Annual Progress Report-2016-17
(April 2016 - March 2017)

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

Contents

Executive Summary

With support of Government of Andhra Pradesh (GoAP), while ICRISAT has worked along with line departments in facilitating scaling-out of low hanging technologies, it has also focussed on developing reference pilot sites of learning and evaluating new technologies across 13 districts.

Evaluation of soil test-based addition of micro and secondary nutrients at state level have recorded yield benefits of 10-40 per cent. Climate smart crops and varieties are evaluated in case of groundnut (ICGV 91114, ICGV 02266), pieonpea (ICPH 2740, ICPL 85063, ICPL 87119, ICPL 8863, ICPL 88039, ICPL 161, TS3R), pearl millet (ICTP 8203, HHB 67), sorghum (CSV 23, PVK 801, ICSV 745), finger millet (GPU 28, MR 1), foxtail millet (Suryanandi), castor (DCH 177, DCS 107, DCH 519, Jwala), rajmah (Arka komal), maize (HT 5402, K 244), green gram (SML 668, LGG 460, IPM 02-14), black gram (PU 31, LBG 752, T9), cowpea (C 152). The yield benefit in Andhra Pradesh with improved varieties ranged between 10-50 per cent as compared to local cultivars.

During 2016-17, ICRISAT-led consortium has evaluated new technologies for efficient resource use. It has evaluated a proof of concept of soil C-building and cutting costs of fertilizers through recycling hardy biomass like left-overs or stalk part of pigeonpea, cotton, maize, pearl millet, sorghum after chopping it through 'shredder machine' on sharing basis and using 'microbial consortium culture' for decomposing it into 'aerobic-compost'. Shredding machines are operated in 8 districts for chopping of hardy biomass to facilitate ease in composting - Anantapur, Krishna, Kadapa, Nellore, Srikakulum, Vijayanagaram**,** Chittoor and East Godavari. With objective to harness organic markets without compromising on the yield levels, new products like 'Aquasap' (a 100% organic extract/fertilizer from sea weeds), and 'Humic acid' (a plant growth stimulant) are evaluated with significant yield improvement.

Other technologies promoted included de-centralized seed production on farmers' fields which brings in dividents to farmers through higher produce cost while promote accessibility to quality seed for intensification. Landform management through, 'broadbed & furrow' and 'conservation furrow' proved effective in in-situ moisture conservation and enhancing yields. To address fodder scarity, multi-cut sorghum variety CSH24MF and sweet sorghum (ICSV 25300 & ICSV 25301) are promoted and evaluated in pilot sites which has bearing in enhancing in milk production and strengthening women as is their domain. Promotion of small scale cultivation of vegetables as kitchen garden by women farmers has showed a proof of concept of improving family nutrition and strengthening women.

Post-production is an issue mostly neglected and so 'solar dryer technology' in collabotation with Science for Society Technological Services, Mumbai, is promoted for processing of vegetable crops and fish. Science for Society is invited under the PPP model to demonstrate by installing solar driers in 5 pilot areas under Rythu kosam project.

Capacity building in pilots remained a focussed activity for ensuring sustainability. It is targeted through farmer meetings, trainings and demonstrations of technologies in the pilots and around 40000 farmers and stakeholders are reached through this during 2016-17.

1. Introduction

For enhancing productivity and incomes of farmers in Andhra Pradesh through the 'Rythu Kosam' is a flagship initiative of the Government of Andhra Pradesh (GoAP). 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.

Building on the efforts during 2015-16, while low hanging technologies are promoted for reaping quick benefits, ICRISAT with support of line departments and other partners has focussed on pilot sites to develop as reference sites of learning and evaluating new technologies for sustaining growth.

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.

3. Objectives

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.

4. District & Pilot Sites Profiles & GVA achieved

4.1 Anantapur

4.1.1 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 (sweet lime, 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 0.10 million 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.

Anantapur is the driest part of the state with a mean annual rainfall of 553 mm and a cultivated area of about 9 Lakh ha (about 7.3 lakh in *Kharif* + 1.7 lakh *Rabi)* under agricultural crops. The rainfall is highly erratic in intensity, frequency, pattern and distribution across the district. The dry spells and drought are common. The soils are very shallow with low moisture holding capacity and cannot support crops during dry spells resulting in drastic reduction in yields. The yield of groundnut averages around 750 kg/ha, castor 850 kg/ha, *jowar* and maize 2200 kg/ha, *bajara* 2450 kg/ha, paddy 3100 kg/ha, redgram 560 kg/ha, horsegram 570 kg/ha. The farmers experience indicate that groundnut, which is grown extensively and across the district as a sole crop, often withstands the harsh climate of Ananthapuram, although other crops like *Jowar*, maize, *bajara*, foxtail millet, *ragi*, cotton, pulses, and even paddy grown in smaller areas and pockets suffer much. The district occupies the lowest position in respect of irrigation facilities only 14.08% of the gross cropped area. Out of the gross cropped area of 1.37 lakh ha, canals account for 17.37%, tanks 1.36%, tube wells 70.83%, wells 10.02% and other sources 0.42%.

4.1.2 Pilot sites profile

The Pilot site I (Ratadu Mandal) has mainly shallow soils and receives an average annual rainfall of 528 mm. There is virtually no irrigation source in the selected villages. The main crops grown here are groundnut with an average yield of 350 kg/ha, foxtail millet with 300kg/ha and castor with 650 kg/ha. The pilot site II (Penukonda and Kothachervu mandals) has medium soils and receives an average annual rainfall 626 mm, and its villages have some ground water irrigation. The main crops grown here are groundnut with an average yield of 1250 kg/ha, maize with 4800 kg/ha, castor with 2500 kg/ha and ragi with 3200 kg/ha.

Rainfall during 2016-17

The rainfall received in pilot areas in 2016-17 is given in Table 6.1.1.1. This year rainfall was for lower than the normal rainfall received in these areas. Most disturbing was it distribution. The rainfall received after September was dismally low and this affected the crop of

pigeonpea and the sowing of *Rabi* -summer crops. See appendix for normal and actual rainfall in Ananthapur district.

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. The pilot site-1 is in Raptadu mandal comprising nine villages representing geographical area of 6522 ha with gross cultivated area of 5446 ha in *Kharif* and 1829 ha in *Rabi* /summer. The pilot site-2 is across Penukonda-Kothachervu mandals comprising five villages representing geographical area of 4105 ha with gross cultivated area of 1842 in the *Kharif* and 154 ha in the *Rabi* /summer (Table 4.1.2.1).

Pilot Sites for Raitu Kosam Program of Andhra Pradesh in Anantapur, Andhra Pradesh

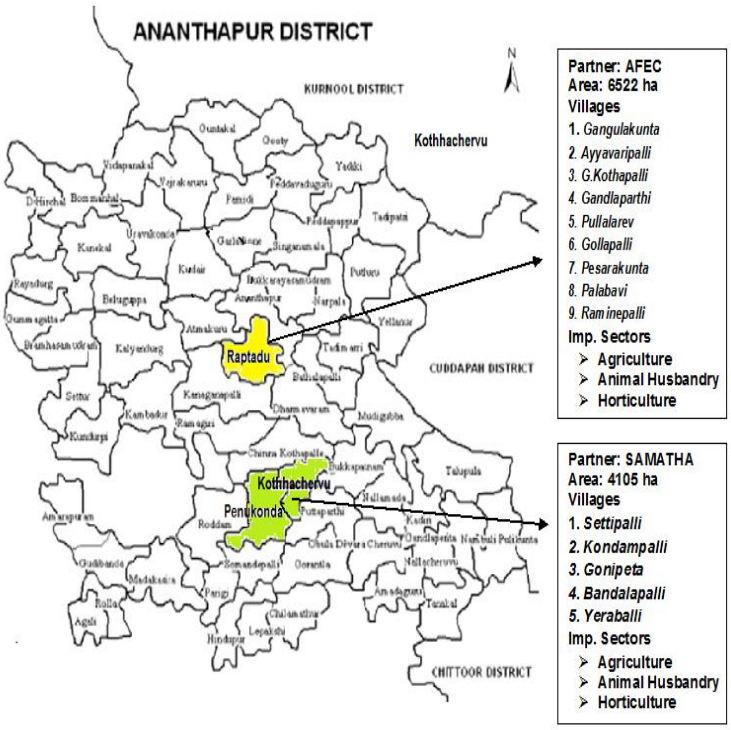


Figure 4.1.2.1: Pilot Sites in Anantapur district, Andhra Pradesh.

The total number of households is 2,380 with population of over 7644 in Pilot-1 and is 990 with population of over 13,986 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.

Table 4.1.2.1: Anantapur Pilot site profile – information.

S. No.	Village	Geographical area (ha)	Net cultivated area (ha)	Gross cultivated area (ha)		Irrigated area (ha)			Area under hort crops (ha)		Livestock population				Inland Fisheries		Households		Population
				Kharif	*Rabi*	Canal	GW	Other	Vegetables	Fruits	Cattle	Buffalos	Sheep	Goat	Area	Ponds	Small & Marginal	Other	
Penukonda mandal																			
1	Kondampalli	1032	274	236	58	0	45	0	27	110	289	94	884	418	0	0	373	37	1163
2	Gonipeta	2370	269	224	45	0	10	0	6	46	336	44	414	424	0	0	362	61	1225
3	Settipalli	2524	477	366	79	0	51	0	6	167	464	269	3471	1593	0	0	798	61	2512
Kottachervu mandal																			
4	Bandlapalli	678	502	436	32.1	0	24	0	29	43	25	15	770	100	0	0	284	12	1060
5	Yerrapalli	904	669	581	42.8	0	32	0	6	7	280	40	6050	380	0	0	380	12	1684
Total		4105	1921	1842	154	0	161	0	73	372	1394	462	11589	2915	0	0	2197	183	7644
Raptadu mandal																			
6	Raminepalli	499	317	420	92	0	0	0	0.0	0				0	0	0	83	0	2565
7	Pullalarevu	1350	889	1060	324	0	0	0	4.2	10	0	3000	0	0	0	0	227	0	1256
8	Gangalakunta	462	276	420	113	0	0	0	5.4	0	5	1000	30	0	0	0	74	0	1463
9	Ayyavaripalli	499	317	420	92	0	0	0	8.3	23	3	3000	30	0	0	0	83	0	1986
10	Kothapalli	855	594	742	383	0	0	0	43.8	59	20	30	0	0	0	0	153	0	1798
11	Gandlaparthi	855	594	742	383	0	0	0	13.8	97	80	6000	120	0	0	0	153	0	2156
12	Palabavi	752	494	612	174	0	24	0	75.0	7				0	0	0	68	0	896
13	Gollapalli	752	494	612	174	0	24	0	6.3	37				0	0	0	68	0	912
14	Pesarakunta	499	317	420	92	0	0	0	1.5	4	0	0	0	0	0	0	83	0	954
Total		6522	4291	5446	1829	0	47	0	158.3	237.0	108	13030	180	0	0	0	991	0	13986
Grand Total		10627	6213	7289	1983	0	209	0	231	609	1502	13492	11769	2915	0	0	3188	183	21630

In both the sites, crops are normally grown over 7289 ha in *Kharif* and 1983 ha in *Rabi* - summer. Groundnut is the main crop (90% of the area). Other crops like foxtail millet, pigeonpea and sorghum are also grown. Irrigation is used in less than 5% area (only 154 ha) 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 (1502), buffaloes (13,492), sheep (11769) and goats (2915), 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.

4.1.2 Gross Value addition

Anantapur district contributes little to total GVA value of the state of Andhra Pradesh as such. The GVA values attained for agriculture and other main sectors in the pilot sites of Rythu Kosam between 2014-15 and 2016-17 are given in Table 4.1.2.2.

Table 4.1.2.2: GVA details for Rythu Kosam area, Anantapur

Sectors	2014-15			2015-16			2016-17			% Increase	
	Area (ha)	Production (Quin)	GAV (Rs. Crores)	Area (ha)	Production (Quin)	GAV (Rs. Crores)	Area (ha)	Production (Quin)	GAV (Rs. Crores)	2015-16 over 2014-15	2016-17 over 2015-16
Agriculture											
Groundnut	6189	38324	16.10	6213	40385	16.96	5675	48521	20.38	5.38	20.15
Pigeonpea	60	159	0.08	80	360	0.18	102	255	0.13	126.42	-29.17
Castor	110	715	0.25	116	835	0.29	127	908	0.32	16.81	8.72
Foxtail Millet	95	285	0.06	110	330	0.07	110	396	0.08	15.79	20.00
F. Sorhum	250	931	0.14	299	1136	0.17	299	1224	0.18	22.10	7.75
Paddy	65	4066	0.57	74	4969	0.70	74	6290	0.88	22.22	26.58
Maize	80	3680	0.48	85	4066	0.53	85	5100	0.66	10.48	25.44
Total	6849	48159	17.67	6977	52081	18.89	6472	62695	22.63	31.31	11.35
Horticulture											
Sweet lime	22	165	0.58	24	182	0.64	29	245	0.86	10.5	34.2
Grapes	24	202	0.38	25	217	0.41	26	270	0.51	7.5	24.8
Tomato	150	450	0.36	157	506	0.40	188	659	0.53	12.4	30.3
Mango	131	498	0.55	133	529	0.58	136	585	0.64	6.2	10.6
Pomegranate	12	36	0.14	13	46	0.17	13	52	0.20	27.6	13.2
Total	339	1350	2.00	352	1480	2.21	392	1811	2.74	12.8	22.6
Animal Husbandry*											
Milk	2275	24275	7.16	2290	24593.22	7.27331	2392	28128.13	8.23634	4.10	11.29
Meat	36885	1959	6.41	3694	1965	6.42	37274	2046	6.69	1.59	3.84
Total	39160	26234	13.57	3923	26558.7	13.6969	39666	30174.31	14.9238	2.84	7.57

* Milk and Meat under the area means number of animals; the production kg/litres here means in quintal litres (,00)

An average GVA increase of 11.35% was recorded in agriculture, 22.6% in Horticulture and 7.57% in animal husbandry in 2016-17 over the previous year 2015-16. The growth in agriculture was not that impressive than that growth achieved in 2015-16 largely for the failure of pigeonpea crop which suffered much this year because of terminal drought during

flowering and podding. The growth in horticulture and animal husbandry were rather impressive in 2016-17 than in 2015-16. Horticulture and animal husbandry people should get the credit for this performance as they provided good support to farmers thru their development programs and financial schemes.

4.2 Chittoor

4.2.1 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 surrounded by Anantapur and Cuddapah districts on the north, by Nellore and Chengai-Anna districts of Tamilnadu on the east, by North ArcotAmbedkar and Dharmapuri district of Tamilnadu on the south and by Kolar district of Karnataka on the west. The district is spread over 15152 Sq. Kms. 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 divided broadly divided into 3 revenue divisions (viz., Chittoor, Tirupati and Madanapalle) and 66 revenue mandals. The district receives an annual rainfall of 918.1 mm. On average the district receives 438.0 mm of rainfall through the South west monsoon (from June to September) and 396.0 mm from North east monsoon (from October to December). The important rivers in the district are Ponnai and Swarnamukhi which originate in the Eastern Ghats. Other rivers include Kusasthali, Beema, Bahuda, Pincha, Kalyani, Araniyar and Pedderu. None of these rivers in the district are perennial. The soils in the district are red loamy (57%), red sandy (34%) and the remaining 9 per cent is covered by black clay, black loamy, black sandy and red clay.

