (Figure 2.10.2; Table 2.10.2, 2.10.3). The Chief Planning Officer conducted a meeting with all line department officers on 9 March 2015. During the meeting, based on the cropping pattern, soils and rainfall of the district covering the activities of the primary sector, the pilot sites identified included Kanigiri and Konakanamitla focusing mainly on agriculture, horticulture and animal husbandry sectors, and Kothapatnamand Ongolefor the fisheries sector.Based on the inputs from all the line department officers, during the meeting conducted by District Collector, a 11,395 ha site was finalized.

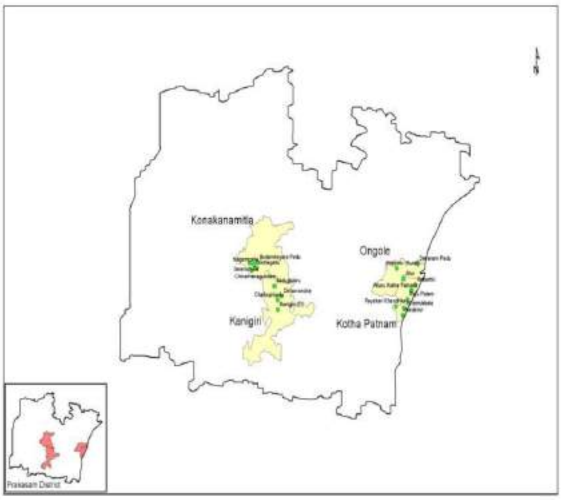


Figure 2.10.2. Map of Prakasam pilot sites

Land use pattern of the Kanagiri and Konakanamitla mandals are shown in Figure 2.10.3 and rainfall and potential evapotranspiration (PET) in Konakanamitlamandal is shown in Figure 2.10.4.The major constraints for productivity identified in the pilot site for the agriculture sector are erratic rainfall,water scarcity,low crop yields,poor soils,fodder scacity (particularly green fodder) and low livestock productivity. In horticulture, the major constraints identified are very small area under horticultural crops and the need to strengthen capacity building program. In livestock sector, fodder scarcity (particularly green fodder) and low livestock productivity are the major constraints while in fisheries sector thenon availability of quality fish seeds, low survival rate due to diseases, lack of technical support, irregular power supply for prawn farming and the need to strengthen capacity building programhave been identified.

Table 2.10.2. Details of pilot sites in Prakasam district.

Name of the mandal	Cultivable area (ha)	Proposed crops	Sectors focused
Konakanamitla (5 villages) IWMP WS (2014-15 batch)	3976	Black gram, cotton, cowpea, acid lime, sweet orange, mango, chilli, vegetables, mulberry	Agriculture, animal husbandry, watersheds, horticulture sericulture
Kanigiri (8 villages) IWMP WS (2014-15 batch)	5941	Red gram, paddy, cowpea, batavia, mango, amla, acid lime, guava, papaya, vegetables, mulberry	Agriculture, animal husbandry, watersheds, horticulture sericulture
Ongole (5 villages)	525	Inland fisheries	Fisheries
Kothapatnam (10villages)	953	Inland fisheries	
4 mandals; 28 villages; Total cultivable area -11,395 ha; IWMP watersheds 2014-15 batch			

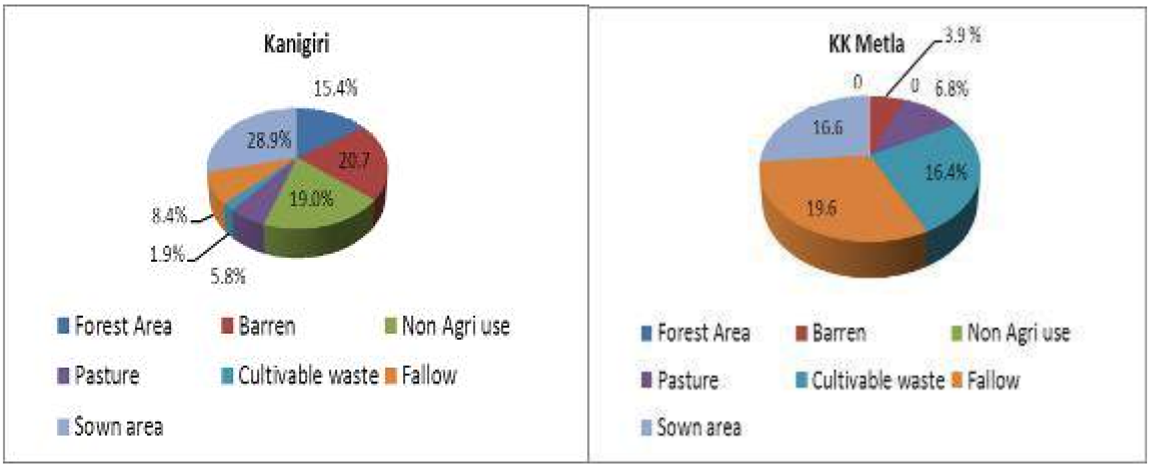
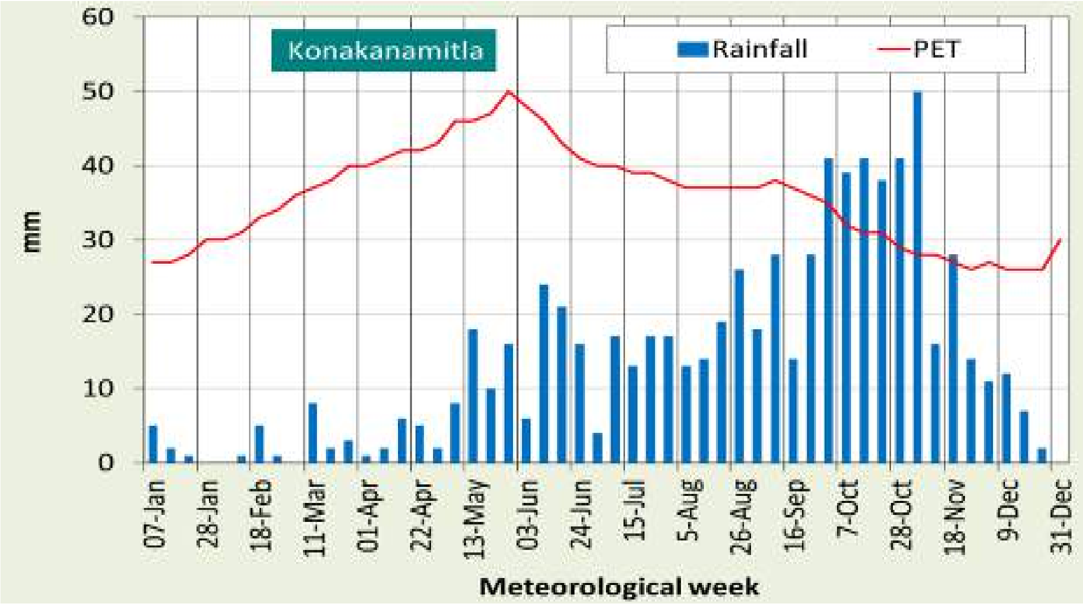


Figure 2.10.3. Land use pattern in the pilot sites of Kanagiri and Konakanametla

Table 2.10.3. Details of Rythu kosam project pilot site details, Prakasam district.			
Mandal	Village	Longitude	Latitude
Konakanamitla	Salanuthala	79.364914	15.549856
Konakanamitla	Chinamanagundam	79.373001	15.521105
Konakanamitla	Nagampalle	79.383781	15.543568
Konakanamitla	Budamkayala Padu	79.400848	15.552551
Konakanamitla	Gotlagattu	79.397263	15.530989
Kanigiri	Ganuga Penta	79.465675	15.457670
Kanigiri	Baduguleru	79.483688	15.462582
Kanigiri	Challagirigala	79.499237	15.409375
Kanigiri	Dirisavancha	79.518883	15.424109
Kanigiri	Yadavalli	79.529526	15.455215
Kanigiri	Kanigiri (U)	79.500053	15.373358
Kanigiri	Punugodu	79.581825	15.369718
Kanigiri	P.Kandrika (This hamlet belongs to revenue village Punugodu)	79.543747	15.442740
Ongole	Devaram Padu	80.174400	15.547661
Ongole	Koppolu (Rural)	80.074501	15.529357
Ongole	Bodduvari palem (This hamlet belongs to revenue village Devarampadu)	79.928365	15.502275
Ongole	Gundayapalem (This hamlet belongs to revenue village Devarampadu)	80.202804	15.538542
Ongole	Chinthayapalem (This hamlet belongs to revenue village Devarampadu)	80.557734	15.924229
Kothapatnam	Kothapatnam	80.144821	15.445495
Kothapatnam	Raju Palem	80.125870	15.411394
Kothapatnam	Ethamukkala	80.108444	15.378050
Kothapatnam	Madanur	80.103134	15.352283
Kothapatnam	Gundamala (This hamlet belongs to revenue village Padarthi)	80.193838	15.486137
Kothapatnam	Motumala (This hamlet belongs to revenue village Allur)	80.190274	15.49033
Kothapatnam	Beeramgunta (This hamlet belongs to revenue village Allur)	80.162754	15.50098
Kothapatnam	Gadepalem (This hamlet belongs to revenue village Allur)	80.139489	15.503124
Kothapatnam	Aloor	80.182624	15.468799
Kothapatnam	Padarti	80.099847	15.432199
No. of mandals	No. of villages		
4	28		



Element	*Kharif*	*Rabi*	Annual
PET (mm)	780	675	1860
Rainfall (mm)	489	169	731

Figure 2.10.4. Rainfall and PET in Konakanamitla mandal, Prakasam district.

2.11. Srikakulam

District Profile: Srikakulam district is situated within the geographic co-ordinates of 18°20’ to 19°10’ N and 83°50’ to 84°50’ E. The district has the longest coastline of about 193 km. Srikakulam district occupies an area of 5.84 million ha with a population of 2.703 million and literacy rate of 61.7%. The average normal rainfall was 1162 mm,total net area sown (52.5%) is 0.306 million ha including fish and prawn culture. Paddy is the single dominant crop in the district and occupies nearly 49.4% of total area sown. Groundnut, coconut and cotton are the other major non-food crops grown in the district. Canals are the major sources (59%) of irrigation followed by tanks (33%), dug wells and tube wells. The average productivity levels of major crops in the district are paddy (2.5 t ha^{-1}), sorghum (2.6 t ha^{-1}), pearl millet (2.5 t ha^{-1}), maize (5.2 t ha^{-1}), red gram (0.7 t ha^{-1}), green gram (0.5 t ha^{-1}), black gram (0.4 t ha^{-1}), groundnut (1.5 t ha^{-1}) and cotton lint (0.6 t ha^{-1}). A total of 0.80 million cattle population exists in the district. A total of 43,306 tons of marine fish and prawns were produced during 2012-13. Overall, the primary sector showed an annual growth rate of 16.3% between the two triennium periods 2004-07 and 2012-14. Agriculture and livestock together contribute to more than 90% in the total primary sector.

Pilot Site: Srikakulam pilot sites cover 44 revenue villages (186 habitations) in three mandals spread over total geographical area of 17,792 ha (agriculture 6,408 ha, horticulture 3,577 ha and fisheries 154 ha) having 20,721 households and total population of 85,581 (Figure 2.11.1; Table 2.11.1). In Polaki mandal 11 revenue villages (57 habitations) were selected covering 5,498 ha of total geographical area (agriculture 3,969 ha, horticulture 168 ha and prawn cultivation 154 ha) with 7,688 households and total population of 29,923. The rainfall distribution in the pilot sites is given in figure 2.11.2.

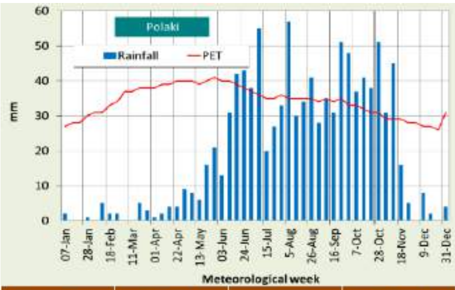
Figure 2.11.1. Pilot site map of Srikakulam

Paddy is the major crop grown in more than 90% area during *kharif*. Among horticultural crops, cashewnut, coconut and chillies are major crops. Cattle (10,057) and sheep (9,351) together have major share (>80%) in total livestock population. The average rainfall of the pilot site mandals ranges from 997mm -1327 mm with an annual potential evapotranspiration (PET) ranging form 1507mm- 1776mm. In Ranasthalam mandal fourteen revenue villages (32 habitations) were selected covering 8501 ha of total geographical area (agriculture 1451 ha and horticulture 2811 ha) having 9,166 households and 36,339 total population. The average rainfall in the mandal is 997 mm with a PET of 1588 mm. Groundwater availability is a major constraint. Maize, cotton and paddy are the dominant crops in selected villages. Banana, coconut, cashewnut and papaya are the predominant horticulture crops in the pilot area. Poultry and sheep are the major contributors (84%) of total livestock population for the study area. Nineteen revenue villages (97 habitations) were selected in Seethampeta mandal covering 3,793 ha of total geographical area (agriculture 988 ha and horticulture 598 ha) having 3,867 households and a total population of 19,319. Paddy, pigeonpea, sugarcane and millets are grown in the pilot site villages. Cashewnut and pineapple are prominent horticultural crops in the villages. Cattle, goats and poultry are the major contributors of livestock. The average rainfall in the mandal is 1327 mmwith a PET of 1507mm. Major soil types are red, sandy, sandy loam, sandy clay loam and alluvial soils in all the pilot villages. A total of 447 soil samples were collected and analyzed in ICRISAT laboratory. In Polaki mandal, the samples are deficient in organic carbon (44%), available phosphorus (31%), calcium (49%), sulphur (29%), zinc (45%) and available boron (31%). In Ranasthalam mandal samples are deficient in organic carbon (79%), available phosphorus (14%), calcium (76%), sulphur (52%), zinc (40%) and available boron (16%). In Seethampeta mandal samples are deficient in organic carbon (57%), available phosphorus (51%), calcium (35%), sulphur (74%), zinc (12%) and available boron (70%).

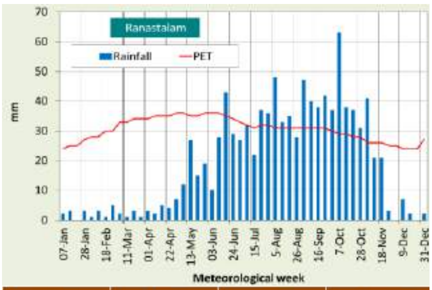
Table 2.11.1. List of villages selected for pilot sites in Srikakulam.				
S. No.	Mandal	Revenue Village	Latitude	Longitude
1	Polaki	Ambeerupeta	18.39978	84.11275
2		Ampalam	18.36417	84.12
3		Belamara	18.41806	84.1575
4		Dandalakshmipuram	18.40306	84.15556
5		Koduru	18.43167	84.18333
6		Nandigam	18.37056	84.12111
7		Polaki	18.36917	84.10417
8		Priyagraharam	18.42361	84.14056
9		Rajapuram	18.41333	84.17028
10		Susaram	18.40389	84.12389
11		Vurjam	18.37806	84.11889
12	Ranastalam	Akkayapalem	18.13264	83.69534
13		Bantupalle	18.18389	83.6641
14		Chillapetarajam	18.13058	83.65877
15		Kondamulagam	18.21351	83.66414
16		Kosta	18.16861	83.6701
17		Kotapalem	18.13533	83.73123
18		Maruvada	18.12851	83.6827
19		Mentada	18.09537	83.66412
20		Naruva	18.11272	83.65343
21		Pydibhimavaram	18.14099	83.61963
22		Ranastalam	18.20259	83.69071
23		Sancham	18.17095	83.62687
24		Teppalavalasa	18.15536	83.73022
25		Varisam	18.1479	83.64277
26	Seethampeta	Addakulaguda	18.62816	83.79415
27		Antikonda	18.69241	83.71547
28		Billumada	18.74369	83.79153
29		Chinarama	18.68794	83.78821
30		Devanapuram	18.70627	83.78587
31		Donubai	18.74207	83.72326
32		Haddubhangi	18.73531	83.81018
33		Jilledepadu	18.58424	83.83643
34		Kuddapalle	18.65457	83.79301
35		Kusimi	18.58063	83.82941
36		Mutyalu	18.591	83.879
37		Pedarama	18.69574	83.77328
38		Pedduru	18.732	83.637
39		Pubbada	18.71484	83.71531
40		Puliputti	18.73994	83.85529
41		Seethampeta	18.69253	83.81681
42		Somagandi	18.70882	83.82388
43		Valagadda	18.64882	83.83883
44		Shathamalli	18.58646	83.81414

Frequent flooding, low productivity of paddy, imbalanced fertilizer application and severe infestation of BPH (Brown Plant Hopper), stem borer and blast, yellow mosaic disease infestation in green gram and black gram, low productivity of horticulture plantations, poor soils, low resource use efficiency, lack of access to the markets, poor mechanization, local breeds giving low milk yield, subsistence vegetable cultivation, insufficient processing industries and lack of storage facilities are the major constraints reported. To address these constraints, different interventions were proposed in agriculture: adoption of climate resilient rice production technologies like improved cultivars tolerant to submergence, soil salinity, drought, pest and diseases, integrated use of organic, inorganic and bio fertilizers in a balanced manner based on soil test results, proper water management, timely weed management, timely control of insect pests and diseases, mechanization of major operations to enhance productivity of paddy. Minimum tillage for sowing *rabi* crops, balanced nutrient application with drought and disease tolerant cultivars and crop diversification with high value crops can increase crop production in rice fallows.

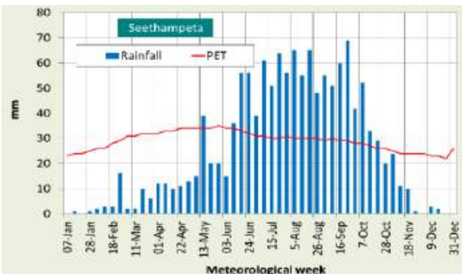
The interventions proposed for the horticulture sector include: Growing suitable intercrops in old horticulture plantations, good quality planting material of high yielding varieties, rejuvenation, top working, integrated nutrient management, micro irrigation and pest and disease control will enhance crop productivity. The interventions proposed under animal husbandrysector for enhancing the milk production area include: Breed improvement with artificial insemination in cattle, feeding with good quality fodder having better digestibility and better feeding practices with mineral mixtures; for enhancing meat production: Breed improvement by providing improved breeding rams and bucks, deworming and vaccination and rejuvenation of grazing lands for increasing fodder availability; for enhancing egg production: Providing backyard poultry units with supply of improved chicks, vaccination and good rearing practices will enhance egg production. For fisheries sector, the interventions proposed are: Rejuvenation of abandoned brackish water aquaculture ponds, providing technical support, supply of disease free good quality brood material, mechanization by providing solar pump sets, solar lights and aerators, construction of cold storages, processing units and market linkages for higher incomes.



Element	Kharif	Rabi	Annual
PET (mm)	734	684	1776
Rainfall (mm)	811	132	1026



Element	Kharif	Rabi	Annual
PET (mm)	657	612	1588
Rainfall (mm)	771	125	997



Element	Kharif	Rabi	Annual
PET (mm)	624	578	1507
Rainfall (mm)	1063	109	1327

Figure 2.11.2. Rainfall pattern and potential evapotranspiration (PET) in pilot mandals.

2.12. Visakhapatnam

District Profile: Visakhapatnam district is one of the northeastern coastal districts of Andhra Pradesh and it lies between 17°15' and 18°32' North latitudes and 18°54' and 83°30' East longitudes. It is bounded on the north partly by Odisha state and partly by Vizianagaram district, on the south by East Godavari district, on the west by Orissa state and on the east by Bay of Bengal. The geographical area of the district is 11,161 km^2 with a population of 4.29million. Red loamy soils predominate with coverage of 70% of the villages. The annual rainfall ranges from 708 mm to 1700 mm.Agriculture is the mainstay for nearly 70% of the households. Paddy is the principal food crop followed by ragi, bajra and jowar and cash crops such as sugarcane, groundnut, sesamum niger and chillies. The productivity of crops is very low due to low seed replacement, erratic rainfall and poor soil management. The total livestock of the district is 1.20 million of which working animals account for 0.21 million while milch animals account for 0.310 million.The fishermen population live in about 59 fishery villages and hamlets on a coastline stretching to a length of 132 km. The district domestic product (DDP) was ₹65,458 crores during 2013-14 with per capita income of ₹113,860.

The district presents two distinct geographic divisions. The strip of the land along the coast and the interior is called the Plains division and the hilly area of the Eastern Ghats flanking it on the North and West is called the Agency division. The Agency division consists of the hilly regions covered by the Eastern Ghats with an altitude of about 900 meters dotted by several peaks exceeding 1200 meters. Sankaram Forest block topping with 1615 meters embraces the mandals of Paderu, G. Madugula, Pedabayalu, Munchingput, Hukumpeta, Dumbriguda, Araku Valley, Ananthagiri, Chinthapalli, G.K Veedhi and Koyyuru, erstwhile Paderu, Araku Valley and Chinthapalli taluks in entirety. Machkhand river which on reflow becomes Sileru, drains and waters the area in its flow and reflow and is tapped for power generation. The Plains division with an altitude not exceeding 75 meters is watered and drained by Sarada, Varaha and Thandava Rivers and rivulets Meghadrigedda and Gambheeramgedda. Since no major irrigation system exists, significant subregional agronomic variations exist in this division. Along the shore lies a series of salt and sandy swamps. The coastline is broken by a number of bald head lands, the most important of them being the Dolphin's Nose, which had afforded the establishment of a natural harbour at Visakhapatnam, Rushikonda (v) Polavaram Rock and the big Narasimha Hill at Bheemunipatnam. Administratively, the district is divided into three revenue divisions and 43 mandals.According to the 2011 census, Visakhapatnam district has a population of 4.2 million. This gives it a ranking of 44thin India (out of a total of 640) and 5th in Andhra Pradesh. The district has a population density of 384 inhabitants $km^{2.}$Agency area shows lesser density and Plain area higher density. Its population growth rate over the decade 2001-2011 was 11.89%. Visakhapatnam has a sex ratio of 1003 females for every 1000 males, and a literacy rate of 67.7%. 57.95% of the population ofVisakhapatnam district is urban as of 2011 census. Out of the total population 2.14 million are males and 2.15 million are females.

The district has differing climatic conditions in different parts of it. Near the coast the air is moist and relaxing, but it gets warmer towards the interior and cools down in the hilly areas on account of elevation and vegetation. April to June are warmest months. The temperature (at Visakhapatnam Airport) goes down with the onset of southwest monsoon and tumbles to a mean minimum of 21°C by January after which there is reverse trend till the temperature reaches a mean maximum of 32.5° C by the end of June.

The district receives annual normal rainfall of 1202 mm of which southwest monsoon accounts for 55.99% of the normal while northeast monsoon contributes 4.68% of the normal rainfall. The rest is shared by summer showers and winter rains. Agency and inland mandals receive higher rainfall from the southwest monsoon, while coastal mandals get similarly high rainfall from the northeast monsoon.

Soils: Red loamy soils predominate with coverage of 69.9% of the villages in the district. The soils are poor textured and easily drained. Sandy loamy soils covers 19.2% of the villages, largely confined to the coastal areas of Nakkapalli, Payakaraopeta, S.Rayavaram, Rambilli, Atchutapuram, Paravada, Visakhapatnam, Pedagantyada, Gajuwaka and Bheemunipatnam mandals and to certain stretches in the interior mandals of Chodavaram, Narsipatnam, K.Kotapadu and Madugula. Black cotton soils cover sizeable chunks of area in K.Kotapadu, Devarapalli, Cheedikada, Paderu and Hukumpeta mandals. About 45% of the soils in the district are low in organic content and 55% in phosphorus content.

The total geographical area of the district is 1.12million ha.Of this only 26.89% is cultivable area while 39.52% is forest area. The rest is distributed among "barren and uncultivable land" of about 11.7% and "land put to non-agricultural uses" of about 9.6%. Out of the cultivable area, the net area sown form 26.89% while cultivable waste and fallow (current and old) lands constitute about 12.8%.

The analysis of last three year subsector-wise District Domestic Product (DDP) at current prices showed that Visakhapatnam district is among the top in industry and service sectors while primary sector contributes poorly (Table 2.11.3). The state had identified growth engines in each of the sectors. Forty-four growth engines contribute 82% (₹53,674 crores GVA) in total DDP of ₹65,458 crores. In agriculture and allied sectors, 28 growth engines contribute 79.48% (₹4,459 crores GVA) in total agriculture sector DDP of ₹5,610 crores. In the industry sector, six growth engines contribute 99.45% (₹19,794 crores GVA) in total industry sector DDP of ₹19,903 crores. In service sector, ten growth engines contribute 73.65% (₹29,421 crores GVA) in total service sector DDP of ₹39,945 crores.

Pilot Site: ICRISAT along with district administration (line departments) identified three mandals to develop as sites of learning (2.12.1). The pilot site has 18,643 ha of geographical area spread across 23 villages in three mandals viz., Butchayyapeta (17.83°N 82.95°E), Chintapalle (17.86°N 82.35°E) and Padmanabham (17.98°N 83.33°E) Figure 2.11.1. The total number of households in the pilot villages is 10,120 with a population of 41,474 including 42% working population. The overall literacy rate is about 47.48 with male literacy rate of 55.91% and female literacy rate of 39.01% (Table 2.12.1).

The site has 10,516 ha of net sown area covering major crops like paddy, maize, sugarcane, ragi, pigeonpea, ground nut and horticulture crops like turmeric, mango, cashewnut (Table 2.12.2). The animal population in the pilot site is about 31,232 and play an important role in enhancing the income status of the households along with inland fisheries. However, due to lack of fodder availability and storage facilities, there is a major challenge in realizing the potential milk yield. The annual average rainfall is about 1014 mm, 1377 mm and 1178 mm in Butchayyapeta, Chintapalle and Padmanabham mandals, respectively.The major constraints in the pilot site s are low crop and livestock productivity, low seed replacement rate, water and fodder scarcity, poor mechanization and management practices and lack of processing units. The major area is under single-cropping system of paddy grown with oarse grain variety which is not consumed in the local market.

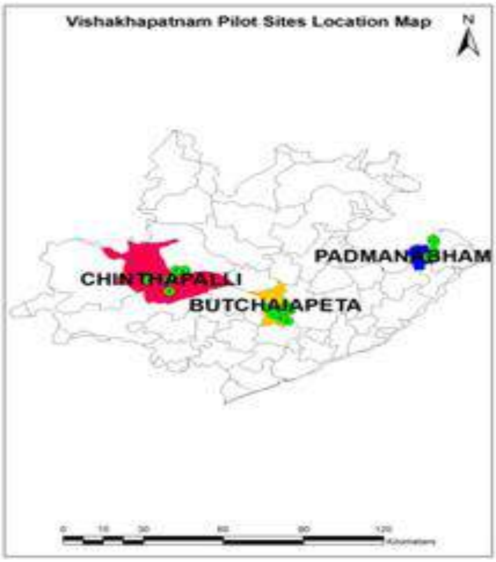


Figure 2.12.1. Visakhapatnam Pilot site map

Table 2.12.1. Basic details of pilot villages in Vishakhapatnam district.

Name of the mandal	Name of the village	Geographical area (ha)	Net area sown (ha)	Current fallows (ha)	Livestock population	No. of tanks
CHINTAPALLE	Vangasari	228	150	22	164	0
	Lammasingi	967	542	53	432	0
	Tajangi	1348	818	25	1805	0
	Pakabu	430	236	28	54	0
	Busulakota	547	286	46	154	0
	Sanivaram	742	396	26	193	0
	Anjalam	80	55	0	210	0
BUTCHAYYAPETA	Gunnempudi	854	541	36	2306	13
	Kandipudi	302	210	28	944	5
	Neelakantapuram	120	77	5	947	4
	Rajam	1172	948	32	3657	8
	Typuram	197	138	10	1372	5
	Chittiyyapalem	335	264	32	1734	5
	China Madina	420	323	27	598	2
	Turakalapudi	931	706	33	1144	6
	R. Sivarampuram	365	202	45	1286	4
	R. Bheemavaram	701	605	51	1985	2
PADMANABHAM	Ayinada	990	443	18	1170	10
	Bapirajutallavalasa	1194	379	67	1949	23
	Korada	1782	687	67	2335	9
	Pandrangi	3251	1669	585	3331	6
	Venkatapuram	425	338	25	1559	5
	Revidi	1261	502	280	1903	13
GRAND TOTAL		18643	10516	1542	31232	120

Table 2.12.2. Sub-sector-wise Gross Value Added (GVA) in pilot mandals of Visakhapatnam district.

Sector	Commodity	2014-15			2015-16			Increase in values			Increase in %		
		Area (ha)	Production (qt)	Gross Value (Rs Crore)	Area (ha)	Production (qt)	Gross Value (Rs Crore)	Area (ha)	Production (qtl)	GVA (Rs Crore)	Area	Production	GVA
Agriculture	Paddy	2187	7572	10.3	2187	7936	11.6	0	364	1.32	0	5	13
	Maize	459	2547	3.36	492	3288	4.47	33	741	1.11	7	29	33
	Pigeonpea	236	129	0.3	244	147	0.3	8.0	19	0.0	3.4	14.7	12.8
	Fingermillet	146	107	0.2	161	128	0.2	14.8	21	0.0	10.1	19.4	20.8
	Sugarcane	1037	57718	13.7	1093	62142	14.7	56.0	4424	1.1	5.4	7.7	7.7
	Turmeric	122	197	0.4	125	222	0.4	3.0	25	0.1	2.5	12.7	12.8
	Groundnut	116	1988	0.8	116	2286	0.9	0.0	298	0.1	0.0	15.0	13.8
Agriculture		4303	70257	28.9	4418	76148	32.6	115.2	5891	3.7	2.7	8.4	12.8
Horticulture	Cashewnut	756	4334	0.4	756	4550	0.4	0.0	216	0.0	0.0	5.0	2.9
	Brinjal	83	5886	0.9	83	6475	1.0	0.0	589	0.1	0.0	10.0	10.2
	Mango	407	27649	4.2	407	30414	4.6	0.0	2765	0.4	0.0	10.0	9.9
Horticulture		1246	37869	5.4	1246	41439	5.9	0.0	3570	0.5	0.0	9.4	9.5
Live stock	Milk (Nos/Kgs)	3005	35738	0.1	3005	39708	0.1	0.0	3970	0.0	0.0	11.1	10.0
	Meat (Nos/M.T)	27075	339	5.7	27075	377	6.3	0.0	38	0.6	0.0	11.1	10.8
	Eggs (No/000)	22642	5705844	1.3	22642	6339827	1.5	0.0	0	0.1	0.0	11.1	10.7
Live stock				7.1	52722		7.9	0.0	4008	0.8	0.0	0.1	10.7
Fisheries	Inland (M T)		606	3.4		674	5.5	0.0	68	2.1	0.0	11.2	65.3
Fishery			606	3.4		674	5.5	0.0	68	2.1	0.0	11.2	65.3
Gross value addition				44.8			51.9						15.7

2.13. Vizianagaram

District Profile: Vizianagaram district is situated within the geographical co-ordinates of 17° 15′ and 19° 15′ North latitudes and 83° 00′ and 83°45′ East longitudes. The district is bounded on the east by the district of Srikakulam, southwest by the district of Visakhapatnam, southeast by the Bay of Bengal, and northwest by the state of Odisha.Vizianagaram district occupies an area of 6,539 km^2 (2,525 sq miles). The principal rivers flowing in the district are River Nagavali, Suvarnamukhi, Vegavathi, River Champavathi, River Gosthani and Kandivalasa. There are no major irrigation projects existing in the district. However, about 12 medium irrigation projects are functioning in the district. There is a coastline of nearly 28 km in the district on the east facing the Bay of Bengal. About 22,000 active fishermen population is engaged in catching fish in the district spanning over only two mandals. Forestry plays an important role in the economy of the district. Five major types of forests are found in the district namely southern tropical mixed deciduous forests, northern tropical dry deciduous forests, southern tropical dry mixed deciduous forests, dry deciduous green forests and dry evergreen forests.

About 51.1% of the land area is sown for agriculture and another 12.3% land is put to non-agricultural uses. The forest covers about 17.8% of the land. About 12.3% of the land is barren and uncultivable and 4% of the land is other fallow lands.

The normal rainfall of the district is 1,131 mm. Main soils are red soils, sandy loams and sandy clay, which constitute 96% of the total area. The predominant soils are loamy with medium fertility. There are red loamy soils in drylands and clay loamy in wetlands. The soils at some places are as thick as 4 meters, probably representingalluvium along the valleys.The climate of Vizianagaram district is characterized by high humidity nearly allround the year with oppressive summer and good seasonal rainfall. The summer season is from March to May followed by southwest monsoon season, which continues up to September. October and November constitute the retreating monsoon season. The hilly regions of the district receive heavier rainfall and is cooler than the plains.

According to the 2011 census, Vizianagaram district has a population of 2.3 million. The district has a population density of 358 inhabitants/km^2. Its population growth rate over the decade 2001-2011 was 4.16%. Vizianagaram has a sex ratio of 1016 females for every 1000 males. The literacy rate is 51.82% as against the average of 61.55% for the entire Andhra Pradesh State. SC & ST population occupies nearly 20% of the total district population.

The district is predominantly an agricultural district as 68.4% of the workers are engaged in agriculture and about 82% of the population is living in rural areas and depend on agriculture for their livelihood. Rainfed farming is the characteristic of agriculture, as about 80% of the cultivation is purely under rainfed conditions. Even the irrigated area is also mostly dependent on rainfall. Hence,the majority of crops grown are dry crops. Paddy is cultivated mainly during *kharif* (rainy) season with 80% of the area under tanks, which in-turn depend on the rainfall. The major crops grown in the district are paddy, mesta, groundnut, ragi, pearlmillet, cotton, sugarcane and pulses. In general, the average crop yields in the district are low.Mango (42,493 ha), cashew (16,378 ha), plantain (7,124 ha) and oil palm (4,916 ha) are the major horticultural crops cultivated in the district. Total livestock population in the district is 1.4 million during 2015-16. Around 27% of them are cattle, 8% buffaloes, rest of them are sheep (35%) and goat (30%) population. Nearly 3.8 million poultry birds are also commercially reared in the district.

The performance of primary sector over the last decade in the district is summarized in Table 2.13.1. Among the three sectors, livestock showed a much impressive growth rate followed by fisheries and agricultural sectors. The total primary sector in the district is growing at the rate of 16.2% per annum during the triennium periods between 2004-07 and 2012-14. However, agriculture sector including horticulture alone showed a growth rate of 14.6% during the same period. Relatively, the share of agriculture in total primary sector slightly declined from 2004-07 to 2012-14. However, livestock sector contribution in the primary sector has increased significantly (from 24.2% to 30.6%) during the study period. In absolute terms, fisheries also showed growth between two periods. Overall, this analysis clearly shows that fisheries, agriculture and horticulture are dominant sectors contributing to total primary sector significantly.

Table 2.13.1. Growth in primary sector, 2004-07 and 2012-14.*

Sub-sector	Triennium 2004-07**	Triennium 2012-14**	Growth rate (%)
Agriculture	95217 (71.4)	251100 (64.6)	14.6
Livestock	32302 (24.2)	119133 (30.6)	20.3
Fishery	5826 (4.4)	18333 (4.8)	17.7
Total primary sector	133345 (100.0)	388566 (100.0)	16.2

**at current prices; ** figures in the parenthesis indicates shares to column total*

Pilot Site: Preliminary meeting was held at JDA office along with CPO Vizianagaram and all heads of line departments – Agriculture, Animal Husbandry, Horticulture, Fisheries, Sericulture, Marketing and scientists from ARS Vizianagaram. Majority of them felt that as there are two revenue divisions Vizianagaram and Parvathipuram, 5000 ha site for each division was planned to select to carry out all the department activities, mainly to incorporate DWMA watershed activity.Each revenue division consisting of two mandals were selected and left to the choice of the Collector for finalizing. The Parvathipuram division consisted of Parvatatipuram and Salur mandals and the Vizianagaramdivision included S.kota and Puspatirega mandals, especially to cover villages with fisheries activity as per ADF suggestion. The final team with all heads of line departments along with CPO and ICRISAT Coordinator met the Collector and presented the selections made and asked for his final decision. The Collector asked all team members for their final view on the selection of Parvathipuram and Pusapatirega, which was approved and finalized (Table2.13.2 & 2.13.3).

The list of villages covering 5000 ha area was finalized and put on a map (Figure 2.13.1).Secondary data of these villages were collected from mandal statistical officer with advice of CPO for all line departments. Pilot sites are representative of region and district in terms of socioeconomic and crops grown to have various interventions of different activities to improve the income and livelihood of the farmer. These villages are learning sites for scaling up of activities in most parts of the district to other villages gradually. Vizianagaram has two divisions Pusapatirega mandal and Parvathipuram division which consists of eighteen mandals where there is a larger population of tribal farmers. Similarly Parvathipuram area, has more tribals and SC farmers, with a lot of hilly terrain. Vizianagaram division has eighteen mandals with different crops, climatic conditions and different land use patterns with more flat and plain lands, unique crop cultivation and living conditions. The source of irrigation is through small and medium tanks and more of rainfed cultivation is done in this district.

Detailed information on land holding pattern of Pusapatirega and Parvathipuram mandal villages are presented in Table 2.13.4 & 2.13.5. There are about 80-85% of farmers falling in the category of small and mariginal farmers.Parvathipuram and Puspatirega mandal villages are presented in Tables 2.13.6 & 2.13.7.

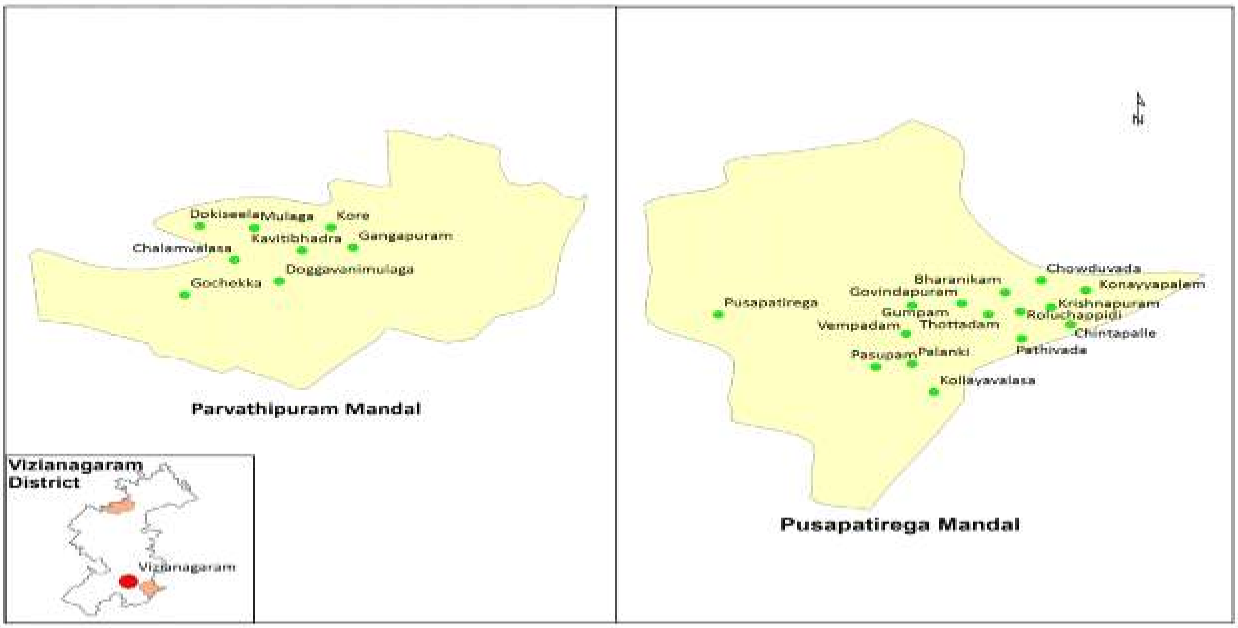


Figure 2.13.1. Pilot site map of Vizianagaram.

Table 2.13.2. Pilot site information for Primary Sector Mission in Vizianagaram district.

S.N	Mandal	No of villages	No of house holds	Popula tion	Geograp hical area	Net area sown	Current fallows	Livestock population	Hortic ulture	Fish eries	Water shed (DWMA)	Tanks
1	Parvathi puram (i)	8	1692	8125	5120	2866	657	6377	616	210	12	83
2	Pusapati rega (II)	15	7061	28851	5153	2192	2316	26178	968	251		117
Total		23	8753	36976	10273	5057	2972	32555	1584	461		200

Table 2.13.3. Village wise area for the pilot sites selected for Vizianagaram district.

Sl.No	Name of the village	No of house holds	Geogra phical area	Net area sown	Current fallows	Live stock popula tion	Wat er shed	Tanks	Latitude (°)	Longitude (°)
	Parvathipuram Mandal (i)									
1	Kore	130	443	204	90	354		11	18.78164	83.354905
2	Gangavaran	153	353	252	26	944		7	18.770604	83.37846
3	Kavitibhadra	111	241	205	5	256		13	18.767027	83.352256
4	D Mulaga	135	91	68	7	871		2	18.751715	83.338736
5	Mulaga	482	1957	800	179	780		20	18.77844	83.330263
6	Challam naidu valasa	99	181	130	19	279		8	18.776706	83.29885
7	Dokiseela	356	1415	319	229	2057	Yes	15	18.740862	83.288254
8	Gochekka	226	439	296	102	836		7	18.752433	83.316111
	BitI Total	1692	5120	2866	657	6377		83	18.09237	83.551961
	Pusapatirega Mandal (II)									
1	Pusapatirega	1387	765	313	379	3021		22	18.075321	83.584322
2	Pasupam	345	227	77	120	724		7	18.092956	83.584112
3	Pallanki	78	165	84	67	861		3	18.058034	83.595037
4	Vempadam	824	623	370	200	3997		13	18.089134	83.595908
5	Gumpam	352	328	132	174	1578		12	18.09388	83.63843
6	Kollayavalasa	369	395	112	209	1354		3	18.099768	83.611058
7	Tottadam	227	202	78	93	733		7	18.070332	83.614417
8	Govindapuram	406	417	292	90	3060		7	18.086597	83.617598
9	Chouduvada	72	414	96	226	2850		17	18.094074	83.611901
10	Barinikam	137	269	93	148	461		5	18.089347	83.565586
11	Pathivada	1002	543	223	223	1463		10	18.09824	83.628297
12	Roluchappidi	153	81	76	0	514		2	18.100602	83.642738
13	Krishnapuram	149	114	87	22	721		2	18.073108	83.657928
14	Konayyapalem	143	196	77	100	641		3	18.78164	83.354905
15	Chintapalli	1417	415	84	264	4200		4	18.770604	83.37846
	Bit –II Total	7061	5153	2192	2316	26178		117		
Grand Total		8753	10273	5057	2972	32555		200		

Table 2.13.4. Details of land holding and extent for pilot villages of Puspatirega mandal.												
Village name	Total number of holdings and extent (ha)						Total number of holdings and extent (ha)					
	Marginal (below 2.47)		Small (2.47-4.93)		Semi-medium (4.94-9.87)		Medium (9.88-24.70)		Large (24.71 & Above)		All sizes	
	No. of holdings	Extent	No. of holdings	Extent	No. of holdings	Extent	No. of holdings	Extent	No. of holdings	Extent	No. of holdings	Extent
Pusapatirega	532	238	171	238	84	223	19	112	3	52	809	863
Pasupam	196	63	27	37	7	17	5	26		0	235	144
Palanki	43	13	9	12	20	59	4	23		0	76	108
Vempadam	404	177	127	176	47	134	14	73		0	592	560
Gumpam	296	101	54	72	13	35	1	5		0	364	212
Kollayavalasa	213	87	68	104	24	65	5	40		0	310	296
Thottadam	305	102	31	41	10	24	3	15		0	349	182
Govindapuram	338	147	46	62	12	33	5	26		0	401	267
Chowduvada	386	163	64	88	31	85	8	41	1	10	490	387
Bharanikam	130	50	20	26	11	35	4	26		0	165	137
Pathivada	402	166	90	123	42	104	13	62		0	547	454
Roluchappidi	169	42	5	6	4	11	0	0		0	178	58
Krishnapuram	119	44	13	17	8	18	2	10		0	142	89
Konayyapalem	127	49	24	32	15	36	3	16		0	169	134
Chintapalle	153	65	38	53	16	47	9	42	3	36	219	244
Total	3813	1508	787	1086	344	927	95	516	7	52	5046	4135
Ref. year : 2013-14, DES												

Table 2.13.5. Details of land holding and extent for pilot villages of Parvathipuram mandal.												
Village name	Total no. of operation holdings and extent (ha)						Total no. of operation holdings and extent (ha)					
	Marginal (Below 2.47)		Small (2.47-4.93)		Semi-medium (4.94-9.87)		Medium (9.88-24.70)		Large (24.71 & Above)		All sizes	
	No. of holdings	Extent	No. of holdings	Extent	No. of holdings	Extent	No. of holdings	Extent	No. of holdings	Extent	No. of holdings	Extent
Kore	135	52	55	71	28	76	14	81	0	0	232	280
Gangapuram	254	87	89	114	26	69	8	48	0	0	377	317
Kavitibhadra	180	80	46	65	12	27	1	5	0	0	239	178
Mulaga	368	235	212	296	133	353	26	172	1	11	740	1068
Dokiseela	252	147	177	245	61	162	20	97	1	10	511	661
Gochekka	195	83	53	74	38	102	14	73	5	68	305	401
Chalamavalasa	89	37	25	35	18	42	0	0	0	0	132	114
Doggavanimulaga	180	105	65	96	22	62	10	55	0	0	277	318
Total	1653	827	722	995	338	894	93	530	7	89.64	2813	3336
Ref. year : 2013-14, DES												

S. No	Village name	Paddy Irrigated	Paddy Un-irri	Maize Un-irri	Red gram Un-irri	Mesta Un-irri	Mango Un-irri	Cashew Un-irri	Palm oil Irrigated	Teku Un-irri	Neelagiri Un- irri
1	Kore	64.8	22	0	0	0.8	8	22	0	0	0
2	Gangapuram	113.6	34	0	0	1.6	18	6	10	2	1.2
3	Kavitibadra	97.6	18.4	6.4	0	1.6	0.8	0	0	0	0
4	D.Mulaga	22	15.2	0	0	0.8	3.6	2	0	0	0.8
5	Mulaga	132.8	208	120.8	0	3.2	94.4	149.6	15.2	0	29.6
6	Chalamvalasa	60	4.8	21.6	0.8	0	4	3.2	0	10	0
7	Dokiseela	122.8	22	124.8	0	0	70.4	94	15.2	6	22
8	Gochekka	130.4	12.8	79.2	0	0	4.8	82.4	12	2.4	11.2
	Total area in ha	744	337.2	352.8	0.8	8	204	359.2	52.4	20.4	64.8

Table 2.13.6. Village wise areain hectares during *kharif*2014-15 in pilot sites of Parvathipuram mandal.

Table 2.13.7.Village wise crop area in hectares during *kharif* 2014-15 in pilot sites of Pusapatirega mandal.

S.No	Village	Paddy -I	Maize	Sugar cane	B.gram	G. gram	Sesamum	Ground nut
1	Pusapatirega	31.6	20	5.6	5.6	4.4	158.8	17.2
2	Pasupam	22	12		4.4		27.6	7.2
3	Palanki	8.8	45.6				14.8	7.2
4	Vempadam	79.6	141.2	1.6	2.4	2	168.4	147.2
5	Gumpam	9.2	10.4				27.6	19.6
6	Kollayavalasa	25.2	147.2		3.6		12	4.8
7	Thottadam	8	7.2				28	
8	Govindapuram	28.8	60.4	12	1.6	2.8	97.2	11.6
9	Chouduvada	8.4	53.2		1.2		4.8	
10	Bharinikam	5.6	110				29.2	12
11	Pathivada	2.8	86				32.4	11.2
12	Roluchappidi	15.6	12.8				10.4	18.8
13	Krishnapuram	6	11.2				12	
14	Konayyapalem	10.8	18	-	-	-	72	-
15	Chintapalli	0.8	25	-	-	-	114	-
	Total	263.2	1836	48	47	23	1744	642

2.14. West Godavari

District Profile: West Godavari district is bounded by the following districts on all the four sides: in the east- Krishna district, in the north - Khammam district and in the south- Krishna district. The district is situated in the tropical region between 16°15’00” to 17°30’00” North latitudes and 80°55’00” to 81°55’00” East longitude andcan be divided into three natural regions, delta, upland and agency area.

Soil, climate and rainfall: The soils in the district are made up of alluvial, black reger and red ferruginous besides a small belt of arenaceous sandy soil along the coastal belt. In the delta area of district the climate is moderate both in winter and summer seasons. In the non-delta area of the district heat in the summer is severe especially in the tracts of upland and agency area. The normal maximum and minimum temperatures recorded in the district are

48°Cand 19°C, respectively.The maximum temperature is usually recorded in the month of April and May.The district receives its rainfall mostly and predominantly from southwest as well as northeast monsoons, whose normal rainfall is 784 mm and 246 mm, respectively. The receipt of actual rainfall during 2009-10 from southwest monsoon is 472mm, while from northeast monsoon it was 160.6 mm. The agriculture activity in the district is deplorable owing to unpredictable monsoons, unreliable rainfall and much dependence on tank, well and micro irrigation (M.I) sources for irrigation in upland and agency areas.

The district occupies an area of 7,742 km^2 with a density of 491 km^2. It accounts for 2.81% of the total area of the state. There are 883 revenue villages exist in the district of which 845 villages are inhabited while the remaining 38 are uninhabited. The physical characteristics, natural resources and potentialities of the mandalas in the district are not homogeneous. As per 2001 census, the total population of the district is 0.3 million. It account for 4.99% of the population of the state. The female population of the district is 0.18 million and this forms 49.8% of the district and 5.02% of the state female population.

According to 2001 census, rural population of the district is 3 million and it constitutes 80.3% of the district population and 5.50% of the state rural population. Similarly, the urban population of the district spread over eight towns is 0.7 million forming 19.7% of the district population and 3.6% of the state urban population.

As regards community wise population, the SC population of the district is 0.7 million,which is 19.16% of the district population and 5.90%of the total SC population of the state. Similarly, the ST population of the district is 0.09 million and it accounts for 2.54% of the district and 1.92% of the state ST population. The SC and ST populations are based on the 2001 census.

The decimal growth of population in the district from 1991 census to 2001 census was 8.12%. The density of population according to the 2001 census is 491/km^2, whereas it was 277/ km^2 for the state. The literacy rate of the district is 73.53%, which is higher than the state literacy rate of 60.46%. The sex ratio of the district is 986 females per 1000 males as against 978 of the state. The number of workers as arrived at in 2001 census is 2.5 million forming 67.6% of the total population of the district and 3.37% of the state population.Rice, sugar, jute, ceramic, oil, textile, flour, food processing, agarbathi, bricks, knitting, coir industries, are the large, medium and small scale industries in the district.

The total forest area in the district is about 81,166 ha forming 10.48% of the total geographical areain Polavaram mandal.The species grown are bamboo and other wood useful for timber, fuel;in Buttayagudem and Jeelugumilli mandals other minor forest produce like adda leaves, beedi leaves, soapnuts, tamarind, honey and fruits are grown. The forest cover area that appears in Pedavegi, Chinatalapudi, T. Narasapuram, Lingapalem and Kamavarapukota are of shrub type.

The net cultivated area is about 61.36% of the total geographical area of the district. Out of the net area sown, a large portion of the area is irrigated by the network of canals. The irrigation system of the river Godavari irrigates all the mandals in the delta region, whereas

Pendyala, Gutala, Vegeswarapuram pumping scheme irrigates some parts of Kovvur, Nadasdavole, Tallapudi, Polavaram and Gopalpuram mandals. The irrigation system of river Krishna irrigates the entire portion of Eluru, Pedapadu mandals and parts of the area in Denduluru and Bhimadolemandals. In upland areas there are irrigation tanks fed by hill streams; besides,a number of tubewells, dugwells and M.I scheme supplements the irrigation sources.On par with East Godavari and Krishna districts, West Godavari district also has the distinction of being the rice granary of Andhra Pradesh. Paddy forms 60 to 65% of the total area sown.The district has an average yield of 4,214 kg ha^{-1}. The other predominant crops also raised in the district are banana, sugarcane, chillies, coconut, maize, and tobacco. The oil palm crop area is also increasing day by day to fulfill the requirements of the oil palm factory established in Pedavegy mandal.

Godavari is the important river flowing in the district. The river borders the entire eastern boundary of the district. At Vijjeswaram, the river divides into two branches, namely the Gowthami Godavari (eastern branch) and Vasista Godavari (western branch) and flows towards the south of the district before falling into the Bay of Bengal near Antarvedi. The other minor rivers that feed the irrigation tanks in the upland area are Tammileru, Yarrakalva, Byneru, Kovvada, Kalva, Jalleru, Rallamadugu and Gunderu.

Pilot site: Government of Andhra Pradesh is targeting to achieve double digit growth in the primary sector. The primary sector has huge untapped potential to harness by converging a number of line department schemes, bringing technologies together from knowledge generating institutes, research institutes (national and international institutes) and universities by implementing science based interventions, and by harnessing the potential of private companies, FPOs and various NGOs. In this context, nearly 10,000 ha area is targeted to be identified in each district of AP and therefore in West Godavari as well. The pilot site should be representative of the district largely covering the major farming systems and also representative of various sectors (agriculture, horticulture, animal husbandry, fisheries, etc) of the district, so that the learning got from these pilot sitescan be replicated to other areas of the district in future.

Following the above guidelines, ICRISAT along with district administrators (District Collector, Chief Planning Officer) and line department officials have identified two mandals (Akivedu and K.Kota) as pilot sites of West Godavari (Figure 2.14.1; Table 2.14.1, 2.14.2). West Godavari comprises large upland areas, which is largely covered by diversity of cropping systems (agriculture and horticulture) on one hand, and the delta regions, which are largely dominated by paddy and aquaculture practices. Akivedu mandal was selected to represent the delta region and K.Kota the upland area.

Figure 2.14.1. Pilot site map of West Godavari

Eleven villages (three in K.Kota and eight in Akividu mandals) are selected as pilot sites covering a total of 10,625 ha geographical area and is home to nearly 75,000 people. Out of the total land, nearly 60% area is covered by agricultural fields; 15% by horticulture and 20% by fisheries and prawn culture. Farmers having land and landless farmers are engaged in various animal husbandry (dairy, meat production and poultry) activities. Maize and paddy are predominating cropping systems in K.Kota and Akivedu mandals, respectively. There are, however, other crops like sugarcane, groundnut grown in K.Kota mandal but it's extend is less than 10%. Oil palm is the largest grown horticulture crop followed by coconut, cashew and mango. Area that was previously under cashewnut and mango area has been brought under oil palm subsequently in the last few decades due to assured marketing opportunity and remunerative returns, whereas paddy is the only major cropping system cultivated in Akivedu mandal. Poor drainage, high salinity and flooding are the major issues bringing paddy yield lower compared to the upland areas.

Table 2.14.1. Number of households, total population and sector wise areas in West Godavari.

SN	Villages	No of HHS	Population	Geographical area (ha)	Agriculture land (ha)	Horticulture area (ha)	Fish pond area (ha)	Prawn area (ha)
	Akivedu Mandal							
1	Dharmapuram	232	1010	508	280	-	160	45
2	Taratava	177	640	240	19	-	168	53
3	Siddapuram	1851	6312	1299	523	-	210	52
4	Madivada	1876	6890	616	329	-	170	40
5	Akivedu	6775	24506	1111	297	-	600	214
6	Dumpagadapa	1508	5467	398	181	-	44	32
7	A. I Bheemavaram	1326	4554	703	378	-	126	42
8	Cherukumilli	1078	3750	671	470	-	82	39
	K.Kota Mandal							
9	K.Kota	4885	16790	3765	3014	873	-	-
1	Rammanapalem	402	1520	510	451	263	-	-
1	Yadavalli	596	3571	804	706	259	-	-
	Total	20706	75010	10625	6647	1395	1560	517

Table 2.14.2. Animal, sheep/goat and poultry population in West Godavari.

SN	Villages	Animal population	Sheep/goat population	Poultry (No)
	Akivedu Mandal			
1	Dharmapuram	222	0	738
2	Taratava	99	0	515
3	Siddapuram	2196	426	2035
4	Madivada	1040	0	379
5	Akivedu	1147	222	4933
6	Dumpagadapa	605	8	566
7	A. I Bheemavaram	705	24	3702
8	Cherukumilli	739	468	1541
	K.Kota Mandal			
9	K.Kota	1238	305	15562
10	Rammanapalem	930	300	418
11	Yadavalli	296	541	1831

Annual rainfall of selected two mandals are between 1000-1100 mm, and out of this 80-85% rain takes place during *kharif* season (June-Oct). Due to higher temperature, annual PET of these mandals is nearly 1800-1900 mm (Table 2.14.3).

Table 2.14.3. Annual and season wise average rainfall and PET for K.Kota and Akividu mandals.

Mandal	Parameter	*Kharif*	*Rabi*	Annual
K.Kota	Rainfall (mm)	899	94	1065
	PET (mm)	724	685	1809
Akividu	Rainfall (mm)	837	131	1033
	PET (mm)	763	728	1913

Due to moderate to higher rainfall occurrence and inflow of surface water to the district, groundwater availability in the district is good. Groundwater utilization in selected pilot site is in safe limit as net draft is less than 70% of total recharge. Density of borewell in K.Kota mandal is 10-12 wells /km^2.

With increasing water scarcity situation, Government of AP is promoting micro-irrigation in agriculture and horticulture. Micro-irrigation has already been adopted in nearly 270 ha land in pilot villages covering diverse cropping patterns.

3. Progress during 2015-2016 (Major Activities)

3.1. Baseline of Pilot Sites

3.1.1 Background and Objectives

Andhra Pradesh (AP) is poised on an interesting juncture in history as it tries to balance the varied challenges that the bifurcation has created for the residuary state against the opportunities that establishment of a new system of governance create in the new state. Andhra Pradesh has started with a renewed attention to make AP one of the three best states in the country by 2022. Challenges are far and many, however, the determination and drive to see that AP attains an enviable position in the country is a key objective driving the populace of the state.

Recently, Government of Andhra Pradesh has also unveiled 'Double Digit Growth Action Plan'[2] to achieve the status of a developed economy with per capita income likely to touch ₹ 0.662 million by 2029-30, if the economy grows consistently at the 10% level and in the event of growth rates crossing this critical threshold, the per capita income may even cross the ₹ 0.800 million mark. Specifically, to achieve 'double digit growth' in agriculture in the state, the government has initiated the 'primary sector mission' (Rythu Kosam Mission) with massive outlay of investments over the next five years period (2015-2020) under consortium approach by bringing state, national and international partners on board. 13 pilot sites corresponding to 13 districts of the state identified for introduction, testing and

[2] See more details in 'Achieving Double Digit Inclusive Growth – A Rolling Plan 2015-16, Government of Andhra Pradesh'

scaling-up of range of technologies over a period of time. Both supply and demand side interventions are aimed for improving the livelihoods of the farmers in the state.

With this background, the major objective of the present study is to document the current status of the pilot sites covering 267 villages from 38 mandals in 13 districts. A primary household baseline survey was conducted from representative sample farmers (5222 HHs) in the 13 district pilot sites. The present report also attempted to estimate the total gross value addition (GVA) across sample villages and pilot site as a whole from different sub-sectors in the primary sector. Both household survey and secondary sources of information were complemented to estimate the GVA values both at village and pilot site level. These estimates will be used as 'benchmark values' for monitoring the project progress over a period of time. The project impact assessment studies if any could be undertaken in future using this baseline information. Overall, this comprehensive state-level baseline repot also helps in identifying major constraints and devising suitable strategies in the pilot sites and districts as a whole.

3.1.2 Sampling Distribution

The sampling framework has been designed for the entire 'Rythu Kosam Mission' which includes 13 pilot sites across 13 targeted districts in the state by considering the extent of diversity among study villages.

About 5222 sample households were interviewed from selected villages and collected the information on socio-economic, assets position, cropping pattern, extent of adoption of technologies, average productivity levels among major crops, details about credit and market access, perceptions about climate change and risk coping mechanisms etc. Out of the total sample interviewed (5222), nearly 4794 HHs were covered in agricultural sample villages while the rest (428 HH) administered in case of fishery sample villages (Table 3.1.2.1).

Table 3.1.2.1. Sample distribution and coverage during baseline (BL) surveys

District	Targeted BL sample	Sample covered in BL
Chittoor	486	481 (0)
Kadapa	396	396 (0)
Anantapur	402	366 (0)
Kurnool	228	228 (0)
Nellore	372	264 (48)
Prakasam	546	342 (91)
Guntur	444	359 (48)
Krishna	570	491 (125)
West Godavari	606	332 (22)
East Godavari	618	406 (52)
Visakhapatnam	462	423 (0)
Vizianagaram	504	460 (18)
Srikakulam	828	674 (24)
Total	**6462**	**5222 (428)**

Note: Figures in parenthesis indicates absolute no.of fishery sample coverage in the total

3.1.3. Methodology

Simple tabular average analysis was used to analyze the household data collected in the primary household survey. The results were summarized by district-wise in the section six of this consolidated baseline report.

For estimation of Gross Value Added (GVA) in primary sector from pilot site in each district, production/value added approach was used. Among the three approaches (production, income and expenditure) available, production/value added approach is mostly applied for the estimation of value added in primary sector. Income approach is normally applied for industry sector. Expenditure approach is applied in general in case of service sector.

As per standard definitions, the primary sector includes agriculture, horticulture, animal husbandry, fisheries, sericulture, forestry and logging and mining and quarrying. But, in the present study context, the primary sector is confined to only agriculture, horticulture, animal husbandry and fisheries only. The standard methodology defined by Directorate of Economics Statistics[3] were adapted with suitable modifications for the estimation of GVA from different sectors in the pilot site using various estimates derived from household survey. The sector-wise methodology followed for estimation of 'Gross Product' is summarized below:

Agriculture/horticulture/floriculture:
This sector includes major agricultural crops (25), minor crops (17), small millets, other pulses, commercial crops, horticultural crops, plantation crops, flowers, sugars, oilseeds, fruits and vegetables, fodders and by-products etc.

Livestock:
This sector includes milk production from cows, buffaloes and goat. Wool production from sheep and goats. Egg production from poultry, ducks etc. Meat production from poultry, sheep, goat and donkeys. Dung and other by-products production from milching animals and other livestock. The incremental livestock value will also be considered in the estimation of GVA.

Fishing:
Village-wise value of inland fish/marine fish/prawns is estimated by multiplying the production with corresponding output prices. Fish sold as salted, dried and frozen should also be accounted. The average productivity level and various input material costs per unit area were estimated from household primary survey. The gross product from fisheries sector is estimated by deducting the input costs from the total gross value product.

Forestry:
Major components of this sector are industrial wood (recorded and un-recorded), fuel wood and major/minor forest produce. However, the present study has attempted to capture only the fuel wood and forest produce components only. The gross value of output is estimated

[3]National Account Statistics: Manual on Estimation of State and District Income (2008), published by CSO

by multiplying the total forest produce with corresponding output prices (Base year 2014-15). In case of forestry, the input costs were not captured in the household survey.

All the household survey information was collected with agricultural reference year 2014-15 crops only. For obtaining the complete information on the three seasons, previous year data was collected. Overall, the summary of methods of estimation of GVAs across sub-sectors are summarized below.

3.1.4. Results of Baseline Ssurvey

Results of the baseline survey are presented in subsequent chapters, district wise. Detailed comparison of productivity levels along with economics of major crops/growth-engines and major constraints and potential opportunities are worked out and a report is submitted to RKVY, AP.

3.1.4.1 Chittoor

The pilot site productivity levels in case of paddy, sorghum and maize were on par or even above with district, state and national average yields. Crops like pearl millet, finger millet, groundnut, cotton and potato showed lower productivity levels in the pilot sites when compared with district average yields. The mean productivity levels of fruits and vegetables in the pilot site were good and only the limitation for them was availability of sufficient irrigation water.

GVA estimation for Chittoor Rythu kosam pilot site

The total GVA estimated in Rs. crores for entire Rythu Kosam pilot site area in the district was 24.41 (Table 3.1.4.1.1). The current estimate of GVA is devoid of both sericulture and forestry contributions. The estimated total GVA from primary sector for the entire district was Rs. 8227 crores for year 2014-15. The pilot is contributing about 0.3 per cent of total primary sector GVA in the district. Approximately each pilot site village is contributing about 1.36 crores. It is estimated that an average household in the pilot has contributed about Rs.34,781 per annum towards primary sector GVA during 2014-15. Each per hectare in the pilot site has contributed about Rs.27122 per annum in total GVA estimations.

Table 3.1.4.1.1. GVA (2014-15) estimation for Chittoor Rythu kosam pilot site

Sub-sector	GVA estimation (Rs in crores)
1. Agriculture including horticulture	14.24
2. Animal husbandry	11.17
3. Fisheries	0.0
4. Forestry	0.0
Grand total	24.41

3.1.4.2 Y.S.R kadapa

The pilot site productivity levels among different crops are significantly lower than the district average yields recorded by Directorate of Economics and Statistics. The mean productivity levels in case of red gram, sesamum and sunflower are on par with the district averages. In case of all other crops, the productivity levels were recorded very low.

GVA estimation for Kadapa Rythu kosam pilot site

The total GVA estimated in Rs. crores for entire Rythu Kosam pilot site area in the district was 45.79 (see Table 3.1.4.2.1). The estimated total GVA from primary sector for the entire district was Rs.6205 crores for year 2014-15. The pilot site is contributing about 0.74 per cent of total primary sector GVA in the district. Approximately each pilot site village is contributing about 3.52 crores. It is estimated that an average household in the pilot has contributed about Rs.40,717 per annum towards primary sector GVA during 2014-15. Each per hectare in the pilot site has contributed about Rs.44,396 per annum in total GVA estimations.

Table 3.1.4.2.1. GVA (2014-15) estimation for Kadapa Rythu kosam pilot site.

Sub-sector	GVA estimation (Rs in crores)
Agriculture including horticulture	22.06
Animal husbandry	23.73
Fisheries	0.0
Forestry	0.0
Grand total	45.79

3.1.4.3 Ananthapuram

The pilot site productivity levels were on par with district average yields in few crops while it was lower in other crops. But, the relative productivity levels in the district are much lower than the state average. So, there is a huge productivity gaps exists among major crops. The mean productivity levels were significantly lower in case of pearl millet, horse gram, castor and cotton than the district average yield reported by Directorate of Economics and Statistics.

GVA estimation for Ananthapuram Rythu kosam pilot site

The total GVA estimated in Rs.crores for entire Rythu Kosam pilot site area in the district was 26.15 (Table 3.1.4.3.1). The estimated total GVA from primary sector for the entire district was Rs.9944 crores for year 2014-15. The pilot site is contributing about 0.26 per cent of total primary sector GVA in the district. Approximately each pilot site village is contributing about 1.86 crores. It is estimated that an average household in the pilot has contributed about Rs.52, 102 per annum towards primary sector GVA during 2014-15. Each per hectare in the pilot site has contributed roughly Rs.26, 150 per annum in total GVA estimations.

Table 3.1.4.3.1. GVA (2014-15) estimation for Ananthapuram Rythu kosam pilot site

Sub-sector	**GVA estimation (Rs in crores)**
Agriculture including horticulture	4.30
Animal husbandry	21.85
Grand total	26.15

3.1.4.4 Kurnool

The pilot site productivity levels were on par with district average yields in few crops while it was lower in other crops. The mean productivity levels were significantly lower in case of four major crops i.e., cotton, sorghum, chickpea and groundnut than the district average yield reported by Directorate of Economics and Statistics. All other crops showed at least 10-20% higher margin of yields in the pilot site than the district mean yields.

GVA estimation for Kurnool Rythu kosam pilot site

The total GVA estimated in Rs. crores for entire Rythu Kosam pilot site area in the district was 37.4 (Table 3.1.4.4.1). The estimated total GVA from primary sector for the entire district was Rs.12036 crores for year 2014-15. The pilot site is contributing about 0.31 per cent of total primary sector GVA in the district. Approximately each pilot site village is contributing about 3.74 crores. It is estimated that an average household in the pilot has contributed about Rs.57, 538 per annum towards primary sector GVA during 2014-15. Each per hectare in the pilot site has contributed about Rs.48, 483 per annum in total GVA estimations.

Table 3.1.4.4.1. GVA (2014-15) estimation for Kurnool Rythu kosam pilot site.

Sub-sector	GVA estimation (Rs in crores)
Agriculture including horticulture	26.6
Animal husbandry	10.08
Grand total	37.4

3.1.4.5 Nellore

The pilot site productivity levels were par below than the district average yields in most of the crops. But, the relative productivity levels in the pilot site are much higher than the district average in case of only paddy. So, there is a huge productivity gaps exists among major crops. The mean productivity levels were significantly lower in case of sorghum, red gram, green gram and black gram than the district average yield reported by Directorate of Economics and Statistics.

GVA estimation for Nellore Rythu kosam pilot site

The total GVA estimated in Rs.crores for entire Rythu Kosam pilot site area in the district was 103.70 (Table3.1.4.5.1). Agriculture including horticulture have contributed significantly (66%) to the total GVA in the selected villages. The estimated total GVA from primary sector for the entire district was Rs.9,729 crores for year 2014-15. The pilot site is contributing about 1.07 per cent of total primary sector GVA in the district. Approximately each pilot site village is contributing about 9.43 crores. It is estimated that an average household in the pilot has contributed about Rs.109,515 per annum towards primary sector GVA during 2014-15. Each per hectare in the pilot site has contributed roughly Rs.84,852 per annum in total GVA estimations.

Table 3.1.4.5.1. GVA (2014-15) estimation for Nellore Rythu kosam pilot site.

Sub-sector	GVA estimation (Rs in crores)
Agriculture including horticulture	65.62
Animal husbandry	10.65
Fisheries	26.80
Grand total	103.70

3.1.4.6 Prakassam

The mean productivity levels were significantly lower (Table 1) in case of pearl millet, cotton, red gram, cowpea and black gram than the district average yield.

GVA estimation for Prakassam Rythu kosam pilot site

The total GVA estimated for entire Rythu Kosam pilot site area in the district was 122.86 crores (Table 3.1.4.6.1). Fisheries have contributed significantly (65%) to the total GVA in the selected villages. The estimated total GVA from primary sector for the entire district was Rs.12,875 crores for year 2014-15. The pilot site is contributing about 0.95 per cent of total primary sector GVA in the district. Approximately each pilot site village is contributing about 4.39 crores. It is estimated that an average household in the pilot has contributed about Rs.58, 788 per annum towards primary sector GVA during 2014-15. Each per hectare in the pilot site has contributed roughly Rs.112,736 per annum in total GVA estimations.

Table 3.1.4.6.1. GVA (2014-15) estimation for Prakassam Rythu kosam pilot site.

Sub-sector	GVA estimation (Rs in crores)
Agriculture including horticulture	16.69
Animal husbandry	18.17
Fisheries	78.00
Grand total	122.86

3.1.4.7 Guntur

The mean productivity levels were lower in case of sorghum, black gram, maize and cotton than the district average yield.

GVA estimation for Guntur Rythu kosam pilot site

The total GVA estimated in Rs.crores for entire Rythu Kosam pilot site area in the district was 196.97 (Table 3.1.4.7.1). The estimated total GVA from primary sector for the entire district was Rs.16,110 crores for year 2014-15. The pilot site is contributing about 1.22 per cent of total primary sector GVA in the district. Approximately each pilot site village is contributing about 10.94 crores. It is estimated that an average household in the pilot has contributed about Rs.1,11,699 per annum towards primary sector GVA during 2014-15. Each per hectare in the pilot site has contributed roughly Rs.149, 174 per annum in total GVA estimations.

Table 3.1.4.7.1. GVA (2014-15) estimation for Guntur Rythu kosam pilot site.

Sub-sector	GVA estimation (Rs in crores)
Agriculture including horticulture	163.36
Animal husbandry	19.71
Fisheries	13.30
Grand total	196.97

3.1.4.8 Krishna

The pilot site productivity levels were on par with the district average yields except in case of maize, sugarcane and cotton crops.

GVA estimation for Krishna Rythu kosam pilot site

The total GVA estimated in Rs.crores for entire Rythu Kosam pilot site area in the district was 143.61 (Table 3.1.4.8.1). Agriculture have contributed significantly (44%) to the total GVA in the selected villages. The estimated total GVA from primary sector for the entire district was Rs.2,522 crores for year 2014-15. The pilot site is contributing about 5.7 per cent of total primary sector GVA in the district. Approximately each pilot site village is contributing about 5.3 crores. It is estimated that an average household in the pilot has contributed about Rs.62,973 Each per hectare in the pilot site has contributed roughly Rs.94,592 per annum in total GVA estimations.

Table 3.1.4.8.1. GVA (2014-15) estimation for Krishna Rythu kosam pilot site.

Sub-sector	GVA estimation (Rs in crores)
Agriculture including horticulture	63.20
Animal husbandry	57.03
Fisheries	23.38
Grand total	143.61

3.1.4.9 West Godavari

The relative productivity levels in the pilot site are much higher than the district average in case of paddy and mango.

GVA estimation for West Godavari Rythu kosam pilot site

The total GVA estimated in Rs.crores for entire Rythu Kosam pilot site area in the district was 269.38 (Table 3.1.4.9.1). The estimated total GVA from primary sector for the entire district was Rs.18,386 crores for year 2014-15. The pilot site is contributing about 1.46 per cent of total primary sector GVA in the district and each pilot site village is contributing about 22.44 crores. An average household in the pilot has contributed about Rs. 116, 338 per annum and each per hectare contribution is about Rs.210, 404 per annum in total GVA estimations.

Table 3.1.4.9.1. GVA (2014-15) estimation for West Godavari Rythu kosam pilot site.

Sub-sector	GVA estimation (Rs in crores)
Agriculture including horticulture	163.50
Animal husbandry	8.48
Fisheries	96.40
Grand total	269.38

3.1.4.10 East Godavari

Compared to district, the mean productivity levels are high except for sugarcane Huge potential exists in the East Godavari pilot site to prosper in future through better scientific post-harvest handling, market linkages and value chains.

GVA estimation for East Godavari Rythu kosam pilot site

The total GVA estimated in Rs.crores for entire Rythu Kosam pilot site area in the district was 96.39 (Table 3.1.4.10.1). The estimated total GVA from primary sector for the entire district was Rs. 16,094 crores for year 2014-15. The pilot site is contributing about 0.60 per cent of total primary sector GVA in the district and each pilot site village is contributing about 3.70 crores. An average household in the pilot has contributed about Rs. 55,120 per annum and each per hectare contribution is about Rs.92,063 per annum in total GVA estimations.

Table 3.1.4.10.1. GVA (2014-15) estimation for East Godavari Rythu kosam pilot site.	
Sub-sector	GVA estimation (Rs in crores)
Agriculture including horticulture	57.71
Animal husbandry	6.58
Fisheries	32.10
Grand total	96.39

3.1.4.11. Vishakapatnam

The pilot site productivity levels were on par with the district average yields except in case of sugarcane, black gram and finger millet crops. But, the relative productivity levels in the pilot site are much higher than the district average in case of paddy, maize and green gram. So, there is huge potential for contribution of pilot site GVA from major crops. The mean productivity levels were significantly lower in case of sugarcane and black gram than the district average yield reported by Directorate of Economics and Statistics.

GVA estimation for Vishakapatnam Rythu kosam pilot site

The total GVA estimated in Rs. crores for entire Rythu Kosam pilot site area in the district was 108.64 (Table 3.1.4.11.1). The details by village-wise are summarized in Fig 5. Agriculture have contributed significantly (95%) to the total GVA in the selected villages. The current estimate of GVA is devoid of both sericulture and forestry contributions. Additional efforts are in place to derive these estimates from respective selected villages. The estimated total GVA from primary sector for the entire district was Rs.6, 300 crores for year 2014-15. The pilot site is contributing about 1.72 per cent of total primary sector GVA in the district. Approximately each pilot site village is contributing about 4.72 crores. It is estimated that an average household in the pilot has contributed about Rs.50,127 per annum towards primary sector GVA during 2014-15. Each per hectare in the pilot site has contributed roughly Rs.103,309 per annum in total GVA estimations.

Table 3.1.4.11.1. GVA (2014-15) estimation for Vishakapatnam Rythu kosam pilot site.	
Sub-sector	GVA estimation (Rs in crores)
Agriculture including horticulture	102.71
Animal husbandry	5.93
Grand total	108.64

3.1.4.12 Vizianagarm

The pilot site productivity levels were on par with the district average yields only in case of paddy and sesamum crops. But, the relative productivity levels in the pilot site are lower than the district average in case of maize, black gram and groundnut. So, there is huge potential for contribution of pilot site GVA from major crops. The mean productivity levels were significantly lower in case of black gram than the district average yield reported by Directorate of Economics and Statistics.

GVA estimation for Vizianagarm Rythu kosam pilot site

The total GVA estimated in Rs. crores for entire Rythu Kosam pilot site area in the district was 34.66 (Table 3.1.4.12.1). The details by village-wise are summarized in Fig 5. Agriculture have contributed significantly (91%) to the total GVA in the selected villages. The current estimate of GVA is devoid of both sericulture and forestry contributions. Additional efforts are in place to derive these estimates from respective selected villages. The estimated total GVA from primary sector for the entire district was Rs.4,961 crores for year 2014-15. The pilot site is contributing about 0.70 per cent of total primary sector GVA in the district. Approximately each pilot site village is contributing about 1.65 crores. It is estimated that an average household in the pilot has contributed about Rs.39,598 per annum towards primary sector GVA during 2014-15. Each per hectare in the pilot site has contributed roughly Rs.33,739 per annum in total GVA estimations.

Table 3.1.4.12.1. GVA (2014-15) estimation for Vizianagarm Rythu kosam pilot site.

Sub-sector	GVA estimation (Rs in crores)
Agriculture including horticulture	31.52
Animal husbandry	3.14
Grand total	34.66

3.1.4.13 Srikakulam

The pilot site productivity levels of major crops were less than the district average yields except in case of paddy, black gram and green gram crops. But, the relative productivity levels in the pilot site are much lower than the district average in case of maize, sugarcane and finger millet. So, there is huge potential for contribution of pilot site GVA from major crops. The mean productivity levels were significantly lower in case of finger millet and sugarcane than the district average yield reported by Directorate of Economics and Statistics.

GVA estimation for Srikakulam Rythu kosam pilot site

The total GVA estimated in Rs.crores for entire Rythu Kosam pilot site area in the district was 41.94 (Table 3.1.4.13.1). The details by village-wise are summarized in Fig 5. Agriculture have contributed significantly (71%) to the total GVA in the selected villages. The current estimate of GVA is devoid of both sericulture and forestry contributions. Additional efforts are in place to derive these estimates from respective selected villages. The estimated total GVA from primary sector for the entire district was Rs.4,855 crores for year 2014-15. The pilot site is contributing about 0.86 per cent of total primary sector GVA in the district. Approximately each pilot site village is contributing about 0.95 crores. It is estimated that an average household in the pilot has contributed about Rs.20,240 per annum towards primary sector GVA during 2014-15. Each per hectare in the pilot site has contributed roughly Rs.42,304 per annum in total GVA estimations.

Table 3.1.4.13.1. GVA (2014-15) estimation for Srikakulam Rythu kosam pilot site.

Sub-sector	GVA estimation (Rs in crores)
Agriculture including horticulture	29.70
Animal husbandry	9.91
Fisheries	2.33
Grand total	41.94

3.1.5 Major Findings and Recommendations

Major findings of the baseline survey and corresponding recommendations across sub-sectors are summarized below (Table 3.1.5.1). Immediate steps are required to address these issues for enhancing each sub-sector contribution in the total Primary Sector GVA of the state.

Table 3.1.5.1. Major findings and recommendations emanating from baseline survey.

Key findings	Specific recommendations
1. Recurrent droughts, un-even distribution of rainfall and low ground water potential are the major concerns in Chittoor, Kadapa, Anantapur, Kurnool, Prakasam and Nellore district pilot sites.	1. High emphasis should be given for *in-situ* and *ex-situ* water conservation technologies in the pilot site villages so that the groundwater recharge and its efficiency in-use can be realized quickly. Measures to enhance water-use-efficiency to increase productivity need to be identified and promoted. 2. The major tanks located in the pilot sites should be inter-connected through major irrigation canals and thereby the groundwater recharge can be improved much faster and assured irrigation will be available.
2. The extent of adoption of improved cultivars (including drought and disease tolerant) are still low in case of major crops like groundnut, red gram, sesamum, greengram, cashewnut, tapioca, turmeric, citrus, pine apple etc. in selected pockets of pilot site villages	3. Huge opportunities for introduction of new improved cultivars both in field and horticultural crops so that the productivity can be improved at least 10-15% very quickly. Appropriate local alternate seed systems need to be developed and popularized.
3. Overall the soils are low to medium fertile and yield gaps exists for major crops in majority of the pilot sites. These are discussed in detailed by pilot site-wise in section 6.5 of this report in comparison with district and national average yields.	4. Good scope for introduction of better management practices (including soil, water, crop, IPM practices and micro irrigation) to improve the crop yields and minimize the per unit output costs. It will significantly improve the competitiveness of our commodities in international markets. 5. Soil Health Management (SHM) and balanced fertilization strategies to build OM need to be scale-up.
4. On the whole the average milk productivity levels across the pilot sites are low at 3-4 litre per animal per day. It might be due to poor feeding practices and fodder scarcity in the pilot sites (especially in Rayalaseema districts). 5. Majority of sample farmers are not happy with milk pricing structure and adulteration practices followed by local dairy milk collection centres.	6. Enormous scope for introduction of cross-bred animals and creating awareness on feeding practices to increase the average milk productivity across pilot site villages. 7. Fodder Strategy for the state to be developed and implemented in a participatory manner. 8. Good scope for strengthening of formal market channels in case of milk, meat and eggs trading to avoid the role of middle men across all scales. The total output in this sector are marketed informally. 9. The surplus fodder producing districts (like Krishna, West Godavari and East Godavari) should be inter-linked with fodder deficit districts

Table 3.1.5.1. Major findings and recommendations emanating from baseline survey.	
Key findings	Specific recommendations
	(especially Rayalaseema region) in the lean period so that fodder scarcity can be mitigated partially.
6. Absence of commodity-based market clusters and value chains (especially in case of horticultural crops) even though the district pilot sites are producing in huge quantities 7. Huge post-harvest losses (around 30%) due to lack of proper post-harvest handling measures especially in case of vegetables and fruits	10. Abundant scope for setting-up of infrastructure for scientific post-harvest handling of fruits and vegetables including cold storages across pilot sites to minimize post-harvest losses. 11. Huge opportunities for piloting commodity specific value chains for targeting export markets. Eg: - *Tomato and Mango – Chittoor* *Acid lime and lemon – Nellore* *Chillies and turmeric – Guntur* *Groundnut – Anantapur and Chittoor* *Rice – Nellore and West Godavari* *Mango, cashewnut, Banana – West Godavari* *Mango, tapioca - East Godavari* *Mango and Vegetables – Krishna* *Cashewnut, Pine apple and jack fruits – Srikakulam* 12. Good potential for encouraging commercial (coffee, Pine apple) crops, floriculture clusters specifically in Chintapalle and other tribal areas of Visakhapatnam and Seethampet in Srikakulam districts. 13. Organic farming clusters can be identified (especially in low input application sites of Visakhapatanam and Srikakulam) and promoted with proper branding and marketing facilities.
8. Low productivity levels of prawns and fish culture due to poor seed quality. High susceptibility to diseases another problem in prawns. 9. High volatility in output prices, steep raise in input prices and absence of output price information etc. are major challenges in the fishery sector	14. Supply high quality certified prawn seed in the state is much needed and appropriate mechanisms need to be put in place. A strong vigilance is required on periodical monitoring of private hatcheries. 15. Stabilized prices along with cooperative storage facilities should be built in all prawn/fish cultivating mandals to avoid distress sales.
10. Sericulture industry is almost disappearing in the state due to crashing prices of cocoons and frequent disease out breaks.	16. The domestic silk industry should be protected by supporting with attractive remunerative output prices and controlling measures to make them competitive along the entry of cheap Chinese silk with appropriate duty and taxation regime.
11. Improper pooling, grading and marketing of valuable forest products/by-products generated in the state.	17. Forestry has enormous potential to contribute to state GDP through proper marketing of its products/by-products across pilot sites.
12. Labor scarcity is the biggest challenge across pilot sites in the state. During peak agricultural operations period, farmers are incurring huge expenditure on labor which is narrow their net margins significantly.	18. Huge scope for introduction and piloting of ICT based custom hiring centres across pilot sites. Fruit harvesters and power sprayers should be promoted with element of subsidies in a large scale.