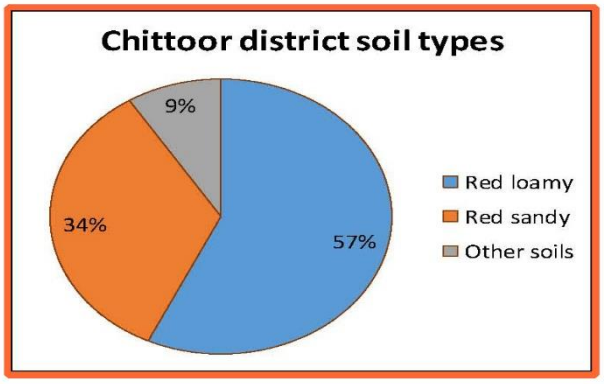


Figure 4.2.1.1: Types of soil in Chittoor district.

According to the 2011 census, Chittoor district has a population of 4,174,064. The population is almost distributed equally between male and female populations. The district is comprised of 22 towns and 1493 census villages. The district has a population density of 275 inhabitants per square kilometre (710/sq mi). Its population growth rate over the decade 2001–2011 was 11.43%. Chittoor has a sex ratio of 997 females for every 1000 males, and a literacy rate of 71.53%. Males have higher level of literacy rate (79.83%) than females (63.28%) in the district. The average size of the household in the district is estimated about 4.0. The total geographical area of the district is 15.15 lakh ha. Nearly 23.4% of that is net area sown including fish and prawn culture. The area sown more than once was only 0.46 lakh ha. The forest area in the district is about 4.52 lakh ha accounts for 29.8% of the total geographical area.

The total no. of holdings in the district area 6.67 lakh ha and they are together contributing a total operated area of 6.26 lakh ha. The average operated holding in the district was estimated at 0.94 ha which is lower than state average (1.08 ha). Nearly 95 per cent of the total holdings in the district having an operated area of less than 2.0 ha. They own nearly 73% of the total operated area in the district. Apart from rivers, minor irrigation structures have created an additional irrigated area of 1.87 lakh ha in the district. Dug wells and deep tube wells together have a share of nearly 86 per cent of the total minor irrigation structures.

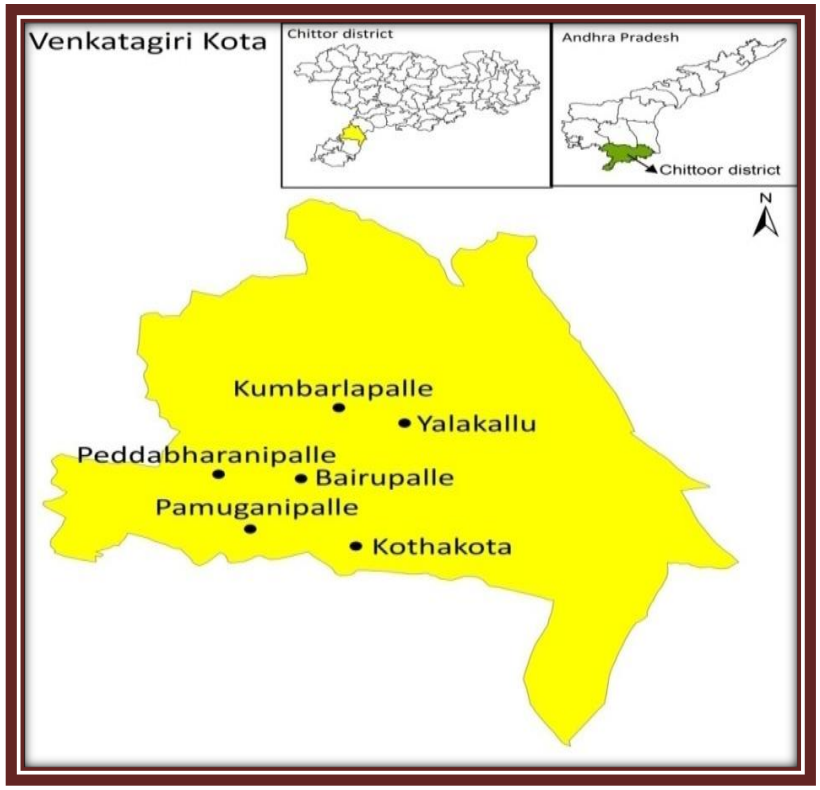
Nearly 37% of total area sown in the district is under Groundnut crop. Rice occupies nearly 12% of total area sown. A total food crop occupies 57% of the cropped area and non-food crops 43% of the cropped area. The productivity levels of major crops during 2012-13 are: paddy (3608 kg/ha), *ragi* (932 kg/ha), groundnut (843 kg/ha), sugarcane (8988 kg/ha) and mangoes (8847kg/ha).

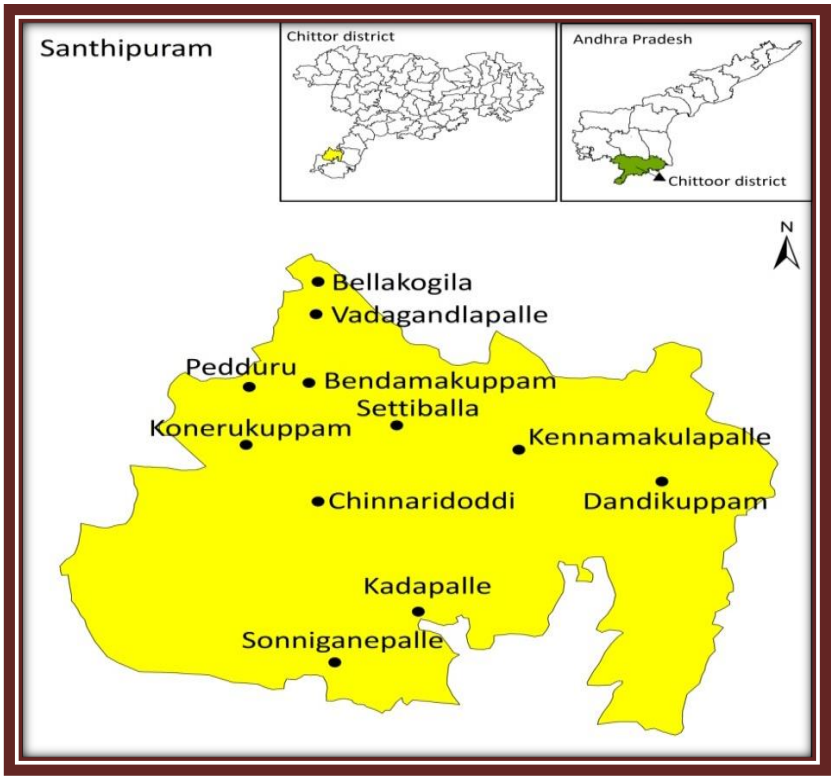
As per 2012livestock census survey, the district owns 9, 26,865 cattle; 84,368 buffaloes population; 12, 50,077 sheep and 4, 28,721 goat populations. The district also has a poultry population of 126.0 lakh during 2012 census. District also produced nearly 4883 tons of inland fish and prawns during 2013-14. However, nearly 1320 fishermen are members of fishing community involving in both fishing and marketing activities.

4.2.2 Pilot site profile

The identification of pilot site in each district was done in several iterations with proper consent of District administrator (Collector and CPO), other line department officials at district and mandal level, interactions with farmers and communities and discussions with NGOs. By following the above criterion and similar steps, the pilot in Chittoor district was identified which is spread over two mandals and 18 villages.

Table 4.2.2.1 furnishes the brief details about pilot site villages in Chittoor district. Approximately 7000 direct beneficiary households and 31317 household members were targeted in the pilot site with a geographical coverage of area around 9001 ha. Roughly 3000 ha of cropped area covered by field crops while another 1145 ha grown under horticulture crops. A total of about 93400 livestock population was estimated in the pilot site villages.





Mandal: Venkatagirikoa
Villages: 1) Pamuganipalle 2) Kothakota 3) Bairupalle 4) Yalakallu Kumbarlapalle 6) Peddabharanipalle 7) Papepalle

Mandal: Santhipuram
Villages: 1) Pedduru 2) Konerukuppam 3) Vadagandlapalle 4) Settiballa 5) 5) Bendam Kuppam 6) Chinnaridoddi 7) Kennmakulapalle 8) Kadapalli 9) Dandikuppam 10) Sonniganepallie11) Bellakunta

Figure 4.2.2.1: No of pilot site mandals: 2; No of pilot villages: 18

Table 4.2.2.1: Pilot village wise details.

S. No.	Village	Geographical area (ha)	Net cultivated area	Gross cultivated area		Irrigated area			Area under hort crops		Livestock population				Inland Fisheries		HHs		Population
				kharif	*rabi*	Canal	GW	Other	Vegetables	Fruits	Cattle	Buffaloes	Sheep	Goat	Area	Ponds	Small & Marginal	Other	
1	Bellakogilla	355	128.4	58.4	4	-	31	-	36	2	191	-	473	-	-	-	170	12	791
2	Bendanakuppam	235	73.2	48.4	6	-	81	-	38.6	6	133	-	12	-	-	-	72	9	315
3	Chinnaradoddi	547	154	108.2	18.5	-	150	-	97	4	414	-	664	-	-	-	359	-	1751
4	Dandikuppam	586	208	52	6	-	173	-	50	4	440	10	295	-	-	-	291	-	1301
5	Kadapalla	505	187.6	53.6	7	-	228	-	57	2	292	-	481	-	-	-	242	-	1174
6	Kenumakulaplle	328	117.2	88.6	8.5	-	192	-	8.4	10	412	-	363	-	-	-	417	1	1779
7	Konerukuppam	307	107.6	72	15	-	81	-	61	5	187	-	535	-	-	-	223	27	931
8	121 Pedduru	339	127.2	86.8	13	-	168	-	52	13.4	191	-	661	-	-	-	164	19	719
9	Settiballa	568	206.4	151	6.5	-	78	-	51	2.4	468	-	1125	-	-	-	348	7	1487
10	Sonnegownipalle	474	174.4	183	11.5	-	420	-	30.4	6	1195	-	602	-	-	-	761	-	3621
11	Vadagandlapalle	486	186	101	5.5	-	44	-	43	10.8	278	-	570	-	-	-	207	20	980
12	Bairupalle	710	335.7	173.2	182.5	-	381.6	-	28.2	30	781	-	790	-	-	-	483	33	2204
13	Kothakota	455	288.9	146.8	142.1	-	132.3	-	21	40	908	-	1292	46	-	-	448	40	2088
14	Kumbarlapalle	492	517.5	252.8	264.7	-	216	-	32.8	54.3	1145	3	1155	-	-	-	560	32	2774
15	Pamuganipalle	907	491.4	234.8	256.8	-	265.7	-	53	58.4	1147	9	1221	-	35	1	539	14	2552
16	Papepalle	190	184.7	90.4	94.3	-	196.3	-	14.4	69.4	158	-	-	-	-	-	122	9	498
17	Peddabharanipalle	422	449	227.6	221.5	-	252.3	-	42.6	38.5	1002	-	1180	155	-	-	517	32	2387
18	Yalakallu	1095	762.2	374	388	-	271.2	-	38.6	33.2	1128	-	1080	654	4	1	839	32	3965
	Total	9001	4699.4	2502.6	1651.4		3361.4		755	389.4	10197	22	12499	855	39	2	6762	287	31317

Table 4.2.2.2: Pilot village wise GVA Details.

Sector	Commodity	2014-15			2015-16			2016-17			% increase in GVA	
		Area(ha)	Production	Gross Value (₹ crore)	Area(ha)	Production	Gross Value (₹ crore)	Area(ha)	Production	Gross Value (₹ crore)	2015-16 over 2014-15	2016-17 over 2015-16
Agriculture	Groundnut	1222	1013.7	4.05	1407	1270	5.12	1416	1508.3	6.365	26.2	24.4
	Paddy	58	204.9	0.28	55	206.6	0.29	60	286.4	0.421	4.5	44.5
	Red gram	75	49.1	0.21	102	70.85	0.33	108	80.4	0.406	53.2	23.9
	Total	1355		4.54	1564		5.74	1584		7.17	28.0	30.9
Horticulture	Mango	315.1	2520.8	2	330.2	2836	2.26	338	2873	2.5857	12.5	14.4
	Tomato	134.2	2281.4	1.8	134.2	2684	2.1	145	2900	2.32	17.6	10.4
	Potato	119.5	2031.5	1.6	127.6	2424.4	1.9	167	3173	2.48	20.2	30.5
	Beans	95.2	761.6	1.1	103.8	903.1	1.4	110	964	1.49	18.6	6.42
	Marigold	127	889	0.6	127	1016	0.7	140	1220	0.83	14.3	18.5
	Chilies	51.1	102.2	0.2	51.1	117.5	0.2	65	149	0.25	15	25
	Total	842.1		7.3	873.9		8.56	965		7.37	16.4	17.5
Live stock	Egg	39577	5936550	1.6	39577	6530205	1.8	41400	6830345	1.88	1.88	4.4
	Meat	7573	75.73	2.2	7873	83.33	2.5	8000	87.67	2.6	2.6	4
	Milk	10491	6924	15.7	10580	6924.1	17.3	10890	77.1	19.2	19.2	10.9
	Total	57,641		19.6	58,030		21.6	60,290		23.6	7.89	6.43

4.3 East Godavari

4.3.1 District Profile

East Godavari is situated on the North East of Andhra Pradesh, lies in between 16.30^0 to 18.20^0 N and 81.3^0 to 82.3^0 E covers total geographical area of around 10807 km^2 as shown in Figure 4.3.1.1. Land use land cover details of East Godavari district are given in Table 4.3.1.1. The average annual rainfall of the district is around 1200 mm and the annual rainfall varies from 770 mm to 1850 mm as shown in Figure 4.1.3.2. The major soils are alluvial, red sandy and loamy soils. The major Rivers flowing in the District are Godavari and Yeleru. The Thandava and Pampa river channels supply water for drinking & cultivation purpose.

Table 4.3.1.1: Land use details of the district.

S. No	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

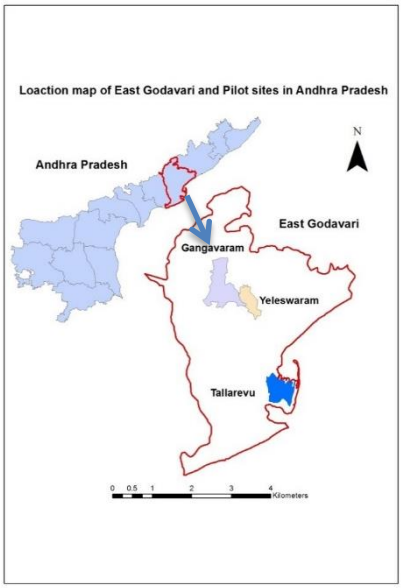


Figure 4.3.1.1: Map of East Godavari and Pilot site

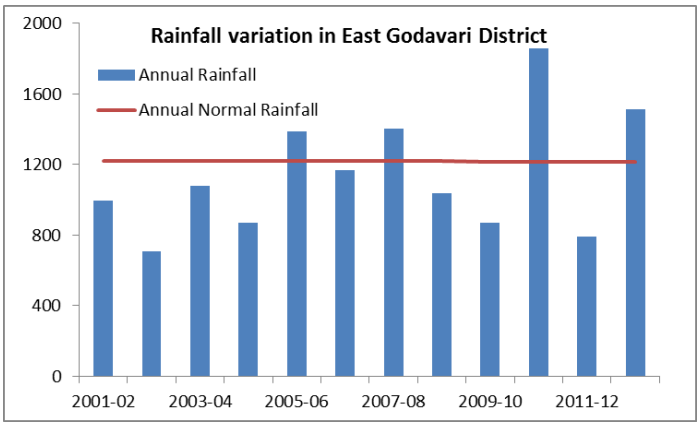


Figure 4.3.1.2: Average annual rainfall pattern in the East Godavari district

The district has a population of 48.73 lakhs as per 2001 census with 5 revenue divisions viz., Kakinada, Rajahmundry, Peddapuram, Ramachandrapuram, Rampachodavaram, Etipaka and Amalapuram. The other details of the district have been provided in Table 4.3.1.2. The district topographically divided into three divisions viz., agency, upland and delta ago 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. With the discoveries of oil and natural gas, it is one of the largest oil & gas hubs in India.