3.2 Soil & Nutrient Management

3.2.1 Soil health mapping & evaluation of balanced fertilization

Soil fertility degradation, due to extensive mining and mismanagement over the years, is one of the major stumbling block for increasing agricultural productivity. Having seen the benefits in the past and in a quest to get higher yields, farmers in some parts are using indiscriminate amounts of NPK fertilizers, but without getting the desired results; while in general, are not aware of secondary and micro nutrients related issues. Therefore, soil health mapping was adopted as an entry point activity to rejuvenate soil resources for agricultural development in the state. Farmer meetings were conducted across all pilot sites and farmers were oriented about soil health issues and trained on soil sampling. About 5400 soil samples were collected from pilot sites during April to June months by adopting stratified sampling method to collect representative samples for topography, soil color, texture, crops and cropping systems and holding sizes. The collected samples were analysed at ICRISAT. The analysis results showed multi-nutrient deficiencies like zinc (Zn), boron (B), sulphur (S) in addition to low levels of soil organic carbon (C), nitrogen (N), phosphorus (P) and potassium (K) (see Table 3.2.1.1; Appendix 1a to 1m). The soil analysis results during 2015 under the Rythu Kosam initiative have shown that micro- and secondary nutrient deficiencies are apparently limiting the realization of optimum yields, and use efficiency of macronutrients as well. Soil test-based fertilizer management with focus on micro- and secondary nutrients is needed for sustainable intensification and resilience-building of production systems.

During 2015-16, soil test-based fertilizer recommendations were developed village wise and disseminated to farmers (Figure 3.2.1.1, 3.2.1.2). The strategy for any micro or secondary nutrient recommendation adopted by consortium is – full dose if >50% deficiency, half dose if 25%-50% deficiency, one fourth dose if 10%-25% deficiency and no dose in case of <10% deficiency. The full dose per ha comprises 15 kg sulphur (100 kg gypsum), 5 kg zinc (25 kg zinc sulphate) and 0.25 kg boron (2.5 kg borax), once in a year (*kharif*+*rabi* seasons). The participatory on-farm trials were conducted on application of micro and secondary nutrients with major crops in Andhra Pradesh (Rythu Kosam initiative). There were two treatments – (1) Farmers practice of adding N, P, K only and (2) Improved practice (N, P, K + soil test-based addition of deficient S, B, Zn).

At maturity crop cutting experiments (CCEs) were conducted in 3 m x 3m area in both the treatments. The fresh weights for grain/pod and straw were recorded and about 2 kg sub sample (~1 kg grain/pod, ~1 kg straw) was sent to ICRISAT. The sub-samples were dried and yields kg ha^{-1} were interpolated.

The results showed that with soil test-based application of micro and secondary nutrients during 2015-16, paddy crop yield increased by 16-27% over no application of micro and secondary nutrients (Figure 3.2.1.3, 3.2.1.4).

Table 3.2.1.1.Soil fertility status of farmers' fields in pilots across districts in Andhra Pradesh.											
District	Low levels of Org C (%)	% deficiency of available nutrients									
		P	K	Ca	Mg	S	Zn	B	Fe	Cu	Mn
Guntur	43	5	0	0	0	3	37	1	3	0	0
Prakasam	76	22	5	39	6	67	84	40	5	12	2
Nellore	39	26	2	4	0	31	34	6	3	1	3
Krishna	34	3	0	1	0	7	37	1	2	0	0
West Godavari	51	10	6	38	13	33	35	26	0	2	0
East Godavari	57	38	4	44	2	68	52	53	0	1	0
Anantapur	81	31	8	29	2	77	86	58	10	22	0
Chittoor	55	17	22	27	0	51	23	60	1	3	1
Kadapa	61	18	5	27	0	44	60	28	4	7	0
Kurnool	89	29	2	26	1	56	81	32	2	10	0
Vizianagaram	57	35	12	46	2	50	58	41	0	2	0
Srikakulam	61	27	13	58	2	46	38	31	0	3	0
Visakhapatnam	44	32	3	36	0	80	49	31	0	1	0
Andhra Pradesh	**58**	**23**	**7**	**30**	**2**	**48**	**52**	**33**	**2**	**5**	**1**

Figure 3.2.1.1. "Soil health Card" with soil analysis results and recommendations in local language

Figure 3.2.1.2. "Wall writings" in pilot villages indicating soil analysis results and recommendations in local language.

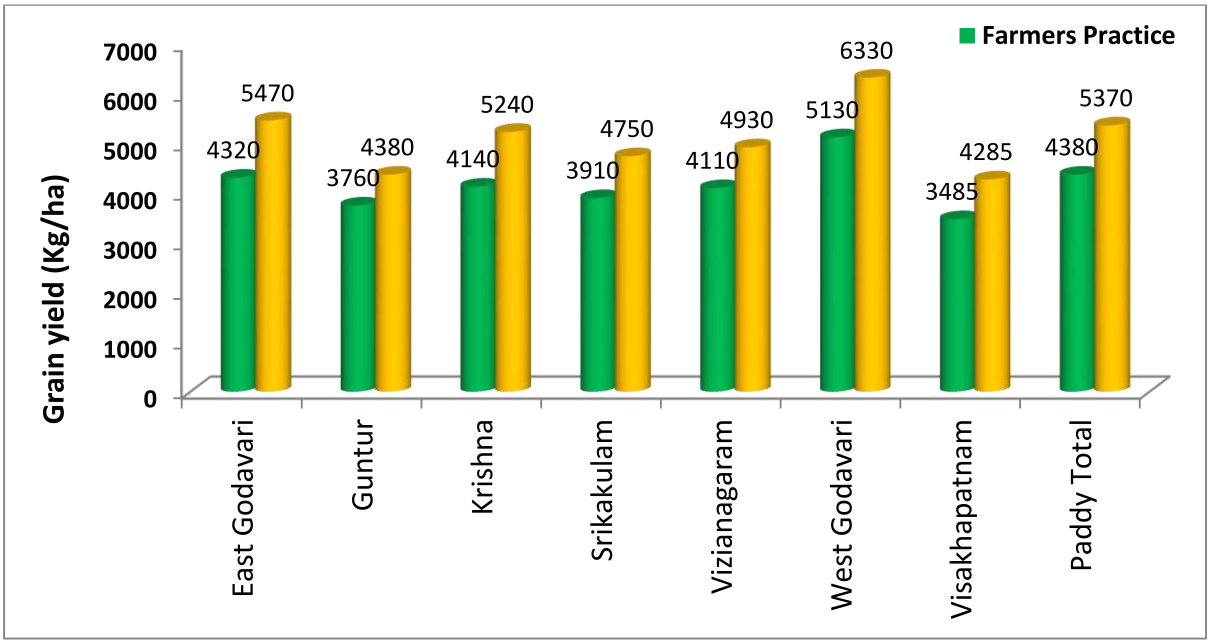


Figure 3.2.1.3. Effect of soil test-based micro & secondary nutrient application in paddy crop yield.

Similarly in case of groundnut crop, groundnut crop yield increased by 12-28% with soil test-based application of micro and secondary nutrients over their no application (Figure 2).

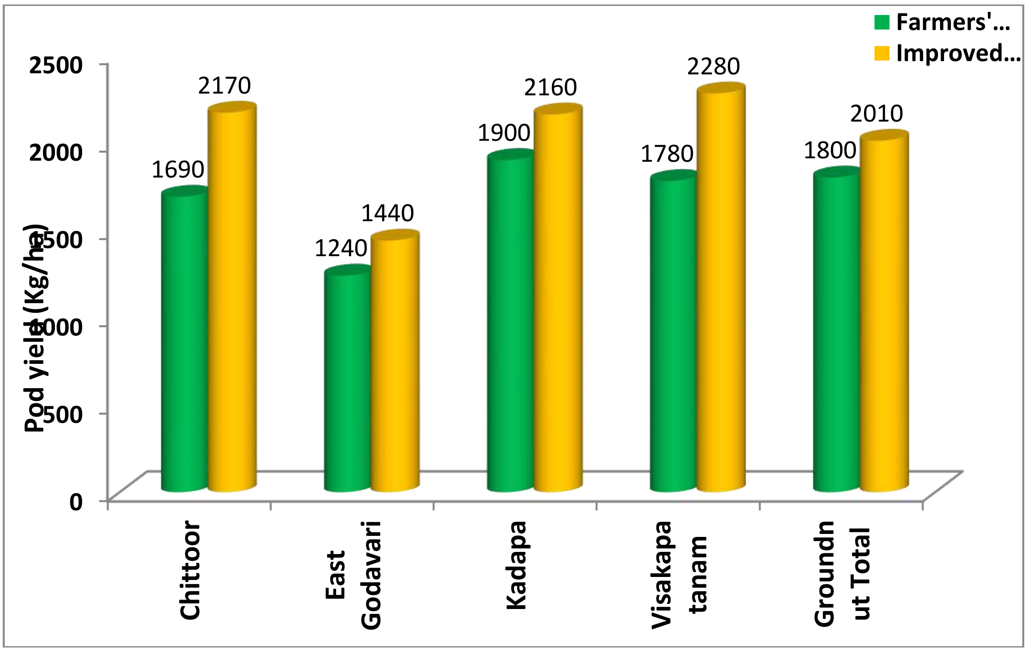


Figure 3.2.1.4. Effect of soil test-based micro & secondary nutrient application in groundnut crop yield.

3.2.2. Contingency plan for fertilizer management under bad weather

In context of poor rainfall scenario in the state in general, a contingency plan for fertilizer management was prepared and promoted through district coordinators. The contingency plan included following components;

- (i) Basal application to be reduced to half and rest half to be added 20-30 days after sowing.
- (ii) Foliar application (3-4 sprays) of urea (1%), MOP (0.5%), zinc sulphate (0.2%) and agribor (0.1%) to be promoted during 20 to 60 days.
- (iii) Compost/fertilizer application near to plant base.

3.2.3. Scaling-out micro and secondary nutrients in the districts

The secondary and micro nutrient fertilizers like zinc sulphate, gypsum and borax were positioned in the villages across districts and awareness was created by line-staff, NGOs for their use by the farmers. As such, about 0.7 million ha area is covered under micro and secondary nutrients during 2015-16.

3.2.4. Recycling of on-farm wastes& biomass generation

The soil analysis results of the pilots and districts as such showed low levels of organic carbon in soil. The importance of organic carbon in soil health is very well documented. Therefore, the addition of organic matter assumes much more importance. Large quantities of organic wastes in on-farm situations present opportunities to recycle those into valuable manures to cut cost of chemical fertilizers while improve soil fertility. The on-station studies have shown microbial consortia culture very effective in quickly converting organic wastes into well decomposed compost called as Aerobic compost. Therefore, aerobic composting demonstrations were piloted across districts in Andhra Pradesh (Table 3.2.4.1). Around 1300 demonstrations were conducted to train farmers about aerobic composting technology.

Table 3.2.4.1. Detail of aerobic composting initiated in pilot sites in district in AP			
District	**No of aerobic composting units piloted**		
	***Kharif* 2015**	***Rabi*/summer 2015-16**	**Total (number)**
Srikakulam	40	100	140
Vizianagaram	50	100	150
Visakhapatnam	5	-	5
East Godavari	5	100	105
West Godavari	20	-	20
Krishna	20	100	120
Guntur	-	-	-
Prakasam	15	-	15
Nellore	50	100	150
Chittoor	75	100	175
Kadapa	100	100	200
Anantapur	100	100	200
Kurnool	20	-	20
Total	**500**	**800**	**1300**

Shredding machines are also piloted from *rabi* 2015-16 season in 8 districts for chopping of hardy biomass to facilitate ease in composting (Figure 3.2.4.1). The 8 districts where shredding machines are piloted during *rabi* season are - Anantapur, Krishna, Kadapa, Nellore, Srikakulum, Vijayanagaram**,** Chittoor and East Godavari.

For biomass generation from soil fertility point of view Gliricidia green manure plant nurseries were raised for transplanting on farm boundaries (Table 3.2.4.2).

Table 3.2.4.2. Details of Gliricidia seeds supplied & seedlings raised and transplanted across 13 pilot districts			
District	**Gliricidia seed (kg)**	**Area of coverage (ha)**	**Progress**
Anantapur	5	50	20,000 seedlings
Chittoor	25	250	1lakh seedlings
East Godavari	5	50	10,000 seedlings
Guntur	5	50	20,000 seedlings
Krishna	5	50	20,000 seedlings
Kadapa	5	50	25,000 seedlings
Kurnool	5	50	20,000 seedlings
Nellore	5	50	25000 seedlings
Prakasam	5	50	25,000 seedlings
Srikakulam	5	50	20,000 seedlings
Visakhapatnam	5	50	20,000 seedlings
Vijyanagaram	5	50	40,000 seedlings
West Godavari	5	50	40000 seedlings
Total	**85**	**900**	

Figure 3.2.4.1. Shredding machine demonstration for chopping-off biomass in Porumamila village, Kadapa district.

3.2.5. Evaluation of Aquasap Application

Aquasap is a 100% organic extract/fertilizer from sea weeds and is used as foliar application on crops. It contains macro & micro nutrients, essential amino acids and plant growth hormones that provide major boost to crop yield by accelerating metabolic function and enhancing its nutrition uptake capacity.

During 2015-16, participatory on-farm trials were conducted on foliar application of aquasap with major crops in Andhra Pradesh (RythuKosam initiative). In Andhra Pradesh, 30 trials in each of the pilot across 13 districts were conducted during *kharif* 2015 season. There were two treatments – (1) Aquasap spray and (2) Farmers practice (in adjoining/nearby field). A 1% aquasap solution was sprayed thrice during crop season after establishment stage, pre-flowering and post flowering stage of crop. During spray at any stage, about 1 litre aquasap solution was used for 1 acre (0.4 ha) area. Similar agronomic practices were followed in both the treatments.

The aquasap liquid is an organic produce and hazard free and can be handled with bare hands for mixing with water for preparation of solution. In vegetable crops, aquasap is also used by dipping the seedling roots in 0.3% solution in addition to foliar application.
At maturity crop cutting experiments (CCEs) were conducted in 3 m x 3m area in both the treatments. The fresh weights for grain/pod and straw were recorded and about 2 kg sub sample (~1 kg grain/pod, ~1 kg straw) was sent to ICRISAT. The sub-samples were dried and yields kg ha^{-1} were interpolated which are discussed crop wise as under;

Groundnut crop

In case of groundnut crop in Andhra Pradesh (Figure 3.2.5.1), pod yield increased significantly with aquasap spray compared to no-spray. The increase recorded was 21% (2370 kg ha^{-1} vs 1950 kg ha^{-1}) in Kadapa district and 17% (2720 kg ha^{-1} vs 2330kg ha^{-1}) in Kurnool district.

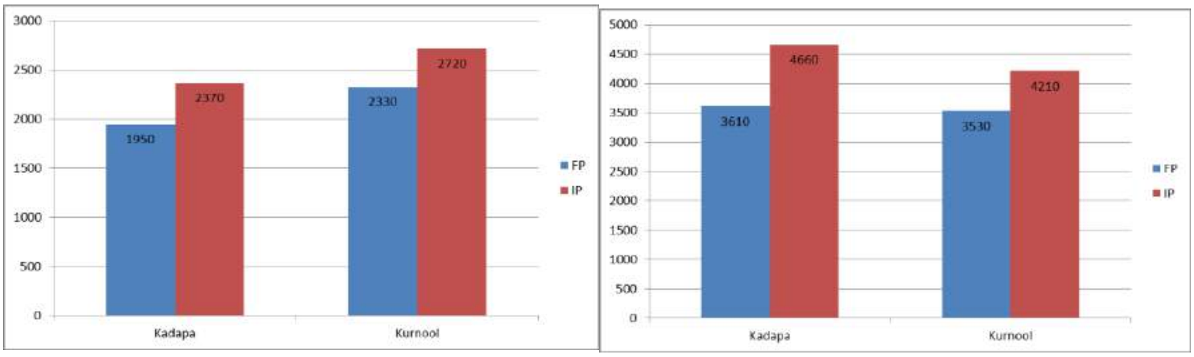


Figure 3.2.5.1. Effect of aquasap spray on groundnut yield (in kg ha^{-1}) in Andhra Pradesh, kharif 2015 – Left: pod yield; Right: straw yield.

Similar to pod yield in groundnut, the starw yield was also higher in aquasap sprayed plots compared to no-aquasap sprayed plots (Figure 4). In aquasap sprayed plot, the straw yield was 4660 kg ha^{-1} over 3610 kg ha^{-1} under control in Kadapa district, and 4210 kg ha^{-1} over 3510 kg ha^{-1} under control in Kurnool district. As such straw yield was 29% higher over the control in Kadapa district, and 19% higher in Kurnool district.

Paddy crop

The significant responses to aquasap spray were recorded in paddy crop in Andhra Pradesh. Under farmers practice, the paddy yield across districts in Andhra Pradesh varied between 2610 and 5290 kg ha^{-1}, while with aquasap spray the yield levels raised to 3230 to 6710 kg ha^{-1} (Figure 3.2.5.2). The results clearly showed yield increases of 14-27% in paddy grain as a result of aquasap spray.

Similar increases were also recorded in paddy straw yield (Figure 6). Per cent increase in paddy straw yield due to aquasap spray varied between 12 and 28%.

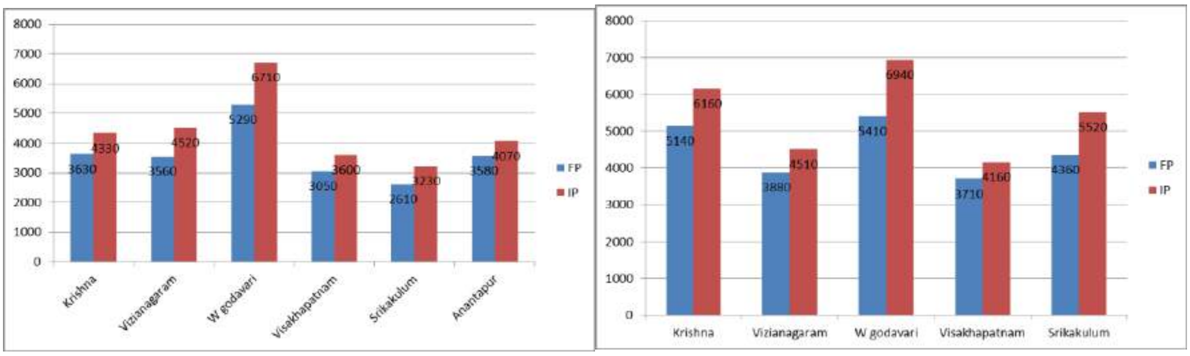


Figure 3.2.5.2. Effect of aquasap spray on paddy yield (in kg ha^{-1}) in Andhra Pradesh, kharif 2015 - Left: grain yield; Right: straw yield.

Pigeonpea crop

The effect of aquasap spray was seen in pigeonpea crop in Anantapur - both as a sole crop as well as inter crop. The average productivity increase was 7% over no-aquasap spray both in sole and inter pegeonpea crop (Figure 3.2.5.3.).

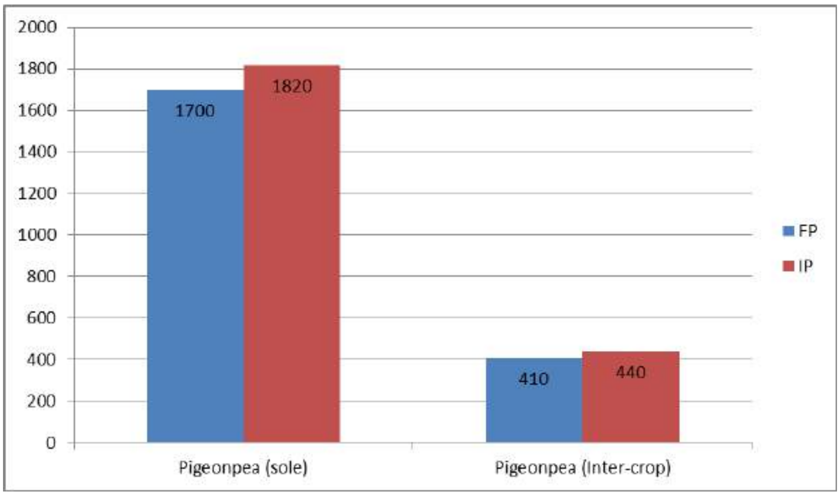


Figure 3.2.5.3. Effect of aquasap spray on pigeon pea grain yield (in kg ha^{-1}) in Anantapur, Andhra Pradesh, kharif 2015.

Vegetables

The evaluation of aquasap spray in vegetables like tomato, potato, onion and chillies showed significant yield benefits – 23% in tomato, 11% in potato, 18% in onion and 9% in chillies (Figure 3.2.5.4).

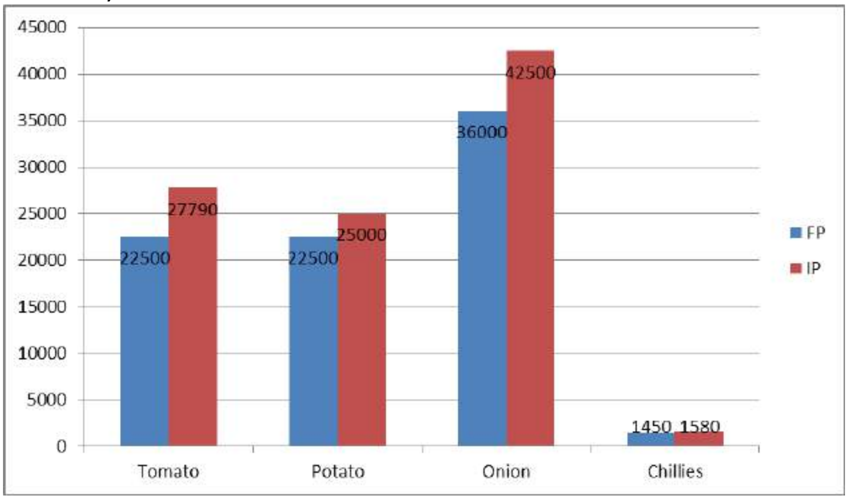


Figure 3.2.5.4. Effect of aquasap spray on vegetables yield(in kg ha^{-1}) in Anantapur in Andhra Pradesh, kharif 2015.

3.2.6. Fertigation

In Andhra Pradesh more than 5 lakh ha area is under micro-irrigation systems. There is vast scope to improve best practices with reference to water management in existing micro-irrigation systems with farmers. Moreover, the micro-irrigation systems can be effectively used for regulated supply of essential plant nutrients i.e. fertigation and soil test-based addition of micro- and secondary nutrients. The important target crops under fertigation include tomato, chillies, turmeric, other vegetables, banana, papaya, mango, sweet orange, acid lime, pomegranate, oilpalm etc. The fertigation practices for important crops targeted under fertigation are worked out using cost-effective regular fertilizers and are being promoted with farmers. Fertigation has recorded an yield improvement of 15-20% in crops like tomato, brinjal and gourds.

3.3 Strengthening Seed Systems

3.3.1. Background

The most essential input of crop production is seed and is the cheapest of all the inputs in rainfed agriculture. A good quality, improved variety seed along with good agricultural practices can enhance crop production on average by 20%. The major source of seed for small-scale farmers comes from their own on-farm savings, seed exchange, borrowings and local traders. In the drought situations farmers depend on subsidized seed supply by government agencies, which meets only 30–40% seed requirement of total smallholder farmers. There are many implications that were noticed from the farmer's feedback on quality, availability and supply of seeds that are as follows;

- Seed quality is low
- Different types of pods in the seed lot (varietal purity is sub-optimal)
- Quantity of seed supply is Inadequate
- Major seed supply is on old variety
- Seed supply is late
- Myth of using his own seed, yield less
- Majority of farmers depend on subsidized seed supply by Govt.
- Procure seed from unorganized markets to meet his requirement

In addition to the quality and supply constraints, There are some major constraints that could also affect the seed system such as;

- Frequent droughts and natural disasters
- Storage Problem, poverty and food insecurity
- Availability of new pest and disease resistant varieties
- Appropriate seed systems for continuous supply of good quality seed at reasonable price.

In order to strengthen the seed delivery system and address the major constraints related to seed security and then food security, interventions to strengthen the existing seed supply systems are required, primarily an alternative seed delivery mechanism and establishing village-based seed Enterprises. The alternate village based seed delivery models could enable sustainability of community seed systems in the dry land ecosystems as shown in Figure 1. The advantages of village seed systems are found as follows;

- There would not be any proprietary issues in multiplying public domain varieties
- Private seed companies' competition will be low as margins in producing open pollinated varieties (OPVs) are low when compared to hybrids
- Seed systems of farmers preferred traits as per their region suitability will be strengthened

To address the above issues and to strengthen the seed delivery system, in 2015, Andhra Pradesh State Government has taken an initiative for sustainability of seed systems of AP named as "Seed Production Program" Under Rythu Kosam Project. This program establishes a village-based seed Enterprises – a business model as an alternative seed delivery mechanism for present and future food and seed security. The objectives of the program are:

3.3.2. Objectives:

1. To improve seed availability and access to improved seed varieties to farmers at reasonable price in required quantity and supply on time.
2. To build capacity of stakeholders at the community and institution level to enhance sustainable seed production systems.
3. To institutionalize the whole process of seed production, storage and distribution on a sustainable seed supply mechanisms.

3.3.3. Approach

A seed consortium has been established under the chairmanship of commissioner of Agriculture on 9th June 2015, by the AP Government with a group of International and National research organisations, development and extension Government agencies and private companies. The formation of seed consortium model includes State Government organisations such as Department of Agriculture (DoA), APSSDC and APSSCA, State Agriculture Universities (ANGRAU), RARS, National and International Research Organisations (ICRISAT) and Non-Government organizations (NGOs). The Department of Agriculture (DoA) involves in the whole process in developing seed value chain and in liaising with the consortium partners.

3.3.4. Support from the AP Government

- Priority for supply of targeted varieties seed for pilot sites (DoA)
- Supply of Breeder/Foundation seed for seed production in pilot sites (ANGRAU/DoA)
- Seed certification by APSSCA
- Seed grading, packing and storage by DoA/APSSDC
- Seed Buy-back agreement by DoA/APSSDC
- Formation of FPO/MACS (NGO-Basixs
- Seed storage structures

3.3.5. The Implementation process

The implementation process is described as under (Figure 3.3.5.1);

1. State Agriculture Universities (ANGRAU, RARS), National and International research organisations (ICRISAT), all the members of the consortium will support the consortium with their developed and selected released varieties. The AP government, will bear 50% of the Breeder seed cost and the remaining seed cost will be paid by the farmers.
2. DoA supports the program by paying the transportation charges of seed from research stations to seed production villages in different districts.
3. ICRISAT identifies the progressive farmers in the village as per crop variety in all the pilot sites of districts.
4. The APSSDCL (AP State Seed Development Corporation) supports the program in paying farmers registration charges to the APSSCA (AP State Seed Certification Agency) on time and will be communicated to all APSSCA district Managers for the follow up.
5. ICRISAT promotes all agronomic practices that to be followed for the seed production with the help of ICRISAT staff, NGOs and DoA Staff.

6. APSSCA supports the program in registering fields of seed production farmers, monitoring their fields and certifying their production at the end of the season.
7. APSSDCL supports the program by buying the certified production from the farmers as per their guide lines. They will enter into buy-back agreement with farmers with a prefixed minimum price of seed procurement. This process will continue till the FPO take charge of the seed production and procurement as a business model.
8. The program starts with breeder seed and its produce (Foundation seed) will be brought back for further seed production until certified seed production by the system.

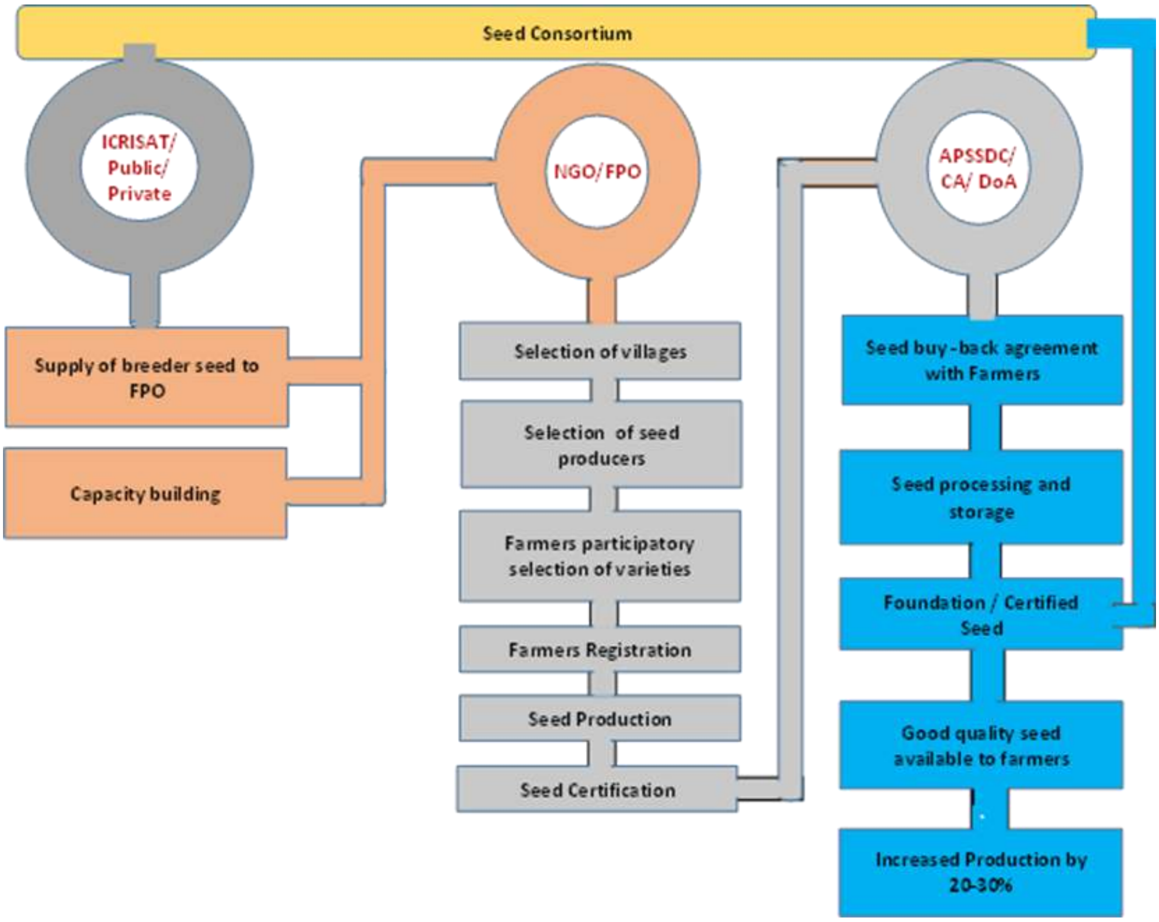


Figure 3.3.5.1. Conceptual diagram of Formal and Informal Seed Production System in AP.

3.3.6. Advantage of Village seed Enterprise

- Easy access and availability of improved varieties seed to farmers
- Achieve targeted suitable variety to the area
- Supply of quality seed at reasonable price
- Timely supply of required quantity of seed
- Reduce dependence on external seed sources
- Path to diffuse new varieties will be easy, once seed chain is established
- Decentralized seed production, storage and distribution
- Income generation activity at village level for the groups

3.3.7 Seed Production Program, *Kharif* 2015

ICRISAT has planned seed production in pilot sites of 13 Districts in AP, under Rythu Kosam Project, where ICRISAT has been demonstrating all the best and good interventions to the farmers in their fields. The major crops that have been selected for seed production during *Kharif* 2015 are groundnut in Rayalaseema region, Pigoenpea and Blackgram production in Guntur district. The program started with breeder seed supplied by different RARS such as groundnut from Kadiri research station, Pigoenpea and Blackgram from Guntur research station. We have covered nearly 117 farmers, in an extent of 178 ha and produced 190 tons of groundnut foundation seed in 4 districts of Rayalaseema region as given in Table 3.3.71. Similarly, we have covered 130 farmers to an extent of 107 ha and produced 172 tons of Pigoenpea foundation seed in Guntur district as given in Table 3.3.7.2. Also we have covered 36 farmers to an extent of 37 ha and produced 37 tons of blackgram foundation seed in the Guntur district as given in Table 3.3.7.3. The seed production details village wise and district wise have been in Table 3.3.7.4 to 3.3.7.8.

Table 3.3.7.1. Groundnut crop breeder to foundation seed production details during *Kharif* 2015.

District Name	Variety	No of Farmers	Area of Extent (ha)	Seed Distributed (kgs)	Production (tons)
Anantapur	Harithandra	41	28.4	4260	
Anantapur	K9	16	13.6	2040	
Total		57	42	6300	73.5
Chittoor	Dharani	3	1.6	180	
Chittoor	K9	5	1.8	240	
Total		8	3.4	420	8.5
Kadapa	K9	11	4.4	1310	
Total		11	4.4	1310	8.8
Kurnool	K9	15	13.2	1980	
Kurnool	KH	26	26.4	3930	
Total		41	39.6	5910	99
	Total	**117**	178.8	**13940**	**189.8**

Table 3.3.7.2. Pigoenpea crop breeder to foundation seed production details during *Kharif* 2015.

District Name	Variety	No of Farmers	Area of Extent (ha)	Seed Distributed (kgs)	Production (tons)
Guntur	LRG41 Lakshmi	62	56	560	70
Guntur	(ICPL85063)	68	51.2	512	102.4
Total		**130**	107.2	**1072**	**172.4**

Table 3.3.7.3. Blackgram crop breeder to foundation seed production details during *Kharif* 2015.

District Name	Variety	No of Farmers	Area of Extent (ha)	Seed Distributed (kgs)	Production (tons)
Guntur	PU 31	36	37	600	36.8

Table 3.3.7.4. Groundnut crop breeder seed area coverage and foundation seed production details during *Kharif* 2015 village wise in Anantapur district				
Name of the Mandal	**Village**	**Area under K9 (ha)**	**Area under Harithandra (ha)**	**Total area covered in the village (ha)**
Kothacheruvu	Appalollapalli		4.8	4.8
	Bandlapalli	8.2	0.4	8.6
Penukonda	Adudakalapalli	1		1
	Chandhragiri		1.6	1.6
	Duddebanda	0.8	7	7.8
	Gondipalli		4.8	4.8
	Gonipalli	0.8		0.8
	Gonipeta	0.6	2.2	2.8
	Kondampalli		0.4	0.4
	Kurubhavandla palli		0.8	0.8
	Munimadugu		1.6	1.6
	Penukonda		1.2	1.2
	Settipalli	1.2	1.8	3
	Venkatagiripalyam		1.8	1.8
Puttaparthi	Bramhanapalli	1		1
Grand Total		**13.6**	**28.4**	**42**

Table 3.3.7.5. Groundnut crop breeder seed area coverage and foundation seed production details during *Kharif* 2015 village wise in Chittoor district				
Name of the Mandal	**Village**	**Area under Dharani (ha)**	**Area under K9 (ha)**	**Total area covered in the village (ha)**
V.Kota	Anathapuram		0.4	0.4
	K.Nakkanapalle		0.8	0.8
	Kumbarlapalli		0.8	0.8
	Maddimakunapalli	0.4		0.4
	Ramanadhapuram		0.4	0.4
	T.Bandapalle	0.4		0.4
	Thimmarajupuram	0.4		0.4
Grand Total		**1.2**	**2.4**	**3.6**

Table 3.3.7.6. Pigoenpea and Blackgram breeder seed crop area coverage and foundation seed production details during *Kharif* 2015 village wise in Guntur district						
District	**Name of the Mandal**	**Name of the Village**	**Area under Lakshmi (ICPL85063) (ha)**	**Area under LRG41 (ha)**	**Ares under PU-31 (ha)**	**Total area covered in the village (ha)**
Guntur	**Mangalagiri**	Chinakakani			36.8	36.8
	Nuzendla	J C Nagar	2	3.2		5.2
		Ramudupalem thanda		20.8		20.8
		Ravvaram	39.6			39.6
	Vinukonda	Andugula Kothapalem	9.6	3.2		12.8
		Sivapuram		28.8		28.8
Grand Total			**51.2**	**56**	**36.8**	**144**

Table 3.3.7.7. Groundnut breeder seed crop area coverage and foundation seed production details during *Kharif* 2015, village wise in Kadapa district				
District	**Name of the Mandal**	**Name of the Village**	**Area under K9 (ha)**	**Total Area (ha)**
Kadapa	**Sambepalli**	Devapatla	1.6	1.6
		Shettypalli	2.8	2.8
Grand Total			**4.4**	**4.4**

Table 3.3.7.8. Groundnut breeder seed crop area coverage and foundation seed production details during *Kharif* 2015, village wise in Kurnool district					
District	**Mandal Name**	**Village Name**	**Area under K9 (ha)**	**Area under KH (ha)**	**Total Area (ha)**
Kurnool	**Devanakonda**	Bhiravanikunta		8.8	8.8
		Devanakonda	6	8.4	14.4
		K Venkatapuram		2	2
		Kukatikonda	4	1.4	5.4
		Nelathalamarri	2.6	0.6	3.2
		Singapuram	0.6	4.6	5.2
		Velamakur		0.4	0.4
Grand Total			**13.2**	**26.2**	**39.4**

3.3.8 Seed Production Program *Rabi*, 2015 -16

The seed production program has also been continued into *Rabi* 2015-16 with groundnut breeder seed supplied by Kadiri research station and Chickpea seed supplied by RARS Nandyal research station. We have covered nearly 196 farmers, to an extent of 112 hectares and produced 330 tons of groundnut foundation seed in 2 districts of Rayalaseema region (Chittoor and Kadapa) and 2 districts of coastal region (East Godavari and Nellore) as given in Table 3.3.8.1. Similarly, we covered 10 farmers to an extent of 8 ha and produced 10 tons of chickpea foundation seed in AP as given in Table 3.3.8.2. Details of breeder seed distributed and foundation produced district wise and variety wise during *Rabi* 2015-16 have been given clearly in Table 3.3.8.3 to 3.3.8.6.

Table 3.3.8.1. *Rabi* 2015-16 Groundnut crop seed production variety wise and district wise					
District	**Variety**	**No of farmers**	**Area of extent (ha)**	**Seed distributed in kgs**	**Production (tonnes)**
Chittoor	Dharani	96	46	8160	
	K6	48	28	8460	
	K9	5	8	1620	
	Harithandra	1	0.4	90	
Total		150	82.4	18330	247.2
East Godavari	K6	11	9.2	1400	
	K9	5	4	600	
Total		16	13.2	2000	33
Kadapa	Dharani	15	6.8	1700	
	K9	7	2.8	700	
Total		22	9.6	2400	24
Nellore	K6	8	6.8	17	
Total		8	6.8	17	25.5
Grand Total		**196**	112	**22747**	**329.7**

Table 3.3.8.1. *Rabi* 2015-16 Groundnut crop seed production variety wise and district wise					
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Chittoor	Dharani	96	46	8160	
	K6	48	28	8460	
	K9	5	8	1620	
	Harithandra	1	0.4	90	
Total		**150**	**82.4**	**18330**	**247.2**
East Godavari	K6	11	9.2	1400	
	K9	5	4	600	
Total		**16**	**13.2**	**2000**	**33**
Kadapa	Dharani	15	6.8	1700	
	K9	7	2.8	700	
Total		**22**	**9.6**	**2400**	**24**
Nellore	K6	8	6.8	17	
Total		**8**	**6.8**	**17**	**25.5**
Grand Total		**196**	**112**	**22747**	**329.7**

Table 3.3.8.2. *Rabi* 2015-16 Chickpea crop seed production in AP					
RARS Nandyal	**Supplied Quantity in quintals**	**Distributed Seed**	**Balance seed to be distributed 2016**	**Area covered (ha)**	**Production (tones)**
JG 11	17.3	2.5	*14.8*	3.2	4
Nbeg 3	7.5	2	*5.5*	2.4	3
KAK 2	9	2	*7*	2.4	3
Total	**33.8**		**27.3**	**8**	**10**

Table 3.3.8.3. Groundnut breeder seed crop area coverage and foundation seed production details during *Rabi* 2015-16, village wise in Chittoor district							
District	**Mandal Name**	**Village Name**	**Area under Dharani (ha)**	**Area under Haritandra (ha)**	**Area under K6 (ha)**	**Area under K9 (ha)**	**Total village Area covered (ha)**
Chittoor	**Bucginaidu Kandriga**	Alathuru			2		2
		Kanchanaputtur			4		4
		Katuru			2.2		2.2
	KVB Puram	Adaram			2.4		2.4
		MA Rajula Kandriga			7.2		7.2
	Mulakala Cheruvu	Gudupalli	2.4				2.4
		Tanakantivaripalli	2.8				2.8
	Nagalapuram	Nagalapuram		0.4	1.6		2
	Nagulapuram	Nagulapuram				5.6	5.6
	Narayanavanam	Narayanavanam				0.6	0.6
	Pichatur	Ramagiri	1.4				1.4
		Pichatur				1.2	1.2

Table 3.3.8.3. Groundnut breeder seed crop area coverage and foundation seed production details during *Rabi* 2015-16, village wise in Chittoor district							
District	**Mandal Name**	**Village Name**	**Area under Dharani (ha)**	**Area under Haritandra (ha)**	**Area under K6 (ha)**	**Area under K9 (ha)**	**Total village Area covered (ha)**
	PTM	Katnagalu	5.2				5.2
	Ramachan drapuram	Kotha Kandriga	0.4				0.4
		P.V.Puram	0.8				0.8
		Ravillavaripalli	0.4				0.4
		T.T.Kandriga	8				8
		Venkatramapuram	0.4				0.4
	Somala	Kammapalli	0.4			0.4	0.8
	Thottanbedu	Thatiparthi			8.8		8.8
	Vadamalapeta	Padiredu	19.16				19.16
		Padiredu AAW	3.2				3.2
		Padiredu H/W	1.2				1.2
Grand Total			**45.76**	**0.4**	**28.2**	**7.8**	**82.16**

Table 3.3.8.4. Groundnut breeder seed crop area coverage and foundation seed production details during *Rabi* 2015-16, village wise in East Godavari district.					
District	**Mandal Name**	**Village Name**	**Area under K6 (ha)**	**Area under K9 (ha)**	**Total Area covered in the village (ha)**
East Godavari	**Y Ramavaram**	Komaravaram	2.4		2.4
		Yarlagadda	6.92	4	10.92
Grand Total			**9.32**	**4**	**13.32**

Table 3.3.8.5. Groundnut breeder seed crop area coverage and foundation seed production details during *Rabi* 2015-16, village wise in Kadapa district.					
District	**Mandal Name**	**Village Name**	**Area under K9 (ha)**	**Area under Dharani (ha)**	**Total Area covered in the village (ha)**
Kadapa	**Sambepalli**	Devapatla	0.8	0.4	1.2
		Shettypalli	0.8	4	4.8
	Veeraballi	Matli	1.2	2.4	3.6
Grand Total			**2.8**	**6.8**	**9.6**

Table 3.3.8.6. Groundnut breeder seed crop area coverage and foundation seed production details during *Rabi* 2015-16, village wise in Nellore district.				
District	**Mandal Name**	**Village Name**	**Area under K6 (ha)**	**Area under village (ha)**
Nellore	**Chittamuru**	Aruru	6.7	6.7
		Ramatheerdham	0.2	0.2
Grand Total			**6.9**	**6.9**

3.4 Weather Monitoring and Climate Analysis

3.4.1. Background

It is impossible to tame the weather on a large scale, or even be in complete harmony with it. However, it is inevitable to make adjustments with the weather to extract maximum benefit from this resource. In this context, knowledge on agroclimatology of a region is a valuable tool in crop planning. In addition, weather abnormalities like cyclones, floods, droughts, hailstorms, frost, high winds and extreme temperature lead to natural disasters affecting agricultural productivity. Understanding of climatic conditions helps in devising suitable management practices for taking advantage of favourable weather conditions and avoiding or minimizing risks due to adverse weather.

Andhra Pradesh with thirteen districts falls under six agroclimatic zones and has five major soil types. About 19.5 lakh ha are under surface irrigation and about 15.5 lakh ha are under groundwater irrigation. Availability of irrigation water depends on the rainfall situation in the state as well in upper states like Telangana, Karnataka and Maharashtra. With the ever-increasing need for food in the State, maximizing agricultural production from both rainfed and irrigated areas in a sustainable manner has become most important. Agroclimatological methods can be used in efficient land use planning, determining suitable crops for a region, risk analysis of climatic hazards, profit calculations in farming; production forecasts and for adopting optimum farming methods and choice of farm machinery.

The rationale of this activity is in assessing the climate variability and change in AP and to enhance awareness on weather and climate among farming community to better crop planning and day-to-day crop management for enhancing crop productivity in a sustainable way.

3.4.2. Key Issues

Agricultural production in the state of Andhra Pradesh is at the mercy of monsoonal rains during the *kharif*season and cyclones / depressions during October-December which many times coincides with harvesting time. Weather and climate information at the micro-level is very much needed in crop planning as well as for day-to-day field operations.

Productivity of rainfed crops in Andhra Pradesh largely depends on both the temporal and spatial distribution of rains. A thorough understanding of the length of the crop growing period and its variability, occurrence of droughts and floods in the growing period at the micro and meso-scales is needed.

Past experience provides farmers with very broad information on rainfall, floods, droughts etc. Yet, for modern agriculture this is not enough. Farmers need to have proper knowledge of the prevailing agroclimatic conditions to derive maximum and sustained agricultural yield from watersheds. Weather forecasts and weather-based agro advisories targeted at micro-level are needed for real-time interventions for sustainable crop production.

During Southwest Monsoon 2015 period (June to September), the state received a rainfall of 522 mm as against the normal rainfall of 556 mm with a deviation of (-) 6 per cent, whereas

rainfall received during the previous year (2014) was 376 mm with a deviation of (-) 32 per cent for the corresponding period. The Government of Andhra Pradesh has declared 359 Mandals in 10 districts of the State as drought affected during the year 2015. Anantapur district topped the list with 63 Mandals followed by Prakasam (56), Chittoor (55), Kadapa (51), Kurnool (40), Nellore (33), Guntur (26) and Srikakulam (18), Krishna (14) and Vizianagaram (3) had been declared as drought affected during the current year. Thus the three districts, West Godavari, East Godavari and Visakhapatnam are not drought affected.
Key issues affecting sustainable agricultural production are;

- Large rainfall variation across districts; annual rainfall varies from 550 to 890 mm
- Rainfall uncertainties, dry spells and droughts
- Severe damage through floods, high winds (Cyclones)
- Decrease in winter rainfall - negative impacts on *Rabi*crops in rainfed areas
- Temperature fluctuations affecting *Rabi* crops
- Lack of intensive research on climate change assessment, impacts and adaptation strategies
- Non-availability of weather-based indices for various crops in different agroclimatic zones for crop insurance
- Less awareness among farmers on weather and climate
- Non-availability of weather-based agro advisories at Mandal level

3.4.3. Strategy

Long period historic climate data at Mandal level will be procured from the Directorate of Economics and Statistics, Government of AP. Normal daily climate data for the 13 districts on maximum temperature, minimum temperature, wind speed, relative humidity and cloud amount will also be collected from the India Meteorological Department. Climate variability at Mandal level will be assessed with respect to the major crops grown. To bring awareness on rainfall, dual-purpose raingauges and dataloggers with built-in temperature sensor will be installed at the pilot Mandals. Interactive lecture sessions in villages will be conducted in local language (Telugu) for bringing in weather and climate awareness among farming community. This activity will be enhanced by identifying two men and two women to become as Climate Managers in the village. Their capacity on climate and weather will be enhanced and they will be trained to take measurements of rainfall from the dual-purpose raingauges, documenting the rainfall data and displaying rainfall data on village boards. Village community will be encouraged to register for receiving freely the weather-based agro advisories being issued by ANGRAU at district-level for taking better crop management options.

3.4.4. Progress of climate activities

Understanding of climatic conditions helps in devising suitable management practices for taking advantage of favorable weather conditions and avoiding or minimizing risks due to adverse weather. Collection of historic climate data and agroclimatic analysis at Mandal level, installation of dual-type raingauges at pilot sites and enhancing awareness on climate variability and climate change among the village community are the activities planned for 2015-16.

3.4.4.1. Climate data collection and analyses

Long period historic rainfall data of the selected 38 Mandals was procured from the Directorate of Economics and Statistics, Government of AP. Details of daily rainfall data collected are presented in Table 3.4.4.1.1. Normal daily climate data for the 13 districts on maximum temperature, minimum temperature, wind speed, relative humidity and cloud amount was collected from the publication of the India Meteorological Department (District Normals, 2008).

Table 3.4.4.1.1. Details of Mandal level daily rainfall data collected*

District	Mandal	Period	No of Years
Anantapur	Penukonda	1984-2016	32
	Raptadu	1984-2016	32
	Kothacheruvu	1990-2016	26
Chittoor	Santhipuram	1991-2016	25
	Venkatagirikota	1988-2016	28
East Godavari	Gangavaram	1990-2016	26
	Thallarevu	1990-2016	26
	Yeleswaram	1997-2016	19
Guntur	Karlapalem	1996-2016	20
	Kollur	1997-2016	19
	Sattenapalle	1984-2016	32
	Thullur	1989-2016	27
Kadapa	Brahmamgarimatham	1990-2016	26
	Porumamilla	1991-2016	25
	Sambepalle	1989-2016	27
	Veeraballe	1990-2016	26
Krishna	G. Konduru	1989-2016	27
	Ghantasala	1989-2016	27
	Machilipatnam	1984-2016	32
Kurnool	Banaganapalle	1984-2016	32
	Devanakonda	1990-2016	26
Nellore	Indukurpet	1990-2016	26
	Podalakur	1984-2016	32
	Thotapalligudur	1990-2016	26
Prakasam	Kanigiri	1990-2016	26
	Konakanamitla	1989-2016	27
	Kothapatnam	1989-2016	27
	Ongole	1984-2016	32
Srikakulam	Polaki	1996-2016	20
	Ranastalam	1986-2016	30
	Seethampeta	1987-2016	29
Visakhapatnam	Butchayyapeta	1991-2016	25
	Chintapalle	1984-2016	32
	Padmanabham	1990-2016	26
Vizianagaram	Parvathipuram	1989-2016	27
	Pusapatirega	1989-2016	27
West Godavari	Akividu	1984-2016	32
	Kamavarapukota	1989-2016	27

*Data collected up to 31 March 2016

Daily rainfall data was quality checked for missing values and the gaps were filled using normal values or with the rainfall data for the same day from the neighboring and representative Mandal. Daily rainfall databases for the 38 Mandals were developed.

Daily normal climate databases were developed for the 13 districts for computing the daily reference crop evapotranspiration (ET_0). Modified Penman method as published in FAO Irrigation and Drainage Paper 56 (Allen et al., 1998) was used to estimate potential evapotranspiration or reference crop evapotranspiration. Computer program was developed for estimating the daily solar radiation from the daily cloudiness data and then the ET_0 for 13 districts. Daily normal ET_0 values were computed for the 38 Mandals depending on their geographical position and altitude. Plant extractable water for 38 Mandals was estimated from soil characteristics. Modified Thornthwaite and Mather method (1955) was used to compute daily water balances. Weekly water balances were computed from the daily water balances.

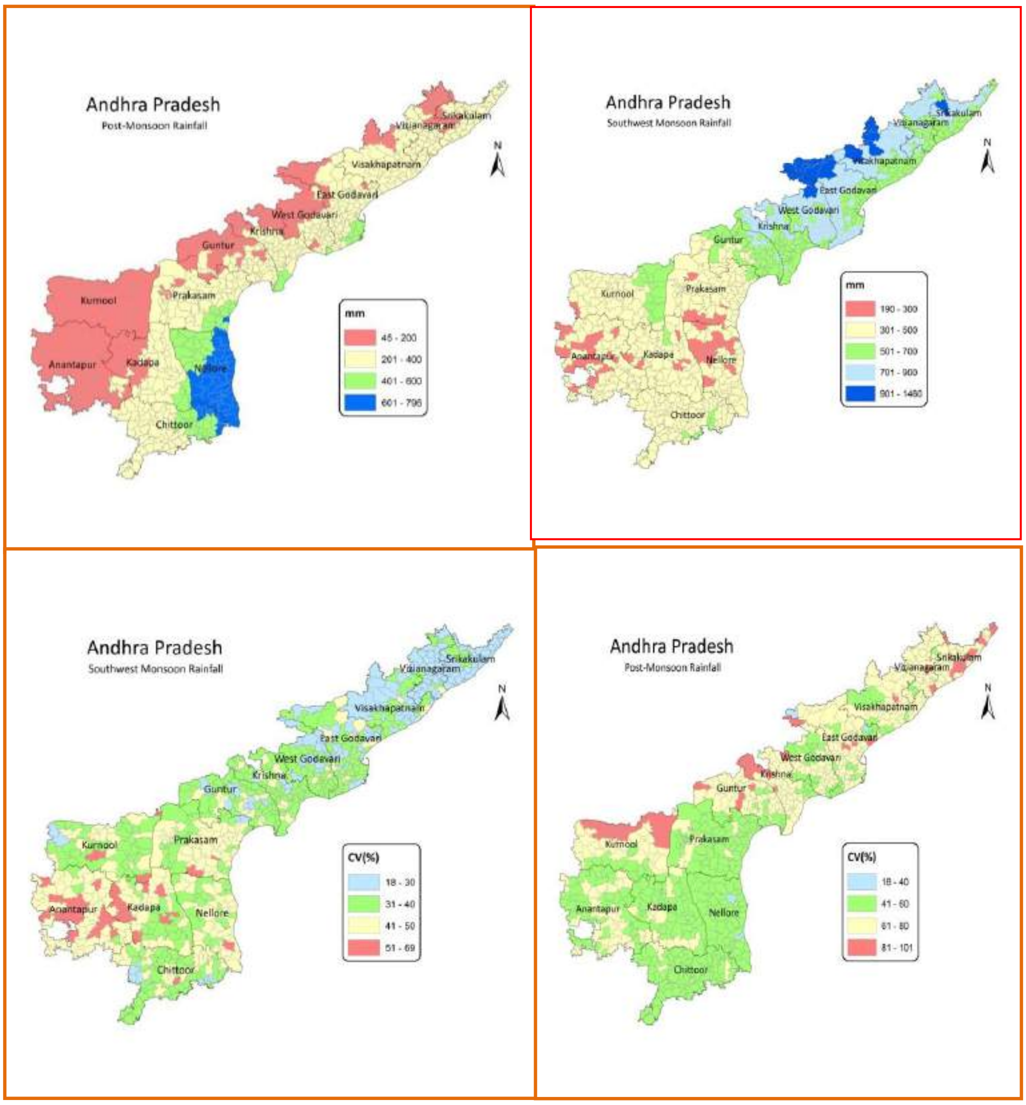


Figure 3.4.4.1.1. Rainfall distribution patter in Andhra Pradesh during 2015-16.

Rainfall probabilities, Length of growing period (LGP) and dry and wet spells during the crop growth period for Kurnool district were computed and similar analyses for the remaining 12 districts are under process.

Mandal level rainfall and coefficient of variation for two seasons viz., southwest monsoon (June-September) and post-monsoon (October-December) were computed and mapped (see Figure 3.4.4.1.1; Appendix 3a to 3m).

3.4.4.2. Rainfall monitoring

The Andhra Pradesh State Development Planning Society (APSDPS) have about 1188 AWS installed in AP and collects weather data on air temperature, humidity, wind speed & direction, rainfall and solar radiation regularly. In general, at least one AWS is available in a Mandal and thus it is planned to install raingauges at one representative pilot site in a district (Table 3.4.4.2.1). Aim is to enhance awareness on rainfall measurement and usage of rainfall data for crop management. Generally, rainfall is measured using a simple manual raingauge or a self-recording raingauge. Dual-type raingauge allows to manually measure rainfall and also to automatically record rainfall. The HOBO pendent logger also records air temperature using an inbuilt temperature sensor.

Table 3.4.4.2.1. Location of dual-purpose raingauges

District	Mandal	Village	Altitude (m)	APSDPS AWS	Status
Srikakulam	Polaki	Priyagraharam	15	Polaki	Completed
Vizianagaram	Parvathipuram	Dokiseela	180	Parvathipuram	Completed
Visakhapatnam	Chintapalle	Lammasingi	836	Chintapalle	Completed
East Godavari	Yeleswaram	Peravaram	51	Yeleswaram	Completed
West Godavari	Kamavarapukota	Ramannapalem	105	Kamavarapukota	Completed
Krishna	Ghantasala	Srikakulam	12	Ghantasala	Completed
Guntur	Sattenapalle	Panidem	61	Dhulipalla	Completed
Prakasam	Konakanamitla	Gotlagattu	165	Chinarikatla	Completed
Nellore	Podalakur	Kanuparthi	64	Not Available	Completed
Chittoor	Santhipuram	Vadagandlapalle	783	Santhipuram	Completed
Kadapa	Porumamilla	Venkataramapuram	165	Porumamilla	Completed
Kurnool	Devanakonda	Nallachelimala	484	Devanakonda	Completed
Anantapur	Raptadu	Raminepalli	373	Raptadu	Completed

Dual-type raingauges were procured, sites selected and raingauges installed. Fig 3.4.4.2.1 shows installations in some districts. Rainfall measurements commenced in all the thirteen locations. Farmers are trained to measure rainfall and document the data.

Dual-purpose raingauge installations and farmer awareness programmes on climate were given wide publicity by the local newspapers (Figure 3.4.4.2.2).

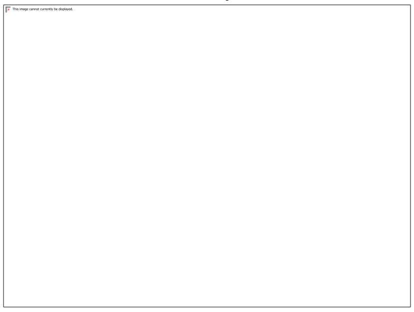
Chittoor 	Kadapa 
Srikakulam 	Kurnool 
Krishna 	Guntur 
Vizianagaram 	East Godavari 

Figure 3.4.4.2.1. Installation of raingauges under AP Rythu Kosam Project

Figure 3.4.4.2.2. Media coverage of activities

Results of the Mandal level agroclimatic analyses were simplified and translated for better understanding by the farming community. PowerPoint presentations on weather and climate in Telugu were made. Agroclimatic information is disseminated through wall writings and interactive lectures (Figure 3.44.2.3). Agroclimatic information in Telugu for Ghantasala Mandal is shown below:

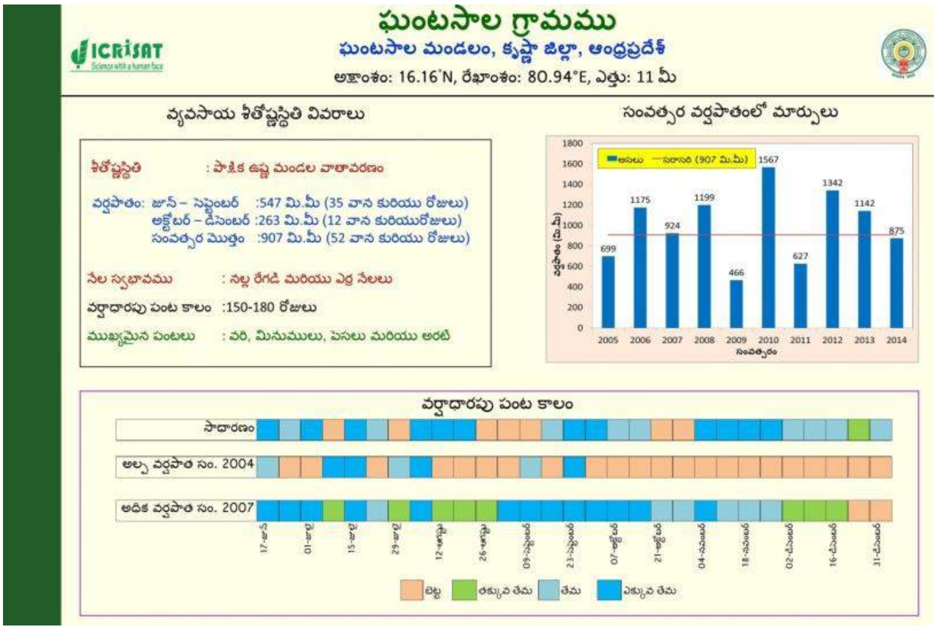


Figure 3.4.4.2.3. Wall writings in pilot villages

Interactive lectures will help the farming community to assess crops and sowing dates with reference to their agroclimate, better understanding of rainfall probabilities and benefits of rainfall measurements for crop management. Capacity building on weather and climate is an activity being taken up with partnership from ANGRAU, private sector and NGOs.

Historical weather and crop (area and production) data for all the Mandals in Rayalaseema were collected for a detailed agroclimatic analysis of Rayalaseema. Results of the analysis will help to identify climate change hot spots and mapping of potential production zones in Anantapur district. Data quality checking and database development are in progress.

3.4.4.3. Rainfall forecasts and monitoring

Numerical Weather Prediction Models-based district level weather forecasts for five-day period are being issued by the India Meteorological Department (IMD). The eight weather elements predicted are Rainfall (mm), Maximum Temperature (°C), Minimum Temperature (°C), Total Cloud Cover (Octa), Maximum Relative Humidity (%), Minimum Relative Humidity (%), Wind Speed (kmph) and Wind Direction (degrees). As rainfall is the most important weather element, rainfall forecasts for the districts are downloaded from the IMD. Daily rainfall data at district level and Mandal level are collected from the APSDPS. Daily rainfall received at the 38 pilot Mandals was accumulated pentad-wise (5-day cumulative). Rainfall forecast bulletins and Observed pentad rainfall bulletins were prepared and shared with the thirteen district coordinators and others. Information on district-wise actual and normal rainfall, deviation from normal and rainfall category (Excess or Normal or Deficient or Scanty) was also included in the Forecast bulletins. This information was useful for understanding the rainfall status of respective Mandals and districts and for planning various crop management practices. During the southwest monsoon (June-September) and post-monsoon (October-December) periods, 38 rainfall-forecast bulletins and 18 observed rainfall bulletins were prepared and shared. (Table 3.4.4.3.1; Figure 3.4.4.3.1).

Table 3.4.4.3.1. Rainfall bulletins prepared and shared during June-December 2015

Details	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Rainfall forecast bulletins	05 Jun	02 Jul	01 Aug	07 Sep	05 Oct	06 Nov	11 Dec
	08 Jun	10 Jul	06 Aug	15 Sep	12 Oct	12 Nov	
	11 Jun	14 Jul	11 Aug	18 Sep	16 Oct	16 Nov	
	15 Jun	17 Jul	18 Aug	21 Sep	26 Oct	20 Nov	
	29 Jun	20 Jul	25 Aug	29 Sep	30 Oct	24 Nov	
		21 Jul	31 Aug	30 Sep		27 Nov	
		24 Jul				30 Nov	
		27 Jul					
Total	5	8	6	6	5	7	1
Details	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Observed pentad rainfall bulletins		05 Jul	05 Aug	05 Sep	25 Oct	06 Nov	
		10 Jul	18 Aug	15 Sep		15 Nov	
		17 Jul	20 Aug	20 Sep			
		20 Jul	25 Aug	25 Sep			
		25 Jul	31 Aug	30 Sep			
Total	Nil	5	5	5	1	2	Nil

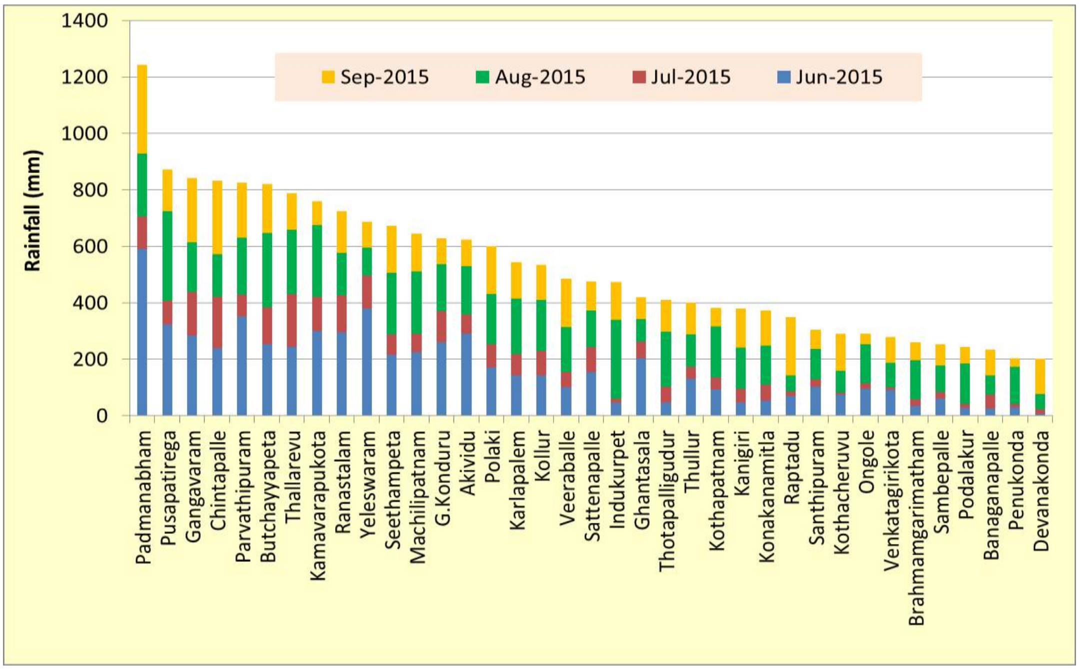


Figure 3.4.4.3.1. Month wise rain fall data in pilot sites

The pert chart of activities are presented in Table 3.4.4.3.2 & 3.4.4.3.3.

Table 3.4.4.3.2. PERT chart showing targets, achievements and timelines for climate activities 1 and 2			
Activity 1: Weather monitoring at pilot villages			
Monitoring Indicators for the activity	Raingauges installed at pilot sites and farmers measure and document rainfall		
Sub-Activity	**Target**	**Achievement**	**Remarks**
1. Selection of site for raingauge installation	Apr to May 2015	Completed	Target achieved
2. Installation of raingauge	Jun to Sep 2015	Installed in 13 districts	Target achieved
3. Training to farmers on rainfall measurement and data recording	Jun to Sep 2015	Completed in 13 districts	Target achieved
Activity 2: Climate analyses of pilot Mandals			
Monitoring Indicators for the activity	Climate databases and document on climate variability for all pilot Mandals are available		
Sub-Activity	**Target**	**Achievement**	**Remarks**
1. Collection of long-period climate data	Jul 2015 to Mar 2016	Daily rainfall data of 38 Mandals for varying periods from 1984 to 2016 collected, quality checked; daily normal climatic data for all 13 districts collected and databases developed	Target achieved
2. Water balance and LGP analyses	Sep 2015 to Mar 2016	Software for computing water balance developed and water balances for all 38 pilot Mandals completed. LGP analyses is under progress	Target achieved for water balance Activity is in progress for LGP
3. Climate variability assessment	Nov 2015 to Mar 2016	Mandal level rainfall for two seasons computed, variability studied and maps prepared	Target achieved

Table 3.4.4.3.3. PERT chart showing targets, achievements and timelines for climate activities 3 and 4.			
Activity 3: Capacity building on climate			
Monitoring Indicators for the activity	Climate wall writings are in place and capacity building activities completed		
Sub-Activity	**Target**	**Achievement**	**Remarks**
1. Preparation of climate wall writings	Jul to Sep 2015	Wall writings in Telugu on agroclimatic details of the pilot sites are ready for 13 districts	Target achieved
2. Displaying climate wall writings at pilot villages	Sep to Oct 2015	Displaying of climate wall writings	Activity is in progress
3. Preparation of presentation on weather and climate	Sep to Oct 2015	PowerPoint presentations in Telugu on climate are ready for 13 districts	Target achieved
4. Capacity building on weather and climate	Oct 2015 to Mar 2016	Capacity building is in progress	Activity is in progress
Activity 4: Agroclimatic characterization of Rayalaseema			
Monitoring Indicators for the activity	**Climate databases and document on climate variability for all pilot Mandals are available**		
Sub-Activity	**Target**	**Achievement**	**Remarks**
1. Collection of Long-period climate and crop data for all Mandals in Rayalaseema	Apr to Dec 2015	Daily rainfall data of 234 Mandals in Rayalaseema collected. Quality checking completed. Crop acreage data collected from DES	Target achieved
2. Identify climate change hot spots in Rayalaseema	Jan to Mar 2016	Climate analyses software developed, test datasets prepared.	Activity is in progress

3.4.4.4. What is new?

- Micro-level agroclimatic assessment for better crop planning
- Rainfall monitoring and documentation by farmers
- Two men and two women climate managers at pilot sites

3.4.4.5. Expected benefits:

- Farmers monitor rainfall and appreciate the use of rainfall data in crop management
- Agroclimatic databases at Mandal level are available
- Better understanding of agroclimates of pilot Mandals for crop planning
- Farmers have increased information and knowledge on climate, water availability and LGP of their locations

- Climate change hot spots in Rayalaseema identified
- Enhanced knowledge on spatial variation in groundnut productivity in Anantapur district

3.5. *In-situ* Soil and Water Conservation

Required farm implement "Tropicultors" have been provided and training on the use of implement and BBF system has been imparted to the farmers (Table 3.5.1; Figure 3.5.1). Broad Bed Furrow (BBF) and conservation furrow system of *in-situ* moisture conservation practice has been adopted in dryland crops.

Table 3.5.1. Details of Tropicultors (BBF making cum seed drill) provided in pilot districts of Rythu Kosam project 2015.

Districts	No. of Tropicultors provided	No. of trainings conducted	No. of participants	Area covered (ha)	
				BBF	Conservation furrow system
Anantapur	1	3	38	4	20
Kurnool	2	8	81	15	150
East Godavari	2	6	48	4	In process
Vizianagaram	2	8	46	1	In process
Chittoor	1	2	18	2	In process
West Godavari	1	2	21	2	In process
Prakasam	1	3	42	3	50

Figure 3.5.1.Groundnut sowing operation on BBF, East Godavari.

3.6. Improved Crop Varieties & Diversification

See Table 3.6.1; figure 3.6.1 below;

Table 3.6.1. Details of crop diversification in pilot districts of Rythu Kosam project 2015.

District	Traditional crop details (ha)	Diversified scenario		
		Change in traditional crop area (ha)	Diversified crop 1 (ha)	Diversified crop 2 (ha)
Kurnool	Cotton & Paddy-750	675	Castor (50)	G. nut + P.pea (25)
	Cotton & Paddy-800	750	Sorghum + Pigeonpea (50)	-
	Cotton & Paddy-800	750	Sorghum + Pigeon pea (50)	-
Kadapa	Paddy-~450 ha, Pearl millet – ~300 ha, cotton-~150 ha	Paddy-~450 ha, Pearl millet – ~300 ha, cotton-~150 ha	Pigeonpea (12)	-
East Godavari	3000 ha (cotton and Tapioca)	2000 ha cashewnut; 1000 (cotton, Tapioca and veges)	Pigeonpea (4 ha)	Groundnut – 2 ha
	4500 ha: 2000 ha paddy; 1000 ha horticulture; 1000 ha Sugar cane: - 1000(cotton and Tapioca)	4500 ha	Pigeonpea (8 ha)	Groundnut – 2 ha
Krishna	280	180	Pigeon pea (25)	Pigeon pea intercrop in Cotton 10 ha
	1000	900	Pigeon pea on field bunds in Paddy (25)	-
Nellore	Greengram & Blackgram	67	Greengram (100)	Blackgram (100)
		162	Greengram (100)	Blackgram (200)
		251	Greengram (200)	Blackgram (250)
		40	Greengram (100)	Blackgram (150)
	Paddy/ fallow	1353	Maize (50)	-
		1172	Maize (50)	
		706	Maize (50)	
		808	Maize (50)	
		775	Maize (20)	
		832	Maize (50)	

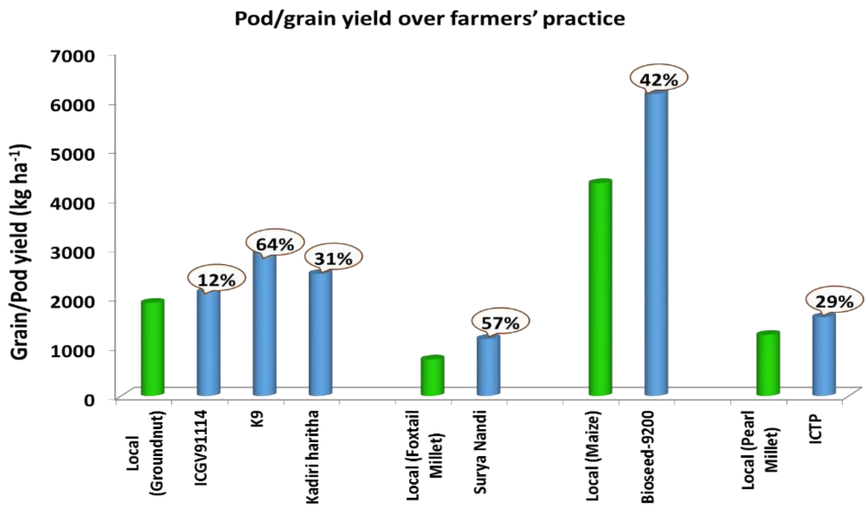


Figure 3.6.1. Crop yields with improved varieties vs local varieties

3.7. Nutri School and Kitchen Gardens

See Table 3.7.1, 3.7.2 and figure 3.7.1 below;

Table 3.7.1. Vegetables seeds supplied for Nutri-School and kitchen gardens in all 13 districts.

S. No.	Crop	Variety	Seed rate (Kg/ha)	Seed rate (g/10 m^2)	Quantity for each district (g)	Recommended spacing
1	Tomato	S 22	0.5	0.5	50	60 x 45 cm
2	Brinjal	Green Round	0.65	0.65	50	50 x 50 cm
3	Cluster beans	Sonali	30	30	500	60 x 15 cm
4	Bhendi	Bhindi No. 10 (Hybrid)	10	10	250	60 x 20 cm
5	Bottle gourd	Gutkha	5	5	50	3 x 0.75-0.9 m
6	Bitter gourd	Green Long	5	5	50	1-2 x 0.6-0.9 m
7	Ridge gourd	Jaipur Long	5	5	50	1-2 x 0.6-0.9 m
8	Spinach (Palak)	All green	30	30	1000	30 x 2.5 cm
9	Amaranthus	Special	2	2	150	20 x 2.5 cm

Table 3.7.2. Progress of Nutri-School and kitchen gardens in all 13 districts.

Name of the district	Number of units* promoted	Number of Beneficiaries**
East Godavari	100	100
Srikakulam	99	99
Kadapa	75	75
Nellore	50	50
Vijayanagaram	35	35
Kurnool	31	31
Visakhapatnam	30	30
West Godavari	30	30
Guntur	25	25
Prakasam	22	22
Chittoor	21	21
Krishna	20	20
Anantapur	17	17
Total	555	555

* Each unit consists of all the 9 vegetable crops listed for ~10 m^2 area

** Beneficiaries includes only women and school children

Figure 3.7.1 Progress of kitchen gardens in pilot sites of Kurnool district.

3.8. Integrated Pest Management

See Table 3.8.1 below;

Table 3.8.1. Progress of IPM activities in all 13 pilot districts.

Output	**Activity**	**Status**
Cropping systems and the constraints of the target villages identified	Planning meeting with clients	After through discussions with the collaborators potential cropping systems and the crops have been decided.
Effective economical and eco-friendly IPM packages for key crops developed	Integration, Evaluation and sharing of IPM in the targeted region	IPM strategies for key pests of important crops of have been assembled and the finalization is in progress with various partners. After incorporating the suggestions from Various partners these IPM packages will be finalized and shared with various pilot sites.
Farmers in target areas are well trained with the latest technologies	Capacity building	Since this is an ongoing activity, specific crop bound IPM strategies will be taken up during September/ October.
Assessing pest populations and prevalence through monitoring	Set up of pheromone traps	Pheromone traps have been given to monitor Helicoverpa armigera and Spodoptera litura pests in all pilot site villages of 13 districts covering 260 villages. Helicoverpa traps- 520 traps + 1560 lures Spodoptera traps- 520 traps + 1560 lures

3.9. Postharvest

3.9.1 Back ground

The Hon'ble Chief Minister Sri N Chandrababu Naidu has committed to transform the Primary Sector under his leadership and has set the aspirational goal of making Andhra Pradesh as one of the three top leading states in India through Swarnandhra Vision by 2029. The objectives of 'Rythu Kosam' are (a) increasing productivity of the primary sector; (b) mitigating the impact of droughts through water conservation and micro-irrigation; (c) postharvest management to reduce wastage; and (d) establishment of processing, value addition capacity and supply chain of the identified crops.

3.9.2 Postharvest losses in AP

It has been estimated that 20-60% of all produce is lost between production and consumption. Postharvest losses are higher in perishable fresh produce at the production and distribution side in India while in developed nations losses are high at the consumer's end. Post-harvest waste management and processing of agricultural produce through value addition is an emerging area of interest for mechanized operations. Markets for value-added and processed commodities are consistently increasing with increasing demands by consumers of these products. Low-cost improved technologies are required to unleash potential and market efficiency to remain competitive. New opportunities have emerged with the opening of the trade, therefore, issues related to sanitary and phyto-sanitary measures would need to be addressed appropriately. Overall, about one third of agricultural crops produced are never consumed by humans as the produce move from production site to the consumers in the supply chain.

Both quantitative and qualitative losses occur in agriculture and horticulture commodities between harvest and consumption. Qualitative losses, such as loss in edibility, nutritional quality, caloric value, and consumer acceptability of fresh produce, are much more difficult to assess than are quantitative losses. Quality standards, consumer preferences and purchasing power vary greatly across districts with diverse cultures, and these differences influence marketability and the magnitude of postharvest losses. Reduction of post-harvest losses can increase food availability to the growing population, decrease the area needed for production, and conserve natural resources. Reducing postharvest wastage through value addition and processing directly reduce wastages in primary sector. Hence the need for this critical intervention in the 'Rythu Kosam' project.

Postharvest interventions occur at two stages: a) Primary intervention (at farm gate) and b) Secondary intervention (away from farm). There are 187 Agriculture Produce Market Committees (APMC), 40 regulated wholesale market yards, 25 regulated wholesale sub market yards along with 94 rural primary markets. There are 80 rythu bazaars (23 permanent and 57 semi-permanent) with no cold storage facilities. State Ware House Corporation has 94 warehouses (12.57 Lacs MT), 24 Central Ware House Corporation warehouse (7.44 lacs MT) in agriculture sector. There are 201 cold storages (13.06 lacs MT), 79 ripening chambers (2054 MT), 48 mango processing units (6000 MT), 61 cashew processing units (671 MT) in horticulture sector. There are 106 cattle shandies, 7 livestock markets, 85 slaughter houses and 7 cattle fairs in livestock sector. There are 4 fishing harbours, 349 fish landing centres, 29,195 fishing boats, 32 boat yards, 148 ice factories (5000 MT), 29 cold storage (25000 MT), 31 curing yards and 38 peeling sheds with 56 fish processing centres (2250 MT per day) in fisheries sector (Bureau of Economics and Statistics, 2014). Presently there are 3413 registered food processing units, However the storage infrastructure is insufficient to meet the production levels to enable farmers to market their produce to distant markets. Storage structures are key enablers to add value to postharvest produce by reducing wastage by keeping quality produce for longer duration which impacts transport and distribution to distant markets.

3.9.3. Objectives

There are two main objectives of applying postharvest technology to harvested fruit and vegetables and aqua namely:

1) To maintain quality (appearance, texture, flavor and nutritive value) and to protect food safety and
2) To reduce losses (both physical and in market value) between harvest and consumption.

Effective management during the postharvest period, rather than the level of sophistication of any given technology, is the key in reaching the desired objectives.

3.9.4. Key activities

There are many interacting steps involved in postharvest system. Produce is handled by many different people and transported and stored repeatedly in-between harvest and consumption. There are general series of steps in postharvest handling systems that are often followed like

- Harvesting and preparation for market
- Curing root, tuber and bulb crops
- Packinghouse operations
- Packing and packaging materials
- Decay and insect control
- Temperature and relative humidity control
- Storage of horticultural crops
- Transportation of horticultural crops
- Handling at destination
- Processing and value addition, eg: solar drying of vegetables, fruit and fishes

3.9.5. Strategy/ Methodology

The district coordinators identified 5 major commodities where postharvest wastes are high in the pilot areas of 13 districts under Rythu Kosam. Participatory approaches will be used to identify the need and capture the expectations of farmers under this activity. A data acquisition sheet was used to identify and select products for solar drying intervention and for finalizing districts. An action plan to reduce postharvest wastage was formulated on a need basis by partnering with resource organizations and all the stakeholders. PPP model will be tried where possible with clear outputs. It was necessary to train the farmers in the key activity’s mentioned in the above section and acknowledge the role played by NGO partners in Rythu Kosam.

Participatory approach has enabled involvement of farmers and also increase their ownership in the intervention. Postharvest activities are expected to reduce wastage by over 20%. Building the skills of the farmers through capacity building activity will lead to improved practices that will significantly enhance the quality of commodities. Returns to the farmers can be increased to the extent of 20%.

3.9.6. Solar dryer technology piloted by ICRISAT

Science for Society Technological Services, Mumbai (2015) developed a technology of Solar Conduction Dryer (SDC), based on conduction as major mode of heat transfer, which gives better efficiency, reduces processing time by 40% and costs INR 7500 /m2 (50% saving) approx., reducing capital cost considerably. The main features of the dryer are:

- The information in brochure at the end of this note is about basic unit of Solar Conduction Dryer (SCD) with 4 trays and capacity of 12-14 Kg. Size of the dryer is 2 meter X 2 meter (4 m^2 drying area). It costs around Rs. 35,000/-.
- The capacity could be increased by increasing the drying area i.e. by increasing number of trays. Thus we can customize the capacity of the dryer as per the customer requirement.
- This technology has been tried on over 20 varieties of vegetables and sprouts, 15 varieties of seasonal fruits and some varieties of fishes, shrimps in the dryer.
- SCD's can be operated in Centralized and De-centralized model as per our requirement. Its a portable system and can uninstall and Install in just 30 Minutes. It weighs about 40 Kg so that easily transported by two persons.
- The technology is recognized as leading sustainable technology by UNESCO, UN-Environment Programme, University of Texas (USA), USAID, UNDP etc. Since last one year 650 SCD's are already installed in India (600) and Kenya (50).

SCD technology works completely on Solar Thermal Energy thus the operating cost is literally ZERO. Also as there is no electronic component or moving part in the Solar Conduction Dryer (SCD), there is no need of any maintenance per se. In SCD a polycarbonate multiwall sheet is used, which itself is a tough material with 15 years life. Apart from that this multiwall sheet provides insulation and blocks 100% UV rays which gives dehydrated produce a better color and nutrition. As it is a natural draft technology so the drying is done in between 50-60 Degree Centigrade. The body of SCD is in SS 302 and Trays are Food Grade Powder Coated so that it meets all the criteria for food processing.

Science for Society is being invited under the PPP model to demonstrate by installing solar driers in 5 pilot areas under Rythu kosam project. List of pilot areas have been identified with targeted beneficiaries in 2015-16 were exposed through result demonstrations on fruit/ vegetable/ aquaculture products (Table 3.9.6.1). These targets were monitored and feed back on scaling up is expected in the due course of implementation of the solar dryers from respective districts.

Table 3.9.6.1. Identified districts and the targeted farmers' in pilot villages of AP					
S. No.	**District**	**Coordinator**	**Postharvest Management**		
			Target farmer	**Veg /Fruit/ Fisheries**	**Location of Solar dryer**
1	Chittoor	Narasimha Rao	50 Farmers	for tomato and other vegetables	Mohana Krishana Project Officer Integrated Rural Development Society (IRDS) D.NO: 3-1170; Brahmana Street Opposite Old post office V.Kota, village V. Kota, Mandal Chittoor District Email: irdswcc@gmail.com
2	East Godavari	Rajesh Nune	50 Farmers in Horticulture	**Vegetables**	Ms. S .Sarala (Agriculture Officer) MPDO Office, Near PHC, Old Gangavaram village Gangavaram Mandal (Agency)- 533284 East Godavari District, Andhra Pradesh
					Charlagirigala village, Porumamila mandal, Kadapa district, Andhra Pradesh. Pin 516505.
3	Vizianagaram	Sachin M	50 farmers in Horticulture	Vegetables/ fisheries/prawns	**Mr Appala Naidu** Sneha NGO; Perapuram Village and Post Pasupathirega mandal Vizianagaram District – 535204
4	Guntur	G Pardhasaradhi	50 farmers in Horticulture	Fisheries, Chilly and Turmeric	**Anantha Lakshmi** c/o Roosevelt Babu D.No.13-1-9/B, 60 Feet Road,Prakashnagar Near RTC Bus stop NARASARAOPET GUNTUR DISTRICT
5	Visakhapatnam	KH Anantha	50 farmers in Chintapalli Mandal	Ginger, Amla, NTF produces	**Mr. P. Viswanadham** Director, VIKASA Administrative Office: MIG - 33, Simhapuri Layout, Vepagunta Post, Visakhapatnam, PIN- 530047

3.9.7. District wise Outputs

3.9.7.1. Chittoor

There was a good response from Chittoor district when the solar dryer was used for over 44 demonstrations conducted in the pilot villages of V.Kota and Santipuram mandals. More than 453 farmers were exposed to the demonstration of solar dryer in the pilot villages of ICRISAT in Chittoor district. Size of cut vegetables determined the time taken for sunshine hours for exposure. As the total number of hours of exposure was less than 6 hours, there was no significant difference in time taken for drying up of vegetables and fruit (data not shown).

The average rise in value addition for all solar dried commodities is 117% of the initial procurement cost of the commodities (Table 3.9.7.1.1). Tomato was the major commodity with highest number (283) of farmers exposed to demonstrations of solar drying of the product Results from the demonstration indicate that the % of increase in value addition is highest for mango fruit to the extent of 150% over the initial cost of fresh mango. There was more interest when potato was used during demonstrations as farmer's could readily taste potato as chips. Other commodities included banana, curry leaf and bitter gourd. Visitors during demonstrations include scientist's from ANGRAUs Regional Agricultural Research Station, Tirupati, KVK, NGOs in Chittoor district.

Table 3.9.7.1.1. Value addition of commodities using solar drying in Chittoor district

Commodity	Initial cost of product (Rs)	Estimated final cost after drying (Rs)	% increase in value addition	Farmers
Tomato	47	95	102	283
Mango	50	125	150	20
Potato	60	109	90	76
Bhendi	18	34	112	37
Others	20	42	130	37
			117	**453**

3.9.7.2. Visakhapatanam

The pilot villages covered were located in Paderu, G,K. Veedhi and Chintapalli mandals in visakhapatanam district. The total number of demonstrations in the district was 17 encompassing various commodities like Coffee, Pepper, turmeric, ginger and fishes to over 175 farmers (Table 3.9.7.2.1).

There is a huge potential in the case of Amla which gives over 200% increase in value addition as fresh commodity takes only 3 to 4 days to dry and retains golden yellow colour of the pericarp. This product is graded higher when compared with conventional drying where browning and darkening is common. Amlacur is sold at higher price in local markets. Value addition of ginger has been highest with an increase of 150% of the original value of the fresh produce. The time to dry the product also dramatically decreased from 21 days (without dryer) to about 7 days by using the dryer. Likewise for turmeric the number of days to process the rhizome through drying using solar dryer was only 6 days instead to the usual

3 weeks time taken for drying under traditional methods. It takes approximately 15 days for pepper to dry completely, however when solar dryer was used the time for drying came down to 2 days. Moreover the product was clean and uniform shape which is desirable for trading due to high grade. High value was realized for drying of fishes that would taken a month using traditional methods, this was significantly reduced to only one third of the time as fish dried up within 9-10 days. The Asst. Director of the district fisheries department was appreciative of the efforts and witnessed the demonstrations conducted in ICRISAT pilot villages. The quality and hygiene of dried fish using solar dryer was superior as farmer's were happy with the color and clean fish. However, it was observed that mucous layer formed over the solar dryer panel where the product was laid; the possible way to overcome this was by rubbing surface of the panel with vegetable oil. This will be tried in the coming days.

Table 3.9.7.2.1. Value addition of commodities using solar drying in Visakhapatanam district

Commodity	Initial cost of product (Rs)	Estimated final cost after drying (Rs)	% increase in value addition	Farmers
Coffee	160	368	130	23
Pepper	80	300	275	20
Turmeric	130	200	53	15
Ginger	120	300	150	14
Fishes	240	380	58	28
Amla	40	120	200	75
			144	**175**

3.9.7.3. *Vizianagaram*

Solar dryer was used for demonstrations in Pusapatirega pilot mandal in vizianagaram district. Over 216 farmer's witnessed the demonstrations conducted in the pilot villages of ICRISAT. Cashew nut is the main commodity that took advantage of solar drying as results indicate over 130 % increase in value addition (Table 3.9.7.3.1). The drying time for fishes was reduced to one third of the time it took by traditional method. It was demonstrated that the clean product of fish earned higher value in the local market as appearance of dry fish was better than the traditional drying method. Other commodities included cluster bean, bhendi and mango.

Table 3.9.7.3.1. Value addition of commodities using solar drying in Vizianagaram district

Commodity	Initial cost of product (Rs)	Estimated final cost after drying (Rs)	% increase in value addition	Farmers
Tomato	75	131	82	60
Cashewnut	50	115	130	56
Fishes	280	640	128	35
others	150	225	50	65
			98	**216**

3.9.7.4. Guntur

Solar dryer was used to demonstrate postharvest losses in the pilot mandals of Narsaraopet, Chilakaluripet, Kollur and sattenapalli mandals in Guntur district. More than 41 demonstrations involving 65 farmers were conducted using tomato, potato, curryleaf, okra and bitter gourd (Table 3.9.7.4.1).

Potato seems to derive the highest value addition through drying as chips are famous even in villages. There is scope to demonstrate solar dryer to fisheries and prawn in Guntur district which will be tried in the coming season.

Table 3.9.7.4.1. Value addition ozf commodities using solar drying in Guntur district

Commodity	Initial cost of product (Rs)	Estimated final cost after drying (Rs)	% increase in value addition	Farmers
Tomato	60	110	83	25
Potato	45	120	167	22
Curryleaf	30	50	67	13
Okra	70	125	79	5
			99	**65**

3.9.7.5. East Godawari

More than 70 demonstrations were carried out on multiple number of commodities like tapioca, tamarind, black gram, red gram and minor commodities like coconut, chilli, Rice, Bengal gram, barley and sago rice. These demonstrations were carried out in Gangavaram mandal reaching out to 410 farmers (Table 3.9.7.5.1). There is an increase of 131% in value addition from all the commodities in the district. The sun shine hours for these products was less than a day and the major contribution and value addition was for maintenance of clean and hygienic commodity after drying. Tapioka had the highest value addition in terms of increase over the commodity after solar drying to the extent of 433 %.

Table 3.9.7.5.1. Value addition of commodities using solar drying in East Godawari district

Commodity	Initial cost of product (Rs)	Estimated final cost after drying (Rs)	% increase in value addition	Farmers
Tapioka	15	80	433	250
Tamarind	35	50	43	50
Black gram	100	120	20	50
Red gram	70	90	29	60
			131	**410**

3.9.8. Outcome

We have successfully demonstrated solar dryer in 5 pilot districts of Andhra Pradesh. The over all value addition for all commodities combined is 119 % over the fresh commodity price. When compared to a target of 250 farmers, significantly higher number of farmers (1319) witnessed demonstration across all the commodities. Chittoor stands out in the number of farmer's (453) who were exposed to the demonstrations, followed by E. Godawari district.

Commodities varied from one district to the other and only few commodities like tomato potato and fishes appeared in more than one district as a major solar dried product. In commodities like turmeric, ginger, fish and amla it was demonstrated that the time to dry was reduced by 60 to 70% when compared to traditional methods. Improvement in quality of the dried product was very high especially like retaining colour in amla or in clean dry fish that enhanced market price when solar dryer was used. Reduction of postharvest wastage to the extent of 20% can be expected; moreover increase in the revenues of farmers is expected through use of solar dryer technology under 'Rythu Kosam'.
Photographs of demonstrations among farmer's and SHG women along with media clippings are presented as under (Figure 3.9.8.1 to 3.9.8.4);


రైతుల నష్టాలకు చెక్
అందుబాటులో సోలార్ డ్రయ్యర్లు
సోలార్ డ్రయ్యర్లతో నష్టాలకు చెక్
రైతులకు, జాలర్లకు పరికరాలు అందుబాటులో ఉంచిన ఇక్రిశాట్

Figure 3.9.8.1. Newspaper clippings – Left Sakshi (14.1.16); Right: Prajasakti news paper (3.3.16)

Figure 3.9.8.2. Left: Trainig of solar dryer by Mr. Ashwin Pawade, Science for Society in V.Kota, Chittoor dist; Right: Solar drying of vegetables in Santipuram mandal, Chittor district

Figure 3.9.8.3. Left: Women SHG members participating in solar drying of vegetables in Narsaraopet, Guntur district; Right: Farmer's and SHG women partaking at Vempadam village, Vizianagaram district

Figure 3.9.8.4. Left: Fishermen and women using solar dryer in Barripeta, Vizianagaram district; Right: Drying of unpeeled coffee grains and tender pepper at GK veedhi mandal - Visakapatnam

3.9.9. Scaling up

Farmers take time to get used to new technologies like solar dryers, it is envisaged that in the coming months all the rest of the 8 districts will be covered with demonstration sites in pilot areas. The response of farmer's in the five pilot districts of Chittor, Guntur, Visakhapatanam, Vizianagaram, E. Godwari.

The actual success can only be rated when farmer's/ SHGs show interest in investing into these technologies. However, due to the high initial cost, intense labour for cutting the commodities, there is potential for SHGs/ farmer interest groups and other community based organisations to take up solar drying in a big way in AP. There is a net benefit of increased incomes to farmers by adopting solar dryer technology. Being Zero energy consuming methodology, this solar dryer has potential for upscaling under Rythu Kosam project.

3.10. Farmer Producer Organizations (FPOs)

3.10.1. Background

Department of Agriculture and Cooperation (DAC), Ministry of Agriculture, Government of India launched a pilot program for promoting member-based Farmer Producer Organisations (FPOs) during 2011-12, in partnership with state governments, which was implemented through the Small Farmers' Agribusiness Consortium (SFAC). Andhra Pradesh government is interested in promoting FPOs in Rythu kosam as a possible mechanism to intervene at the farmer's level to aggregate the produce and increase the collective incomes of the farming community in agriculture, horticulture, fisheries and dairy sectors.

3.10.2. Why FPOs

Collectivization of producers, especially small and marginal farmers, into producer organizations has emerged as one of the most effective pathways to address the many challenges of agriculture but most importantly, improved access to investments, technology and inputs and markets. Department of Agriculture and Cooperation, Ministry of Agriculture, Govt. of India has identified farmer producer organization registered under the special provisions of the Companies Act, 1956 as the most appropriate institutional form around which to mobilize farmers and build their capacity to collectively leverage their production and marketing strength.

3.10.3. FPO process

Mobilizing farmers into groups of between 15-20 members at the village level (called Farmer Interest Groups or FIGs) and building up their associations to an appropriate federating point i.e. Farmer Producer Organisations (FPOs) so as to plan and implement product-specific cluster/commercial crop cycles.

- Strengthening farmer capacity through agricultural best practices for enhanced productivity.
- Ensuring access to and usage of quality inputs and services for intensive agriculture production and enhancing cluster competitiveness.
- Facilitating access to fair and remunerative markets including linking of producer groups to marketing opportunities through market aggregators.

3.10.4. Services provided

The set of services include Financial, Business and Welfare services. An indicative list of services includes:

a) Financial Services: The FPO will provide loans for crops, purchase of tractors, pump sets, construction of wells, laying of pipelines.
b) Input Supply Services: The FPO will provide low cost and quality inputs to member farmers. It will supply fertilizers, pesticides, seeds, sprayers, pumpsets, accessories, pipelines.
c) Procurement and Packaging Services: The FPO will procure agriculture produce from its member farmers; will do the storage, value addition and packaging.
d) Marketing Services: The FPO will do the direct marketing after procurement of agricultural produce. This will enable members to save in terms of time, transaction

costs, weight losses, distress sales, price fluctuations, transportation, quality maintenance etc.

e) Insurance Services*:* The FPO will provide various insurance like Crop Insurance, Electric Motors Insurance and Life Insurance.

f) Technical Services: FPO will promote best practices of farming, maintain marketing information system, diversifying and raising levels of knowledge and skills in agricultural production and post-harvest processing that adds value to products.

g) Networking Services: Making channels of information (eg, about product specifications, market prices) and other business services accessible to rural producers; facilitating linkages with financial institutions, building linkages of producers, processors, traders and consumers, facilitating linkages with government programmes.

3.10.5. Guiding principles of FPOs

a) Voluntary & open membership
b) Democratic farmer member control
c) Farmer-member economic participation
d) Autonomy & Independence
e) Education - Training
f) Co-operation
g) Concern for community
h) Caring for others
i) Networking services

3.10.6. Status of FPOs in Rythu Kosam

NABCONS, NABARD's consultancy service provider is the apex organization in Andhra Pradesh steering the formation of FPOs. The resource organization chosen for hand holding FPOs in all the primary sector's line departments is Society for Elimination of Rural Poverty (SERP). A road map has been developed in consultations at Spl. Chief Secretary's office for FPOs in AP. The formation of FPOs is in various stages of inception and consultations with farmer interest groups in Agriculture, Animal husbandry (Dairy), Horticulture and Fisheries departments.

3.10.7. Scoping Study of Farmer Producer Organization during 2015-16

3.10.7.1 Why this study?

The Planning Department of GOAP, had organised a series of meetings and discussions with all the stakeholders for over a year since February, 2015 to come out with a strategy and policy for FPOs in the state of Andhra Pradesh (AP). Further, an exclusive conference for CEO's of agri related companies was organised under the chairmanship of the Chief Minister to focus on Public Private Partnership (PPP) for promotion of FPOs, on 18th of March 2016. The Chief Minister and the Chief Secretary steered these deliberations to elicit suggestions from more than 55 agri-industry leaders. The World Economic Forum and ICRISAT had organised this conference to seek a long term engagement with private companies in promoting FPOs across various commodities in AP state. At the end of the meeting, the Chief Secretary of Andhra Pradesh clearly stressed the need for a comprehensive scoping study with a baseline on the proposed FPOs (1000) to be taken up by ICRISAT. Hence, this study by ICRISAT.

The objectives of this Scoping Study are to;

a) Document the present status of FPOs in AP state.
b) Understand the organisational, financial, market and other related activities of FPOs.
c) Consult various promoting agencies- NGOs, NABARD and others, about their experiences in promoting these FPOs and their future plans.
d) Identify specific functional and futuristic constraints of these FPOs.
e) Identify and recommend organisations that can play a vital role in building the capacity of FPOs at state and district level.
f) Suggest changes, based on the above, in the existing policy framework and in operational guidelines.

3.10.7.1. Consultations with the government departments

The study team had a structured consultations with all the concerned departments of the government of AP. It includes Agriculture, Horticulture, Animal Husbandry, fisheries. Following points emerged from the discussions (also see Appendix 4 a to 4 k).

a. The total number of FPOs proposed by the departments combined stand at 689, falling short to the expected 1000 targeted by the government of AP.
b. The list of FPOs existing appear to have some merger with the activities of two departments, for example Horticulture FPOs were highlighted as vegetable and fruit FPOs by the Agriculture department. While it is expected that there will be convergence of activities of all the departments as farmers might have multiple activities spread over across all sub-sectors of the primary sector. It is also expected that the activity/ commodity specific FPOs can be handled by respective departments.
c. Fisheries department adopted a scientific process in clustering farmers using latest technologies like GIS, which could be adopted by other departments.
d. Processes followed by each department appears to be commodity based, but the existing staff's capability in handholding the formation and management of FPOs needs to be taken up on a priority right from the beginning stage.
e. Funding clarity is expected by all the departments except agriculture, who expect the existing RKVY as a major source for FPO funding.

3.10.7.2. Scope for setting –up of FPOs in Andhra Pradesh

Mapping of potential commodities (major crops) regionwise is done for setting up of FPOs see Appendix 3a-j).

3.10.7.3. Baseline sampling framework and methodology

As per the recent draft 'state FPO policy guidelines', the government is envisaged to set-up 1000 FPOs to benefit at least one million farmers initially. With a series of deliberations with department of planning, most of the line departments have completed their meticulous planning in setting-up of proposed FPOs across commodities in different districts. This initial secondary information was systematically collected from line departments which was used as basis for this comprehensive scoping study in the state of Andhra Pradesh.

Research design and sampling framework

This study was carefully designed based on the secondary sources of information collected across officials from different sub-sectors of primary sector. Further, this information was also used for developing suitable sampling framework for the study. Before proceeding further, it is worthy to understand the existing structure of functional and proposed FPOs in Andhra Pradesh across selected commodities and districts.

Proposed FPOs structure in Andhra Pradesh

As the state envisioned to set-up FPOs across different commodities, the government of Andhra Pradesh has requested the concerned line departments to provide an action plan for setting-up of feasible FPOs across the state by commodity. Based on the information provided by Department of Agriculture, Horticulture, Animal Husbandry, Fisheries and SERP, a total of 689 FPOs are tentatively proposed across commodities and locations during 2016-17. The summary of their break-up is provided in Table 3.10.7.4.1.

So far based on the available information in the state, the proposed number of FPOs in the state are falling short by 311 than the envisioned target of setting-up 1000 (see Table 3.10.7.4.2). The initial analysis also indicates that the proposed list of FPOs also may have some merger/convergence of activities or commodities across sub-sectors at selected locations. Most of the line departments have used ‘commodity-based approach’ while proposing the FPOs in the state. However, department’s capacity in handling the formation and management of FPOs needs to be taken-up on priority basis from the initial stage. This kind of effort brings harmony among the proposed FPOs in different sub-sectors. Enough ground work needs to be done on identification of sources of funds from initial set-up of FPOs to till they reach maturity.

Table 3.10.7.4.1. Break-up of proposed FPOs across sub-sectors.

District	Agriculture						Animal Husbandry				Fisheries						Horticulture	SERP
	NF/ NPM	SFAC			Millets Revival													
		IGC	VRUTTI	ALC	Tribal	Rainfed	Dairy FPO	Sheep & Goat	Poultry FPO	Fodder FPO	FW Fish	Shrimp/ prawn	Marine	Marketing	Seabass	Mudcrab		Agri commodities
ANANTHAPUR	10	3	6			20	13	11	0	2								2
CHITTOOR	10	3	3			6	12	2	2	2								2
CUDDAPAH	10		3				15	6	0	0								2
EAST GODAVARI	10				2		38	0	3	0	1	11	1	0	0	0		6
GUNTUR	10	6					9	6	1	0	2	4	1	0	0	1		2
KRISHNA	10						19	7	1	1	4	10	3	0	1	2		2
KURNOOL	11	15	9			6	18	11	0	0								2
NELLORE	10						5	2	0	0	0	3	0	0	0	0		2
PRAKASAM	10						12	2	0	0	1	3	3	0	0	0		2
SRIKAKULAM	10			5	3		8	2	0	0	0	1	0	0	0	0		5
VISAKHAPATNAM	10				8		6	2	1	0	0	1	2	0	0	0		4
VIZIANAGARAM	10	3			2		6	2	0	0	0	0	0	1	0	0		6
WEST GODAVARI	10						15	2	2	0	3	6	0	0	0	0		2
Total	131	30	21	5	15	32	176	55	10	5	11	39	10	1	1	3	105	39
Grand Total	**234**						**246**				**65**						**105**	**39**

Table 3.10.7.4.2. Budget estimate for setting up 1000 FPOs in AP state					
Sl. No	**Sectors**	**FPOs**	**Farmers**	**Commodities**	**Budget Requirement for formation and nurturing for 3 years @ 35.26 Lakhs / FPO as per national policy**
1	Agriculture	314	3,73,039	Maize, Millets, Oil Seeds and Pulses	11071.64
2	Horticulture	345	2,74,153	Fruits, Vegetables, Spices	12164.70
3	Animal Husbandry	238	2,45,000	Milk, Meat, Egg, Backyard Poultry and Fodder	8391.88
4	Fisheries	103	1,07,808	Fish, Prawn, Crab and Shrimp	3631.78
	Total	1,000	10,00,000		35260.00

Source: GoAP (2016)

As per secondary sources of information, there has been around 44 FPOs that are being registered formally and functioning in the state. They are formed based on two sources of funds: 1) SFAC and 2) PRODUCE fund under NABARD. A purposive random sampling method has been adopted to cover at least 1 to 2 functional FPOs (either most successful or failed ones) from each district in the state. A separate case study format has been prepared (see Annexure) exclusively to cover this category. This format was pre-tested and standardized across cases to bring harmony among them for further comparison. It will be useful to comprehend the drivers behind the success/failure of each studied FPO in the state. This entire process will enlighten us to broadly understand the current situation as well as understand financial viability of these formal institutions in the state.

Similarly in case of proposed FPOs, the scoping baseline survey was planned to cover by sub-sector wise. The sub-sector wise sampling framework has been prepared for better representation of sample and coverage of survey sample units across all thirteen districts of the state. As highlighted in the previous sections, it would be herculean task to study all 689 proposed FPOs across commodities and districts. For bringing the cost and time efficiency, a sub-sample of sampling units covering all sub-sectors are planned. A rough target of 10 per cent of total population (N=689) has been targeted in the present study to minimize the survey travel time and costs.

Overall, the present study has been targeted to cover at least 13 functional FPOs and 79 proposed FPOs covering diversified commodities and mandals in the state (appendix 3k). This comprehensive coverage of crops and locations will generate significant chunk of results and policy recommendations. However, the survey team members have extensively interacted and collected a lot of qualitative information from farmers, various government officials, traders and NGOs about feasibility of setting-up of proposed FPOs in the identified locations. The feedback provided by FPO board members, POPIs and RIs will also enriched the content of this study report.

3.10.7.4. Tool and methods

The present study used simple tabular average analysis for summarizing the scoping survey responses. Both quantitative and qualitative responses are used for summarizing the results by providing appropriate weights/scales as per the need.

The results generated from this study are based on representative random sample identified across sub-sectors. The findings can be scaled-up to the targeted mandals and districts only. They may be suitably modified when applied for the entire state.

3.10.7.5. Issues and Options

Rural economy of Andhra Pradesh state must transform itself to meet the new challenges and improve the livelihoods of the rural population. It needs a transformational shift in whole gamut of activities from input marketing, production, post-production handling, value addition and finally value capturing in consumers' market. For this, farmers producers organisations (FPOs) is being promoted in the state of Andhra Pradesh in big way for almost all the commodities which can be produced and sold.

Based upon the information gathered after consultation with various stakeholders under the a scoping study, analyzing secondary data sources, and our own primary data from the field, the following issues have been identified and possible strategies have been developed;

Lack of convergence of govt. agencies:

Such ambitious initiatives requires convergence of all the sectors- public/private/NGOs. However, there is undirected chaos and exuberance among line-department, NABARD, SERP, SFAC, private groups, etc. to create and set up FPOs in each district. This may mar the long-term sustainability or whole effort of creating value for the rural population. There is high probability of duplicity of efforts in the same district and for same commodity groups. Different agencies are completely unaware of the efforts by other agencies in the same region. Consequent upon this, there are chances of several small groups may be formed, which may find difficult to get the economy of scale or provide significant return to the members.

Options: There is need to create one regulatory platform where the area of operations can be delineated on the basis of potentiality of the commodities/ services, and core competency of the agencies. The agency can bring the information in the public domain so that everyone can have full knowledge about the risks and opportunity to initiate similar process. The agency may also plan to have next wave of FPO formation, once first wave gets some success in any region. A Project Support Unit (PSU) can perform this role of regulating FPOs in AP at state level to strategize innovations, while having Project Management Units (PMUs) at state and district level through all line department staff (Operational Guidelines, GoAP, section 6 and 10).

Untapped social capital/community resources:

During the study, it was evident that many proposed FPOs are toiling to bring rural households together to make a cohesive group. In the process, lot of apprehensions and skepticism among the participants. Although, the state of Andhra Pradesh has very good natural strength of community level associations, like SHGs, JLGs, Co-operatives, MACS, Rythu Mithra groups etc.

Options: The promoting agencies should first attempt to bring these groups together to form the FPO. It would make easier to communicate with them due to their past experiences of working together. Local NGOs can play a critical role for the social mobilization activities and need to be empaneled at both state and district levels by the PMU/ line departments/SERP (Operational Guidelines, GoAP, section 8). However, while dealing with formation of FPOs, the NGOs should be selective in re-grouping the existing community resources by identifying the local produce and mobilize only those interested in participating as producer members through a business model.

Lack of business planning

FPOs is considered to be a business entity, in which energy for growth should come from within. For this, every FPO needs to have business plan. Though, several FPOs are functional and many more in pipelines to get registered, but most of them lack robust business plan. Currently, most of the functional FPOs are merely tapping the space of traders/ middlemen. In the long run, this can have its own limitation if there is no value addition to the aggregation model.

Options: Business plan entails identifying the opportunity, which can have long term growth prospects and create value to its participants. Therefore, the resource organization should provide such expertise (with skills, abilities and knowledge) who can visualize the opportunities with the given local resources available. The business plan should include the details about products (or services) and strategy, marketing plan, operating plan, financial plan and the management team. This will guide the activities of FPOs in right direction (Operational Guidelines, GoAP, section 8). This is vital for the success of FPOs as it can form basis for taking up activities to increase income.

Limited knowledge base of resource institutions (NGOs)

To a large extent, the functional FPOs are promoted by a local NGO, as resource organization, with the support of agencies like state department(s)/ SFAC/ NABARD/ on its own. In many cases, these NGOs were executing different kinds of projects in the region, which helped them in winning the confidence of the rural populace. This is right pre-requisite for setting up new institutions like FPOs. However, in new role, many NGO personnel lack the detail knowledge of the products to be handled or the strategies to be followed. Going forward, FPO activities require linking the farmers to consumers, while those resource institutions (RIs) erstwhile were providing different kinds of services earlier.

The limitations of knowledge and skills of the resource institutions is one of the biggest roadblocks in the success of FPOs. However, this can be overcome by proper skilling of the RIs' staffs according to their needs with respect to particular FPOs. While this is critical for implementation of FPO policy, the RIs capacities have to be built for the NGOs to perform better in hand holding FPOs.

Traders become FPOs' key functionaries

Large number of functional FPOs have been initiated by primary level trader or a commission agent. These persons are primarily a farmer also cultivating the same commodity. Though, they have better understanding of the commodity as well as market, but the whole purpose of FPOs is getting defeated, as they have more power in managing the FPO's functions without contributing equally to the volume of transactions. They also have their vested interests and therefore, become prone to financial and managerial manipulations.

Options: For creating member-organisation design for FPO, there should be rules/norms that reinforce patronage cohesiveness. For example, compulsory contribution (products/ services) by each member on regular basis, retaining 5% of transacted volume from each member for creating capital base, voting rights on the basis of share in the business, etc. Operational guidelines for FPO needs to address and bring more transparency. PMU at state and district level to monitor and evaluate regularly though indicators.

Few executive members handle all responsibilities

In several functional FPOs, the trader turned FPO executive committee member or secretary, handles the responsibilities of aggregating, registering farmers, writing books of accounts, contacting the buyers, arranging transportation, negotiating prices. These activities have to be handled in a professional manner, but this can impact the running of the FPO and its performance. Being new and first time handlers, the executive committee members fall short in their capacities to manage books maintenance, establishing proper system in place, hiring or operating specific location for a commodity handling.

Options: This can become a major impediment when functioning of FPO is not in a professional manner. The role played by skill development and management institutes can enhance governance of FPO. Capacity building of farmer members is pivotal for engaging business activities of FPOs. The role played by PMU and the support provided by PSU will be useful when implementing the policy guidelines. There should be hand holding to identify competent staff and train them for managing FPO. FPO requirements of infrastructure facilities for value addition of commodities, skill improvement in handling of new technology, methods and process are dependent upon a formal system of financial linkage with loan providers like NABARD, Local Banks, etc.

Market identification and price discovery

The functional FPOs are yet to find a formal or contract arrangements for regular marketing for their commodities. None of the perishable commodity-based FPOs have proper storage facilities. Owing toaggregation of a commodity, its bulk size and then managing to get a dedicated transport vans, a functional FPOs are able to avoid local middle man and directly negotiate with the bulk purchaser in a nearby major city. But this has reduced only at two levels– (1) middle man at farm gate price and (2) middle man at the local market. The local farmer producers have surely felt that these FPOs have enabled them to earn 15-25% more in the price discovery. Hence, local farmer producers are willingly participate. On the other hand, the bulk traders based in major cities (Hyderabad, Vijayawada, and Vishakhapatnam) will not disclose the price unless the commodity arrives at their door step. Their negotiations are always 30-40% lower than the market sale price. Many a times these big traders also act on cartel, which traps the FPOs and force to sell at the big trader quoted price. While the big trader make money and they don't share this with the FPOs. This is true, in case of fish, both marine and fresh water.

FPOs should be linked through modern electronic markets/ commodity exchange platforms. An enabling atmosphere to utilize digital tools of ICT integrated (weather, markets, insurance) systems. Active role should be played by APMARKFED, Marketing department along with the PMU. Organisations like ICRISAT/ ICAR/ State Agricultural Universities technical back stopping might be critical in better price discovery of commodities and market identification for FPOs.

Missing primary level processing

Very few FPOs have realized the importance of doing primary level processing of the commodity. Although this is realized over time that the processed commodity fetches better price in the market. There is a disconnect in the transfer of technology and upgradation in taking up processing at FPO level due to failure of extension activities by the line departments.

Options: Enabling technological innovations through primary processing will give the FPOs the leading edge and the unique selling point for their produce. This requires transfer of technology from established institutions and resource organizations. Knowledge and Infrastructure plays an important role and hence it is critical for both Knowledge institutions and financial institutions to come together under PSU/ PMU with commodity based processing plans.

Lack of forward and backward integration

Most of the FPOs are in infancy and have not realized the benefits from aggregation of agricultural inputs like seeds, agro-chemicals, farm machinery, etc. The same is the case of output markets for their products. There is a lacuna in identifying honest brokership through forward and backward linkages as NGOs do not have the where withal to undertake such an important function.

Part of the issues of integration would get resolved if the FPO has systematic estimate of the opportunity and develop the business plan. It is critical to have forward and backward linkages to be established by facilitating institutes.

Limited access to credit: Many FPOs have experienced in their early stages lack of access to low interest credit. This has constrained them in building minimal infrastructure like ware house, cold storage or even purchasing own goods transport vehicle. The local banks are charging 13% interest for the loans. This has become a huge burden on the FPOs funds.

This is probably the most important issue which surpasses and caters to most of the needs for sustaining FPO in the long term. While organizations that build capacities of FPOs to prepare business plans are important, it is vital that bank linkages are handled professionally without bias at district and mandal levels

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Table 3.10.7.6.1 Summary of Issues, Options and enabling Institutions.		
Issues	**Options**	**Suggestive institutions**
Lack of convergence of govt. agencies	Having a state level and district level agency for convergence	PSU/ PMU/ Agril. Dept./ ICRISAT
Untapped social capital/ community resources	Utilize existing CBOs like SHGs, Rythu Mithra groups, JLGs, Cooperatives, MACTS etc	PSU/ PMU/ Agril. Dept./ SERP
Lack of business planning	Prepare business plans through professional facilitation	Management Schools/ ICRISAT/ Consultants
Limited knowledge base of resource institutions	Identification of Resource organizations for skill improvement	ICRISAT/ SAUs
Traders become FPOs' key functionaries	Creating farmer member organisations	PSU/ PMU to identify institutions for facilitating
Few executive members handle all responsibilities	Governance and function of FPOs need to be transparent	PSU/ PMU to identify institutions for facilitating
Market identification and price discovery	Digital platforms to be used and FPOs linked to transparent trading facilities	PSU/ PMU/ APMARKFED/ EXPORTERS/
Missing primary level processing	Technological innovations for commodities to be transferred to FPOs	ICRISAT/ State Agricultural Universities/ others
Lack of forward and backward integration	Facilitating forward and backward linkages	PSU/PMU to identify Resource Organisations
Limited access to credit	Provide bank linkages at district and mandal level	PSU/ PMU/ Banks/ NABARD

3.10.7.9. A brief on functional FPOs

This section gives a brief description of the selected functional FPOs outlining the major features and characteristics which has led to their formation and functioning. In the first part we describe the major features of these FPOs and in the second part we present the major features which acts as rallying point for the performance of these FPOs.

Functional FPOs in Andhra Pradesh: Selected Case Studies

Freshwater Fish – FPO (Krishna district)

Snehanjali Inland fish producer Co ltd, is located at Gummalapadu village, Kaikaluru mandal, Krishna District. The FPO is promoted by SNEHA (NGO) through NABARD's support, and established in September, 2015. There are 110 farmers who hail from 10 surrounding villages. The FPO is located adjacent to Kolleru lake in a rented office. More than 80% members are small farmers, whose farm ponds range from 1 to 2 ha. Prawns are sold at an average rate of Rs. 400 and fish for Rs. 120 per kg. They collectively sell around 2000 ton of fish and 50 ton of prawn produced by member farmers every year. As feed is the major input cost in aquaculture, the FPO is collectively procuring fish feed which reduces their input costs by up to 20%. There is paucity of funds as only Rs. 33,000 have been raised by selling shares to the farmers, hence the FPO is trying to expand its membership base by sensitizing other farmers in the region. This FPO has prepared a business plan for the year 2016 for Rs. 6.5 crores and seeking funds from NABARD and the department of fisheries. The FPO envisages to take up refurbishing water tanks of all aqua farms for its members in a phased manner and construct cold storage for primary level fish processing. The FPO is also interested to open retail fish stores in Vijayawada and Hyderabad. It will be interesting to see how the FPO members implement their action plan in the near future.

Banana FPO (Krishna district)

Sri Vigneshwara Banana FPO is located at Chagantipadu village, Thotlavallurumandal, Krishna district. This FPO was functioning as a mutually aided credit society for the last 3 years and formally registered as a company in July 2015 with 190 active members. Nestham (NGO) has been hand holding the FPO with an initial share capital of Rs. 1 lakh. Farmers from 30 surrounding villages encompassing 5 mandals converge to sell their banana fruit bunches on every Monday and Thursday during the week. The turnover of the FPO was Rs. 96 lakhs during 2015-16, with a profit of Rs. 5.5 lakhs, earned by charging 6% levy on banana sales. Farmers get the services of uniform costs of servicing of harvesting banana through engagement of labourers by the FPO at a predetermined rate and at right time. One major service rendered through this collective aggregation model is the cutting down of the transport cost of bringing the harvested banana to the market. This is being done by the FPO owned, transport van, which is a unique strategy by the FPO that benefited the member farmers. The cost of labour charges and transport directly benefits FPO member in addition to the higher price secured from the traders who now come to this new market for buying bananas. A member farmer, Shri. S. Nagireddy says, “If I sell banana bunch to a local trader at the farm gate, I get Rs 150 per bunch. Here in FPO, I get Rs 325 per bunch. By being a part of the FPO fetched me more than 100%”. The abuse of middle men in differential pricing has dramatically reduced for farmers participating in this FPO where grading and pricing is handled with transparency. This is attracting new banana farmers from other places. The FPO started constructing a market yard and a building (3600 sft) in the village through support from Horticulture department and NABARD (Rs. 12 lakhs). The FPO looks to diversify its portfolio of working on other days of the week (presently market auctions are held for 2 days of week). There are plans to introduce auctioning of vegetables on commission basis in the new market yard. It will be interesting to review the progress of this FPO in the coming months after the start of the new market yard.

Jasmine FPO (Krishna district)

Sambasiva Jasmine Producer Company Ltd, formerly Vigneswara MACS society is located at Sentraigudem, Mylavaram mandal, Krishna district, AP. The FPO was registered in September 2015 with over 600 member farmers from two revenue panchayat’s encompassing 20 hamlets. A share capital of Rs. 25 lakhs is invested by the 5 directors of the FPO personally. The FPO is active during the jasmine season from February to August every year. Jasmine crop is perineal (up to 7 years) but grown only in small pockets of <0.4 ha by each member as most of them have other sources of income like mango orchards. The market opens every day early in the morning at the village temple premises, where weighing, bagging, labeling is done by hired staff by the FPO. Watering of the packaged flowers is a critical activity to keep the flowers fresh during their transport to Hyderabad’s Guddimalkapur market through their own vans (4). Due to high perishability of flowers, the farmers are vulnerable to price fluctuations in Hyderabad. The Directors are concerned about the growing apathy in Hyderabad market towards them as Andhra farmers. Moreover, the commission agents do not follow a set standard while determining flower prices. This makes them to ponder if it was possible to have a market at nearby city like Vijayawada. Presently there are plans to build a shed to undertake operations during rains. At present the remuneration to the member farmers is higher than that of the outside traders. However, it will be challenging to see how this FPO runs in the long run with investments controlled by few directors.

Turmeric FPO (Guntur district)

Mangalagiri Agricultural Producers' Company Limited, located at Mangalagiri, Guntur district is promoted by Nilgiri Foundation, NGO. This FPO was registered in July, 2015 with 350 turmeric producing small farmers from 21 villages. These farmers collectively hold about 380 ha of land producing 950 tonnes of turmeric annually. Under normal conditions, it takes around 20 days to process turmeric after harvesting. Shri Raghuram Reddy, chairman of Nilgiri foundation introduced a novel turmeric processing that brings down the processing time from 20 days to 10 days. So he introduced this technology to the farmer's groups and convinced them through awareness and sensitization programmes. Nilgiri foundation organized exposure visits to Erode, Tamil nadu to witness latest turmeric processing systems for some farmers. When the farmers were convinced about the enhanced quality of curcumin in processed turmeric, they were willing to adopt the technology as they believed it fetched higher price. The FPO purchased 3 boilers and one polishing machine that was run by employing contract labourers during the harvest season. Inputs like seed material, organic fertilizers required for crop production are procured by the FPO for their members through a retail outlet in Nutathi village. The operations have been professionally run by its CEO, Mr. Gautam Reddy. Marketing of turmeric at Duggirala market is done exclusively by FPO. The FPO has taken all the required licenses as a retail supplier of inputs and marketing agent in Duggirala market. Turmeric is a commercial crop with high input costs to the tune of Rs. 50-60,000 per acre (1 acre=0.4 ha). FPO farmer's benefit directly by reducing their seed and fertilizer costs by up to 15%. Further farmers benefit to the extent of 10% their collective marketing in Duggirala market. FPO's initiative to reduce input costs, processing times and market linkage appears to impact the livelihoods of small farmer's with increased profit from turmeric cultivation. Now the FPO is planning to do commercial production of turmeric powder with high curcumin as present markets are not using grading systems of high curcumin content but following traditional ways like size of the rhizome. However, the directors of the FPO pooled up their personal collateral to purchase boilers and polishing machine's for the FPO and looking for credit support from the local banks, with low-interest rates.

Marine Fisheries FPO (Krishna district)

Samyuktha fisheries producer company, Etimandipallepallu village, Kruttivennu mandal, Krishna district has 425 member farmers which was registered in September, 2015, through NABARD's support and SNEHA, local NGO as facilitator. The farmer's come from 30 villages on the coast line of Krishna district. The NGO organized awareness and exposure visits to most of the member farmer's to fish markets at Narsapur, Chennai and Bhimavaram. This has enabled farmer's to realize the advantages of coming together collectively to bargain higher prices in the markets as they were cheated by the middle men in their villages who gave only 40-50% of prices that they inturn earned in these markets. The FPO established 3 collection centres, an ice factory and also placed cooling boxes with a weighing machine in each of the collection centre. They deal with a wide range of marine products like fish, prawn and crabs. The FPO managed bank linkages in facilitating their member farmer's to credit facility of Rs. 30 lakhs through Indian Bank and Saptagiri cooperative bank. There is huge need for working capital by farmers which is informally met through money lenders, who happen to be members of the FPO. Loans are provided to farmers ranging from Rs 5000 to Rs one lakh without interest. However, the farmer had to sell their marine catch to the money lender at a lower price, about Rs.5 below the prevailing market price per kg. A detailed participatory action planning exercise was conducted by the FPO, and proposals have been submitted to Fisheries department for one crore rupees. The action plans include fish drying platforms, nets, ice boxes, tool kits, plastic trays, life jackets, salaries for at least 2 staff. FPO is interested to take up cultivation of casurina trees in the sandy soils to generate additional income to farmer members.

Pulses & Millets FPO (Kurnool district) (supported by Reliance Foundation)
Since 2013, the Reliance Foundation is working in this mandal, and improving livelihood of the rural population by intervention in the area of land development, soil fertility management, water harvesting and health & nutrition. The Foundation has formed Village Farmers' Association (VFA) in 16 villages spread in 3 mandals of the district. The Foundation is in advanced stage of registering an FPO based on pulses and millets, by bringing together 13 VFAs falling under the Gajiwanga watershed, on single platform. The region faces problem of salinity, water shortage and non-availability of clean and safe drinking water. The primary source of livelihood is agriculture coupled with rearing small ruminants, like goats & sheep. The interventions started with organizing farmers to create awareness and give training about soil and water conservation measures. The major crop grown during *kharif*season is mainly cotton (80%) and groundnut (20%). During *rabi* season red gram, Bengal gram, Ajwain and Jowar is grown. They also grow Fox tail millet for own consumption. The collective action started with interventions in soil and water conservation, organic farming, and nutrition gardens to improve the nutritional status by promoting dietary diversity. Currently, there are 1330 members in 13 VFAs and together, mobilized an initial seed capital of ₹ 26 Lakhs by equal contribution (Rs 2000 each) from the members. Each VFA has its own office space in the village. After registration of FPO, the group is planning to purchase agricultural inputs in bulk and market the produce collectively.

Bethamacherala Progressive Farmers' Producer Company Ltd. (Kurnool district) (supported by NABARD)
With the technical support of Vrutti Livelihood Resource Centre, legume-based FPO is in the process of formation in Bethamcherla mandal, about 53 km from district headquarter Kurnool. The mobilization of farmers and group formation for the Bethamcherla Progressive Farmers' Producer Company Ltd. (BPFPC) started in March 2015, with the support of NABARD and Vrutti as POPI. The company has 700 group members from 5 surrounding villages in the radius of 12-15 km. Although, only 70 members have contributed Rs. 1000/- each as share capital. In the mandal, most of the farmers are growing pigeon pea as main

crop, and some farmers are also growing foxtail crop, mixed with pigeonpea. Therefore, the group targets to handle only pigeonpea. Though, till now, the group formation and mobilization of households to join and contribute in the company has taken place. Actual activities related to collective production, procurement, marketing or capacity building for different operations has not taken place. The company is expected to be registered in couple of months.

Dairy FPO (Kurnool district) (proposed, supported by AH depart.)
Animal Husbandry department is promoting one dairy FPO (proposed) in Nandyal mandal (around Ryatunagaram village). The Assistant Veterinary surgeon is leading the process. There is plan to group 20 milk producer-farmers in each of 20 surrounding villages. Every expected member household have 5-6 graded Murrah buffalo, who are currently selling their milk in the Nandyal market @Rs. 38/litre. The discussions with villagers revealed the potential for formation of FPO focusing on dairy and the benefits to farmers through enhanced income levels. However, they had lot of apprehensions about the size of the organization and the sustainability of group cohesion. The FPO formation is still at very nascent stage, as group formation has not yet taken place. The villagers are also not clear about the potential benefits coming through the FPO. Although, potential areas of intervention existing are- bulk purchase of feed and fodders, collective silage making, manufacturing of livestock feed at small scale, value addition in milk and milk products, etc. Therefore, lot of background work on creating awareness, bringing clarity on the process of formation of organization and clear guidelines on formation of FPOs are required to address initial glitches. The department also needs to identify the local resource organization who can continuously work with the milk producers.

Chethana Groundnut Producer Company Ltd. (Prakasam district) (supported by NABARD)
Chethana Groundnut Producer Company Ltd is located at Kothapatnam village (under Kothapatnam mandal), about 17 km from Ongole, Prakasam district. The company has been registered in February 2016 under Companies Act, 2013, with the financial support of NABARD. An NGO named EFFORT is providing technical support to the producer members. Currently, the company has 65 members who has contributed share capital of Rs. 500 each. Groundnut is the main crop in the mandal. Many farmers grow two groundnut crops in a year. It is in operation in only one village, but plans to expand to 500 groundnut growers in 6 surrounding villages. The NGO given IPM demonstration in the village and also collected and sent 250 soil samples for its test to the state department. Though, the company has its own rented office and also rented in some space for input and output marketing, but the actual operation has not yet taken place. Moreover, the supporting agency is also not very clear about the scaling up strategies and future plan of value added services for the company. Therefore, producer-members are reluctant in participating in any meetings or discussion.

A detailed analysis of selected FPOs which are functional in different parts of Andhra Pradesh revels the following characteristics.

a) Most of the well-functioning FPOs are built around activities based on handling of (including production/harvesting, processing and marketing of perishable commodities. These ranges from fish, marine products and milk to banana and jasmine. There is a necessity for the members of these FPOs to come together and collectivize operations to address some of the technical constraints which arise out of the perishable nature of commodities.

b) A large share of these FPOs are relatively new in terms of age of collectivization. Most of them were formed during 2015 and note more than 2-3 years old. There could have been an improvement in the process of formation of institutional arrangements like FPOs in recent times, mainly facilitated by efforts from the State towards this direction through support in various forms.
c) Another significant feature of these performing FPOs is that they give greater focus on interventions and facilitation of the marketing functions of the focus commodities/activities. This emphasizes the role of facilitation and innovations in the marketing functions in improving the incentives to producers and their importance as a boarding point for focusing efforts towards collectivization to reduce transaction costs and taking advantage of economies of scale.
d) In addition to marketing functions or related activities, they also focus on arrangements to regulate and facilitate availability and access to inputs at reasonable prices and convenience to the members. This is a major intervention which transfers the benefits of economies of scale to the members which acts as a major incentive and bonding factor for their participation in formation of FPOs.
e) These FPOs has a wider geographical coverage, with most of them has members belonging to more than 10 villages. This ensures that there is sufficient scope for interventions focusing on FPOs to utilize the opportunities to reap the benefits from economies of scale in production, post-harvest handling and marketing of the primary sector commodities.

3.11 Partnerships with NGOs

Eighteen NGOs have been selected for all thirteen districts of Andhra Pradesh for supporting the Rythu Kosam project at field level. The details of the NGOs selected for each district are furnished in Table 7.1.

The defined roles and responsibilities for the NGOs selected are as stated below.

1. Community mobilization
2. Farmers identification for various interventions
3. Conducting trainings and capacity building programs
4. Liaison with all line departments, private companies and other stakeholders for convergence and implementation
5. Data collection necessary for the project such as data collection on socio-economic conditions, collecting samples, conducting crop cutting experiments, data related to livestock and fisheries, etc.
6. Dissemination of results through field days or farmers days
7. Collection of groundwater and rainfall data
8. Weekly progress report (One pager) to be submitted
9. Half-yearly and annual progress report to be submitted
10. Half-yearly and annual financial expenses report as per the ICRISAT finance department
11. Act as a focal point to visitors in the pilot sites of learning
12. Any other activities required by the program.

Table 3.11.1. List of selected NGOs in all 13 districts of AP for Rythu Kosam.		
	Name of the NGO	District
1	SAMATHA Society for Rural Education and Development	Anantapur
2	Accion Fraterna Ecology Centre (AFEC)	Anantapur
3	Integrated Rural Development Society (IRDS)	Chittoor
4	Nature Voluntary Organization	East Godavari
5	Aranya Agriculture Alternatives Permaculture India- Forest Farming	Guntur
6	Weaker Section Social Welfare Association [Sambepally mandal]	Kadapa
7	Mamre Foundation Society [Porumamila & B. Matam mandals]	Kadapa
8	Society for Education Research of Vulnerable & Indigenous Communities Empowerment (SERVICE)	Krishna
9	Chaitanya Youth Association	Kurnool
10	Sri Parameswari Educational Society	Kurnool
11	NAVAJEEVAN ORGANIZATION	Nellore
12	Rural Reconstruction and development society	Nellore
13	PROTECT	Prakasam
14	Youth Club of Bejjipuram (YCB)	Srikakulam
15	Amma Vodi	Vijyanagaram
16	SNEHA	Vijyanagaram
17	VIKASA	Visakhapatnam
18	The Chaitanya Rural Development Association	West Godavari

3.12 Public-Private Partnership

East Godavari farmers-DOA-Kubota-ICRISAT

KUBOTA Japanese farm Machinery Company has come forward to introduce machine transplantation of paddy nearly in 40 ha of the pilot site for less cost than tradictional practice. We (ICRISAT, KUBOTA and DOA) have conducted farmers' awareness meeting in Lingumparthy village of Yeleswaram mandal on paddy machine transplantation and nearly 120 farmers (nearly 24 ha) came forward for paddy transplantation (Figure 3.12.1). The nursery of different varieties of paddy has been raised at the Maruteru Research Station (West Godavari) by Kubota Company during in the month of July 2015 as per expected sowing dates of farmers. The machine transplantation started in the first week of August and around 16 ha were transplanted in Yeleswaram mandal and Gangavaram mandal.

Figure 3.12.1. Paddy machine transplantation being done in the farmer's field in Lingumparthy village of Yeleswaram mandal.

Figure 4.1. Interaction and awareness meeting with farmers on machine transplantation of paddy organized by ICRISAT-Kubota-DOA.

4. Progress during 2015-2016 (District & Sector wise)

4.1 Agriculture Sector

The agriculture sector in the newly formed Andhra Pradesh state, popularly known as the "rice bowl of India" is in crisis. Andhra Pradesh has a total cultivation area of 6.35 million ha covering rice, oilseeds, pulses, cotton, maize, tobacco, vegetables, fruits, oil palm and others. The productivity of major crops is stagnant in recent years. The cost of cultivation has increased over the last decade, while farmers' income is not in tune with it. Increased labor cost, migration to nearby urban areas and inflationary pressures have added to the miseries of farmers and livelihoods. Another evidence of emerging crisis is the "Crop holiday" practiced by the farmers of East Godavari district in an area of 34,020 ha during*kharif*(rainy season) of 2011. Even cloud seeding in some districts (of united Andhra Pradesh) during 2004-09 by incurring expenditureof ₹127 crores could not yield any tangible results. Further, distress sale of commodities, absence of adequate storage and processing facilities and non remunerative prices added to miseries of farmers over the years.

4.1.1 Anantapur

Baseline Study of Pilots sites

Base line study was carried out in the pilot site (see Section 3.1). Baseline has highlighted to focus on following;

1. Soil & water conservation technologies so that the groundwater recharge and its efficiency in-use can be realized.
2. Increased emphasis on introduction of drought and heat tolerant crop varieties and technologies.
3. Climate-smart studies, technologies and guidance to farmers' to minimize the climate change experienced and also perceived by farmers.
4. Improve livestock based livelihoods through Fodder promotion, improving livestock breeds and credit support.
5. Strengthening formal markets and value chain.
6. Promotion of small-scale industries

Soil health mapping and results based management

The Agriculture department collected around 30,323 soil samples as against the target of 32000 across the district and analysed these mainly for major nutrients NPK inclusive of 14292 samples for micronutrients. In general, low content of carbon and deficiency of nitrogen and some micronutrients including Sulphur, boron and Zinc were recorded. Following this, low usage of fertilizers 25-50% of the recommended dosages and foliar application of micro-nutrients were recommended.

ICRISAT did soil sampling in all the villages under pilot sites and analysed close to 343 soil samples for major and micronutrients. The analysis data on nutrient status of the soils of different villages are given in Appendix 1g.

Most soils were found deficient in organic carbon, nitrogen, sulphur, zinc and boron. Individual farmers from whom we collected the samples as per the plan of sampling the area (1 sample/25 ha) have been told about the results of their soil samples and also to farmers having lands around sampled areas. The general information about the status of nutrient status in soils of their village has also been given to farmers. The soil data were also displayed by wall paintings at major places.

Farmers were initially asked to go for a basal soil application of micronutrients. However, since there was no rain in most of the areas of the pilots even for sowing crops, they were later guided to apply micronutrients when the crops would be sown following the rain.

As per the decision taken in the planning meetings of Rythukosam, each district department of agriculture ordered micronutrients S, Zn, and Bo in the form of Gypsum, Zinc sulphate and Borax respectively and kept these ready for distribution to farmers well in time. The allocated, positioned and distributed quantities to the district for the year 2015-16 are given in the table 4.1.1.1 below.

Table4.1.1.1. Allocation, positioning and distribution of micronutrients in Ananthpuramu, 2015-16				
Area		**Gypsum**	**ZnSO4**	**Borax**
Anantapuramu district	Allocation (MT)	12800	1000	100
	Positioned (MT)	4466	421	39
	Distributed (MT)	3250	280	29
Raptadu Mandal (Pilot-1)	Positioned (MT)	400	74	3
	Distributed (MT)	286	14	1.1
Penukonda (Pilot-2)	Positioned (MT	122	10	0.5
	Distributed (MT)	104	8.2	0.5

The pattern of use of supplied micronutrients recorded with farmers is given in Table 4.1.1.2 below. Farmers used only Zinc sulphate (Zn) in Paddy, Gypsum (S, Ca) and Borax (B) in groundnut and only Borax (B) in vegetables – Bhedi, Brinjal, Tomato.

Table 4.1.1.2. The pattern of use of micronutrients used by farmers, Ananthapuram, 2015-16						
Details	**Kharif**			**Rabi**		
Crop	**ZnSO4 (MT)**	**Gypsum (MT)**	**Borax (Kgs)**	**ZnSO4 (MT)**	**Gypsum (MT)**	**Borax (Kgs)**
Pilot I -Raptadul Mandal						
Paddy	10.6			3.6		
Groundnut		90.1	100		196.29	
Vegetables			440			495
Total	**10.6**	**90.1**	**540**	**3.6**	**196.29**	**495**
Pilot II- Penukonda/Kothachervu mandals						
Paddy	**7.1**			1.2		
Groundnut		54	15		50	
Vegetables			15			23
Total	**7.1**	**54**	**30**	**1.2**	**50**	**23**

We monitored some groundnut plots in Penukonda where famers tried improved package (with micronutrients was used) as against their normal package (without micronutrients) and took crop cuttings to record the yields. The mean data for groundnut is presented in Table 4.1.1.3 below. Groundnut grown with improved package yielded average 26% more pods, 23% more seed and 38% more stalk.

Table 4.1.1.3. Mean Groundnut yields obtained under improved practice (with micronutrietns) Vs Farmers practice of crop cultivation, Penukonda & Raptadu mandals, Ananthapuram 2015-16										
		Improved Practice kg/ha			**Farmers Practice kg/ha**			**% Benefit of IP over FP**		
Mandal	**Village**	**Pod**	**Grain**	**Stalk**	**Pod**	**Grain**	**Stalk**	**Pod**	**Grain**	**Stalk**
Penukonda	Bandlapalli	7070	4150	1570	4030	2350	940			
	Gonepeta	5000	2980	1550	4770	2700	1270			
	Settipalli	5620	2480	840	4340	2120	620			
	Mean	**5900**	**3200**	**1320**	**4380**	**2390**	**950**	**35**	**34**	**40**
Rapthadu	Ramnepalli	2340	1650	400	2640	1270	430			
	Pesarakunta	2460	1320	550	2400	1640	320			
	Pullalarevu	2700	1180	600	2380	1630	320			
	Mean	**4000**	**2140**	**880**	**3480**	**1960**	**650**	**15**	**9**	**35**
Mean for pilot sites		**4950**	**2670**	**1100**	**3933**	**2174**	**799**	**26**	**23**	**38**
Note: A total of 3 fields each with IP & FP were sampled in each village above villages.										

We also monitored pigeonpea which was grown by almost all farmers as intercrop with groundnut. We recorded the pigeonpea yield where plots had received the micronutrients. The average yield recorded for intercrop pigeonpea at both the pilot sites are given table 4.1.1.4 below. The intercrop pigeonpea with improved package yielded 8-10% more yield than normal package

Table 4.1.1.4. Average yield of pigeonpea (6 ft R to R) in groundnut/ pigeonpea system in pilot areas, Anantapurmu, 2015-16				
Mandal	**No. of farmers**	**Yield kg/ha**		**Benefit (%)**
		Improved package	**Farmer package**	
Penukonda	3	560	500	10.7
Kottachervu	2	490	450	8.7
Raptadu	8	460	430	8.9
Mean	**13**	**500**	**460**	**9.5**

Evaluation of aquasap

We introduced Seaweed extract (product: Aquasap) which is known for improving crop health and producing more crop yields. We gave interested farmers 1 litre product "Aquasap" to be used for 2 sprays in an acre (1 acre=0.4 ha) of crop, 1st at flowering and 2nd at fruit or grain formation stage. The average crop yields recorded by farmers were significantly higher with use of Aquasap foliar sprays (see Section 3.2.5).

Recycling of on-farm wastes & biomass generation for soil fertility

As against Vermi-composting which is, otherwise, commonly promoted and supported by the state government, ICRISAT this time introduced a well evaluated system of an aerobic composting for processing of animal and plant wastes in pilot villages. A microbial culture (Madhyam®) required for composting was used for demonstrations across the villages and over 131 tons of plant and animal wastes have been composted between April 2015 and March 2016 to the satisfaction of farmers (Table 4.1.1.5; figure 4.1.1.1). Almost all farmers liked this method of composting as it helped them to compost their wastes in open within 45-60 days with less of labour or any input as required in worming composting. Most repeated composting in the *Rabi* season demanding more culture.

Table 4.1.1.5. Plant and animal wastes composted by aerobic microbial culture in Pilot site and other villages, Ananthapuramu, 2015-16

Mandal	Village	Farmers (Nos.)	Waste material used Percentage	Quantity composted (tons)
Pilot I (Raptadu mandal)				
Raptadu	Ayyavaripalli	2	cowdung 50%, Maize waste 50%	4
Raptadu	G.Kothapalli	2	cowdung 50%, Maize waste 50%	6
Raptadu	Gandlaparthi	1	Cowdung 60%, Paddy waste40%	2
Raptadu	Gangulakunta	1	Cowdung 60%, Paddy waste40%	2
Raptadu	Gollapalli	2	Cowdung70%,Paddywaste30%	2
Raptadu	*Hampapurum*	1	Cowdung 50%+plant wastes (+mulberry)	40
Raptadu	Pesarakunta	2	Cowdung65%, Sorgham waste35%	4
Raptadu	Raminepalli	1	Cowdung70%,Sorgham waste35%	2
Total		**12**		**62**
Pilot II (Penukonda & Kottachervu mandals)				
Ananthpur	*Ananthpur*	2	Cowdung 10%-50% Mushroom and plant wastes	12
Kothhachervu	Bandlapalli	2	cowdung 45%, Paddy waste 55%	4
Kothhachervu	Yerraballi	4	cowdung 50%, Paddy waste 50%	7
Somandepalli	*Chalakuru*	3	cowdung 50%, Agri. waste 50%	7
Penukonda	Gonipeta	2	Cowdung 20%,Maize waste 80%	2
Penukonda	Kondampalli	10	Cowdung 20-50%+Mz, Sorg, Gnut or Paddy wastes	12
Penukonda	Penukonda	1	Cowdung 10%+Coconut and other plant wastes	8
Penukonda	*Rampuram*	1	cowdung 45%, Maize waste 55%	2
Penukonda	Settipalli	7	cowdung 50%+Maize or Paddy waste	11
Putlur	*S.Gudur*	2	Cowdung 70%, Maize+Paddy waste 30%	4
Total		**34**		**69**
Grand Total		**46**		**131**

Note: A tractor operated shredder machine was used for big size plant wastes - Mulberry, Maize, tree wastes etc.



Figure 4.1.1.1. Aerobic composting in pilot sites

Some demonstrations were carried out in other villages so that the technology gets known to more people. The technology is now being spread also thru 2016-17 by making supply of culture on cost to the technology adopters and on also on some subsidy to new adopters. The partner NGO Samatha has now created a rolling fund of Rs. 10,000/ for supplying microbial culture on cost to farmers not only of Penukonda/kottachervu area but also to farmers of other areas of Anantapuramu.

Further, we gave and deployed a tractor operated shredder machine in our pilot areas under the control our partner NGO – Samatha to shred crop and plant wastes that are longer and harder (Figure 4.1.1.2). The microbial composting of this shredded material mixed with animal wastes were also demonstrated in different areas. Farmers found this shredding machine useful not only for shredding the crop waste for composting but animal fodder like sorghum/maize fodder for animal feed. Farmers are now borrowing this machine from NGO to cut their crop and plant wastes. There have been request from farmers that this machine could be supplied by the government on some subsidy.

A tractor operated shredding machine deployed for shredding crop &plant wastes

A farmer apply culture mixed in cowdung slurry.

Figure 4.1.1.2. Shredding machine for chopping biomass for aerobic composting

We not only made the farmers to compost their wastes but also suggested them to grow in some crops in compost treated with untreated plots. Most farmers who know the benefit of compost applied the entire compost in their fruit and vegetable crops, some farmers attempted studying the benefit treating some area of the crop with compost and leaving other area without compost. The average yield of some crops recorded by our field staff from the treated and untreated plots are given table 4.1.1.6 below.

Table 4.1.1.6. Average crop yields recorded in compost treated and untreated plots in the same fields, Penukonda/Kottachervu mandals, Ananthapurmu, 2015-16.

Villages	Crops	Fields (nos.)	Season	Q/ha		Benefit %
				Treated	Untreate	
Settipalli	Groundnut	4	Kharif	28.75	25	15.0
Kondampalli/Yerraballi,/Settipalli	Groundnut	8	Rabi	20.9	17.1	21.9
Settipalli	Paddy	2	Kharif	18	15.5	16.1
Gonipeta	Paddy	2	Rabi	16	13.25	20.8
Yerraballi	Maize	2	Rabi	15.5	14	10.7
Kondampalli	Onion	1	Rabi	60	50	20.0

* Fields with distinct area for treated & untreated crop where 1-1.2 tons/Ac. compost used were only monitored.

In general, plots treated with compost produced 15-20% more crop yields than plots without compost. Most farmers do know the benefit of compost and hopefully they would compost their plant and animal wastes in future and also reducing the use of chemical fertilizers. Vegetable and fruit growing farmers who applied compost also reported high crop yields in general and better quality of produce.

We have rather requested the departments that they should consider supplying the composting cultures to farmers at subsidized rates giving farmers a formal training on the methodology of aerobic composting. The simplicity and low costing of the technology are attractive features as against other composting technologies.

ICRISAT now is aiming to create some entrepreneurs among farmers or a group of farmers including SGH to process plant and animal wastes of their village to provide either composting service to farmers or make the compost locally available to farmers. Animal owning farmers in particular are now being targeted.

Towards soil fertility management, the department of agriculture targeted to distribute 100 tons of green manure *Dhiancha* seeds but could do that only to the extent of 20 tons as there was virtually no demand from farmers owing drought. The material was given could largely in paddy areas of Anantapuramu In pilot sites, ICRISAT, provided seeds of *Glyricidia* to partner NGOs and asked them to raise nurseries. A nursery of over 6000 plants was raised and distributed for planting on bunds and also in waste land. Dryland farmers though sceptical early in the season, they picked up some plants later in the season in August-September when there was good rain in the district.

Seed production and seed systems

Seed multiplication and its distribution is a problem in groundnut because no private sector companies have taken any interest in this for a large size of seed to be handled. ICRISAT has been trying to create a system locally so that seed is produced with a given area and get distributed for the benefit of large number of farmers. ICRISAT provided some breeders seeds of three of its new groundnut varieties (ICGV91114, ICGV0351,ICGV0350) and one Pearl Millet variety Dhanalaxmi (Iron rich) to our NGO partners for seed multiplication in pilot areas with an assurance that the seeds produced will be purchased from the farmers so that these could be given for next season/next year to farmers in general for further multiplication. This program was taken only irrigated area Penukonda villages, particularly Kondampalli village (see Section 3.3 for details).

Improved crop varieties

The detail of improved seeds for scaling out and evaluations is given in Table 4.1.1.7.

Table 4.1.1.7.

DOA seed allocation, positioning and sale thru Dept. of Agriculture, Ananthpuramu District, 20015

S. No.	Crop	Allotment (Qtls.)	Postioned (Qtls.)	Sales (Qtls.)
1	Groundnut	328000	216586	216586
2	Redgram (LRG-41)	8000	6917	5923
3	Green gram	100	-	-
4	Maize	1000	1274	650
5	Jowar	100	-	-
6	Castor	100	40	-
7	Sunflower	100	-	-
8	Korra	100	-	-
9	Horse gram	2000	-	-
10	Soybean	1500	-	-
11	Diancha	1000	220	126
	Total	342000	225037	223285

ICRISAT seeds given for demos in Pilot sites, Ananthpuramu, 2015

S. No.	Seeds	Variety	Qua. (kgs)
1	Groundnut	ICGV91114	1200
2	Groundnut	ICGV0350	150
3	Groundnut	ICGV0351	100
4	Groundnut	K-9	150
5	Castor	DCH 177	20
6	Castor	DCH 519	40
7	Castor	Jyothi	20
8	Sorghum Fodder	CSH24 MF	15
9	Sorghum	PVK801	24
10	Pigeonpea	ICPH2740	20
11	Pigeonpea	ICP8863	10
12	Pigeonpea	ICPL87119(Asha)	10
13	Pigeonpea	ICPL161	10

While groundnut was largely liquidated, the seeds of other crops placed were not fully liquidated as drought prolonged and farmers as usual preferred groundnut for sowing. ICRISAT also distributed some quantity of seeds of some crops in pilot site villages through partner NGOs with an intention to create some more diversity of crops and give farmers better options to choose a good variety/s if possible, particularly in groundnut and pigeonpea and castor.

***In-situ* moisture and land management**

While there is no specific program as yet from the department of agriculture, ICRISAT opted for trying raised-bed and furrow systems of land preparation for sowing the crop. We wanted to try groundnut on Broadbed and furrow system (1.5 m) in about 50-100 ha in the pilot site of Penukonda, but we ended up trying it only in 4 ha, that too under irrigation as there was no/sufficient rain to take up this activity. However, we learned during this exercise that we should be trying here more of ridge and furrow system than beds for sowing the crop.

Next year we would go for more of ridges sowing the seeds midway on slopes of ridges, that is, accommodating 2 rows per ridge. We would make a ridge of 67.5 cm as the standard wheel-to-wheel-distance in all available tractors is 1.35 m which can make two ridges easily while sowing the seed simultaneously. We would go for BBF of 1.35 m in irrigated area with sprinklers as this can easily be made without making any change in the tractor alignment with the tool bar attachments

a) Weather monitoring

Our pilot site sites are originally from watershed areas. So they have rain-gauges and weather observatories at appropriate places managed largely the Indian meteorological centres. Besides there are rain-gauges installed in some villages. Considering the positioning of observatories, we installed only one automatic rain-gauge at village Ramenipalli of Raptadu mandal which was not being covered properly earlier under the net-work of weather observatory (see Section 3.4).

This year rain started early but was very erratic. Most villages of Raptadu and Kottachervu mandals received good rainfall in the beginning of June and with this 60-90% sowings were completed. However, sufficient rainfall was not received in Penukonda areas so no sowing was done. Then there was a continuous drought with very little rain in July until late August. Raptadu was most affected with over 50% crops almost died within the fields. *Kharif* crops except mostly some groundnut crop that survived thru early season drought yielded reasonably well between 1500-2500 kg/ha; even up to 4 tons/ha in Penukonda and Kottechervu mandals under supportive irrigation.

More than normal rain was received during September in all the three mandals and it continued well until November in Penukonda and Kottacheru mandals. With good rain and borewells recharged, the Penukonda & Kottachervu farmers took good *rabi* crops of paddy and maize harvesting 4-5 ton/ha. A reasonably good vegetable crops were grown by the penukonda and Kottacheru farmers in the *Rabi* season.

Crop diversification, Intensification

The crop diversification has been on the agenda of both the department of agriculture and ICRISAT. However, there was no rain in many areas. Some rain followed by continuous drought affected this agenda of our program. The crop diversification achieved in *kharif* 2015-16 in spite of drought is given in table 4.1.1.8 below.

Table 4.1.1.8. Crop diversification recorded in Raptadu mandal, 2015-16									
Pilot I- Raptadu mandal	**Villages**								
	Gangulakunta	**Ayyavaripalli**	**Gandlaparthi**	**G.Kothapalli**	**Pullarev**	**Raminepalli**	**Pesarakunta**	**Gollapalli**	**Palabhavi**
Dryland									
Gnut+Pigeonpea	180 (270)	205(300)	136(190)	156(206)	800(340)	224(209)	45(30)	0	80(37)
F.millet+Pigeonpea	210 (8)	3(3)	0	0	2(1)	2(1)	0	0	0
Greengram	16 (15)	12(18)	4(3)	6(4)	0	0	0	8(20)	0
Beans (Dolichus lablab)	6 (6)	0	2(2)	10(7)	0	0	0	0	0
Sorghum	28 (8)	24(12)	26(15)	32(20)	0	0	0	20(25)	0
Pearl millet	2 (1)	2(2)	0	0	0	0	0	0	0
Castor+Pigeonpea	10 (5)	8(8)	6.4(6)	11.2(12)	0	0	0	3.6(4)	0
Irrigated Land									
Groundnut+Pideonpea	8 (4)	12(6)	78(38)	82(40)	153(148)	3.6(2)	4(4)	60(70)	7.2(20)
Tomato	6 (12)	12(25)	38(80)	48(15)	21.6(20)	16.8(20)	3.6(2)	32(20)	12(10)
Bhendi	0	0	0	0	8(6)	2(1)	8(7)	0	17.2(22)
Brinjal	1.2 (3)	2(7)	7.2(15)	12(18)	0	0	0	0	0
Beans (Dolichus lablab)	2 (3)	7/4F	115/60	130/70	20/11	0	0	60/10	0
Chillies	2 (2)	4(5)	8(10)	8(8)	0	0	0	0	
Paddy	0	12(18)	28(30)	80/29	12(16)	0	2.4(3)	0	6(7)
Rainfall (till Aug 2015)	180 mm	200 mm	250 mm	210 mm	122 mm	112.1 mm	110 mm	100 mm	100 mm

Much of groundnut crop was sown intercropped with pigeonpea. Groundnut/pearl millet intercrop was also grown by some farmers implying that there is a good scope for introducing other crops as an intercrop with groundnut. Further, irrigated farmers tried vegetable and other crops too so that they realise better income. The credit for this goes to essentially to the efforts of Horticulture department. Relatively more diversification was recorded in Penukonda and kottachervu mandals.

Crop Diversification Penukonda and Kottachervu mandals, 2015-16
Please see Table 4.1.1.9 as under;

Table 4.1.1.9.

Pilot II- Penukonda and Kothachervu Mandals (Pilot II)	Villages				
	Kondamapalli	Settipalli	Gonipeta	Bandlapalli	Yerrapalli
Dryland					
Gnut+Pigeonpea	263(208)	286(314)	62(43)	140(102)	306(262)
F. millet+Pigeonpea	5(4)	2(2)	3.50(5)	17(16)	10(6)
Greengram	5(5)	2.5(2)	0	4(2)	5(5)
Sorghum	5(3)	10(8)	0	0	0
Castor+Pigeonpea	16(12)	5(4)	4(3)	2(3)	2.5(5)
Pearl millet (Sajja)	3(8)	6(12)	8(3)	6(8)	0
Irrigated Land					
Groundnut+Pigeonpea	64(23)	28(36)	6.5(7)	29(12)	72(24)
Tomato	6.05(12)	4.85(6)	1.63(3)	39.52(17)	2.42(3)
Bhendi	0	0	2.48(2)	2.02(4)	2(6)
Brinjal	2.02(3)	2.02(3)	1.21(4)	4.03(11)	1.21(4)
Onion	16.13(32)	3.22(8)	2.42(8)	0	0
Chillies	2.23(6)	4.03(8)	2.62(6)	2.50(5)	3(6)
Paddy	8.06(12)	16.94(140	10.45(10)	6.05(7)	4.84(6)
Maize	6.45(8)	2.50(5)	1(1)	3.50(4)	1.50(4)
Sunflower	3(5)	0	0	0	0
Rainfall (till Aug 2015)	134 mm	224.5 mm	213.3 mm	160 mm	160 mm

* only 15% area sown under drylands with some rains that occurred.

\# All crops suffered badly in dryland, almost all crops succumbed

* Irrigated crops also suffered in some areas as water table dipped much below t

Integrated Pest Management
IPM practice that we could promote was largely of seed treatment. We made all farmers, most specially groundnut farmers of pilot villages to treat their seeds with Thirum 75 WP, Dithane M45 or Carbendazim 50 WP @ of 5 gm/kg of seed.

We advised farmers on pest control as per the need. We monitored *Helicoverpa* and *Spodoptera* which become important pests in most crops in many situations and helped the farmers in managing these and others pests effectively across almost all villages in Pilot I and II. Pheromone traps both for *Helicoverpa* and *Sposodptera were* installed to get forewarning.

Water management
Besides promoting general water management practices like encouraging drip irrigation, we this time put a special effort in our Pilot I – Rapatdu mandal, in building farm ponds lined properly with use of soil-cement mix (3:1). Three ponds - 2 in Palabavi and 1 in Gangalakunta villages were constructed. Water collected in these ponds was used for

irrigating crop in the later part of the *Kharif* season when there was drought. Around one ha *Kharif* groundnut crops were saved by using this water thru tanker/drip irrigation.

Timely sowing and establishing the crop

The timely sowing and establishing a crop is itself a problem in Anantapur area which receives very erratic rainfall. Often seed fail to germinate for the lack of rain and farmers lose their investment on seed and fail totally to raise the crop. To tackle this problem to some extent, our partner NGO-AFEC had earlier worked on an idea of applying water in seed furrows for widely spaced crops like pigeonpea and castor.

So, under Rythu Kosam, we tried this idea in pigeonpea and castor (row spacing 2 m). A tractor drawn seed drill mounted with two 200 litres of drums on either side was used apply water regulated thru flexible plastic tubes in seed furrows while seeding the crop. A total 5000 ltrs of water was applied for an acre (1 acre= 0.4 ha) of each of pigeonpea and castor. This practice worked successfully. Good crop of pigeonpea was raised in 1.5 ha in Gandlaparthi and 1.5 ha in G. Kothaplli. A crop of castor was also raised successfully in 1 ha in Pullarev village.

Monitoring and Evaluation

We have been continuously monitored and evaluated all activities that we initiated. The activity of aerobic composting has proved to be liked by most farmers. Further, the seed production program for multiplication and distribution of seeds locally. Crop diversification through intercropping/mixed cropping was also liked by farmers.

Capacity/Team building

The capacity and team building activities are on from the beginning of the Rythu Kosam Project.

Weekly meetings are being conducted by our partner NGOs at pilot sites along with our SO and RTs at the location to review and plan the work. The district co-ordinator invariably visit the pilot sites and meet district level officers once in fortnight to take the stock of the situations and decide the action plans. Some of the key meetings/workshops conducted at the district/pilot levels are cited below.

- Primary Sector Activities/Action Plan review Meeting called by Joint collector II, Anantapuramu, 17-06-2015.
- Interaction meeting of key officials of all line departments with farmers under the chairmanship of Joint Collector at Kondampalli, Penukonda, 8-7-2015.
- Special awareness programmes and trainings program for MPEOs and Farmers in highlighting cost reduction and promotion of sustainable farming, DOA, Anantapuramu, 1-08-2015.
- Big Agriculture exhibition held in Penukonda in 10th February 2016 with over 1000 farmers participated. Ministers and higher govt. Official participated.

Our NGO partners who have been involved in agriculture and rural development programs including watershed developments have been conducting farmers training and educational programs on regular basis. AFEC of Raptadu is known for its bigger reach to the villages for being in operation for various development activities in Ananatapuramu. Under Ruthu Kosam program they conducted some programs and educated farmers (see Table 4.1.1.10 below).

Table 4.1.1.10. Capacity Building Training and education to farmers of pilot sites, Anantapuramu, 2015-16					
S. no.	**Name of the programs/topics**	**Penukonda/Kottachervu**		**Raptadu**	
		No. of programs	**Participants (Nos.)**	**No. of programs**	**Participants (Nos.)**
1	Rural livelihood education (fortnightly)	24	250	24	1000
2	Orientation on APPSM (Rythukosam)	2	220	2	450
3	Soil testing/analysis	5	300	9	900
4	Seed development	10	150	9	900
5	Compost making education	10	250	3	50
6	Usage of Micro Nutrients	10	230	9	500
7	Pre/post harvest techniques of horticulture crops	5	150	9	50
8	Land & water management	2	50	1	10
9	Womens' Day	1	100	1	500
Total			1450		3860
* Raptadu NGO, AFEC being a known for various activities combined their some programs together					

Publicity (Wall writings, pamphlets, media (newspaper, video and audio)

The local print and TV media covered the news of Raythu Kosam from the start of the program in Anantapur (Figure 4.1.1.3). We did wall painting on soil nutritional status in every village of pilot sites. Over 500 pamphlets and 3 big banners on aerobic composting including one on shredder machine; 2 banners on micronutrient awareness program were extensively used for educating farmers in the meetings and exhibitions. Digital green has made two short video-films - one on composting, another on farm ponds. These have also been uploaded on youtube.


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1800-425-8888

Figure 4.1.1.3. Print media coverage of aerobic composting and Rythu kosam programs

Public-private partnership

Under Rythu Kosam program, effort are being made to seek public private partnership. Under this program we requested M/s Coromandel International for conducting their products (NPKS) trials in Maize and Paddy in Penukonda. In both the trials laid out with 4 replicates, farmers could see the benefit of using fertilizer products fortified with Sulphur. All products containing sulphur helped in producing 12-15% more crop yields than products without sulphur. The products were used to apply NPK in recommended doses (Paddy: 120N: 60P: 40K and Maize: 120N: 60P: 50K) mixing with straight fertilizer like Urea and Muriate of Potash as to balance the NPK.

T1: Ammonium Phosphate (AP) 20:20:0:13S

T2: Urea Ammonium phosphate (UAPS) 20:20:0:13S (Gromor Max)

T3: Ammonium Phosphate (AP) 16:20:0:13S

T4: Diammonium Phosphate (DAP)

T5: Ammonium Phosphate. 20:20:0 (without S)

Post-harvest

Groundnut storage at home for the purpose of seed is a big problem because of insects and microbial infection that occur during storage. To tackle this problem to some extent, we with our partner NGO-AFEC demonstrated 3-layered polythene bags for good storage of groundnut seed pods. Farmers could see the benefit of this as they observed no insect attack and microbial infections over a period until next season. We distributed some bags in Raptadu mandal. The supply of such bags to farmers is being taken up now on a regular basis by AFEC on a subsidized cost. The demand for such a bag is increasing for groundnut seed storage at home.

Formation of FPOs

The Farmer Producers Organization (FPO) are being formed at both pilot sites. Several orientation cum formal and informal meetings were organized between NABARD officials and farmers to create interest amongst farmers. Following the efforts made during 2015-16, we have now succeeded in registering one FPO in Penukonda on 25th July 2016 named "Kondampalli Sri Rama Swamy Rythu Utpathidaralu Mutually Aided Cooperative society (Registration AMC/ATP/DCO/2016/4561). This FPO presently has a membership of over 200 farmers covering two villages Kondampalli and Settipalli of Penukonda mandal. It is formed largely for production and marketing of groundnut. One more FPO for the production and marketing of horticulture crops is under the process of registration in Penukonda.

In Raptadu mandal, our partner NGO, the AFEC as a first step created and registered a village-wise farmers' Cooperatives eventually to help them to work on some business activities in production and marketing of agriculture produce. We have plan to develop each of these groups to work for a particular commodity/some commodities. Some specific activity of farmers' interest like the seed production of dry-land crops is being discussed with farmers depending upon the strength.

Documentation of case studies

We documented two cases - one on onion and one on vegetable garden from Penukonda where farmers produced more yields and made good profits with low expenditure. Case studies (Nos. 3) of some poor farmers of Anantapur have been made by our IDC program when the selected progressive farmers from different districts visited ICRISAT under Rythu Kosam program in 2015.

4.1.2 Chittoor

Baseline survey:

Around 480 farmers were interviewed for data collection in 9 villages of both the mandals of pilot site by ICRISAT survey team (see section 3.1). The data will be used for analysing farmer's status about income through different sectors, technology adoption, crops, livestock, productivity, perception about the schemes etc.

Soil health mapping and scaling out soil test based fertilizer management:

Collection of soil samples:

Around 495 soil samples have been collected from farmers' fields across in 12 villages in Santhipuram mandal and 6 villages in V. Kota mandal and have been analysed at ICRISAT (Figure 4.1.2.1). Respective soil samples were collected through stratified soil sampling method as explained to farmers in ~ 16 meeting in the villages.

Figure 4.1.2.1. Farmers training on soil sample collection in Bellakunta village, V.kota mandal, Chittoor district.

***Soil-test- based fertilizer management**:*

The soil test based recommendations are developed including on soil deficient micro and secondary nutrients. Thesoils tests results indicates that the soils in Santhipurammandal are deficit with Organic carbon (60%), sulphur (50%), zinc (28%) and boron (51%) and the soils in V.Kotamandal are deficit with Organic carbon (48%) sulphur (51%), zinc (16%),boron (75%) and Calcium(34%) with varying deficient levels as given in Appendix 1h.Farmers meetings are going on to create awareness about soil health and soil test based recommendations. Soil health cards were distributed to all farmers, along with major crops, major and minor nutrients recommendations. The recommendations are shared with line-departments, NGOs and ICRISAT line staff who are creating awareness and disseminating the results amongst the farmers. In context of observed deficiencies, the use of micronutrient fertilizers is being promoted.

***Micro nutrient distribution along with DoA**:*

The promotion of soil test-based addition of secondary and micronutrients is the focus area in pilot sites. The soil test-based recommendations including for secondary and micronutrients are provided to Agriculture department and are being promoted with farmers. As such the quantities of micro and secondary nutrients distributed is given in Table 4.1.2.1 (see figure 4.1.2.2).

Table 4.1.2.1. Micro nutrients distribution status in pilot site and in the district				
Mandal	**Micronutrient**	**Indented (t)**	**Received (t)**	**Distributed (t)**
V.Kota	Zinc sulphate	4.5	4	4
	Borax	0.5	0.45	0.45
	Gypsum	63	63	63
Santipuram	Zinc sulphate	6.2	5.8	5.8
	Borax	0.475	0.45	0.45
	Gypsum	100	69	69
Chittoor district	Zinc sulphate	372	330	330
	Borax	40	36.5	36.5
	Gypsum	6000	5952	5952

Figure 4.1.2.2.Micronutrients distribution & application in pilot villages

Soil health mapping and wall writings:

Soil Health Cards were distributed to the individual farmers from whom the soil samples were collected initially (Figure 4.1.2.3). A consolidated soil health report for the pilot villages was arrived by taking the average of all the soil samples collected from the village and depicted as wall writings in the popular meeting places of village. A total of 18 wall writings were done in V.Kota and Santhipuram pilot villages.

Figure 4.1.2.3. Soil health card released distributionat Santhipuram mandal by Chittoor district collector, Sri Siddhartha Jain garu and Wall writing in V.Kota pilot village.

Seed Production and Seed systems: As the climatic conditions were favourable for quality seed production in Chittoor, which may be a good income-generating activity for the farmers. Therefore, with support from RARS and Department of Agriculture (DoA), seed production of groundnut (Kadiri6 Dharani, K9, ICGV91114) is done during *kharif*and *Rabi* 2015-16(Figure 4.1.2.4; also see Section 3.3).

Figure 4.1.2.4. Groundnut breeder seed distribution in Santhipuram mandalseed production field visit Plot at KVBpuram

Evaluation of new varieties

Foundation seeds of different improved varieties of Groundnut, Pigeon pea, Finger millet, Fodder-Sweet Sorghum, Green gram and Black gram have been distributed to the progressive farmers in both mandals to evaluate the performance and adoptability of varieties in the pilot villages (Table 4.1.2.2). Different Pigeon pea varieties like ICPH2740, ICP 8863 (Maruthi), lakshmi and ICPL161 with varying crop duration between 135-180 days and groundnut varieties like ICGV91114, ICGV00350,ICGV00351with varying crop duration between 95-120 days were distributed to the 146 progressive farmers as given in the below Table. Crop cutting experiments were conducted and yields were compared with local cultivars (see Section 3.6).

Table 4.1.2.2. Details of ICRISAT – Improved varietal evaluation farmer fields in the pilot villages

Mandal	No. of villages	Crop	Variety	Area (ha)	Quantity distributed	No. of farmers
V.Kota, Santipuram	18	Ground nut	K9, Dharani,ICGV91114, ICGV00350,ICGV00351	19.2	2660	62
V.Kota, Santipuram	6	Pigeon pea	ICPH2740,ICPL161, Maruthi, Lakshmi	8	48	25
Santipuram	5	Sorghum	PVK801	3.4	17	6
Santipuram	3	Fodder sorghum	CSH24 MF	1.4	14	3
V.Kota, Santipuram	9	Sweet sorghum	Hybrid	8	48	23
Santipuram	3	Black gram	T9	2.8	30	9
V.Kota, Santipuram	3	Greengram	PS16	2	19	3
V.Kota, Santipuram	4	Bajra	ICTP8203(Dhanshakti)	4.8	25	15
Total	**51**			49.6	**2,861**	**146**

Recycling of on-farm wastes& biomass generation for soil fertility:
Madhyam microbial culture was supplied to farmers which were used for compost production (Figure 4.1.2.5). For this, they used the crop residues of banana, vegetables, other crops and animal wastes to produce good quality compost that can be used later in crop production to increase the soil fertility (see Section 3.2.4).

Figure 4.1.2.5. Compost preparation and Chipper shredder demonstration at Dandikuppam village.