Table 4.3.1.2: Political and demographical features of the district.			
Area	10,807Sq Km	No. of Revenue Divisions	7
No. of Taluks	19	No. of Revenue Mandals	60 (58 Rural + 2 Urban)
No. of Mandal Praja Parishads	65	No. of Gram Panchayats	1011
No. of Municipalities	7	No. of Municipal Corporations	2
No. of Census	14	No. of Villages	1404

Cropping Pattern

The principal crops in the district are Paddy (52%), Coconut (11%), Cotton (10%), Cashew nuts (7%), sugarcane (6%), Mangoes (3%), plantation crops (3% each) and remaining are different vegetable cultivation areas (<5%) as shown in Figure 4.3.1.3. The production levels of major crops during 2012-13 are: paddy (2679621 M tons), sugarcane (1288800 M tons), cotton (18270 M tons), and vegetables (194600 M tons). As per 2012-13 statistics, the average annual per capita income is Rs 75,977/- year.

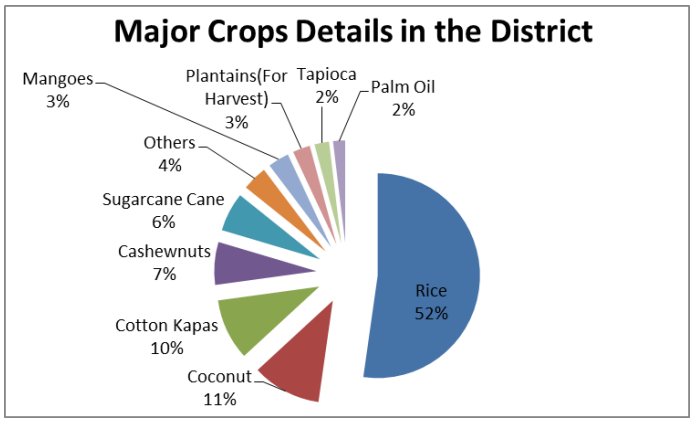


Figure 4.3.1.3: Major crops and their proportions in the East Godavari district.

Agriculture Sector

As per 2015-16 plans, the department of agriculture planned for achieving double digit growth with the selected growth engines as given in Table . The major proposed interventions are promoting micro nutrients, area expansion during *Kharif* and *rabi* 2015-16 and replacing

low yield cultivars with high yielding cultivars for important crops. The Expected increase in GVA as per department of agriculture is Rs 14 crores for 2015-16.

Paddy

In the agriculture sector, the highest income comes from paddy production. The data on paddy crop area-yields-production for 2007-2013 has been analysed for understanding the gaps in the paddy production. The results show that during *Kharif* season the paddy cultivating area and its yield are decreasing slowly from 2,41,000 ha to 2,35,000 ha and 2960 to 1850 kgs/ha, respectively. Whereas the paddy crop areas and their yields during *rabi* season are more or less same (1, 69,150 ha - 1, 69,500 ha) and 4,748 to 4,587 kgs/ha in the district. Overall, the production of paddy in the East Godavari district is declining from the past 5 years as shown in Figure 4.3.1.4.

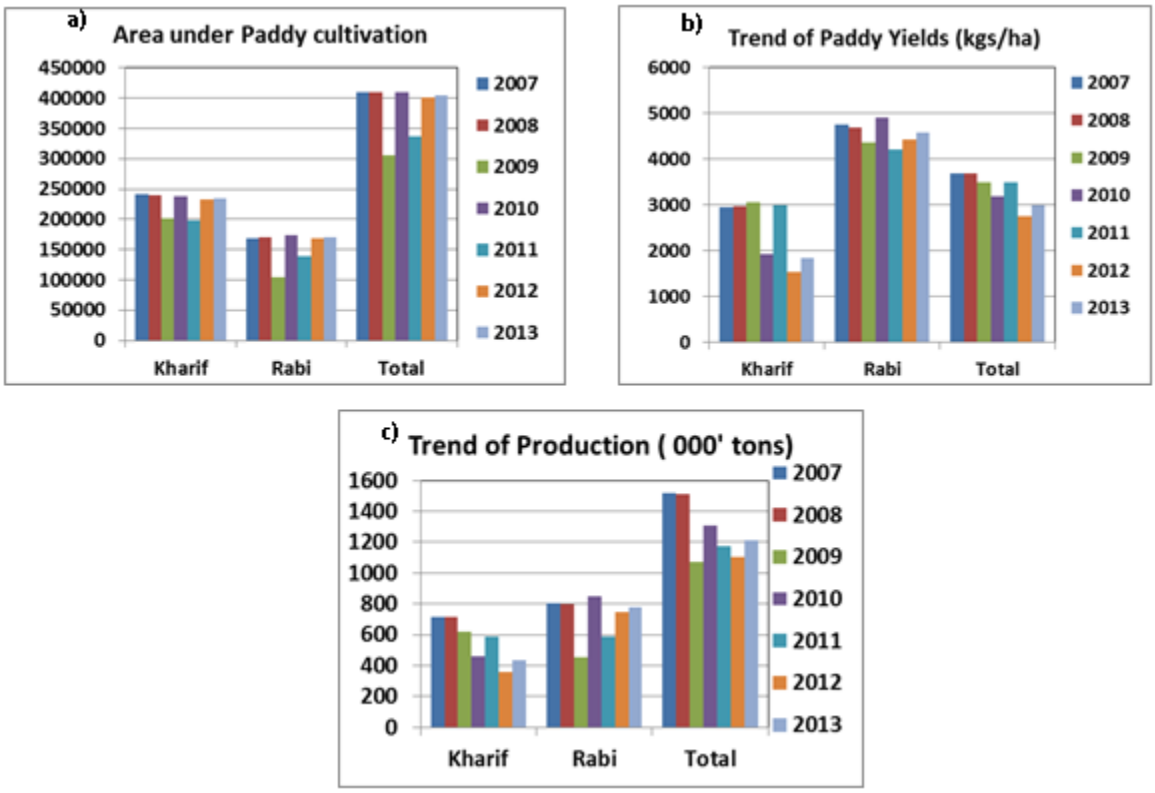


Figure 4.3.1.4: Paddy crop area-yield-production during Kharif and Rabi season from 2007-2013 in the district.

Key Drivers: The key drivers that impacting the yields of paddy have been identified such as, excess use of fertilizers, water shortages in tail ends of canals, cultivation of old age cultivars that lodging pest and diseases, deep planting, extra density of plantation, micro nutrients deficiency, poor weed management, low organic content, indiscriminative use of pesticides and post harvesting losses. To address these issues the following interventions were been planned for during 2015-16 as stated in Table 4.3.1.4.

Table 4.3.1.3: Comparison statement of Area, Yield, Production and GVA - 2014-15 & 2015-16.

S. No	Name of the Crop	2014-15			GVA (Cr)	2015-16			GVA (Cr)	% GVA
		Area (Ha)	Yield (Kg)	Production (MTs)		Area (Ha)	Yield (Kg)	Production (MTs)		
1	Paddy	395364	5891	2329063	3168	413458	6481	2679811	3645	15
2	Jowar	2060	1037	2137	3	1842	1160	2137	3	0
3	Bajra	58	1183	69	0	60	1183	71	0	0
4	Maize	13256	8288	109861	144	16571	8224	136281	179	24
5	Ragi	432	750	324	1	430	750	323	0	0
	Coarse Grain	411170	17149	2441454	3315	432361	17799	2818622	3827	15
6	Red gram	2164	600	1298	6	2200	600	1320	6	0
7	Greengram	1432	677	969	4	1500	524	786	4	0
8	Blackgram	15242	741	11301	49	19228	742	14272	62	27
	Total Pulses	18838	2018	13569	59	22928	1866	16377	71	20
	Total Food grains	430008	19167	2455022	3375	455289	19665	2834999	3898	15
9	Groundnut	153	1744	267	1	149	2452	365	1	0
10	Sesamum	3295	222	731	3	3450	222	765	4	33
	Total Oilseeds	3448	1966	998	9	3599	2673	1130	5	-44
11	Cotton	22433	812	74557	280	22500	812	85632	321	15
12	Sugarcane	14728	96000	1413888	240	13425	96000	1288800	219	-9
13	Tobacco	3394	2832	9612	31	3400	3068	10431	33	6
	Other crops	40555	99644	1498057	551	39325	99880	1384863	574	4
Total Cropped Area		474011	120777	3954078	3934	498213	122218	4220992	4477 (543Crs)	14

Table 4.3.1.4: The major issues and proposed interventions for 2015-16 in the districts.			
S No	Issue	Intervention	Proposed Area (ha)
1	Micro nutrient deficiency	Soil test based micro nutrient application for yield enhancement	2,40,000
2	Age old cultivars	Promoting non-lodging New Varieties like, MTU - 1061; 1064; 1075 and RP Bio 226	5000
3	Deep Planting	To reduce deep planting Direct sowing, SMSRI and Drum seeded Rice methods are promoted more	Direct Seeded- 29000; SMSRI – 600; Transplanting – 150000; Drum seeded – 600.
4	Machine Transplanting	To reduce cost of cultivation	25
5	Low organic matter	Promoting green manure crops	20000

Sugarcane

Sugarcane is the second major crop in the agriculture sector with high production in the district. The data analysis results show that the crop area under sugarcane also declining slightly since 2007, similarly it is observed that sugarcane crop yields are also declining.

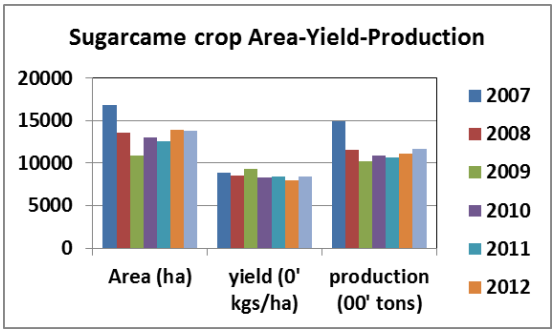


Figure 4.3.1.5: Sugarcane crop-yield-production trends.

Key Drivers: The major key drivers that impacting sugarcane yields are due to not usage of appropriate seed materials and not following seed treatments procedures prior to sowing. To address these issues, single bud chip of plantation Seed treatment with Malathion and Carbendazim are in promotion for *Kharif* 2015-16.

Cotton

The crop area under cotton show an increasing trend in the district, i.e. 8000 ha to 22000 ha, whereas yields show a decreasing trend from 1200 to 600 kgs/ha from 2007-2013.

Key Drivers: Majorly two key drivers were found responsible along with others such as non-maintenance of optimum seed plantation and sucking pest damage. To address these issues, the farmers are been given trainings on encouraging to sow 700 gram/acre (10000 ha) rather than 450 gram/acre and promotion of stem application of pesticides against sucking pest (7000 ha).

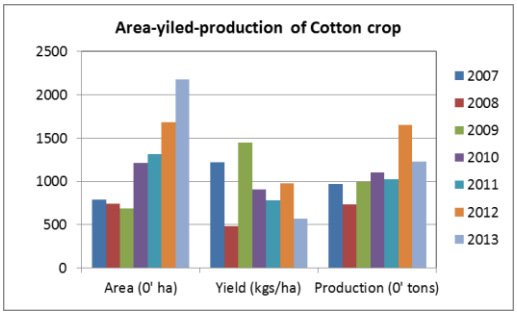


Figure 4.3.1.6: Trends of cultivated area-yield-production of cotton crop.

4.3.2 Pilot Site profile

The pilot site is divided into three parts that spreads across three agro-ecological zones of East Godavari district, i.e. 7 villages in Gangavaram mandal of agency zone and 9 villages in Yeleswaram mandal of upland land zone and 10 villages in Tallarevu mandal (inland fisheries) of delta zone as shown in. The total geographical area of the pilot site is about 15,870 ha including 4052 ha of agricultural land, 3634 ha of horticulture area and 2203 ha of fisheries. The total population of the pilot site is 67,843 with 17,487 households as given in Table 4.3.2.1. Total animal population in the pilot site is 20,303 with low milk yield capacity due to fodder scarcity and poor management practices. The pilot site in the district also contains almost all the major growth engines such as Paddy (in both Gangavaram and Yeleswaram), Cotton (in both Gangavaram and Yeleswaram), Sugarcane (in Yeleswaram), Cashewnut (In Gangavaram), Banana (in Yeleswaram) and vegetables in both mandals.

Weather Information

The pilot site receives around 1000-1050 mm as annual rainfall, in which around 90% rains during South-West monsoon (June–September) season and around 10% rains during North-East monsoon (October–December) season as given in appendix.

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 micro nutrient application for all crops; 2) Improved seed/varietal replacement to fill the yield gaps with new plantation methods (PPP mode); 3) Crop diversification with Pigoenpea, 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; Introduction of micro irrigation in horticulture and vegetable crops; 6) Introducing multi-purpose maize hybrid for fodder production and 8) Rejuvenation of cashew nut crop area with grafting and micro irrigation.

Table 4.3.2.1: Mandal wise geographical and crop area particulars of pilot site in East Godavari district.

S No	Mandal Name	Geo Area (ha)	Total *Kharif* Area (ha)	Total *Rabi* Area (ha)	No Of HH	Population	Agriculture (ha)	Horticulture (ha)	Vegetables (ha)
1	Gangavaram	4902	3034	-	1331	4901	670 (22%)	1874 (62%)	490 (16%)
2	Yeleswaram	8967	4652	2784	16156	62942	3381 (73%)	1033 (22%)	236 (5%)

Table 4.3.2.2: General and crop details of pilot villages of East Godavari district.

S No	Mandal Name	Village Names	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	Gangavaram	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	Yeleswaram	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

Table 4.3.2.3: Details of farmer's trainings under different interventions in Gangavaram and Yeleswaram mandals 2015-16.													
S No	Mandal	Village Name	Soil Sampling	BBF	Soil test results	Micro nutrients Usage	Improved Varieties	IPM	(Kubota -ICRISAT-DoA) Machine Transplantation	Horticulture & Animal Husbandry Schemes	Men	Women	Total
1	Gangavaram	Amudalabanda	2	2	1	3	1	1	1	1	240	120	360
2	Gangavaram	Gangavaram	2	2	1	3	1	1	1	1	360	60	420
3	Gangavaram	Goragommi	2	2	1	3	1	1	1	1	120	480	600
4	Gangavaram	Kusumarai	2	2	1	3	1	1	1	1	240	60	300
5	Gangavaram	Lakkonda	2	2	1	3	1	1	1	1	300	240	540
6	Gangavaram	PP palem	2	2	1	3	1	1	1	1	120	240	360
7	Gangavaram	Rajampalem	2	2	1	3	1	1	1	1	240	120	360
8	Yeleswaram	Bhadravaram	2	2	1	3	1	1	2	1	260	65	325
9	Yeleswaram	E L Puram	2	2	1	3	1	1	2	1	325	0	325
10	Yeleswaram	J Annavaram	2	2	1	3	1	1	2	1	390	195	585
11	Yeleswaram	Lingamparthi	2	2	1	3	1	1	2	1	910	39	949
12	Yeleswaram	Marriveedu	2	2	1	3	1	1	2	1	325	0	325
13	Yeleswaram	Peravaram	2	2	1	3	1	1	2	1	390	0	390
14	Yeleswaram	Ramanayyapeta	2	2	1	3	1	1	2	1	325	65	390
15	Yeleswaram	Siripuram	2	2	1	3	1	1	2	1	325	65	390
16	Yeleswaram	Yeleswaram	2	2	1	3	1	1	2	1	390	130	520
		Total	32	32	16	48	16	16	25	16	5260	1879	7139

4.4 Guntur

4.4.1 District Profile

Guntur district has total area 11.39 lakh ha lies between the north latitudes of 15.18 to 16.50 degrees and 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.

Table 4.4.1.1: Guntur district targets of major crops (Ha.)

Crop	2015-16			2016-17				2017-18 (target)			
	Kharif	*Rabi*	Total	Spl Inter	*Kharif*	*Rabi*	Total	Spl Inter	*Kharif*	*Rabi*	Total
Paddy	160608	2102	162710	0	163747	10000	173747	0	235607	15000	250607
Cotton	206374	0	206374	0	141856		141856	0	180000		180000
Blackgram	1624	53271	54895	16137	519	80000	96656	26000	767	80000	106767
Maize	689	29137	29826	1000	411	45000	46411	3500	896	48000	52396
Greengram	3232	43488	46720	7512	2887	16000	26399	11500	2316	22000	35816
Jowar		11761	11761	0		28000	28000	0		28000	28000
Redgram	21691		21691	1300	32377		33677	2000	27000		29000
Bengalgram		15000	15000	0		19865	19865	0		20000	20000
Groundnut		5590	5590	0		4670	4670	0		5000	5000
Others	7546	2413	9959	2529	6087	6150	14766	4000	2003	7482	13485
Total	401764	162762	564526	28478	347884	209685	586047	47000	448589	225482	721071

Table 4.4.1.2: Guntur district productivity targets of major crops (Kg/Ha)

Crop	2015-16			2016-17			2017-18(Target)		
	Kharif	*Rabi*	AVRG	*Kharif*	*Rabi*	AVRG	*Kharif*	*Rabi*	AVRG
Paddy	4678	5625	5152	6891	6188	6540	6959	6374	6667
Cotton	1850		1850	2289		2289	2420		2420
Black gram	1470	1441	1456	975	866	921	995	1150	1073
Maize	3810	8500	6155	3810	8750	6280	3924	8826	6375
Green gram	500	1050	775	725	500	613	740	910	825
Jowar		6472	6472		6500	6500		6650	6650
Red gram	1114		1114	1164		1164	1353		1353
Bengal gram		1520	1520		2022	2022		2123	2123
Groundnut		2585	2585		2450	2450		2523	2523
Others	10721		10721	6480		6480	3919		3919

Table 4.4.1.3: Guntur district production Conclusions (% of increase or decrease in respect of GVA of different crops).

Crop	2015-16		2016-17		% of Increase in GVA over 2015-16	2017-18		% (+/-) (over 16-17)
	Production (Mts)	GVA (Rs Cr.)	Production (Mts)	GVA (Rs Cr.)		Production (Mts)	GVA (Rs Cr.)	
Paddy	763148	824	1190261	1285	56	1735199	1874	45.78
Cotton	381792	1426	324708	1213	-15	435600	1627	34.15
Blackgram	79151	267	85520	289	8	118633	400	38.72
Maize	250290	271	399126	432	59	440898	477	10.47
Greengram	47278	166	15539	55	-67	30244	106	94.63
Jowar	76117	96	182000	229	139	186200	234	2.31
Redgram	24164	75	39200	122	62	39237	122	0.09
Bengalgram	22800	63	40167	111	76	42460	118	5.71
Groundnut	14450	55	11442	44	-21	12615	48	10.26
Others	106771	130	95691	122	-6	52845	135	10.74
Total	1765961	3373	2383653	3900	16	3093931	5141	31.81

Table 4.4.1.4: GVA addition through proposed strategies for 2017-18 (Additional areas through increasing cropping intensity).

S. No	Name of the Intervention	Area proposed for 2017-18 (Ha.)	Expected Additional GVA as per Constant prices 2011-12 (Cr.)
1	Pre *Kharif* Crops	40,000	117.22
2	Redgram on Field bunds (20,000 ha of Redgram = 2,000 ha. of Pure crop)	2,000	8.39
3	Inter Cropping in Redgram	3,000	7.89
4	Double Cropping in Single Cropped *Rabi* Areas	2,000	4.21
	Total Additional Area :	47,000	137.71

Guntur district Animal Husbandry:

Table 4.4.1.5: Targets & Achievements During 2016-17.

Sl No	Key Indicator / Growth Engine	Physical				GVA (Rs. in Crs)		
		Unit	Annual Target	Ach.	% of Ach.	Annual Target	Achievement	% of GVA (Ach.)
1	MILK (L.MTS)	Lakh .MTs	1340	1623.33	121.14	4047	4901	121%
2	MEAT (000'MTS)	(000, MTs)	553000	67473.47	122.01	1455	1642	112 %
3	EGGS (Cr.No)	(Cr.os)	16200	16229.62	100.18	424	424	100%
	Functional Indicators							
1	Curative Treatment	Nos	2600000	*3028866*	116.5			
2	Preventive Treatment (Deworming)	Nos	2070000	*2529764*	122.2			
3	Castrations	Nos	27000	*30631*	113.4			
4	Vaccinations	Nos	4000000	*4457541*	111.4			
5	A I Done	Nos	300000	*275019*	92			
6	Calf Births	Nos	140000	*107447*	76.7			

Sl. No.	Key Indicator / Growth Engine	Action Plan – 2017-18				
		Physical			GVA (Rs. in Crs)	
		Unit	Annual Target	% increase over 2016-17.	Annual Target	% increase over 2016-17
1	MILK (L.MTS)	Lakh .MTs	1500	11	4665	15
2	MEAT (000'MTS)	(000, MTs)	65000	17	1690	16
3	EGGS (Cr.No)	(Cr.os)	18500	14	508	20
Functional Indicators						
1	Curative Treatment	Nos	2730000	5		
2	Preventive Treatment (Deworming)	Nos	2173500	5		
3	Castrations	Nos	27000	0		
4	Vaccinations	Nos	400000	0		
5	A I Done	Nos	4750000	58		
6	Calf Births	Nos	205000	46		

4.4.2. Pilot Site profile

Pilot Site Location and Details: Guntur district pilot site area was selected in two mandals based on the cropping pattern. Kolluru mandal for paddy, *Rabi* maize and horticulture crops. Sattenapalli mandal mainly for cotton and chilli crops. Total households of the pilot site is 17634 with a population of 63202. The average rainfall is 1219 and 858 mm for Kolluru and Sattenapalli mandals.

Table 4.4.2.1: Pilot site villages, Guntur district.

S.No	Mandal Name	Villages Covered	Crops and area in ha in parentheses
1	Kollur(7)	Chilumuru, Donepudi, Gajullanka, Ipuru, Kollur, Potharlanka, Ravikampadu	Paddy (3444), Maize (3619), Horticulture ,(1337)
2	Sattenapalli (6)	Gudipudi , Kattamuru, Nandigama, Panidem Pedamakkena, Rentapalla	Cotton (2907), Chillies (2132)
3	Karlapalem	Tummalapalli, Pedapuluguvari Palem	Shrimp farming (Fisheries) (300)
4	Tullur	Venkatapalem	Cage farming (Fisheries)

Table 4.4.2.2: Pilot site crop area, Guntur district.

			Kharif crops area ha				*Rabi* crops area ha			
Mandal	Total	Cultivable	Agriculture		Horticulture					
	area ha	area ha	Paddy	Cotton	Chillies	Others	Maize	Sorghum	Pulses	Horticulture
Kollur	7721	6269	3444	0	0	2530	3619	250	121	275
Sattenapalli	7197	7094	1876	2907	2132	99	0	0	0	0
Pilot site	14918	13363	5319	2907	2132	2629	3619	250	121	275

Table 4.4.2.3: Pilot site livestock, Guntur district.							
Live Stock	Cattle	Buffalo	Sheep	Goat	Milk	Egg	Meat
					Lakh liters/year	Lakh No/year	kg/year
Kollur	272	5488	1405	237	39.61	68.1	37427
Sattenapalli	838	6975	4775	591	58.64	0.92	93241
Pilot site total	1110	12463	6180	828	98.25	69.02	130668

Major Crops and Constraints for Productivity: The soils at Kollur and Sattenapalli mandal pilot sites are deficient in Organic Carbon (28, 53%), and Zinc (17, 51%), the other nutrients are not deficient.

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, pest, diseases etc.

Table 4.4.2.4: Guntur district pilot site cropped area for 2016-17.													
Sl.No.	District	Mandal	Village	Paddy	Yam	Turmeric	Banana	Betelleaves	Fodder	Maize (I)	Sorghum (UI)	Blackgram (U.I)	Banana (I)
				Kharif						*Rabi*			
1	Guntur	Kolluru	Kolluru	3355	70	153	84	0	69	2812	190	200	28
2	Guntur	Kolluru	Ipuru	586	283	351	150	120	40	577	380	50	66
3	Guntur	Kolluru	Chilumuru	380	139	181	64	30	10	147	420	40	37
4	Guntur	Kolluru	Gajullanka	0	461	618	332	0	20	815	0	315	110
5	Guntur	Kolluru	Donepudi	1296	88	143	43	4	20	987	250	20	59
6	Guntur	Kolluru	Ravikampadu	3118	0	0	0	0	23	2881	130	154	0
7	Guntur	Kolluru	Potharlanka	0	903	1742	543	299	65	1591	0	401	710
Total area in acres				8735	1944	3188	1216	453	247	9810	1370	1180	1010
Area in Hectares				3535	787	1290	492	183	100	3970	554	478	409

Table 4.4.2.5: Guntur district pilot site Sattenapalli mandal Crop are for 2016-17.						
Sl No	District	Mandal	Village	Paddy	Chillies	Cotton
				Kharif		
1	Guntur	Sattaenapalli	Rentapalla	15	230	202
2	Guntur	Sattaenapalli	Kattamuru	66	680	743
3	Guntur	Sattaenapalli	Phanidam	48	1155	1208
4	Guntur	Sattaenapalli	Pedamakkena	12	810	840
5	Guntur	Sattaenapalli	Gudipudi	28	860	910
6	Guntur	Sattaenapalli	Nandigama	53	737	815
Total area in acres				222	4472	4718.4
Area in Hectares				90	1811	1910

Interventions Planned in Guntur District Pilot Site Area

Soil test based nutrient application, recycling of crop residue, Stem application in cotton, Intercropping of cotton with red gram (1:4), Sun hemp preceding chillies, Drip and fertigation in cotton and chillies , Hi-tech nursery-Poly house/shade net technology , Solar pump sets ,

Tissue culture banana plants, ripening chambers, Market linkage, Introduction of turmeric boilers for better quality, Capacity building programs.

Table 4.4.2.6: Interventions at pilot site, Guntur district.		
Key Interventions at Pilot sites	Targets	Achievements
Building Soil health		
Soil sample analysis for horticulture fields, information given	300 samples	294 samples done
Soil Health Cards	Under process	Done
Aerobic composting & its use	5 farmers	Being tried
Micronutrients distribution in tons	4570 kg of Zinc sulfate	Done
Crop diversification		
Inter crop with Pigeon pea in Cotton	Maruthi , Asha, ICPH 2740 and short duration	60 acres
Intercrop with Ginger in Banana		5 acres
Multi cut sorghum as fodder	10 Kg	5 acres
Introducing native varieties of seed banks like ginger, Turmeric and sorghum	Trial basis with 5 farmers	Done
Value addition to the existing crops	Moringa powder, Rosella and Neem powder	Done
Solar energy promotion for irrigation of crops		
Vegetable seeds distribution for kitchen gardens promotion	150 members	136 members
Integrated pest management in horticulture crops		
Maize as a fodder		3 farmers
Farmers Advisory Services	Documentation of crop management practices, yields, net incomes, and use of pesticides and fertilizers in Chillies and Cotton crops.	
Live Stock (Dairy, Poultry, Meat)	As per the department targets	In Process
Fisheries	As per the department targets in 2 pilot villages	In Process

Farmers Advisory Services

As part of the Farmanet services, Aranya has been collecting data from Kattamuru village of Sattenapalli & Potharlanka village of Kollur mandal farmers. The data includes documentation of crop management practices, yields, net incomes, and use of pesticides and fertilizers. Analysis of the data for one year was done and report was shared with each respective farmer. This report helped the farmers to understand the deficiencies and issues in their farming practices and they could take remedial measures as per the recommendations made in the reports. These farmers adopting the recommendations given by the scientists such as:

- Chilly Farmers are growing green manure crops to increase organic matter in the soils.
- Reduced use of chemical Fertilizers and increased application of FYM or Green manure crops inCotton & chilly and Turmeric.
- Initiated organic farming practices.

Monthly Rainfall Status in Guntur District at 4 Pilot Mandals during 2016-17
Average the Rainfall was below Normal for 2016-17 *Rabi* seasons, see appendix for actual and normal rainfall. Nagarjunasagar command area paddy was not grown due to no canal water. So half of the paddy area reduced for the district.

4.5 Kadapa

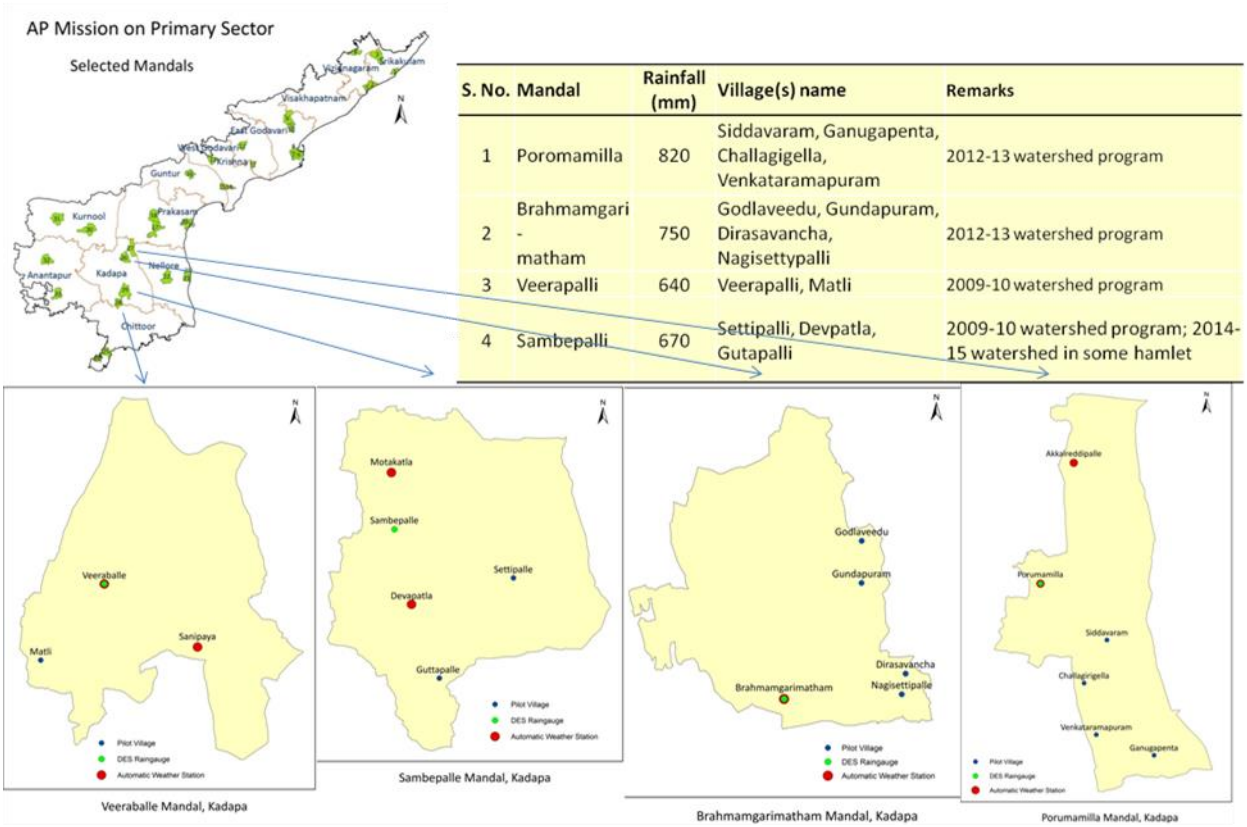
4.5.1 District profile

Kadapa district has a geographical area of 15,35,900 ha and is home to 25,73,000 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% population depend 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 3,56,880 ha (212480 ha *kharif*; 144404 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 – 138132 cattle, 457504 buffaloes, 1399755 sheep and 453971 goats, 1153290 backyard poultry birds, 365860 commercial farm birds (2012 census). About 25,660 ha reservoir and tank area is under fisheries. Sericulture related activities cover about 240 ha area. As such current gross value from agriculture in Kadapa is 5708 crores. And per capita income in the district is Rs 70,820. Poor income from agriculture sector is mainly because of low crop productivity levels in the district. For example crop productivity is 2,950 kg ha^{-1} in paddy, 990 kg ha^{-1} in groundnut, 850 kg ha^{-1} in sunflower, 750 kg ha^{-1} in bengal gram, 8,260 kg ha^{-1} in mango, 30,000 kg ha^{-1} in banana 19,000 kg ha^{-1} in tomato, 17,000 kg 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, buffaloes along with fodder scarcity and improper healthcare and feeding schedule is responsible for poor livestock yield.