Shredding machine is also piloted which used to chop the banana stems and agricultural wastes into small pieces which in turns fastens the decomposing while composting.

To enrich the soils of the pilot sites, 50,000 *Glyricidia* (green manure crop) seedlings were raised in collaboration with forest department and 20,000 seedlings were distributed to farmers (Figure 4.1.2.6). These seedlings were planted on the field bunds for biomass production, later harvested the leaves and added to soil to improve the organic carbon status (Table 7).

Figure 4.1.2.6. Glyricidia raised nursery at Chittoor forest nursery and Seedlings distributed to the farmers in pilot villages.

Evaluation of aqua sap:
During 2015-16, participatory on-farm trials were conducted on foliar application of aqua sap on potato crops in pilot villages. In Chittoor district, 45 trials in each of the pilot sites across 9 villages were conducted during *Rabi* 2015-16 season with potato and beans crops (~12 ha).

In situ moisture and land management:

For soil conservation, arresting soil moisture evaporation &erosion and to retain more moisture in the soils, broad bed and furrow system is introduced in the pilot site villages. One-bullock cart mounted Tropicultor was placed in Santhipuram mandal for effective land and water management. For purpose of demonstration, broad bed and furrow system was done in 2 ha in different villages in Santhipuram mandal with crops like groundnut, pigeon pea and sorghum. Necessary trainings were conducted to farmers on making and sowing with BBF system more area is covered under BBF.

PPP Initiative & on-farm mechanisation - ***Tropicultor:***

As a demonstration purpose we supplied one seed drill mounted Tropicultor in Santhipurammandal which in turn reduces the manual labour and also increases the plant density by maintaining recommended spacing (Figure 4.1.2.7). The demonstration was taken up in 3 farmers' field covering 10 acres of land in 2 villages for groundnut crop.

Figure 4.1.2.7. Seed drill demonstration (With Tropicultor) at Pedduru village, Santhipuram mandal

Integrated Pest Management:

Training programmes was conducted in the villages of pilot sites to control the pests of groundnut giving more emphasis on IPM. Around 120 farmers from 4 villages of 2 mandals participated in the training programmes organised jointly by NGO's, DOA and ICRISAT. Farmers were trained on identification of pests, initial symptoms, nature of damage and economic part infested (Figure 4.1.2.8).

A total of 100 insect pheromone traps (*Spodoptera* and *Helicoverpa* pheromone traps - 50 each) have been installed in pilot sites to monitor the pest incidence and its activity during the cropping period in farmer fields (Figure 4.1.2.8). The total count of insects captured in the traps is being tabulated on regular intervals to recommend the control measures based on ETL.

Figure 4.1.2.8.Left: Farmers training on pest management in GummiReddypalli village, V.Kota mandal, Chittoor district; Right: Insect traps installed in farmers field in the pilot village

Rain gauge installation:
Dual typerain gauge was installed in the premises of Sri Jayappa, a progressive farmer of Chinnaridoddi village, Santhipuram mandal of Chittoor district. The dual-type rain gauge allows manually measuring rainfall and air temperature. Knowledge of weather, particularly on rainfall received in the village helps the farmers in better management of their crops like deciding whether to apply fertilizer or not; irrigate or not; and to determine how much to irrigate. Proper scheduling of irrigation can save precious water as well as energy.

Crop cutting experiments: In micronutrient experiment, Kadiri6 with micronutrient application showed 29% increase in the yield than its control (Table 4.1.2.3; Figure 4.1.2.9). While in Varietal evaluation between ICGV 91114 and Kadiri6, ICGV 91114 Showed 28% increase in the yield than the Kadiri6.

Table 4.1.2.3. Groundnut crop pod yield increase with micronutrients and improved variety in Chittoor district pilot villages during *kharif*-2015.

Activity	Crop	Variety	Pod yield kg ha^{-1}	% increase over FP
Micronutrients	Groundnut	Kadiri6	2170	29
		Kadiri6	1660	
Varietal trial	Groundnut	ICGV 91114	1820	28
		Kadiri6	1420	

Figure 4.1.2.9. Groundnut crop sampling in pilot villages in Chittoor district

Field days: Six field days were organized to demonstrate crop growth and yield enhancement with improved management including use of micronutrients and suitable improved varieties (Figure 4.1.2.10). Total 312 farmers were attended in this meeting at pilot villages.

Figure 4.1.2.10. Farmers'participation in groundnut field day at V.Kota pilot village

Micro-Irrigation:

Farmers showed interest in bringing their farms under drip irrigation in Chittoor district (Table 4.1.2.4). In the pilot site farmers registered for drip irrigation by paying the non-subsidised amount (10%) to avail the subsidy benefit (90%) in APMIP scheme under Department of Horticulture.

Table 4.1.2.4. New Drip farmer details in Santhipuram and V.Kota pilot villages						
Season	**No. of mandals**	**No. of villages**	**No. of applications**	**No. of units distributed**	**No. of farmers benefited**	**Extent Area (ha)**
Kharif	2	10	100	60	60	24
Rabi	2	7	150	75	75	30

Green SIM cards: 300 green SIM cards were supplied to farmers in collaboration with IFFCO and airtel. These farmers were benefited by getting the updates on agriculture informations, pest management and local market prices.

Agro forestry: With the help of forest department, we hadsupplied the drumstick and curry leaf plants for planting on bunds surrounding the fields and in waste lands in pilot site villages(Table 4.1.2.5).

Table 4.1.2.5. Agro forestry plants distribution details in pilot villages					
Mandal	**No. of villages**	**No. of plants distributed**		**Total plants**	**No. of farmers benefited**
		Pomegranate	**Curry leaf**		
V.kota	6	280	260	540	240

Capacity building:

Participated in division level awareness program in Kuppam and Palamaneru organised by Mr Subba Reddy, Joint Collector-2 Chittoor district with all line department HOD's, village surpanch and farmers, About 330 participants, it discussed about the objectives and strategy of the Rythukosam (Figure 4.1.2.11).

Figure 4.1.2.11. Division level awareness program at KuppamandPalamaneruwith Joint Collector-2 and other line departments.

As a part of mission, we conducted village level awareness program in 10 villages in 2 pilot site mandals (V.kota and Santhipuram) (Figure 4.1.2.12). In these program we addressed about benefits of soil test based micro and macro nutrient recommendations, soil moisture conservation, advantages in growing new varieties of groundnut (ICGV 91114, ICGV 00351), red gram hybrid (ICPH 2740) and sweet sorghum, procedure for compost preparation, advantages of integrated pest management and explained about the schemes in agriculture and allied departments. In these training programs around 2730 farmers (including ~600 women farmers) participated during *kharif* season and about 1550 (including ~250 farmers) during *rabi* 2015-16 season.

Figure 4.1.2.12. Village level awareness program at ChinnaridoddiandYerrinagepalli villages.

Scaling-out in collaborative with line departments:

Agriculture: The area that has been covered during *kharif* season for groundnut was 1, 14,394 ha and the seed distributed was 62,717 quintals. Red gram (intercrop) and the seed distributed was 610 quintals. Pilot site V.Kota mandal the area covered is 3,508 ha and ground seed distributed was 1620 quintals and in the other site Santhipuram mandal the area covered was 2407 ha and the seed distributed was 1,264 quintals.

During *Rabi* season area covered was 11,933 ha and the quantity of seed distributed was 7,236 quintals of ground seed.

Micronutrients: The area covered under groundnut crop was 23,808 ha, paddy was 13,200 ha and other crops 14,600 ha. The department of Agriculture supplied micro nutrients which are: zinc sulphate -330 m.tons, gypsum –5,952 m.tons and borax - 36.5 m.tons which were used in the above areas.

Farm ponds under NREGS Programme: In Chittoor district number of farm ponds which are in progress is 27,645 and completed is 2,470. In pilot sites Santhipuram farm ponds which are in progress is 567 and completed is 164 and in V.Kota farm ponds which are in progress is 361 and completed is 42.

Rythu Kosam in Media:

During the *kharif*and *rabi*season 2015-16, Rythu Kosam project on farm activities and implementation in the pilot sites of all thirteen districts have been well covered by the media (Figure 4.1.2.13a, b). The performance of the project has been highlighted through different media channels like regional newspapers and TV channels. Most popular newspapers like Sakshi, Eenadu, Andhra Jyothi and Surya covered eighty one different news clippings from Chittoor district pilot sites.

ఆశాజనకంగా ఇక్రిశాట్ వేరుశెనగ

శాంతిపురం: ఇక్రిశాట్ ద్వారా విత్తనాలు, సాగు సలహాలు అందిస్తున్న కొత్త వేరుశెనగ వంగడం రైతుల్లో ఆసక్తిని రేకెత్తిస్తోంది. ఇప్పటికే శాంతిపురం, వి.కోట మండలంలో ఎంపిక చేసిన 10 వేల హెక్టార్లలో ఇక్రిశాట్ కార్యకలాపాలు సాగుతున్నాయి. మొత్తం 50 మంది రైతులకు ఐసీజీవీ 91114 రకం వేరుశెనగ ఫౌండేషన్ విత్తనాలను ఇచ్చారు. సాధారణ రకంతో పోల్చితే వేరుశెనగ పంట బాగుందని, పెద్ద సంఖ్యలో కాయలు కాస్తున్నాయని దండికుప్పానికి చెంది న రైతు జంగం జనార్దన్ సంతృప్తిని వ్యక్తం చేశారు. అధికారులు పొలాన్ని తరచు సందర్శించి అవసరమైన సల హాలు ఇస్తున్నారని చెప్పారు. ప్రయోగాత్మకంగా సాగుతున్న కొత్తరకం వేరుశెనగ సాగులో పండే పంటను ప్రభుత్వమే కొనుగోలు చేస్తుందని ఇ క్రిశాట్ టెక్నీషియన్ రామంజనేయులు, ఏఈఓ మెహ బూబ్‌బాషాలు తెలిపారు.

లింగాకర్షక బుట్టలు ఏర్పాటు

రాయితీ ధరతో వేరుశెనగ పొలాల్లో లింగాకర్షక బుట్టలు, జిప్సం అందజేశామని వారు చెప్పారు.

సాయిల్ హెల్త్‌కార్డుల పంపిణీ

శాంతిపురం: ఇక్రిశాట్ ఆధ్వర్యంలో రైతుల వ్యవసాయ భూముల్లో తీసిన మట్టి నమూనాలను పరీక్షించి 'సాయిల్ హెల్త్ కార్డు'లను రైతులకు పంపిణీ చేస్తున్నారు. సోమవారం చిన్నారిదొడ్డిలో జరిగిన కార్యక్రమంలో ఇక్రిశాట్ టెక్నీషియన్ రామాంజనేయులు పాల్గొన్నారు. ఎయిర్‌టెల్‌తో ఒప్పందం మేరకు రైతులకు ప్రతిరోజూ 3 వాయిస్ మెసేజ్‌లు వచ్చే గ్రీన్‌సిమ్‌లను పంపిణీ చేశారు. ఈ సందర్భంగా జరిగిన గ్రామసభలో ఆయన మాట్లాడుతూ స్థూల పోషకాలతో పాటు సూక్ష్మ పోషకాలు కూడా పరీక్షించి ఇచ్చిన కార్డులు రైతులకు అన్ని విధాలుగా ఉపయోగపడతాయన్నారు. తమ భూమిలో అవసరం ఉన్న ఎరువులను కావాల్సిన మోతాదులో మాత్రమే ఉపయోగించటం ద్వారా ఖర్చులు తగ్గుతాయని తెలిపారు.

Figure 4.1.2.13a. Left: ICGV 91114 Groundnut Variety Performance (Sakshi) 07/08/2015; Right: Soil Health cards Distribution at Santhipuram Pilot Villages (Sakshi) 21/09/2015;

మొక్కలు నాటేందుకు సులువైన పరికరం

సాక్షి Wed, 09 December 2015
epaper.sakshi.com/c/7545186

అధునాతనం.. అందిపుచ్చుకుంటే విజయం

ఆకట్టుకుంటున్న వ్యవసాయ పరికరాలు

బ్రష్ కట్టర్

విత్తన గొర్రు

చిప్పర్ షెటర్

ఈజీ ప్లాంటర్

సోలార్ డ్రయ్యర్

మెట్టప్రాంత రైతులకు ప్రోత్సాహకం

Figure4.1.2.13bLeft: Easy Planter Demonstration at Santhipuram and V.kota Mandal Pilot Villages (Sakshi 08/12/2016); Right: New Farm Implements in Santhipuram & V.Kota Mandal (Eenadu) 09-02-2016

4.1.3 East Godavari

Baseline survey

Around 500 farmers, starting from small-marginal-big farmers, were interviewed in all the pilot villages, by ICRISAT survey team (see Section 3.1). The objective of the study is to document the current status of the pilot site covering 26 villages from three mandals in East Godavari district. A post survey may be conducted near to the end of 5 years' time to analyse farmer's status before and after program implementation. A detailed report on the survey has been included along with this report as Base line survey in Andhra Pradesh.

Soil health mapping and scaling-out soil-test-based fertilizer management

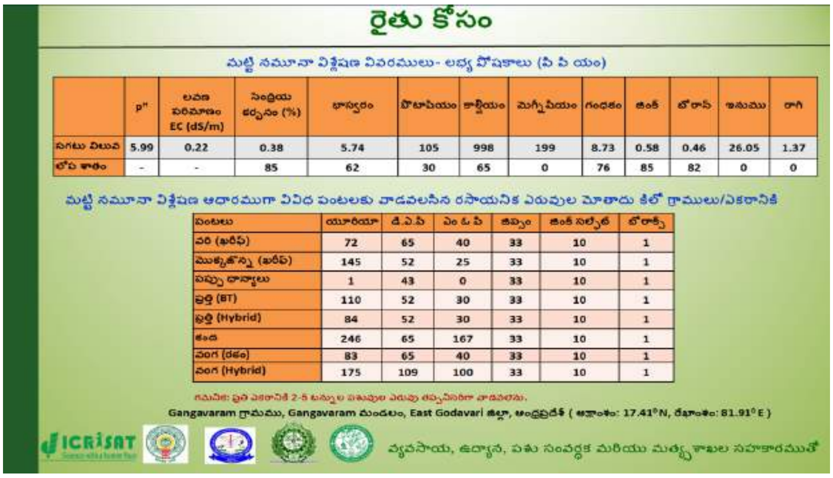
Around 368 soil samples were collected from farmers' fields in all villages (7 villages in Gangavaram mandal and 8 villages in Yeleswaram mandal) of pilot site (Figure 4.1.3.1; Table 4.1.3.1). Predominantly, red and black soils are covering in the pilot villages, in detail the villages in Gangavaram mandal are dominated by red soils and the villages in Yeleswaram mandal are dominated by black cotton soils. The number of soils that were collected from each village is as given in Table. For this we have conducted around 45 farmers meetings (2 times at least in each village) in the pilot site as shown in Figure.

Figure 4.1.3.1.Training farmers on soil collection procedure

Table 4.1.3.1.Details of soil samples collected from different villages of Gangavaram and Yeleswaram Mandals in the pilot site

Village Name	No of Samples	Village Name	No of Samples
Amudalabanda	28	Bhadravaram	11
Gangavaram	34	J Annavaram	25
Goragommi	17	Lingamparthi	39
Kusumarai	20	Marriveedu	20
Lakkonda	64	Peravaram	7
Pandrapottipalem	19	Ramanayyapeta	15
Rajampalem	24	Siripuram	25
		Yeleswaram	20
Gangavaram	**206**	**Yeleswaram**	**162**

Collected soils were tested and analysed for understanding the secondary and micro nutrients status in the pilot villages. The soils tests results indicates that the soils in Gangavaram mandal are deficit with sulphur (84%), zinc (67%) and boron (86%) and the soils in Yeleswaram mandal are deficit with sulphur (47%), zinc (31%) and boron (10%) with varying deficient levels as given in 4.1.3.2. The fertilisers' recommendations of secondary and micro nutrients were prepared as per soil test results for each village and shared the data with the department of agriculture. Soil health cards were printed with secondary and micro fertilizers recommendations for the major crops and the cards will be distributed to all farmers in the pilot site villages. Soil sample test results evaluated village level were printed on 6X6 feet flexes and hanged out to walls at each village major farmer's gatherings areas as shown in Figure 4.1.3.2 and 4.1.3.2.



రైతు కోసం

మట్టి నమూనా విశ్లేషణ వివరములు- లభ్య పోషకాలు (పి పి యం)

	pH	లవణ పరిమాణం EC (dS/m)	సేంద్రియ కర్బనం (%)	భాస్వరం	పొటాషియం	కాల్షియం	మెగ్నీషియం	గంధకం	జింక్	బోరాన్	ఇనుము	రాగి
సగటు విలువ	5.99	0.22	0.38	5.74	105	998	199	8.73	0.58	0.46	26.05	1.37
లోప శాతం	-	-	85	62	30	65	0	76	85	82	0	0

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

పంటలు	యూరియా	డి.ఎ.పి	ఎం ఓ పి	జిప్సం	జింక్ సల్ఫేట్	బోరాక్స్
వరి (ఖరీఫ్)	72	65	40	33	10	1
మొక్కజొన్న (ఖరీఫ్)	145	52	25	33	10	1
పప్పు ధాన్యాలు	1	43	0	33	10	1
ప్రత్తి (BT)	110	52	30	33	10	1
ప్రత్తి (Hybrid)	84	52	30	33	10	1
కంద	246	65	167	33	10	1
వంగ (దేశ)	83	65	40	33	10	1
వంగ (Hybrid)	175	109	100	33	10	1

Gangavaram గ్రామము, Gangavaram మండలం, East Godavari జిల్లా, ఆంధ్రప్రదేశ్ (అక్షాంశం: 17.41° N, రేఖాంశం: 81.91° E)

ICRISAT వ్యవసాయ, ఉద్యాన, పశు సంవర్ధక మరియు మత్స్య శాఖల సహకారముతో

Figure 4.1.3.2. Wall paintings on soil test results in each village corners

The soil test results were shared with all the farmers and explained the importance of micro nutrients application and the role in increasing production of their crop yields. To promote advantage of micro nutrients usage as basal application, so far we have conducted nearly 50 farmers meetings (also more than 3 times in each village and still going on) in the pilot site before sowing taken place. Every week,in each village a group of interested farmers were identified and the identified farmers lists were given to concern village Agriculture Officer for dispatching material to those villages. We are trying to reach more farmers by conducting more corner meetings in every village.

***In-situ* moisture and land management**

For soil moisture conservation, arresting soil erosion and to retain more water in the soils, Broad Bed and Furrow method was introduced in the pilot villages in the month of May 2015 (Figure 4.1.3.3). The pulverised soils are made into 1.0 m width and 0.2 m high beds by using Tropicultor (Type of Plough) for conserving more water during the rainy season that supports the crop during dry spell time. This method is tested in ICRISAT and promoted all over India and other countries as soil and water conservation technique. For promoting this intervention in the pilot villages, two Tropicultors (one-tractor mounted Tropicultor in Yeleswaram Mandal, one-bullock cart mounted Tropicultor in Gangavaram mandal) were brought from ICRISAT, Hyderabad and placed one in Gangavaram mandal and one in Yeleswaram mandal. A demo of nearly 1 ha each in 3 villages (Rajampalem, Amudalabanda and Goragommi) was made initially as farmers trainings in Gangavaram mandal as shown in Figure. Due to extra cost involved for making beds after pulverisation of soils, farmers in the Gangavaram mandal have not come forward for adopting this method. This issue was taken up to the notice of Project Director (PO, ITDA) and PAO and HO for requesting convergence of schemes and support from the government. Due to lack of sufficient funds the BBF method was not taken forward more than demos. This method can be adopted in Cotton, pigeonpea, groundnut, vegetable crop fields as soil and water conservation method. The demo field were visited by PAO and ADA Gangavaram, AO-Gangavaram on 15-6-15 and also in later dates.

Figure 4.1.3.3.Broad Bed and Furrow soil and water conservation technique demonstration in Goragommi village of Gangavaram mandal.

Evaluation of Improved Crop Varieties: Groundnut and Pigoenpea

Foundation seeds of different improved verities of Pigoenpea, groundnut, finger millet, fodder-sweet sorghum, and Gliricidia seeds have been distributed to 38 progressive farmers in both mandals to evaluate the performance and adoptability of varieties in the pilot villages. Different Pigoenpea varieties like ICPH2740, ICP8863 (maruthi), ICPL87119 (Asha) and ICPL161 with varying crop duration between 135-180 days and groundnut varieties like ICGV91114, ICGV0351 with varying crop duration between 95-120 days were distributed to the 40 progressive farmers in different pilot villages.

Private Public Partnership (PPP): Kubota India-Farmer-Department of Agriculture-ICRISAT-NGO

The partnership was started in July 2015 at Lingumparthy village of Yeleswaram mandal in East Godavari District, Andhra Pradesh (Figure 4.1.3.4). The ICRISAT staff Rajesh Nune, Visiting Scientist, Bharat Chandra (SO) and T. Sangeeta (RT) have conducted several awareness programs to the farmers in the village with the help of NGO coordinators about the cost reduction and increased yield difference due to machine technology. The Kubota company will procure the farmers requested seed from the nearest Rice research Institute (Maruteru), raise the nursery, transport to farmers' fields and transplant nursery with

Kubota machine on the farmers fields with only cost of Rs 3000/- per acre, whereas a farmer usually spend nearly Rs 5500 to Rs 6500 for the above work. The labour shortage was a big problem in this mandal, which has been addressed with machines and with this PPP mode. The demos are successfully done with 14 farmers.

***Kharif* 2015**

We have collected the farmers data (nearly 120 farmers came forward) such as seed variety, date of sowing, proposed area of machine transplantation, etc., from the interested farmers and requested the Kubota staff to raise the required variety as per sowing dates and areas. The nursery of different varieties of paddy (MTU 1001 8 ha; Swarna 8 a; BPT 5204 8 ha; MTU 1001–16 ha) has been raised at the Maruteru Research Station (West Godavari) by Kubota Company during the month of July 2015 as per expected sowing dates.

The program was launched by local MLA Sri Varupula Subba Rao garu, Rajesh Nune, Visiting Scientist- ICRISAT with coordination of village ex-president Sri Raju garu, Agriculture Officer Sri Ashok, Sri Senthil Kumar-Kubota Company, T. Sangeeta Research Technician-ICRISAT and NGO coordinators. The machine transplantation has been started in the first week of August and around 16 ha were transplanted in Yeleswaram mandal and 2 ha in Gangavaram mandal.

We have conducted farmer’s field visits for other pilot villagers to some of the machine transplanted demonstrated fields during harvesting time. ICRISAT has conducted crop cutting experiments in presence of farmers and AO Yeleswaram mandal in most the machine transplanted fields along with control fields to understand the yield difference between the two fields. It was observed that on an average the machine transplanted fields show increased yield around 3-5 bags (75kgs) than the farmer practice fields. The farmers showed their satisfaction in yield difference observed in their fields.

Figure 4.1.3.4. Left: Awareness program on machine transplantation in Lingumparthy village of Yeleswaram mandal, East Godavari district, AP; Right: Machine transplantation in Gangavaram Mandal.

***Rabi* 2015 - 16**

The crop cutting experiments were carried out between machine transplantation and normal farmers plantations during harvesting season of *Kharif* 2015 in presence of farmers and agriculture officers. It was observed that the field transplanted by machine yielded more than (3 to 5 bags extra) the regular farmers practice. The farmers from Siripuram village adjacent to Lingumparthy village have also come forward and joined in the PPP mode. The PPP mode has been expanded to 75 ha in *Rabi* 2015-16, 36 ha in Lingumparthy village, 31 ha in Siripuram village, 4 ha in Yarravaram village, 3 ha in Irupaka village and 1.5 ha in Chinnampeta village of Yeleswaram mandal (Table 4.1.3.2). The program was successfully carried out and good yields were obtained to all the farmers in both the villages.

Table 4.1.3.2. Details of machine transplantation fields farmers in Lingumparthy village of Yeleswaram mandal during *Kharif* 2015

District Name	Mandal Name	Village Name	Total Area covered in each village under Machine Transplantation (ha)
East Godavari	**Yeleswaram**	Chinnampet	1.6
		Irupaka	2.8
		Lingamparthi	36.4
		Siripuram	31.2
		Yerravaram	4
	Yeleswaram Total		**76**
Grand Total			**76**

Crop diversification

The new rice variety RP Bio 226 was introduced in the pilot villages and around 32 ha were sown in the *Kharif* 2015. Crop cutting experiments will be conducted to evaluate yields compared with local cultivars and performance in poor rainfall scenarios.

Recycling of on-farm wastes & biomass generation for soil fertility

The composting activity using microbial consortia is piloted with 10 farmers/100 tons in the pilot sites of Gangavaram mandal.

Considering low levels of soil organic matter in farmers' fields, we are promoting planting of N-rich green manure plant Gliricidia on farmers' fields. With the help forestry department a nursery of 10 kgs of Gliricidia seedling were raised and around 3500 plants were distributed to the pilot site farmers as shown in Figure4.1.3.5.

Figure 4.1.3.5.Gliricidia plants raised with the help of Forestry Department

Monitoring of important pests

Total 100 inset traps are placed as shown in Figure 4.1.3.5 in the pilot sites and are being established in pilot villages/hamlets for proper guidance to farmers (both in Gangavaram and Yeleswaram pilot villages).

Seed Production program 2016.

The breeder seed (20 quintals) has imported from ARS Kadiri and distributed to the identified farmers (13 ha) with 50% subsidy. The farmers were trained on seed treatment procedure and all seed were treated before sowing. The fields were also visited by Project Officer, ITDA, Sri Chakder IAS and encouraged all the farmers for doing the good program and helping other farmers in AP. (Nearly 33 tons of foundation seed was produced by the farmers and the produced was procured by the APSSDCL by paying extra 20% of MSP at the time of harvest see Section 3.3).. The farmers of these villages have got good price and income with this program.

Capacity building

On daily basis, 4 NGO staff and 2 ICRISAT staff (in different locations) in collaboration with line-departments (agriculture, horticulture, animal husbandry, micro-irrigation, watershed) are conducting farmer meetings, and training programs on new technologies and to scale-out good practices on large number of farmers' fields in the pilot villages. In various capacity building programs, about 7100 farmers participated (including ~1900 women farmers) and learnt about improved technologies.

4.1.4 Guntur

Activities target & progress

Table 4.1.4.1. Rythu Kosam Project Activities during 2015 - 16		
Key Interventions at Pilot sites	**Targets**	**Achievements**
Baseline study of villages	400 farmers of 9 villages,	Done
Building Soil health		
Soil sample analysis, information given	400 samples	368 samples done
Soil Health Cards	368	Done
Aerobic composting & its use	5 farmers	Being tried
Micronutrients distribution in tons	Zinc 64, Gypsum 142, Borax 0.5	Done
Water use efficiency		
Drip systems in irrigated area	150 farmers	15 farmers
Seed Production-Seed Village		
Pigeon pea breeder seed (Kg's)	LRG41 (600 Kg), Lakshmi (552 Kg)	116 ha
Black Gram	PU31 (600 Kg)	3 ha
Crop diversification		
Inter crop with Pigeon pea in Cotton	Maruthi (125 Kg), Asha, ICPH 2740, Lakshmi	25 ha
Paddy	Samba sub 1 (225 Kg)	4 ha
Multi cut sorghum as fodder	10 Kg	2 ha
Live Stock (Dairy, Poultry, Meat)	As per the department targets	In Process

Capacity building

Table 4.1.4.2. Participants in Capacity Building Trainings			
Program	**No. of trainings**	**Officials**	**Farmers**
District level	4	300	
Mandal level	3	75	650
Village level	60	200	2400

Rythu Kosam Project Activities - Kollur Mandal

- Soil testing in selected fields.
- Identifying the fields in Google mapping system.
- Soil health cards distribution in the villages.
- Seed distribution.
- Conducted various awareness programs in the villages.
- Crop cutting experiments.
- Soil Organic matter enhancement
- Wall writing.

Soil Health Awareness Program

In Kollur Mandal, 9 villages where soil analysis was undertaken (see Appendix 1a), it is observed that the lands had deficiency of Zinc and Organic Carbon and other nutrient status is normal.
Village wise farmer meetings were conducted and explained the soil nutrient status and distributed soil health cards to the farmers (Figure 4.1.4.1).

In Kollur mandal, the nine villages were surveyed and soil health cards and seeds were distributed to farmers. Awareness to the farmers on various soil issues and suggestions made to resolve them.

Figure 4.1.4.1. Soil health awareness through meetings, wall writings and soil health card distribution

Evaluation of improved varieties

Table 4.1.4.3. Seed Distribution in Kollur Mandal		
Village	**Crop**	**Seed Qty (Kg)**
Ipuru	Pigeon pea (Maruthi)	15
	Green Gram (LGG460)	600
Potharlanka	Pigeon pea (Maruthi)	15
Chilumuru	Pigeon pea (Maruthi)	6
Gajula Lanka	Pigeon pea (Maruthi)	8
Donepudi	Pigeon pea (Maruthi)	10

Medium duration Pigeon pea (Maruthi) seed provided to grow on paddy field bunds. One farmer Mr.Sreedhar of Ipuru village has grown 1 Kg of super early pigeon pea of ICPL88039 (90 days) variety. He was happy as he got 30 Kg seed by growing on farm bunds.

IPM Program in the Villages

As part of ***IPM** (Integrated Pest Management)* program, in Kollur mandal, the selected villages were given traps for implantation in the pulses fields.

Farmers from these villages were oriented about the uses of simple ***Pheromone traps*** and were shown some practical examples and made aware of the natures trick.

Four Pheromone traps were distributed in Ipur and Potharlanka villages

An integrated pest management awareness program was conducted on 10-09 - 2015 at Ipuru village of Kollur mandal as part of Rythukosam project. Dr.G.V.Ranga Rao, ICRISAT and DAATT coordinator Dr. Rama Chandra Rao from lam farm participated.

Aqua Sap Evaluation

Selected farmers were also given thorough information about Aqua sap, a Hormonal chemical to be used in turmeric fields for higher yielding. In Ipuru village, in total of 0.4 ha, farmers were given Aqua sap for using in their fields. Farmers were explained about the usage and benefits:

- Improves nutrient uptake in the plants,
- Improves resistant abilities in the plant towards harmful diseases caused by insect and environmental stress.

Crop Cutting Experiments

As part of program, various on-farm demo trials were conducted. In the process, ***16 farmers*** were selected from various villages and crop cutting experiments were conducted in paddy, pulses, yam and turmeric fields (Figure 4.1.4.2).

The selected fields were visited in duration of 10 days and required study was carried out in the aspect of growth, pests or diseases. In case of abnormality, farmers were made aware of the situation and necessary actions were exercised.

Figure 4.1.4.2. Aquasap trials in pilot sites.

Kitchen gardens

Table 4.1.4.4. Seed Distribution in the Villages			
Village	**Fields**	**School or fields**	**Name of crops**
Potharlanka	5	Fields	Palak, Menthi, Dolichos, Bottle gourd, French Bean, Tomato, Bhindi, Bitter Gourd, Ridge Gourd, Guar, Coriander, Brinjal
Kolluru	1	School	Palak, Menthi, Dolichos, Bottle gourd, French Bean, Tomato, Bhindi, Bitter Gourd, Ridge Gourd, Guar, Coriander, Brinjal

Aerobic Composting preparation and usage

In Ipuru and Potharlanaka villages, ***15 farmers*** showed interest towards Aerobic composting preparation.

Rythu Kosam Project Activities - Sattenapalli Mandal

Awareness Program on Soil Health

Soil health awareness meetings conducted in all the villages and briefg the farmers about the soil health satus). Each farmer has provided with soil health card. Village mean nutrient deficiencies and fertilizer recommendations were displayed at important places of the villages through wall writings.

Evaluation of improved varieties

Farmers were encouraged to grow pigeon pea as inter crop in cotton fields by providing good quality pigeon pea seed (Table 4.1.4.5). Farmers were benefited with an extra income with pigeon pea inter crop.

Table 4.1.4.5. Variety demos/trials in pilor sites			
Village	**Seed Qty (Kg)**	**Type of seed distributed**	**Suggested solutions**
Kattamuru	20	Pigeon pea (Maruthi) Green Gram (LGG460) Pigeon pea m (ICPL88063) Pigeon pea (ICPL2740)	Suggestions given to farmers about Agronomic principles in seed development
Rentapalla	15	Pigeon pea (Maruthi)	Sowing red gram in the ridges to gain extra income to farmer
D D Palem	10		
Nandigama	12		
Gudupudi	20		
Pedamakkena	15		

IPM Program in the Villages

As part of ***IPM*** *(Integrated Pest Management)* program, in Sattenapalli mandal, the selected villages were given traps for implantation in the fields, harvesting pulses. Farmers from these villages were oriented about the uses of simple ***Pheromone traps*** and were shown some practical examples.
Twenty Pheromone traps were distributed in Kattamuru, Bhatluru, Rentapalla, DD Palem and Nandigama villages

IPM- Yellow Sorghum border crop for Chilly:

As part of IPM farmers interested to adopt Sorghum crop as border crops to manage the pest. Aranya has provided 50 Kgs sorghum (Yellow) given to the farmers.

Aqua sap distribution in the village

Nine farmers were given Aqua sap and created awareness about the usage of aqua sap to the farmers for yield enhancement.

Crop cutting experiments.

As part of program, various experiments were conducted in the fields for fruitful harvest. In the process, ***18 farmers*** were selected from various villages and crop cutting experiments were conducted in cotton and chilli.

Aerobic Composting preparation and usage

In Sattenapalli mandal, ***11 farmers*** showed interest towards Aerobic composting preparation.

Gliricidia Saplings Distribution in Kattamur Village of Sattenapalli Mandal:

Nursery was established with 1000 plants of Gliricidia (Figure 4.1.4.3), Sesbania grandiflora and Moringa.

Figure 4.1.4.3. Gliricidia nurseries raised for on-farm biomas generation

Productivity Enhancement through Micro-Nutrients

Due to low rain fall the paddy grain and cotton kapas productivity was substantially reduced when compare to last year. The average paddy grain yield was 4380 Kgs in improved practice and 3900 kgs in farmers practice (figure 4.1.4.4). The average cotton kapas yield was 2670 Kgs in improved practice and 2390 Kgs in farmer practice.

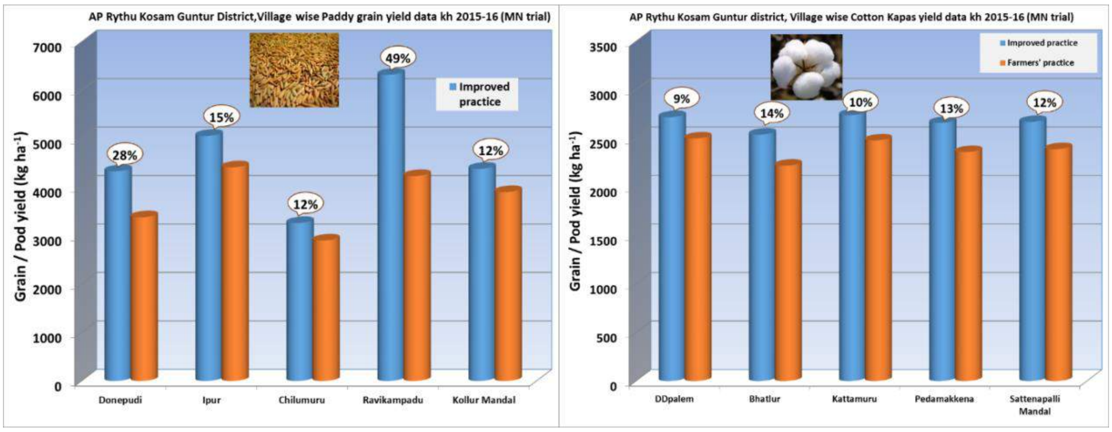


Figure 4.1.4.4. Effects of micronutrients application on crop yields

Seed Multiplication Trial Details 2015 - 16

Six quintals of PU 31 black gram breeder seed provided in Mangalagiri mandal. The multiplied seed was directly purchased by AP Seed Corporation from the farmers. An average of 6-8 quintals per acre (1 acre=0.4 ha) seed was obtained by farmers (Figure 4.1.4.5; see Section 3.3).
Six quintals of LRG 41 and six quintals of Laxmi (ICPL 85063) pigeon pea breeder seed provided for seed multiplication in Vinukonda mandal, Guntur district (Figure 4.4.4.5). AP Seed Corporation purchased the seed from the farmers.

Figure 4.1.4.5. LRG 41 and PU31 grown fields visit with AP Seed Corporation **manager**

Capacity Building

Attending National Level Workshops/Conferences:

As part of Capacity building organized women farmers to visit Baptla to participate in the National Convention of women farmers, 10 women from Kattamuru and 8 women from Potharlanka were attended for the national convention of women farmers.

4.1.5 Kadapa

Pilot site identification

In meeting with CPO, district heads of line department followed by field visits during March-April months during 2015 along with line staff and interactions with all stakeholders, pilot sites to be developed as sites of learning were identified in 13 villages across 4 mandals. The pilot sites were identified in watershed (completed or ongoing) boundaries. The sites were carefully chosen to represent important agricultural crops in the district i.e. paddy, groundnut, cotton and also having potential for vegetable and horticultural crops. Sites are good representation of the district in terms of representing rainfed regions and irrigation thru borewell. Sites also varied in terms of rainfall - 750 mm in Brahmamgarimatham; 820 mm in Poromamilla; 640 mm in Veerapalli and 670 mm in Sambepalli.

Baseline survey

To effectively track the impact of this initiative, we have done extensive baseline survey across pilot site villages in all 4 mandals (see Section 3.1). More than 400 farmers were interviewed to capture details about income portioning thorugh different sectors, technology adoption, crops, livestock, productivity, perception about the schemes etc. Study shows that pilot site productivity levels among different crops are significantly lower than the district average yields recorded by Directorate of Economics and Statistics. The mean productivity levels in case of red gram, sesamum and sunflower are on par with the district averages. In case of all other crops, the productivity levels were recorded very low. This indicates the huge potential of the Kadapa pilot site to bridge the yield gaps through introduction of good management practices across various crops. Along with low productivity, recurrent droughts and in-sufficient rains over a period of time, fodder shortages during lean periods are major constraints. There are potential opportunities through water-conservation measures, soil test-based INM, dryland horticulture, market potential for livestock based livelihoods, and market linkages and value chains in crops like turmeric, tomato and cotton.

Soil health mapping and scaling-out soil-test-based fertilizer management

Farmer meetings were conducted across all hamlets in 13 revenue villages in pilot sites and farmers were oriented about soil health issues and trained on soil sampling. A total of 470 soil samples were collected during April-May, 2015 by adopting stratified sampling method to collect representative samples for topography, soil color, texture, crops and cropping systems and holding sizes. The collected samples were sent to ICRISAT for analysis.

The soil samples were analysed for macro, micro nutrients and soil organic carbon. Multiple nutrient deficiencies (20-95% in Zn, 0-92% in B, 0-100% in S, 0-87% in Ca, 0-47% in P, 8-100% in org C) are identified as major stumbling blocks for higher yields across different villages (Appendix 1i). Soil test-based recommendations are developed for all cereals, pulses, oilseeds and vegetable crops. The recommendations are shared with line-departments, NGOs and ICRISAT line staff who created awareness and disseminated the results amongst the farmers. In context of observed deficiencies, the use of micronutrient fertilizers is being promoted.

The participatory on-farm trials were conducted on application of micro and secondary nutrients inKadapa district. There were two treatments – (1) Farmers practice of adding N, P, K only and (2) Improved practice (N, P, K + soil test-based addition of deficient S, B, Zn).

At maturity crop cutting experiments (CCEs) were conducted in 3 m x 3m area in both the treatments. The fresh weights for grain/pod and straw were recorded and about 2 kg sub sample (~1 kg grain/pod, ~1 kg straw) was sent to ICRISAT. The sub-samples were dried and yields kg ha^{-1} were interpolated.

The results showed that with soil test-based application of micro and secondary nutrients during 2015-16, groundnut podyield increased by 14% over no application of micro and secondary nutrients (Figure 4.1.5.1, 4.1.5.2). Similarly straw yield increased by 22%.

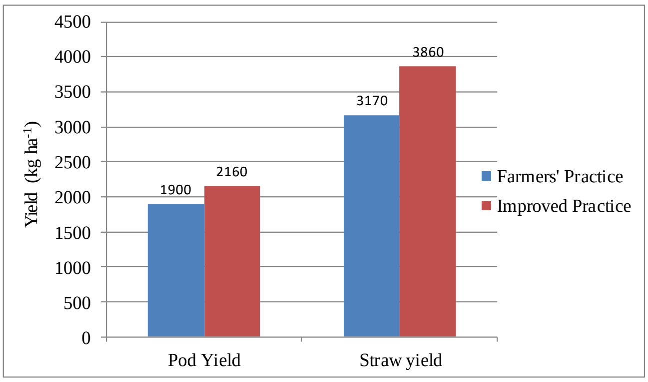


Figure 4.1.5.1. Left: Effects of soil test-based balanced fertilization on groundnut yield in Kadapa district during 2015-16 Right: Good groundnut crop growth under soil test-based micro & secondary nutrients application in Mr Narasimulu's field in village Devaptla, Sambepalli mandal, Kadapa district

Figure 4.1.5.2. Good paddy crop growth under soil test-based micro & secondary nutrients application in Mr Venkataia's field in village Ganugupenta, Porumamilla mandal, Kadapa district.

The existing about 80000 ha micro-irrigation systems can be effectively used for regulated supply of essential plant nutrients i.e. fertigation and soil test-based addition of micro- and secondary nutrients. So, during 2015-16, fertigation practices for important crops were worked out using cost-effective regular fertilizers and promoted with farmers. Fertigation has recorded an yield improvement of 15-20% in crops like tomato, brinjal and gourds Figure 4.1.5.3).

Figure 4.1.5.3. Fertigation in tomato: Left: Ms Saraswathi, Devapatla village, Sambepalli mandal; Right: Ms Subbamma Devapatla village, Sambepalli mandal, Kadapa district.

Evaluation of new varieties

Currently farmers are growing old and low yielding varieties and this is a great opportunity in increasing crop yields. ICRISAT and State Agricultural Universities released improved cultivars and proprietary hybrids of crops with better adaptation to biotic and abiotic stresses are promoted through demonstrations to enhance productivity. Demonstrations of pigeonpea varieties like ICPH2740, ICP8863 (maruthi), ICPL87119 (Asha) and ICPL161 varying in duration betweem 135-180 days and groundnut varieties like ICGV91114, ICGV0351 and K9 varying in duration between 95-120 days are given on 50 farmers' fields.

Crop cutting experiment in groundnut showed 13% higher pod yield (2310 kg ha^{-1} vs 2040 kg ha^{-1}) over local cultivar (Figure 4.1.5.4). Similarly, straw yield under improved variety is also higher over the local variety.

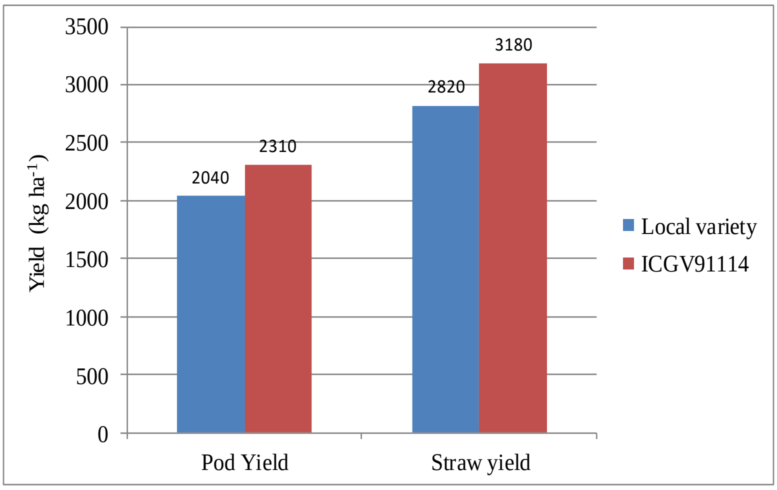


Figure 4.1.5.4. Performance of improved vs local groundnut cultivars in Kadapa district during 2015-16.

Recycling of on-farm wastes & biomass generation for soil fertility

Half decomposed dung which farmers apply in their fields is creating pest and fertility-related problems. Due to water scarcity, farmers face problems in continuously maintaining moist environment for earthworms used in vermicomposting. Therefore, microbial consortia culture (Madhyam culture, which is tested on-station at ICRISAT) is demonstrated for recycling on-farm agricultural, household wastes. The composting activity using microbial consortia is piloted with 100 farmers during *kharif* 2015 season who produced a total of around 80 t of compost and saved chemical fertilizers in crops like paddy, pearl millet, groundnut and tomato (Figure 4.1.5.5).

Considering low levels of soil organic matter in farmers' fields, we are promoting planting of N-rich green manure plant *Gliricidia* on farmers' fields. During 2015-16, nurseries are raised and about 7000 plants are established by 16 farmers on farm boundaries.

Figure 4.1.5.5. Aerobic composting demos – Left: Ms Ramadevi, Matli village, Veeraballi mandal, Kadapa district; Center: Ms Lakshamma, Devapatla village, Sambepalli mandal, Kadapa district; Right: Mr Srinivasareddy, Charlagirigala village, Porumamilla mandal, Kadapa district.

Evaluation of aquasap

Aquasap is a 100% organic extract/fertilizer from sea weeds and is used as foliar application on crops. It contains macro & micro nutrients, essential amino acids and plant growth hormones that provide major boost to crop yield by accelerating metabolic function and enhancing its nutrition uptake capacity.

During 2015-16, participatory on-farm demonstrations/trials were conducted on foliar application of aquasap with major crops in Kadapa like groundnut, paddy, turmeric and tomato (see Section 3.2.5). There were two treatments – (1) Aquasap spray and (2) Farmers practice (in adjoining/nearby field). A 1% aquasap solution was sprayed thrice during crop season after establishment stage, pre-flowering and post flowering stage of crop. During spray at any stage, about 1 litre aquasap solution was used for 1 acre (0.4 ha) area. Similar agronomic practices were followed in both the treatments. The aquasap liquid is an organic produce and hazard free and can be handled with bare hands for mixing with water for preparation of solution. In vegetable crops, aquasap is also used by dipping the seedling roots in 0.3% solution in addition to foliar application.

The crop cutting experiments showed significant yield advantage of 21% (2370 kg ha^{-1} vs 1950 kg ha^{-1}) in case of groundnut with Aquasap application (Figure 4.1.5.6, 4.1.5.7). Similarly, straw yield also increased by 29% over no application of Aquasap

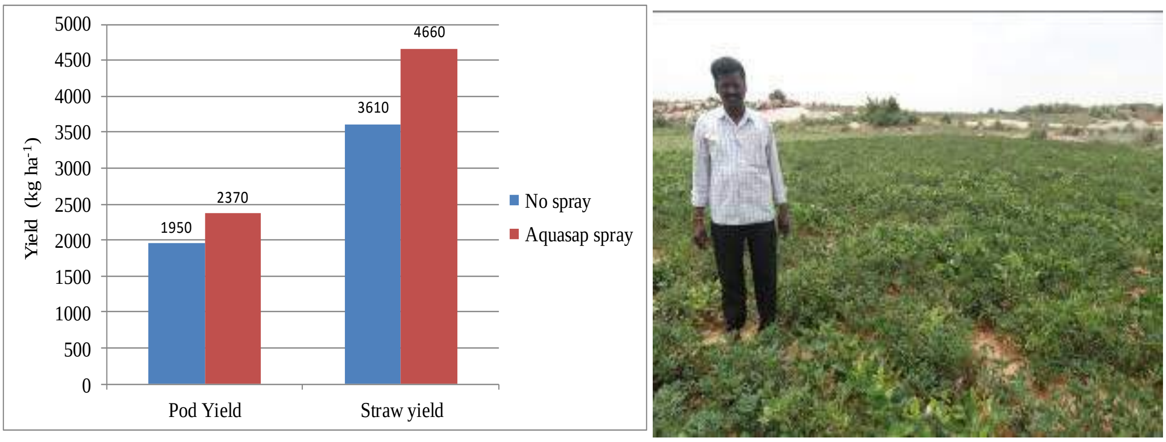


Figure 4.1.5.6. Left: Effects of Aquasap foliar spray on groundnut yield in Kadapa district during 2015-16: Right: Right: Aquasap demo in groundnut crop –Mr Siddiramaiah, Settipalli village, Sambepalli mandal

Figure 4.1.5.7. Aquasap demos – Left: paddy crop in Mr Chinasubhaiah's field , Ganugapenta village, Porumamilla mandal; turmeric crop in Mr Krishnareddy's field, Charlagirigala village, Porumamilla mandal, Kadapa district

Seed production and seed systems

Due to congenial conditions for seed production in Rayalseema, this can be good income-generating activity for the farmers. Therefore, with support from RRS and DoA, seed production of groundnut (Dharani, K9, Dharani, 2010 kg seed of each) is undertaken with 33 farmers during *kharif* and *rabi* seasons of 2015-16 (Figure 4.1.5.8, 4.1.5.9.; See Section 3.3). During *kharif* 2015, breeder to foundation seed production was undertaken by 11 farmers in 2 villages viz. Devpatla and Settipalli; while during *rabi* 2015-16, 22 farmers participated in seed production in 3 villages namely Devpatla, Settipalli and Matli. During *kharif* season, farmers realized per acre (1 acre = 0.4 ha) seed production varying between 870-1180 kg, while in *rabi* season it varied between 800-1950 kg. During *kharif* season, a total of about 11 t foundation seed was produced, while during *rabi* 2015-16, about 23 t foundation seed was produced.

Figure 4.1.5.8. Seed production during kharif 2015 – Mr Bayyareddy farmer, Devapatla village, Sambaepalli mandal

Figure 4.1.5.9. Seed production in Settipalli village, Sambepalli mandal during rabi 2015-16 – Left: Mr Kondareddy; Right: Mr Venkatareddy

Monitoring of important pests

For avoiding indiscriminate use of pesticides and properly guiding farmers w.r.t. integrated pest management on day-to-day basis, extensive pest-monitoring is initiated. Total 100 inset traps were installed in pilot sites for proper guidance to farmers (Figure 4.1.5.10).

Figure 4.1.5.10.Insect trap installed in tomato crop - Ms Saraswathi, Devapatla village, Sambepalli mandal, Kadapa district

Weather information - Rain gauge installation

Automatic weather stations are there near to selected villages in 3 mandals, however, in 4th mandal (Porumamila), the weather stations are at distant places, and therefore one dual purpose raingauge cum temperature recording device is installed in Ganugapenta village (Figure 4.1.5.11). The data is recorded regularly.

Figure 4.1.5.11. Raingauge established in Ganugapenta village, Porumamila mandal

Green SIM cards for advisories

Green SIM cards are distributed to 170 farmers and they are getting advisorices on agricultural practices.

Capacity building

On daily basis, 4 NGO and 2 ICRISAT staff (in different locations) in collaboration with line-departments (agriculture, horticulture, animal husbandry, micro-irrigation, watershed) visited villages and conducted farmer meetings/visits for awareness/trainings on new technologies introduced and to scale-out good practices on large number of farmers' fields along with data recording and documentation (4.1.5.12, 4.1.5.13). In various farmer meetings/training programs, more than 5000 farmers participated each during *kharif* and *rabi* seasons. The district and activity coordinator scientists from ICRISAT HQ visit on monthly basis or more for capacity building of line staff and ensure proper implementation of interventions and data recording.

Figure 4.1.5.12. Capacity building of farmers/stakeholders in pilot site villages by ICRISAT scientists.

పల్లెల్లో ఇక్రిశాట్ శాస్త్రవేత్తల పరిశీలన

గురువారం 9 జులై 2015

భూసార పరీక్షల ద్వారా ఎరువులు వేయాలి

వీరబల్లి: భూసార పరీక్షల ఆదారంగా ఎరువులు వాడాలని సీనియర్ సైంటిస్టు గిరీష్‌చంద్ర తెలిపారు. బుధవారం మండల పరిధిలోని పెద్దివీడు, మట్లి, సోమవరం గ్రామాల్లో రైతులతో సమావేశం ఏర్పాటు చేశారు. ఇందులో బాగంగా వ్యవసాయాన్ని అభివృద్ధి చేసేందుకు ప్రణాళిక సిద్ధం చేసినట్లు తెలిపారు. రాష్ట్రంలో వ్యవసాయాన్ని బలోపేతం చేసేందుకు ప్రభుత్వం హైదరాబాదుకు చెందిన ఇక్రిశాట్ సంస్థ అనుబంధంగా పనిచేస్తున్నట్లు గిరీష్ చంద్ర తెలిపారు. అందులో బాగంగా జిల్లాలోని పలు మండలాలతో పాటు వీరబల్లి మండలాన్ని కూడా ఎంపిక చేసుకున్నట్లు తెలిపారు. కార్యక్రమంలో ఇక్రిశాట్ సంస్థ ప్రతినిదులు జిల్లా సైంటిస్టులు హరిక్రిష్ణ, పవన్‌కుమార్‌లు, వాస్వా ఎన్‌జీవో రామక్రిష్ణ, ప్రతినిధి నాగేంద్ర, న్యూస్ స్వచ్ఛంధ సంస్థ ప్రతినిధి ఆదినారాయణ, గ్రామంలోని రైతులు పాల్గొన్నారు.

మాట్లాడుతున్న సైంటిస్టు గిరీష్‌చంద్ర

గురువారం 9 జులై 2015

ప్రభుత్వ పథకాలను సద్వినియోగం చేసుకోవాలి

Figure 4.1.5.13. Media coverage & awareness of stakeholders

Progress in close collaboration with line-departments

Promotion of micro & secondary nutrients

The promotion of soil test-based addition of secondary and micronutrients is the focus area in pilot sites. The soil test-based recommendations including for secondary and micronutrients are provided to line staff and are being promoted with farmers. As such, a total of about 56 t gypsum, 11 t zinc sulphate and 400 kg borax is distributed in the pilot site villages in *kharif* and *rabi* seasons during 2015-16 (Table 4.1.5.1).

Similarly at district level, about 6470 t gypsum, 348 t zinc sulphate and 33 t borax is distributed in *kharif* and *rabi* seasons during 2015-16 (Table 4.1.5.2).

Table 4.1.5.1. The quantities of secondary and micronutrients distributed during *kharif* and *rabi* seasons of 2015-16 in Kadapa pilot site villages.							
Village	**Mandal**	**Micro & secondary nutrient fertilizer distribution**					
		***Kharif* 2015 season**			***Rabi* 2015-16 season**		
		Zinc sulphate (M t)	**Gypsum (M t)**	**Borax (kg)**	**Zinc sulphate (M t)**	**Gypsum (M t)**	**Borax (kg)**
Godlaveedu	B.Matam	0.2	2	10	0	0	0
Gundapuram	B.Matam	0.1	2	10	0	0	0
Dirasavancha	B.Matam	0.2	2	10	0	0	0
Nagisettipalli	B.Matam	0.2	2	0	0	0	0
	Sub-total	**0.7**	**8**	**30**	**0**	**0**	**0**
Siddavaram	Porumamilla	0.7	3	20	0.2	0.7	10
Venkataramapuram	Porumamilla	0.5	2	10	0.1	0.3	5
Charlagirigala	Porumamilla	1	4.5	30	0.4	2	15
Ganugapenta	Porumamilla	0.8	1.5	20	0.3	1	10
	Sub-total	**3**	**11**	**80**	**1**	**4**	**40**
Settipalli	Sambepalli	0.4	2	25	0.9	2.8	30
Guttapalli	Sambepalli	0.2	0.8	10	0.7	1.2	27
Devapatla	Sambepalli	0.3	1.3	15	0.6	1.8	36
	Sub-total	**0.9**	**4.1**	**50**	**2.2**	**5.8**	**93**
Veeraballi	Veeraballi	0.5	5	50	0.8	6.5	0
Matli	Veeraballi	0.5	5	40	0.85	6	0
	Sub-total	**1**	**10**	**90**	**1.65**	**12.5**	**0**
	Grand total in Pilot site	**5.6**	**33.1**	**250**	**4.85**	**22.3**	**133**

Table 4.1.5.2. The quantities of secondary and micronutrients distributed during kharif and rabi seasons of 2015-16 in Kadapa district.		
S. No.	**Fertilizer**	**Distributed (M t)**
1	Zinc sulphate	348
2	Borax	33
3	Gypsam	6470

Soil organic carbon building

As soil organic C content of farmers' fields is low, therefore with a purpose to build soil health, green manure crop seed was distributed to farmers in the pilot site mandals - dhaincha (605 q), sunnhemp (280 q) and pillipesara (20 q) (Table 4.1.5.3).

Table 4.1.5.3. The quantities of green manure crop seeds distribute in pilot sites during kharif 2015		
Mandal	**Crop**	**Distributed (qt)**
B.Matam	Pillipesara	10
	Dhaincha	400
	Sunhamp	270
Porumamilla	Pillipesara	10
	Dhaincha	205
	Sunhamp	10

Similarly at district level, 6670 dhaincha, 1800 q sunnhemp and 105 q pillipesara seed as distributed to farmers (Table 4.1.5.4).

Table 4.1.5.4. The quantities of green manure crop seeds distribute in Kadapa district during kharif 2015	
Crop	**Seed distributed (qt)**
Dhaincha	6670
Sunnhemp	1700
Pillipesara	105

Promotion of fertigation

The addition of fertilizers like N, K, Zn and B is also being promoted as fertigation in crops like tomato, onion, chillies, groundnut, cottton, papaya etc. The fertigation schedules developed using regular low cost fertilizers are being promoted with farmers in pilot sites. For evaluating fertigation with banana crop, trials were taken in pilot satellite village Vanipenta in Mydukuru mandal where farmers have recorded an yield advantage of about 10% over no fertigation. Similarly, farmers observed 15% - 18% higher yield in tomato, brinjal crops in Veeraballe and Sambepalle mandals with fertigation.

Promotion of high-yielding crop varieties

To promote high yielding varieties improved crop seeds were distributed in pilot site mandals during *kharif* and *rabi* seasons of 2015-16 (Table 4.1.5.5 to 4.1.5.7).

Table 4.1.5.5. The quantities of improved crop seeds distribute in pilot sites during *kharif* 2015		
Mandal	**Crop**	**Distributed(qt)**
B.Matam	Paddy	170
	Groundnut	45
	Redgram	35
Porumamilla	Paddy	220
	Redgram	70
	Greengram	28
	Cowpea	90
	Horsegram	27
Sambepalli	Groundnut	1172
	Redgram	20
	Greengram	4
Veeraballi	Groundnut	900
	Redgram	5
	Greengram	11
	Cowpea	3

Table 4.1.5.6. The quantities of improved crop seeds distribute in pilot sites during *rabi* 2015-16		
Mandal	**Crop**	**Distributed(qt)**
B.Matam	Blackgram	8
	Greengram	10
Porumamilla	Bengalgram	6
Sambepalli	Groundnut	193
Veeraballi	Groundnut	106

Similarly at district level, about 34000 q improved crop seed was distributed during *kharif* 2015 and about 7500 q improved seed was distributed during *rabi* 2015-16 (Table 8).

Table 4.1.5.7. The quantities of improved crop seeds distribute in Kadapa district during 2015-16			
Crop (*kharif*)	**Seed distributed (q)**	**Crop (*rabi*)**	**Seed distributed in (q)**
Groundnut	27833	Groundnut	6655
Redgram	1339		
Paddy	1440		
Greengram	1219		
Cowpea	1476		
Horsegram	697		
		Blackgram	441
		Bengalgram	504

Contingency plan in crop seeds and fertilizer management

The June and July months witnessed deficit to scanty rainfall situation in most pilot site villages (Table 4.1.5.8). Therefore, rather than a normal course of plan implementation, a contingency plan was prepared and implemented.

Table 4.1.5.8. Rainfall (in mm) situation in pilot site villages during June, July months 2015.								
Mandal	**Jun-15 (in mm)**				**Jul-15 (in mm)**			
	Total	**Normal (unit)**	**% deviation**	**Status**	**Total**	**Normal**	**% deviation**	**Status**
B Matam	36.2	80.5	-55	Deficit	21.9	110.8	-80.2	Scanty
Porumamila	68.9	87.6	-21	Deficit	12.3	85.8	-85.7	Scanty
Sambepalle	54	61.7	-12	Normal	24.5	103.5	-76.4	Scanty
Veeraballe	100	72.3	39	Excess	54.3	101.4	-46.5	Deficit

As the farmers could not sow paddy and groundnut crops in most villages, seeds of contingent crops were positioned and distributed to farmers (Table 4.1.5.9).

Table 4.1.5.9. The quantities of contingent crop seeds positioned and distributed during *kharif* 2015			
Mandal	**Cowpea (q)**	**Horse gram (q)**	**Red gram (q)**
Sambepally	20	20	
Veeraballi	10	10	
Porumamilla	20	5	10
B Matam	10	5	10
Total	**60**	**40**	**20**

With regard to fertilizer management, by contrast to normal course, following contingency measures are promoted;

(iv) Basal application to be reduced to half and rest half to be added 20-30 days after sowing.

(v) Foliar application (3-4 sprays) of urea (1%), MOP (0.5%), zinc sulphate (0.2%) and agribor (0.1%) to be promoted during 20 to 60 days.

(vi) Compost/fertilizer application near to plant base.

Watershed

Working on plan of action for strengthening water resources, 53 new farm ponds, 9 check dams, 3 each of percolation tanks and check walls are constructed in pilot site villages. Repair of 23 check dams and 8 percolation tanks is done (Table 4.1.5.10).

Table 4.1.5.10. Progress on implementation of repair and construction of water harvesting structures, 2015

Village	Repair - Check dam	Repair- Percolation tank	New - Check dam	New - Check wall	Farm pond	New - Percolation tank
Godlaveedu	3					
T.Soudrapalli	3					
Dirasavancha						
Nagisettipalli	1					
Gundapuram	1					
Settipalli			3		1	1
Guttapalli			4			1
Devpatla	3	1	1		1	
Veeraballe					1	
Matli						
Ganugapenta	5	3	1	1	20	
Challagirigella	5	3		1	25	
Venkatrampuram	2	1			1	1
Siddavaram				1	4	
Total	**23**	**8**	**9**	**3**	**53**	**3**

Micro-irrigation

Similarly with an objective to promote judicious use of water resources, drip and sprinkler irrigation systems are promted in pilot sites. (Table 4.1.5.11). Drip system is promoted with 97 farmers covering an area of 108 ha and sprinkler system is promoted with 30 farmers covering an area of 16 ha.

Table 4.1.5.11. Progress on implementation of micro-irrigation systems in Kadapa pilot sites

Mandal	Village	Drip		Sprinkler	
		Number	**Area (acre)**	**Number**	**Area (acre)**
Porumamila	Siddavaram	6	10		
	Ganugapenta				
	Challagirigella				
	Venkataramapuram				
BMatam	Godlaveedu			10	7.2
	Gundapuram				
	Dirasavancha			20	8.8
	Nagisettipalle				

	Veeraballe	8	6		
Veeraballe	Matli	12	26		
	Settipalle	37	30.4		
	Devapatla	23	23.6		
Sambepalle	Guttapalle	11	12.4		
	Total	**97**	**108.4**	**30**	**16**

4.1.6 Krishna

Baseline Survey:
A baseline survey ofabout 400 households in the three pilot site mandals was completed by the ICRISAT team to identify the constraints and understand the socioeconomic status of the farmers in the pilot sites through interactions and interviews (see section 3.1).

Weather monitoring

The current rainfall status in the district is detailed in Table 4.1.6.1 below (also see Section 3.4).

Table 4.1.6.1. Rainfall status in Krishna district 2014-15 over 2015-16.

S.No	Month	Normal rainfall (mm)	2014-15		2015-16		
			Rainfall received (mm)	Rainy days	Rainfall received (mm)	Rainy days	Dev (%)
1	June 2015	97.8	28.2	2.4	240	12	(+)145.4
2	July 2015	210.6	218.3	8.9	95.9	7.8	(-)54.5
3	August 2015	212.8	122.1	7	178.4	10.5	(-) 16.0
4	September 2015 (on 06.09.2015)	30.9	12	4	10.5	2	(-)66.0
Total normal as on 06.09.2015		552.1	380.6	22.3	524.8	32.3	(-)5.0

Collection of Soil samples, analysis and fertilizer recommendations:
Soil sampling was done in all the pilot site villages by collecting 270 soil samples from farmers' fields and analysed (Appendix 1d). Soil analysis results indicated that the villages in Ghantasala mandal are deficient only in Zn (23%) and the villages in G. Kondur mandal exhibited a similar trend of Zn deficiency (65%) in the soils. was indicated. In both the mandals the soils were deficient in organic carbon content. The fertilisers recommendations of secondary and micro nutrients were prepared by pilot site mandals and villlages for all major crops and soil health cards were printed and distributed to all farmers.

Based on soil-test recommendations, 5.8 tons of Zinc in Ghantasala mandal and 14.85 tons of Zn in G. Kondur mandal was distributed to the farmers on 50% subsidy basis by the DOA. For the dissemination of results, all the pilot villages were attended with a wall painting that was the mean attributes of the village (Figure 4.1.6.1). These oil paintings were done on prominent places like the village panchayat or the primary school where visibility was high. Sample wall paintings are placed below.

Figure 4.1.6.1. Wall Painting at Kowluru village, G. Konduru Mandal, Krishna District

Crop cutting experiments (CCE) were conducated in the pilot areas. There was significant increase in the yields of Paddy (for MTU 1061 and BPT 5204 varieties) that received micro nutrient dosage by 26% over the control treatment (where no micronutrients were used) (Figure 4.1.6.2). This was observed in both G.Konduru and Ghantasala mandals. Aquasap was a growth enhancer using sea weed as source of active ingredient. Aquasap was sprayed at 1 litre per acre for 3 times during the growth and development of paddy. It is interesting to note that there was 21% increase in yields of paddy when compared to control plots when aquasap was sprayed. 840 ha of direct seeded method of paddy was taken up in the Ghantasala mandal for the year 2015-16.

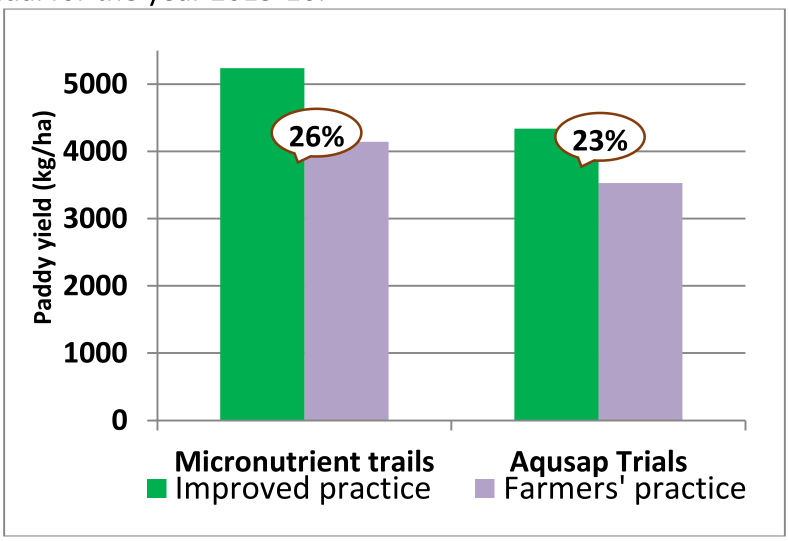


Figure 4.1.6.2. Graph showing results from Crop Cutting Experiment in Krishna district for Paddy Crop Diversification

Cotton + Pigeonpea in taken up in 37 hac of G. Kondur and Ghantasala mandals and the details are given in the table 4.1.6.2.

Table 4.1.6.2. Crop diversification area in Krishna pilot site mandals

Mandal	Village	Traditional crop	Area under diversified crop (ha)
G. Kondur	Gaddamanugu	Cotton	Pigeon pea 16 hac
	Pinapaka	Cotton	P. pea 1 hac
	Chevuturu	Cotton	P. pea 10 hac
Ghantasala	5 villages	Paddy	P. pea 10 hac

f) Recycling of on-farm waste:

20 kgs of Madyam culture was given to the farmers and the identification of the farmers was done in *Kharif*, however this activity was scalled up in *Rabi*. Ghantasala pilot mandal was exposed to over 300 MT of aerobic composting through shredding of crop residues and dung from cattle (Figure 4.1.6.3).

Figure 4.1.6.3. Left: Demonstration of Shredder at Chitturpu village, Ghantasala mandal; right: Aerobic composting pit in Chitturpu village, Ghantasala mandal

g) Biomass generation for soil fertility:

5 kgs of Gliricidia seed is given to the farmers in the pilot sites of Ghantasala mandal to promote green manuring to promote soil fertility in convergence with the animal husbandry farmers. Over 20,000 saplings have been raised through forest nursery located in the adjacent mylavaram. An additional 3 kg of seedlings are in progress in the same nursery.

h) Integrated Pest Management (IPM):

To reduce the indiscriminate use of pesticides by the farmers, Integrated Pest Management is taken up for pest monitoring in both both the pilot mandal through installation of pheromone traps (Figure 4.1.6.4). Total 100 insect traps are placed in the pilot sites and are being monitored in pilot villages for proper guidance to farmers.

j) Weather monitoring:

Monitoring rainfall and temperature is important meteorological parameters in agriculture therefore a dual purpose type of tipping bucket rain-gauge along with temperature sensors was installed at supplied at Kodali village in Ghantasala mandal for recording minimum and maximum temperature and rainfall on hourly basis.

Figure 4.1.6.4. Setting of pheromone trap in farmer's field, G.Kondur

k) Capacity building:

Capacity building and awareness programs were conducted in coordination with the line departments, NGO staff and ICRISAT staff in the pilot sites. 168 trainings have been conducted in pilot villages in which around 2000 farmer participated.

Biogas/ solar lanterns/ solar pumpsets

Over 15 old abandoned biogas units in Chiturpu village in Ghantasala mandal were identified during a transect walk during November, 2015. NEDCAP officials in Krishna district were approached and persued to complete the set up by taking up refurbishing works.
This has helped restore all the 15 poor households to meet the energy needs (Figure 4.1.6.5). Solar lantern's were distributed to 10 beneficiaries and 3 solar pumpsets were applied in Chiturpu village.

Figure 4.1.6.5. biogas operational to meet the energy needs of a household in chiturpu village, Ghantasala mandal.

Natural and Organic farming

Krishna district has been in the forefront of innovations as many farmers have started to take up natural farming initiative of the Agricutlture department. It has been observed that Mr. Surrapaneni, a farmer in Ghantasala has been a pioneer of natural farming systems in his 4 ha paddy. A MACTS society 'NOFA' Natural and Organic Farmers Association is based in Vijayawada with more than 1,000 farmer's taking up this methodlogy of cultivation. They have also started a super market in Vijayawada.

There is a large farmer who has taken up organic farming in more than 80 ha of leased land and located in Ghantasala palem, Mr. Uppala Prasada Rao is also the proud recipient of state level award 'Rythu Ranga' in 2015-16 for his efforts in organic farming (Figure 4.1.6.6). His farm has over 300 cattle which is the major source of dung which has been used for making aerobic composting using madhyam culture provided by ICRISAT.

Figure 4.1.6.6. Mr. Uppala Prasada Rao of Ghantasala palem, Krishna district is the receipient of Rythu Ranga award for his consistent efforts for Organic farming

Hydroponics in G.Konduru mandal

A big farmer, Mr. Balakrishna undertook a unique program of starting a hydroponics in his dairy farm having 6 tonnes capacity. This is the pioneer work in the area as this place has been used by the local animal husbandry officials to expose farmers to the new fodder cultivation technique. The farm has a gosala that takes care of 115 cattle, however it is a unique place for capacity building of local dairy farmer's as there is no commercial activity in this farm (Figure 4.1.6.7).

Animal Husbandry department has moved ahead in formation of dairy farmers FPOs by forming Farmer Interest Groups (FIGs) through their staf (Figure 4.1.6.8)f. Focus has been on dairy milk, fodder and silose making. Few FPOs for sheep, goat and poultry have been envisaged.

Figure 4.1.6.7. Hydroponic fodder cultivation at Balakrishnaiah's farm in Chevaturu, G.Konduru mandal

Figure 4.1.6.8. Training program to Farmer Interest Groups for FPO formation at Animal Husbandry's JDAH office in Vijayawada

FPO Baseline in Krishna district

As a part of the scoping study for baseline survey of Farmer Producer Organisations in Krishna district, 5 FPOs were visited and data on diverse parameters was collected (Figure 4.1.6.9; see Section 3.10 for details).

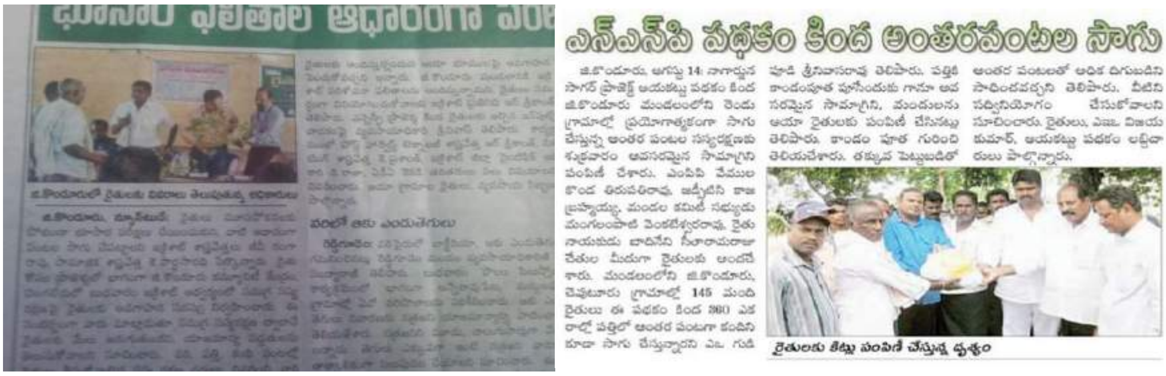


Figure 4.1.6.9. Media coerage of pilot activities

Progress in close collaboration with line departments

Agricultural area has changed over the period of last two years in Krishna district (Table 4.1.6.3) and the reasons for the changes are summerised below:

- The area under paddy, Sugarcane & cotton is decreased due to drought situations prevailed in the district
- Canal water not released to Krishna delta because of which paddy area is not fully covered, there is unsown of 46,000ha in the district
- Deficit rain fall received in the district during July, August & September months due to which cotton and other crops are not completely covered in upland mandals

Table 4.1.6.3. Crop wise areas (in ha) during the last 2 years and areas targeted for 2016-17									
	2014-15			**2015-16**			**2016-17(Target)**		
Crop	***Kharif***	***Rabi***	**Total**	***Kharif***	***Rabi***	**Total**	***Kharif***	***Rabi***	**Total**
Paddy	235212	51140	286352	210818	10546	221364	250000	15000	265000
Maize	4682	21362	26044	3457	16019	19476	4000	20000	24000
Greengram	2147	13730	15877	3711	9495	13206	4500	10000	14500
Blackgram	841	139618	140459	1444	135902	137346	1500	140000	141500
Cotton	55571	0	55571	52784	0	52784	55000	0	55000
Sugarcane	16719	0	16719	14555	0	14555	15000	0	15000
Others	12019	6884	18903	13846	7235	21081	15000	10000	25000
	327191	232734	559925	300615	179197	479812	345000	195000	540000

Poly crop models have been taken up for both rainfed and irrigated conditions in Krishna:

For Rain-fed conditions

- Cotton-Green gram-Red gram-Korra
- Red gram-Green gram-Korra-Castor
- Green gram-Cowpea-Jowar
- Ground nut-Red gram-Jowar-Bajra
- Maize- Green gram
- Black gram-Korra -Sesamum

Irrigated conditions

- Rice-Red gram-Cowpea
- Maize-Red gram-Cowpea

Productivity of major crops during 2015-16 in Krishna

Productivity of major crops in Krishna district achieved last year when compared to previdous years is shown in Table 4.1.6.4 ; it can be noted that the targets for 2016-17 have been estimated based on the discussions with JDA, Krishna district and their team

Crop wise reasons for lower productivity in Krishna:

Paddy:

- ❑ Low organic Carbon content
- ❑ Late or no release of canal water
- ❑ Micro nutrient deficiency

- Growing of single variety(BPT 5204) over a long period time prone to lodging and affected due to pests & diseases resulting in low yields

Maize:

- Micro nutrient deficiency
- Pests & disease incidence

Black gram:

- YMV incidence
- Incidence of pests & diseases
- Lack of proper water management
- Lack of proper weed management

Cotton:

- Micro nutrient deficiency
- Lack of Weed management
- Sucking pest complex
- Low plant population
- Moisture stress

Sugar cane:

- Micro nutrient deficiency
- Low yielding varieties
- Lack of water management methods

Table 4.1.6.4. Productivity achievements and future targets of major crops in Krishna district

	2014-15 kgs/ha			2015-16 kgs/ha			2016-17 (Target)		
Crop	***Kharif***	***Rabi***	**Total**	***Kharif***	***Rabi***	**Total**	***Kharif***	***Rabi***	**Total**
Paddy	5050	7100	6077	5076	6690	5883	5400	7125	6263
Maize	4680	6500	6170	7115	7500	7431	7000	7500	7416
Green Gram	600	680	672	765	750	754	750	1000	1000
Black Gram	820	750	754	1070	1125	1165	1000	1250	1247
Cotton	2310	0	2315	2120	0	2120	2420	0	2420
Sugarcane	89400	0	89400	100000		100000	10500	0	10500

Production of major crops in Krishna during 2015-16

Production of major crops in MT in 2015-16 in comparision to the previous year and a future target for the year 2016-17 is provided in Table 4.1.6.5.

Table 4.1.6.5. Production (t) of major crops in Krishna during 2015-16

	2014-15			2015-16			2016-17(Target)		
Crop	***Kharif***	***Rabi***	**Total**	***Kharif***	***Rabi***	**Total**	***Kharif***	***Rabi***	**Total**
Paddy	1187232	363375	1550607	1071030	70569	1141599	1350000	106875	1456875
Maize	21851	138853	160704	113975	146070	260045	28000	150000	178000
Green Gram	1284	9391	10675	7263.68	9904.5	17168.2	3375	10000	13375
Black Gram	686	105272	105958	145415	154514	299929	1500	175000	176500
Cotton	103200	0	103200	111720	0	111720	125000	0	125000
Sugar cane	1413400	0	1413400	1500000	0	1500000	1530000	0	1530000

GVA of crop growth engines in Krishna district in 2015-16

Due to decrease in paddy's area and productivity in the year 2015-16 has effected the over all GVA of Krishna districts agriculture which dropped by -7% in comparision to previous year's achievement (Table 4.1.6.6).

An ambitious 18% rise in the year 2016-17 is being targeted by the agriculture department which can be achieved if there are specific strategies to reach the goals.

Table 4.1.6.6. % increase or decrese in GVA of crop growth engines

Crop	**2014-15**		**2015-16**		**% increase/Decrease over 2014-15**	**2016-17**		**% increase/ Decrease over 2015-16**
	Production (in Mts)	**GVA**	**Production (in Mts)**	**GVA**		**Production (in Mts)**	**GVA**	
Kharif								
Paddy	1187232	1197.91	1071030	1080.66	-10 %	1350000	1362.15	+14 %
Cotton	103200	382.76	111720	414.36	+8.0 %	125000	463.625	+12.0 %
Sugar cane	1413400	332.99	1500000	353.4	+6.0 %	1530000	360.46	+2.0 %
Rabi								
Paddy	363375	336.64	70569	71.20	-81.0 %	106875	107.83	+51.4 %
Maize	138853	139.68	146070	146.94	+5.0 %	154514	155.44	+6.0 %
Black gram	105272	330.86	150000	471.45	+42.0 %	175000	550.0	+17.0 %
Total	3311332	2721	3049389	2538	-7.00%	3441389	3000	18.00%

Crop wise strategies to achieve targets of major crops in 2016-17 are discussed below:

PADDY:

- Promotion of micro nutrients like ZnSo4 based on Soil Health card
- Reclamation of problematic soils by application of Gypsum
- Promotion of green manure crops, Vermi compost etc.
- Promotion of Natural farming- application of Jeevamrutam, Beejamrutam & various botanical extracts like 5 % NSKE
- Promotion of varietal replacement of BPT5204 with MTU 1061
- Adoption of direct method of sowing, SMSRI
- Raising of Red Gram on paddy field bund
- Preparation of Village crop models in consultation with ANGRAU scientist and educating the farmers accordingly
- Conducting of Farmer awareness programme
- Popularization of MTU 1121, MTU 1075 & RP BIO 226 in place of BPT5204
- Farmer awareness programme on formation alleys & Maintenance of optimum plant population

MAIZE:

- Promotion of micro nutrients based on Soil Health card

- Awareness on need based plant protection methods
- Growing of Baby corn, Sweet corn Hybrid maize to have more value addition & more returns
- Preparation of Village crop models in consultation with ANGRAU scientist and educating the farmers accordingly

BLACK GRAM:

- Popularizing of YMV tolerant varieties Like PU31,TBG104, LGB787 & GBG 1
- Providing life saving/Protective irrigation by using Rain gun technology
- Need based plant protection methods
- Preparation of Village crop models in consultation with ANGRAU scientist and educating the farmers accordingly

COTTON:

- Promotion of micro nutrients like Boron, Magnesium based on Soil Health card
- Encouraging High density planting
- Adoption of weed management
- Adoption of plant protection measures & Refugee
- Preparation of Village crop models in consultation with ANGRAU scientist and educating the farmers accordingly

SUGAR CANE:

- Promotion of micro nutrients based on Soil Health card
- Growing of high yielding varieties based on scientist recommendations
- Growing of single node seedling to enhance yields
- Better water management practices
- Preparation of Village crop models in consultation with ANGRAU scientist and educating the farmers accordingly

Revisiting strategy to achieve strategic interventions of ICRISAT in pilot areas of Krishna in G.Konduru and Ghantasala mandals is given below:

- ✓ Imparting training by their concerned ADAs
- ✓ Direct involvement of cluster wise village wise gaps identification, working out the strategies & in preparation of village action plans under the supervision of MAOs
- ✓ The information on interventions & best management practices in the form of book lets
- ✓ Continues monitoring by TELEGRAM App through tabs
- ✓ Organization of FFS & OFDs
- ✓ Establishment of Village Knowledge Centers-MPEOs will have regular interaction with progressive farmers of the village
- ✓ Adoption of direct sowing methods
- ✓ Promotion of rain gun technology at times of moisture stress conditions
- ✓ Adoption of poly cropping system in identified locations of upland mandals
- ✓ Promotion of Natural Farming
- ✓ Promotion of farm ponds & NTR Jalasiri

The major interventions taken up in Krishna district for agriculture sector based on the growth engines are as follows (Table 4.1.6.7)

Table 4.1.6.7. Agriculture area specific interventions taken up in Krishna in 2015-16		
Crop	Interventions	Area covered (ha)
Paddy	Varietal replacement in 11 sea coastal mandals	25,000
	Direct sowing by Drum Seeding, Seed cum fertilizer drill , Mechanical transplantings in all mandals	75,000
	Micronutrient application in 50 mandals	30,000
	Green manuring in 22 mandals	50,000
	Raising Pigeonpea on Rice field bunds in 28 delta mandals	3,600
Cotton	High density planting in 10 mandals	500
	Micronutrient like Zn, B and Mg in 22 mandals	10,000
Black gram	Varietal replacement to Yellow Mosaic Virus in 28 mandals	50,000
	1 or 2 need based light irrigations in 28 mandals	10,000
Maize	Additional area under Maize in 12 mandals	15,000
	Zero tillage in rice fallows in 10 mandals	10,000
	Micronutrient supply in 22 mandals	5,000
	Need based plant protection sprayings for control of stem borer in 10 mandals	1,000

4.1.7 Kurnool

Demonstration and evaluation of *in-situ* and *ex-situ* soil and water management practices

Moisture stress and drought are common features of agriculture in Kurnool. *In-situ* soil and water conservation measures are important for effective conservation of soil and water at the field level. The broadbed & furrow, conservation furrow and contour cultivation systems have been implemented on large numbers of farmers at pilot sites (Fig 4.1.7.1). Few units of broadbed makers have been provided at both pilot sites. Necessary field trainings has been given at both locations. Total about 145 farmers have implemented these *in-situ* moisture conservation system at their fields.

Figure 4.1.7.1. Broadbed and furrow land and water management system with groundnut at pilot village, Devanakonda mandal 2015.

Due to these *in-situ* soil and water conservation practices the groundnut yield increased by 27% and pearl millet 19% compared to traditional flat system (Fig 4.1.7.2). Along with District Watershed Department implemented several ex-situ water harvesting structures at both pilot sites. At Devanakonda pilot site total 152 farm ponds and 12 dugout ponds have been constructed and are used for irrigation during 2015-16 (Fig 4.1.7.3). Rain guns have been used to provide supplemental irrigation to groundnut and other crops to save the crops from severe drought conditions during 2016.