4.5.2 Pilot site profile

ICRISAT along with line departments has selected 13 villages across 4 mandals spread over 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 4.5.2.1; Table 4.5.2.1). The livestock population in pilot villages is about 9,500 breedable cattle & buffaloes (with ~5,100 animals in milk), and 91,200 sheep & 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 is addressing the constraints to harness the potential for improving productivity of different systems and gross value addition (GVA) (Table 4.5.2.2) through several innovations such as soil test-based fertilizer practices; improved crops and varieties; 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,

sheep/goat/chick distribution, deworming /vaccination (~70-100% livestock) AI (~10% livestock); 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 4.5.2.1: Detail of pilot sites in Kadapa district.

Table 4.5.2.1: Pilot village wise details.

S. No.	Village	Geographical area (ha)	Net sown area (acres)			Gross Irrigated area (Acres; 2013-14)			Gross Area under hort (Acres; 2016-17)		Livestock population (Number)				Inland Fisheries		HHs		Population
			kharif	*rabi*	Total	Canal	GW	Other	Veg	Fruits	Breedable Cattle	Breedable Buffaloes	Sheep	Goat	Area (acres)	Ponds (No)	Small & Marginal	Other	
1	Siddavaram	3133	363	251	614		475	72	61		5	832	2874	411	63	1	373	47	1939
2	Ganugapenta	4651	326	208	534		506	0	45	10	12	783	2499	964			701	68	2382
3	Tsallagirigella	5953	431	258	689		504	0	65	10	0	1025	1144	921			593	64	2113
4	Venkataramapuram	333	162	109	271		348	0	35		20	398	4060	464	30	1	190	13	975
5	Godlaveedu	2890	209	0	209		371	0	7		0	211	3608	162			462	14	1428
6	Gundapuram	5637	110	80	190		190	0	5		0	25	773	100			156	8	508
7	Dirasavancha	5963	501	180	681	30	613	2	50	5	0	528	6109	888			884	25	3011
8	Nagisettipalle	1840	491	80	571	70	470	0	33	5	10	344	1881	135	28	1	466	12	1607
9	Veeraballe	3702	1895	1390	3285		1849	499	15	880	369	250	6055	1979	262	2	897	55	8720
10	Matli	3533	1649	814	2463		996	296	22	440	587	746	6429	2436	45	1	1195	198	6836
11	Settipalle	7852	4750	1089	5839		2056	218	197	460	1638	116	18083	1641			2194	393	9224
12	Devapatla	8289	3116	668	3784		1382	100	213	400	1130	155	25374	245			1485	73	6532
13	Guttapalle	1595	339	129	468		293	0	52	50	267	70	1918	129			282	72	1469
	TOTAL	55371	14342	5256	19598	100	6859	797	800	2260	4038	5483	80807	10475	427	6	9878	1042	46744

Table 4.5.2.2: GVA Details.

Sector	Commodity (e.g.)	2014-15			2015-16			2016-17			% increase in GVA	
		Area	Production	Gross Value	Area	Production	Gross Value	Area	Production	Gross Value	2015-16 over 2014-15	2016-17 over 2015-16
		(acres)		(₹ crore)	(acres)		(₹ crore)	(acres)		(₹ crore)		
Agriculture	Paddy (prod in t)	1118	1206	1.57	2337	2469	3.21	1993	2162	2.81	104	-12
	Groundnut (prod in t)	4847	1535	6.14	7458	2294	9.18	5740	1862	7.45	50	-19
	Cotton (prod in t)	643	157	0.58	324	80	0.3	376	94	0.35	-48	17
	Other (prod in t)	4524	742	2.97	5243	864	3.46	5397	897	3.59	16	4
	Total	11132	3640	11.26	15362	5707	16.15	13506	5015	14.2	43	-12
Horticulture	Vegetables (prod in t)	210	4324	3.75	488	10317	8.55	814	17596	14.1	128	65
	Fruits (prod in t)	2175	783	1.57	2250	810	1.62	2260	814	1.63	3	1
	Total	2385	5107	5.32	2738	11127	10.17	3074	18410	15.73	91	55
Livestock	Milk (Prod in L)		5565885	18.4		5736205	18.9		5870180	19.4	3	3
	Meat (Prod in kg)		465656	17.8		481045	18.4		490942	18.8	3	2
	Eggs (Prod in No)		1723803	0.51		1749090	0.52		1769097	0.53	2	2
	Total		7755344	36.7		7966340	37.8		8130219	38.7	3	2
Fisheries	Total	-	-	-	-	-	-	-	-	-	-	-
	G. Total			53.3			64.1			68.7	20	7

4.6 Krishna

4.6.1 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 millions with a literacy percentage of 60.65 out of which 29.63% is under Agricultural sector. The district falls under the Tropical climatic zone and experiences extreme hot summer and severe winter. Summer temperatures rises even upto 50˚C and 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 South-West and North-East monsoons. Total normal Rainfall of the district is 1034 mm and 67% (686 mm) of this is contributed from South-West monsoon, 24% (250 mm) is contributed by North-East monsoon, while remaining 8 % (98 mm) is shared by winter and summer showers (Figure 4.6.1.1).

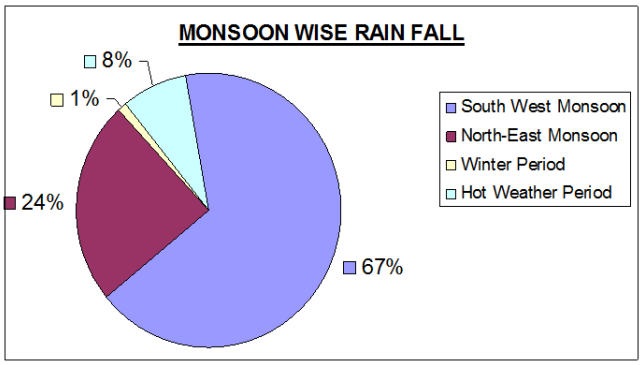


Figure 4.6.1.1: Rainfall pattern in Krishna district.

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 all most 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 which details below (Figure 4.6.1.2)

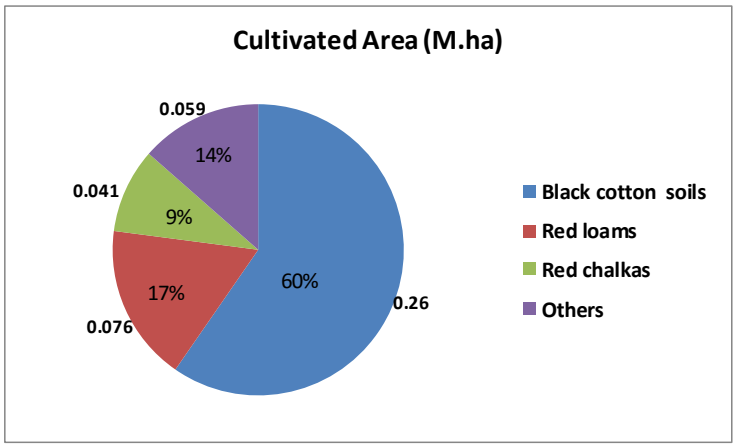


Figure 4.6.1.2: Cultivated area under different soil types (million ha).

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 4.6.1.1: 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 in to four Revenue Divisions i.e. 1. Machilipatnam 2. Vijayawada 3. Gudiwada and 4. Nuzvidu. The Agro climatic conditions are different in four divisions of the district. Machilipatnam and Gudiwada are located in high rainfall zone covered under K.E. 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 74.7% of the total cropped area is.

Cropping Pattern

The cropping pattern of the district varies due to the existence of different Agro-climatic conditions which includes the following major cropping patterns listed in the table.

Table 4.6.1.2: 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

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 4.6.1.3; it can be noted that the targets for 2016-17 have been estimated based on the discussions with JDA, Krishna district and their team

Table 4.6.1.3: Productivity achievements and future targets of major crops in Krishna district.

	2015-16 kgs/ha			2016-17 (Target)		
Crop	*Kharif*	*Rabi*	Total	*Kharif*	*Rabi*	Total
Paddy	5076	6690	5883	5400	7125	6263
Maize	7115	7500	7431	7000	7500	7416
Green Gram	765	750	754	750	1000	1000
Black Gram	1070	1125	1165	1000	1250	1247
Cotton	2120	0	2120	2420	0	2420
Sugarcane	100000		100000	10500	0	10500

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

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

Horticulture:

Horticulture is one of the key sectors identified in the district for achieving the double digit growth. Based on the growth engines listed for Horticulture, Mango occupies the first place cultivated in 60, 486 ha with a production of 544373 tonnes with a GVA value of Rs. 646 crores followed by tomatoes and chillies.

The major interventions proposed in Horticulture sector for Krishna district to achieve double digit growth are detailed below

Table 4.6.1.4: Horticulture specific interventions in Krishna	
Crop	Interventions proposed
Oil Palm	Drip Irrigation, INM, Inter crop
Vegetables	Hybrid vegetable seed, Trellies, Pandals IPM & INM, Mulching
Guava	Drip Irrigation, INM.
Chilli	Drip with fertigation , IPM & INM, Mulching
Mango	Drip Irrigation, Canopy management, INM & IPM

Animal Husbandry:

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.

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.

Fisheries

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.

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.

4.6.2 Pilot Site profile

The Rythu Kosam-AP Primary sector pilot site in Krishna district has been selected in three mandals namely Ghantasala, G. Kondur and Machilipatnam mandals 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 4.6.2.1. The total geographical area of the pilot site is about 18103 ha with a cultivable

area of 15182 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 falls under the delta region while G. Kondur mandal falls under upland area. The major crops grown in the G. Kondur mandal includes cotton, paddy, chillies, vegetables and mango.

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

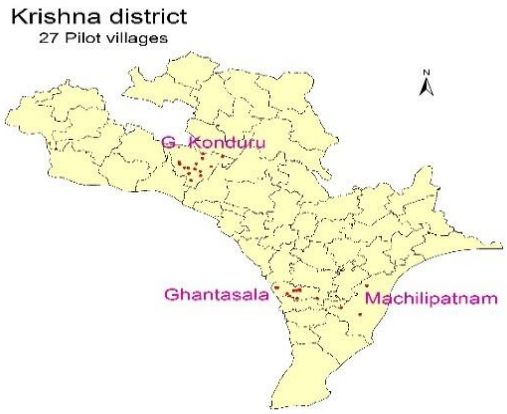


***Figure 4.6.2.1: Map of Krishna pilot* sites.**

Table 4.6.2.1: 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

Rainfall status 2016-17

The average rainfall in the selected pilot sites ranges between 910 mm to 1076 mm annually, see appendix for actual and normal rainfall in Nellore district.

Major Crops and Constraints for Productivity:

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 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.

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 socio-economic status of the farmers in the pilot sites through interactions and interviews.

Wall paintings
All the pilot villages were attended with a wall painting that was the mean attributes of the village. These oil paintings were done on prominent places like the village panchayat or the primary school where visitbility was high. Sample wall paintings are placed below.

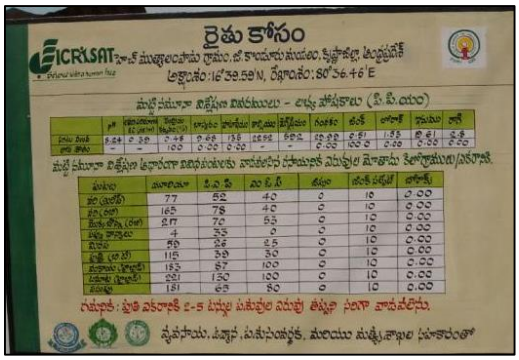


Figure 4.6.2.2: Wall painting of soil nutrient status.

4.7 Kurnool

4.7.1 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.

4.7.2 Pilot site profile

In Kurnool district there are two pilot sites one in Devanakonda and second in Banaganapalle mandal (Fig 4.7.2.1). These have been selected after visiting several sites along with Kurnool district officials and considering several key parameters. The pilot site at Devanakonda mandal is having mostly red soils with mean annual rainfall of 601 mm while the pilot site at Banaganapalle mandal is having black soils (Vertisols) with mean annual rainfall of 643 mm.

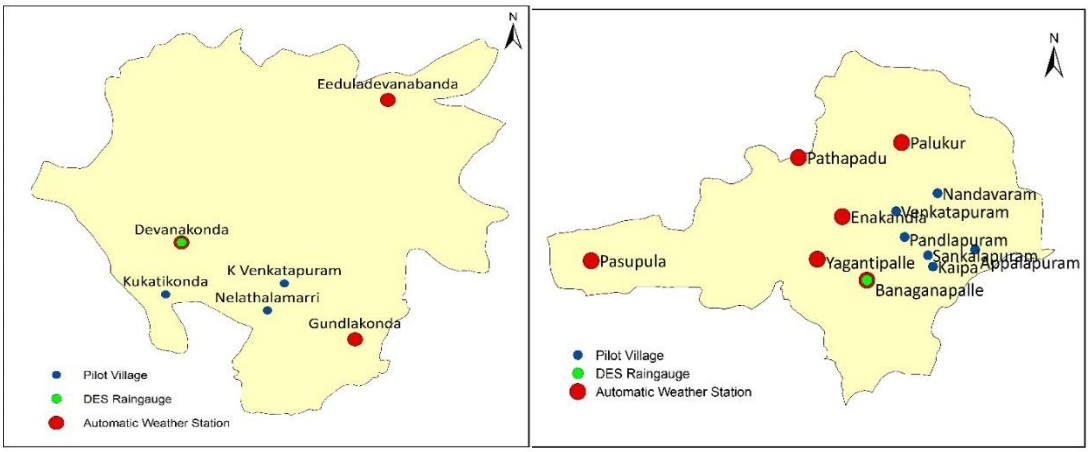


Figure 4.7.2.1.Selected pilot sites in Kurnool district.

The name of villages and their latitude, longitude of two selected pilot sites in Kurnool district are given in Table 4.7.2.1.

Table 4.7.2.1: 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)

The total households at both pilot sites is 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 are irrigated and remaining 85% area is rainfed. Major crops grown at the pilot sites are groundnut, rice, sorghum, bengal gram, Pigeonpea, cotton, vegetables and horticulture crops. Some of the major constraints to primary sector at the pilot sites are low rainfalls & 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%).

Table 4.7.2.2: Pilot village wise details- Devanakonda pilot site, Kurnool.

S. No	Village	Geographical area (ha)	Net cultivated area	Gross cultivated area		Irrigated area			Area under hort crops		Livestock population				Inland Fisheries		HHs		Population
				kharif	*rabi*	Canal	GW	Other	Vegetables	Fruits	Cattle	Buffaloes	Sheep	Goat	Area	Ponds	Small & Marginal	Other	
1	Devanakonda	975	637	380	54	0	62	0	10	1.5	43	36	1587	243	0	0	1570	673	9664
2	Kukatikonda	1485	1282	1024	54	0	68	0	7	19	155	253	792	521	0	0	530	149	2200
3	Nethalamari	2047	1593	1065	126	0	206	0	18	31	152	179	1249	469	0	0	486	48	1897
4	K.Venkatapuram	693	243	193	11	0	11	0	9	18	34	44	202	62	0	0	424	31	1200

Table 4.7.2.3: Pilot village wise details- Banaganapalle pilot site, Kurnool.

S. No.	Village	Geographical area (ha)	Net cultivated area	Gross cultivated area		Irrigated area			Area under hort crops		Livestock population				Inland Fisheries		HHs		Population
				kharif	*rabi*	Canal	GW	Other	Vegetables	Fruits	Cattle	Buffaloes	Sheep	Goat	Area	Ponds	Small & Marginal	Other (Big)	
1	Nandavaram	1264	983	200	650	758	40	25	20	0	356	920	9872	2042	6	3	1200	30	5623
2	Pandlapuram	782	576	100	550	500	30	40	62	0	40	292	100	250	0	0	235	5	710
3	Venkatapuram	822	729	100	625	570	65	44	0	0	90	911	265	247	0	0	561	8	1629
4	Kaipa	668	554	300	418	400	35	49	31	0	165	763	839	447	15	1	354	2	1760
5	Sankalapuram	657	429	63	346	411	0	9	0	0	16	118	0	12	0	0	189	2	651
6	Appalapuram	906	644	121	641	461	0	53	0	0	71	250	208	361	0	0	360	6	1402

Table 4.7.2.4: Growth Engines of Kurnool district for 2015-16(AE) and 2016-17 (Target & achievement) at Constant (2011-12) Prices.											
Sl. No	GROWTH ENGINES	(Prod. in '000 Tons) (GVA in Lakhs)									
		2015-16 (AE)		2016-17 Target		2016-17 Achievement					
						Q1	Q2	Q3	Q4		
		Prod.	GVA	Prod	GVA	GVA	GVA	GVA	GVA	Total	% Ach
	Agriculture										
1	Cotton (kapas)	382986	133658	298	153707	0	0	75608.4	23104	98712.4	64.22
2	Paddy	618100	62708	712.07	72114	0	0	51059.4	22595	73653.95	102.14
3	Bengalgram	176421	45724	247	52582	0	0	0	57418	57418.25	109.20
4	Groundnut	92013	32706	123.22	37612	0	36817	0	7240.6	44057.62	117.14
5	Tobacco	32397	23552		27084	0	0	0	0	0	0.00
6	Jowar	126100	14805	218.05	17026	0	0	845.62	13171	14016.82	82.33
7	Maize	172580	17443	282.87	20060	0	22886	0	4367.8	27253.83	135.86
8	Blackgram	18821	5936	50	6826	0	11396	0	6777.5	18173.5	266.24
9	Redgram	17319	5020	67.9	5773	0	0	28217.6	0	28217.6	488.79
10	Castor	16986	5099	81.6	5863	0	11524	0	0	11524.16	196.56
11	Sunflower	12699	3468		3989	0	995.84	0	393.22	1389.06	34.82
12	Sesamum (Gingelly)	2034	783		900	0	0.62	0	39.12	39.74	4.42
13	Sugarcane	79130	2507		2883	0	0	539.68	0	539.68	18.72
14	Greengram	3251	1067	3.3	1227	0	1501.1	0	106.06	1607.16	130.98
15	Rape and Mustard	2695	754		867	0	0	0	0	0	0.00
16	Rest of Agri. crops		24227	90.6	27862	0	6799.1	0	1583.7	8382.79	30.09
	Agriculture Total		379457	2174.6	436376	0	91919.66	156270.7	136796	384986.56	88.22

4.7.2.5: DOUBLE DIGIT GROWTH - Progress report on production plan and GVA during *kharif* 2016 under primary sector agriculture- Kurnool district					
Sl. No.	Parameter	*Kharif*			
		2014	2015	Projected for 2016 *Kharif*	Achievement during *Kharif* 2016
1	Area in Ha.	701441	559046	620763	656214
2	Production in M.Ts	1459777	970479	1583171	1387505
3	GVA Rs. In Crores	3106	2305	3194	2764.71
4	Projected % increase in GVA over 2014 *Kharif*	2.83			-10.99
5	Projected % increase in GVA over 2015 *Kharif*	38.57			19.94

Table 4.7.2.6: Progress report on growth engine wise GVA during *kharif* 2016 under Primary Sector – Agriculture							
Sl. No	Crop Name	Normal area	Area in Ha		Value in Rs. Lakhs		
			Actual sown area	Yield recorded in Kg per Ha	Production in MTs	2011-12 Constant prices Rs per MT	GVA in Rs. Lakhs
1	Paddy	79018	79264	6700	531068.8	10800	57355.43
2	Jowar	14062.4	6869	2500	17172.5	12565	2157.72
3	Bajra	7844	8413	2000	16826	10530	1771.78
4	Maize	30154.2	27874	7500	209055	10816	22611.39
5	Korra	13612.6	11601	2500	29002.5	8316	2411.85
6	Redgram	48227.8	111296	800	89036.8	31020	27619.22
7	Greengram	1648.4	2098	1400	2937.2	35137	1032.04
8	Blackgram	3543.8	13542	1800	24375.6	33754	8227.74
9	Horsegram	21	0	0	0		0.00
10	Groundnut	104236.6	113447	900	102102.3	38040	38839.71
11	Sesamum	32.8	29	500	14.5	41189	5.97
12	Sunflower	5420	2988	1200	3585.6	29231	1048.11
13	Castor	54406	19915	1800	35847	32124	11515.49
14	Soyabeen	184.6	593	2000	1186	17050	202.21
15	Other oil seeds	14.2	0	0	0	0	0.00
16	Chillies	15566.8	26477	0	0		0.00
17	Onion	20746	24502	0	0		0.00
18	Turmeric	2534.8	1861	0	0		0.00
19	Sugarcane	975.6	406	65000	26390	2045	539.68
20	Cotton	192247.6	176195	1500	264292.5	37349	98710.61
23	Other crops	17138.2	28844	1200	34612.8	7000	2422.90
	Total	621155	656214		1387505.1		276471.84

Table 4.7.2.7: Double Digit Growth - Progress report on production plan and GVA during *rabi* 2016-17 under Primary Sector Agriculture- Kurnool district

Sl. No.	Parameter	*Rabi*			
		2014	2015	Projected for 2016 *Rabi*	Achievement during *Rabi* 2016-17
1	Area in Ha.	270312	340680	354341	313219
2	Production in M.Ts	471861	421117	652043	565219
3	GVA Rs. In Crores	942	976	1169	1085.14
4	Projected % increase in GVA over 2014-15 *Rabi*	24.09			15.19
5	Projected % increase in GVA over 2015-16 *Rabi*	19.77			11.18

Table 4.7.2.8: Progress report on growth engine wise GVA under Primary Sector - Agriculture during *rabi* - 2016-17 in Kurnool district

Sl.No	Crop Name	Normal area	Area in Ha		Value in Rs. Lakhs		
			Actual sown area	Yield recorded in Kg per Ha	Production in MTs	2011-12 Constant prices Rs per MT	GVA in Rs. Lakhs
1	Paddy	19296	25152	6000	150912	10800	16298.50
2	Jowar	62203	47191	2000	94382	12565	11859.10
3	Bajra	371	205	1500	307.5	10530	32.38
4	Maize	8528	7153	6000	42918	10816	4642.01
5	Korra	342	364	1800	655.2	8316	54.49
6	Redgram	1002	1929	1000	1929	31020	598.38
7	Greengram	1610	1364	1200	1636.8	35137	575.12
8	Blackgram	9251	19644	1500	29466	33754	9945.95
9	Horsegram	503	83	2000	166	14899	24.73
10	Groundnut	16796	15241	900	13716.9	38040	5217.91
11	Sesamum	1187	164	500	82	41189	33.77
12	Sunflower	15140	1458	800	1166.4	29231	340.95
13	Castor	661	30	900	27	32124	8.67
14	Safflower	144	13	1400	18.2	26889	4.89
15	Other oil seeds	26	0	0	0	0	0.00
16	Chillies	554	289	0	0		0.00
17	Onion	2292	1304	0	0		0.00
18	Coriander	5222	1771	0	0		0.00
19	Bengalgram	192744	172508	1200	207009.6	27737	57418.25
20	Cotton	240	4	1200	4.8	37349	1.79
23	Other crops	16229	17352	1200	20822.4	7000	1457.57
	Total	354341	313219		565219.8		108514.47

4.8 Nellore

4.8.1 District Profile

Nellore district, has total geographical area of 13.16 lakh 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 26.6 lakh with working population of 10.3 lakh and having literacy rate of 78.58 %. Out of the cultivable area the net area had 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 South West monsoon season which extends up to end of September, October and November constitute the retreating monsoon or post monsoon season. The period from December to February is the North East 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 crops. Tobacco, Groundnut, Chillies, Sesamum, Sugarcane are also mainly 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 paraboiled 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 to marine Resources, Nellore district has a long Coast line With ‘Scampi’ under cultivation, farmers are having a good time in the aquaculture. Fish is also available in plenty and good number of aqua processing plants, feed mills and ice plants are existing 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 DDP at current prices showed that Nellore district is ranked middle in industry and service sectors while primary sector contributes poorly. The state had identified growth engines in each of the sectors. Forty-one growth engines contributes 79.40% (Rs.21469 Crores GVA) in total DDP of Rs.27039 Crores. In Agriculture and Allied Sector, 26 Growth Engines contributes 87.71% (Rs.7534 Crores GVA) in total Agriculture sector DDP of Rs.8590 Crores. In Industry Sector, 6 Growth Engines contributes 99.58% (Rs.5736 Crores GVA) in total Industry sector DDP of Rs.5760 Crores. In Service Sector, 9 Growth Engines contributes 64.62% (Rs.8199 Crores GVA) in total Service sector DDP of Rs.12688 Crores.

ICRISAT along with district administrators (District Collector, Chief Planning Officer) and line department officialshave identified pilot site (Figure 4.8.1.1) comprised of three mandals viz., Indukurpet mandal (Jagadevipeta, Gangapatnam, Mypadu village); TP Gudur mandal (Peduru, Varigonda, T.P.Gudur I, T.P.Gudur 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 sites has 14371 ha of geographical area and ~8800 ha of net sown area comprising of Agriculture-6600 ha, Horticulture-1643 ha, fisheries-475 ha and sericulture-25 ha etc (Table 4.8.1.2 & 4.8.1.3). The total number of households in the pilot villages is about 11242 and the population is 40408. The overall literacy rate is about 62.87 with male literacy rate is 68.93 and female literacy rate is 56.82 per cent. Annual rainfall of selected mandals are in between 1050-1150 mm, and out of this 30-40% rain takes place during *Kharif* season (may-sept) whereas 65-70 % rainfall i.e. N-E rain is during September - January.

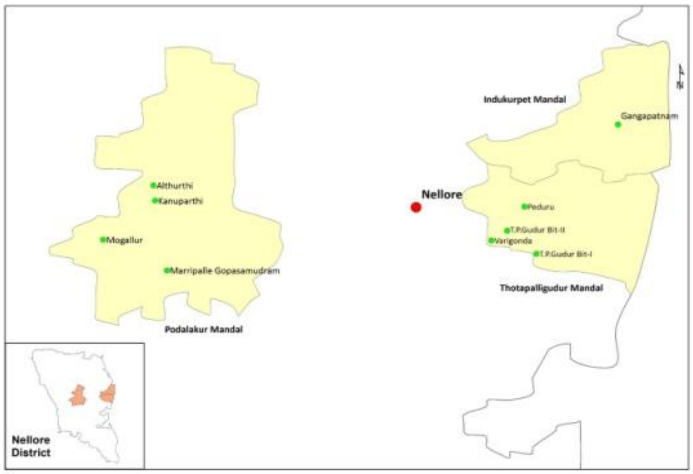
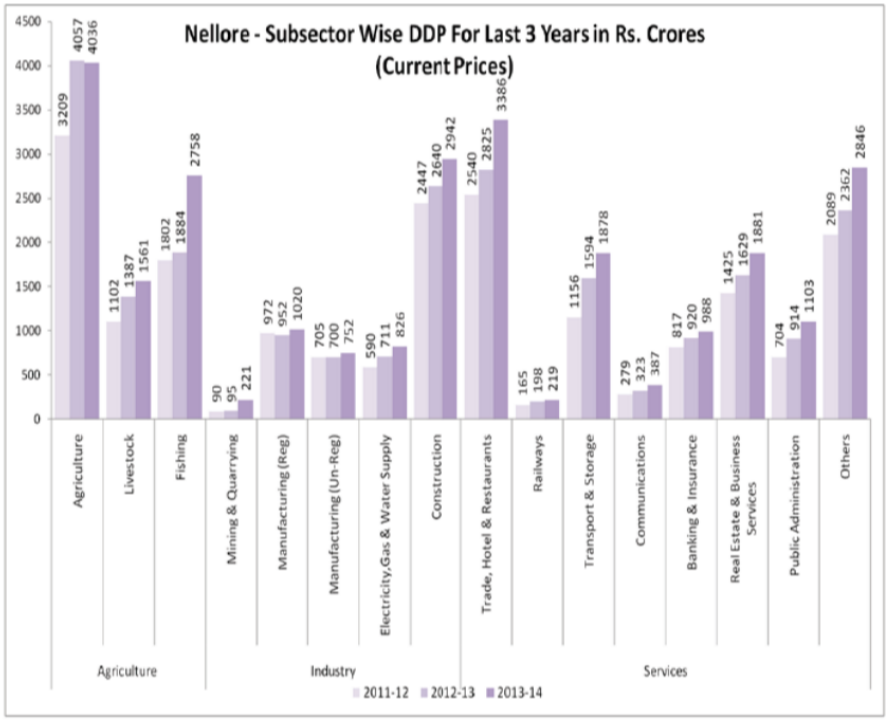


Figure 4.8.1.1: Geo-graphical representation of Identified Pilot sites.



District	2011-12	2012-13	2013-14	2014-15 (AE)	2015-16 (T)
Nellore	20298	23405	27039	30292	36350

AE : Advance Estimates
T : Target

Figure 4.8.1.2: Subsector wise DDP for lase 3 year in Rs crores (current prices) in Nellore district.

Table 4.8.1.1: Details of pilot site in Nellore district.

Name of the Situation	Mandals covered	Village	Geographical Area in Ha	Village Identified with Area (Ha.)							
				Cultivable Land	Net Area Sown			Horticulture	Fisheries	Sericulture	No. of HH
					Kharif	*Rabi*	Total				
Coastal situation (3680 Ha.)	Indukurpet	Lebur Bit-II (Jagadevipeta)	1333	1052	856	196	1052	519	48	--	1452
		Gangapatnam	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 (Papireddy Palem)	956	613	53	418	471	2	24	--	1045
Dry Land (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

Major constraints addressed are soil degradation and soil health management. 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 ground water depletion. Due to higher temperature, annual PET of these mandals is very high. Poor drainage, high salinity and flooding is the major issues bringing paddy yield lower compared to upland areas.. As regards to dairy sector, indigenous and low milk yielding cattle, non-availability of nutritious fodder are main issues. The fishery sector in the district ranks number 1 in the country however there are some serious issues viz, unavailability of quality fish seed, technical knowledge, and storage structures etc.