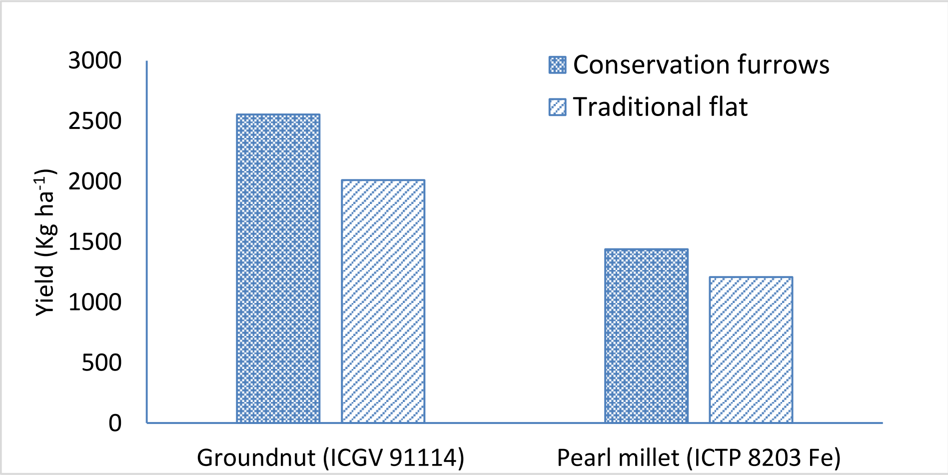


Figure 4.1.7.2. Effect of conservation furrows on groundnut and pearl millet yields during 2015 at Devanakonda pilot villages.

Figure 4.1.7.3 . Life saving irrigation from the farm pond to cotton crop at Devanakonda pilot site during severe drought in August 2016.

Soil test-based fertilizer use including micronutrients

During 2015-16 several farmer meetings were conducted in all pilot villages and they were oriented about soil health issues and trained on soil sampling. A total of 443 soil samples were collected during April 2015 by adopting stratified sampling method to collect representative samples for topography, soil color, texture, crops and cropping systems and holding sizes. The soil samples were analyzed at ICRISAT for macro, micro nutrients and soil organic carbon. Multiple nutrient deficiencies (50-100% in Zn, 0-72% in B, 29-72% in S, 0-61% in Ca, 2-57% in P, 68-100% in org C) are identified as major stumbling blocks for higher yields across different villages (see Appendix 1j). Soil test-based recommendations are developed for all cereals, pulses, oilseeds and vegetable crops. The recommendations are shared with line-departments, NGOs and farmers. In context of observed deficiencies, the use of micronutrient fertilizers is being promoted. The soil health cards have been given to for 443 farmers. Due to severe drought conditions in 2015 very few farmers at the pilot sites used the micronutrients and gypsum. Only few farmers used gypsum for groundnut and zinc for paddy. The zinc application in paddy gave 17% higher grain yield compared to control. The gypsum application to groundnut increased the pod yields by 31% compared to control (1680 kg ha^{-1}). During 2016 the number of farmers who have used micronutrients and gypsum has increased by 5 folds.

Demonstration and evaluation of improved crop varieties

Improved varieties of groundnut (K9, Kadiri Harithandra, ICGV91114), Pigeonpea (ICPH2740, ICP8863 (Maruthi), ICPL87119 (Asha)), Korra/Foxtail Millet (Surya Nandi), Pearl millet (ICTP8203 Fe), Sorghum (CSV17, PVK 801, CSH 24 MF (Fodder)), and Castor (DCH177, CSH 519) are being taken up on 118 farmers' fields (Fig 4.1.7.4 & Table 4.1.7.1). Crop cutting experiments were conducted to evaluate yields compared with local cultivars.

Figure 4.1.7.4. Demonstration of various crops at pilot villages during 2015, Devanakonda mandal

Table 4.1.7.1. Breeder seeds and improved crop varieties provided to farmers at pilot sites in Kurnool during 2015-16.				
During 2015				
Crop	Variety	Village	Mandal	Area (ha)
Groundnut	ICGV 91114, Kadiri Harithandra, K9	Devanakonda, Nelathalamarri, Kukatikonda, K Venkatapuram	Devanakonda	15.68
Pigeonpea	ICPH 2740, ICP 8863 (Maruthi), ICPL 87119 (Asha)	Devanakonda, Nelathalamarri, Kukatikonda, K Venkatapuram, Appalapuram, Nandavaram	Devanakonda, Banaganapalle	9.28
Foxtail millet	Surya Nandi	Devanakonda, K Venkatapuram	Devanakonda	4
Pearl millet	ICTP 8203 Fe	Devanakonda, Nelathalamarri	Devanakonda	2.4
Castor	CSH 519, DCH177	K Venkatapuram, Nandavaram	Devanakonda, Banaganapalle	1.12
Sorghum	CSV17, PVK 801, CSH 24 MF (Fodder)	Devanakonda, Nelathalamarri, K Venkatapuram	Devanakonda	2.4
During 2016				
Groundnut	ICGV 91114, ICGV 350 (Breeder seed)	Devanakonda, Nelathalamarri, Kukatikonda, K Venkatapuram	Devanakonda	5.28
Pigeonpea	ICPH 2740, ICPL 87119 (Asha), ICPL 87119 Breeder seed	Devanakonda, Nelathalamarri, Kukatikonda, K Venkatapuram	Devanakonda, Banaganapalle	8.96
Castor	DCH 519	Nelathalamarri, Kukatikonda, K Venkatapuram	Devanakonda	8
Pearl Millet	ICTP 8203	Devanakonda, Kukatikonda	Devanakonda	20
Foxtail Millet	Suryananadi	Appalapuram, K Venkatapuram, Nandavaram, Pandlapuram, Devanakonda, Kukatikonda	Devanakonda, Banaganapalle	20
Green gram	IPM 02-14	Kypa, K Venkatapuram, Nandavaram	Banaganapalle	1.12
Black gram	T 9	Appalapuram, K Venkatapuram, Nandavaram		1.12

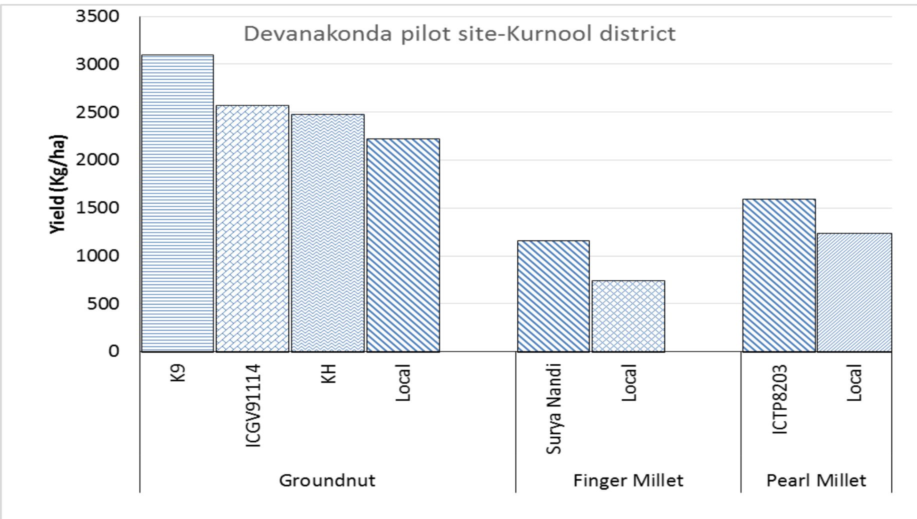


Figure 4.1.7.5. Performance of different varieties of groundnut, finger millet and pearl millet at Devanakonda pilot villages during 2015.

The performance of different improved varieties compared to local shown in Fig 4.1.7.5. In groundnut the highest pod yield of 6012 Kg/ha was recorded in K9 which is 40 % higher than local. Similarly the KH and ICGV 91114 also gave 12% and 16% higher pod yields compared to local. In pearl millet ICTP 8203 have 29 % higher yield compared to local while in finger millet Surya nandi have 56% higher yield compared to local.

Groundnut and Pigeonpea seed production

Availability of good quality seed is a major constraint in increasing its productivity particularly in Rayalaseema region. In partnership with DoA and agricultural university, improved groundnut varieties (breeder seed) of K9 & Kadiri Harithandra (6775 Kg) have given to 50 progressive farmers in 2015. During 2016 total 2010 Kg of groundnut breeder seeds (ICGV 91114 and ICGV 350) were given to 22 farmers at Devanakonda pilot villages. This has substantially increased the availability of quality groundnut seed. In addition to groundnut, pigeonpea breeder seed of ICPL 87119 variety was provided to 11 farmers at Devanakonda and 7 farmers at Banaganapalle pilot sites.

Integrated pest management (IPM)

To effectively implement IPM at the pilot villages total 80 insect traps have been established. This allowed us to do the day to day monitoring of major insects & pests at the sites and provide recommendations to farmers. Most of the farmers who have used this information feels that this was very useful in guiding about the plant protection measures.

Improving soil health through recycling of on-farm wastes

Most of the soils at the pilot sites are very low in organic matter. Therefore, we are evaluating microbial consortia culture (Madhyam culture) for recycling on-farm agricultural and household wastes. The composting using microbial consortia is given to 4 farmers in the pilot sites. With this culture entire process of decomposition is very fast. In addition to this 7 farmers are making vermicomposting and using them for vegetables.

Gliricidia plantation

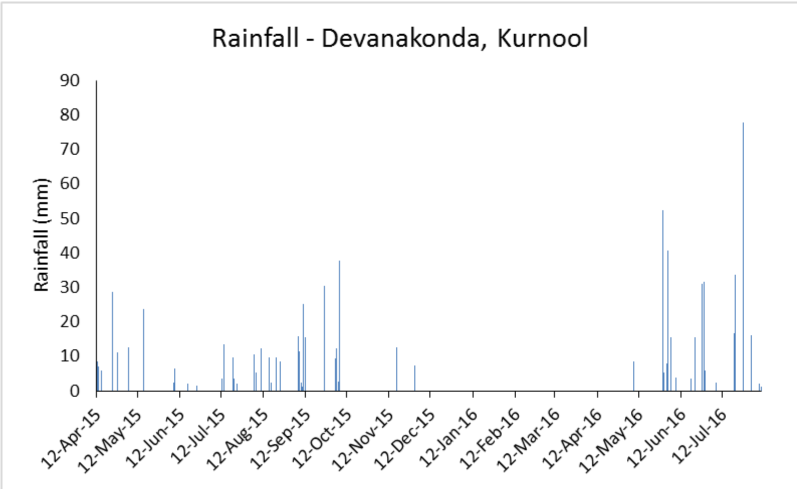
Considering low levels of soil organic matter in most farmers' fields, we are promoting planting of N-rich green manure plant *Gliricidia* on farmers' fields. Total 12 farmers planted it on their farm boundaries. However due to severe drought conditions during 2015 most of the plants did not survive.

Aquasap

During 2015, *Kharif* season total 10 farmers at Devanakonda and 9 farmers at Banaganapalle pilot sites were given aquasap for application on groundnut, Pigeonpea and Vegetables. Necessary information and trainings were given to farmers about its dosage and frequency of application. At both pilot sites the farmers were quite happy and they feel that the 2 applications of aquasap has improved their crop yields. The application of aquasap gave 12-29% higher groundnut pod yields and 6-39% higher biomass yield compared to control. In Pigeonpea 15-21% yield increase was recorded due to application of aquasap.

Rainfall and groundwater monitoring

Total four dual type rain gauge which allows both manual as well as automatic recording of rainfall, have been installed at different villages in Devanakonda pilot villages (see Section 3.4). These units have HOBO pendent logger which also records air temperature using an inbuilt temperature sensor. The rainfall recorded during 2015-16 at Devanakonda and Banaganapalle pilot sites are shown in Fig 4.1.7.6. Devanakonda received very low rainfall while the rainfall at Banaganapalle was above normal.



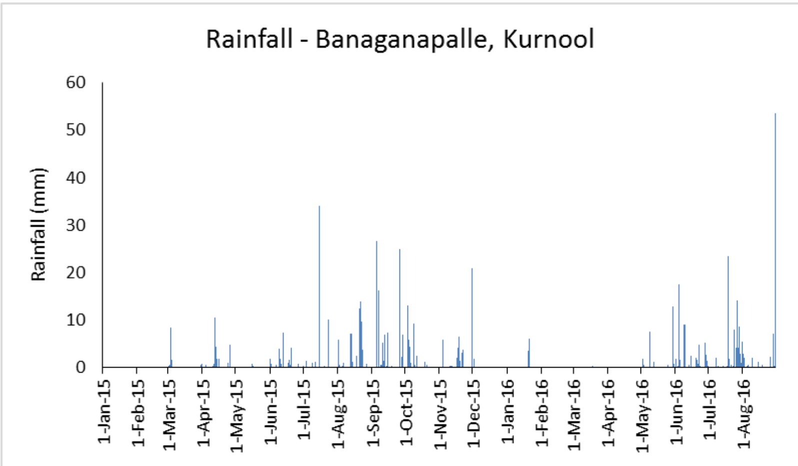


Figure 4.1.7.6. Rainfall recorded at Devanakonda and Banaganapalle pilot villages during 2015-16.

One groundwater meter has been provided at pilot site to measure the fluctuations in groundwater. This is helps in assessing the groundwater availability at pilot site which will be useful for planning the crops and cropping systems. It is also be useful in assessing the impact of various watershed interventions. The collected groundwater reading from the pilot villages clearly shows the positive impact of farm ponds and other *ex-situ* water harvesting structures.

Awareness and capacity building

This activity was given high importance at pilot villages both at Devanakonda and Banaganapalle sites. All the awareness program, training, field demonstrations and meetings were conducted in collaboration with government line departments (Agriculture, watershed, and horticulture), local NGO and other agencies. The major focus was given on *in-situ* and ex-situ moisture conservation (broadbed and furrow system, conservation furrows, contour cultivation and farm ponds), integrated nutrient management and high yielding varieties. During 2015-16, total 252 capacity building and awareness programs were conducted at pilot villages and about 3670 farmers were oriented and trained on innovative and now technologies for implementation in fields (Table 4.1.7.2)

Table 4.1.7.2. Awareness & capacity building programs on various technologies at pilot sites in Kurnool during 2015-16

S. No.	Villages	No of awareness programs	No of capacity building programs	Total participants
1	Devanakonda	35	12	630
2	Kukatikonda	23	03	430
3	Nelathalamarri	24	04	527
4	K Venkatapuram	20	09	525
5	Sankalapuram	20	8	250
6	Appalapuram	13	3	305
7	Pandlapuram	17	8	215
8	Nandavaram	15	3	205
9	Kypa	14	5	195
10	Venkatapuram	18	2	100
	Total	199	57	3382

Progress on various activities implemented in close collaboration with line departments District Watershed Management

We have been providing necessary technical assistance to district watershed official and project implementing agencies in planning, design and management of *in-situ* and *ex-situ* water harvesting systems at our both pilot sites in Kurnool. The district officials &PIAs are now using hydrological data viz. runoff and peak runoff rate in the design and planning of *ex-situ* water harvesting structures. At both pilot sites, watershed department has taken-up several interventions such as check dam, repairs to existing check dam/check wall, rock fill dam, loose Boulder Structure, farm pond, dugout pond, earthen bunding with plantation, trenching at foot Hills, cattle trough, NADEP compost pit, avenue plantations, bund plantations, dry land horticulture mango, fodder production and solar street light. The details of various watershed development activities at Devanakonda pilot villages are given in Table 4.1.7.3 and for Banaganaplle pilot village in Table 4.1.7.4.

During 2015-16, at both pilot sites the major emphasis was given to construction of farm ponds and check dams (figure 4.1.7.7, 4.1.7.8). At Devanakonda pilot site total 212 runoff harvesting and groundwater recharging structures have been constructed. At Banaganapalle pilot villages a total 42 runoff harvesting and groundwater recharging structures have been constructed during 2015-16.

Table 4.1.7.3. Various watershed development activities implemented at Devanakonda pilot villages Kurnool						
S. No	Name of the activity	Village name				
		Devanakonda	Nelathalamarri	Kukatikonda	K.Venkatapuram	Total
1	Check dam (no)	3	3	0	0	6
2	Repairs to existing check dam (no)	5	6	13	13	37
3	Repairs to existing check wall (no)	1	0	1	3	5
4	Rock fill dam (no)	4	0	0	0	4
5	Loose Boulder Structure (no)	23	5	10	2	40
6	Avenue plantations	1	1	0	0	2
7	Farm pond (no)	13	26	102	11	152
8	Dugout pond (no)	0	5	7	0	12
9	Cattle troughs (no)	1	1	1	1	4
10	NADEP compost pit (no)	1	0	0	0	1
11	Solar street light (EPA) (no)	5	0	0	0	5
12	Trenching at foot Hills	0	1	0	0	1
13	Bund plantations (ha)	2	2.4	9.2	0	13.6
14	Dry land horticulture mango (acre)	1.5	5	45.7	18	70.2

Table 4.1.7.4. Various watershed development activities implemented at Banaganapalle pilot villages Kurnool district during 2015-16.								
S. No	Name of the activity	Appla-puram	Venkata-puram	Pandla-puram	Nanda-varam	Sankala-puram	Kaipa	Total
1	Loose boulder structure (no)	0	1	0	1	0	0	2
2	Rock fill dam (no)	0	2	0	3	0	0	5
3	Earthen bunding with plantation (no)	0	0	0	10	0	0	10
4	Farm pond (no)	43	12	9	28	5	31	128
5	Dugout pond (no)	8	15	1	13	3	4	44
6	Check dam (no)	0	3	0	1	0	0	4
7	Repairs to existing check dam (no)	12	2	0	7	0	7	28
8	Avenue plantation	1	2	0	1	0	0	4
9	Raising of perennial fodder	2	0	6	18	0	0	26
10	Cattle troughs (no)	1	0	0	0	0	0	1
11	NADEP compost pit (no)	5	0	1	0	0	0	6

Figure 4.1.7.7. Left: Farm ponds for water harvesting; Right: Check dams for groundwater recharging;

Figure 4.1.7.8. Rock fill dams and loose boulder structures for soil and water conservation

Due to various interventions at Devanakonda pilot villages the surface and groundwater availability increased by 6 lakh m^3 during 2015-16. Due to this additional crops in 240 ha were given life saving irrigation. Increased water availability also resulted in increased area under vegetables and high value crops.

Due to increased water availability additional 30 ha of mango plantations were taken up by farmers. On about 34 ha avenue plantations were completed at Devanakonda pilot villages (Fig 4.1.7.9). Several other interventions viz. vermicomposting, solar street lighting, and cattle troughs were completed during 2015-16 (Fig 4.1.7.9).

Figure 4.1.7.9. Left: Avenue plantation at Devanakonda pilot villages; Right: Vermicomposting at Devanakonda pilot villages, Kurnool district during 2015-16.

Agriculture

In 2015, Due to extremely low rainfall in the Kurnool district, the planting of various crops were affected. Even in irrigated areas the planting was badly affected due to non-release of irrigation water. Out of total 6.26 lakh ha only 3.82 lakh ha (61 %) has been planted in *kharif* 2015. Cotton planted 1.43 lakh ha (-0.1 % less than 2014), groundnut planted 64000 ha (46% less than 2014), paddy planted 15000ha (83 % less than in 2014) and pigeonpea planted 43000 ha (14 % less than in 2014). In 2016 the planting of various crops viz groundnut, cotton, Pigeonpea, onion and other are about 20 -40% higher compared to 2015. The awareness meeting were conducted across district about the balance nutrient application. The application of secondary and micro nutrients were highlighted. In spite of very poor rainfall the uptake of secondary and micro nutrients by farmers was good during 2015. Due to high rainfall and cropping area the uptake of micronutrients and gypsum are significantly better compared to 2015. In 2016, the uptake of Borax, Zinc sulphate and Gypsum in Kurnool district is shown in Table 4.1.7.5.

Table 4.1.7.5. Statement showing the micronutrients in Kurnool 2016.

S.NO	Name of the Mandal	Sale Point	Qty in MTs						
			ZINC SULPHATE			GYPSUM		BORON	
			21%	33%	12%	Bulk	Bagged	10.5% for Basal	20% for foliar
	DIST. TOTAL		532	76	152	646	5389	15	36

Media Coverage and Awards:

Our various Rythu Kosam activities at pilot villages and district were well covered by various newspapers, radio and TV programs (Fig 4.1.7.10). During 2016 both pilot sites (watersheds) have been awarded No 1 and No 2 in whole Kurnool. These awards are given by the director of DWMA and other senior district officials based on their overall performance in implementing various interventions.

యూరియా ద్రావణంతో బెట్ట నుంచి విముక్తి

దేవనకొండ : ప్రస్తుతం నెలకొన్న వర్షాభావ పరిస్థితుల కారణంగా వాడుపట్టిన పంటలపై యూరియా ద్రావణం పిచికారి చేస్తే బెట్ట నుంచి తాత్కాలికంగా రక్షించుకోవచ్చని ఇక్రిషాట్ శాస్త్రవేత్త ప్రభాకర్‌పటాక్ తెలిపారు. శుక్రవారం ఆయన మండల పరిధిలోని కూకటికొండ, వెలమకూరు గ్రామాల్లో పర్యటించారు. లీటర్ నీటికి 10 గ్రా. యూరియా, 2గ్రా. జింక్‌సల్ఫేట్, గ్రాము బోరాన్‌ను కలిపిన ద్రావణాన్ని వాడుపట్టిన వేరుశెనగ పైరుపై పిచికారి చేయడం వల్ల బెట్ట నుంచి పంట కొన్ని రోజులు తట్టుకుంటుందన్నారు. అదృష్టవశాత్తు వర్షాలు కురిస్తే పంటలు తిరుగుముఖం పట్టే అవకాశం ఉందన్నారు. ఆయన వెంట ఇక్రిషాట్ ఎస్‌ఓ ఆదినారాయణ, నల్లచెలిమల ప్రాజెక్టు ఆఫీసర్ మధుసూదన్ తదితరులున్నారు.

కూకటికొండ పరిధిలో ఎండిపోయిన వేరుశెనగ పంటను పరిశీలిస్తున్న శాస్త్రవేత్త ప్రభాకర్ పటాక్

సాక్షి Sat, 27 August 2016
epaper.sakshi.com/c/12774824

ఈనాడు
కర్నూలు
గురువారం 25 ఫిబ్రవరి 2016 16 పేజీలు

శీతల గోదాముల ఏర్పాటుకు సన్నాహాలు

దేవనకొండ, న్యూస్‌టుడే : రైతుల అభివృద్ధిని దృష్టిలో ఉంచుకొని కేంద్ర, రాష్ట్ర ప్రభుత్వాలు శీతల గోదాములు ఏర్పాటుకు చర్యలు తీసుకొంటున్నట్లు ఇక్రిశాట్ శాస్త్రవేత్త పాఠక్ తెలిపారు. దేవనకొండలోని నల్లచెలిమల వాటర్‌షెడ్ కార్యాలయంలో బుధవారం మాట్లాడారు. రైతుల ఆర్థిక ఇబ్బందులను దృష్టిలో ఉంచుకొని శీతల గోదాముల ఏర్పాటుకు కేంద్ర ప్రభుత్వం, నాబార్డు ముందుకొచ్చిందన్నారు. వంద మంది రైతులు కమిటీగా ఏర్పాటు చేసుకొని తమ పంటలను కాపాడుకొనేందుకు తోడ్పాటు చేసుకోవచ్చన్నారు.

రైతులు ఈ అవకాశాన్ని సద్వినియోగం చేసుకోవాలని కోరారు. దేవనకొండ మండలంలో రెండు శీతల కేంద్రాల ఏర్పాటుకు అవకాశం ఉందని వివరించారు. ఒక్కో గోదాముకు రూ.8 లక్షల నుంచి రూ.10 లక్షల వరకు ఖర్చవుతుందని పేర్కొన్నారు. ఆయన వెంట ఐడబ్ల్యూఎంపీ పీవో మధుసూదన్, పరిశోధన శాస్త్రవేత్త ప్రగతి తదితరులు ఉన్నారు.

రైతులతో చర్చిస్తున్న శాస్త్ర వేత్త పాఠక్

ఈనాడు
కర్నూలు
శుక్రవారం 25 సెప్టెంబరు 2015 16 పేజీలు

అధిక విత్తనోత్పత్తే లక్ష్యం

దేవనకొండ, న్యూస్‌టుడే : వర్షాధార పొలాల్లో అధిక విత్తనోత్పత్తి సాధించడమే లక్ష్యమని డాట్ సెంటర్ సమన్వయకర్త పి.సుజాతమ్మ అన్నారు. నల్లచెలిమల ప్రాజెక్టు పరిధిలోని గ్రామాలైన దేవనకొండ, కూకటికొండ ప్రాంతాల్లోని పొలాలను ఇక్రిశాట్ శాస్త్రవేత్తలు గోపీనాథ్, సాధన, ప్రాజెక్టు అధికారి మధుసూదన్ తదితరులు గురువారం సందర్శించారు. పొలాలను పరిశీలించి పంటలకు సంబంధించిన తెగుళ్లు, నివారణ పద్ధతులు తదితరాల గురించి వివరించారు. వేరుసెనగ కెళి, వేరుసెనగ కేహెచ్, పత్తి, ఆముదం, జొన్న, కంది మొదలగు పంటల నూతన వంగడాలపై అవగాహన కల్పించారు. రబీలో రైతులకు మంచి నూతన వంగడాల విత్తనాలు పంపిణీ చేస్తామని తెలిపారు. ప్రత్యామ్నాయ పంటలైన కంది, జొన్న, సజ్జ తదితర విత్తనాలు ఇస్తామన్నారు. ఇక్రిశాట్ అధికారులు, వాటర్‌షెడ్ సిబ్బంది వెంకన్న, రామచంద్ర, మురళి, రాఘవ పాల్గొన్నారు.

పంటను పరిశీలిస్తున్న అధికారులు

విశాలాంధ్ర
ప్రాంతీయం
• కర్నూలు • అనంతపురం • బళ్ళారి

పంటల పరిశీలన

Figure 4.1.7.10. Newspaper coverage of various activities of pilot sites in Kurnool during 2015-2016.

4.1.8 Nellore

Pilot site identification

In meeting with CPO and district collector, district heads of line department followed by field visits during 10-13 March 2015 along with line department heads and interactions with all stakeholders, pilot sites to be developed as sites of learning were identified in 11 villages across 3 mandals. The sites were carefully chosen to represent the agro-eco regions of the district (viz, coastal belt, delta belt and dryland belt). Accordingly, it was looked at representation of the copping patter in the district viz, agricultural crops in the district i.e. paddy, green gram, black gram, maize, in horticulture crops acid lime, mango and vegetables and coastal area for fisheries. Sites are good representation of the district in terms of representing rainfed regions and irrigation thru borewell.

Soil sampling, analysis and soil test-based fertilizer recommendation including for micronutrients

Participatory soil sampling was done in the pilot sites with active support from DoA. Farmer meetings were conducted across all the11 villages in pilot sites and farmers were oriented about soil health issues and trained on soil sampling. A total of 435 soil samples were collected during April month by adopting stratified sampling method to collect representative samples for topography, soil color, texture, crops and cropping systems and holding sizes. The collected samples were sent to ICRISAT for analysis. The soil samples were analyzed for macro, micro nutrients and soil organic carbon (See Appendix 1c).

Multiple nutrient deficiencies (3-95% in Zn, 0-30% in B, 0-90% in S, 0-23% in Ca, 0-58% in P, 5-85% in org C) are identified as major stumbling blocks for higher yields across different villages particularly in dryland belt of podalukur mandal. Soil test-based recommendations are developed for all cereals, pulses, oilseeds and vegetable crops. The recommendations are shared with line-departments, NGOs and ICRISAT line staff who are creating awareness and disseminating the results amongst the farmers. In context of observed deficiencies, the use of micronutrient fertilizers is being promoted. To promote results of soil analysis, in each village, two wall writings are done at prominent place to showcase the result (Fig. 4.1.8.1)

Figure 4.1.8.1. Wall writings at village gram panchayat/ School

In order to createinterest amongst the framers and to promote their active involvement in the project, the soil health cards were distributed during field days and exposer visits to live demonstrations in presence of Agriculture and horticulture department staffs (Figure 4.1.8.2).

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Nellore District Edition

Soil health card distribution
News paper cuttings.

Figure 4.1.8.2. Soil health crads distribution to farmers

Rythu Kosam Baseline Survey in Nellore:

Baseline survey was conducted during August, 2015 covering about 264 sample household farmers from eight pilot villages of Nellore district (Figure 4.1.8.3, 4.1.8.4; see Section 3.1). Three villages each were covered from Podalakur and Thotapalligudur mandals where agriculture and livestock rearing are the main livelihood options for farmers. Another two sample villages were covered in Indukurpet mandal in which prawn and fish culture are the major activities. The survey was comprehensively covered all the sectors which include agriculture, horticulture, livestock, fish production, sericulture and minor forest products etc. in the pilot site area covering about 10,000 ha. Specifically, the details about family compositions, average land holdings, cropping patterns, resource endowments, average productivity levels, extent of adoption of different technologies, livestock details, household access to markets, average household incomes, perceptions about climatic variability, major constraints and coping mechanisms were covered in the survey. The details about cost of cultivation of major crops, milk production, prawn production etc. were also surveyed and documented. The data entry and data validation is on-going. The data analysis and baseline report will be completed very soon.

Figure 4.1.8.3. ICRSIAT and line department staffs during Survey at Gangapatnam village, Indukurpeta Mandal

Figure 4.1.8.4. ICRSIAT and line department staffs during Survey at Kanuparthi village, Podalakuru Mandal

Rain gauge installation

Automatic weather stations are there near to selected villages in 2 mandals, however, in 3rdmandal viz Podalkuru, the weather station is at distant places, and therefore we are establishing one dual purpose raingauge cum temperature recording device in Kanuparthi village, Podalukuru mandal (figure 4.1.8.5).

Figure 4.1.8.5. Raingauge established in Kanuparthi village, Podalukuru mandal

Participatory Evaluation of improved crop varieties

In Nellore, farmers were given choice to choose improved varieties of preferred dryland crops as well as irrigated crops from the list of varieties provided to farmers' groups (Table 4.1.8.1; Figure 4.1.8.6). ICRISAT and State Agricultural Universities released improved cultivars and proprietary hybrids of crops were evaluated in RythuKosam program with an objective to select cultivars having suitable traits for better adaptation to biotic and abiotic stresses to enhance or sustain productivity and further scaling up the spread of these varieties to satellite taluks. Each demonstration was laid-out approximately on half to one acre of farmers' field. Best-bet management include application of 70 kg DAP, 100 kg Urea fertilizers, 5 kg Borax, 50 kg Zinc Sulphate and 200 kg Gypsum ha^{-1} for cereal crops and for legumes a reduction in urea application from 100 kg to 40 kg ha^{-1} was done. The layout of Varietal trial was designed to assess the performance of local variety with traditional way of input management. In this trial, there are two treatments with (FP) local/traditional cultivar+ farmers' inputs, (T1) and improved cultivar + best-bet inputs (T2).

With these trials, farmers will be exposed to several improved varieties of each crop grown in their watershed and had the option of evaluating the performance of each variety more or less in the same climatic and soil conditions with different levels of input management. Participatory Varietal selection trials are confined to two or three main rainfed cropping systems of the district/region during the crop season (Table 10). During season, crops evaluated include cereals and millets (paddy), pulses (greengram, blackgram, pigeonpea).

The activity is promoted through Bhoochetana program in all the 11 villages of pilot sites in Nellore with active involvement of agriculture department and ICRISAT. The program collects and delivers the data which, not only assists farmers with their choice of suitable varieties, but also facilitates the registration and commercialization of new cultivars by plant breeders. The experimental protocol, has been established to evaluate the performance of improved varieties under balanced nutrition against a common set of traditional varieties to characterize their yield, quality, disease resistances/tolerances and agronomic characteristics. The information on yield performance of the improved cultivars is planned to be collected through crop cutting experiments by ICRISAT staff and FFs in presence of agriculture department staff/officials.

Table 4.1.8.1 Participatory evaluation of improved crop cultivars in Nellore district

Sl No.	Crop	Variety	Quantity (kg)	No. of Farmers
1	Paddy	NLR 3041	1200	200
		DRR DHAN39 and DRR DHAN 44	540	80
2	Pigeon pea	ICPH2740	20	20
		ICPL87119 (Asha)	20	15
		ICP8863	10	10
		ICPL88039	10	5
3	Black gram	T9	450	225
4	Green gram	SML668	60	30
		IPM0214	90	40
		LGG460	200	100


చౌడు భూముల్లో సైతం మంచి దిగుబడులు

Figure 4.1.8.6. Promoting improved ultivars in pilot sites

The cultivars evaluated performed exceptionally good under prevailing monsoon vagaries viz, drought condition during earlier growth stage followed by heavy rainfall during flowering. The local and prevailing cultivars suffered due to yellow vain mosaic virus however, new introduced cultivars shown resistance to the disease and to monsoon vagaries. Overall, there was 126 per cent higher yield in green gram and 70 per cent increased yield in black gram over local cultivars (Table 4.1.8.2).

Table 4.1.8.2. Performance of improved cultivars under on farm situation in Nellore district

Crop	Yield IP	Yield FP	% increase
Green gram	3.52	1.56	126
Black gram	5.45	3.2	70
Pigeonpea	2.3	0	

Breeder Seed production of groundnut variety ICGV 91114

In order to make available good quality groundnut seed of high yielding K6 variety at village level, farmer participatory breeder seed production plots were encouraged even outside our pilot areas viz, at Aroor village, Chittamur Mandal of Nellore district. In all 18 farmers participated in these demonstrations covering 8.8 ha groundnut area. These farmers were guided for best management practices including balanced nutrient management, gypsum application and weed management etc. The plots were linked for registration with APSSDAL. Farmers have recorded very good yield compared to other cultivars and are interested in continuation of the demonstrations in next year.

The farmers obtained very good yield averaging 2970 kg/ha as against an average of 2200 kg/ha with local variety (Figure 4.1.8.7). Thus the farmers obtained additional return averaging of Rs. 38500/ha compared to local variety.

Figure 4.1.8.7. Seed production activities in pilot sites

Micro-Irrigation

Similarly with Micro irrigation department, the plan was targetted to bring new areas under Micro irrigation particularly with drip and sprinkler system. The works are targeted in convergence with DoA and DoH for effective implementation and higher returns. The important crops covered include Acid lime, mango, tomato, vegetables and maize. Overall, 8 ha new areas were brought under MI during last year in pilot sites.

Evaluation of sorghum fodder variety

Fodder scarcity is the major stumbling block for high animal productivity which is a prominent activity with farmers in pilot site. So, multi-cut sorghum variety CSH24 MF is being evaluated with 30 farmers (Figure 4.1.8.8). On an average, farmers harvested 18 t/acre green fodder and are very happy about the cultivar.

Recycling of on-farm wastes for soil fertility

We are evaluating microbial consortia culture (Madhyam culture, which is tested on-station at ICRISAT) for recycling on-farm agricultural, household wastes. ICRISAT supplied one shredder machine in pilot site to fasten the process of decomposition thru encouraging copping of waste organic material in and around field (figure 4.1.8.9). This activity was promoted through lead farmers in the villages and capacity building. The composting activity using microbial consortia is piloted with 350 farmers in the pilot sites.

Figure 4.1.8.8. Fodder promotion in ilot villages

పర్యావరణ పరిరక్షణ అందరి బాధ్యత

సైదాపురం: పర్యావరణ పరిరక్షణ అందరి బాధ్యతని ఆర్ఆర్డీఎస్ సేవా సంస్థ డైరెక్టర్ గంగిరెడ్డి పేర్కొన్నారు. సైదాపురంలో అంతర్జాతీయ మెట్ట పంటల పరిశోధన సంస్థ సహకారంతో ఆర్ఆర్డీఎస్ సేవా సంస్థ ఆధ్వర్యంలో ఫామ్ వేస్ట్ ష్రెడ్డర్ యంత్రం పనితీరుపై గురువారం రైతులకు అవగాహన కల్పించారు. ఈ సందర్భంగా ఆయన మాట్లాడుతూ యంత్రం సాయంతో వ్యవసాయ వ్యర్థాలను చిన్నచిన్న ముక్కలుగా చేసి కంపోస్ట్ ఎరువులను తయారు చేసుకోవచ్చన్నారు. వ్యవసాయ వ్యర్థాలను కాల్చివేయడం ద్వారా పర్యావరణానికి ముప్పు వాటిల్లుతోందన్నారు. పశుగ్రాసాన్ని ముక్క ముక్కలుగా చేసి పశువులకు మేతగా వేయవచ్చన్నారు.

గడ్డిని ముక్కలుగా చేస్తున్న యంత్రం

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Figure 4.1.8.9. Aerobic composting promotion in pilot sites

Monitoring of important pests

For avoiding indiscriminate use of pesticides and properly guiding farmers w.r.t. integrated pest management on day-to-day basis, extensive pest-monitoring is initiated. Total 100 inset traps are transported to pilot sites and are being established in pilot villages/hamlets for proper guidance to farmers.

Demonstration of Aquasap- a sea weed extract

Aquasap is a Sea weed extract organic fertilizer which is used as foliar spray for commercial crops. Aquasap- 5X: This is a 100% organic extract from sea plants. It contains macro & micro nutrients, essential amino acids and plant growth hormones that provide major boost to crop yield by accelerating metabolic function and enhancing its nutrition uptake capacity. Spraying preparation 1% for foliar application for 3 times during crop season. After establishment stage, pre-flowering and post flowering stage of crop. It can also be used for vegetable crop the seedlings roots need to be dipped in 0.3% solution. The solution is available in 1 litre pack and sufficient for one acre (1 acre = 0.4 ha)area. The liquid is an organic produce and hazard free and can be handled with bare hands for mixing with water for preparation of solution. The requirement for one acre trial 3 times sprays need 3 liter.

The demonstrations are being conducted in pilot villages on organic paddy, green gram, blackgram, maize, vegetables viz, brinjal, capsicum, okra, Bitter gourd, etc has resulted in good crop growth and vigour (Figure 4.1.8.10). The yield data revealed that there is significant yield improvement with aquasap application. Overall, ICRISAT covered 100 aquasap demonstrations.

Figure 4.1.8.10. Aquasap demonstrations

Capacity building

On daily basis, 4 NGO and 2 ICRISAT staff (in different locations) in collaboration with line-departments (agriculture, horticulture, animal husbandry, sericulture) are conducting farmer meetings, awareness and training programs on new technologies being introduced and to scale-out good practices on large number of farmers' fields along with data recording and documentation. About 200 capacity building programs were conducted in pilot villages and about 2500 men and women farmers were oriented and trained on innovative and low hanging technologies for implementation (Figure 4.1.8.11).

Figure 4.1.8.11. Capacity building program conducted in Nellore

Progress in close collaboration with line department

The promotion of soil test-based addition of secondary and micronutrients is the focus area in pilot sites. The soil test-based recommendations including for secondary and micronutrients are provided to line staff and are being promoted with farmers. As such the quantities of fertilizers positioned and distributed particularly gypsum, zinc sulphate and borax (Table 4.1.8.3)

Table 4.1.8.3. The quantities of secondary and micronutrients indented, received and distributed, 2015				
Mandal	**Micronutrient**	**Indented (t)**	**Received (t)**	**Distributed (t)**
T.P.Gudur	Zinc Sulphate	5	3	3
	Borax	0.25	0.25	0.2
	Gypsum	69	59	32
Podalakur	Zinc sulphate	50	20	20
	Borax	0.1	0.1	0.075
	Gypsum	80	80	75
Indukurpet	Zinc sulphate	5	3	3
	Borax	0.25	0.25	0.25
	Gypsum	45	34	34

As soil organic C content of farmers' fields is low, therefore with a purpose to build soil health, green manure crop seed was distributed to farmers in the pilot sites for - Dhaincha (450 t received/250 t distributed and sunnhemp (210 t received/130 t distributed) and pillipesara (10 t received/10 t distributed).

The addition of fertilizers like N, K, Zn and B is also being promoted as fertigation in crops like banana, tomato, onion, chillies, groundnut, papaya etc. the fertigation schedules developed using regular low cost fertilizers are being promoted with farmers in pilot sites. For evaluating fertigation with banana crop, trials were taken in pilot villages in indukurpeta and TP gudur mandal.

To promote high yielding varieties, improved crop seeds were positioned and distributed in pilot sites villages – 1100 q paddy, 845 q greengram, 900 q blackgram, 40 q pigeonpea, and 380 q groundnut.

4.1.9 Prakasam

Rainfall received and area sown in the pilot site villages during *kharif* 2015-16.
Continuous monitoring of rainfall is done in the pilot sites (Table 4.1.9.1; see Section 3.5). Overall all the four mandals of the pilot sites have faced deceit rainfall viz. Kanagiri mandal 9.7%, Konakanamitla 12.7%, Kothapatnam 42.5% and Ongole 63.8%. This has affected the sown area in the mandals (Table 4.1.9.2). The district average of all the mandal is average 668 mm against average of 872 mm

Table 4.1.9.1. Prakasam district average rainfall during 2015-16.

Month	Normal Rainfall (mm)	2015-16		
		Rainfall Received (mm)	% of Deviation	No. of Rainy Days
SW monsoon (Jun-Sep)	388.3	342.9	-11.7	39
NE monsoon (Oct-Dec)	393.7	254.3	-35.4	17
Winter (Jan-Feb)	16.3	1.2	-92.6	0
Summer (Mar-May)	73.2	69.9	-4.5	7
Total	871.5	668.3	-23.3	63

(Source: DoA, Prakasam)

The area sown in Konakanamitla is 23% and Kanagiri mandal is 64% of normal area to be sown due to scanty and erratic rainfall, while in *rabi* season it was 107% and 74% of normal area in Konakanamitla and Kanagiri mandals respectively (Table 5a,5b,5c) during the 2015-16.

Table 4.1.9.2. Major crops sown area in pilot site mandals during kharif and rabi 2015-16.

Crop season	Normal/Actual	Konakanmitla	Kanagiri	Total
		Area (ha)		
Kharif	Normal	5976	6927	12903
	Actual	1351	4412	5763
	% of area covered	23	64	44
Rabi	Normal	7181	9634	16814
	Actual	7681	7116	14797
	% of area covered	107	74	88

(Source: DoA, Prakasam)

Baseline survey

A detailed baseline survey was conducted by a team of social scientist covering 350 households in pilot villages. Secondary data / basic information were also collected for characterizing and identifying constraints and suitable interventions (see Section 3.1).

Soil health mapping and soil test based fertilizer recommndation

Soil health mapping was done by collecting and analysing 486 soil samples by stratified randomized soil sampling method across the pilot siltes (Fig.6). The soils analysisi data reveal thet the percent of farmers field difienct in various nutrients in Kanagiri mandal are organic carbon 60%, sulphur 52%, zinc 80%, in Konakanmitla mandal soil are deficient in organic carbon 95%, calcium 88%, sulphur 93%, zinc 90%, boran 71%, while ongole soils were deficient in organic carbon 92%, zinc 80% (see Appendix 1b). Soil test based crop specific fertilizer recommandations were provided. Soil health cards with soil test based fertilizaer recomandation was provided (Fig. 4.1.9.1). Micronutrients based on the soil test results were provided to farmers in the pilot sites. Several farmers meetings were conducted along with Agriculture department officials in each of the villages to create awareness of soil test based fertilizer applications. For wider publicity and effective dissimination of soil health status wall writings were displayed in each villages.

Figure 4.1.9.1. Left: Participatory soil sampling; Center & Right: Soil health card distributed to farmers

During the year in two mandals of pilot sites, micro and secondary nutrients viz. 37% zinc sulphate, 40% gypsum and 34% borax (against quantity positioned) were distributed (Table 4.1.9.3).

Table 4.1.9.3. Micronutrients distribution status in the pilot site villages, Prakasam.			
Mandal	Micronutrients distributed – kharif and Rabi 2015 -16		
	Zinc sulphate (Mt)	Gypsum (Mt)	Borax (Mt)
KK Metla	1.5 (50%)*	14 (33%)	0.040 (20%)
Kanagiri	5.0 (24%)	28 (48%)	0.095 (48%)
Total	6.5 (37%)	42 (40%)	0.135 (34%)

*values in parantheses is the % distributed against positioned

Variety field trials

Farmer participatory selection of promising improved varieties was taken up (Table 4.1.9.4). Improved seeds of pigeonpea, pearl millet, sorghum, multi-cut fodder sorghum have been provided by ICRISAT for farmers' participatory selection and further scaling up. Department of agriculture has distributed the seeds on subsidy basis in the pilot site mandals (Table 4.1.9.5). Pheromone traps has been provided by DoA in pilot villages (Table 4.1.9.6; figure 4.1.9.2).

Table 4.1.9.4. Farmers participatory varietal selection in pilot site villages during 2015-16, Prakasam.				
Crop	Variety	Quantity (kg)	Area(ha)	No. of farmers involved
Multi-cut fodder sorghum	CSH24MF	20	2	5
Pearl milet	ICMH 1201	5	1	2
Pearl millet	ICTP 8203 Fe	25	4	10
Pigeonpea	ICPH 2740	20	2	8
Pigeonpea	ICPL 89117	20	2	8
Pigeonpea	TS3R	21	2	9

Table. 4.1.9.5. Seeds districbuted (quantals) by the department of agriculture in the pilot site mandals.				
Seeds	Status	K.K.Mitla	Kanigiri	Total
Dhaincha	Positioned	5	90	95
	Distributed	4	46	50
Sunnhemp	Positioned	12	55	67
	Distributed	10	12	22
Pillipesaru	Positioned	2	40	42
	Distributed	1.2	38	39.2
Pigeonpea (LRG41)	Positioned	88	320	408
	Distributed	56	237.8	293.8
Green gram (LGG 460)	Positioned	25	30	55
	Distributed	25	24.6	49.6

IPM

Table 4.1.9.6. Pheromone traps to monitor the pest were distributed (DoA convergence program)			
Name of the village	**Name of the mandal**	**No. of beneficiaries**	**Quantity (no)**
Punugodu	Kanigiri	1	2
Ganugapenta	Kanigiri	1	2
Pattabhipuram	Kanigiri	2	4
Chinamana gundam	KK Mitla	1	2
Nagampalli	KK Mitla	1	2
Salanutala	KK Mitla	1	2

Figure 4.1.9.2. Pheromone traps installed in Nagampalli, KK metla mandal.

Aerobic compost preparation

To improve the soil health, cost effective on-farm prepartion of aerobic composting has been introduded in volving 50 farmers in pilot villages of Kanagiri and KK mitla mandal. The microbial culture "Madhyam" was provided to prepare the compost of 50 ton using the crop resudu 10-12 weeks. The necessary demonstartion with trainings were provided (Fig 4.1.9.3).

Figure 4.1.9.3. Aerobic compost preparation in Yadavalli village.

Glricidia- on-farm generation of N-rich green manure

The soils in the pilot sites area low in organic carbon. Gliricidia can paly a important role in improving the organic matter of soil. The loppings of the plant is cut into small pieces. The chopped material is applied to the soil surface as mulch or incorporated into soil as green manure. *Gliricidia* nursery established with 10000 seedlings (Fig. 4.1.9.4). About 6000 saplings were distributed and distribution is continued until the end of rainy season (Table 12).


Figure 4.1.9.4. Gliricidia nursery raised by a NGO and gliricidia planted on field bund in pilot site, Prakasam.

Vermi composting has been taken up as a convergence of DoA program in Ponugodu and Badugallar villages the pilot village (Fig. 4.1.9.5).

Figure 4.1.9.5 Left:. Vermi-compost in pilot village, Prakasa; right: Azolla preparation

Azola preparation has been introduced in Brammanapally and Gotlagattu **v**illages as a convergence program with Animal Husbandry department (Fig 13).

***In-situ* moisture conservation practices**

An appropriate *in-situ* soil and water conservation measures play very critical role in sustaining a good crop stand during long dry spells. The main aim of these practices is to reduce or prevent soil erosion and improve the moisture regime for sustainable production. In Prakasam district pilot sites soils area mainly red soils. We have introduced conservation furrow system of moisture conservation practice in 50 ha. till now and subsequently the area under this practice will increase, as sowings take place. BBF has been done with vegetable farmers in red soils (Fig. 4.1.9.6). During *rabi* in maize crop it is planned to take up broadbed and furrow (BBF) system of land management.

Figure 4.1.9.6. A farmer in Salanutala village, Konakanamitla mandal showing BBF landform with vegetable crop.

Productivity enhancement micro-mutrient trails yield data

Productivity enhancement field trials included the soil test based fertilizer management particularly application of secondary and micronutrients and aquasap spay. Due to low and erratic rainfall the crop yield were affected compare to last year. The average pigeonpea grain yield was 1190 Kgs/ha in improved practice (micronutrient and aquasap spray) and 950 kgs/ha in farmers practice, cowpea yield ranged 610-650 Kgs/ha in improved practice and 440-460 Kgs/ha in farmer practice and similarly, blackgram with micronutrient application the grain yield was 400 kg/ha and in farmers practice it was 330 kg/ha, while cowpea with aquasap application the grain yield was 410 kg/ha and in farmers practice it was 330 kh/ha. Average increase in grain yield ranged for different crops were 21-41% increase in improved practice when compared to farmers practice (Table 4.1.9.7 and Fig. 4.1.9.7).

Table 4.1.9.7. Crop yield with micronutrient application and aquasap spray in Prakasam district, 2015-16.

Treatment	Yield (Kg ha^{-1})									
	Blackgram-Micronutrient		Blackgram-Aquasap		Cowpea-Micronutrient		Cowpea-Aquasap		Pigeonpea-Aquasap	
	Grain	Stalk	Grain	Stalk	Grain	Stalk	Grain	Stalk	Grain	Stalk
Improved practice	400	900	410	1060	650	1040	610	950	1190	3440
Farmers' practice	330	760	330	870	460	780	440	700	950	2630
% increase	21	18	24	22	41	33	39	36	25	31

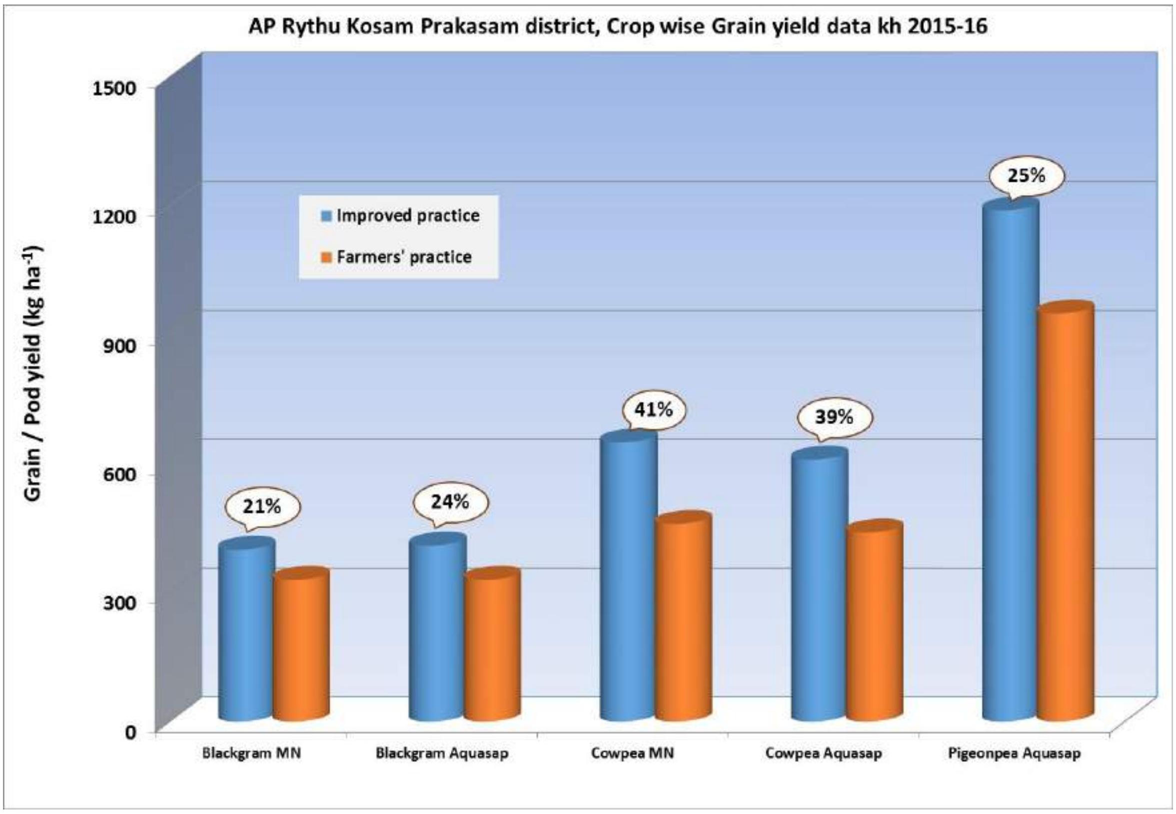


Figure. 4.1.9.7. Grain yield with improved practice in Prakasam district , 2015-16.

Crop diversification

The pilot site villages come under IWMP III phase, now detail project report is in process. In these villages, area under horticultural crops has beenfocused to increased. Horticulture department has identified the benefishiries for the area expansion of Acid Lime, T.C. Banana, papaya and Guava. About 100 ha of chilli and vegetable are covered this season. Capacity building activities on nutrient manage net, drip and protected cultivations were conducted in pilot site villages.

Capacity building and public awareness activities

In pilots it is done on regular basis for implementation of innovation technologies (Figure 4.1.9.8). Several capacity building/training programs were conducted in each of the villages covering topics on the objective of the project, participatory soil sampling, soil test based nutrient mangement including the impotance of balanced and micro nutrient application, soil and water conservation, aerobic and vermi composting and improved agronomic practices. Horticulture department officials have conducted capacity building activities on nutrient manage net, drip and protected cultivations were conducted in pilot site villages. Similarly animal husbandry department conducted training on feed and fodder management of mulching animals. Wall writings with soil health status and fertilizer recommandations were displayed in each villages.

వ్యవసాయ సాగుపై ప్రాథమిక అంచనా

నాగంపల్లి(పొదిలి గ్రామీణం): రైతులు తాము సాగు చేసే పంటలపై అవగాహన పెంపొందించుకుంటే మంచి దిగుబడులు సాధించేందుకు అవకాశం ఉంటుందని అధికారులు పేర్కొన్నారు. కొనకనమిట్ల మండలంలోని చినమనగుండం, నాగంపల్లి, సలనూతల, గొట్లగట్టు గ్రామాలను వ్యవసాయ ప్రాథమిక విభాగం కింద ఎంపిక చేసినట్లు మండల వ్యవసాయాధికారి ఐ.కాశీవిశ్వనాథ్ తెలిపారు. ప్రాథమిక అంచనాల్లో భాగంగా ఆయా గ్రామాల్లోని రైతులతో ఇక్రిశాట్ శాస్త్రవేత్త సూది రాఘవేంద్రరావు, అధికారులు మాట్లాడారు. వర్షాధార పంటలు, వాటి సాగులో రైతులు పాటిస్తోన్న విధి విధానాల గురించి అడిగి తెలుసుకున్నారు. వినియోగిస్తున్న రసాయన, కాంప్లెక్స్ ఎరువులు, ఖర్చుల వివరాలను సేకరించారు. దీనివల్ల ఆయా గ్రామాల్లో రైతులకు అందించాల్సిన రాయితీ, యంత్రాలు, పనిముట్లు వంటి వివరాలపై అధికారులకు నివేదిక అందజేస్తారని తెలిపారు. ఈ కార్యక్రమంలో ప్రాథమికరంగ మిషన్ కోఆర్డినేటర్ ఎం.శ్రీనివాసరెడ్డి, ఏఈవో మాధురి, ఆత్మా ఎస్ఎం రుబియా, ఎంపీఈవోలు చైతన్య, యాకోబు రైతులు పాల్గొన్నారు.

మాట్లాడుతున్న శాస్త్రవేత్త రాఘవేంద్రరావు

Rain gauge installed in kanagiri Publicity through news paper

Figure. 4.1.9.8. Variuos capacity building and awareness activities conducted in Prakasam district.

Other activities

Environmental education awareness program to 7th,8th and 9th class students of Gotlagattu ZP high school in pilot site, total students 120 were participated the program. World water day program was conducted on March 22 2016 at ZPHS at Gotlagattu in pilot site. Earth day program was April 22 2016 at Gotlagattu village farmers to created awareness environmental protection. World environment day conducted on 5th June 2016 in pilot site farmers to create awareness on conservation of natural resources.

Farmers' day program was conducted in Gotlagattu village farmers and explained soil health management.

ICRISAT staff participated in awareness program, formation and farmers registration for FPOs for Cowpea cultivators with department of Agriculture staff in Gotlagattu, salanuthala,Nagampally and chinamangundam of KK Mitla mandal village.

Rythu sadhbavana yatra program were conducted by Government of Andhra Pradesh where in scientists of ICAR and ICRISAT participated as resource persons in Prakasam District on 27-30 January 2016 (Fig 4.1.9.9).

రైతు అభ్యున్నతే ధ్యేయం

శివరాజ్‌నగర్(దర్శి), న్యూస్‌టుడే: రైతు అభ్యున్నతే ధ్యేయంగా శాస్త్రవేత్తల పరిశోధనలు జరగాలని హైదరాబాద్, జాతీయ వరి పరిశోధనా స్థానం ప్రధాన శాస్త్రవేత్త డాక్టర్ కృష్ణవేణి పేర్కొన్నారు. గురువారం శివరాజ్‌నగర్‌లోని కృషీవిజ్ఞాన కేంద్రంలో శాస్త్రవేత్తలు రైతులతో ముఖాముఖి కార్యక్రమాన్ని నిర్వహించారు. ఈ సమావేశానికి కేవీకే ప్రధాన శాస్త్రవేత్త డాక్టర్ వర ప్రసాదరావు అధ్యక్షత వహించారు. ఇక్రిశాట్ జాతీయ వరి పరిశోధనా స్థానం, కోళ్ల పెంపకం ప్రధాన శాస్త్రవేత్తలు డాక్టర్ కృష్ణవేణి, డాక్టర్ సునీత, డాక్టర్ కన్నికి, నాగరాజులు పరిశోధనా స్థానాన్ని సందర్శించారు. అనంతరం రైతులతో సమావేశమయ్యారు. ఈ సందర్భంగా రైతులకు కోళ్లపెంపకంపై అవగాహన కల్పించారు. సాగర్ జలాలు ఆధారంగా పండించే పంటల సాగులో తీసుకోవాల్సిన జాగ్రత్తలు, చీడపీడల ఉధృతిని ఎదుర్కొని పంటలను కాపాడుకునే విధానాన్ని వివరించారు. వర్షాభావ పరిస్థితులను తట్టుకుని పెరిగే పంటల రూపకల్పన, పెసర, మినుము పంటలను ఆశించే పల్లాకు తెగులు నివారణకు సూచనలు తెలపాలని రైతులు శాస్త్రవేత్తలను కోరారు. ఈ సమస్యను ప్రభుత్వం దృష్టికి తీసుకుపోతామని వచ్చే ఖరీఫ్ సీజన్‌లో రైతులకు నాణ్యమైన విత్తనాలు అందేలా చూస్తామని తెలిపారు. దర్శి వ్యవసాయ సబ్ డివిజన్ సంచాలకులు సుబ్రమణ్యేశ్వరరావు మాట్లాడుతూ సబ్ డివిజన్ పరిధిలోని పంటల స్థితిగతులను వివరించారు. జాతీయ పంట బీమా ఆవశ్యకత, రైతులకు ప్రభుత్వం రాయితీపై అందించే రెయిన్‌గన్స్ వివరాలను తెలిపారు. మండల వ్యవసాయాధికారి బి.సంగమేశ్వరరెడ్డి, ఎస్వో చంద్రారెడ్డి, కేవీకే శాస్త్రవేత్తలు సునీల్‌కుమార్, అపర్ణ, రవి వెంకన్నబాబు, రైతులు పాల్గొన్నారు.

సమావేశంలో మాట్లాడుతున్న శాస్త్రవేత్త డాక్టర్ కృష్ణవేణి

Figure 4.1.9.9. Rythu SadhbhavanaYatra conducted in Prakasam district

4.1.10 Srikakulam

Soil health mapping and results based management

Total 447 soil samples (188 from Polaki, 185 from Ranasthalam and 74 from Seethampeta) were collected (Fig. 4.1.10.1) from farmers' fields and analyzed in ICRISAT laboratory (see Appendix 1l for details). In Polaki Mandal 44% samples are deficient in organic carbon, 31% samples deficient in available phosphorus, 49% samples deficient in available calcium, 29% samples deficient in available suphor, 45% samples deficient in available zinc and 31% samples deficient in available boron. In Ranasthalam Mandal 79% samples are deficient in organic carbon, 76% samples deficient in available calcium, 52% samples deficient in available suphor, 40% samples deficient in available zinc and 16% samples deficient in available boron, where as in Seethampeta Mandal 57% samples are deficient in organic carbon, 51% samples deficient in available phosphorus, 35% samples deficient in available calcium, 74% samples deficient in available suphor, 12% samples deficient in available zinc and 70% samples deficient in available boron.

Figure 4.1.10.1. Left: Soil samples collection in Polaki Mandal, Srikakulam; Right: Explaining soil test results and soil test-based fertilizer recommendations

Dissemination of information about soil analysis results and soil test-based fertilizer recommendations were undertaken by printing flexes and displaying on walls of Gram Panchayat buildings or any other prominent locations in 56 villages for accessibility of information to farmers in the pilot villages. Soil health cards were printed in Telugu language and distributed to 447 farmers in the pilot villages.

Evaluation of improved varieties

Pigeonpea (20 kg ICPH 2740, 10 kg ICPL 87119) multi cut fodder sorghum (20 kg CSH 24 MF) seeds were sent from ICRISAT to pilot villages for planting pigeonpea (Fig. 4.1.10.2) on paddy field bunds, promoting fodder sorghum for livestock, during *kharif* 2015.

During *rabi* 2015-16, 80 kg of 2 black gram (LBG752, LBG752) varieties, 250 kg of 3 green gram (IPM02-14, SML668, LGG460) varieties, 120 kg of hybrid maize (Bioseed9220) and 155 kg of 3 chickpea varieties (NBeG3, JG11, KAK2)) were supplied to farmers in pilot villages for farmer participatory varietal evaluation trials in the district (Figure 4.1.10.3).

Figure 4.1.10.2. Pigeonpea crop on hills in Jilledupadu and Velagedda villages in Seethampeta Mandal

Figure 4.1.10.3. Chickpea crop grown in Gedalavanipeta (left) and Sancham (right) villages in Ranasthalam

Evaluation of aqua sap

Twenty three farmers evaluated aqua sap on different crops like paddy, vegetables and fruit crops (Fig. 4.1.10.4) and got good results during 2015-16.

Figure 4.1.10.4. Aqua sap demonstration on Tomato in Eppaguda village, Seethampeta Mandal

Aerobic composting during 2015-16

Farmers were educated on the importance of integrated nutrient management and trained them to convert bio-degradable farm waste into valuable compost for improving soil health and organic carbon. About 38 farmers in pilot villages produced about 56 tons of aerobic compost (Fig. 4.1.10.5) and used for different crops.

Figure 4.1.10.5. Compost production in Naruva village in Ranasthalam Santamalli village in Seethampeta Mandal

Provision of Shredder and Compost production during 2015-16

A Shredder was provided and demonstrated in pilot villages to convert bio-degradable waste from coconut, banana and other plantations to chip the material into small pieces and convert it into compost by using microbial consortia culture. More than 100 tons of waste was chopped (Fig. 4.1.10.6) and converted into valuable compost (Table 4.1.10.1) for improving soil health and increasing crop productivity.

Table 4.1.10.1. Shredder Demonstrations and Compost production during 2015-16

S. No	Mandal	Village	Quantity chopped (tons)
1	Ranasthalam	Naaruva	6
2		Boyapalem	5
3		Pisini	8
4	Gaara	Sathiwada	10
5		Nizamabad	15
6		Zafarbad	8
7		Jallapeta	11
8	Narasannapeta	Gundivellapeta	20
9		Gopalapenta	14
10		Narasannapeta	7
	Total		104

Figure 4.1.10.6. Shredder demonstrations in pilot villages in Ranasthalam Mandal

Gliricidia seed dibbling during 2015

Gliricidia seeds were supplied to farmers for direct seed dibbling on farm boundaries during rainy season 2015 and about 69 farmers have adopted this practice (Table 16).

Capacity building activities in pilot villages during 2015-16

Awareness campaignswere conducted in the pilot villages to create awareness about the objectives of Rythu Kosam project, improved crop management practices, soil test results and soil test based fertilizers application, composting, kitchen gardening and other technologies. Total 276 awareness campaigns were conducted, about 2083 women and 5094 men participated (Table 19) in the pilot villages during 2015-16. ICRISAT stall was put up in KR stadium, Srikakulam during the visit of Sri Nara Chandrababunaidu, Honorable Chief Minister, Govt. of Andhra Pradesh on 4th May 2016. The Honorable C.M learnt about the functioning and utility of shredder and instructed for distribution of shredders on subsidy basis to interested farmers and also to municipalities for waste management. Now the Joint collector and special officer, Srikakulam municipality is going to introduce shredder for waste management.

Progress in close collaboration with department

Based on soil test results, soil test based fertilizers recommendations were developed and zinc sulphate, gypsum and borax were procured and supplied to the farmers for application to address the zinc, sulphur and boron deficiencies in the soil as well as for enhancing productivities of crops. In total 450 t of zinc sulphate, 700 t of gypsum and 4 t of borax was stocked in the go-downs and 138 t of zinc sulphate, 700 t of gypsum and 0.4 t of borax was distributed to the farmers during *Kharif* and *Rabi* 2015-16 (Table 4.1.10.2)

Table 4.1.10.2. Details of secondary and micronutrients distribution in Srikakulam district during 2015-16

Division	Mandal	Name of the Crop	Zinc sulphate (t)			Gypsum (t)			Borax (t)		
			Kharif		*Rabi*	*Kharif*		*Rabi*	*Kharif*		*Rabi*
			Target	Achieved	Achieved	Target	Achieved	Achieved	Target	Achieved	Achieved
Sompeta	Itchapuram	Paddy,Gnut	10	3	0	47	33	10		0	0
	Kaviti	Paddy,Gnut	10	2	0	0	0	0		0	0
	Kanchili	Paddy,Gnut	10	1	0	21	5	16		0	
	Sompeta	Paddy,Gnut, vegetables	10	5	0	22	22	0	1	0.1	0.1
	Total		**40**	**11**	**0**	**90**	**60**	**26**	**1**	**0.1**	**0.1**
Palasa	Palasa	Paddy,Gnut	10	0	5	21	12	9		0	0
	V.Kottur	Paddy,Gnut	10	2	0	0	0	0		0	0
	Mandasa	Paddy,Gnut	15	2.8	0.7	21	16	5		0	0
	Meliaputti	Paddy,Gnut	15	1.1	0.9	0	0	0		0	0
	Total		**50**	**5.9**	**6.6**	**42**	**28**	**14**	**0**	**0**	**0**
Tekkali	Nandigam	Paddy,Gnut	15	2.6	1.9	21	7	14		0	0
	Tekkali	Paddy,Gnut	10	0.5	1.5	22	22	0		0	0
	Santhabommali	Paddy,Gnut	15	2	0	22	22	0		0	0
	Kotabommali	Paddy,Gnut	15	2	0	22	22	0		0	0
	Pathapatnam	Paddy,Gnut	15	3	0	22	7	15		0	0
	Total		**70**	**10.1**	**3.4**	**109**	**80**	**29**	**0**	**0**	**0**
Narasannapeta	Narasannapeta	Paddy,Gnut	15	2	1	21	14	7		0	0
	Polaki	Paddy,Gnut	15	5	0	21	21	0		0	0
	Jalumuru	Paddy,Gnut	15	5	0	17	15	2		0	0
	Saravakota	Paddy,Gnut	15	5	1	22	14	8		0	0
	Total		**60**	**17**	**2**	**81**	**64**	**17**	**0**	**0**	**0**
Srika-kulam	Srikakulam	Paddy,Gnut	10	2.8	3.7	21	21	0		0	0
	Gara	Paddy,Gnut	15	3	2	62	62	0		0	0
	Amadalavalasa	Paddy,Gnut	15	7	0	22	8	14		0	0
	Etcherla	Paddy,Gnut	10	1.05	1.95	17	17	0		0	0
	Total		**50**	**13.85**	**7.65**	**122**	**108**	**14**	**0**	**0**	**0**

Table 4.1.10.2. Details of secondary and micronutrients distribution in Srikakulam district during 2015-16											
Division	**Mandal**	**Name of the Crop**	**Zinc sulphate (t)**			**Gypsum (t)**			**Borax (t)**		
			Kharif		***Rabi***	***Kharif***		***Rabi***	***Kharif***		***Rabi***
			Target	**Achieved**	**Achieved**	**Target**	**Achieved**	**Achieved**	**Target**	**Achieved**	**Achieved**
Rana-stalam	Ranastalam	Paddy,Gnut	5	0	0	21	17	4		0	0
	Laveru	Paddy,Gnut,cotton	5	4.4	0.6	21	17	4	1	0.02	0.08
	Ponduru	Paddy,Gnut,cotton	10	0	0	22	14	8	1	0.05	0.05
	G.Sigadam	Paddy,Gnut	10	6	0	22	21.5	0.5		0	0
	Total		**30**	**10.4**	**0.6**	**86**	**69.5**	**16.5**	**2**	**0.07**	**0.13**
Rajam	R.Amadalavalasa	Paddy,Gnut	15	3	0	22	17	15		**0**	0
	Santhakaviti	Paddy,Gnut	15	2	0	0	0	0		**0**	0
	Rajam	Paddy,Gnut	10	2	2	21	20	1		**0**	0
	Vangara	Paddy,Gnut	10	3	2	22	22	0		**0**	0
	Total		**50**	**10**	**4**	**65**	**59**	**16**	**0**	**0**	**0**
Pala-konda	Palakonda	Paddy,Gnut	15	3	2	22	11	11		0	0
	Veeraghattam	Paddy,Gnut	15	3	2	22	16	6		0	0
	Burja	Paddy,Gnut	10	3.5	0	6	5	1		0	0
	Seethampeta	Paddy,Gnut	10	3.5	0	6	5	1		0	0
	Total		**50**	**11**	**7.5**	**50**	**32**	**18**	**0**	**0**	**0**
Kottur	Kottur	Paddy,Gnut	10	0	0	0	0	0		0	0
	Bhamini	Paddy,Gnut,cotton	10	4.5	0.5	21	5	16	1	0	0
	Hiramandalam	Paddy,Gnut	10	2.5	0	17	14	3		0	0
	L.N.Peta	Paddy,Gnut	10	1	1	0	0	0		0	0
	Sarubujjili	Paddy,Gnut	10	2.8	4.7	17	0	11		0	0
	Total		**50**	**10.8**	**6.2**	**55**	**19**	**30**	**1**	**0**	**0**
	Dist.Total		**450**	**100.05**	**37.95**	**700**	**519.5**	**180.5**	**4**	**0.17**	**0.23**

Seed distribution in the district during 2015-16

Paddy is the single dominant crop (>80%) in Srikakulam district during *kharif* and farmers are growing traditional varieties which are susceptible to waterlogging, pest and diseases resulting in low yields. Department has supplied improved varieties of paddy less than 10 years old for replacing old varieties and supplied 1989 quintals during *kharif* 2015. In total 48567 quintals of seeds were supplied to farmers during *kharif* (Table 4.1.10.3) and 6946 quintals during *rabi* 2015-16 (Table 4.1.10.4).

Table 4.1.10.3. Seed distribution by the department of agriculture in Srikalulam district during *Kharif* 2015.

Name of the Crop	Name of the Variety	Qty. Allotted in Qtls.	Qty. distributed in Qtls.	Subsidy allowed per quintal
PADDY	More than 10 years old (BPT 5204, BPT 3291, MTU 7029, MTU 1001, MTU 1010 and RGL 2537)	53064	44597	500
	Less than 10 years old (NLR 34449, MTU 1075, MTU 1061 and MTU 1064)	12593	1989	1000
	Total	**65657**	**46586**	
GROUND NUT	K6	1600	675	2137
MAIZE	Var. / Hybrid	150		2500
REDGRAM	LRG41	30	15	3120
BLACKGRAM	LBG752	200	15	2840
GREEN MANURE	Diancha/Sunhemp	3950	1276	50% sub
Grand Total		**71587**	**48567**	

Table 4.1.10.4. Seed distribution by the department of agriculture in Srikalulam district during *Rabi* 2015-16.

S. No	Name of the Crop	Name of the Variety	Qty. Allotted in Qtls.	Qty. distributed in Qtls.	Subsidy allowed per quintal
1	**2**	**3**	**4**	**5**	**6**
1	PADDY	MTU 1010 (> 10 years)	1760	380	500
		NLR 34449(< 10 years)		31	1000
		Total	**1760**	**410**	
1	GROUND NUT	K6	5000	5387	2100
2	SESAMUM	YLM17	50	13	3828
		Total	**5050**	**5400**	
3	GREENGRAM	LGG460	1450	50	3633
4	GREENGRAM	LGG460		451	3085
5	BLACKGRAM	LBG752	4200	490	5100
6	BLACKGRAM	LBG752		144	4050
		Total	**5650**	**1136**	
	Grand Total		**12460**	**6946**	

Status of planting in the district during *kharif* and *rabi* 2015-16

Even though it was low rainfall year, in general 97% area was planted with different crops where as 99% area was planted with paddy as compared to normal area during *kharif* 2015 (Table 4.1.10.5) and 83% area was planted with different crops during *rabi* 2015-16 (Table 4.1.10.6).

Table 4.1.10.5. Extent of crops sown (ha) in Srikakulam district during *kharif* 2015					
Sl. No.	Crop	Normal area (ha)	Area covered (ha)	Area covered during *Kharif* 2015 (ha)	% coverage over normal
			Kharif 2014		
1	Paddy	205030	205485	204003	99
2	Jowar	98	44	47	48
3	Bajra	638	196	176	28
4	Maize	5930	9103	10570	178
5	Ragi	494	207	291	59
6	Minor Millets	44	-	43	98
7	Red gram	996	646	639	64
8	Green gram	1314	675	304	23
9	Black gram	883	465	143	16
10	Bengalgram	4	-	-	-
11	Groundnut	10909	3874	4165	38
12	Sesamum	1519	322	845	56
13	Cotton	7579	9563	8883	117
14	Mesta	3738	2487	2519	67
15	Chillies	52	43	25	48
16	Turmeric	215	214	215	100
17	Sugarcane	5867	6378	6117	104
18	Onion	29	-	16	55
	DISTRICT TOTAL	**245339**	**239702**	**239001**	**97**

Table 4.1.01.6. Extent of crops sown (ha) in Srikakulam district during *rabi* 2015-16					
Sl.No.	Crop	Normal area	Area sown as on date ***Rabi* 2014-15**	Area sown as on date ***Rabi* 2015-16**	% coverage over normal
1	Paddy	4063	4734	2107	52
2	Jowar	7			-
3	Maize	5002	5767	5094	102
4	Ragi	795	954	639	80
5	Redgram	11	12	14	127
6	Greengram	29809	32417	29038	97
7	Blackgram	42046	42570	40657	97
8	Horsegram	5793	3482	2663	46
9	Groundnut	6620	4805	3807	58
10	Sesamum	4616	6367	1524	33
11	Sunflower	2176	1158	403	19
12	Sugarcane	4796	5476	3175	66
13	Chillies	2168	1555	1024	47
14	Onion	950	641	327	34
	DISTRICT TOTAL	**108852**	**109938**	**90472**	**83**

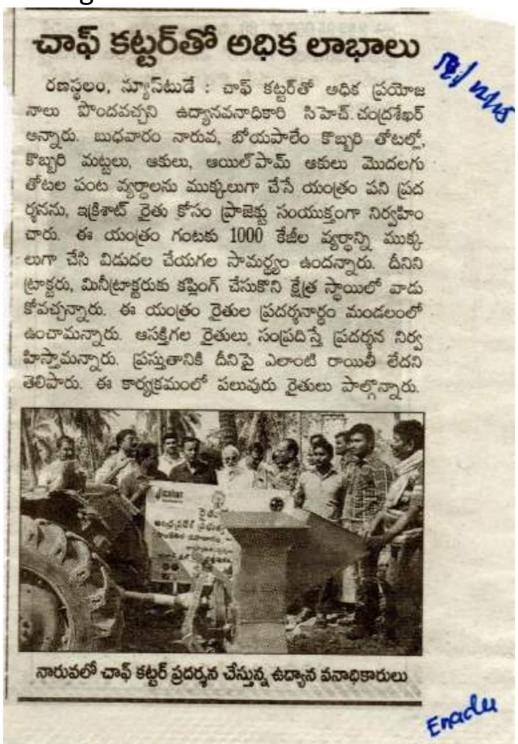
Capacity building activities in the district

Capacity building programs were conducted in all the 38 mandals in the district under "Polam Pilustundi" program and all the departments' officials and scientists of agriculture, horticulture, animal husbandry, fisheries, sericulture, ATMA, PACS, KVK, ARS and DAATTC participated and provided technical information for productivity enhancement of respective systems (Fig. 4.1.10.7). About 1500 villages were covered under this activity and trained 58942 men 9387 women farmers.

Figure 4.1.10.7. "Polam Pilustundi" capacity building programs in Narsannapeta on 21 August 2015 (left) and in Ranasthalam A.D Office (right)

Media coverage

See Figure 4.1.10.8.



చాఫ్ కట్టర్‌తో అధిక లాభాలు

రణస్థలం, న్యూస్‌టుడే : చాఫ్ కట్టర్‌తో అధిక ప్రయోజనాలు పొందవచ్చని ఉద్యానవనాధికారి సిహెచ్. చంద్రశేఖర్ అన్నారు. బుధవారం నారువ, బోయపాలేం కొబ్బరి తోటల్లో, కొబ్బరి మట్టలు, ఆకులు, ఆయిల్‌పామ్ ఆకులు మొదలగు తోటల పంట వ్యర్థాలను ముక్కలుగా చేసే యంత్రం పని ప్రదర్శనను, ఇక్రిశాట్ రైతు కోసం ప్రాజెక్టు సంయుక్తంగా నిర్వహించారు. ఈ యంత్రం గంటకు 1000 కేజీల వ్యర్థాన్ని ముక్కలుగా చేసి విడుదల చేయగల సామర్థ్యం ఉందన్నారు. దీనిని ట్రాక్టరు, మినీట్రాక్టరుకు కప్లింగ్ చేసుకొని క్షేత్ర స్థాయిలో వాడుకోవచ్చన్నారు. ఈ యంత్రం రైతుల ప్రదర్శనార్థం మండలంలో ఉంచామన్నారు. ఆసక్తిగల రైతులు సంప్రదిస్తే ప్రదర్శన నిర్వహిస్తామన్నారు. ప్రస్తుతానికి దీనిపై ఎలాంటి రాయితీ లేదని తెలిపారు. ఈ కార్యక్రమంలో పలువురు రైతులు పాల్గొన్నారు.

నారువలో చాఫ్ కట్టర్ ప్రదర్శన చేస్తున్న ఉద్యాన వనాధికారులు

Enadu

ఈనాడు
శ్రీకాకుళం

బుధవారం 24 ఫిబ్రవరి 2016 16 పేజీలు

సేంద్రియ సాగుపై అవగాహన పెంచుకోవాలి

సేంద్రియ సాగుపై అవగాహన కల్పిస్తున్న దృశ్యం

ఈనాడు
శ్రీకాకుళం
మంగళవారం 29 మార్చి 2016
16 పేజీలు

అంతర పంటల్లో కోకోనే మేలు

సాగుపై రైతులకు శిక్షణ

సాక్షి
శనివారం | నవంబర్ | 28 | 2015
మన నరసన్నపేట
శ్రీకాకుళం 5

ఆక్వా రంగంపై స్పష్టమైన అవగాహన అవసరం

కృషి విజ్ఞాన కేంద్రం శాస్త్రవేత్త బాలకృష్ణ

మాట్లాడుతున్న శాస్త్రవేత్త బాలకృష్ణ

పోలాకి: ఆక్వా రంగంలో రాణించాలంటే రైతులకు స్పష్టమైన అవగాహన అవసరమని కృషి విజ్ఞానకేంద్రం శాస్త్రవేత్త కె.బాలకృష్ణ అన్నారు. అంపలాం గ్రామంలో ఇక్రిశాట్ మరియు యూత్‌క్లబ్ ఆధ్వర్యంలో శుక్రవారం నిర్వహించిన అవగాహన కార్యక్రమంలో పాల్గొన్న ఆయన మాట్లాడారు. చెరువుల తవ్వకం మొదలుకుని, విత్తనంఎంపిక, ఫీడ్ మరియు ప్రో బయోటిక్స్ అందించే విధానం, ఏరియేటర్స్ ఏర్పాటు, కల్చర్‌లో వచ్చే రోగాన్ని గుర్తించటం, ఆఖరికి ఎక్స్‌పోర్ట్ వరకు ప్రతి విషయంలో క్షుణ్ణంగా అవగాహన కలిగి ఉండాలని సూచించారు. ఇంతకు ముందు ఈ ప్రాంతంలో ఆదరించే టైగర్ రకానికి ఇవుడు వనామీ రకపు రొయ్యిలకు ఉన్న తేడా, వ్యాధి నిరోధక లక్షణాల గురించి రైతులకు వివరించారు. అప్రమత్తంగా ఉండకపోతే ఏదశలోనైనా ఆక్వా రైతు అడ్డంగా మునిగిపోయే అవకాశం ఉందని హెచ్చరించారు. మత్స్యశాఖ ఇన్‌స్పెక్టర్ సురేష్‌కుమార్ మాట్లాడుతూ రైతులు మత్స్యశాఖ నుంచి అనుమతులు పొందకపోతే నష్టపోయిన రైతుకు ఎలాంటి బీమా వర్తించదని తెలిపారు. క్యాంప్ కో-ఆర్డినేటర్ సింహాచలం, రైతులు మైలపల్లి త్రినాథరావు, యర్రయ్య తదితరులు పాల్గొన్నారు.

Figure 4.1.10.8. Media coverage of activities in pilot sites in srikakulum.

4.1.11 Visakhapatnam

Rainfall situation

During June to August, the district received 595 mm rainfall which is 35 per cent higher than the normal rainfall. However, across the Mandals the rainfall distribution is uneven and resulted in excess or scarce rainfall situation. In the three pilot Mandals viz., Chintapalli, Butchayyapeta and Padmanabham, the rainfall situation is considered as normal but Padmanabham Mandal received excess rainfall which is almost double the normal rainfall. The rainfall and PET is presented in Figure 4.1.11.1.

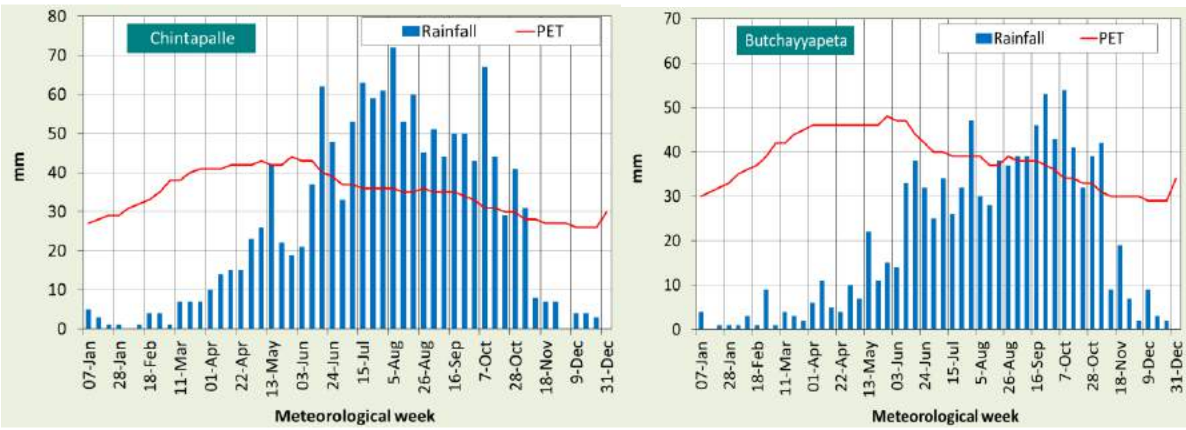


Figure 4.1.11.1. Rainfall and PET in – Left: Chintapalli; right: Butchayyapeta

Installation of dual type raingauge with HOBO pendent logger UA003-64 and radiation shield at Lammasingi –Chintapalli mandal as part of ICRISAT intervention.

Socio-economic baseline

Around 423 households representing small, marginal and large farmers were interviewed in 10 pilot villages by ICRISAT team (see Section 3.1). The baseline data will be used for analyzing the impact of different interventions on crop yield, economics and farmers livelihood in a larger perspective.