The consortium worked towards resolving the constraints and harnessing the potential In agriculture sector, thru concentered efforts targeting increasing cropping intensity, crop diversification, mechanization etc with the aim to improving production and productivity of different systems through several innovations. Based on 2015-16 year results, the successful interventions targeted in pilots comprised of soil test-based application of deficient nutrients including secondary- & micro- nutrients (3000 ha) particularly in dryland areas viz, Podalakur mandal wherein S (78 %) and Zn (68 %) are severely deficient along some deficiency of Zn (16-29 %) in coastal mandals. Introducing improved crop varieties (320 ha), crop intensification by bringing fallows under cultivation (50 ha), Recycling of on-farm wastes to make quality composts –pilot (600 nos.) and capacity building (CB) in best agricultural practices (~250 nos.). As regards to horticulture, the interventions are focusing reducing drudgery of farm women by introducing easy planter for transplanting the vegetable seedlings. This activity was promoted with ATMA scientist and agricultural department. Similarly, the other interventions comprised of bringing new areas under vegetable cultivation (100 ha), convergence for MI and micro- & secondary- nutrients, rejuvenation of existing plantation along with micro- &

secondary nutrients and capacity building (20 nos). In dairy sector, for increasing the milk, the interventions are promotion of fodder (dual purpose maize, mulit cut sorghum, fodder grasses) on 50 ha, silage making ~25 across all villages, regular health camps – deworming/vaccination of 50% livestock; AI of 20% livestock, concentrated feed for 6 months (~3000 livestock) and capacity building for~3000 farmers. As regards to meat, focus is on deworming – twice in a year (100% livestock), sheep & goat distribution (5+1 Ram) = 50 units (thru bank finance + 25% incentive, capacity building – ~500 farmers. For eggs, vaccination & deworming (100% birds), chick distribution (45 birds) unit to each of 4 farmers in 11 pilot villages and capacity building for ~1000 farmers. For the fishery sector, the interventions designed are regulation of unauthorized fisheries through active involvement of Deputy Director of Fishery with support from District collector. Expansion of area through revival of Brackish water Aquaculture and Scampi culture and production of mangrove crab farming. Similarly it comprises mechanisation of Aquaculture thru providing solar pump sets, solar lights and aerators (5 nos.) as well as stocking of fish seed in tanks and reservoirs under RKVY and sea weed culture promotion on experimental basis is another targeted area.

Table 4.8.1.2: Details of population and other details for pilot site.

Sl. No.	Selected mandal	Selected village	Population	No. of Households	No. of persons per Household size	Cultivators	Agricultural Laborers	No. of Literates			Literacy Rate		
								Total	Male	Female	Total	Male	Female
1	Indukurpet	Lebur Bit-II	4979	1452	3	5	7	3009	1575	1434	67.24	72.75	62.08
		(Jagadevipeta)				217	1710						
2		Gangapatnam	7223	2063	4			4122	2222	1900	63.43	69.66	57.44
3		Mypadu	6532	1773	4	364	2276	3670	2112	1558	63.26	71.52	54.71
4	T.P.Gudur	Peduru	4103	1170	4	238	1524	2304	1225	1079	63.26	66.94	59.55
5		Varigonda	5676	1583	4	305	1478	2981	1579	1402	59.08	62.68	55.48
6		T.P.Gudur I	2208	668	3	744	1315	1324	705	619	66.13	71.72	60.75
7		T.P.Gudur II	4019	1045	4	250	655	2466	1366	1100	67.54	72.78	62.01
		(Papireddy Palem)				668	1200						
8	Podalakur	Althurthi	1078	278	4			624	351	273	62.9	69.64	55.94
9		Kanuparthi	1816	495	4	213	258	894	505	389	55.94	62.66	49.12
10		Mogaluru	1854	480	4	219	450	1064	597	467	63.37	72.01	54.94
11		Marripalli	920	235	4	227	539	490	267	223	59.39	65.93	53.1
		(Gopasamudram)				74	269						

4.8.2 Pilot site profile

Process adopted and work plans

Finalizing pilot site work plans for testing innovative technologies

The ICRISAT-led consortium comprising line departments, SAUs, NGO and private sector has adopted a strategy to develop pilots as sites of learning for scaling-out science-led technologies and field laboratories for testing proven new technologies to sustain future growth. The work plan consists of demonstrating and evaluating following proven technologies on farmers' fields during 2015-16 seasons;

- Soil mapping and soil test-based fertilizer management
- Participatory evaluation of improved crop varieties
- Evaluation of sorghum multi-cut fodderfor enhancing fodder availability (CSH24 M)
- Demonstrating and evaluating composting of on-farm wastes through microbial consortia culture
- Demonstrating and evaluating biomass generation thru Gliricidia
- Monitoring of important insect-pests based recommendations
- Demonstrating and evaluating women-centric small scale vegetable cultivation

Finalizing pilot site work plans in collaboration with line departments

The planned targeted increase in GVA at pilot site through different interventions in potential sectors is benefitted with Rs 32.89 crores from current Rs 266.15 crores to Rs 299.04 crores (Table 4.8.2.1).

Table 4.8.2.1. Sector-wise summary of GVA during 2015 and 2016 (targeted) in Nellore district.

Department	GVA (crores)		% increase over 2015-16
	2015-16	2016-17	
Agriculture	44.22	51.23	13.68
AHDS	30.562	33.9227	9.91
Fishery	116.36	132.28	12.04
Horticulture	75.005	81.5995	8.08
Total	266.15	299.04	11.00

To achieve the desired GVA increase, sector wise detailed department-wise plans are worked out as follows;

Agriculture

The plan for 2016-17 through department of agriculture consists of promoting high yielding cultivars of important pulses crops in dryland areas and paddy and maize in coastal areas. The soil health management comprising soil test-based application of secondary- & micro-nutrients in about 8801 ha area (Table 4.8.2.2). The GVA increase Rs 7.01 crores.

Table 4.8.2.2: Plan for promoting improved varieties and balanced fertilization along with GVA increase in Nellore pilot site, 2016-17.

Mandal	Village	Crop	2015-16			2016-17			% increase over 2015-16
			Area	Production	Total GVA	Area	Production	GVA	
TP Gudur	Peduru	Paddy	1237	8756	9.55	1225	10057	10.97	12.93
	Varigonda	Paddy	753	5330	5.82	741	6222	6.79	14.33
	T.P.Gudur-I	Paddy	476	3369	3.68	464	3894	4.25	13.49
	T.P.Gudur-II (Papireddy Palem)	Paddy	672	4757	5.19	660	5925	6.46	19.71
Indukur peta	Lebur Bit-II (Jagadevipeta	Paddy	1026	7108	7.75	1014	8372	9.13	15.1
	Gangapatnam	Paddy	1018	7053	7.69	1006	8098	8.83	12.91
	Mypadu	Paddy	535	3706	4.04	523	4177	4.55	11.28
Pilot Area Total paddy			5717	40079	43.72	5633	46746	50.99	14.25
Podalakur	Aldurthi	Green gram	20	4	0.01	8	1.6	0.006	-150
	Kanuparthi		21	4	0.02	9	1.71	0.006	-133.33
	Mogaluru		0	0	0	3	0.6	0.002	100
	Marripalli		0	0	0	2	0.38	0.001	100
Green gram Total			41	8	0.03	22	4.3	0.02	-20.83
Podalakur	Aldurthi	Black gram	63	13	0.22	47.3	9.75	0.03	-588.29
	Kanuparthi		205	41	0.14	153.8	30.75	0.1	-33.33
	Mogaluru		119	24	0.08	89.3	18.42	0.06	-29.06
	Marripalli		48	10	0.03	36	7.2	0.02	-36.17
Black gram total			435	88	0.47	326.3	66.1	0.22	-171.71
Pilot Area Agriculture Total			6193	40175	44.22	5981.3	46816	51.23	13.68

Fisheries

In fisheries sector, the pilot sites has high potential particularly in coastal mandal viz, Indukurpeta comprising three villages (Jagadevipeta, Gangapatnaam and Mypadu). Therefore, during this year the plan is to focus more on deep water fishing, Shrimp culture and Venami culture besides reviving ponds. An expected value addition is about Rs 11.5 crores through fisheries interventions (Table 4.8.2.3).

Table 4.8.2.3: Targeted fisheries production and GVA increase in Nellore pilot site, 2015-16.

Crop	2015-16			2016-17			% increase over
	Area	Production	GVA	Area	Production	GVA	
Jadevipeta (Fresh Water)	22	1540	12.32	24.2	1694	13.55	9.1
Gangapatnam (Venami)	181	2172	65.16	204.53	2454.36	73.63	11.5
Mypadu (Venami)	108	1296	38.88	125.28	1503.36	45.10	13.8
Total	311		116.36	342.1		132.28	11.5

Horticulture

Through department of horticulture (DoH), there are plans to increase production and GVA from horticultural sector through bringing in new area under cultivation of vegetables and rejuvenation of plantations. As al long term planning, new area are planned to bring under cultivation of acid limes and mango. The expected increase to add GVA is by Rs 6.6 crores.

Table 4.8.2.4: Targeted horticulture sector production and GVA increase in Nellore pilot site, 2016-17.

Mandal	Village	Crop	2015-16			2016-17			% increase in GVA over 2015-16
			Area	Production	GVA (crore)	Area	Production	GVA	
Indukurpet	Lebur Bit-II	Vegetables	300	7500	8	310	8060	8.06	6.95
	(Jagadevipeta	Banana	160	6400	19	170	6970	20.91	8.18
		Mango	25	375	1	25	400	0.60	6.25
		Coconut	120	1560000	2	120	1560000	1.56	0.00
	Gangapatnam	Vegetables	50	1250	1	60	1500	1.50	16.67
		Banana	40	1600	5	45	1800	5.40	11.11
		Mango	25	375	1	25	400	0.60	6.25
		Sapota	17	255	0	17	272	0.28	6.25
		Coconut	35	455000	0	35	455000	0.46	0.00
Podalakur	Althurthy	Chillies	25	188	2	44	328	2.63	42.86
		Mango	25	300	0	25	294	0.44	-2.04
		Acidlime	330	5940	12	314	5643	11.29	-5.26
	Kanuparthi	Acidlime	220	3960	8	209	3762	7.52	-5.26
	Mogalluru	Chillies	40	300	2	70	525	4.20	42.86
		Acidlime	270	4860	10	257	4617	9.23	-5.26
		Vegetables	10	250	0	18	438	0.44	42.86
		Mango	25	300	0	25	294	0.44	-2.04
	Marripalli	Acidlime	80	1520	3	60	1140	2.28	-33.33
		Vegetables	50	1250	1	88	2188	2.19	42.86
	Pilot Area Horticulture Total				75.005			81.6	9.47

Animal husbandry

Through Department of Animal Husbandry (DoAH), the GVA increase is targeted through increase in milk, meat and egg production. The expected increase in GVA is Rs 3.36 crores through milk, through meat and crores through eggs (Table 4.8.2.5).

The targeted production in pilot sites is planned to be achieved through;

- Feed quality assessment and proper recommendation / Balance Nutrient cards for animal feed
- Participatory evaluation of Dual purpose cereal, grasses and legume crops (100 ha)
- Promoting improved technology on sto*rabi*lity of maize as fodder after harvesting cobs (2 units of silage in each pilot village)

- Food and economic security through financial assistance for integrated Giri Raja birds rearing
- Capacity building on balanced feeding
- Health camps – deworming/vaccination of 70% livestock; AI of 10% livestock
- Concentrated feed for 6 months (~2000 livestock)
- Capacity building of about 4000 farmers

Table 4.8.2.5: Targeted increase in Animal husbandry sector production and GVA in Nellore pilot site, 2016-17.

Village	Particulars	2015-16			2016-17			per cent increase over 2015-16
		Number	Production (MT)	GVA (crores)	Number	Production (MT)	GVA (crores)	
Peduru	Milk	550	530	1.33	570	550	1.43	7.92
	Meat	2250	7	0.25	2319	7.2	0.25	2.86
	Egg	1400	0.5	0.00015	1700	0.8	0.00024	60
Varigonda	Milk	1900	1850	4.63	1938	1900	4.94	6.81
	Meat	4300	29	1.02	4375	32	1.12	10.34
	Egg	2200	0.6	0.00018	2400	0.9	0.00027	50
T.P.Gudur I	Milk	480	460	1.15	490	500	1.3	13.04
	Meat	1770	15	0.53	1777	16	0.56	6.67
	Egg	1160	0.6	0.00018	1200	1	0.0003	66.67
T.P.Gudur II	Milk	810	780	1.95	811	800	2.08	6.67
(Papireddy Palem)	Meat	7900	9.5	0.33	7940	12	0.42	26.32
	Egg	1300	0.5	0.00015	1349	0.7	0.00021	40
Lebur Bit-II	Milk	340	320	0.8	352	350	0.91	13.75
(Jagadevipeta)	Meat	2080	30	1.05	2095	33	1.16	10
	Egg	1400	0.5	0.00015	1409	0.65	0.0002	30
Gangapatnam	Milk	1551	1420	3.55	1551	1450	3.77	6.2
	Meat	4952	7	0.25	4952	10	0.35	42.86
	Egg	2402	0.8	0.00024	2402	1	0.0003	25
Mypadu	Milk	794	700	1.75	794	760	1.98	12.91
	Meat	5227	70	2.45	5227	78	2.73	11.43
	Egg	3840	1.2	0.0004	3840	1.5	0.0005	25
Aldurthi	Milk	795	500	1.25	795	590	1.53	22.72
	Meat	4227	21	0.74	4227	22	0.77	4.76
	Egg	1607	0.5	0.0002	1607	0.75	0.0002	50
Kanuparthi	Milk	1209	800	2	1209	865	2.25	12.45
	Meat	11479	50	1.75	11479	58	2.03	16
	Egg	2191	0.7	0.00021	2191	0.85	0.0003	21.43
Mogaluru	Milk	915	600	1.5	915	690	1.79	19.6
	Meat	2014	17	0.6	2014	18	0.63	5.88
	Egg	219	0.08	0.00002	219	0.1	0.0001	25
Marripalli	Milk	631	420	1.05	631	480	1.25	18.86
(Gopasamudram)	Meat	3413	18	0.63	3413	19	0.67	5.56
	Egg	977	0.2	0.0001	977	0.4	0.0001	100
Pilot Area AHDS Total				30.56			33.92	9.91

4.9 Prakasam

4.9.1 District profile

Prakasam district (Table 4.9.1.1; Figure 4.9.1.1) 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 these sector sectors is 19.73%.

Table 4.9.1.1: 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

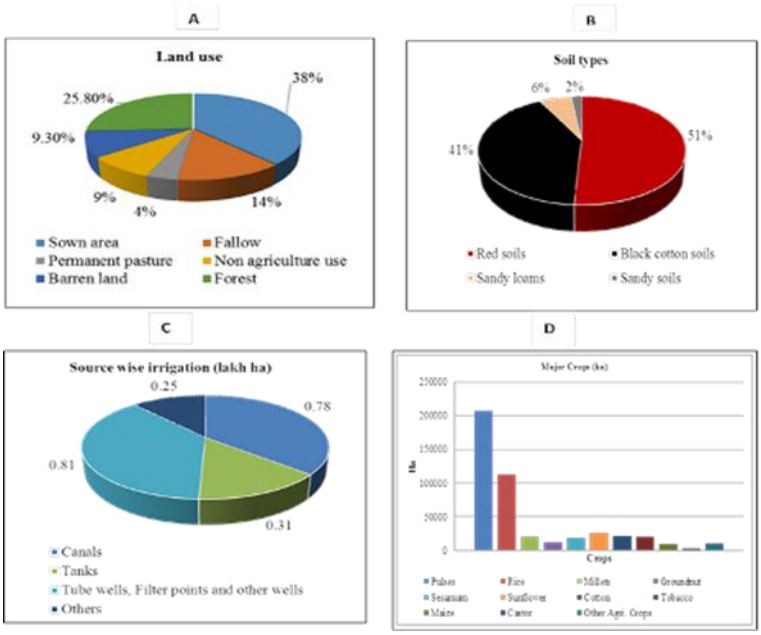


Figure 4.9.1.1: Details of A: Land use pattern, B: Soil types, c: Source of irrigation, D: Major crops in Prakasam district.