Soil fertility status and management

The major soils in the pilot sites are black and red soils. Soil-test based fertilizer recommendation is one of the important interventions targeted. About 422 soil samples have been collected representing different cropping systems and analysed for understanding the deficiencies of micro and secondary nutrients (Appendix 1m). The analysis indicated that farmers' fields are deficient with sulphur (80 %), zinc (49 %) and boron (31 %) in selected Mandals along with organic carbon (44 %), available phosphorus (32%) and calcium (36%). According to the test results, soil fertilizer recommendations were developed and shared with farmers and other stakeholders.

Soil health card distribution campaign inaugurated by Joint Collector II in pilot mandals (Figure 4.1.11.2). Soil health cards distributed to 422 farmers through conducting village level meetings with the participation of panchayat sarpanch and village elders. Scientific officer, research technician from ICRISAT and NGO staff organized meetings and explained about the use of soil health cards.

Figure 4.1.11.2. Soil health campaign inaugurated by Joint Collector II and soil health card distribution to farmers in pilot Mandals

The soil test results were shared with all the farmers and explained the importance of micro nutrients application as soil health management and the role in increasing production of their crop yields (Figure 4.1.11.3). To promote advantage of micro nutrients usage as basal application, 129 trainings with 1717 farmers participation in each village of pilot site before sowing taken place. This is a continuous activity which has been pursued by the line departments, NGOs and ICRISAT staff located in the district. In Chintapalli, there are 35 trainings were organized with 613 farmers participation. Similarly, in Butchayyapeta and Padmanabham pilot mandalas, there are about 49 and 45 trainings organized respectively. Both men and women farmers actively participated in these programs as a result, about

1000 men farmers and 700 women farmers participated in these trainings benefiting soil health management.

Figure 4.1.11.3. Awareness program in pilot sites of Visakhapatnam district

The crop yield obtained from micronutrient trails revealed that crop yield was ranging between 13 and 35 per cent compared to farmers' practice. Further, among the varieties, MTU1010 performed better compared to RGL2537 and MTU7029 respectively (Figure 4.1.11.4).

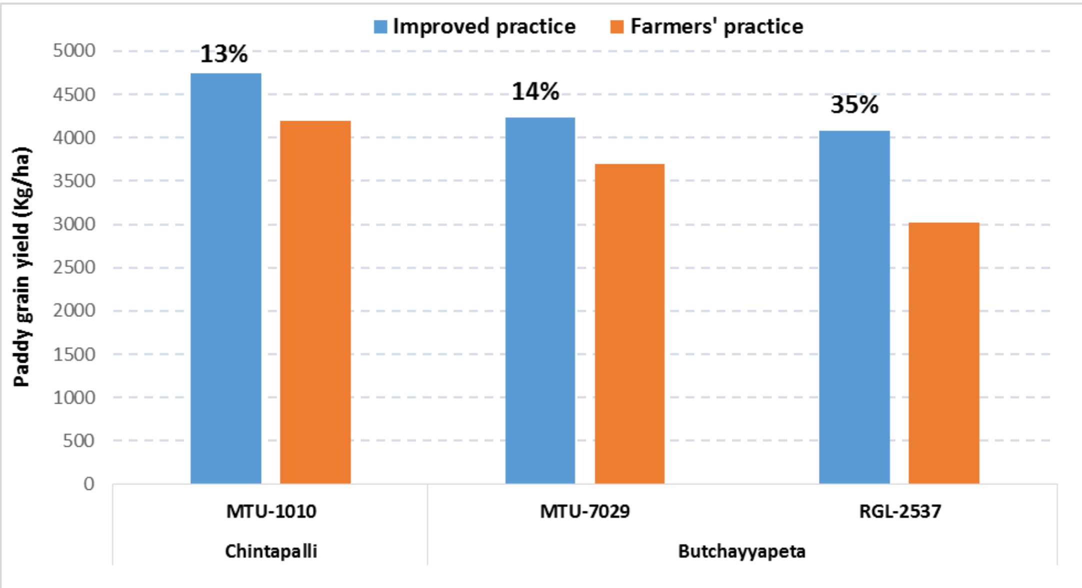


Figure 4.1.11.4. Crop yield Comparison between improved practice and farmers' practice

Crop Sowing

Major crops like groundnut, pigeonpea, finger millet, paddy, maize, sorghum crops have been sown in the pilot Mandals with onset of monsoon. Nearly 150 ha area has been sown with vegetable crops in Padmanabham Mandal pilot site and sugarcane is promoted in about 1000 ha area in Butchayyapeta area (Table 4.1.11.1).

Table 4.1.11.1. Area sown in pilot villages									
Name of the Mandal	Name of the Village	Actual area sown (ha)							
		Ground nut	Pigeon pea	Ragi	Maize	Paddy	turmeric	sugarcane	vegetables
		20	12	11	16	24	6		
	Lammasingi	32	35	29	25	27	14		
	Tajangi	13	33	21	14	146	45		
	Pakabu	8	21	16	10	41	18		
	Busulakota	34	37	8	5	16	14		
	Sanivaram	78	68	4	6	65	16		
	Anjalam	23	22	5	9	19	10		
BUTCHAYYAPETA	Gunnempudi					44		148	
	Kandipudi					106		64	
	Neelakantapuram					26		43	
	Rajam					107		358	
	Typuram					58		25	
	Chittiyyapalem					81		89	
	China Madina					68		90	
	Turakalapudi					214		165	
	R. Sivarampuram					19		11	
	R. Bheemavaram					99		85	
PADMANABHAM	Ayinada	25			25	171			25
	Bapirajutallavalasa	34			40	232			
	Korada				30	339			50
	Pandrangi	4			20	458			25
	Venkatapuram	25			20	150			4
	Revidi				25	261			50

Crop improvement/crop diversification

Foundation seeds of different improved verities of Pigoenpea, groundnut, finger millet, fodder- sorghum, and Gliricidia seeds have been distributed to the progressive farmers in all the selected Mandals to evaluate the performance and adoptability of varieties in the pilot villages. Pigoenpea variety ICPL87119 (Asha) with varying crop duration between 135-180 days and groundnut varieties like ICGV91114, ICGV0350 with varying crop duration between 95-120 days were distributed in Chintapalli and Padmanabham Mandals Table 4.1.11.2.

Table 4.1.11.2. Crop improvement/Crop diversification in pilot sites of Visakhapatnam district						
Crop	Variety	Village	Mandal	Area (ha)	Quantity (Kgs)	No. of farmers
Groundnut	ICGV91114	Pandrangi, Saymalavalasa, Venkatapuram, B.Tallavalasa, Ayyyanada	Padmanabham	2	600	9
Groundnut	ICGV0350	Korada	Padmanabham	1	100	1
Groundnut	ICGV0350	Labbangi,	Chintapalli	0.2	50	1
Finger millet	MR1	Pakabu, A.Sanivaram, Busalakota, Labbangi,	Chintapalli	2.4	25	3
Pigeonpea	ICPL87119 (Asha)	Andela Sanivaram, Busala kota,Labbangi	Chintapalli	0.8 Intercrop with Ground nut	5	3

Aquasap as foliar spray in field and horticulture crops

This is a 100% organic extract from sea plants. It contains macro & micro nutrients, essential amino acids and plant growth hormones that provide major boost to crop yield by accelerating metabolic function and enhancing its nutrition uptake capacity. 30 trails are conducting in 3 mandals to evaluate efficiency of aquasap material while doing of crop cutting experiments (Figure 4.1.11.5). Paddy, groundnut, Rajmah, and vegetables in farmers field level.

Figure 4.1.11.5. ADR- RARS, Chintapalli, Dr. Padmodaya field visit after distribution of soil health cards in Tajangi (L); AQUASAP spraying at Tajangi, Pakabu, Vangasari, Sanivaram villages at Chintapalli mandal (R)

Impact of aquasap foliar spray on paddy yield

Aquasapis a 100% organic extract/fertilizer from sea weeds and is used as foliar application on crops. It contains macro & micro nutrients, essential amino acids and plant growth hormones that provide major boost to crop yield by accelerating metabolic function and enhancing its nutrition uptake capacity. At maturity crop cutting experiments (CCEs) were conducted in 3 m x 3m area in both the treatments. The fresh weights for grain/pod and straw were recorded and about 2 kg sub sample (~1 kg grain/pod, ~1 kg straw) was sent to ICRISAT. The sub-samples were dried and yields kg ha^{-1} were interpolated.

The significant responses to aquasap spray were recorded in paddy crop in Visakhapatnam district pilot sites. Under farmers practice, the paddy yield across different varieties varied between 2710 and 3760 kg ha^{-1}, while with aquasap spray the yield levels raised to 2930 to 5070 kg ha^{-1} (Figure 4.1.11.6). The results clearly showed yield increases of 8-35% in paddy grain as a result of aquasap spray.

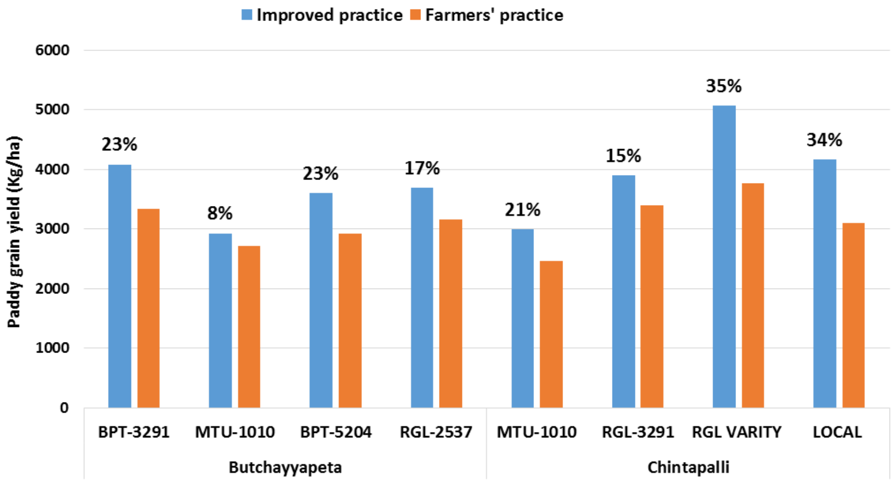


Figure 4.1.11.6. Aquasap foliar spray on paddy crop in pilot Mandals of Visakhapatnam district, 2015-16

Performance of different paddy varieties

Varietal demonstration of paddy crops undertaken in pilot sites showed a significant yield improvement compared to local varieties (Figure 4.1.11.7). In Butchayyapeta Mandal, the highest yield recorded was for MTU1010 compared to local variety. Similarly, in Chintapalli, the highest yield was in MTU3626 compared to local variety. This shows that new varieties have good potential of bridging the yield gaps in the district.

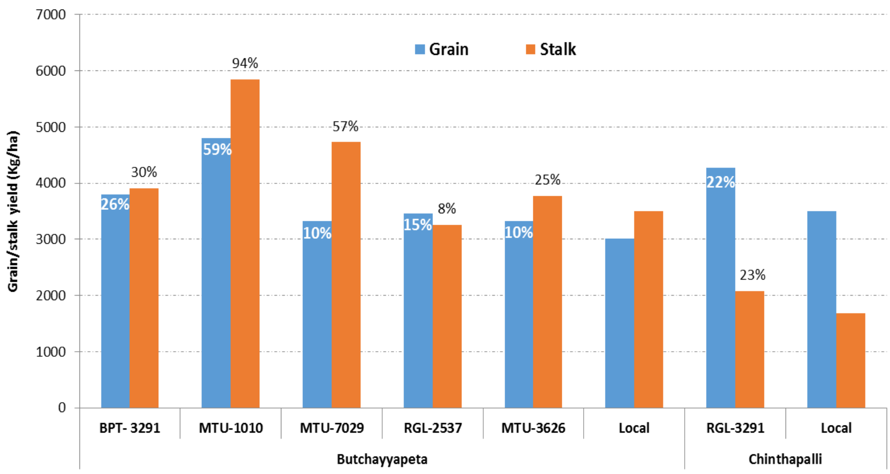


Figure 4.1.11.7. Paddy varietal demonstration in pilot Mandals of Visakhapatnam district, 2015-16

Performance of different crop cultivars in pilot Mandals

Apart from paddy, farmer participatory demonstration of improved crop cultivars of groundnut, ragi and rajma was undertaken. The results of these demonstration is presented in Figure 4.1.11.8, 4.1.11.9. The figure indicates that the groundnut yield was 10% higher compared to local variety. Similarly, Ragi and Rajma recorded 12 and 19% higher yield compared to local varieties respectively.

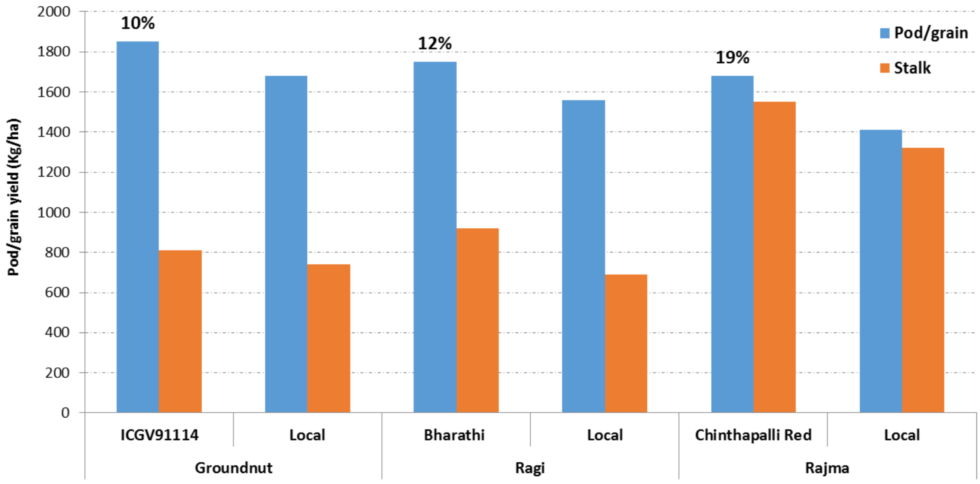


Figure 4.1.11.8. Yield comparison of field crops in pilot sites of Visakhapatnam district

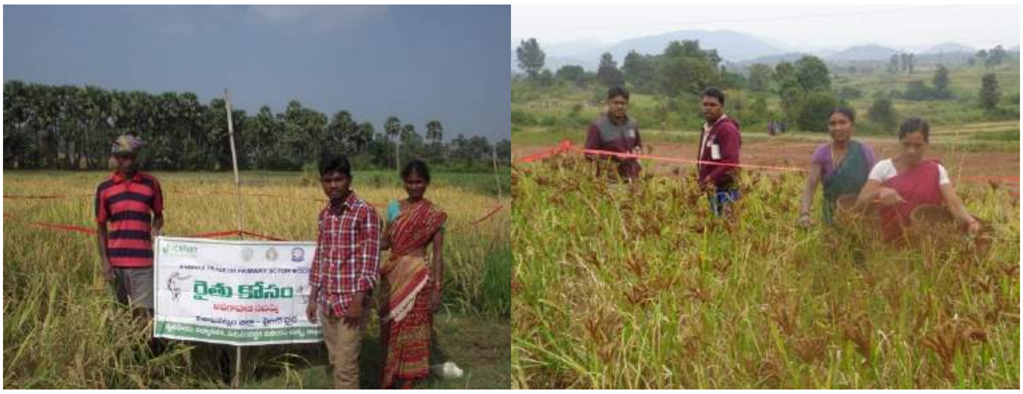


Figure 4.1.11.9. Crop cutting experiments for paddy and Ragi in pilot mandals

Rabi season

During *rabi* season about 4631 ha was sown with different crops in pilot mandals as against to the target of 4161 ha. Major area sown was under pulses followed by other crops (Table 4.1.11.3).

Table 4.1.11.3. Area (ha) sown under different crops in *rabi* season				
Crop	**Chinthapalli**	**Padmanabham**	**Butchayyapeta**	**Total**
Maize	0	210		210
Horse Gram	0	136	44	180
Green Gram	0	72	11	83
Black Gram	0	85	20	105
Cow Gram	0	0	30	30
Other Pluses	3452	0	0	3452
Tobacco	0	8	0	8
Chillies	0	42	31	73
Ground Nut	0	22	0	22
Niger seed	468	0	0	468
Total target area	**2381**	**1127**	**653**	**4161**
Actual area sown	**3920**	**575**	**136**	**4631**
% of area coverage	**165**	**51**	**21**	**111**

Chickpea demonstration in pilot Mandals

As part of scaling up of new crop cultivars, nearly 325 kgs of chickpea seeds was distributed to around 30 farmers covering 5.2 ha in padmanabham pilot Mandal in Visakhapatnam district during 2015-16 *rabi* season (Table 4.1.11.4). The crop yield from these demonstrations revealed that JG11 (2095 kg/ha) and NBeg 3 (2020 kg/ha) cultivars performed better compared to KAK2 (1260 kg/ha) (Figure 4.1.11.10).

Table 4.1.11.4. Chickpea varietal demonstration in pilot Mandals			
Varity name	Seed distributed (Kgs)	Area covered (ha)	No of beneficiaries
KAK2	254	3.5	23
JG11	30	0.84	3
NBeg 3	40	0.96	3

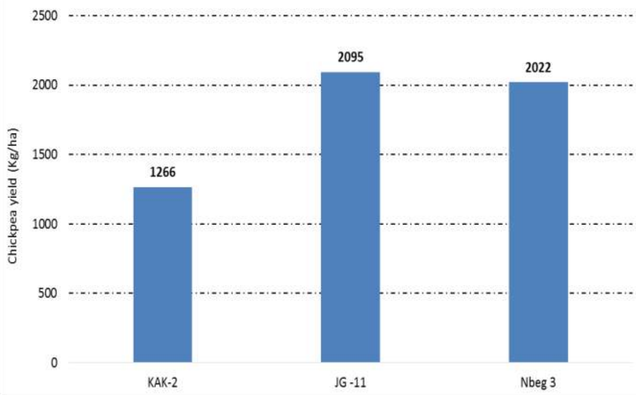


Figure 4.1.11.10. Chickpea yield (kg/ha) harvested in demonstration fields in Padmanabham pilot Mandal

Biomass generation for soil fertility

Considering low levels of soil organic matter in farmers' fields, we are promoting planting of N-rich green manure plant Gliricidia on farmers' fields. With the help forestry department a nursery of seedling of 5 kgs of Gliricidia has been in progress. Apart from this, DoA is also promoting Sunhemp in almost 1300 ha area of Padmanabham and Butchayyapeta Mandals.

Compost pits:

To address the lack of insufficient organic manure, NGO-vikasa organized training programmes on preparation of biomass based manure in Vangasara and sanivaram villages of Chintapalli mandal. Farmers collected the available biomass from their fields filled the pits with biomass and cow dung. All most 5 villages have been covered 10-15 pits are made, madyam culture given to 50 farmers for preparation of aerobic compost.

Monitoring of important pests

For avoiding indiscriminate use of pesticides and properly guiding farmers with respect to integrated pest management on day-to-day basis, extensive pest-monitoring is initiated. Total 100 inset traps are placed in the pilot sites and are being established in pilot villages/hamlets for proper guidance to farmers.

Training on Horticulture crops:

Training on horticulture crops organized at Gunnumpudi village of Buchchayyapeta mandal (Figure 4.1.11.11). HO attended to the training and explained about the schemes and cultivation methods.

గున్నెంపూడిలో 'రైతు కోసం'

గున్నెంపూడి (బుచ్చెయ్యపేట), న్యూస్‌టుడే: మండలంలోని గున్నెంపూడిలో సోమవారం రైతు కోసం కార్యక్రమం జరిగింది దీనిలో భాగంగా ఇక్రిశాట్, హైదరాబాద్ ఆధ్వర్యంలో రైతులకు ఒక్కరోజు శిక్షణ కార్యక్రమాన్ని నిర్వహించారు ఈ సందర్భంగా ఇక్రిశాట్ ప్రతినిధి ఎ శివాజీ మాట్లాడుతూ గతంలో భూసార నమూనాలు సేకరించిన రైతులకు భూసార పరీక్ష ఫలితాల కార్డులను అందజేశామన్నారు తమ కార్డుల్లో సూచించిన విధంగా రైతులంతా ఎరువుల మోతాదును వాడుకోవాలని సూచించారు సూక్ష్మపోషకాలపై కూడా దృష్టిసారించాలని చెప్పారు భూసార పరీక్ష ఫలితాల ప్రకారం ఇక్కడ ఎక్కువ మంది రైతుల పొలాల్లో జింకులోపం ఉన్నట్లు గుర్తించామన్నారు రైతులందరూ తమ పొలాల్లో తప్పనిసరిగా జింకును వేసుకోవాలని సూచించారు చోడవరం ఉద్యానశాఖ అధికారి వి రాధాకృష్ణ మాట్లాడుతూ కాయగూరలు, ఉద్యానపంటల సాగు ద్వారా రైతులు ఎక్కువ లాభాలు పొందవచ్చని పేర్కొన్నారు ఈ కార్యక్రమంలో సర్పంచి కొసనం గణేష్ వికాస స్వచ్ఛంద సంస్థ ప్రతినిధి శ్రీనివాసరావు తదితరులు పాల్గొన్నారు

Figure 4.1.11.11. Horticulture training as well as seed distribution to farmers

4.1.12 Vizianagaram

Soil sampling for assessing the nutrient status:

Totally 500 samples collected from two pilot site mandals (Parvathipuram and Pusapatirega) of Vizianagaram district from agriculture field to assess the nutrient status and fertilizer recommendation. The detail of no of soil samples collection based on land holding for different villages in different terrain is followed. Soil samples collected at 15cm depth. The analyzed results are presented in Appendix 1k. The report indicates deficiency of micronutrients zinc, calcium, boran, sulphur and also nitrogen, phosphorous nutrients. Looking at these results fertilizer recommendations were made for different crops. The results for each village will be written on walls and banners nearer to gram panchayat to know each farmers' about soil health from their village.

The results were disseminated to farmers (Figure 4.1.12.1, 4.1.12.2), and balanced fertilization evaluated on farmers fields which showed yield benefit of 20% with micronutrient addition (Figure 4.1.12.3).

Figure 4.1.12.1. Soil health cards with all details distributed to farmers in pilot villages

భూసార పరీక్షా ఫలితాల ఆధారంగా సాగు చేయాలి

సూచనలు పాటించండి

Figure 4.1.12.2. Newspaper clipping: distribution of soil heath card in puspatirega mandal, Vizianagaram district

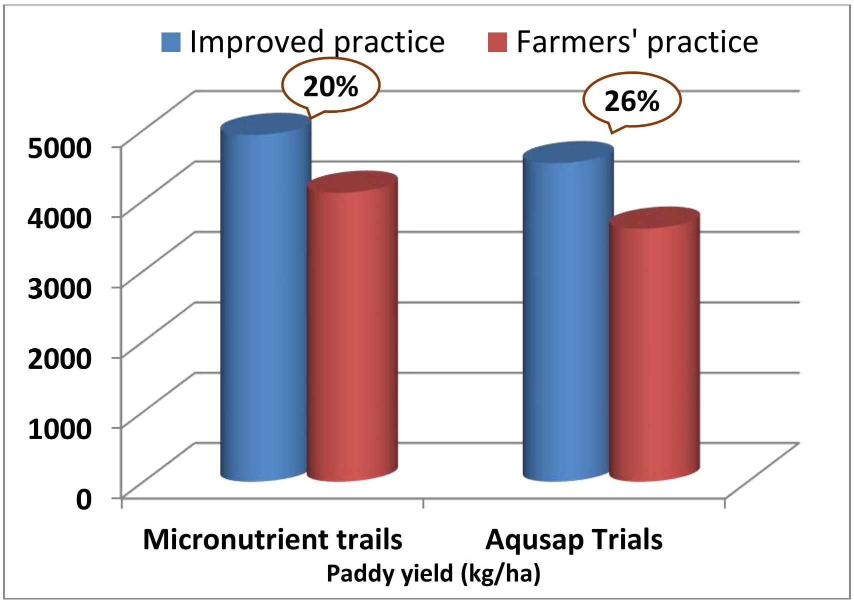


Figure 4.1.12.3. Comparison of grain yield performance of paddy with micronutrient and aqusap trails.

Weather information of pilot site Mandals:

The average rainfall of vizainagaram district is 1131mm and climate of Vizianagaram district is characterized by high humidity nearly all-round the year with oppressive summer and good seasonal rainfall (Figure 4.1.12.4; see Section 3.4). The summer season from March to May is followed by South West monsoon season, which continues up to September. October and November constitute the retreating monsoon season. The climate of the hilly regions of the district receives heavier rainfall and cooler than the plains.

The average rainfall of Puspatirega Mandal pilot site is about 927 mm and during rainy season it amount to 627mm and in *rabi* season 110mm. Similarly the potential evapo-transipration during rainy season is 677mm and during *rabi* it will be 627mm as indicated below. The majority of rain events occur during may 15 to nov 15.

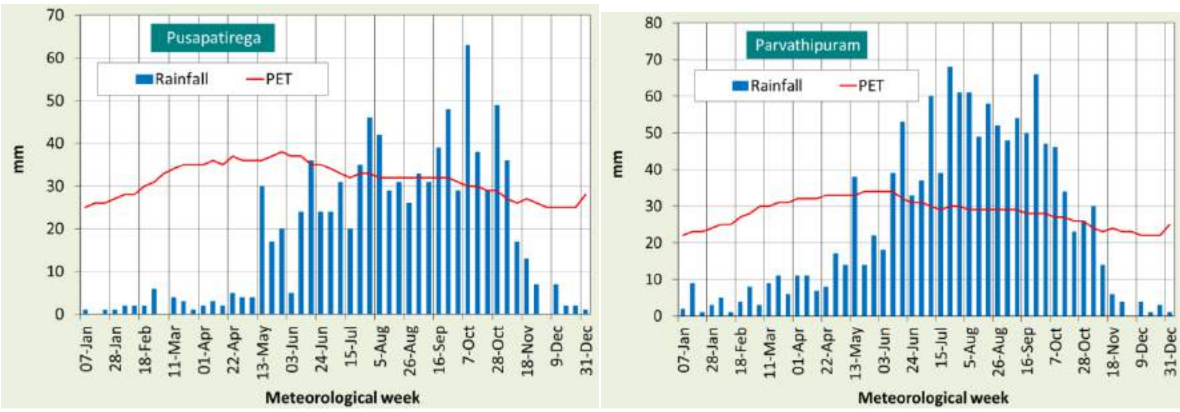


Figure 4.1.12.4. Rainfall and PET in pilot sites

The average rainfall of Parvatipuram Mandal pilot site is about 1289 mm and during rainy season it amount to 1004 mm and in *rabi* season 136 mm. Similarly the potential evapotransipration during rainy season is 611 mm and during *rabi* it will be 559 mm as indicated below. The majority of rain events occurs during May 15 to Nov15.

During the year 2015 rainy season we have installed a dual recording rain gauge at Telunaiduvalasa hamlet of Dokiseela village of Parvathipuram Mandal for measuring rainfall (Figure 4.1.12.5). Relative humidity and Minimum and Maximum temperature.

Figure 4.1.12.5. Rainguage installation at Telunaidu valasa Hamlet of Dokiseela village Parvathipuram

GLyricidia as Green manure grown as hedge in farmers field bunds.
Grown and distributed 80,000 seedlings in both the pilot sites of district (Figure 4.1.12.6).

Figure 4.1.12.6. Glyricidia plantation on field bunds in Puspatirega and Parvathipuram mandal

Aerobic Microbial Composting:
We Encouraged farmers to make aerobic composting and 100 ton was targeted during year 2015-16 from participation of more no of farmers from both Mandal villages have been successfully implemented**.** Another 100 ton of microbial culture has been asked by farmers for *rabi* season (figure 4.1.12.7). Nearly **204 ton** waste material of paddy, maize straw and haulms of cotton, groundnut and horticulture waste viz, banana, coconut leave made into pieces by **shredder machine** in 12 different villages of pilot sites mandalas which is very useful for easy conversion of farm waste into compost. The details procedure and steps for composting were mentioned below in details:

Figure 4.1.12.7. – Left: Vempadam village in pusapatirega; Right: Shredder machine in konayyapalem village in pusapatirega

Farmer's participatory varietals seed demonstration

The details of different crops varieties provided in table 22 and 23 and detailed characteristics, duration seed requirement for ha is presented in annusure I. We covered an area of 150 ac field demonstration with comparison of ICRISAT varieties' and local varieties used by farmers during the year 2015-16 (Table 4.1.12.1 to 4.1.12.2; figure 4.1.12.8).

Table 4.1.12.1. Seeds for demonstration in APPSM Puspatirega Mandal, Vizianagaram district Rainy season 2015

S. No.	Seeds	Variety	Duration (days)	Spacing (cm)	Seed Rate kg ac^{-1}	Quantity (kg)	Cost (Rupee's kg $^{-1}$)
1	Groundnut	ICGV91114	95-100	30 X10	60	300	75
2	Groundnut	ICGV0350	110-115	31 X10	60	100	150
3	Groundnut	ICGV2266	110-120	30 X10	60	75	150
4	Sorghum Fodder variety	CSH24 MF	Multiple cut	40X 10	5	21	150
5	Sorghum	PVK801	100	45X15	3	24	100
6	Pigeon pea	ICPH2740	170-180	150X30	sole 5 inter crop 2kg	20	250
7	Pigeon pea	ICPL85063 (Laxmi)	150-160	150X30	sole 5 inter crop 2kg	10	150
8	Pigeon pea	ICPL87119 (Asha)	150-160	150X31	sole 5 inter crop 2kg	10	150
9	Green gram	IPM0214	70	30 X 10	4	16	100
10	Black gram	T9	75	31 X 10	4	30	100
11	Compost	Madyam culture				30	90
12	Glyricidia	Green manure			8000 seedlings per kg	3	500
13	Maize	Bio-seed 9220	100	75 X 20	8	100	120
14	Maize	Hitech 5404	100	75 X 20	8	100	120
15	Pigeon pea	ICPH2671	170-180	150X30	sole 5 inter crop 2kg	10	250
	Total quantity (Kg)					**851**	

Table 4.1.12.2. Seeds for demonstration in APPSM Parvatipuram Mandal, Vizianagaram district Rainy season.							
S No	**Seeds**	**Variety**	**Duration days**	**Spacing cm**	**Seed Rate kg ac^{-1}**	**Quantity kg**	**Cost Rupee's kg $^{-1}$**
1	Sorghum Fodder variety	CSH24 MF	Multiple cut	40X 10	5	20	150
2	Sorghum	PVK801	100	45X15	3	24	100
3	Pigeonpea	ICPH2740	170-180	150X30	sole 5 inter crop 2kg	16	250
5	Pigeonpea	ICPL87119(Asha)	150-160	150X30	sole 5 inter crop 2kg	20	150
7	Pearl millet	ICTP8203 Dhanshakti	75-80	45X 10	2	15	50
8	Green gram	SML668	70	30 X 10	4	16	100
9	Blackgram	T9	75	31 X 10	4	30	100
10	Compost	Madyam culture				50	90
11	Glyricidia	Green manure			8000 seedlings per kg	3	500
12	Maize	Bio-seed 9220	100	75 X 20	8	100	120
13	Maize	Hitech 5404	100	75 X 20	8	100	120
14	Pigeon pea	ICPH2671	170-180	150X30	sole 5 inter crop 2kg	10	250
15	Finger millet	MR1	100-110	30 X 5	5kg	100	40
	Total quantity (Kg)					**394**	

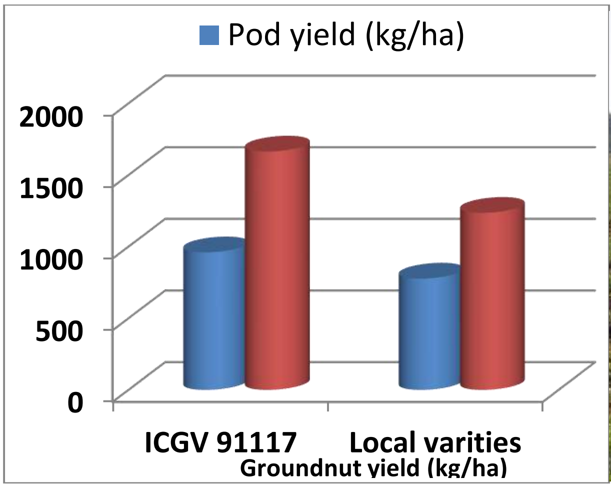


Figure 4.1.12.8 Left: Yield with improved variety; Right: Groundnut field with improved variety in vempadam village, Pusaptirega mandal

Monitoring of important pests:

The first step to integrated pest management (IPM) is the timely detection of pest infestation. Insect traps not only allow detection and monitoring of pest problem but also provides estimates regarding pest population density in the sample area. One of the major advantages of using insect pheromone traps with lure is that they are designed to attract single species of insect. Some other flying insects may accidentally visit the trap but their numbers will be lower than the target pest. Therefore, insect identification is automatic with lure-based traps and this trap data can significantly complement field scouting. Most manufacturers provide informative brochure that provides information about trap installation, trap placement, replacement of sticky bottom, identification of target insect, and record keeping.

Extensive pest-monitoring was initiated and a total of 85 pheromone traps were established in pilot sites and it performed well specially for vegetables crop, cotton and maize (Figure 4.1.12.9a, b). Regular meetings with DATTC scientists to farmers for solutions.

Figure 4.1.12.9a. Installation of pheromone traps in Groundnut field in parvathipauram	***Figure 4.1.12.9b. Installation of pheromone traps in Groundnut field in pusapatirega***

Sea weed extract as organic fertilizer for foliar spray -Aquasap- 5X:

This is 100% organic extract from sea plants. It contains macro & micro nutrients, essential amino acids and plant growth hormones that provide major boost to crop yield by accelerating metabolic function and enhancing its nutrition uptake capacity. The requirement for one acre (1 acre = 0.4 ha) trial is 3 liters for 3 times spray. Ninety liters of aqua sap was provided for pilot sites in the district for undertaking trials in different crops. This activity got quite good results, majority of farmers asking about this for their crops (Figure 4.1.12.10). Huge demand for aquasap wherever we conducted trials in last season.

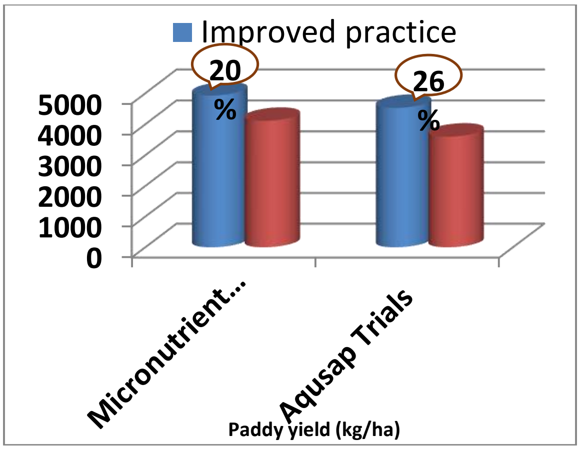


Figure 4.1.12.10. Comparison of grain yield performance of paddy with micronutrient and aqusap trails.

Organic Farming in NPK clusters in plot villages:

Collaboration with DATTC Vizianagaram had conducted biological trials in Brinjal fruit borer. Total of 10 farmers from pusaptirega and Parvathipuram villages were mobilized to cultivate only with natural products especially vegetables (Figure 4.1.12.11).

Figure 4.1.12.11. Azolla cultivation in Pusapatirega mandal

1. Soil-Moisture conservation (BBF) methods

Broad Bed and Furrow method was introduced in the pilot villages for soil moisture conservation, arresting soil erosion and to retain more water in the soils (Figure 4.1.12.12). The soils was pulverised into 120 cm width and 25 cm high beds by using Tropicultor for conserving more water during the rainy season that supports the crop during dry spell time. If rainfall was high, the extra runoff rain water drained easily from the furrow and crop will not suffer with wilt. This method was tested in ICRISAT and promoted all over India and other countries as soil and water conservation technique. For promoting this intervention in the pilot villages, two Tropicultors (tractor mounted and bullock cart mounted) were brought from ICRISAT, Hyderabad and placed in puspatirega mandal of Viziangaram district. A demo of nearly 1 acres (1 acre = 0.4 ha) in 4 different villages were made in groundnut crop. This method was also tested in Cotton, pigeonpea, groundnut fields as soil and water conservation method.

యాంత్రీకరణపై రైతులకు అవగాహన

పూసపాటిరేగ: గోవిందపురం, వెంపడాం గ్రామాలలో ఇక్రిశాట్ అధికారుల ఆధ్వర్యంలో శనివారం రైతులకు వ్యవసాయ యాంత్రీకరణ పద్ధతులపై అవగాహన కలుగజేశారు. గోవిందపురంలో ఇక్రిశాట్‌వారు అభివృద్ధిపరచిన యంత్రం ద్వారా మొక్కజొన్నను వేసే విధానం తెలియజేశారు. విత్తనాలు, ఎరువులను ఒకేసారి ఈ యంత్రం ద్వారా వేయవచ్చున్నారు. దీని వినియోగం ద్వారా లోతుగా విత్తనాలు పడతాయని, విత్తనం వద్దే ఎరువు కూడా పడటంతో ఎరువు పూర్తిగా వినియోగపడుతుందని ఇక్రిశాట్ సీనియర్ శాస్త్రవేత్త జాంగ్‌వాడ్ తెలిపారు. ఇక్కడ రైతులకు 50శాతం సబ్సిడీపై మొక్కజొన్న విత్తనాలను అందజేశారు. వెంపడాం పరిధిలో ఇదే పద్ధతిద్వారా వేరుశనగ విత్తనలను వేయటంపై రైతులకు అవగాహన కలిగించారు. కార్యక్రమంలో ఇక్రిశాట్ శాస్త్రవేత్త శ్రావణి, పరిశోధక సాంకేతికుడు తిరుపతిరావు, స్నేహ కార్యదర్శి పిన్నింటి అప్పలనాయుడు, సిబ్బంది, రైతులు పాల్గొన్నారు.

రైతులకు అవగాహనకలుగజేస్తున్న ఇక్రిశాట్ అధికారులు

Figure 4.1.12.12. Promotion of landform management in pilot sites.

Capacity building activity:

During *kharif* and *rabi* season of 2015-16 several capacity building at different level was organized to reach officials, local leaders and farmers mainly on primary sector mission project (Figure 4.1.12.13). The technology which was mainly highlighted was balance nutrient usage, improved seeds, improved equipment's for field operations, composting and and green manuring and fodder development activity. Majorly this year through NGOs, we mobilized farmers to apply micronutrients around 500ha in pusapatirega and 250ha in parvathipuram. A total number of 80 awareness program and training were conducted in Pusapatirega mandal and 91 in Parvathipuram Mandal, Vizianagaram district. The activity will continue in all sectors covering different expertise staff from ANGARU, Agriculture, Horticulture, Animal Husbandry and Fisheries Department official's ad ICRISAT scientists.


Figure 4.1.12.13. Capacity building program at different villages of pupspatirega and parvathipuram mandal of Vizianagaram district.

Progress in close collaboration with line departments

Performance of primary sector (Rs in lakhs)

The performance of primary sector over the last decade period in the district is summarized in Table 4.1.12.3. Among the three sectors, livestock showed a much impressive growth rate followed by fisheries and agricultural sectors. The total primary sector in the district is growing at the rate of 16.2 per cent per annum during the triennium periods between 2004-

07 and 2012-14. However, agriculture sector including horticulture alone showed a growth rate of 14.6% during the same period. Relatively, the share of agriculture in total primary sector slightly declined from 2004-07 to 2012-14. But, livestock sector contribution in the primary sector has increased significantly (from 24.2% to 30.6%) during the study period. In absolute terms, fisheries also showed growth between two periods. Overall, this analysis clearly visualize that fisheries, agriculture and horticulture are dominant sectors contributing to total primary sector significantly.

Table 4.1.12.3. Growth in primary sector, 2004-07 and 2012-14*

Sub-sector	Triennium 2004-07**	Triennium 2012-14**	Growth rate (%)
Agriculture	95217 (71.4)	251100 (64.6)	14.6
Livestock	32302 (24.2)	119133 (30.6)	20.3
Fishery	5826 (4.4)	18333 (4.8)	17.7
Total primary sector	133345 (100.0)	388566 (100.0)	16.2

**at current prices*
*** figures in the parenthesis indicates shares to column total*

Crop area coverage during 2015-16

See tables 4.1.12.4 and 4.1.12.5;

Table 4.1.12.4. Crop area coverage during *kharif* and *rabi* season of 2015-16 in Vizianagaram district.

***Kharif* 2015-16**				***Rabi* 2015-16**			
Crop	**Normal Area *Kharif* 2015**	**Area Sown *Kharif* 2015**	**% of area Coverage**	**Crop**	**Normal**	**Actual**	**% of Area coverage**
Paddy (I)	112353	116793	104				
Paddy(UI)	7119	6667	94	Paddy (I)	5577	2412	43
Sub-total	119472	**123460**	**103**	Jowar	4	0	0
Sugarcane	15754	13655	87	Bajra	1	0	0
Sesamum	10224	11165	109	Maize	12356	16830	136
Maize	11715	16377	140	Ragi	629	597	95
Cotton	13770	15294	111	Horse gram	7444	4121	55
Ground nut	13264	4407	33	Greengram	14679	18257	124
Mesta	12145	2792	23	Blackgram	16623	22510	135
Jowar	368	46	13	Redgram	6	8	143
Bajra	292	196	67	Bengal gram	292	123	42
Ragi	2032	1624	80	Chillies	1016	970	95
Samai	361	17	5	Sugarcane	10530	8525	81
Korra	166	14	8	Onion	243	168	69
Varagu	57	0	0	Sunhemp	82	1	1
Red gram	1719	1010	59	Groundnut	2382	1712	72
Black gram	1251	485	39	Sesamum	6864	4236	62
Green gram	1124	523	47	Sunflower	66	0	0
Sunflower	1	1	100	Niger seed	63	34	54
Tobacco	70	0	0	Tobacco	893	268	30
chillies	162	128	79	**GRAND TOTAL**	**79750**	**80772**	101
Onion	105	68	65				
Sub-Total	**84580**	**67802**	**80.2**				
TOTAL	**204052**	**191262**	**94**				

Table 4.1.12.5 Crop wise micro nutrient area covered during 2015-16 in Vizianagaram district					
Sl.no	Name of the micro nutrient	Qty positioned in MTS	Qty sales in MTS	Crop wise area covered	
				Crop	Area in Ha.
1	Zn SO4	178	36	Maize	1444
			26	Paddy	520
2	Borax	16.15	8.33	cotton	3332
3	Gypsum	680	328	Groundnut	656

4.1.13. West Godavari

Socio-economic baseline survey: Around 333 farmers representing small, marginal and large farmers were interviewed in all the pilot villages by ICRISAT survey team (see Section 3.1 for details).

Soil fertility mapping: Total 333 soil samples from 11 pilot villages were collected those widely covered cropping system, soils, and social and economic status of the pilot area. Appendix 1e shows soil test results of important nutrient parameters in different pilot villages. The analysis indicated that farmers' fields in K.Kota pilot villages are deficient with sulphur (71 %), zinc (58 %) and boron (57 %), calcium (79%) and highly deficient in organic carbon (>90% fields). Whereas soils in delta region (Akividu) is found nutrient rich and no-major and micro nutrient deficiency traced.

Soil test results shared with farmers, officials at DoA, other stakeholders and fertilizer recommendations are made accordingly (figure 1.1.13.1). Soil health card of these farmers has also prepared and will be distributed shortly within a week period. To promote advantage of micro nutrients usage as basal application, so far we have conducted more than 30 trainings/meetings at village scale. This is a continuous activity which has been pursued by the line departments, NGOs and ICRISAT staffs located in the district. Moreover awareness building program on animal health (timely vaccination and deworming) is being conducted through regular interaction of community.

Figure 4.1.13.1. Awareness campaign of balanced fertilizer application through wall writing and farmers interactions

Fertigation is one of the important activity in Rythukosam Project to to minimize the cost of cultivation, protect environment by controlling leaching and same time enhanced productivity. Fertilizer scheduling was advised to the farmers in Pilot Villages. In banana and oil palm plantation, fertigation through irrigation was recommended. Awareness campaigns have been conducted in consortium with line department.

4.4 Improved Land Management Practices and Crop Diversification:

Improved land management practices such as broad bed and furrow practices which enhances soil moisture availability, introduction of improved variety seeds, micro-irrigation and crop diversification (introducing green gram, black gram, groundnut, millet, sorghum, pigeon pea) activities has been promoted with help of agricultural departments at pilot site villages. Field demonstrations for enhancing *in-situ* soil moisture is planned in selected model villages. Land form methods such as Broad-Bed and Furrow demonstrated during *Kharif* 2015 which enhances soil moisture 10-15% compare to traditionally cultivated field, and also this methods helps in disposing-off excess runoff safely during heavy down-pour. Increased soil moisture in BBF field helps crop to protect from water stress situation especially during dry-spells.

Nearly 300 kg of improved variety seeds of different crops (Groundnut, finger millet, sorghum, pigeon pea, and castor) were provided to farmers in pilot villages under crop diversification activities (Table 4.1.13.1)). Moreover department of Agriculture is consistently putting serious efforts for promoting improved variety seeds. Crop cutting experiments will be conducted to evaluate these cultivars compared with local cultivars.

Table 4.1.13.1. Improved cultivars provided for participatory varietal evaluation during *Kharif* 2015

Crop	Variety name	Seed supplied (Kg)
Pigeonpea	ICPH 2740	40
Pigeonpea	ICPH 2671	20
Pigeonpea	ICPH 87119	30
Pigeonpea	ICPH 8863	10
Pigeonpea	ICPH 85063	20
Sorghum	CSH 24MF	20
Castor	DCH 519	20
Pearl Millet	ICTP 8203	24
Groundnut	ICGV91114	90

4.5 Green Manuring for Enhancing Soil Fertility, Aerobic Composting

Considering low levels of soil organic matter in farmers' fields, we are promoting planting of N-rich green manure plant Gliricidia on field bunds (Figure 4.1.13.2). Nearly 50,000 seedlings of *Glaricidia* plants were raised on nursery bed with help of department of agro-forestry.

Farmers are selected to grow these plants on field bunds in selected villages of K.Kota mandal. Apart from this, aerobic composting is also promoted in the pilot villages nearly with 50 farmers (Figure 4.1.13.2).

Figure 4.1.13.2.Glaricidia nursery raised at K.Kota mandal; demonstration of aerobic composting using Madhyam culture

Monitoring of important pests: For avoiding indiscriminate use of pesticides and properly guiding farmers with respect to integrated pest management on day-to-day basis, extensive pest-monitoring is initiated. Total 100 insect traps are placed in the pilot sites and are being monitored in pilot villages for proper guidance to farmers.

Kitchen garden (vegetable cultivation) for nutrition security: To address the issue of malnutrition in children and women, vegetable cultivation at backyard is promoted (Figure 4.1.13.3). Kitchen garden kits are distributed to nearly 100 women in KKota villags Mandals.

Figure 4.1.13.3. Kitchen garden activities promoted in Dhumpagadapa village of Akiveedu mandal, West Godavari district

4.8 Weather Monitoring

Monitoringrainfall and temperature is important meteorological parameters in agriculture therefore a dual type tipping bucket rain-gauge along with temperature sensors was supplied at K.Kota mandal, will be established in one week period (figure 4.1.13.4). This instrument monitors minimum and maximum temperature and rainfall at hourly basis.

Figure 4.1.13.4. Raingauge installed in Ramanapalem village of KKota mandal

4.9 Need based Irrigation scheduling using Water Impact Calculator

Need based irrigation scheduling (through Water Impact Calculator) is targeted for enhancing water use efficiency both in agriculture and horticulture sector. Secondary data on soil physical properties; agronomic parameters such as crop coefficients and root growth pattern of major cropping system has been identified and tool is set for various important horticulture crop (e.g., oil palm, coconut) and agriculture crops (maize, paddy *etc*.) for west Godavari district. This tool will preciously suggest exact timing and quantity of water to be applied as per water balance approach. Practicing WIC based irrigation scheduling can save 30% water without comprising in crop yield.

***In-situ* soil moisture conservation through land form technique: Broad Bed and Furrow method**

Farmer's participatory field demonstration on land form treatment (BBF) was undertaken In Ramannapalem village and groundnut crop (ICGV91114) was sown (Figure 4.1.13.5). This increased crop yield by 100-150 kg/acre compared to traditionally managed condition. Number of farmers shown the interest to adopt this technique for cultivating Maize and Maize intercrop with Pigeon pea.

- *In-situ* water conservation technique such as Broad Bed and Furrow methods helps in enhancing soil moisture availability and also disposing excess water safely from the field during the heavy downpour
- It protect crop both from drought and water logged situation

Figure 4.1.13.5. Demostartion of BBF technique in Ramannapalem village of K.Kota mandal, West Godavari

Introduction of growth promoters to different crops of pilot mandals:

AQUASAP powder is the natural extract of cultivated red algae called "Kappaphycus Alvarezii". AQUASAP powder is a rich natural source of pottassium and other natural nutrients. It provides a major boost to crop yields and stronger root system due to the acceleration of the plant's metabolic function as a result of the plant's increased nutritional uptake. Aquasap is a natural source of macro and micronutrients and growth promoters which can improve fertilizer efficiency, increase soil nutrient availability, improve nutrient uptake, improve plant resistance to disease, insect and environmental stress. Aquasap was provided nearly to 20 farmers and found that application of Aquasap improved crop growth and crop yield additionally by 200-250 kg/acres in paddy, maize and other crops (Figure 4.1.13.6).

Figure 4.1.13.6. Promoted Aquasap to be applied as foliar application in Pilot villages in different field crops

Demonstration of machine transplanting of Paddy

Machine transplanting involves planting young rice seedlings into puddled soil by machine (Figure 4.1.13.7). Machine transplanting requires considerably less time and labor than manual transplanting (1–2 ha/person/day versus 0.07 ha/person/day).

Figure 4.1.13.7.Machine transplanting of Paddy is undertaken in in 40 ha area of Chityala village, Gopalapuram Mandal, West Godavari

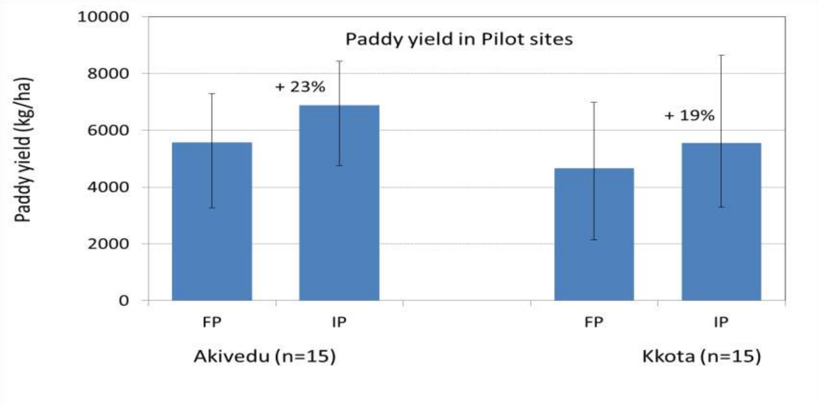
Fast and efficient (1–2 ha/d), uses less labor and ensures timely planting. This technique reduces stress, work load, and health risks. Ensures uniform spacing and plant density. Seedlings recover fast, tiller vigorously, and mature uniformly. Machine transplanting of Paddy is undertaken in in 100 acre area of Chityala village, Gopalapuram Mandal, West Godavari as pilot demonstration.

- Paddy Transplanter was supplied by the KUBOTA Company on charged basis (3,500/- per acre) for transplanting with their seedlings
- The cost cultivation decreased by Rs. 2,000/- per acre
- As per CC experiment, paddy yield was harvested as 2700 kg/acre compared to 2400 kg/acre in nearby control field in which paddy was traditionally grown (manual transplating method)

Farmers benefited by additional income of 5000-5500 Rs/acre due to machine transplanting compared to conventional method of manual transplanting

Crop cutting experiments in year 2015-16

Figure 4.1.13.8 & 4.1.13.9 compared yield obtained under improved management practice with traditionally managed practices in different farmers field. Paddy yield increased by applying micro-nutrients 19-23% compared to controlled fields clearly indicates the importance of balanced fertilizer application. Moreover paddy yield further increased with application of Aquasap by 22% on average. Straw yield is also found higher with increasing yield levels.



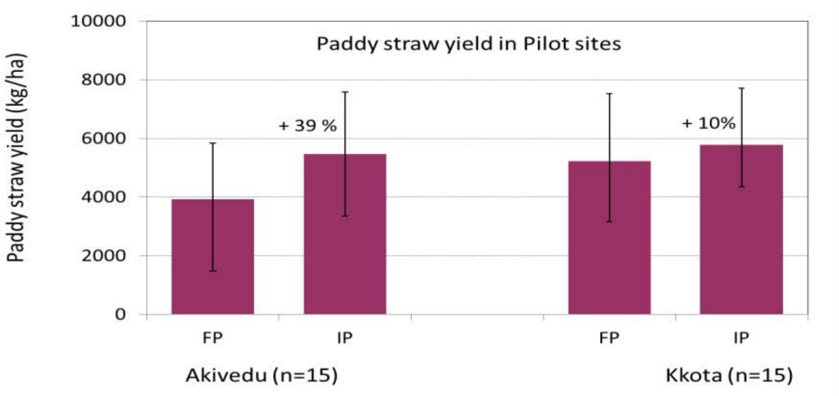


Figure 4.1.13.8. Comparison of paddy –Above: crop yield, Below: straw yield in response to balanced fertilizer application in selected fields of KKota and Akivedu mandals of West Godavari district; FP= Farmers practice, IP= Improved practice

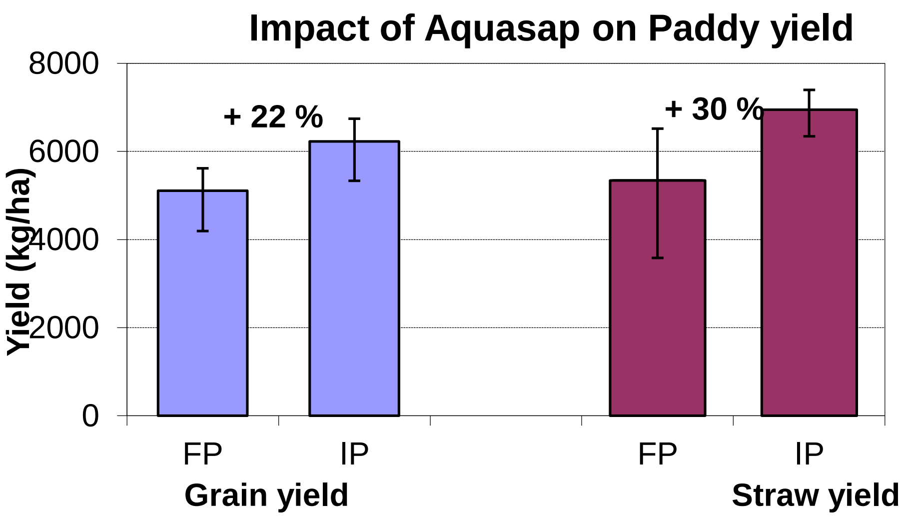


Figure 4.1.13.9. Comparison of paddy crop yield in response to Aquasap application in selected fields; FP= Farmers practice, IP= Improved practice

4.3. Animal Husbandry

4.3.1. Anantapur

Anantapuramu has 6.1 lakh white cattle, 3.7 lakh black cattle 38 lakh sheep, 7.8 lakh goat and 10 lakh poultry. Though the district having huge cattle population, most of the animals are indigenous. The high yielding milch animals were raised to 2.7 lakh by artificial insemination technique and introduction of high yielding milch animals under different schemes over a period.

There is fairly a good animal population at pilot sites. Both sites together have 3829 cattle, 3137 buffaloes, 152566 sheep and goats which form a major source of income for many farmers and the landless labourers (5-10% population).

The government operated various schemes for increased production of milk, meat and eggs besides taking increased care of animal health through Veterinary Hospitals, Dispensaries and Polyclinic (Table 4.3.1.1). One or other facilities are available across all the mandal headquarters and some important villages. The various schemes operated by the Animal husbandry department are given in table below.

Table 4.3.1.1. Various schemes operated by Animal husbandry department for increasing Livestock production (Milk, Meat and eggs), Anantapuram, 2015-16.

Schemes	Items given	Beneficiary/units
Cows/Buffalos Development		
1. Sunandini Programme	Feed & health care-for Calves	1700 calves
2. Ksheera Sagar	Feed & health for Pregnant animals	1706 animals
Sheep Development		
1. Mini Sheep & Goat Units	5 Ewes/Does + 1 Ram/buck	370+40 units
	20 Ewes/Does + 1 Ram/buck	21+4 units
	Exchange/Gift of Breeding Ram	76+13 units
2. Mass deworming	Sheep/goat 100%	93.07 Lakhs sheep
Poultry Development		
1. Backyard poultry	25 Cheeks - 4 week old	5000 units
2. Animal healthcare	Vet.Hospitals, dispensaries, goshala	144 units added
Fodder Production		
1. Tankbed cultivation	Napier grass, Sorghum & Maize	5565 ha
2. Controlled fodder units	Azolla	54 unit
	Hydroponic	27 units
	SiloBunkers	8 units
3. Green fodder for 2016-17	Sorghum, Cowpea, Sugargraze, and Maize	259 MT seed supplied
Drought mitigation		
1. Fodder arranged from outside	Cattle feed	6064 MT
	Fodder Silage Bales	1275 MT
Other help given	Chaff cutters	30 units
	Milking machines	20 units

With a good push given by the department spending over Rs. 1168 Crores under all schemes, the department recorded positive growth of 8.23% in milk, 4.62% in meat and 6.67% in egg production over the previous year with the GVA values recorded very high due increased cost of live stock products (Table 4.3.1.2).

Table 4.3.1.2. Growth recorded in livestock production and value addition over previous year, Anantapuramu, 2015-16					
S.No	**Strategies for livestock Production**	**Unit**	**Achievement**		**% Growth**
			2014-15	**2015-16**	
1	Milk Production	Lakhs MTs	6.2	6.71	8.23
2	**GVA from Milk**	Rs. In Cr	1108	1903	71.75
3	Meat Production	MTs	44207	46249	4.62
4	**GVA from Meat**	Rs. In Cr	556	1081	94.42
5	Egg Production	Cr. No	19.95	21.28	6.67
6	**GVA from Egg**	Rs. In Cr	43	49	13.95

4.3.2. Chittoor

Promoting and Strengthening livestock based livelihoods:

Promotion of backyard poultry

Manakodi scheme with the help of Animal husbandrydepartment, we distributed Girirajaandvanaraja chick units for meat and egg purpose supplied the pilot site villageswhich can acts as a source of secondary income to the farmers (Table 4.3.2.1; Figure 4.3.2.1)).

Figure 4.3.2.1.Giriraja chicks growing in Pedduru village at Santhipuram mandal

Table 4.3.2.1. Backyard poultry unit's distribution details in V.Kota and Santhipuram pilot villages				
No.of mandals	**No. of villages**	**No. of units distributed**	**No. of farmers benefited**	**Total chicks (1unit=40)**
2	5	23	13	920

Animal health camp:Animal health camp and awareness program was conducted with the help of animal husbandry department (Figure 4.3.2.2). Vaccinationsagainst the foot& mouth disease, deworming, mineral deficiencywas given to the cattle.

Figure 4.3.2.2. Animal health camp at V.Kota and Santhipuram mandal pilot villages

Fodder:Fodder scarcity is major stumbling block for high animal productivity which is a prominent activity with farmers in pilot site (Figure 4.3.2.3). So, multi-cut sweet sorghum hybrid is being evaluated with 23 farmers of 8 ha in the pilot site.

Figure 4.3.2.3. Sweet sorghum varietal evolution in Chinnaridoddi village, Santhipuram mandal.

4.3.3. East Godavari

Improving fodder availability for cattle

Fodder scarcity is major stumbling block for high animal productivity which is a prominent activity with farmers in pilot site. So, multi-cut sorghum variety CSH24 MF is being evaluated with 5 farmers of 8 ha in the pilot site. Data will be recorded on the no of cuttings and yield.

4.3.4. Guntur

Animal husbandry department conducted the 2 to 3 animal health camps in our pilot mandals.Capacity building meetings also conducted regarding feed and high yield milch cattles.

4.3.5. Kadapa

Improving fodder availability for cattle - *sorghum fodder variety*

Fodder scarcity in major stumbling block for high animal productivity which is a prominent activity with farmers in pilot site. So, multi-cut sorghum variety CSH24 MF is promoted and evaluated with 50 farmers. Farmers cultivated sorghum fodder in about 800 m^2 and got 1900 to 4200 kg fodder (9500-21000 kg ha^{-1} productivity) (Figure 4.3.5.1)).

Figure 4.3.5.1. Fodder demo in farmers' fields – Left: Mr Viswanadhreddy, Devapatla village, Sambepalli mandal; Center: Ms Lakshmi, Devapatla village, Sambepalli mandal, Kadapa district; Right Ms G Tirupallamma in Nagisettipalli village, B Matam mandal, Kadapa district

Feed & Fodder promotion

Proper animal nutrition is a major limiting factor low animal yield and therefore feed was distributed @ 120 kg per family in pilot site villages. As such total of 578 tons of feed was distributed in pilot site villagess across 4 mandals (Table 4.3.5.1).

Similarly, to address fodder scarcity, fodder development is being promoted in pilot sites and during 2015-16, 2.35 ton fodder seed is distributed to farmers (Table 4.3.5.2).

Table 4.3.5.1. Detail of feed distribution for cattle in pilot site villages during 2015=16

Mandal	Item	Distributed (kg)
B. Matam	Feed	206960
Porumamilla	Feed	191400
Sambepalli	Feed	121800
Veeraballi	Feed	57600
Total		**577760**

Table 4.3.5.2. Detail of fodder seed distribution in 13 pilot site villages during 2015-16

Mandal	Item	Distributed (kg)
B. Matam	Fodder seed	800
Porumamilla	Fodder seed	650
Sambepalli	Fodder seed	300
Veeraballi	Fodder seed	600
Total		**2350**

Health camps

For promoting animal healthcare, health camps were done in pilot site villages (Table 4.3.5.3);

Table 4.3.5.3. Detail of animal health camps done in pilot site villages during 2015-16

Mandal	Health camps done
B.matam	7
Porumamilla	8
Sambepalli	5
Veeraballi	8
Total	**28**

The scaling out of good practices in pilot site villages through Animal Husbandry department has recorde a total GVA addition of 1.87 crores rupees in milk production, 58 lakh rupees in meat production and and 75 throusand rupees in egg production (Table 4.3.5.4 to 5.3.5.6)

Table 4.3.5.4. Milk production and GVA increase in Kadapa pilot site, 2015-16

Village	Milk production			
	2014-15 (ltr)	2015-16 target (ltr)	2015-16 achievement (ltr)	GVA (Rs)
Siddavaram	409530	491436	421550	396660
Ganugapenta	362445	434934	382550	663465
Challagirigella	482895	579474	512330	971355
Venkataramapuram	168630	202356	179550	360360
Godlaveedu	121545	145854	131215	319110

Table 4.3.5.4. Milk production and GVA increase in Kadapa pilot site, 2015-16				
Village	**Milk production**			
	2014-15 (ltr)	**2015-16 target (ltr)**	**2015-16 achievement (ltr)**	**GVA (Rs)**
Gundapuram	19710	23652	21950	73920
Dirasavancha	304410	365292	322510	597300
Nagisettipalle	257325	308790	269550	403425
Veeraballe	525600	630720	533790	270270
Matli	623055	747666	642350	636735
Settipalle	902280	1082736	1270000	12134760
Devapatla	1117995	1341594	1152650	1143615
Guttapalle	270465	324558	291210	684585
Total	**5565885**	**6679062**	**6131205**	**1,86,55,560**

Table 4.3.5.5. Meat production and GVA increase in Kadapa pilot site, 2015-16										
Village	**Sheep meat**			**Goat meat**			**Poultry meat**			**Total value added (Rs)**
	2014-15 (kg)	**2015-16 (kg)**	**Value added (Rs)**	**2014-15 (kg)**	**2015-16 (kg)**	**Value added (Rs)**	**2014-15 (kg)**	**2015-16 (kg)**	**Value added (Rs)**	
Siddavaram	14226	14870	257480	1562	1580	7280	498	510	1163	265923
Ganugapenta	12370	13520	459980	3663	3790	50720	823	890	6706	517406
Challagirigella	5663	5870	82880	3500	3700	80080	1013	1040	2750	165710
Venkataramapuram	20097	21500	561200	1763	1870	42720	431	460	2913	606833
Godlaveedu	17860	18970	444160	616	630	5760	289	300	1088	451008
Gundapuram	3826	3980	61460	380	395	6000	49	50	106	67566
Dirasavancha	30240	31280	416180	3374	3570	78240	1119	1150	3063	497483
Nagisettipalle	9311	9500	75620	513	520	2800	339	370	3081	81501
Veeraballe	29972	30120	59100	7520	7770	99920	8396	8570	17356	176376
Matli	31824	32150	130580	9257	9520	105280	5089	5590	50106	285966
Settipalle	89511	92150	1055660	6236	6460	89680	4960	5000	3988	1149328
Devapatla	125601	129000	1359480	931	1000	27600	2501	2730	22856	1409936
Guttapalle	9494	9800	122360	490	500	3920	349	370	2125	128405
Total	**399995**	**412710**	**5086140**	**39805**	**41305**	**600000**	**25857**	**27030**	**117300**	**58,03,441**

Table 4.3.5.6. Egg production and GVA increase in Kadapa pilot site, 2015-16			
Village	**Poultry Eggs**		
	2014-15 (No)	**2015-16 (No)**	**Value added (Rs)**

Siddavaram	33225	33548	969
Ganugapenta	54863	53569	-3881
Challagirigella	67500	69745	6735
Venkataramapuram	28725	30123	4194
Godlaveedu	19275	20173	2694
Gundapuram	3263	3345	248
Dirasavancha	74625	79456	14493
Nagisettipalle	22613	22345	-803
Veeraballe	559763	576544	50345
Matli	339263	312345	-80753
Settipalle	330675	345676	45003
Devapatla	166763	177654	32675
Guttapalle	23250	24567	3951
Total	**1723800**	**1749090**	**75,870**

Similarly, at district level, 6050 t feed is distributed to promote animal health and milk production. And 350 t fodder seed is distributed for fodder promotion in the district. A total of 1562 halth camps were conducted to promote better animal health. And a total of about 80000 AI were done during the year for breed improvement.

4.3.6. Krishna

To improve the milk yields, meat and egg production different schemes and interventions were proposed at the district level and majorly concentrated in the pilot sites of learning. The specific interventions taken up in the pilot site mandals is given in the Table 4.3.6.1 below

Table 4.3.6.1. Progress of activities in Krishna district pilot sites

Mandal	Growth	Intervention	Activity	Beneficiaries
Ghantasala 10 pilot villages	Milk	Suphalam scheme	14 health camps were	490 animals were treated
		Fodder Development	59 Fodder Mini Kits were	46 farmers
	Meat	Manakodi scheme	26 units are approved	26 farmers.
G.Kondur 13 pilot villages	Milk	Suphalam scheme	13 health camps were	325 animals were treated
		Fodder Development	135 Fodder Mini Kits were	83 farmers
		Ksheerasagar	Concentrated feed of 600kgs	56 farmers
		Sunandini	Caring for calves	21 farmers

Progress in close collaboration with DoAH

Krishna district has a good potential of Livestock with 0.09 millioncattle, 0.695 million buffaloes, 0.508 million sheep, 0.151 million goat, 1.081 million*Desi* poultry and 10.128 million commercial poultry with good production traits. 0.352 million households (32 %) are engaged in livestock rearing activities out of 1.124 million households exist in Krishna district. The district stands 3rd in buffaloes, 6th in sheep, and 2nd position in poultry in the state. Krishna Dist, stands at 2nd position in milk production, 3rd in egg production and 6th in meat production in the state, as per Government of India estimates for 2013-14. Production status and targeted growth for the Year 2015-16 compared to 2014-15 are given in the Table 4.3.6.2.

<table>
<tr><th colspan="11">Table 4.3.6.2. Production and GVA in 2015-16 in Krishna district</th></tr>
<tr><td colspan="5">Production 2014-15</td><td colspan="6">Production 2015-16</td></tr>
<tr><td colspan="2">Milk MTs</td><td colspan="2">Meat MTs</td><td>Eggs lakh</td><td colspan="2">Milk MTs</td><td colspan="2">Meat MTs</td><td colspan="2">Eggs lakh No’s</td></tr>
<tr><td colspan="2">1062000</td><td colspan="2">62708</td><td>19648</td><td colspan="2">1200000</td><td colspan="2">65000</td><td colspan="2">21000</td></tr>
<tr><td colspan="5">% Enhancement</td><td colspan="2">12.99</td><td colspan="2">3.66</td><td colspan="2">6.88</td></tr>
<tr><td colspan="11">GVA in₹Crores</td></tr>
<tr><td>Milk</td><td colspan="2">Meat</td><td>Egg</td><td>Total GVA 2014-15</td><td>Milk</td><td colspan="2">Meat</td><td colspan="2">Egg</td><td>Total GVA 2015-16</td></tr>
<tr><td>2968.74</td><td colspan="2">995.42</td><td>384.78</td><td>4348.95</td><td>3748.68</td><td colspan="2">1131.94</td><td colspan="2">414.54</td><td>5295.16</td></tr>
<tr><td colspan="5">% Enhancement</td><td>26.27</td><td colspan="2">13.71</td><td colspan="2">7.73</td><td>21.76</td></tr>
</table>

Milk:

- Milk production in 2014-15 is 1.062 million Mts and the targeted milk for the year 2015-16 is 1.2 million Mts was achieved with an expected growth rate of 13 %.
- GVA from milk for the Year 2014-15 is Rs 2968.74 crores and the targeted GVA for the year 2015-16 is Rs. 3748.68 crores with an expectedgrowth rate of 26.27 % was achieved.

Meat:

- Meat production in 2014-15 is 62708 Mts and the targeted meat for the year 2015-16 is 65000 Mts with an expected growth rate of 3.66 % was achieved.
- GVA from Meat for the Year 2014-15 is₹ 995.42 crores and the targeted GVA for the year 2015-16 is Rs. 1131.94 crores achieved with a growth rate of 13.71 %.

Eggs:

- Egg production in 2014-15 is 1964.8 million numbers and the targeted eggs for the year 2015-16 is0.02 million numbers was achieved with a growth rate of 6.88 %.
- GVA from Eggs for the year 2014-15 is Rs. 384.78 crores and the targeted GVA for the year 2015-16 was Rs 414.54 crores achieved with a growth rate of 7.73 %.

The major interventions proposed for the Animal husbandry sector includes Entrepreneur Development to young and small holders of dairy animals, heifer management, milk enhancement, fodder production though fodder production groups, hydroponic fodder cultivation, integrated livestock development units and sexed semen through different departmental schemes. The Total GVA from AH sector for the year 2014-15 is Rs 4348.95 crores and the targeted GVA for the year 2015-16 is Rs 5295.16 crores was achieved with a growth rate of 21.76%.

4.3.7. Kurnool

The district has large populations of livestock and small ruminants. Availability of quality fodder particularly green fodder in summer months is one of the major limiting factor in increasing milk production. Several interventions were taken up to improve the fodder situation. Good number of improved milch animals and heifer calves were inducted to upgrade the quality of livestock. Coverage of livestock and small ruminants by vaccination against foot and mouth disease in case of bovines and against the common diseases in case of small ruminants were taken up to reduce the mortality and morbidity. Additional areas were planted with agroforestry plants to improve the fodder situation. At pilot villages the area under fodder has been increased substantially.

4.3.8. Nellore

As regards to Livestock sector, focus is on Strengthening of capacity building program, promoting quality fodder development particularly multi-cut fodder sorghum and dual purpose maize and promoting fodder mixtures with concentrate to increase milk yield.

Capacity Building Training:
154 Progressive dairy farmers and 66 farmers of sheep and goat farmers are identified from each Mandal for giving one day capacity building training at Mandal Headquarters wherein they will be enlightened the managemental practices in dairying and sheep rearing to improve the productivity.

Ksheerasagara and Sunanghini Programe:
Proper animal nutrition is a major limiting factor low animal yield and therefore feed was distributed @ 120 kg per family in pilot site villages (Table 13). More number of farmers will be assisted in these villages under Ksheerasagara and Sunandhini programme in coming months

Supply of improved fodder seed:
Indent for increased improved fodder seed availability is placed and the sufficient fodder seed will be kept at the Veterinary Institutions shortly for distribution to the needy farmers on 75% subsidy basis. At present, with the existing staock, the improved fodder seed is supplied in pilot villages (Table 4.3.8.1).

Mass sheep and Goat deworming programme:
Mass sheep and goat deworming programme was completed in these mandals during Aug-2015

Mass Foot and Mouth Disease Vaccination programme:
Mass Foot and Mouth Vaccination campaign is going on now in these villages to protect the livestock against Foot and mouth disease.

Crop intensification
Crop intensification is focused in pilot sitesthrough introduction of short duration, disease resistant high yielding pulse crops in Podalukuru mandal. The fallow area brought under cultivation of blackgram (150 demonstrations), greengram (150 demonstrations), and pigeonpea (150 demonstrations).

Table 4.3.8.1. Fodder promotion details in pilot villages.

S.No	Name of the Village	Name of the Mandal	Name of the Scheme					
			Ksheerasagara		Sunandhani		Fodder seed	
			No. of farmers benefitted	Qty of feed issued (Kgs)	No. of farmers benefitted	Qty of feed issued (Kgs)	No. of farmers benefitted	Qty of seed issued (Kgs)

1	Varigonda	T.P.Gudur	2	720	-	-	35	700
2	T.P.Gudur-I	T.P.Gudur	-	-	-	-	50	1000
3	T.P.Gudur-II	T.P.Gudur	7	2520	8	320	75	1500
4	Peduru	T.P.Gudur	-	-	3	320	15	300
5	Marripalli	Podalakur	2	720	6	1200	5	100
6	Kanaparthi	Podalakur	5	1800	6	1200	15	300
7	Mogalluru	Podalakur	10	3600	-	-	10	200
8	Aldhurthi	Podalakur	5	1800	-	-	10	200
9	Mypadu	Indukurpeta	-	-	12	210	21	240
10	Gamgapatnam	Indukurpeta	8	2880	13	2600	2	20
11	Jagadevipeta	Indukurpeta	10	3600	8	360	30	300

4.3.9. Prakasam

Fodder promotion:

To address fodder scarcity, fodder promotion is a focused activity to increase milk production (Table 4.3.9.1).

Table 4.3.9.1. Details of fodder seed distribution in pilot sites.

Name of the village	Name of the mandal	Name of the scheme					
		Ksheerasagara		Sunandhani		Fodder seed	
		No. of farmers benefitted	Qty of feed issued (tons)	No. of farmers benefitted	Qty of feed issued (tons)	No. of farmers benefitted	Qty of seed issued (tons)
Varigonda	T.P.Gudur	2	0.72	-	-	35	0.70
T.P.Gudur-I	T.P.Gudur	-	-	-	-	50	1.00
T.P.Gudur-II	T.P.Gudur	7	2.52	8	0.32	75	1.50
Peduru	T.P.Gudur	-	-	3	0.32	15	0.30
Marripalli	Podalakur	2	0.72	6	1.20	5	0.10
Kanaparthi	Podalakur	5	1.80	6	1.20	15	0.30
Mogalluru	Podalakur	10	3.60	-	-	10	0.20
Aldhurthi	Podalakur	5	1.80	-	-	10	0.20
Mypadu	Indukurpeta	-	-	12	0.21	21	0.24
Gamgapatna	Indukurpeta	8	2.88	13	2.60	2	0.02
Jagadevipeta	Indukurpeta	10	3.60	8	0.36	30	0.30

4.3.10. Srikakulam

Improving fodder availability for cattle during 2015-16

Multi-cut fodder sorghum hybrid (CSH 24 MF) seed was supplied to farmers in the pilot villages (Fig. 11) for increasing fodder availability to cattle, especially for milch animals. Farmers in 10 pilot villages grown fodder sorghum and produced about 30 t of green fodder (Table 4.3.10.1; Figure 4.3.10.1).

Table 4.3.10.1. Fodder production in pilot villages during 2015-16

S.No.	Mandal	Village name	Quantity Distributed(kg)	Quantity produced(kg)	Remarks
1	Ranasthalam	Bantupalli	3	6000(3 cuttings)	
2		Maruwada	3	5500(3 cuttings)	

3		Pisini	3	6200 (3 cuttings)	
4		Kondamulagam	2	--	Not germinated due to lack of water
5	Polaki	Mettapeta	0.5	1500(3 cuttings)	
6		Koduru	0.5	1700 (3 cuttings)	
7		priyagraharam	0.5	1600 (3 cuttings)	
8		Nandigam	1.5	-	Damaged due to lack of moisture at peak stage
9		Urjam	2	-	
10	Ranasthalam	Pisini	4	8000(3 cuttings)	
	Total		**20**	**30500**	


Fig. 4.3.10.1. Fodder sorghum grown in Pisini village (left) in Ranasthalam Mandal and Pallipeta village (right) in Polaki Mandal

Progress in close collaboration with DoAH

Farmers in pilot sites got benefited from animal husbandry schemes during 2015-16. About 67 farmers got benefited from Ksheerasagar scheme, 49 farmers from Sunandini scheme, 74 farmers from fodder development scheme and 25 farmers from backyard poultry scheme (Table 4.3.10.2) in pilot villages during 2015-16. In addition to these schemes, vaccination for buffalos and see fox disease for sheep is around 1400 animals at our pilot villages.

Table 4.3.10.2. Animal husbandry progress in pilot villages during 2015-16

Name of the Scheme /Programme	Number of beneficiaries in Polaki pilot villages	Number of beneficiaries in Ranasthalam pilot villages	Number of beneficiaries in Seethampeta pilot villages
Ksheerasagar	22	28	17
Sunandini (SCSP)	6	32	11
Fodder Development	24	29	21
Rural Backyard Poultry	9	-	16

Progress of various animal husbandry schemes in the district with respect to annual targets and achievements during 2015-16 are given in Table 4.3.10.3 and Table 4.3.10.4.

Table 4.3.10.3. ANIMAL HUSBANDRY DEPARTMENT - SRIKAKULAM DISTRICT SCHEMES PROGRESS DURING 2015-16

S.No.	Name of the Indicator / Scheme /Programme	Annual Target (2015-16)			Achievement		Remarks
		Unit of measurement for Physical	Physical (Numbers)	Financial (In Rs. Lakhs)	Physical (Numbers)	Financial (In Rs. Lakhs)	
1	Ksheerasagar	No.s	700	63.00	1418	127.62	
2	Sunandini (SCSP)	No.s	1000	57.98	349	20.23502	Sunandini scheme is allotted to SC community only. Due to non availability of AI female calves the grounding was not effected successfully
3	Mini Sheep & Goat (NSP)	No.s	126	37.8	126	37.8	Beneficieries identified & Preparing for apprvoal
4	Mini Sheep & Goat (TSP)	No.s	78	23.4	78	23.4	
5	Rural Backyard Poultry	No.s	475	21.66	475	21.66	
6	Azolla	No.s	400	13	383	12.4475	
7	Hydroponics	No.s	500	166.5	118	39.294	
8	Fodder & Feed Development	MTs	50	7.83	50 Mt	7.83	

Table 4.3.10.4. PROGRESS REPORT ON PERFORMANCE INDICATORS FOR 2015-16 IN SRIKAKULAM DISTRICT

S. No.	PERFORMANCE INDICATOR	Annaul Target	Annual Achievement	% Achievement
1	**2**	**7**	**8**	**9**
1	Curative Treatment	3300000	3406883	103.24
2	Preventive Treatment (Deworming)	2370000	2828825	119.36
3	Castration	14000	18148	129.63
4	Vaccinations	3300000	4285903	129.88
5	Artificial Inseminations	216000	209480	96.82
6	Calf Births	74685	84304	111.56
7	Fodder Development: (ha)	4400	4800	109.99
8	Rythu Sadassus	4000	4325	108.13
9	HRD Trainings	200	230	115.00
10	Fertility Camps	550	758	137.82

11	Detailed Inspection	31	29	93.55
12	Monthly Seminors	12	12	100.00

Progress of achievements under animal husbandry during 2015-16 on milk production (497672 t), meat production (17460 t) and egg production (142280961 lakh Nos.) were presented in Table 4.3.10.5. Achievements are in the range of 102% to 103%.

Table 4.3.10.5. Statement showing the progress report on economic indicators for the year 2015-2016 of srikaklam district

Sl No.	Name of the indicator	Annual Target	Annual Achievement	% of Ach.
1	Milk in M.Tons	490000	497672	102
2	Meat in M.Ts	17000	17460	103
3	Egg in lakh Nos	140000000	142280961	102

4.3.11. Visakhapatnam

Fodder promotion

Please see Table 4.3.11.1 below;

Table 4.3.11.1. Fodder promotion in pilots

Crop	Variety	Village	Mandal	Area (ha)	Quantity (Kgs)	No. of farmers
Fodder sorghum	CHS24	Gunnampudi, Rajam, Turakalapudi,	Buchyyapeta	1.2 (10 cents/ farmer)	15	30

Animal health

In the pilot villages, there are about 30000 animals requires attention in terms of health and management aspects. Till now, about 10 animal health camps have been organized to create awareness about animal health and their management. Nearly 4200 dewormings have taken places and 1300 animals have been vaccinated and 228 animals have been inseminated for breed.

4.3.12. Vizianagaram

Fodder promotion

In order to increase fodder availability, multi-cut sorghum demonstrations (var.CSH24 MF) was conducted with 36 farmers. Similarly, progressive dairy farmers and sheep and goat farmers were identified from each Mandal for giving capacity building and training at Mandal Headquarters wherein they are enlightened with the best management practices in dairy and sheep rearing to improve the productivity.

See growth engines in the district compiled in Table 4.3.12.1 and intervention wise progress in Table 4.3.12.2 and Table 4.3.12.3.

Table 4.3.12.1. Growth Engines of Vizianagaram district 2016-17 (Target) at Constant (2011-12) Prices & Q1 Achievement										
Sl. No	GROWTH ENGINES	2015-16(AE)		2016-17(T)			Q1			
		Prod.	GVA	Prod.	GVA	Growth %	Prod.(T)	GVA (T)	Production Achivement	% of Achivement
d) Livestock										
1	Milk (MTs)	486914	98065	579000	**116611**	19%	141300	28458	142142	101%
2	Meat (MTs)	23963	37256	27500	**42755**	15%	7400	11505	7570	102%
3	Egg (Lakh No.)	3339	5658	3900	**6609**	17%	1000	1695	1004	100%
	Others		2962		**2890**					
	Total Livestock		**143941**		**168865**			**41657**		

ANIMAL HUSBANDRY DEPT ACTIVITIES FOR THE YEAR 2015-16

See tables 4.3.12.2 and 4.3.12.3

Table 4.3.12.2. Functional indicators for the Year 2015-16			
Sl. No.	**Category of Livestock**	**Target**	**Achievement**
1	No of Artificial Insemination done	225410	244151
2	No.of Calves Born	43106	47587
3	No of cases Treated	2100000	2365069
4	No Preventive Dewormings done	3960000	4210501
5	No of Castrations done	14000	20995
6	No.of Vaccinations Done	4300000	4607127
7	Fodder Development (ha)	10800	11550
8	Fertility Camps (Nos)	1050	1385
9	Pasu vignana Sadassus (NOs)	3000	3965

Table 4.3.12.3. PROGRESS OF KEY PERFORMANCE INDICATORS OF ANIMAL HUSBANDRY DEPARTMENT FOR THE YEAR 2015-16.			
SL No	**Intervention proposed**	**Cumulative Up to the end of Ivth Qtr (2015-2016)**	
		Target	**Achievement**
A	KEY INDICATORS		
1	Seasonal fodder Dev. in Ac	6000	4998
2	Perennial fodder development in Ac	300	185
3	No of animals under Ksheerasagara	6000	7515
4	No of animals under Sunandini	5200	5944
5	No of Animals Treated under SUPHALAM	12000	13195
6	No of farmers trained under Capacity Building programme	9500	18200
7	Distribution of Backyard poultry units	760	760
8	No of Mini sheep & Goat units	589	242

4.4. Fisheries

4.4.1 Anantapur

There is virtually no fisheries activity in Rythu Kosam pilot sites of Raptadu and Penukonda/Kottachervu mandals as these areas fall under severe drought prone area and there are no water reservoirs to take up fish culturing.

At district level, the target and achievements of Fish Seed Farms in the district are as follows for 2015-16 (Table 4.4.1).

Table 4.4.1. Fish seed farm production details during 2015-16.													
S. No.	**Name of the F.S.F.,**	**Spawn production achievement (lakhs)**				**Spawn rearing (lakhs)**				**Fry production (lakhs)**			
		MC		**CC**		**MC**		**CC**		**MC**		**CC**	
		T	**A**	**T**	**A**	**T**	**A**	**T**	**A**	**T**	**A**	**T**	**A**
1	Ananthapuramu	200	210	30	15	40	40	30	15	20	20	15	4.50
2	M.P.Dam	250	265	20	15	30	30	20	15	15	15	10	3.00
3	B.T.Project	-	-	15	10	30	30	15	10	15	15	5	1.50
4	PABR	-	-	25	20	80	80	25	20	40	40	15	4.50
	Total:	**450**	**475**	**100**	**60**	**180**	**180**	**100**	**60**	**90**	**90**	**45**	**13.50**

Further in 2015-16, a total of 42.86 lakh of seed was stocked in 12 tanks and 4 reservoirs on 50% share basis for development of fishery wealth in water bodies in the District. In addition, 24 aquaculture cages establishment were initiated for the culture tilapia fish at PABR Reservoir.

Implementation of schemes for 2015-16

See Table 4.4.2 below;

Table 4.4.2. details of progress in fisheries sector in the district during 2015-16.		
S.No	**Name of the scheme**	**Beneficier/Quantity (No.)**
1	Supply of fish seed to Fishermen Coop Soc. 50% subsidy	8
2	Supply of Ice boxes to fishermen & fish venders	30
3	Cage culture	1
4	Construction of captive fish seed rearing ponds	2
6	Supply of Nets to the SC Fishermen under SCSP	60
7	Supply of Nets to the ST Fishermen under TSP	30
8	Revolving fund to MMgs	03

4.4.2. Chittoor

We planted fish seed in farm ponds in the pilot sites with the help of fishery department, which can acts as a secondary income source to the farmers (Table 4.4.2.1; figure 4.4.2.1).

Table 4.4.2.1. Fish seed distribution in pilot villages				
Mandal	**No. of villages**	**No. of fish seed distributed**	**No. of farmers benefited**	**No. of farm ponds covered**
V.kota	3	2200	6	6

Fig 4.4.2.1. Fish finger lings released in farm ponds at Yallakallu village

During the year 2015-16 no of tanks under the RKVY scheme is 352 and inland fish production the target is 5410 mts and achievement is 5299 mts. For prawn production only one tank was used and the production is 50 mts.

APMIP: Around 17972 units distributed, the area covered was 15,918 ha and number of farmers who were benefitted was 17,972.

4.4.3 East Godavari

The focus of Fisheries sector in East Godavari district in the selected pilot sites is on;
a) Cage culture under PPP mode is under proposal,
b) Revival of abandoned lands,
c) Introduce new species such as Tilapia, Seabass, Mud crab, etc.
d) Minimize cost of culture,
e) Establish local markets
f) Change in policies,
g) Cold chain and market facilities,
h) Restructuring and strengthening Fisheries Department.

4.4.4. Guntur

Fisheries department officials conducted three capacity building meetings in Karlapalem and Repalle mandals.

Further, the Fisheries Department, Guntur has conducted one stakeholder's workshop on 6 August 2015 at Revenue Kalyana mandapam, Guntur. A large number of aqua farmers and representatives of various govt departments like Revenue, Groundwater Departments, MPEDA, NACSA, CIBA, etc. participated in the stakeholders meeting and discussed in detail about the BMP (Best Management Practices) in aquaculture. Another workshop was conducted on 13 August 2015 at Karlapalem mandal (pilot site), wherein Best Management Practices (BMP) in aquaculture were discussed.

- Pond Management
- SPF seed selection
- Feed management
- Disease surveillance
- Post-harvest management
- Knowledge sharing, exchange ideas
- Discussions on usage of banned antibiotics, drugs and spurious chemicals, probiotics, etc.
- Formation of Farmers Producers Organization (FPOs) was also discussed. The district has 93 aqua farmers societies which were organized by NACSA (a unit of MPEDA)
- As per the instructions of Commissioner Office, a survey has been conducted to develop infrastructure facilities like formation of roads, electricity lines, etc. At the same time estimates have been prepared for de-filiation, de-weeding of creeks, canals and backwaters from which the aqua farmers are drawing water for shrimp culture.
- Instructions were issued by the Commissioner of Fisheries, AP, the APSAC (AP Space Application Center), Hyd for providing maps and data related to total aquaculture area existing and potential area suitable for development of aquaculture in Guntur district.
- An amount of 20 million has been sanctioned by the Govt for the revival of brackish water shrimp culture ponds in Guntur district. The department will give 50% subsidy per ha, one lakh rupees for strengthening of bunds, purchase of seed and feed, etc. It is proposed to revive 200 ha of brackish water aqua ponds by the end of September.
- It is proposed to introduce "Tilapia" fish in 10 ha in Bapatla mandal and introduce cage culture in Prakasam barrage with an amount of 5.4 million. The candidate species for cage culture is Tilapia Fish

The following recommendations were proposed by the group of farmers for the development of fish aquaculture in AP.

Seed

- Establishment of fish brood banks
- Promotion of Cryopreservation technology for quality seed
- Popularization of improved varieties/strains like Jayanthi rohu, etc.
- Hatcheries for alternate species like fangasius, tilapia, etc.
- Strict vigilance on banned, non-permitted and exotic fish species.
- Establishment of modern fish landing centres at major reservoirs.

Feed

- Exemption of VAT on mash feed.
- Labelling of proximate composition on fish feeds.
- R&D on plankton to reduce the cost of feed.
- Development and popularization of local fish feeds

Credit flow

- Flexibility of credit supply.
- Hypothecation and mortgage issues.
- Inspection charges are “Unreasonable”
- Credit guarantee fees

Restructuring of subsidies

- Treating aquaculture on par with agriculture
- Popularization and sensitization on schemes of Central and State Governments on subsidies
- Infrastructure subsidies on power, roads, and minor drains should be on par with other states.
- Uniform power subsidy to all fish and related industries.
- Subsidies on solar lighting and solar pump sets.

Fish disease management

- Accreditation of private labs on the lines of NABL.
- Establishment of state of the art referral lab at Vijayawada/Eluru/Kakinada/Nellore
- Setting up of new labs under PPP mode.
- Subsidies on mobile labs and mobile test kits.
- Control and regulation on fish medicines.

Fish marketing and processing

- Creating “ Brand Andhra” for fish products by starting with regular conduct of fish festivals
- Setting up of modernized fish markets by govt. by establishing standard operating facilities.
- Institutional setup on the lines of ACPC and NECC.
- Promotion of FPOs
- Promotion of ornamental fish marketing
- Supply of advanced hygienic handling of fish tools on subsidy basis to all fish retail outlets.
- Toll free number for farmer services

The following recommendations were proposed by farmers group for the sustainable development of shrimp farming in AP.

- Quarantine facility centers are needed at all ports (Rs. 50 lakh facility)
- Nucleus breeding centers of L-Vannamei, similar to those established in Thailand for freshwater inland prawns
- Brood stock multiplication centers after nucleus breeding PPP model, one in each district
- Nauplii rearing centers, individuals
- State level holistic quality control plan
- Accredited quality testing labs
- Certified inputs (minerals and chemicals),
- Alternative species
- There is a need for regulation for global certification on seed, free from antibiotic certificate, etc; even feed needs to be certified.
- Pricing of feed is very high and variable. Control is required
- Macro infrastructure support: Dredging, HT lines, motorable roads
- Financial support to improve farms
- Access to credit facilities needs intervention by government immediately at Secretary Level to call for a meeting with shrimp farmers and bankers.
- FPOs confederation
- 95% farmers are not able to meet power, irrigation and drainage facilities are not available. High perishability (to be sent to processing within 2 hrs.)
- Strengthening domestic or local markets
- Cold chain facilities are very poor
- Growth engines for R&D and Human Resource Development
- Mission with Vision Restructuring department on project mode
- MPEDA division should be attached to Vizag to facilitate easy business and opening for aqua imports.
- Cost effective feeds need to be evolved as 50-60% production cost for prawn is the feed cost.
- Holistic Quality Control Program to tackle export rejections
- AP Govt. to navigate Govt. of India to withdraw import duties and taxes

4.4.5. Kadapa

Due to water scarcity in ponds, the release of fish seedlings planned could not be implemented. And as such there is no GVA addition through fisheries during 2015-16 in pilot site villages.
During the year, the area under fisheries in the district was about 3000 ha, however no fingerlings were reeased.

4.4.6. Krishna

For the fishery sector in the Krishna district pilot sites the following area is selected for specific interventions detailed in the Table 4.4.6.1 below.

Table 4.4.6.1. Village wise interventions proposed in the pilot sites			
Sl. No	Name of the Village	Cultivable species names	Proposed Total Area (ha.)
1	Bandar west	L.Vennamei P.Monodon CrabSea Sea-bass	250
2	Kona		150
3	Chinnapuram		100
	TOTAL		500

The major interventions proposed in the pilot site villages are

1. Revival of abundant brackish water aquaculture Ponds and also by increasing productivity in the existing freshwater fish tanks
2. Promotion of alternative species like crab, sea bass fish and silver pompano etc.
3. By adopting poly culture practices with tiger prawns and Vannamei
4. Fertilizer usage by analyzing soil nutrients
5. Transfer of latest technology, Training, and also by close technical monitoring etc
6. Providing mobile lab facilities.
7. Promoting organic farming
8. Adopting good management practices
9. Implementing govt. subsidy schemes
10. Supply quality seed with the help of RGCA
11. Minimise cost of culture,
12. Establishing local markets
13. Change in policies,
14. Cold chain and market facilities
15. Restructuring and strengthening Fisheries department.

There is a major issue in the identified fisheries pilot villages as most of the aquafarms are on assigned lands and to get benefits from the schemes, farmer's should own the land. Moreover the move by government to procure farm's for the proposed port area is causing disturbance as some farmer's have taken up agitation in these areas.

Fisheries livelihoods are more evolved in inland areas in other parts of Krishna district where aquaculture of fish, prawn have provided increased incomes to farmer's. The department of fisherie's has provided guidelines to indentify clusters for the formation of FPOs. While exporters of aquaculture are through big commercial farm's, small and marginal farmer's have been left out. In this context, NABARD has pioneered to start Fisheries FPOs for both marine and inland fisheries. Samyuktha Fisheries Producer Company, Krutivennu mandal is a marine fisherie's FPO formed with NABARDs support (Figure 4.4.6.1). The challenges are multifold as the investments are high due to requirements of fish nets, cold chain, landing centres, cold boxes, ice factory and market linkage to farmer groups.

Figure 4.4.6.1. Samyuktha Fisheries Producer Company at Etimandipallepallu, Kruttivennu mandal

Progress in close collaboration with DoAH

The fishery sector in Krishna district consists of a coast line of 111km with 4 coastal mandals comprising of 38 fishermen habitations. The total marine fishermen population is 1,12,977 with 38,914 active fishermen. Fisheries sector in the district is majorly two types namely fresh water aqua culture and brackish water aqua culture. The specific growth engines identified for achieving the double digit growth in the district are

1. Inland fish production :
2. Prawn production (includes marine, brackish water, fresh water)
3. Marine fish production

In land fresh water acqua culture is cultivated in an area of 38,108 ha. The potential area of brackish water resources is 30,000 hac out of which 20,000 ha is the total area developed and the current area under culture is 5600 hac which includes species of shrimp and crab cultivation. The Total GVA achieved from fisheries sector in the district for the year 2014-15 I Rs. 5848 crores and the achieved GVA for the year 2015-16 is Rs. 7813.48 crores with an increase in over GVA growth by 33% (Table 4.4.6.2).

Table 4.4.6.2. GVA achieved for 2014-15 and 2015-16 in Krishna district

S No	Item	2014-15				2015-16			
		Area ha	Production tons	Value in crores	GVA in crores	Area ha	Production tons	Value crores	GVA crores
1	Fresh water fish	5649	541000	4563.5	3787	6049	577310	4929	4041.2
2	Shrimp	5810	54000	2105	1881	1081	105500	4436	3633.58
3	Marine fish	...	36000	220	180	...	27740	163.67	138.7
	TOTAL	6230	631000	6888.5	5848	7130	710550	9528.67	7813.48

Major interventions proposed for achieving the double digit growth are

Inland

- Adding 4000 ha area for Fresh water aquaculture by clearing pending fresh water applications for registration through DLC.
- To increase fish production in the irrigation tanks, Panchayat tanks and Prakasam barrage reservoir duly stocking advanced major crap finger lings.
- Stocking of Juvenile prawn in the irrigation tanks.
- Taking up of captive seed rearing units where there are big minor irrigation tanks.
- Promoting Tilapia and Vennamei culture by giving permissions.
- Establishment of labs for disease dignosis.
- Introduction of cage culture.
- Supporting the small and marginal farmers by providing subsidies for farm mechanization.

Brackish water

- By revival of 5000 ha abandoned brackish water tanks.
- By increasing productivity in the farms.
- By promoting alternative species culture like crabs, sea bass, Silver pompano etc.

Marine

- Promoting deep sea fishing.
- By providing fish finders and echo sounders.
- By providing sea safety equipment.
- Implementing ban period

4.4.7. Nellore

In Fisheries sector, focus was on Capacity building to reduce knowledge gaps, introduction of quality seeds free from diseases and pest particularly during early stage of growth and strengthening processing facility and value addition. However, due to water scarcity in ponds, the release of fish seedlings planned could not be implemented so far. However, once the ponds are filled, the fish seedlings as planned will be released.

In pilot sites, there are 3 Mandals i.e. T.P. Gudur, Indukurpet, Podalakur, out of these 3 mandals the Podalakur Mandal is in dry land situation, and Indukurpet is in Coastal situation, where as T.P. Gudur falls under I.D situation. In Indukurpet Mandal there is an extent of 387 ha. of Aquaculture whereas in T.P. Gudur Mandal the aquaculture activities is limited to 88 ha. The following are the interventions of the Department of Fisheries, in Indukurpet and T.P. Gudur Mandals. The Department of Fisheries has conducted four work shopes on the following dates for sustainability of the culture by promoting Good Management Practices (GMPs).

a) On 3.6.2015, Farmers interaction work shop was conducted at Minerva Grand Hotel, Nellore duly covering the pilot site farmers and explained in detail about selection of quality seed, feed and adoption of Good Management Practices.
b) On 31.7.2015 a meeting was conducted involving Hatchery operators of the District and stress the need of producing SPF L. Vannamei seed and Bio security methods.
c) On 1.8.2015 a meeting was conducted involving feed companies and Aqua farmers and emphasized the need of providing quality feed to the farmers at reasonable price. Processors have been requested to provide optimum price to the producers.

d) On 12.8.2015 a meeting was conducted covering Aquaculture Technicians and farmers and enlightened not to recommend and use spurious drugs and products having prohibited antibiotics.

Besides these, awareness camps were conducted in the pilot sites of Indukurpet, T.P. Gudur Mandals regarding the regularization of existing Aquaculture. As a result 293 number of farmers applied for license which were processed and 293 number of registrations issued by the Department and Coastal Aquaculture Authority (CAA), Chennai.

4.4.8. Prakasam

Prakasam district has very good potential for fishery sector to develop and contribute significantly to DDP. Fisheries department has planned to increase the present fishery area from 877.7 ha with an additional area of 600 ha. Department has identified 75 ha for improving breeder fish seed, 25 ha each in 3 revenue divisions.
DoF and ICRISAT involvement during 2015-16;

- Conducted field survey of hatcheries (21nos.) and aqua farmers with the fishery department (Figure 4.4.9.1).
- Established linkage between hatcheries and aqua farmers to supply SPF shrimp seed to farmers in Ongole and Kothapatnam mandal pilot villages.
- Conducting awareness meetings (4 nos.) on best management practices in aquaculture.

Figure 4.4.9.1. Fisheries activities in pilot villages

Progress in close collaboration with department

Fresh water fish production: 53 lakhs fingerlings were supplied to 700 tanks (212.4 ha) in the district (about 25 tanks in the pilot villages);

Brackish water aquaculture area in the district is 922.87 ha (Table 4.1.10.1) out of which 410 ha is under cultivation (344 farmers) and in the pilot villages (Fig. 4.1.10.1) is 170 ha (75 farmers and area increased by 16 ha over last year area) and 200 ha is planned for extension.

Table 4.1.10.1. Aquaculture status in Srikakulam district during 2015-16							
Total Aquaculture area in the District							
S.No.	Name of the Village	Brackish water		Fresh water		Total	
		No. of Farmers	Extent (ha)	No. of Farmers	Extent (ha)	No. of Farmers	Extent (ha)
I	**ETCHERLA MANDAL**						
1	Kuppili	37	40.46	0	0	37	40.46
2	Budagatlapalem	18	13.44	0	0	18	13.44
3	Bonthalakoduru	5	10.40	0	0	5	10
	Mandal Total	**60**	**64.30**	**0**	**0**	**60**	**64.30**
II	**SRIKAKULAM MANDAL**						
1	Mofasubandaru	14	14.35	0	0	14	14.35
2	Kallepalli	4	12.50	0	0	4	12.50
	Mandal Total	**18**	**26.85**	**0**	**0**	**18**	**26.85**
III	**GARA MANDAL**						
1	Thonangi	13	7.50	0	0	13	7.50
2	Vamaravalli	17	28.41	0	0	17	28.41
3	Nagaralapeta	3	2.00	0	0	3	2.00
4	Korlam	16	56.70	0	0	16	56.70
5	Vatchavalasa	6	14.50	0	0	6	14.50
6	Padapanipeta	10	8.20	0	0	10	8.20
7	Sunkarapalem	39	20.99	0	0	39	20.99
8	Srikurmam	27	19.47	0	0	27	19.47
9	Kurmanadhapuram	14	8.81	0	0	14	8.81
	Mandal Total	**145.00**	**166.58**	**0**	**0**	145	**166.58**
IV	**POLAKI MANDAL**						
1	D.L.Puram	36	88.7	0	0	36	88.7
2	Ampalam	23	29.01	0	0	23	29.01
3	Nandigam	4	10.95	0	0	4	10.95
	Mandal Total	**63**	**128.66**	**0**	**0**	**63**	**128.66**
V	**SANTHABOMMALI MANDAL**						
1	R.H.Puram	27	44.16	0	0	27	44.16
2	Seethanagaram	40	78.93	0	0	40	78.93
3	Mulapeta	66	69.25	0	0	66	69.25
4	Naupada	17	31.07	0	0	17	31.07
5	Meghavaram	1	32.86	0	0	1	32.86
6	Rajapuram	7	2.90	0	0	7	2.90
7	S.B.kotturu	3	2.66	0	0	3	2.66
8	Yamalapeta	1	2.00	0	0	1	2.00
9	Akasalakkavaram	0	0	1	1.56	1	1.56
	Mandal Total	**162**	**263.822**	**1**	**1.56**	**163**	**265.382**
VI	**TEKKALI MANDAL**						

Table 4.1.10.1. Aquaculture status in Srikakulam district during 2015-16							
Total Aquaculture area in the District							
S.No.	**Name of the Village**	**Brackish water**		**Fresh water**		**Total**	
		No. of Farmers	**Extent (ha)**	**No. of Farmers**	**Extent (ha)**	**No. of Farmers**	**Extent (ha)**
1	Patha Naupada	1	0.9	0	0	1	0.9
2	Kaspa Naupada	4	3.17			4	3.17
	Mandal Total	**5**	**4.07**	**0**	**0**	**5**	**4.07**
VII	**VAJRAPUKOTTURU MANDAL**						
1	Laxmidevipeta	4	3.59	0	0	4	3.59
2	Nagaralapeta	10	33.78			10	33.78
	Mandal Total	**14**	**37.37**	**0**	**0**	**14**	**37.37**
VIII	**SOMPETA MANDAL**						
1	Bhattigalluru	40	76.186	0	0	40	76.186
2	Nadumuru	3	2.74	0	0	3	2.74
3	Donkaluru	4	9.726	0	0	4	9.726
4	Ekavuru	4	6.18	0	0	4	6.18
5	Baruva	8	18.37	0	0	8	18.37
6	Mulapalem	14	23.12	0	0	14	23.12
7	Yekavuru	1	13.76	0	0	1	13.76
8	Uppalam	28	13.01	0	0	28	13.01
	Mandal Total	**102**	**163.092**	0	0	**102**	**163.092**
IX	**KAVITI MANDAL**						
1	Kusumpuram	1	3.40	0	0	1	3.40
2	Balliputtuga	3	16.05			3	16.05
	Mandal Total	**4**	**19.45**	**0**	**0**	**4**	**19.45**
X	**ICHAPURAM MANDAL**						
1	Donkuru	11	18.62	0	0	11	18.62
2	Burjapadu	34	30.06	0	0	34	30.06
	Mandal Total	**45**	**48.68**	**0**	**0**	**45**	**48.68**
XI	**KOTTURUMANDAL**						
1	Hamsa	0	0	2	10.72	2	10.72
2	Madanapuram	0	0	2	8.00	2	8.00
3	Vasapa	0	0	1	9.50	1	9.50
	Mandal Total	**0**	**0**	**5**	**28.22**	**5**	**28.22**
XII	**BHAMINI MANDAL**						
1	Thalada	0	0	4	22.70	4	22.70
	Mandal Total	**0**	**0**	**4**	**22.70**	**4**	**22.70**
XII	**HIRAMANDALAM MANDAL**						
1	Gulumuru	0	0	7	40.80	7	40.80
	Mandal Total	**0**	**0**	**7**	**40.80**	**7**	**40.80**
XIII	**SARUBUJJILI MANDAL**						

Table 4.1.10.1. Aquaculture status in Srikakulam district during 2015-16							
Total Aquaculture area in the District							
S.No.	Name of the Village	Brackish water		Fresh water		Total	
		No. of Farmers	Extent (ha)	No. of Farmers	Extent (ha)	No. of Farmers	Extent (ha)
1	Mulasavalapuram	0	0	4	10.70	4	10.70
	Mandal Total	**0**	**0**	**4**	**10.70**	**4**	**10.70**
XIV	**SARAVAKOTA MANDAL**						
1	Maluva	0	0	6	9.80	6	9.80
2	Navathala	0	0	3	6.00	3	6.00
	Mandal Total	**0**	**0**	**9**	**15.80**	**9**	**15.80**
XV	**PALAKONDA MANDAL**						
1	Thampatapalli	0	0	2	2.50	2	2.50
	Mandal Total	**0**	**0**	**2**	**2.50**	**2**	**2.50**
XVI	**VANGARA MANDAL**						
1	Magguru	0	0	2	28.00	2	28.00
	Mandal Total	**0**	**0**	**2**	**28.00**	**2**	**28.00**
XVII	**R.AMADALAVALASA MANDAL**						
1	Venkampeta	0	0	8	27.64	8	27.64
2	R.Amadalavalasa	0	0	4	13.48	4	13.48
3	Chelikanivalasa	0	0	2	6.84	2	6.84
4	Nayaralavalasa	0	0	2	12.48	2	12.48
5	Sankili	0	0	1	1.68	1	1.68
	Mandal Total	**0**	**0**	**17**	**62.12**	**17**	**62.12**
	DISTRICT TOTAL	**618**	**922.874**	**51**	**212.40**	**669**	**1135.27**

Figure. 4.1.10.1. Prawn cultivation in Ampalam (left) and Pallipeta (right) in Polaki Mandal

4.4.10 Vizianagaram

Solar conduction dryer for value addition

Solar dryer demonstrations were conducted for value addition of fishes in barripeta and puligedda village of Pusapatirega pilot mandal in Vizianagaram district (Table 4.4.12.1; figure

4.4.12.1). Over were 70 farmer's witnessed the demonstrations conducted. The drying time for fishes was reduced to one third of the time it took by traditional method. It was demonstrated that the clean product of fish earned higher value in the local market as appearance of dry fish was better than the traditional drying method.

The actual success can only be rated when farmer's/ SHGs show interest in investing into these technologies. However, due to the high initial cost, intense labour for cutting the commodities, there is potential for SHGs/ farmer interest groups and other community based organisations to take up solar drying in a big way in AP. There is a net benefit of increased incomes to farmers by adopting solar dryer technology. Being Zero energy consuming methodology, this solar dryer has potential for upscaling under Rythu Kosam project.

Table4.4.12.1. Solar Dryer Data				
1	Date	05.03.2016	14.03.2016	27.03.2016
2	District	Vijayanagaram	Vijayanagaram	Vijayanagaram
3	Mandal	Pusapatirega	Pusapatirega	Pusapatirega
4	Village	Barripeta	Puligedda	Barripeta
5	Farmer/ Farmers Name	Nookaraju A	Saraya bhuyi	Radhamma
6	Name of Veg/Fruit/Fish	Fish	Fish	Fish
7	Weight in kg (before drying)	12	8	10
8	Value of the product in Rs.	280	200	360
9	Start time	11.00am	09.00am	10.00am
10	End time	11.03.2016	19.03.2016	31.03.2016
11	Sun shine hours	6-8	4-7	5-8
12	Total drying time in hrs	42	30	35
13	Weight in kg (after drying)	5.5	4.2	6.8
14	Value after drying in Rs.	400	380	420
15	Number of farmers attended	25	16	15

Figure 4.4.12.1. Barripeta village in Puspatirega mandal

Appendices

Appendix 1a: Soil fertility status of farmers' fields in Guntur district Pilot in Andhra Pradesh

District	Mandal	Village	% Low levels of org C	% deficiency of available nutrients										No of samples
				P	K	Ca	Mg	S	Zn	B	Fe	Cu	Mn	
Guntur	Kollur	Chilumuru	50	28	0	0	0	0	44	0	0	0	0	18
Guntur	Kollur	Chintallanka	17	0	0	0	0	0	17	0	0	0	0	6
Guntur	Kollur	Dhonepudi	15	6	0	0	0	0	18	3	0	0	0	33
Guntur	Kollur	Gajullanka	33	0	0	0	0	0	0	0	0	0	0	9
Guntur	Kollur	Ipur	10	6	0	0	0	0	6	0	3	0	0	31
Guntur	Kollur	Kollur	56	11	0	0	0	0	44	0	0	0	0	9
Guntur	Kollur	Potharlanka	28	0	0	0	0	0	0	0	0	0	0	18
Guntur	Kollur	Ravikampadu	47	0	0	0	0	0	16	0	0	0	0	19
Guntur	Kollur	Suggunalanka	33	0	0	0	0	0	17	0	0	0	0	6
Guntur	**Kollur Total**	**Kollur Total**	**28**	**7**	**0**	**0**	**0**	**0**	**17**	**1**	**1**	**0**	**0**	**149**
Guntur	Sattenapalli	Bhatluru	21	0	0	0	0	10	24	0	0	0	0	29
Guntur	Sattenapalli	DD Palem	40	7	0	7	0	0	93	0	0	0	0	15
Guntur	Sattenapalli	Gudipudi	83	4	0	0	0	0	78	0	9	0	0	46
Guntur	Sattenapalli	Kattamuru	57	10	0	0	0	17	60	7	13	0	0	30
Guntur	Sattenapalli	Nandigama	48	0	0	0	0	0	38	0	0	0	0	21
Guntur	Sattenapalli	Panidam	32	0	0	0	0	0	16	0	0	0	0	37
Guntur	Sattenapalli	Pedamakkena	61	0	0	0	0	13	39	0	0	0	0	23
Guntur	Sattenapalli	Rentapalla	78	22	0	0	0	6	78	0	17	0	0	18
Guntur	**Sattenapalli Total**	**Sattenapalli Total**	**53**	**5**	**0**	**0**	**0**	**5**	**51**	**1**	**5**	**0**	**0**	**219**
Guntur Total	**Guntur Total**	**Guntur Total**	**43**	**5**	**0**	**0**	**0**	**3**	**37**	**1**	**3**	**0**	**0**	**368**

Appendix 1b: Soil fertility status of farmers' fields in Prakasam district Pilot in Andhra Pradesh

District	Mandal	Village	% Low levels of org C	% deficiency of available nutrients										No of samples
				P	K	Ca	Mg	S	Zn	B	Fe	Cu	Mn	
Prakasam	Kanigiri	Baduguleru	58	25	2	10	0	38	88	10	6	2	0	52
Prakasam	Kanigiri	Challagirigalla	50	7	14	0	0	36	71	14	0	0	0	14
Prakasam	Kanigiri	Dirisivancha	20	0	0	0	0	0	40	0	0	0	0	10
Prakasam	Kanigiri	Gangugapenta	90	29	14	14	0	81	95	43	14	5	0	21
Prakasam	Kanigiri	Kammavaripalli	83	9	0	4	0	78	87	39	0	17	0	23
Prakasam	Kanigiri	Kothapalli	30	10	0	0	0	50	70	10	0	0	0	10
Prakasam	Kanigiri	Machavaram	100	13	0	0	0	88	100	38	0	0	0	8
Prakasam	Kanigiri	Nandanamarella	58	26	5	0	0	47	79	5	11	0	0	19
Prakasam	Kanigiri	P Kandrika	71	100	0	14	0	100	100	57	0	0	0	7
Prakasam	Kanigiri	Pattabhipuram	87	20	20	33	0	67	80	33	7	20	0	15
Prakasam	Kanigiri	Punugodu	68	37	0	0	0	63	68	37	16	21	0	19
Prakasam	Kanigiri	Yadavalli	42	42	0	0	0	39	74	11	5	2	0	62
Prakasam	**Kanigiri Total**	**Kanigiri Total**	**60**	**28**	**4**	**6**	**0**	**52**	**80**	**20**	**6**	**5**	**0**	**260**
Prakasam	Konakana Mitta	China Mana Gundam	96	7	7	87	9	96	93	63	2	15	2	46
Prakasam	Konakana Mitta	Gotla Gattu	100	9	0	100	0	100	73	73	0	9	0	11
Prakasam	Konakana Mitta	Nagam Palli	90	6	0	71	3	87	94	48	19	26	19	31
Prakasam	Konakana Mitta	Naidu Peta	100	22	26	100	37	98	85	96	0	37	0	46
Prakasam	Konakana Mitta	Salanuthala	98	23	2	91	16	98	88	79	2	28	2	43
Prakasam	Konakana Mitta	Velugonda Rayudi Palli	78	26	0	74	0	74	96	48	4	4	4	23
Prakasam	**Konakana Mitta Total**	**Konakana Mitta Total**	**95**	**16**	**8**	**88**	**15**	**93**	**90**	**71**	**5**	**23**	**5**	**200**
Prakasam	Ongole	Boddulurivaripalem	100	33	0	0	0	0	78	0	0	0	0	9
Prakasam	Ongole	Devaram Padu	100	0	0	0	0	0	100	0	0	0	0	5
Prakasam	Ongole	Gundayapalem	80	20	0	20	0	20	80	0	0	0	0	5
Prakasam	Ongole	Koppolu	83	0	0	0	0	33	67	0	0	0	0	6
Prakasam	**Ongole Total**	**Ongole Total**	**92**	**16**	**0**	**4**	**0**	**12**	**80**	**0**	**0**	**0**	**0**	**25**
Prakasam	**Prakasam Total**	**Prakasam Total**	**76**	**22**	**5**	**39**	**6**	**67**	**84**	**40**	**5**	**12**	**2**	**485**

Appendix 1c: Soil fertility status of farmers' fields in Nellore district Pilot in Andhra Pradesh

District	Mandal	Village	% Low levels of org C	% deficiency of available nutrients										No of samples
				P	K	Ca	Mg	S	Zn	B	Fe	Cu	Mn	
Nellore	Indukurpeta	Gangapatnam	58	15	8	23	0	0	15	4	0	15	38	26
Nellore	Indukurpeta	Jagadevipeta	21	14	7	0	0	0	29	0	0	0	0	14
Nellore	Indukurpeta	Mypadu	48	0	0	4	0	0	9	0	0	0	4	23
Nellore	**Indukurpeta Total**	**Indukurpeta Total**	**46**	**10**	**5**	**11**	**0**	**0**	**16**	**2**	**0**	**6**	**17**	**63**
Nellore	Podalakuru	Aldurthi	60	22	0	0	0	77	57	2	10	0	0	60
Nellore	Podalakuru	Kanuparthi	80	58	0	0	0	88	82	20	0	0	0	50
Nellore	Podalakuru	Marripalli	85	45	0	0	0	90	95	30	5	0	0	20
Nellore	Podalakuru	Mogalluru	35	20	0	3	0	60	53	13	10	0	0	40
Nellore	**Podalakuru Total**	**Podalakuru Total**	**63**	**35**	**0**	**1**	**0**	**78**	**68**	**13**	**6**	**0**	**0**	**170**
Nellore	T.P.Gudur	Jagadevipeta	18	5	0	0	0	0	23	0	0	0	0	22
Nellore	T.P.Gudur	Peduru	18	58	8	5	0	0	10	3	0	0	5	40
Nellore	T.P.Gudur	T.P.Gudur-1	23	43	0	8	0	0	15	0	0	0	0	40
Nellore	T.P.Gudur	T.P.Gudur-2	5	13	5	10	0	3	15	5	0	5	0	40
Nellore	T.P.Gudur	Varigonda	20	5	0	0	0	0	3	0	0	0	0	60
Nellore	**T.P.Gudur Total**	**T.P.Gudur Total**	**17**	**24**	**2**	**4**	**0**	**0**	**11**	**1**	**0**	**1**	**1**	**202**
Nellore Total	**Nellore Total**	**Nellore Total**	**39**	**26**	**2**	**4**	**0**	**31**	**34**	**6**	**3**	**1**	**3**	**435**

Appendix 1d: Soil fertility status of farmers' fields in Krishna district Pilot in Andhra Pradesh

District	Mandal	Village	% Low levels of org C	% deficiency of available nutrients										No of samples
				P	K	Ca	Mg	S	Zn	B	Fe	Cu	Mn	
Krishna	G Konduru	C.H.Madhavaram	100	0	0	0	0	0	75	25	0	0	0	4
Krishna	G Konduru	Chevutur	92	25	0	0	0	25	75	0	0	0	0	12
Krishna	G Konduru	G.Konduru	86	14	0	0	0	57	86	0	0	0	0	7
Krishna	G Konduru	Gaddamanugu	100	10	0	0	0	20	80	0	40	0	0	10
Krishna	G Konduru	Guiruraj Palem	92	8	0	25	0	8	50	0	0	0	0	12
Krishna	G Konduru	H.Mutyalampadu	100	0	0	0	0	0	100	0	0	0	0	1
Krishna	G Konduru	Kawluru	56	0	0	0	0	0	37	0	0	0	0	19
Krishna	G Konduru	Munagapadu	50	0	0	0	0	0	75	0	0	25	0	4
Krishna	G Konduru	Pinapaka	71	14	0	0	0	14	71	0	14	0	0	7
Krishna	G Konduru	Velagaleru	0	0	0	0	0	0	0	0	0	0	0	1
Krishna	G Konduru	Venkatapuram	100	13	0	0	0	47	80	13	0	0	0	15
Krishna	**G Konduru Total**	**G Konduru Total**	**82**	**10**	**0**	**3**	**0**	**20**	**65**	**3**	**5**	**1**	**0**	**92**
Krishna	Ghantasala	Kothapalli	30	0	0	0	0	0	15	0	0	0	0	20
Krishna	Ghantasala	Achampalem	25	0	0	0	0	0	42	8	0	0	0	12
Krishna	Ghantasala	Chittrupu	0	0	0	0	0	0	6	0	0	0	0	18
Krishna	Ghantasala	Daliparu	0	0	0	0	0	0	28	0	0	0	0	18
Krishna	Ghantasala	Ghantasala palem	0	0	0	0	0	0	0	0	0	0	0	17
Krishna	Ghantasala	Goginenipalem	0	0	0	0	0	0	36	0	0	0	0	14
Krishna	Ghantasala	Kodali	5	0	0	0	0	0	5	0	0	0	0	19
Krishna	Ghantasala	Papavinasanam	8	0	0	0	0	0	67	0	0	0	0	12
Krishna	Ghantasala	Srikakulam	23	0	0	0	0	0	46	0	0	0	0	13
Krishna	Ghantasala	Tadepalli	0	0	0	0	0	0	8	0	0	0	0	12
Krishna	Ghantasala	Teluguvaripalem	13	0	0	0	0	0	40	0	0	0	0	15
Krishna	Ghantasala	Vemulapalli	0	0	0	0	0	0	0	0	0	0	0	8
Krishna	**Ghantasala Total**	**Ghantasala Total**	**9**	**0**	**0**	**0**	**0**	**0**	**23**	**1**	**0**	**0**	**0**	**178**
Krishna Total	**Krishna Total**	**Krishna Total**	**34**	**3**	**0**	**1**	**0**	**7**	**37**	**1**	**2**	**0**	**0**	**270**

Appendix 1e: Soil fertility status of farmers' fields in West Godavari district Pilot in Andhra Pradesh

District	Mandal	Village	% Low levels of org C	% deficiency of available nutrients										No of samples
				P	K	Ca	Mg	S	Zn	B	Fe	Cu	Mn	
West Godavari	Akividu	Akividu	23	3	0	0	0	0	19	0	0	0	0	31
West Godavari	Akividu	Cherukumilli	0	0	0	0	0	0	5	0	0	0	0	20
West Godavari	Akividu	Dharmapuram	35	0	0	0	0	0	25	0	0	0	0	20
West Godavari	Akividu	Dumpagada	14	0	0	19	0	0	0	0	0	0	0	21
West Godavari	Akividu	I Bheemavaram	33	5	0	10	0	0	19	0	0	0	0	21
West Godavari	Akividu	Madivada	21	0	0	0	0	0	17	0	0	0	0	24
West Godavari	Akividu	Sidhapuram	5	0	0	0	0	0	15	0	0	0	0	40
West Godavari	Akividu	Taratava	0	0	0	0	0	0	0	0	0	0	0	2
West Godavari	**Akividu Total**	**Akividu Total**	**17**	**1**	**0**	**3**	**0**	**0**	**15**	**0**	**0**	**0**	**0**	**179**
West Godavari	Kamavarau Kota	Kkota	88	21	13	75	24	72	57	58	1	6	1	100
West Godavari	Kamavarau Kota	Ramannapalem	100	11	5	95	11	89	79	79	0	5	0	19
West Godavari	Kamavarau Kota	Yedavalli	89	20	20	83	46	60	49	40	0	3	0	35
West Godavari	**Kamavarau Kota Total**	**Kamavarau Kota Total**	**90**	**19**	**14**	**79**	**27**	**71**	**58**	**56**	**1**	**5**	**1**	**154**
West Godavari Total	**West Godavari Total**	**West Godavari Total**	**51**	**10**	**6**	**38**	**13**	**33**	**35**	**26**	**0**	**2**	**0**	**333**

Appendix 1f: Soil fertility status of farmers' fields in East Godavari district Pilot in Andhra Pradesh

District	Mandal	Village	% Low levels of org C	% deficiency of available nutrients										No of samples
				P	K	Ca	Mg	S	Zn	B	Fe	Cu	Mn	
East Godavari	Gangavaram	Amudalabanda	89	86	0	71	4	96	79	96	0	0	0	28
East Godavari	Gangavaram	Gangavaram	85	62	3	65	0	76	85	82	0	0	0	34
East Godavari	Gangavaram	Goragommi	41	41	0	76	6	47	53	59	0	0	0	17
East Godavari	Gangavaram	Kusumarai	80	40	20	60	10	75	75	80	0	5	0	20
East Godavari	Gangavaram	Lakkonda	59	53	0	70	0	88	48	86	0	0	0	64
East Godavari	Gangavaram	Pandrapottipalem	95	79	0	89	11	95	89	100	0	5	0	19
East Godavari	Gangavaram	Rajampalem	92	63	4	92	4	96	67	96	0	8	0	24
East Godavari	**Gangavaram Total**	**Gangavaram Total**	**75**	**60**	**3**	**73**	**3**	**84**	**67**	**86**	**0**	**2**	**0**	**206**
East Godavari	Yeleswaram	Bhadravaram	36	18	0	0	0	36	36	0	0	0	0	11
East Godavari	Yeleswaram	J Annavaram	76	40	12	24	0	60	76	36	4	4	0	25
East Godavari	Yeleswaram	Lingamparthi	10	3	0	3	0	54	23	5	0	0	0	39
East Godavari	Yeleswaram	Marriveedu	80	0	0	10	0	75	30	15	0	0	0	20
East Godavari	Yeleswaram	Peravaram	29	0	0	0	0	71	14	0	0	0	0	7
East Godavari	Yeleswaram	Ramanayyapeta	0	0	20	0	0	13	20	0	0	0	0	15
East Godavari	Yeleswaram	Siripuram	20	4	0	0	0	28	16	0	0	0	0	25
East Godavari	Yeleswaram	Yeleswaram	25	5	5	15	0	35	25	15	0	0	0	20
East Godavari	**Yeleswaram Total**	**Yeleswaram Total**	**34**	**9**	**4**	**7**	**0**	**47**	**31**	**10**	**1**	**1**	**0**	**162**
East Godavari Total	**East Godavari Total**	**East Godavari Total**	**57**	**38**	**4**	**44**	**2**	**68**	**52**	**53**	**0**	**1**	**0**	**368**

Appendix 1g: Soil fertility status of farmers' fields in Anantapur district Pilot in Andhra Pradesh

District	Mandal	Village	% Low levels of org C	% deficiency of available nutrients										No of samples
				P	K	Ca	Mg	S	Zn	B	Fe	Cu	Mn	
Anantapur	Penukonda	Gonipeta	100	76	28	45	0	93	97	93	3	21	0	29
Anantapur	Penukonda	Kondampalli	76	36	4	22	2	62	87	60	4	24	0	45
Anantapur	Penukonda	Settipalli	97	68	23	35	3	90	95	90	22	40	0	60
Anantapur	**Penukonda Total**	**Penukonda Total**	**90**	**59**	**18**	**33**	**2**	**81**	**93**	**81**	**12**	**31**	**0**	**134**
Anantapur	Raptadu	Ayyavaripally	91	9	0	64	0	91	82	45	0	9	0	11
Anantapur	Raptadu	G.Koythapally	65	6	0	18	0	76	82	29	24	12	0	17
Anantapur	Raptadu	Gandlaparthi	90	62	10	33	14	90	86	62	5	24	0	21
Anantapur	Raptadu	Gangulakunta	77	0	0	32	0	68	77	36	5	9	0	22
Anantapur	Raptadu	Gollapalli	84	12	0	28	0	92	88	28	8	16	0	25
Anantapur	Raptadu	Palbhavi	67	0	0	17	0	46	63	21	0	4	0	24
Anantapur	Raptadu	Pesarakunta	85	0	0	38	8	77	100	62	8	38	0	13
Anantapur	Raptadu	Pullalarevu	60	12	0	20	0	72	84	48	0	4	0	25
Anantapur	Raptadu	Raminepally	91	9	4	35	0	91	96	96	4	17	0	23
Anantapur	**Raptadu Total**	**Raptadu Total**	**78**	**13**	**2**	**29**	**2**	**77**	**83**	**47**	**6**	**14**	**0**	**181**
Anantapur	Kothhachervu	Yerrabali	59	18	0	6	0	41	76	12	35	29	0	17
Anantapur	Kothhachervu	Bandlapalli	64	18	18	9	0	64	73	36	18	27	0	11
Anantapur	**Kothhachervu Total**	**Kothhachervu Total**	**61**	**18**	**7**	**7**	**0**	**50**	**75**	**21**	**29**	**29**	**0**	**28**
Anantapur Total	**Anantapur Total**	**Anantapur Total**	**81**	**31**	**8**	**29**	**2**	**77**	**86**	**58**	**10**	**22**	**0**	**343**

Appendix 1h: Soil fertility status of farmers' fields in Chittoor district Pilot in Andhra Pradesh

District	Mandal	Village	% Low levels of org C	% deficiency of available nutrients										No of samples
				P	K	Ca	Mg	S	Zn	B	Fe	Cu	Mn	
Chittoor	Santipuram	121.Pedduru	55	13	10	32	0	26	19	52	3	10	3	31
Chittoor	Santipuram	30.Sonneganipalle	0	0	0	0	0	0	0	0	0	0	0	1
Chittoor	Santipuram	Bellakogilla	35	0	15	5	0	15	5	5	5	5	5	20
Chittoor	Santipuram	Bendamakuppam	58	11	16	26	0	26	37	42	0	11	0	19
Chittoor	Santipuram	Chinnaridoddi	82	43	29	21	4	89	39	82	0	4	0	28
Chittoor	Santipuram	Dandikuppam	75	21	18	14	0	43	32	71	0	0	0	28
Chittoor	Santipuram	Kadapalle	45	10	17	21	3	55	14	41	0	0	0	29
Chittoor	Santipuram	Kenumakulapalle	45	5	10	5	0	70	30	50	5	5	0	20
Chittoor	Santipuram	Konerukuppam	80	17	27	37	0	57	33	53	3	7	3	30
Chittoor	Santipuram	Settiballa	67	33	30	17	0	67	47	40	0	0	0	30
Chittoor	Santipuram	Sonneganipalle	41	7	3	24	0	28	10	41	7	7	7	29
Chittoor	Santipuram	Vadagandlapalle	67	13	37	37	0	67	40	63	0	0	0	30
Chittoor	**Santipuram Total**	**Santipuram Total**	**60**	**17**	**20**	**23**	**1**	**50**	**28**	**51**	**2**	**4**	**2**	**295**
Chittoor	V.Kota	Bairupalli	40	30	20	25	0	55	35	70	0	0	0	20
Chittoor	V.Kota	Balendrapalle	50	0	30	30	0	30	0	50	0	0	0	10
Chittoor	V.Kota	Bellakunta	40	20	25	85	0	55	15	80	0	5	0	20
Chittoor	V.Kota	Govindapuram	20	10	40	20	0	20	10	70	0	10	0	10
Chittoor	V.Kota	Gummireddypalli	65	18	30	18	0	45	20	83	0	0	0	40
Chittoor	V.Kota	Kumabarlapalle	50	0	20	40	0	60	0	50	0	0	0	10
Chittoor	V.Kota	P.Kallupalle	50	10	30	10	0	60	20	80	10	10	10	10
Chittoor	V.Kota	Pamuganipalli	70	30	10	20	0	70	30	100	0	0	0	10
Chittoor	V.Kota	Papepalli	30	0	10	20	0	20	0	90	0	0	0	10
Chittoor	V.Kota	Peddabarinepalle	25	5	5	15	0	35	10	35	0	5	0	20
Chittoor	V.Kota	Timmarajupuram	40	30	30	50	0	70	20	100	0	0	0	10
Chittoor	V.Kota	Yalakallu	40	20	20	20	0	40	20	100	0	0	0	5
Chittoor	V.Kota	YC Balendrapalle	80	40	80	80	0	100	0	80	0	0	0	5
Chittoor	V.Kota	Yerrinagipalle	55	30	25	55	0	75	10	85	0	0	0	20
Chittoor	**V.Kota Total**	**V.Kota Total**	**48**	**18**	**25**	**34**	**0**	**51**	**16**	**75**	**1**	**2**	**1**	**200**
Chittoor Total	**Chittoor Total**	**Chittoor Total**	**55**	**17**	**22**	**27**	**0**	**51**	**23**	**60**	**1**	**3**	**1**	**495**

Appendix 1i: Soil fertility status of farmers' fields in Kadapa district Pilot in Andhra Pradesh

District	Mandal	Village	% Low levels of org C	% deficiency of available nutrients										No of samples
				P	K	Ca	Mg	S	Zn	B	Fe	Cu	Mn	
Kadapa	B Mattam	Choudaryvaripalli	53	10	8	18	0	30	70	20	0	8	0	40
Kadapa	B Mattam	Dirasavancha	8	0	0	0	0	8	80	0	0	0	0	25
Kadapa	B Mattam	Godlaveedu	57	7	0	0	0	7	53	3	3	0	0	30
Kadapa	B Mattam	Gundapuram	39	17	0	0	0	0	67	0	0	0	0	18
Kadapa	B Mattam	Nagisettypalli	85	70	0	0	0	40	95	10	20	0	0	20
Kadapa	**B Mattam Total**	**B Mattam Total**	**48**	**17**	**2**	**5**	**0**	**18**	**71**	**8**	**4**	**2**	**0**	**133**
Kadapa	Porumamilla	Cherlagirigara	40	10	0	5	0	5	60	0	0	0	0	20
Kadapa	Porumamilla	Chinnaypalli (Siddavaram)	35	15	0	3	0	20	28	3	0	0	0	40
Kadapa	Porumamilla	Ganugapenta	84	8	0	16	0	36	68	4	0	0	0	25
Kadapa	Porumamilla	Repalle (Ganugapenta)	84	44	0	24	0	56	72	36	0	0	0	25
Kadapa	Porumamilla	Venkata Ramapuram	70	20	0	0	0	30	70	10	0	10	0	10
Kadapa	**Porumamilla Total**	**Porumamilla Total**	**59**	**19**	**0**	**10**	**0**	**29**	**54**	**10**	**0**	**1**	**0**	**120**
Kadapa	Sambepalli	Chinnabidiki (Settipalli)	79	21	7	79	0	100	64	79	0	21	0	14
Kadapa	Sambepalli	Chinnajangampalli (Settipalli)	96	32	44	76	0	96	92	92	0	56	0	25
Kadapa	Sambepalli	Gandlapadu (Settipalli)	40	10	0	0	0	0	20	0	0	0	0	10
Kadapa	Sambepalli	Guttapalli	90	0	5	70	0	100	55	85	0	5	0	20
Kadapa	Sambepalli	Kattaguttapalli (Devpatla)	87	17	0	83	0	91	78	70	0	13	0	23
Kadapa	Sambepalli	Motukuvandlapalli (Devpatla)	100	0	40	87	0	100	47	80	0	7	0	15
Kadapa	**Sambepalli Total**	**Sambepalli Total**	**86**	**15**	**18**	**71**	**0**	**88**	**65**	**74**	**0**	**21**	**0**	**107**
Kadapa	Veeraballi	Matli	42	4	4	29	0	42	54	13	4	0	0	24
Kadapa	Veeraballi	Tatiguntapalli (Matli)	92	28	0	44	0	92	56	40	36	20	0	25
Kadapa	Veeraballi	Veeraballi	83	47	0	47	7	73	87	53	13	3	0	30
Kadapa	Veeraballi	Gurappagaripalem (Veeraballi)	0	0	0	0	0	0	0	0	0	0	0	30
Kadapa	**Veeraballi Total**	**Veeraballi Total**	**53**	**20**	**1**	**29**	**2**	**50**	**49**	**27**	**13**	**6**	**0**	**109**
Kadapa Total	**Kadapa Total**	**Kadapa Total**	**61**	**18**	**5**	**27**	**0**	**44**	**60**	**28**	**4**	**7**	**0**	**469**

Appendix 1j: Soil fertility status of farmers' fields in Kurnool district Pilot in Andhra Pradesh

District	Mandal	Village	% Low levels of org C	% deficiency of available nutrients										No of samples
				P	K	Ca	Mg	S	Zn	B	Fe	Cu	Mn	
Kurnool	Banaganpalli	Applapuram	90	54	0	0	0	50	96	0	0	0	0	50
Kurnool	Banaganpalli	Kypa	95	52	0	0	0	29	76	5	14	0	0	21
Kurnool	Banaganpalli	Nandavaram	83	47	2	0	0	29	76	2	4	2	0	49
Kurnool	Banaganpalli	Pandlapuram	68	43	0	0	0	35	59	3	0	0	0	37
Kurnool	Banaganpalli	Sankalapuram	100	57	0	0	0	29	86	0	0	0	0	7
Kurnool	Banaganpalli	Venkata puram	78	46	0	0	0	60	80	6	0	0	0	50
Kurnool	**Banaganpalli Total**	**Banaganpalli Total**	**83**	**49**	**0**	**0**	**0**	**42**	**79**	**3**	**2**	**0**	**0**	**214**
Kurnool	Devanakonda	Devanakonda	88	2	2	25	0	65	50	33	2	0	0	48
Kurnool	Devanakonda	K.Venkatapuram	100	39	11	22	0	67	100	28	0	17	0	18
Kurnool	Devanakonda	Kukatikonda	99	9	4	61	3	72	90	66	3	24	0	67
Kurnool	Devanakonda	Nelathalamarri	96	9	1	59	1	68	91	72	1	25	0	96
Kurnool	**Devanakonda Total**	**Devanakonda Total**	**95**	**10**	**3**	**50**	**1**	**68**	**83**	**59**	**2**	**19**	**0**	**229**
Kurnool Total	**Kurnool Total**	**Kurnool Total**	**89**	**29**	**2**	**26**	**1**	**56**	**81**	**32**	**2**	**10**	**0**	**443**

Appendix 1k: Soil fertility status of farmers' fields in Vizianagaram district Pilot in Andhra Pradesh

District	Mandal	Village	% Low levels of org C	% deficiency of available nutrients										No of samples
				P	K	Ca	Mg	S	Zn	B	Fe	Cu	Mn	
Vizianagaram	Parvathipuram	Challam Valasa	38	48	10	43	5	48	71	86	0	0	0	21
Vizianagaram	Parvathipuram	D.Mulaga	47	24	12	18	0	41	71	94	0	0	0	17
Vizianagaram	Parvathipuram	Dokiseela	71	76	10	88	14	84	73	76	0	10	0	51
Vizianagaram	Parvathipuram	Gangapuram	40	63	50	83	7	63	63	47	0	0	0	30
Vizianagaram	Parvathipuram	Gochekka	50	38	17	71	4	67	38	75	0	0	0	24
Vizianagaram	Parvathipuram	Kavitibadra	32	52	56	40	0	80	84	52	0	0	0	25
Vizianagaram	Parvathipuram	Kore	52	80	44	48	4	52	68	52	0	8	0	25
Vizianagaram	Parvathipuram	Mulaga	68	48	9	45	0	86	77	89	0	2	0	56
Vizianagaram	**Parvathipuram Total**	**Parvathipuram Total**	**54**	**57**	**23**	**59**	**5**	**71**	**69**	**73**	**0**	**3**	**0**	**249**
Vizianagaram	Pusapatirega	Bharinikam	75	8	0	33	0	25	50	8	0	0	0	12
Vizianagaram	Pusapatirega	Chinatapalli	69	13	0	63	0	6	25	13	0	0	0	16
Vizianagaram	Pusapatirega	Chouduwada	100	0	0	50	0	0	100	50	0	0	0	2
Vizianagaram	Pusapatirega	Govindhapuram	43	10	0	28	0	8	63	10	0	0	0	40
Vizianagaram	Pusapatirega	Gumpam	69	25	0	13	0	38	88	0	0	0	0	16
Vizianagaram	Pusapatirega	Kollayyavalasa	80	25	0	55	0	85	35	40	0	0	0	20
Vizianagaram	Pusapatirega	Konayyapalem	50	0	10	30	0	20	50	10	0	10	0	10
Vizianagaram	Pusapatirega	Krishnapuram	100	13	13	63	0	100	63	13	0	0	0	8
Vizianagaram	Pusapatirega	Palanki	80	10	0	60	0	40	30	0	0	0	0	10
Vizianagaram	Pusapatirega	Pasupam	58	33	0	25	0	33	58	0	0	0	0	12
Vizianagaram	Pusapatirega	Pathivada	73	14	0	59	0	32	23	27	0	9	0	22
Vizianagaram	Pusapatirega	Pusapatirega	21	12	0	9	0	9	35	0	0	0	0	34
Vizianagaram	Pusapatirega	Roluchappidi	17	0	0	17	0	0	17	0	0	0	0	6
Vizianagaram	Pusapatirega	Tottadam	58	8	0	33	0	33	42	8	0	0	0	12
Vizianagaram	Pusapatirega	Vempadam	77	20	0	23	0	43	50	3	0	0	0	30
Vizianagaram	**Pusapatirega Total**	**Pusapatirega Total**	**59**	**14**	**1**	**34**	**0**	**30**	**46**	**10**	**0**	**1**	**0**	**250**
Vizianagaram Total	**Vizianagaram Total**	**Vizianagaram Total**	**57**	**35**	**12**	**46**	**2**	**50**	**58**	**41**	**0**	**2**	**0**	**499**

Appendix 1l: Soil fertility status of farmers' fields in Srikakulum district Pilot in Andhra Pradesh

District	Mandal	Village	% Low levels of org C	% deficiency of available nutrients										No of samples
				P	K	Ca	Mg	S	Zn	B	Fe	Cu	Mn	
Srikakulam	Polaki	Ambeerupeta	14	0	0	14	0	14	0	29	0	0	0	7
Srikakulam	Polaki	Ampalam	22	11	11	22	0	22	22	11	0	0	0	9
Srikakulam	Polaki	Belamara	36	21	14	64	7	43	57	50	0	7	0	14
Srikakulam	Polaki	Chitapanapeta	0	33	0	0	0	67	33	0	0	0	0	3
Srikakulam	Polaki	Dandulakshmipuram	48	43	13	48	4	30	48	26	0	0	0	23
Srikakulam	Polaki	Guppadipeta	75	25	0	100	0	0	25	0	0	0	0	4
Srikakulam	Polaki	Koduru	100	14	43	100	0	57	71	86	0	0	0	7
Srikakulam	Polaki	Kottarevu	82	82	29	88	29	59	65	65	0	29	0	17
Srikakulam	Polaki	Magatapadu	100	27	73	82	0	36	100	45	0	0	0	11
Srikakulam	Polaki	Mettapeta	20	20	0	20	0	0	60	20	0	0	0	5
Srikakulam	Polaki	Nandigam	40	40	20	40	0	100	60	20	0	0	0	5
Srikakulam	Polaki	Palavalasa	50	0	0	50	0	0	0	50	0	0	0	4
Srikakulam	Polaki	Pallipeta	50	0	0	50	0	50	0	50	0	0	0	2
Srikakulam	Polaki	Polaki	21	7	3	21	0	10	24	10	0	0	0	29
Srikakulam	Polaki	Priyagraharam	43	29	36	57	0	14	36	57	0	0	0	14
Srikakulam	Polaki	Rajapuram	50	50	0	100	25	75	50	75	0	25	0	4
Srikakulam	Polaki	Sathraopeta	29	57	0	57	0	21	79	0	0	0	0	14
Srikakulam	Polaki	Susaram	38	50	0	25	0	13	50	25	0	0	0	8
Srikakulam	Polaki	Urjam	13	25	0	13	0	13	0	0	0	0	0	8
Srikakulam	**Polaki Total**	**Polaki Total**	**44**	**31**	**15**	**49**	**4**	**29**	**45**	**31**	**0**	**4**	**0**	**188**
Srikakulam	Ranasthalam	Akkayapalem	100	0	0	77	0	69	31	8	0	0	0	13
Srikakulam	Ranasthalam	Bantupalli	40	0	0	40	0	0	20	0	0	0	0	5
Srikakulam	Ranasthalam	Boiapalem	75	0	0	50	0	100	50	25	0	0	0	4
Srikakulam	Ranasthalam	Chillapeta Rajam	83	21	4	83	0	71	42	21	0	8	0	24
Srikakulam	Ranasthalam	Kambalapeta	100	0	0	100	0	0	0	33	0	0	0	3
Srikakulam	Ranasthalam	Kondamulagam	29	7	0	50	0	21	0	14	0	0	0	14
Srikakulam	Ranasthalam	Kosta	83	0	17	100	0	83	0	67	0	0	0	6
Srikakulam	Ranasthalam	Kotapalem	100	0	43	86	0	43	57	29	0	29	0	7
Srikakulam	Ranasthalam	Maruvada	50	0	0	0	0	25	75	0	0	0	0	4
Srikakulam	Ranasthalam	Mentada	100	55	18	86	0	77	45	18	0	5	0	22

District	Mandal	Village	% Low levels of org C	% deficiency of available nutrients										No of samples
				P	K	Ca	Mg	S	Zn	B	Fe	Cu	Mn	
Srikakulam	Ranasthalam	Nakkalapeta	100	17	33	100	0	50	67	0	0	0	0	6
Srikakulam	Ranasthalam	Naruva	91	4	13	78	0	52	17	17	0	4	0	23
Srikakulam	Ranasthalam	NeelamPeta	14	0	0	71	0	0	86	0	0	0	0	7
Srikakulam	Ranasthalam	Pittapalem	100	0	0	100	0	83	17	17	0	17	0	6
Srikakulam	Ranasthalam	Pydibheemavaram	80	0	20	100	0	40	60	60	0	0	0	5
Srikakulam	Ranasthalam	Ranasthalam	100	0	0	100	0	0	0	0	0	0	0	5
Srikakulam	Ranasthalam	Sancham	75	6	0	38	0	38	75	0	0	0	0	16
Srikakulam	Ranasthalam	Teppalavalasa	75	50	25	100	0	75	100	0	0	0	0	4
Srikakulam	Ranasthalam	Varisam	73	18	27	91	0	55	55	9	0	9	0	11
Srikakulam	**Ranasthalam Total**	**Ranasthalam Total**	**79**	**14**	**10**	**76**	**0**	**52**	**40**	**16**	**0**	**4**	**0**	**185**
Srikakulam	Seethampeta	Addakulagudem	33	0	0	0	0	100	0	33	0	0	0	3
Srikakulam	Seethampeta	Akkannaguda	50	67	0	0	0	50	50	50	0	0	0	6
Srikakulam	Seethampeta	Anthikonda	0	0	0	0	0	0	0	0	0	0	0	4
Srikakulam	Seethampeta	Belamada	67	33	0	67	0	100	0	100	0	0	0	3
Srikakulam	Seethampeta	Chinnarama	100	100	67	67	0	100	0	100	0	0	0	3
Srikakulam	Seethampeta	Devanapuram	100	67	0	100	0	100	0	100	0	0	0	3
Srikakulam	Seethampeta	Donubhai	17	67	33	33	0	83	17	50	0	0	0	6
Srikakulam	Seethampeta	Haddubangi	83	50	0	50	17	100	17	100	0	0	0	6
Srikakulam	Seethampeta	Jilledupadu	50	50	50	25	0	75	25	75	0	0	0	4
Srikakulam	Seethampeta	Kuddapalli	67	33	0	67	0	100	0	100	0	0	0	3
Srikakulam	Seethampeta	Kusimi	60	60	20	40	0	60	0	80	0	0	0	5
Srikakulam	Seethampeta	Mutyalu	0	0	0	0	0	20	0	60	0	0	0	5
Srikakulam	Seethampeta	Peddarama	100	100	100	100	0	100	0	100	0	0	0	3
Srikakulam	Seethampeta	Pedduru	67	100	0	0	0	67	33	67	0	0	0	3
Srikakulam	Seethampeta	Puliputti	75	88	0	38	0	63	25	50	0	0	0	8
Srikakulam	Seethampeta	Santhamalli	100	67	0	67	0	100	0	100	0	0	0	3
Srikakulam	Seethampeta	Seethampeta	33	0	0	33	0	100	0	67	0	0	0	3
Srikakulam	Seethampeta	Valagedda	67	0	0	0	0	100	0	100	0	0	0	3
Srikakulam	**Seethampeta Total**	**Seethampeta Total**	**57**	**51**	**14**	**35**	**1**	**74**	**12**	**70**	**0**	**0**	**0**	**74**
Srikakulam Total	**Srikakulam Total**	**Srikakulam Total**	**61**	**27**	**13**	**58**	**2**	**46**	**38**	**31**	**0**	**3**	**0**	**447**

Appendix 1m: Soil fertility status of farmers' fields in Visakhapatnam district Pilot in Andhra Pradesh

District	Mandal	Village	% Low levels of org C	% deficiency of available nutrients										No of samples
				P	K	Ca	Mg	S	Zn	B	Fe	Cu	Mn	
Visakhapatnam	Butchayyapeta	Chinna Madina	85	15	15	54	0	85	46	46	0	8	0	13
Visakhapatnam	Butchayyapeta	Chittiyyapalem	60	60	30	60	0	70	40	50	0	0	0	10
Visakhapatnam	Butchayyapeta	Gunnempudi	64	32	5	32	0	68	77	14	0	0	0	22
Visakhapatnam	Butchayyapeta	Kandipudi	75	38	0	38	0	88	88	38	0	0	0	8
Visakhapatnam	Butchayyapeta	Neelakantapuram	75	25	0	25	0	50	75	25	0	0	0	4
Visakhapatnam	Butchayyapeta	Rajam	49	21	0	23	0	56	59	18	0	3	0	39
Visakhapatnam	Butchayyapeta	Turakalapudi	68	57	4	29	0	64	82	18	0	7	0	28
Visakhapatnam	Butchayyapeta	R . Bhima varam	56	40	4	44	0	84	72	28	0	0	0	25
Visakhapatnam	Butchayyapeta	R.SIVARAM PURAM	25	25	13	88	0	100	63	25	0	0	0	8
Visakhapatnam	Butchayyapeta	TYPURAM	40	40	20	40	0	40	80	20	0	0	0	5
Visakhapatnam	**Butchayyapeta Total**	**Butchayyapeta Total**	**59**	**35**	**6**	**38**	**0**	**70**	**68**	**25**	**0**	**2**	**0**	**162**
Visakhapatnam	Chintapalli	Anajalam	0	33	0	67	0	67	33	0	0	0	0	3
Visakhapatnam	Chintapalli	Busalakota	33	58	0	67	0	92	50	67	0	0	0	12
Visakhapatnam	Chintapalli	Lammasingi	0	75	0	30	0	100	20	30	0	0	0	20
Visakhapatnam	Chintapalli	Pakabu	0	10	10	70	0	80	40	60	0	0	0	10
Visakhapatnam	Chintapalli	Sanivaram	0	57	0	71	0	93	43	50	0	0	0	14
Visakhapatnam	Chintapalli	Vangasari	0	0	0	50	0	83	0	17	0	0	0	6
Visakhapatnam	Chintapalli	Tajangi	0	58	0	97	0	100	52	52	0	0	0	33
Visakhapatnam	**Chintapalli Total**	**Chintapalli Total**	**4**	**52**	**1**	**69**	**0**	**94**	**39**	**46**	**0**	**0**	**0**	**98**
Visakhapatnam	Padmanabham	Venkatapuram	100	25	13	75	0	100	63	75	0	0	0	8
Visakhapatnam	Padmanabham	Ayinada	27	0	0	0	0	64	9	9	0	0	0	22

District	Mandal	Village	% Low levels of org C	% deficiency of available nutrients										No of samples
				P	K	Ca	Mg	S	Zn	B	Fe	Cu	Mn	
Visakhapatnam	Padmanabham	B Tallavalasa	0	6	0	0	0	69	0	0	0	0	0	16
Visakhapatnam	Padmanabham	Korada	69	62	0	4	0	96	81	15	0	0	0	26
Visakhapatnam	Padmanabham	Revidi	45	5	0	5	0	60	25	20	0	0	0	20
Visakhapatnam	Padmanabham	Kurapalli (Pandrangi)	33	17	0	0	0	100	100	33	0	0	0	6
Visakhapatnam	Padmanabham	Pandrangi	71	11	0	22	0	91	33	44	0	0	0	55
Visakhapatnam	Padmanabham	Samivalasa (Pandrangi)	50	25	0	25	0	100	25	50	0	0	0	4
Visakhapatnam	Padmanabham	Venkatapuram	0	0	0	0	0	67	0	0	0	0	0	3
Visakhapatnam	Padmanabham	Yenugupalem (Pandrangi)	50	50	0	0	0	100	50	50	0	0	0	2
Visakhapatnam	**Padmanabham Total**	**Padmanabham Total**	**52**	**18**	**1**	**13**	**0**	**83**	**36**	**28**	**0**	**0**	**0**	**162**
Visakhapatnam Total	**Visakhapatnam Total**	**Visakhapatnam Total**	**44**	**32**	**3**	**36**	**0**	**80**	**49**	**31**	**0**	**1**	**0**	**422**
AndhraPradesh	**Grand Total (AP)**	**Grand Total (AP)**	**58**	**23**	**7**	**30**	**2**	**48**	**52**	**33**	**2**	**5**	**1**	**5393**

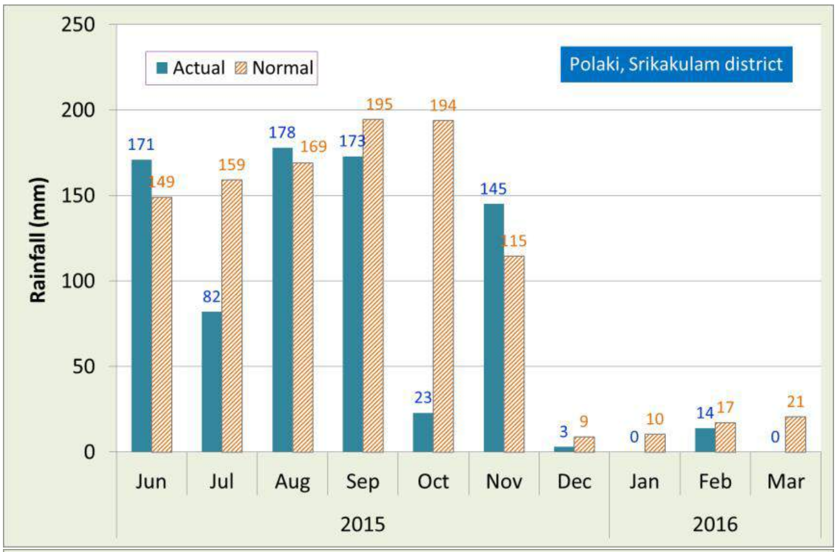
Appendix 2: Mandal wise detail of soil samples collection from fruit orchards in Andhra Pradesh.

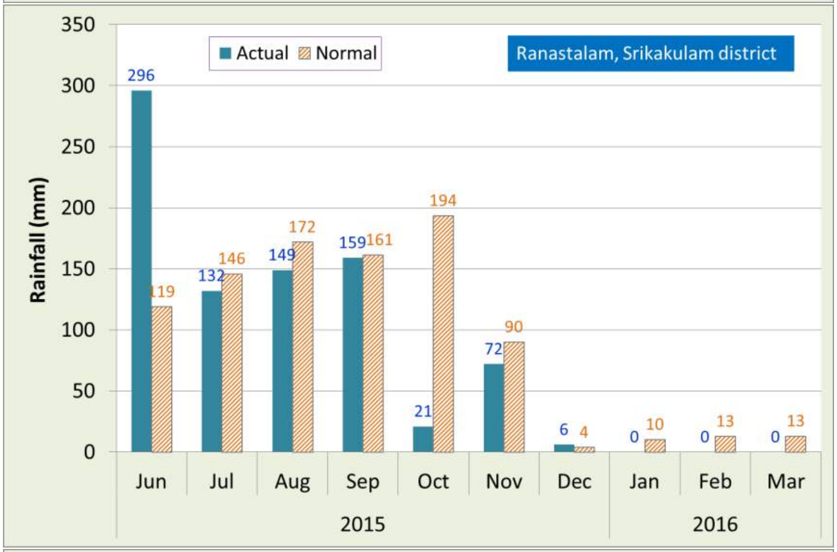
District	**Mandal**	**Target soil samples to be collected (no)**
Guntur	Bhattiprolu	59
	Kollipara	68
	Kolluru	52
	Mangalagiri	15
	Peda kakani	4
	Tadepalli	4
Krishna	Agiripalli	381
	Avanigadda	9
	Bapulapadu	66
	Challapalli	4
	Chatrai	45
	G.Konduru	86
	Gannavaram	67
	Jaggaiahpeta	12
	Kruthivennu	14
	Musunuru	247
	Mylavaram	191
	Nandigama	12
	Nuzvid	756
	Penuganchiprolu	70
	Reddygudem	264
	Thotlavalluru	18
	Tiruvuru	144
	Vijayawada Rural	68
	Vissannapeta	153
West Godavari	Kamavarapukota	67
	Denduluru	4
	Lingapalem	23
	T.Narasapuram	44
	Devarapalli	70
	Chintalapudi	103
	Elamanchili	59
	Nallajerla	33
	Pedavegi	183
	Tadepalligudem	5
	Mogalturu	53
	Jangareddygudem	4

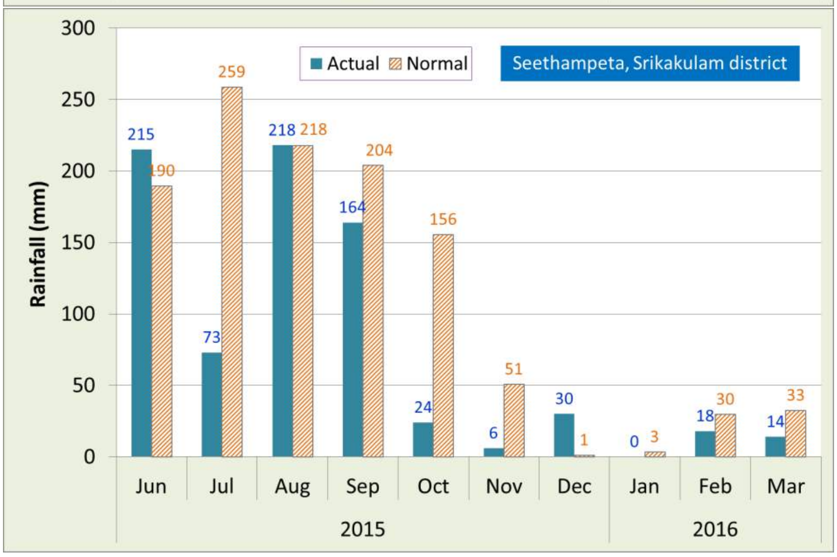
District	Mandal	Target soil samples to be collected (no)
East Godavari	Amalapuram	74
	Gollaprolu	5
	I.Polavaram	67
	Kotananduru	59
	Malikipuram	75
	Parthipadu	41
	Pithapuram	2
	Rowthulapudi	42
	Sakinetipalli	55
	Sankhavaram	43
	Tallarevu	17
	Thondangi	110
	Tuni	54
	Uppalaguptam	20
	Alamuru	9
	Ambajipeta	440
	Atreyapuram	66
	Biccavolu	6
	Gandepalli	51
	Gokavaram	15
	Jaggampeta	7
	Kapileswarapuram	21
	Korukonda	26
	Kothapeta	123
	Mandapeta	17
	P.Gannavaram	149
	Rajamundry	18
	Rajanagaram	135
	Rangampeta	53
	Ravulapalem	81
	Seethanagaram	5
Visakhapatnam	Anakapalli	4
	Anandapuram	54
	Bhemmunipatnam	6
	Devarapalli	9
	K.Kotapadu	41
	Kasimkota	21
	Munagapaka	4
	Padmanabham	21

District	Mandal	Target soil samples to be collected (no)
	Paravada	4
	Ravikamatham	5
	Sabbavaram	15
Vizianagaram	Badangi	39
	Bhogapuram	53
	Bobbili	16
	Cheepurupalli	21
	Denkada	10
	Gantyada	159
	Garividi	40
	Gurla	31
	Jami	29
	Jiyyammavalasa	45
	Kothavalasa	107
	L.Kota	11
	Marakamudidam	169
	Parvathipuram	19
	Pusapatirega	40
	Ramabadrapuram	29
	S.Kota	5
	Saluru	31
	Seetanagaram	5
	Therlam	45
	Vepada	4
Srikakulum	Etcherla	21
	Kanchili	51
	Kaviti	126
	Mandasa	130
	Narasannapeta	20
	Palasa	48
	Pathapatnam	9
	Polaki	9
	Ranasthalam	59
	Seethampeta	39
	Sompeta	15
	Kotturu	138

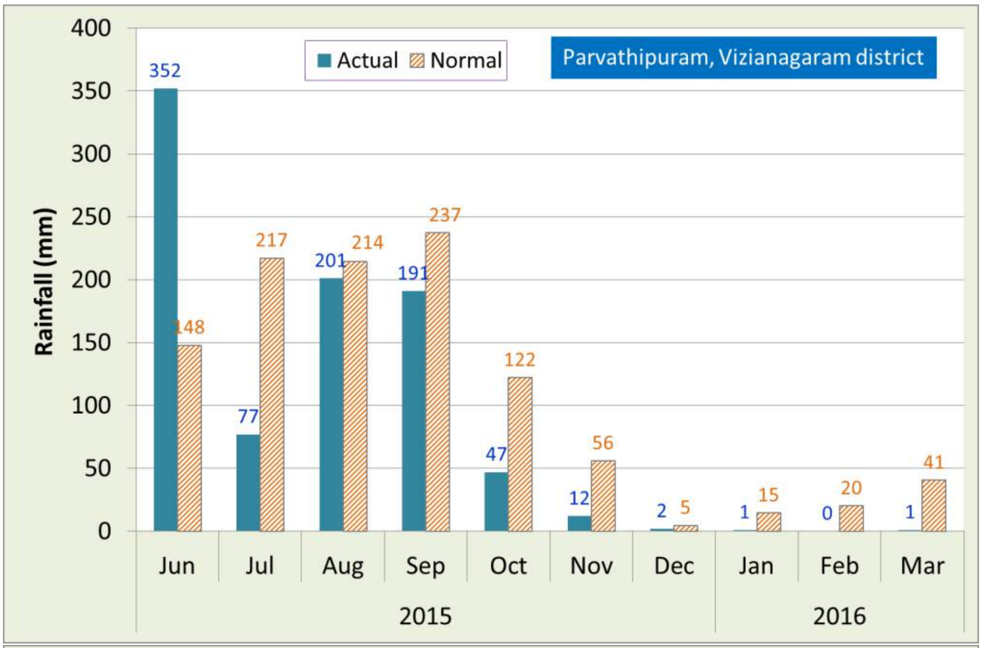
Appendix 3a.Monthly Rainfall status in Srikakulam pilot sites during 2015-16

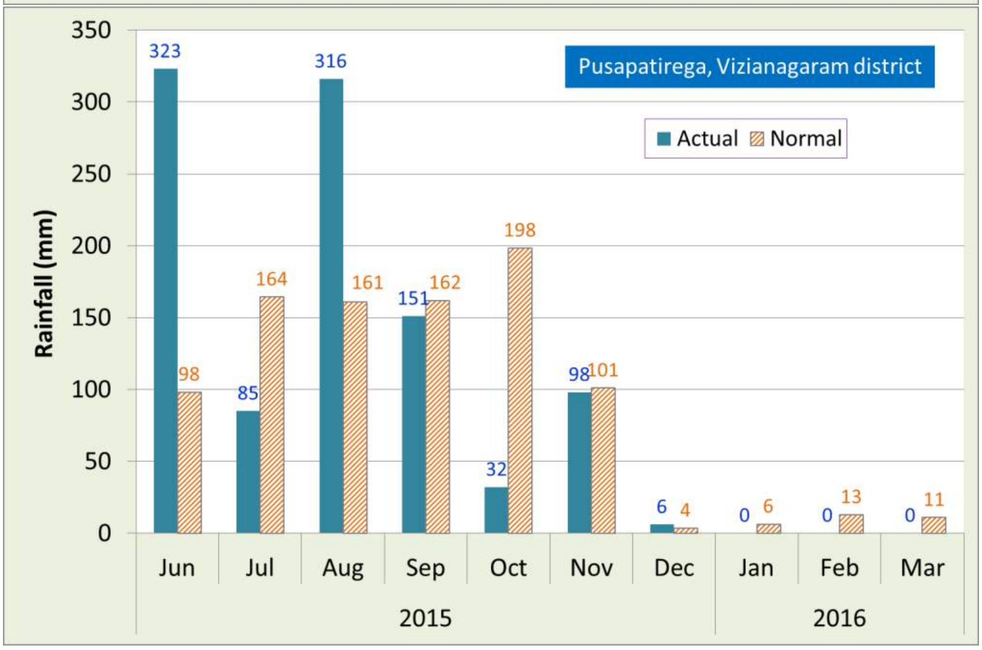




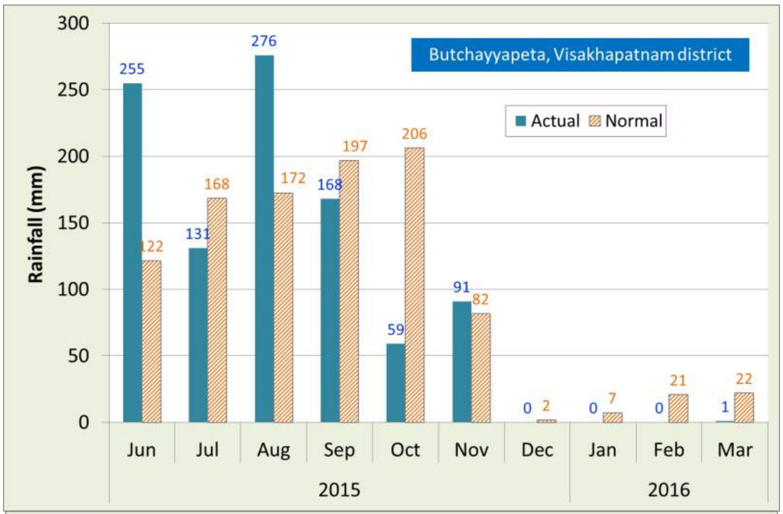


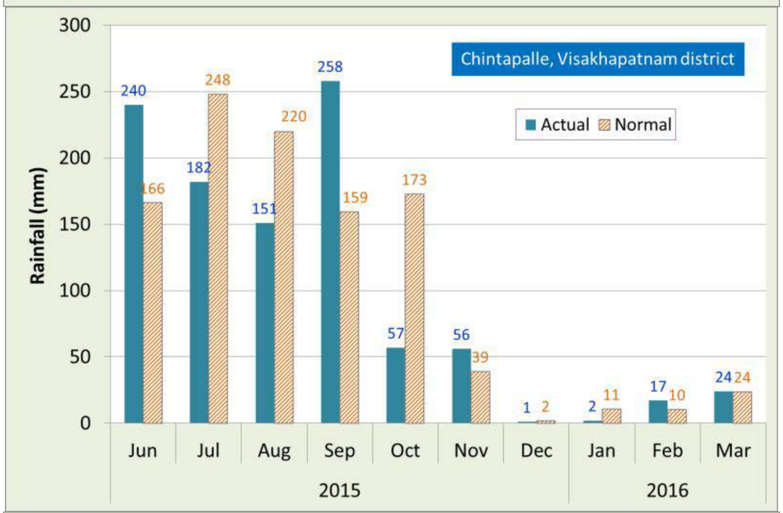
Appendix 3b. Monthly Rainfall status in Vizianagaram pilot sites during 2015-16

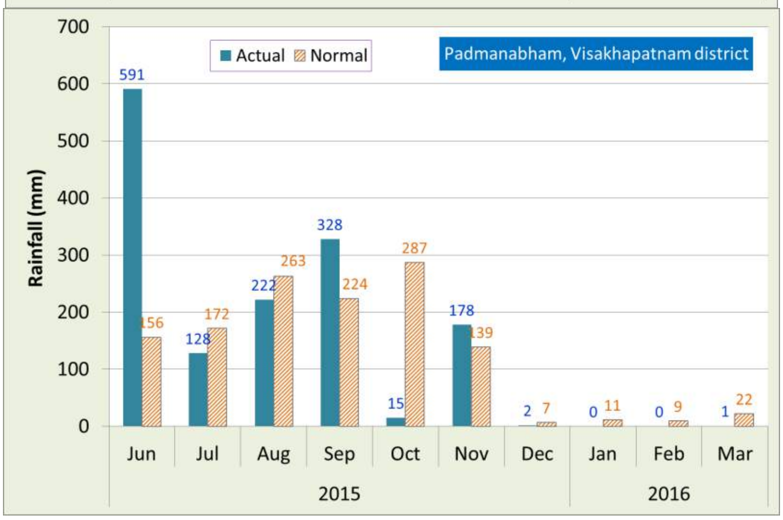




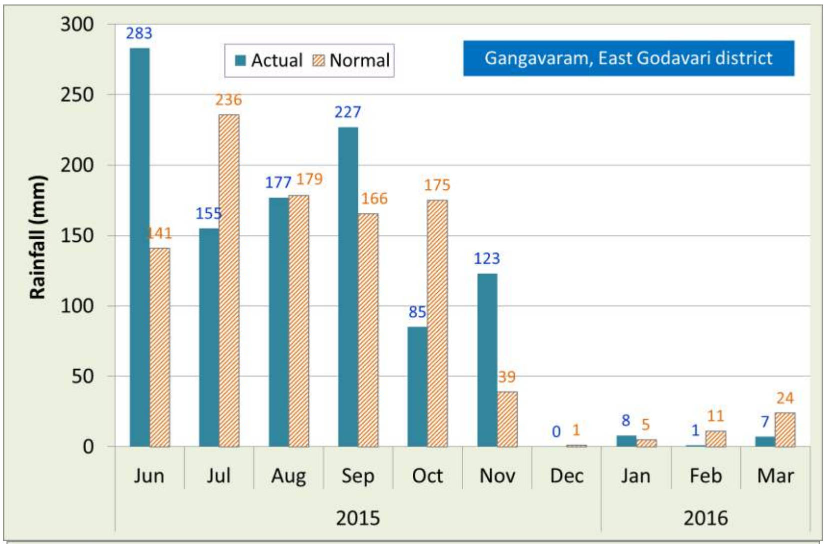
Appendix 3c. Monthly Rainfall status in Visakhapatnam pilot sites during 2015-16

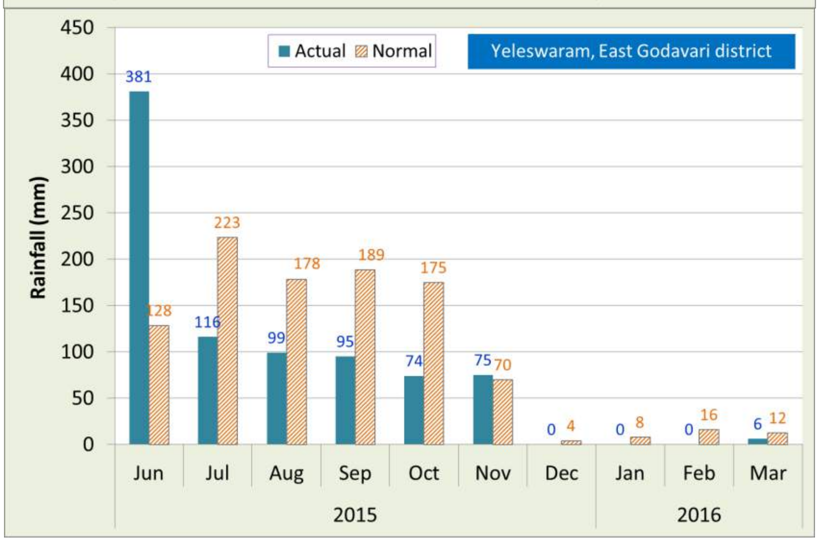




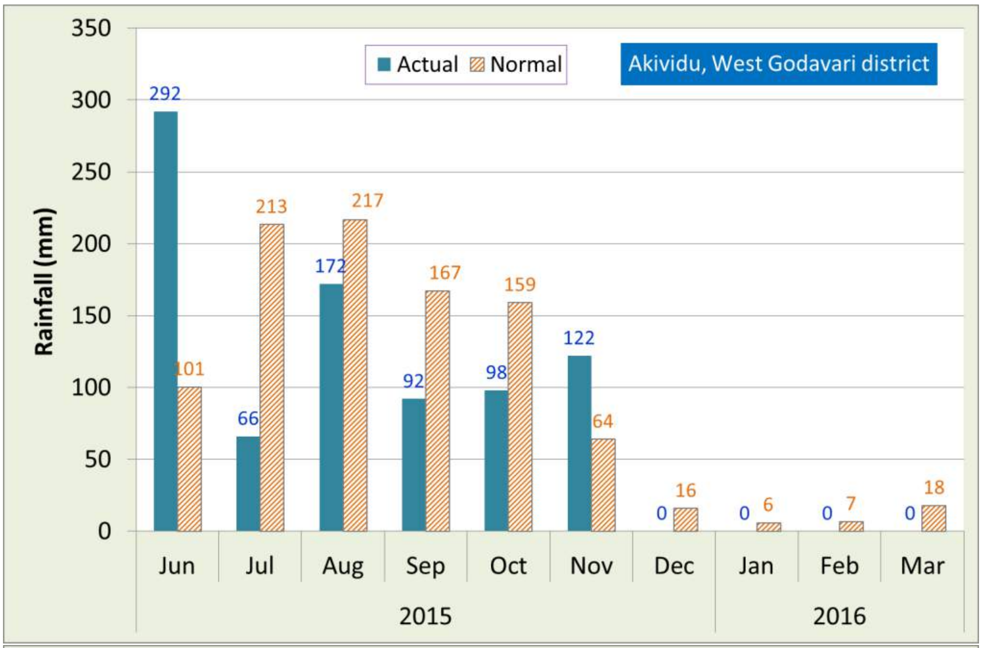


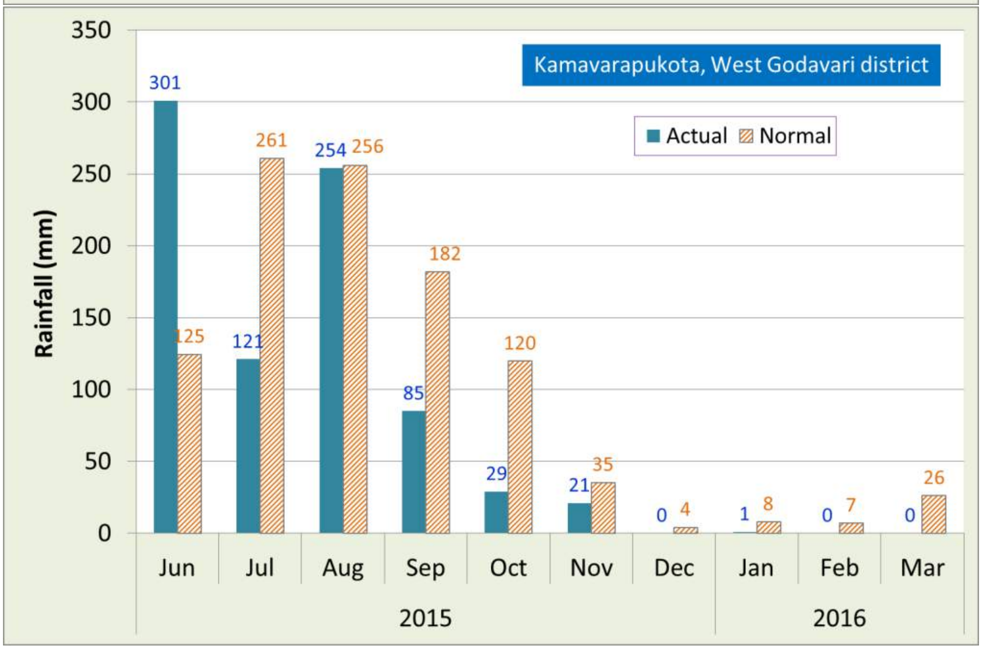
Appendix 3d. Monthly Rainfall status in East Godavari pilot sites during 2015-16



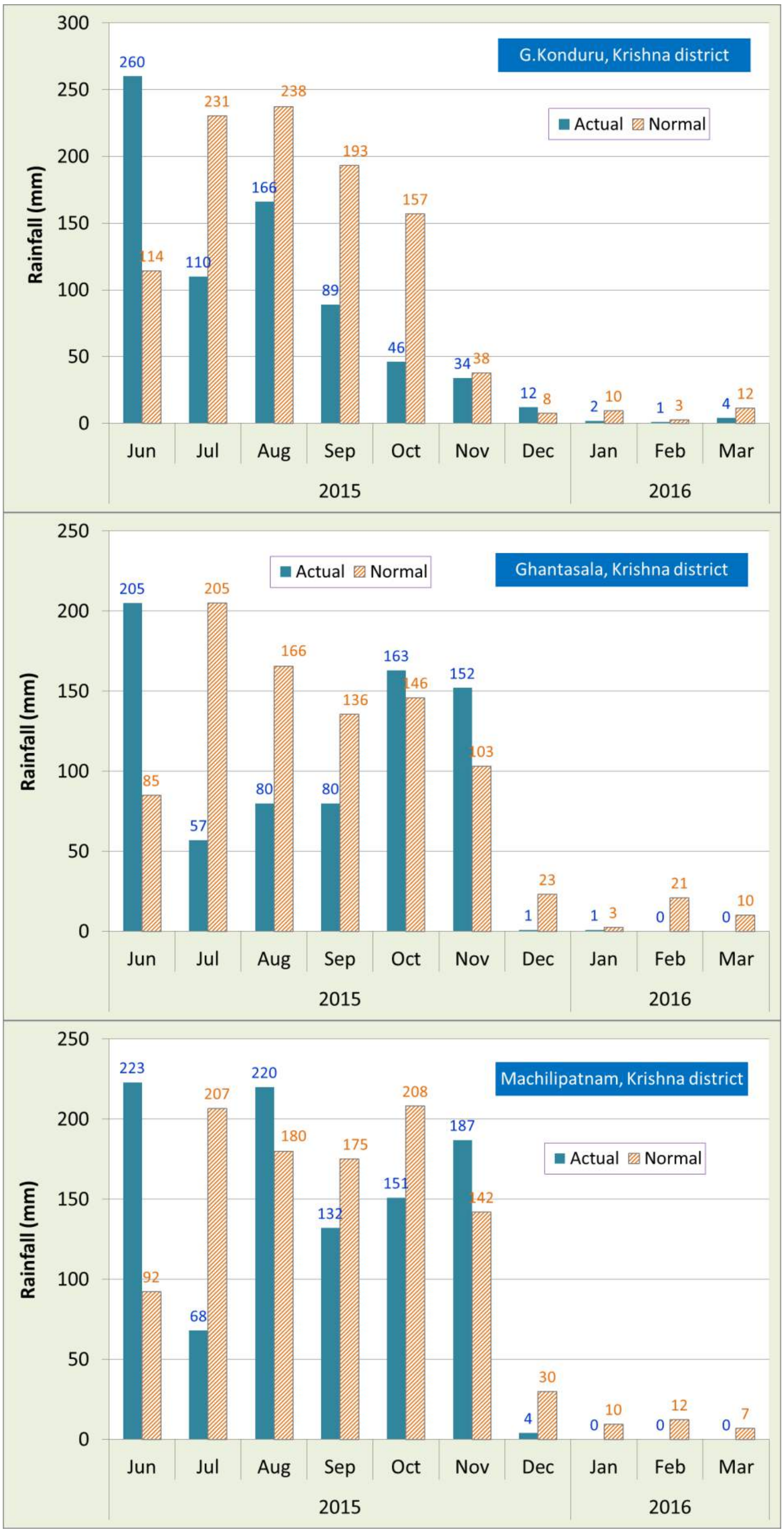


Appendix 3e. Monthly Rainfall status in West Godavari pilot sites during 2015-16

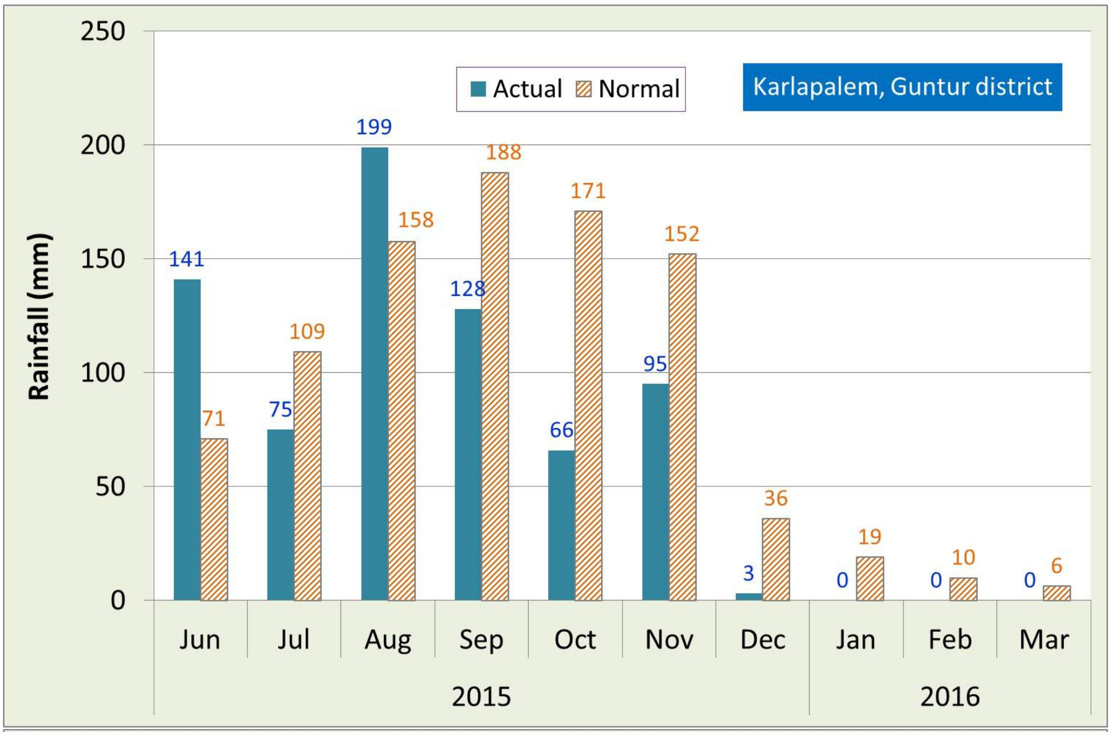


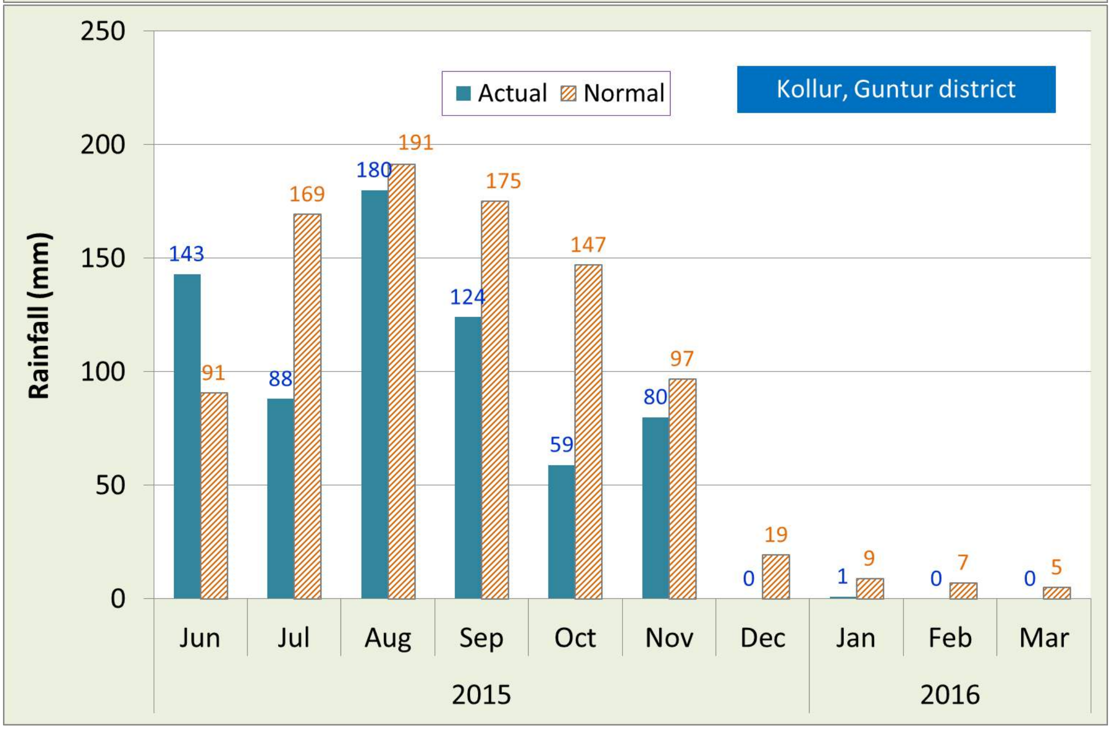


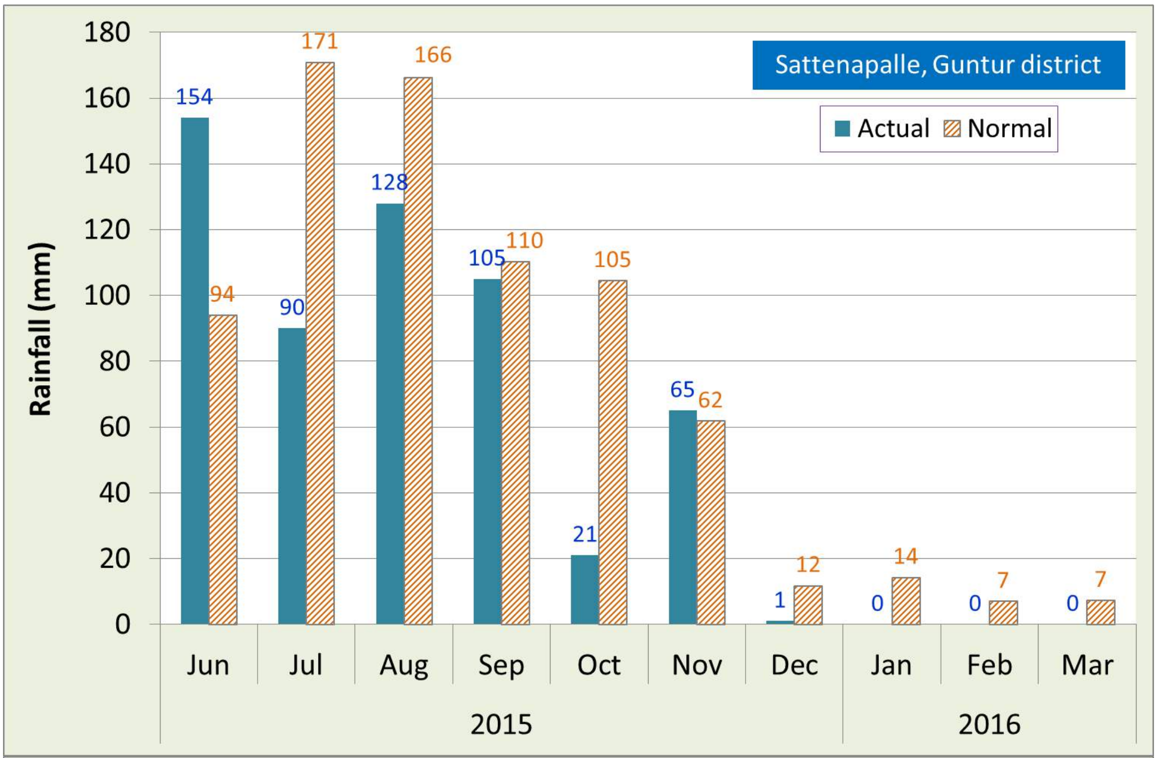
Appendix 3f. Monthly Rainfall status in Krishna pilot sites during 2015-16

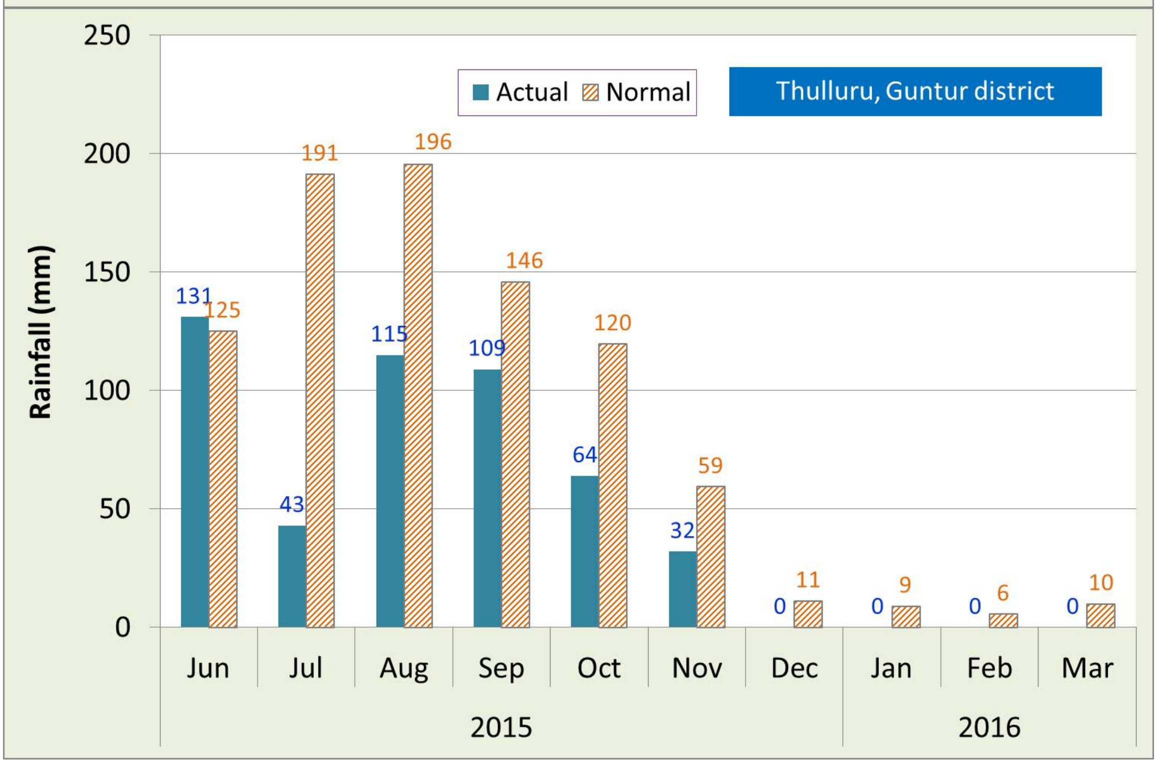


Appendix 3g. Monthly Rainfall status in Guntur pilot sites during 2015-16

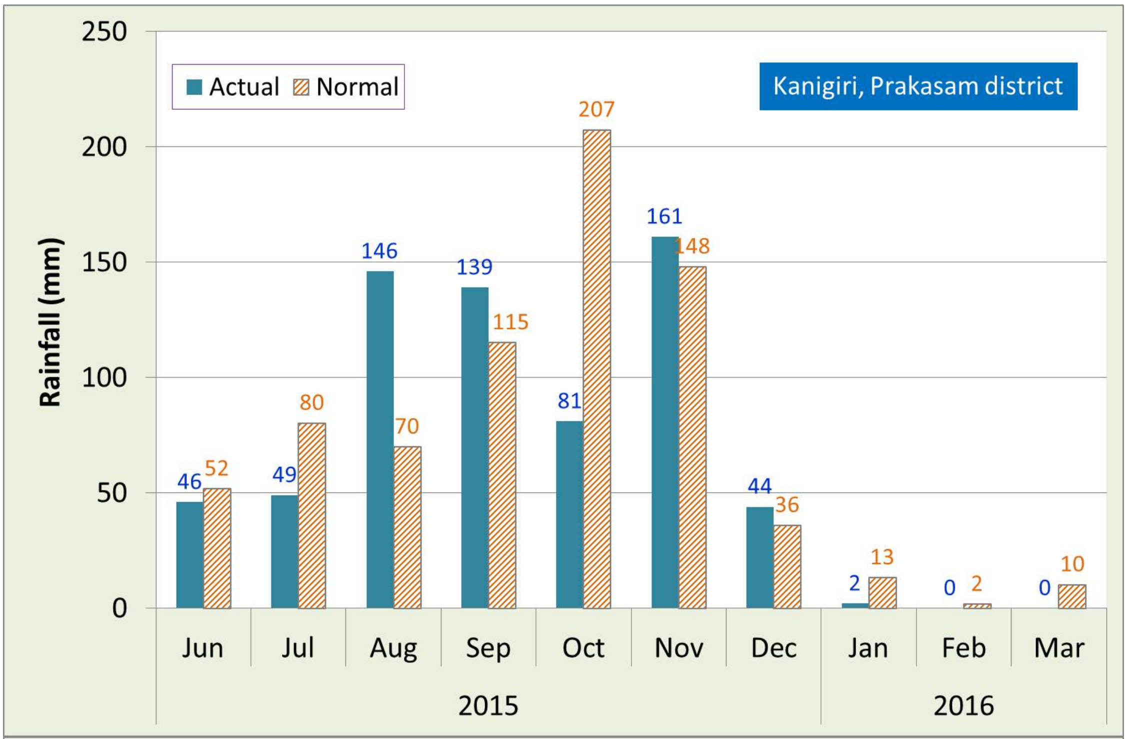


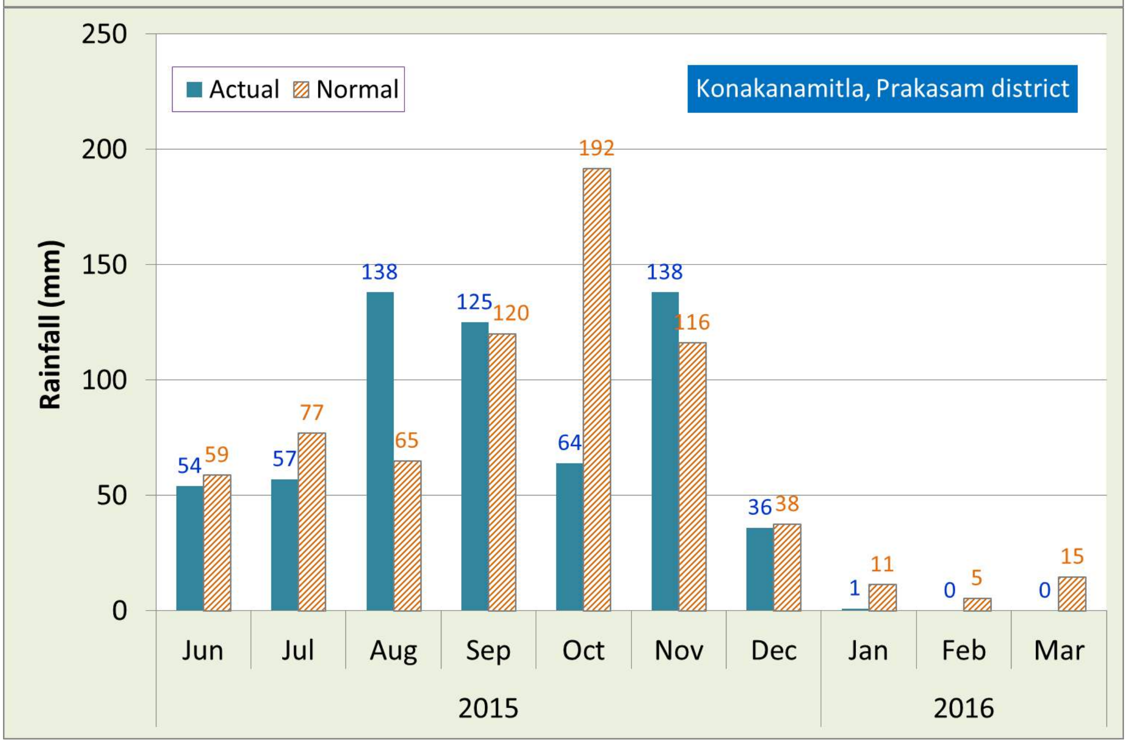


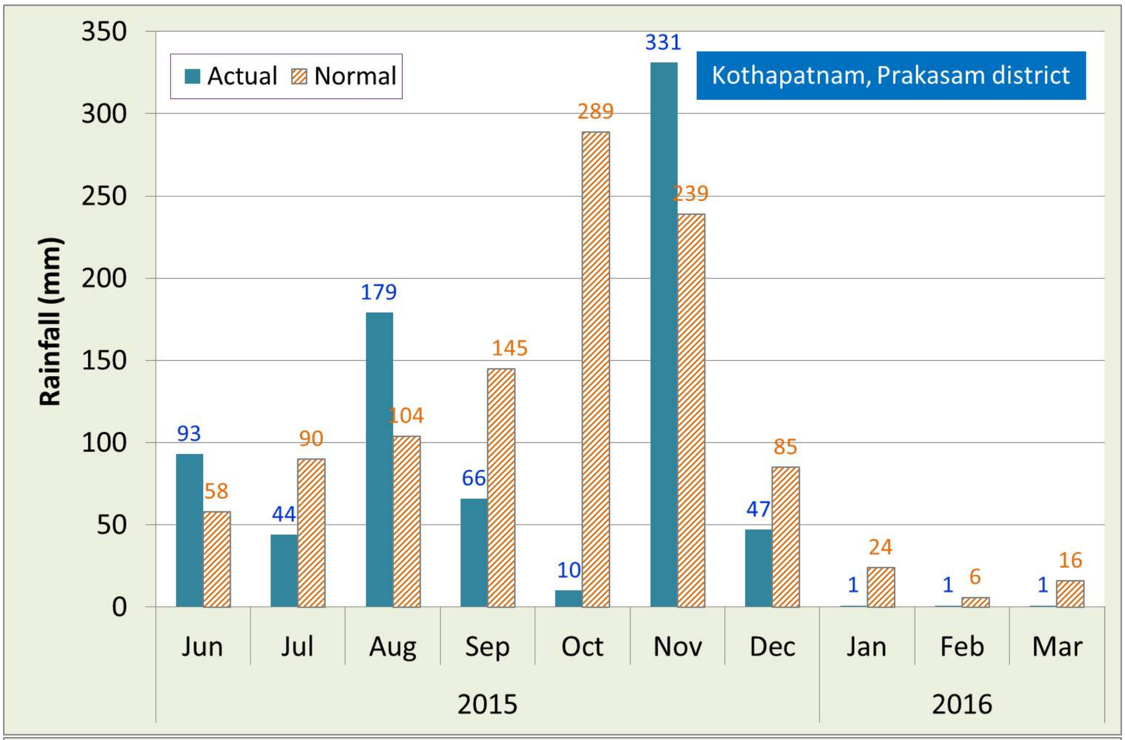

Sattenapalle, Guntur district
Actual
Normal
Rainfall (mm)
180
160
140
120
100
80
60
40
20
0
154
94
90
171
128
166
105
110
21
105
65
62
1
12
0
14
0
7
0
7
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Jan
Feb
Mar
2015
2016

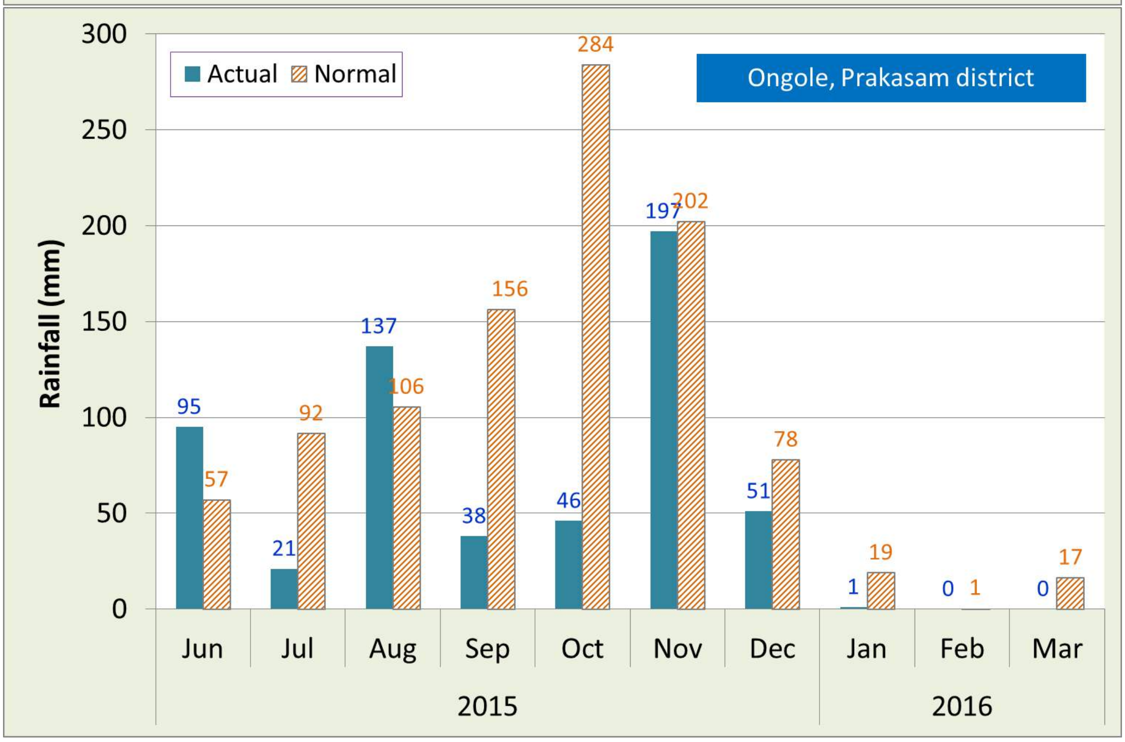

Actual
Normal
Thulluru, Guntur district
Rainfall (mm)
250
200
150
100
50
0
131
125
43
191
115
196
109
146
64
120
32
59
0
11
0
9
0
6
0
10
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Jan
Feb
Mar
2015
2016

Appendix 3h. Monthly Rainfall status in Prakasam pilot sites during 2015-16

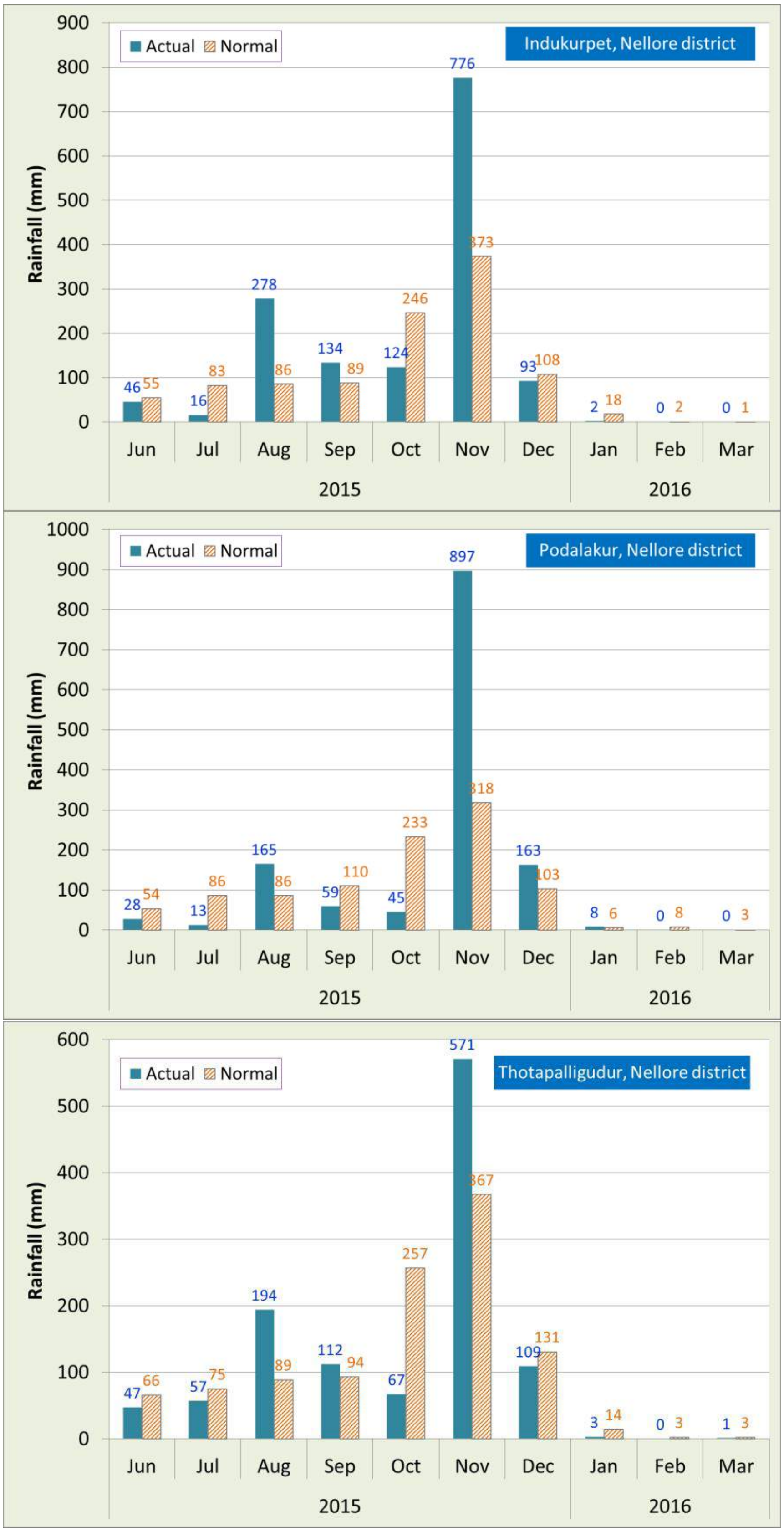




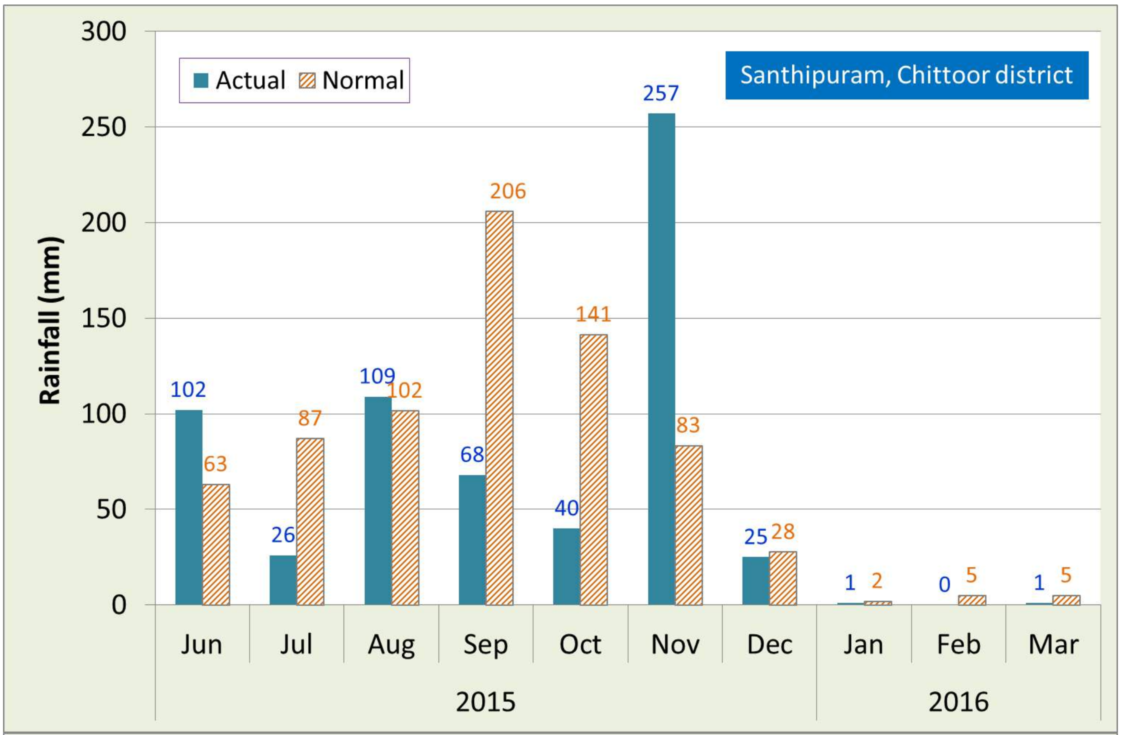

Actual
Normal
Kothapatnam, Prakasam district
Rainfall (mm)
350
300
250
200
150
100
50
0
93
58
44
90
179
104
66
145
10
289
331
239
47
85
1
24
1
6
1
16
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Jan
Feb
Mar
2015
2016

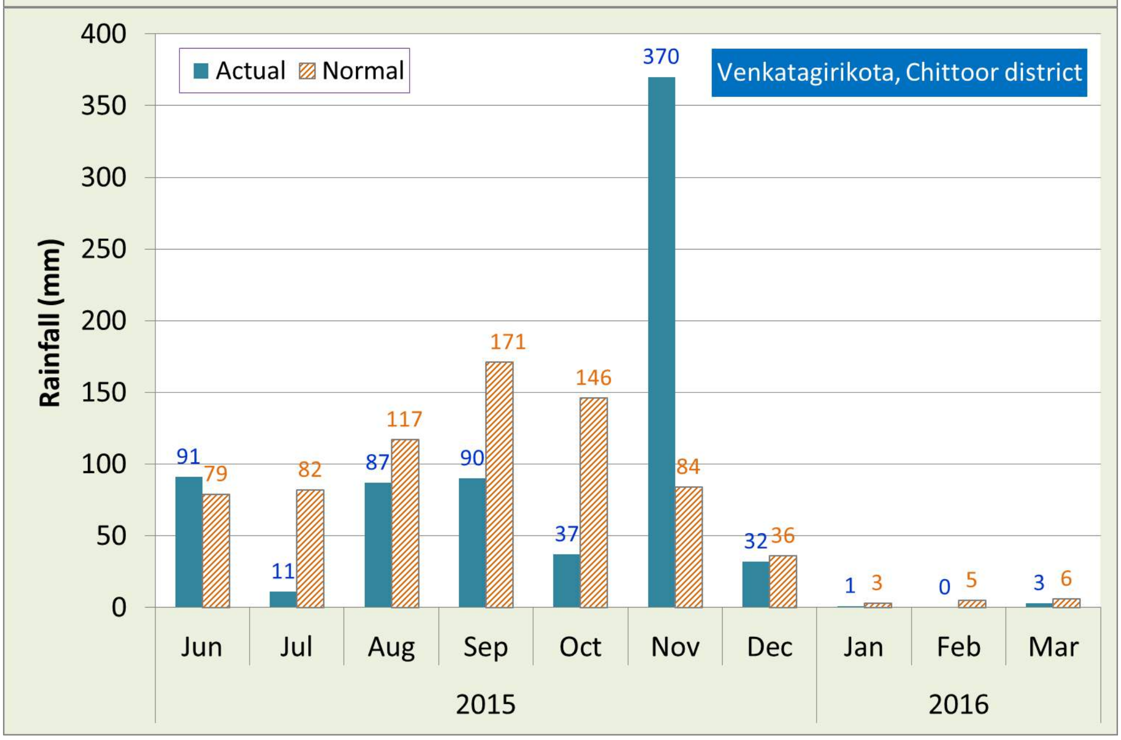

Actual
Normal
Ongole, Prakasam district
Rainfall (mm)
300
250
200
150
100
50
0
95
57
21
92
137
106
38
156
46
284
197
202
51
78
1
19
0
1
0
17
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Jan
Feb
Mar
2015
2016

Appendix 3i. Monthly Rainfall status in Nellore pilot sites during 2015-16

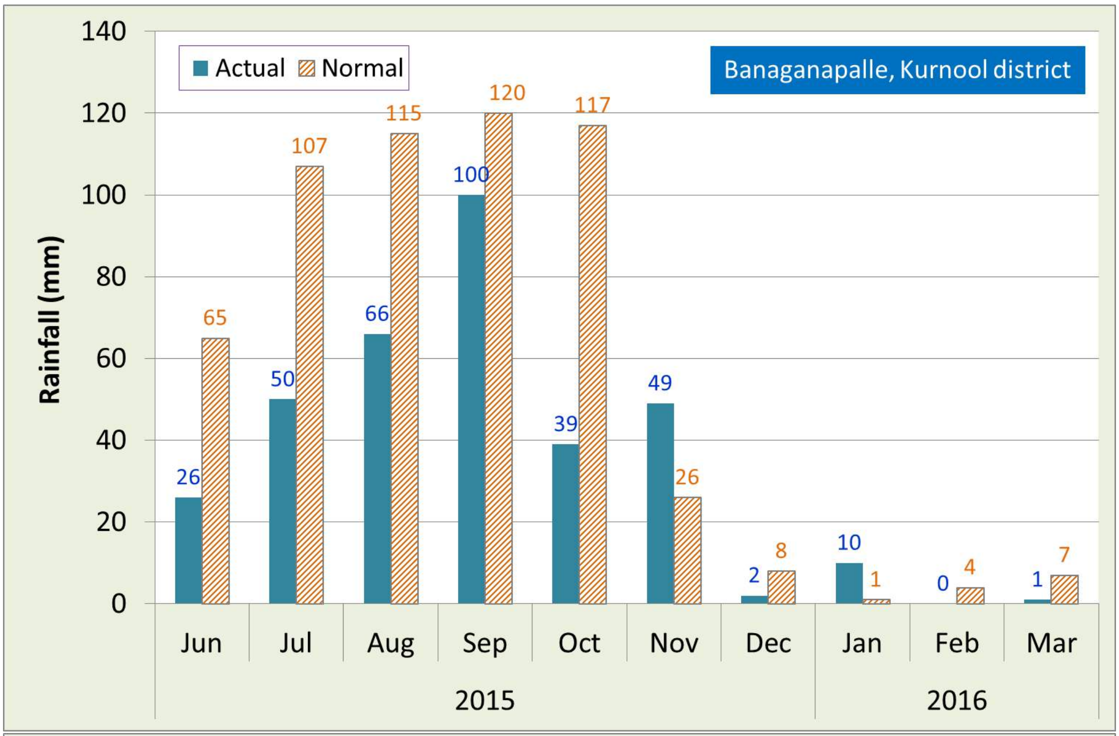


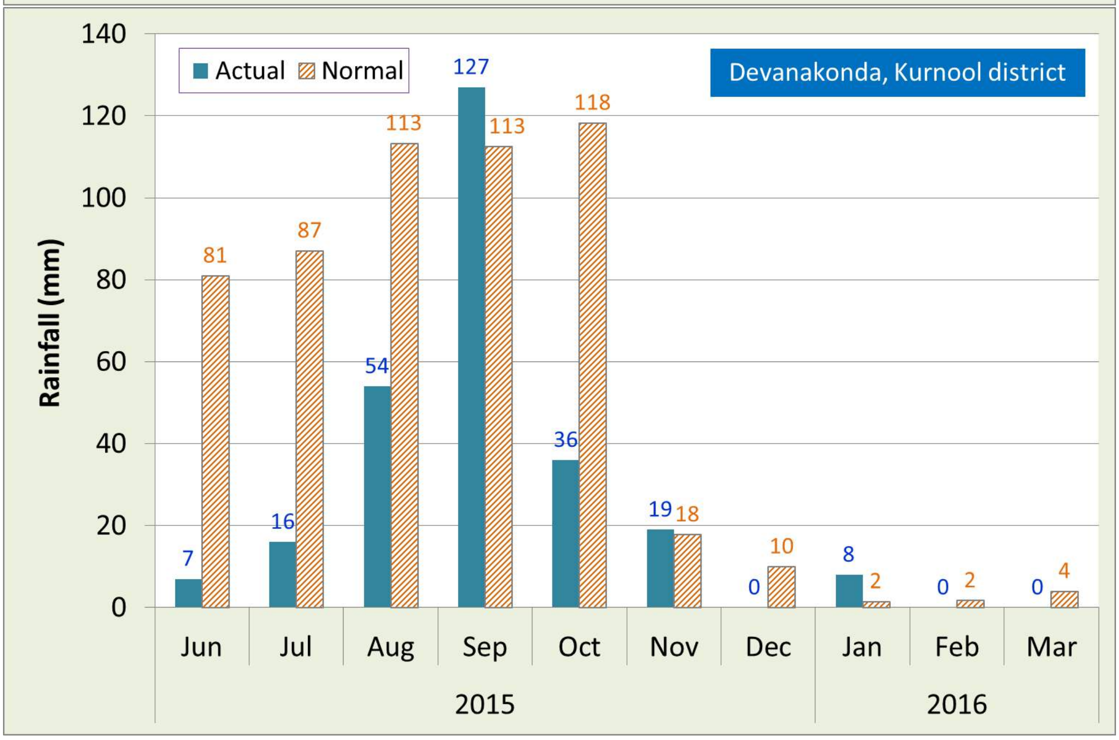
Appendix 3j. Monthly Rainfall status in Chittoor pilot sites during 2015-16



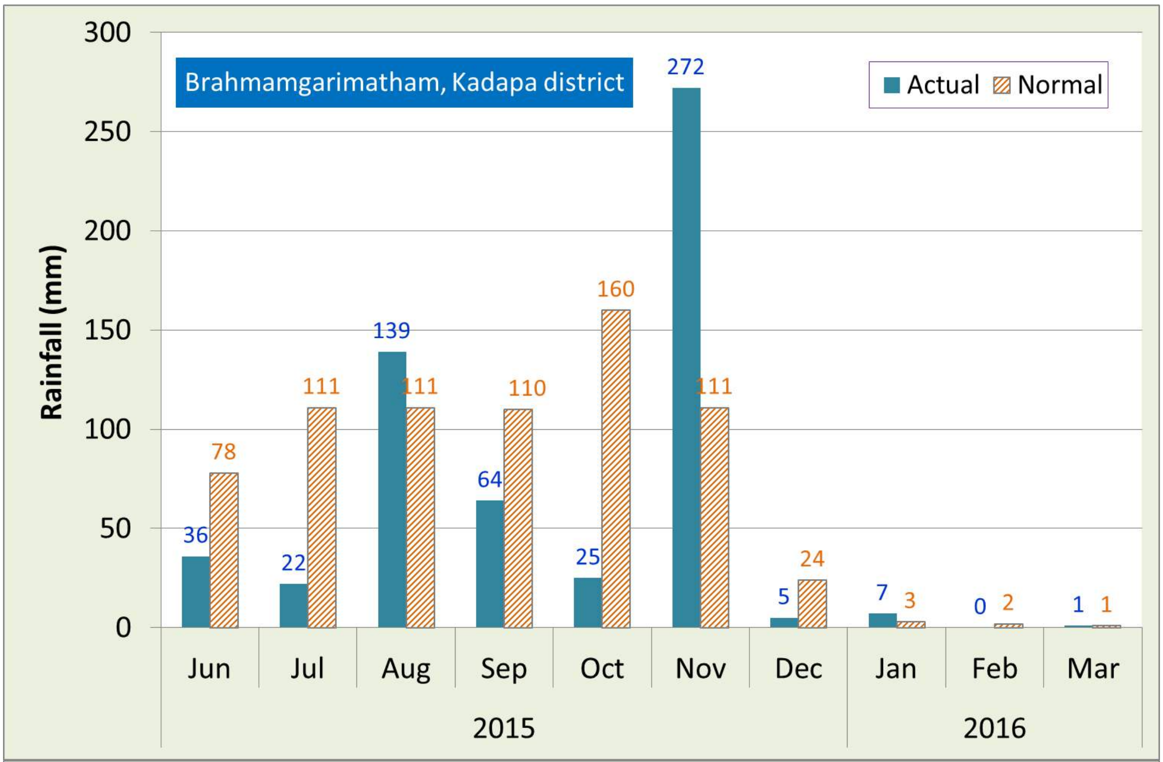


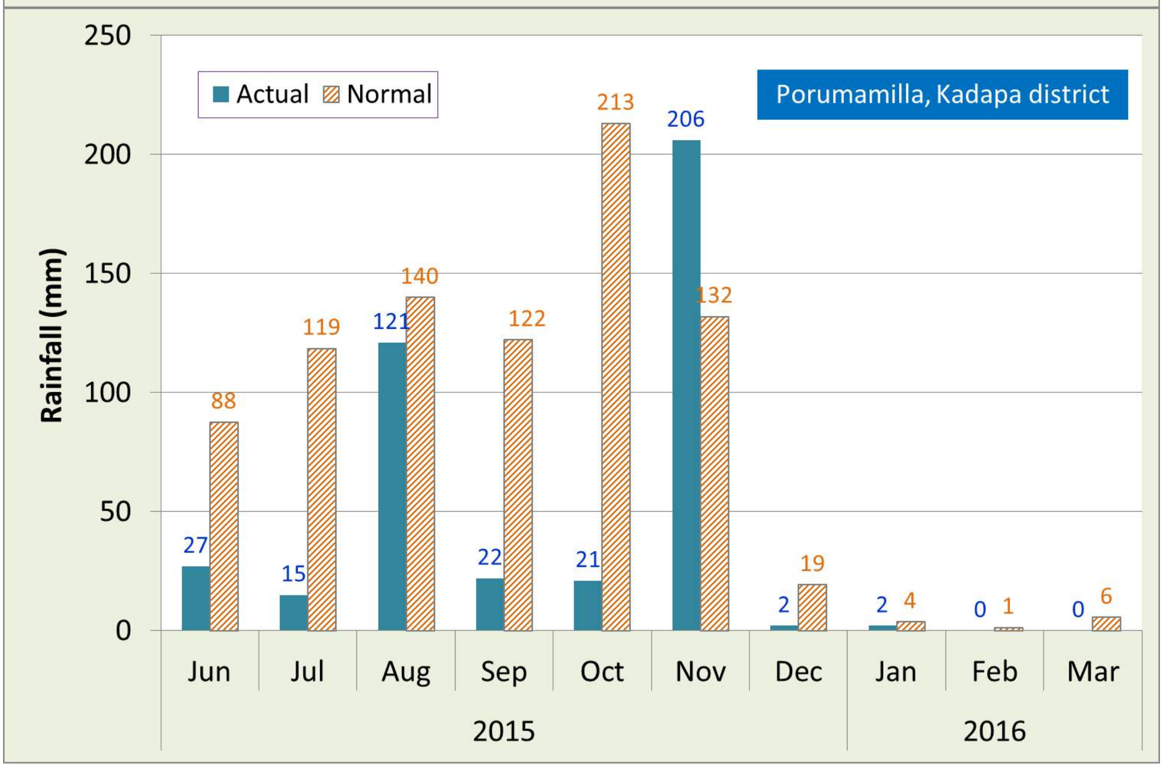
Appendix 3k. Monthly Rainfall status in Kurnool pilot sites during 2015-16

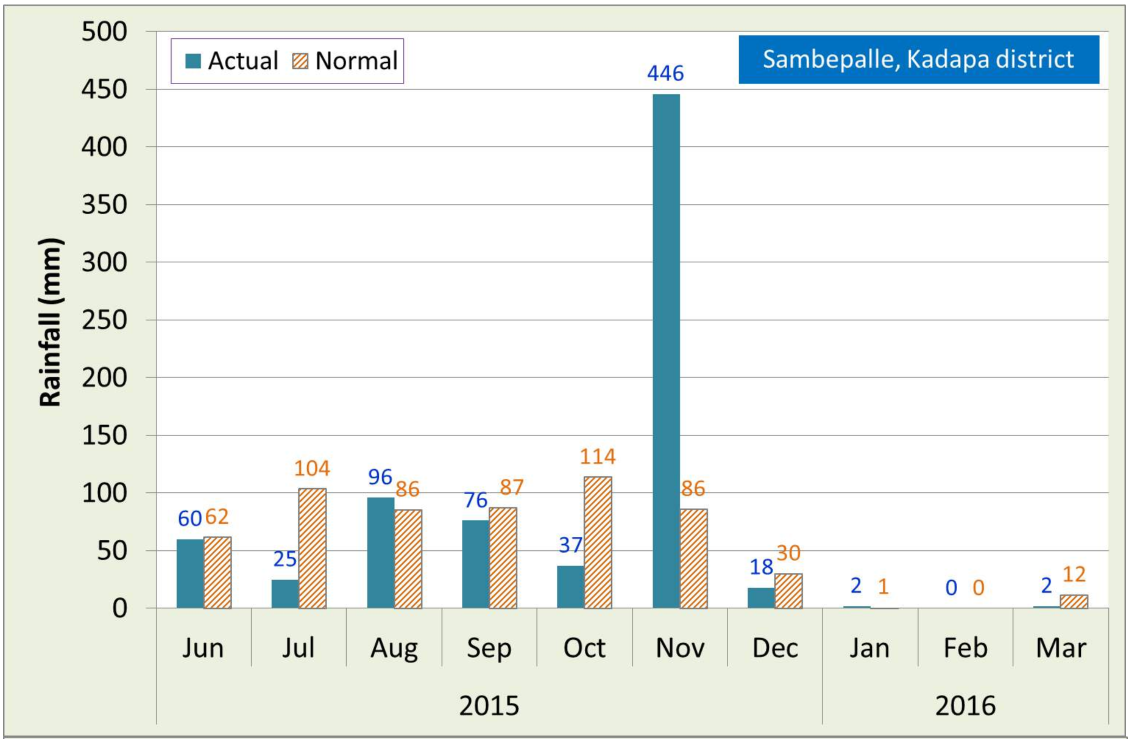




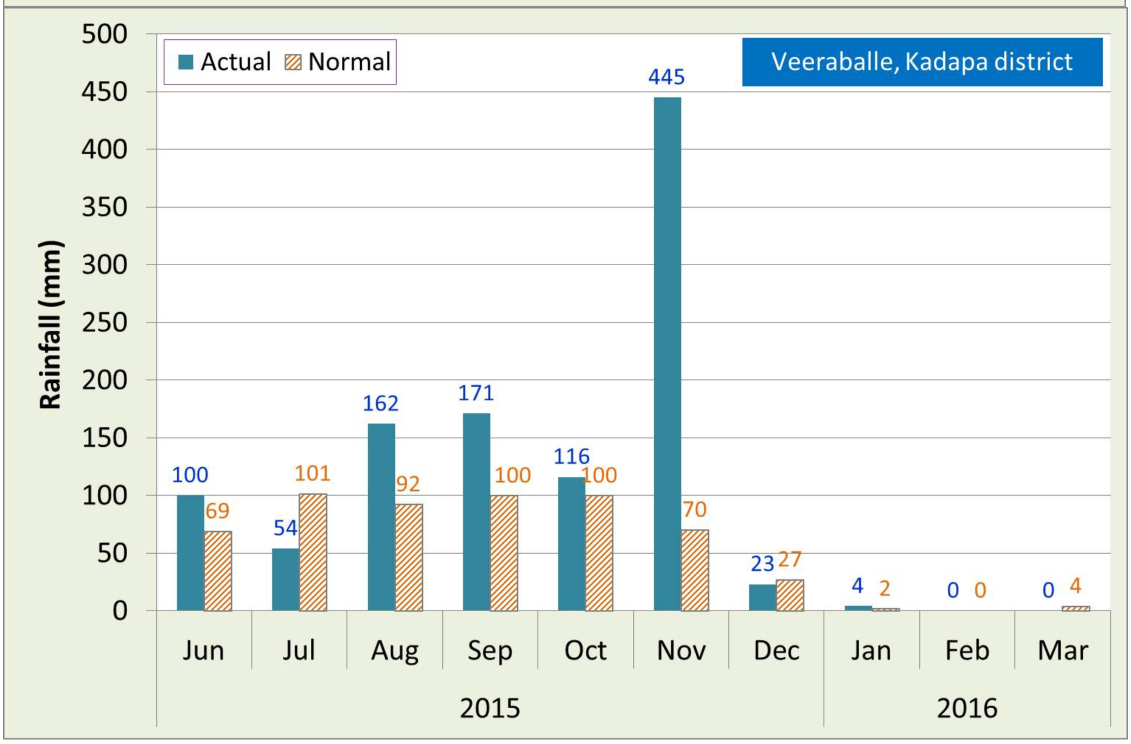
Appendix 3l. Monthly Rainfall status in Kadapa pilot sites during 2015-16





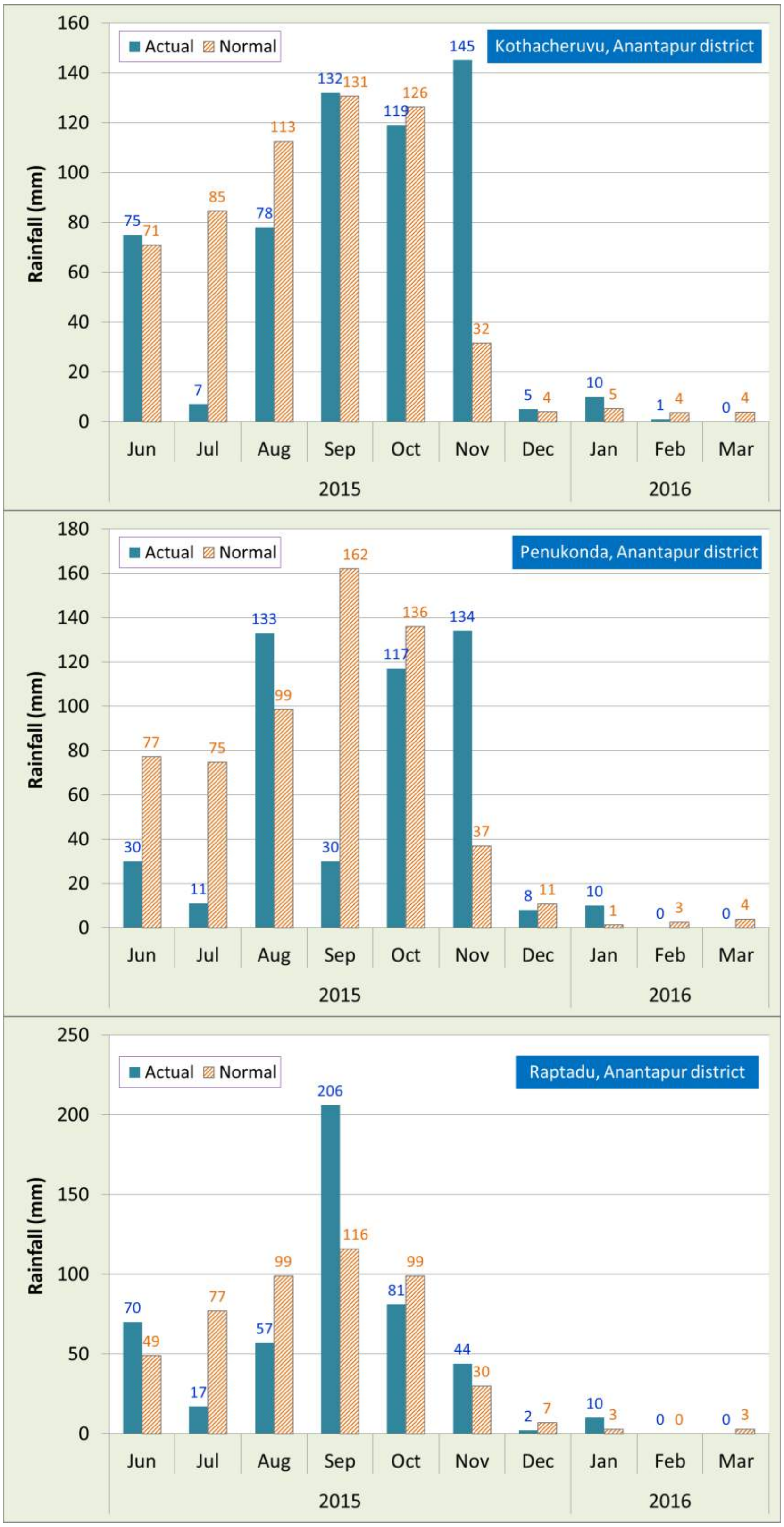


Sambepalle, Kadapa district
Actual
Normal
Rainfall (mm)
500
450
400
350
300
250
200
150
100
50
0
60 62
25 104
96 86
76 87
37 114
446 86
18 30
2 1
0 0
2 12
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Jan
Feb
Mar
2015
2016

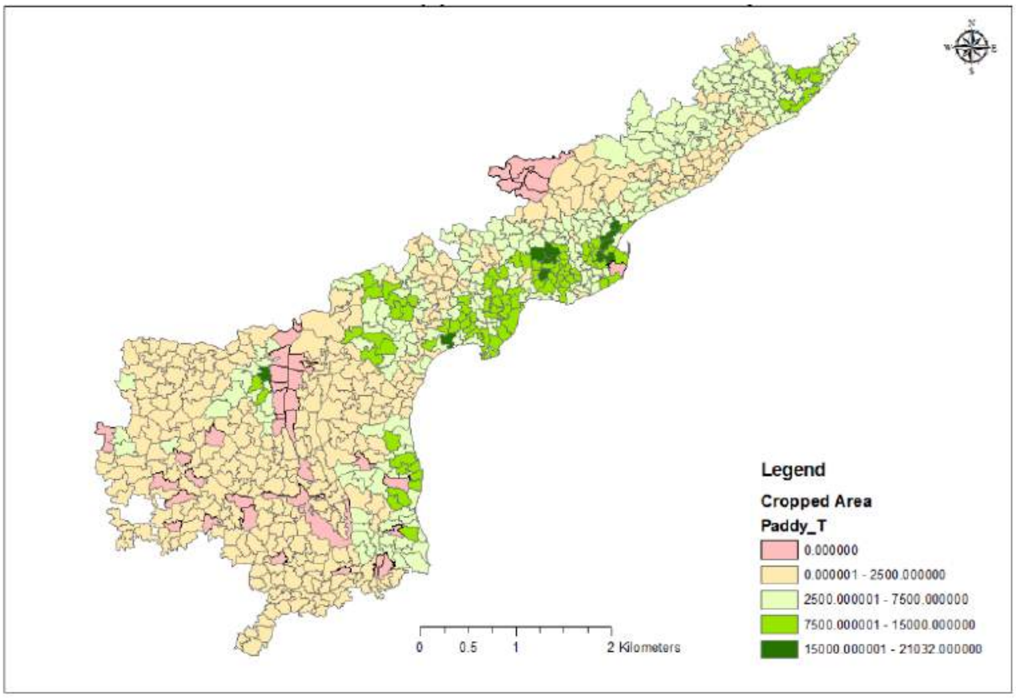


Veeraballe, Kadapa district
Actual
Normal
Rainfall (mm)
500
450
400
350
300
250
200
150
100
50
0
100 69
54 101
162 92
171 100
116 100
445 70
23 27
4 2
0 0
0 4
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Jan
Feb
Mar
2015
2016

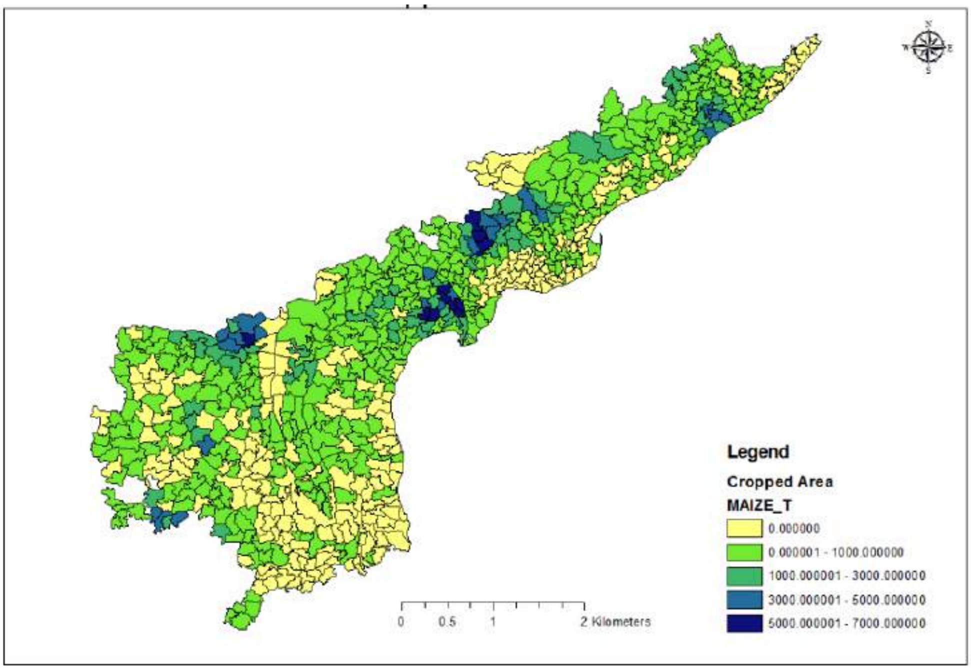
Appendix 3m. Monthly Rainfall status in Anantapur pilot sites during 2015-16



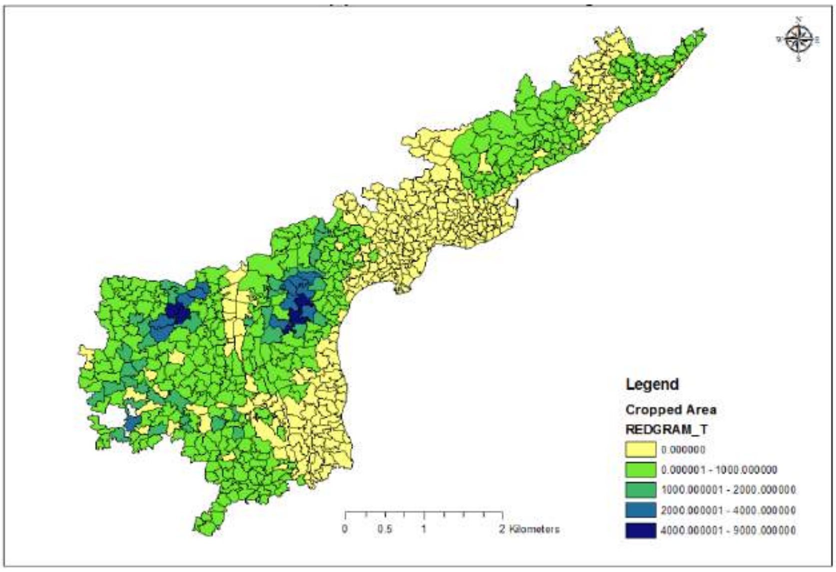
Appendix 4a. Mandal wise cropped area under paddy – AP



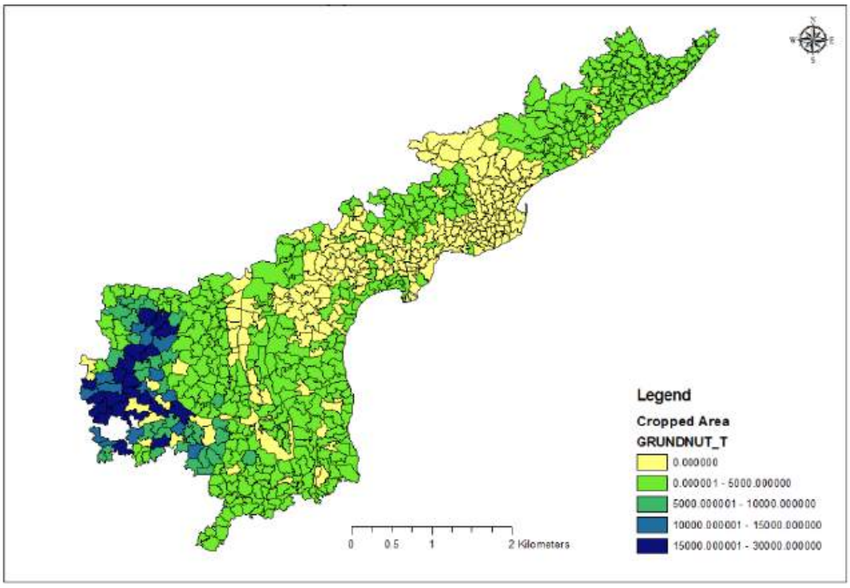
Appendix 4b. Mandal wise cropped area under maize – AP



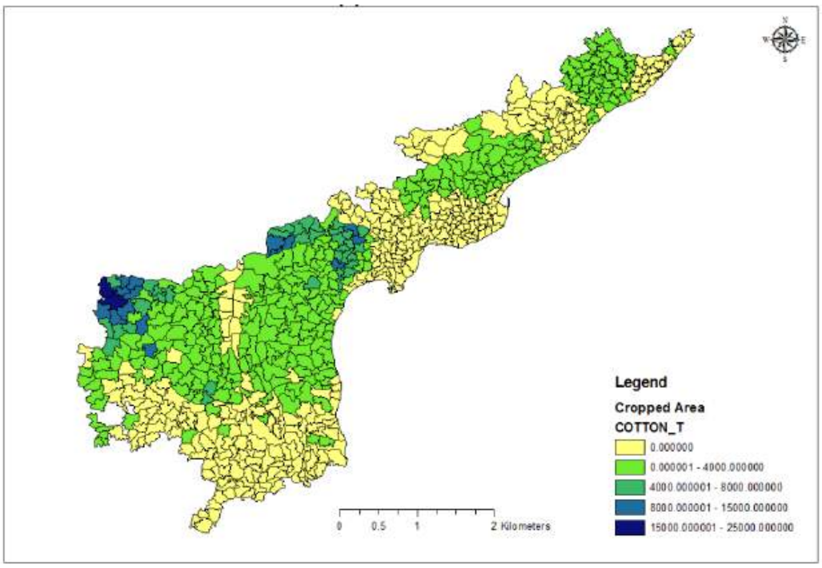
Appendix 4c. Mandal wise cropped area under Redgram – AP



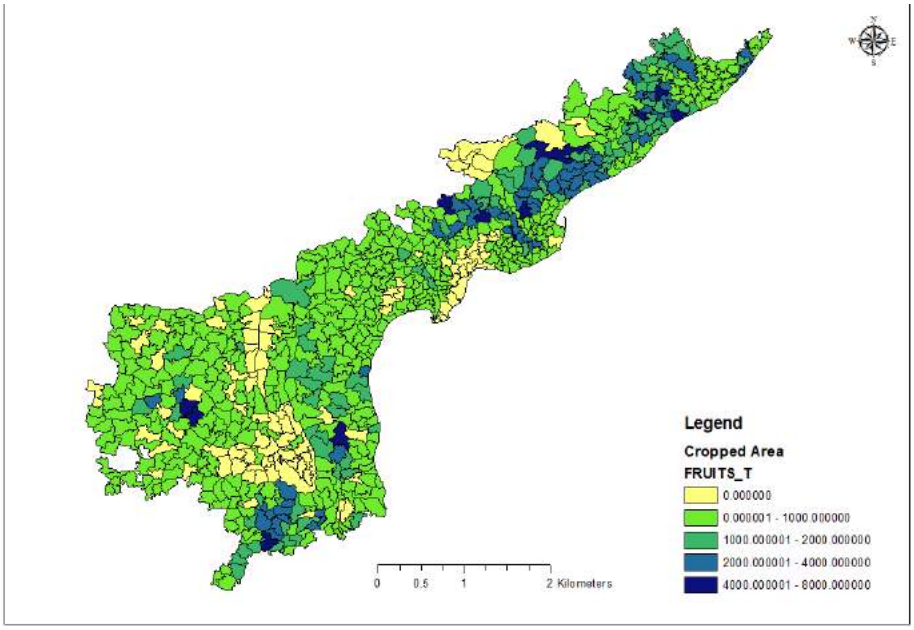
Appendix 4d. Mandal wise cropped area under Groundnut – AP



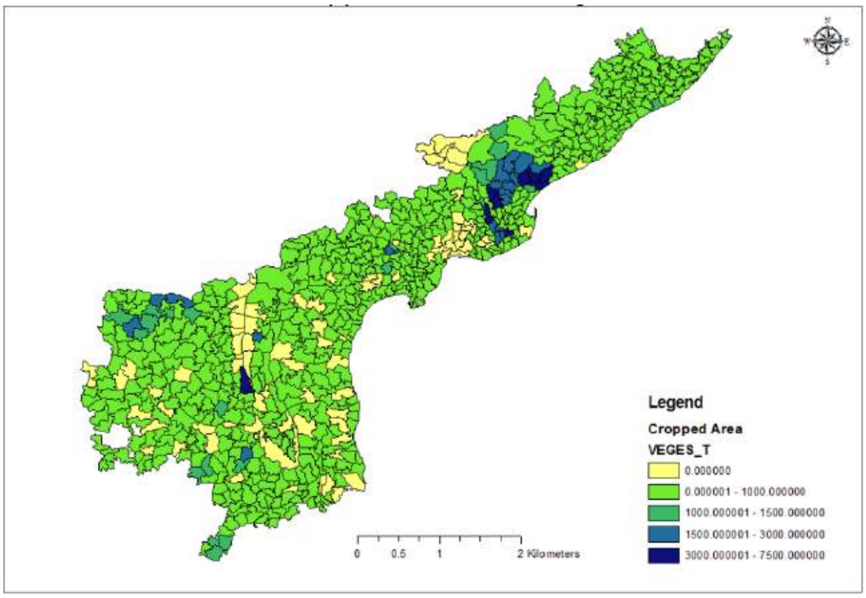
Appendix 4e. Mandal wise cropped area under cotton – AP



Appendix 4f. Mandal wise cropped area under fresh fruits – AP



Appendix 4g. Mandal wise cropped area under Vegetables - AP



Appendix 4h. Sale of major crops at Regulated markets in Andhra Pradesh in 2014 (values in ‘000 Tones).

District	Mango	Coconut*	Paddy	Cotton	Ground nut	Bengal Gram	Banana	Tomato	Lemon
Anantapur					0.002	0.017			
Chittoor	0.98		0.13					1.608	
Kadapa			0.003	0.007	0.016	0.023	0.000		
East Godavari	41.33	15424.09	5.33				9.898		
Guntur			0.022	0.042		0.001			
Krishna	0.33		1.00	0.021			0.008	0.039	
Kurnool			0.14	0.71	0.72	0.14	0.034	0.021	
Psr nellore	0.04		0.84	0.01	0.03	0.010	0.009		0.267
Prakasam			0.001			0.002			
Srikakulam	0.01	1575.00	7.08	0.03			0.032		
Visakhapatnam			0.001		0.011	0.016	0.28		
Vizianagaram	0.09	8000.00	0.20	0.24	0.008	0.008	0.90	0.003	
West Godavari		2797.27	0.20	0.30			0.88	0.005	
Grand total	43	27796	15	1	1	0	12	2	0.27
AP total production	2018	1610007	7993	2188	881	648	1888	889	191
% share of regulated market to total production	**2.12**	**1.73**	**0.19**	**0.06**	**0.09**	**0.03**	**0.64**	**0.19**	**0.14**
Average price per kg (Rs)	9.8	5.3	14.48	40.1	37.52	31.66	13.55	8.22	12.48

Source: http://market.ap.nic.in/repyearly.jsp; *values in ‘000 numbers

Appendix 4i. Table 3.10.7.6.2. Export Scenario of Agricultural Commodities- A comparative analysis.

Product	All India		Andhra Pradesh		AP Export Share (%)		AP Production
	Quantity (MT)	Value (Cr)	Quantity (MT)	Value (Cr)	Qty	Value	
Buffalo meat	1314157.87	26681.56	10973.92	209.86	0.84	0.79	122.5 thousand tones, 10.5%of India Production
Basmati rice	4045795.79	22718.41	82.99	0.83	0.00	0.00	-
Non basmati rice	6366585.4	15129.07	2508218	5368.82	39.40	35.49	13.91 Million MT (2014-15), 10.93 % of India Production
Groundnuts	537888.01	4046.04	80.31	0.65	0.01	0.02	1.23 Million MT, 12.71 % of India Production
Cereal preparations	314641.95	3341.32	63211.36	573.05	20.09	17.15	
Guargum	325250.67	3233.87	10.2	0.08	0.00	0.00	AP ranks 10th in all India production
Other processed fruits & vegetables	320730.93	2900.35	3660.17	23.08	1.14	0.80	
Fresh onions	1201242.74	2747.41	178.00	0.66	0.01	0.02	
Miscellaneous preparations	354901.77	2593.5	32905.29	78.99	9.27	3.05	
Other fresh vegetables	699598.29	2119.48	4531.52	26.1	0.65	1.23	
Alcoholic beverages	239127.37	2005.13	0.51	0.03	0.00	0.00	
Pulses	251642.79	1603.21	545.03	9.08	0.22	0.57	1136.2 MT, 6.54% of India production (2014-15)
Fresh grapes	156203.89	1551.32			0.00	0.00	
Other fresh fruits	308255.01	1538.13	1806.14	32.98	0.59	2.14	
Jaggery & confectionery	292211.13	1289.21	2787.5	23.35	0.95	1.81	
Cocoa products	32633.3	1266.98	714.69	9.44	2.19	0.75	6.30MT, 39.25% of India Production (2014-15)
Maize	650102.89	1089.88	21587.52	51.23	3.32	4.70	5.3 Million MT, 21.81% of India Production
Milled products	416076.61	1078.45	664.38	3.38	0.16	0.31	
Cucumber and gherkins(prepd. & presvd)	202925.35	999.17	8003.23	39.02	3.94	3.91	
Wheat	618019.21	978.6			0.00	0.00	
Dried & preserved	66187.5	914.19	17.84	0.23	0.03	0.03	

Product	All India		Andhra Pradesh		AP Export Share (%)		AP Production
	Quantity (MT)	Value (Cr)	Quantity (MT)	Value (Cr)	Qty	Value	
vegetables							
Sheep/goat meat	21950.71	837.77	31.84	1.19	0.15	0.14	
Mango pulp	128865.38	796.17			0.00	0.00	
Poultry products	659294.13	768.69	7908.24	105.12	1.20	13.68	
Dairy products	33376.98	754.23	213.76	1.94	0.64	0.26	9656.15 MT milk, 6.6 % of India production
Natural honey	38176.35	705.88	3.33	0.17	0.01	0.02	
Other cereals	264967.69	517.19	23467.64	48.21	8.86	9.32	
Fruits & vegetables seeds	10925.47	493.55	467.96	87.02	4.28	17.63	
Floriculture	22517.73	479.43	1468.26	14.27	6.52	2.98	
Fresh mangoes	36310.91	317.09	1161.85	12.66	3.20	3.99	2.73 Million MT, 14.8% of India Production
Casein	5897.86	215.94			0.00	0.00	
Albumin(eggs & milk)	1933.95	149.82	211.86	15.36	10.95	10.25	130958.24 Lakh numbers, 16.7 % of India production
Walnuts	3291.1	117.9			0.00	0.00	
Animal casings	206.36	17.02			0.00	0.00	
Processed meat	280.88	6.18	3.54	0.34	1.26	5.50	
Grand total	19942173.97	106002.14	2694916	6737.14	13.51	6.36	

Source: http://agriexchange.apeda.gov.in/IndExp/PortNew.aspx

Appendix 4j. Export Scenario ofAgricultural Commodities- Products not listed in APEDA.

Commodity	Unit	Qty ('000)	Major importing Countries	AP Production
COTTON YARN	TON	236009004	China, Bangladesh, Egypt, Taiwan, Hong Kong	166728.3 (2011-12) 5.3 % of India Production
SPICES	KGS	163735333	USA, China, Vietnam, Malaysia, UAE	775820 (2013-14) 13.2 % of India Production
COTTON RAW INCLUDING. WASTE	TON	128158992	China, Bangladesh, Vietnam and Pakistan	27 lakh bales, 7% of India production
SUGAR	TON	97717281	China, US and UAE	8.6 Lakh tons (including Telengana), 3.4% of India Production (2014-15)
COFFEE	KGS	51226595	Italy, Germany, Russia Federation,	7,425 MT, 2.3% of India Production (2014-15)
CASHEW	TON	50247663	US UAE, Netherlands	100 MT, 13.42 % of India Production (2014-15)

Source: DGCIS

Appendix 4k. Functional & Proposed FPOs in Andhra Pradesh

Sl	District	Mandal	Functional FPOs	Proposed FPOs	Commodity
1	East Godavari	Amalapuram	NOVEEAL COCONUT PRODUCER COMPANY LIMITED AMALAPURAM		Coconut
2	East Godavari	Kapileshwarapuram		(Name not finalized)	Vegetables
3	East Godavari	Kothakota		(Name not finalized)	Banana, Vegetables
4	East Godavari	Sakkinetipalli		BS Murthy AFWS	Fisheries
5	East Godavari	Razole		Sri Lakshmi Pathi AFWS	Fisheries
6	East Godavari	Sakkinetipalli		Sri Satyanarayan AFWS	Fisheries
7	Guntur	Mangalagiri	Mangaladri Agri producer company		Turmeric
8	Guntur	Machavaram		Red Chilli Farmer's PC	Red chilli
9	Guntur	Repalle		Gangaputra Fisheries PC	Inland fishes, prawn
10	Guntur	Mangalagiri		Sehamitha Producers C	Organic cotton, chillies
11	Guntur	Machavaram		Srinidhi Milk Producers C	Fresh Milk
12	Krishna	Kruttivennu	Samyuktha Fisheries FPO		Marine fishes
13	Krishna	Kaikalur	Snehanjali inland fisheries		Inland fishes, prawn
14	Krishna	Thotavalleru	Vigneswars Banana		Banana
15	Krishna	Mylavaram	Sambasiva Jasmine		Jasmine
16	Krishna	Vijayawada rural		Navyandhra Organic Producer’s company	Natural organic farming
17	Kadapa	Rayachoti		(Name not finalized)	Organic Farming
18	Kadapa	Mydukur	Health Education & Rural Development Society		Animal Husbandry (sheep, goat)
19	Kadapa	B Matam		Chainchaigaripalli Macha Sahakara Sangham	Fisheries
20	Kadapa	Vempalle		Sri Sai Sangameshwara Horticulture Farmers Producers Mutually aided Cooperative Society	Horticulture (banana)
21	Kurnool	Betamcherla		Bethamcherla Progressive Farmers Producers Company Ltd	Redgram; Foxtail Millet
22	Kurnool	Nandyal		Dairy FPO	Dairy
23	Kurnool	Alur	Reliance Foundation		Multiple Commodities
24	Prakasam	Kanigiri		Dairy FPO	Dairy
25	Prakasam	Kothapatnam	Chethana Groundnut Producer Company Limited		Groundnut
26	Visakhapatnam	V Madugula		Proposed	Fisheries
27	Visakhapatnam	Cheedikada		Seethamma Milk Producers Company Ltd	Animal Husbandry
28	Visakhapatnam	S Rayavaram		Gurajada Coconut farmers producer Company Ltd	Coconut
29	Visakhapatnam	Paderu		D Gonduru Girijan Farmer Producer	Medicinal plants

Sl	District	Mandal	Functional FPOs	Proposed FPOs	Commodity
				Company Ltd, Paderu	
30	Visakhapatnam	Araku valley		Sabari Farmer Producer Company Ltd	Multi commodity (Mango, sapota, Turmeric, Amla, pulses)
31	Visakhapatnam	Subavaram	Susag Millet Producers Company Ltd (Recently registered)		Pulses
32	West Godavari	Chagallu	Sri Seetharamanjaneya Seed Society		Rice Seed
33	West Godavari	Kovurru		Sri Venkateshwara Farmer Seed Society	Rice Seed
34	West Godavari			Dharmavaram Society	Natural Farming
35	West Godavari	Chinatalapudi		Viswa Mitra FPO,	Natural Farming (Multicommodity)
36	West Godavari			Sri Anjaneya FPO	
37	West Godavari	KAMAVARAPUKOTA		Kamadenuvu FPO,	Palm oil (Natural farming)
38	West Godavari			Laxmi Sai FPO	Natural Farming (multi Commodity)