District administration of Prakasam district has projected sector wise the target and achievements also the strategies to achieve for the 2016-17 as follows.

Primary Sector: Agriculture

(CURRENT PRICES) (Ha.) (MTs) (Crores)

Table 4.9.1.2: GVA Target and achievement in Agriculture sector, Prakasham district.

Sl No	Growth Engine	2015-16 Achievements				Target for 2016-17				Percentage increase/ decrease in GVA over 2015-16	2016-17 Achievement (Area)			Current Prices (Rs/ Qtl)
		Area (Ha)	Productivity (Kg/Ha)	Production (M.T)	GVA (Cr.)	Area (Ha)	Productivity (Kg/Ha)	Production (M.T)	GVA (Cr.)		*Kharif*	*Rabi*	Total	
1	Paddy	44385	5701	253039	506	51945	5781	300294	601	18.7	19297	13016	32313	2000
2	Cotton	58025	1437	83382	467	14105	2262	31906	179	-61.7	14105	0	14105	5600
3	Redgram	76569	864	66156	476	92838	900	83554	602	26.3	92838	0	92,838	7200
4	Bengalgram	91972	1932	177690	657	100473	2000	200946	744	13.1	0	32752	32752	3700
5	Blackgram	45269	588	26618	160	42055	950	39952	240	50.1	6832	22039	28,871	6000
6	Tobacco	52804	1936	102229	1636	53206	2715	144454	2311	41.3	0	11626	11626	16000
	Total	369024		709113	3902	354622		801106	4675	19.8	133072	79433	212505	
7	Other Crops	89058	2599	231547	301	112776	3065	345764	449	49.3	50596	13392	63988	1300
	Total Agrl.	458082		940660	4203	467398		1146870	5125	21.9	183668	92825	276493	

Agriculture sector strategies implemented to achieve the targeted growth

Rice:

- Adoption of direct seeding and MSRI methods.
- Application of Zinc Sulphate.
- Formation of Alley Ways.
- Selection of Blast tolerant varieties like NLR 34449, I 45, BPT 2270.

Pigeonpea:

- Seed treatment with Trichoderma Viridea.
- 1 to 2 life saving irrigations at critical stages.
- Intercropping with greengram, blackgram @ 1:6 ratio and Bajra @ 1:2 ratio.
- IPM measures for control of Maruca.
- Foliar spraying with KNO3 at Pod development stage and moisture stress conditions.

Blackgram:

- Seed treatment PSB.
- Timely control of weeds with chemical weedicides.
- Control of pest ie. Maruca by adopting IPM Measures.
- Life saving irrigation with rainguns at critical stages.

Cotton:

- Encouraging the farmers to grow refugee crop.
- Correction of micro nutrient deficiencies.
- Timely control of sucking pests.
- Implementation of ICM.

Primary Sector: Horticulture

Table 4.9.1.3: GVA target and achievement in Horticulture sector, Prakasham district.

Sl	Crop	Area (ha)			Productivity (MTs)		Production (MTs)		GVA (Rs in Cr)	
		2015-16 (Achiev)	2016-17 (Target)	2016-17 (Achiev)	2015-16 (Achiev)	2016-17 (Target)	2015-16 (Achiev)	2016-17 (Target)	2015-16 (Achiev)	2016-17 (Target)
1	Red Chilli	42500	43000	51662	3.000	5.00	127500	215000	1530.00	1935.00
2	Sweet Orange	8584	8885	8685	12.000	13.00	103008	115505	148.78	181.20
3	Mango	8308	8450	8458	4.000	9.00	33232	76050	77.40	88.74
4	Papaya	675	700	1100	60.000	75.00	40500	52500	25.80	31.50
5	Banana	688	600	250	50.000	50.00	34400	30000	23.22	24.00
6	Vegetables	9036	9500	5972	10.000	10.00	90360	95000	58.73	66.50
7	Others (Guava, sapota, Cashew, Turmeric etc,)	6769	6800	7463	10.000	10.00	67690	68000	85.00	98.23
	Total	76560	77935	83590					1948.93	2425.17

Horticulture sector strategy

Protected cultivation

- By Establishing shadenet houses in 10 Lakhs Sqmtrs in the district virus free seedlings like chillies and Vegetables are being produce and is catering to 35-40% of total area in the district which is contributing to the low incidence of virus infestations.

- Encouragement of off season, High Value vegetables & Flowers in Shadenets.

Permanent pedals

- The department has supported for eraction of permanent pendals for Vegetable cultivation in 600 acres. This has lead to increase in quality, productivity and production of cucurbitaceae vegetables.
- Trellies system for Tomato Cultivation is being encourage for higher yields and better quality.

IPM in chilli

- Due to implementation of integrated pest management (IPM) and as part of the supply of pheromone traps, Yellow and Blue sticky pads etc. farmers are adopting these practices on large scale the incidence of sucking pest complex, virus infestations have significantly come down in the district.
- Due to intervention by the department and also training of the farmers on the indiscriminate use ages of (Bio Products) growth promoters have also come down very significantly.
- As part of implementation of ICM project by ITC the interventions like sub soil compaction, poly tunnels for seedling raising IPM, Solar dryers etc. are gaining popularity in farming community and adding quality to the produce.

Postharvest management

- 6 Nos Ripening chambers with a capacity of 400 MT per day are established in the district. Further it is proposed to establish require ripening chambers strategically to cover al l major urban areas of the district.
- Promoted to avoid usage of calcium carbide for ripening of fruits.
- Promotion of Pack Houses, Cold storages, Ripening Chambers and Reefer Vans under Post Harvest Management to reduce post harvest losses.
- Mulching for water conservation increase in yields and reduction in cost of cultivation.
- Extension and training programmes.
- Bring all horticulture cultivation under micro-irrigation
- Increasing productivity through – Soil testing.
- ✓ Use of micronutrients & water soluble fertilizers.
- ✓ Intercropping and multiple cropping.
- ✓ Micro- irrigation linked with fertigation.
- Promotion of organic farming by involving NGOs/ Certification agencies like ICCOA, SIMFED in Ulavapadu, Gudlur and Kandukur in Mango crop.

Drip and Water Harvesting Structures: 2016-17

- To transform Prakasam District as 100% Micro Irrigation District.
- 100% Bore well wise coverage under Micro Irrigation, Identification and registration of farmers in Mee-Seva Centers on priority.
- Focus on Crop wise area coverage under all major crops Fruits, Vegetables, Chillies, Fodder crops and Mulberry.
- 100% convergence with DWMA – NREGS, NTR Jalasiri, S.C. Corporation (Land purchase scheme), S.T Farmers having assured Irrigation facility in Co-ordination with S.C. Corporation, DTWO, P.O. I.TDA

- To achieve 15000 Ha under M.I. Installations with 50% subsidy as per APMIP Guidelines.To provide Agronomical support and post installation services and trainings to the MI Farmers to achieve 100% Fertigation for productivity enhancement and quality improvement.

Primary Sector: Livestock

Table 4.9.1.4: GVA target and achievement in Livestock sector, Prakasham district.

ITEM	H1 Achievement			% of Growth over 2015-16
	2015-16	2016-17		
		Target	Achievement	
Production				
Milk Production (Lakh MTs)	5.62	6.365	6.44	14.59
Meat Production (MTs)	32866	35565	37365	13.69
Egg Production (Lakh Nos.)	1210	1300	1302	7.60
GVA in Crores				
Milk Production	1593.27	1896.32	1918.66	20.42
Meat Production	794.93	867.31	922.98	16.11
Egg Production	31.46	32.76	33.38	6.10
Others	72.27	83.98	86.35	19.48
Total	2491.93	2880.37	2961.37	18.84

Livestock sector strategy

Various initiatives of on-going schemes like curative treatment, deworming, castrations, vaccinations, artificial insemination have been implemented and several capacity building programs were conducted.

Primary Sector: Fisheries (production in MTon)

Table 4.9.1.5: Production target and achievement in Fisheries sector, Prakasham district.

Sector	H1 Achievement			
	2015-16	2016-17		% of Growth Over 2015-16
		Target	Achievement	
Marine Fish	13829	14712	18890	36.60
Inland Fish	8512	9860	7929	-6.85
Marine Shrimp	3039	3978	5515	81.47
Inland Prawn	1997	3002	3004	50.43
B.W. Shrimp	7170	10240	11886	65.77
Total	34547	41792	47224	36.69

Fisheries sector strategies

- Voice messages to 2500 Aqua farmers and 10,000 BOATS to FISHERMENs through RELIANCE FOUNDATION, voice messages on Good Management Practices
- Cage Culture in Gundlakamma reservoir with 65.00 lakhs investment, 650 traditional fishermen.
- Mee Seva service introduced for processing of Aqua farmers applications on line.

- AQUA LAB & AQUA FARMERES CAPACITY BUILDING CENTER & MOBILE AQUA LAB started.
- Under Quality seed monitoring, Shrimp seed Hatcheries TASK FORCE COMMITTEE formed with AD Fisheries, SDPO & RDO to check hatcheries fortnightly
- Aqua ZONEs declaration is under Process, Conducting meetings at Village/ Mandal level to demarcate and declare 5 Aqua Zones in the District with analyzing APSAC MAPs.
- 36 Engines, 274 OBMs, Nets, 102 Mopeds, 13 Autos, 126 Cycle /Nets, Ice Boxes Marketing Kiosks have been providing to fishermen in the district. Under SCP Rs. 333.42 Lakhs and TSP Rs.143.22 lakhs worth of inputs under execution on 90% subsidy during this year 2016-17.

4.9.2 Pilot site

Based on the standard criteria pilot sites were identified (Figure 4.9.2.1; Table 4.9.2.1 & 4.9.2.2). 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 Kothapatnam and Ongole for 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.

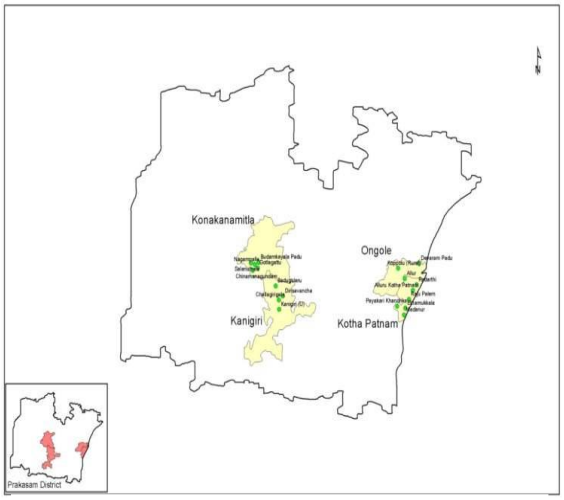


Figure 4.9.2.1: Map of Prakasam pilot sites

Land use pattern of the Kanagiri and Konakanamitla mandals are shown in Figure 4.9.2.2 and rainfall and potential evapotranspiration (PET) in Konakanamitlamandal is shown in Figure 4.9.2.3. 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 4.9.2.1: 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			

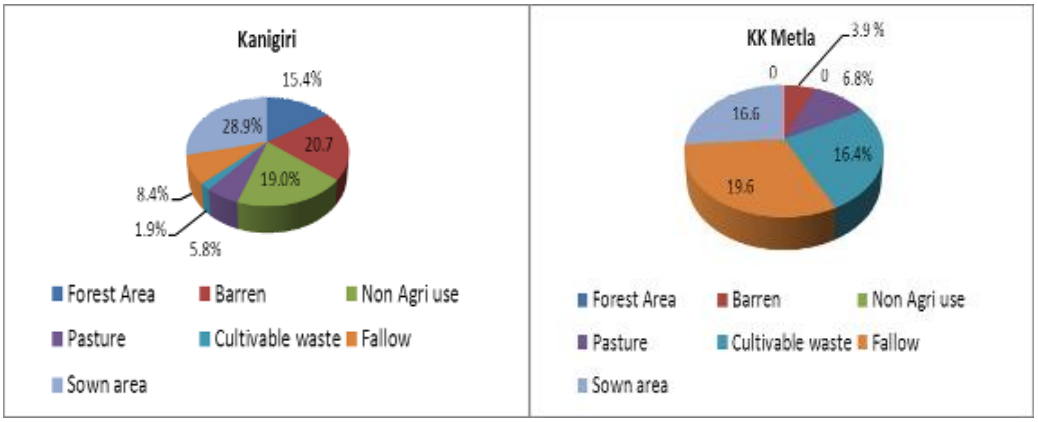
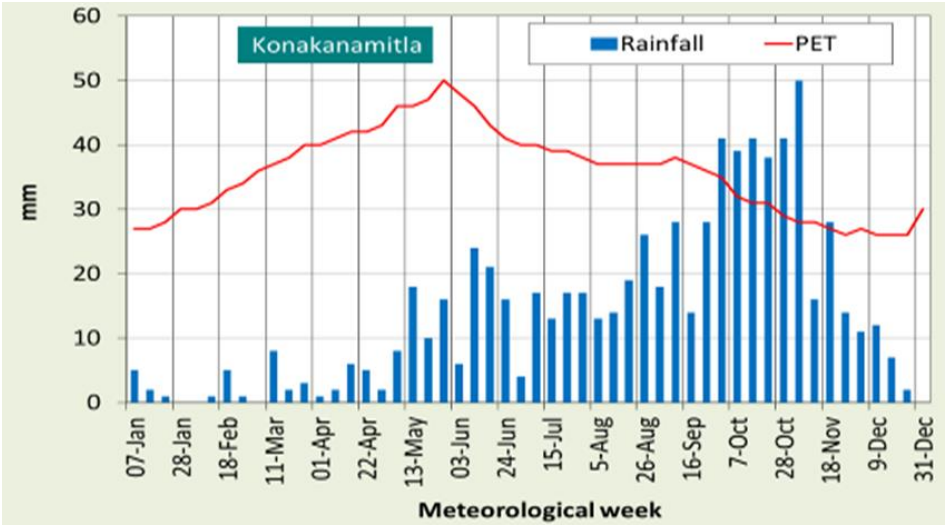


Figure 4.9.2.2: Land use pattern in the pilot sites of Kanagiri and Konakanametla.



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

Figure 4.9.2.3: Rainfall and PET in Konakanamitla mandal, Prakasam district.

Table 4.9.2.2: 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		

During 2016-17, in Prakasam district, the cropped area details are shown in Table 4.9.2.3.

Table 4.9.2.3: Area sown (ha) in pilot site mandals during *kharif* 2016-17.						
Crops	Area (ha)	Kanagiri	Konakanamitla	Ongole	Kothapatnam	District
Paddy	Normal	491	275	165	82	32185
	Actual sown	354	115	30	150	19297
Pearl millet	Normal	1153	1799	1	0	17030
	Actual sown	334	1545	0	0	16399
Pigeonpea	Normal	5113	3149	9	0	53611
	Actual sown	7997	3570	7	10	92838
Green gram	Normal	135	109	36	0	3123
	Actual sown	172	252	184	45	10222
Black gram	Normal	420	37	40	0	4681
	Actual sown	437	3	128	10	6832
Cowpea	Normal	133	58	0	0	1026
	Actual sown	97	0	0	0	229
Cotton	Normal	92	1875	40	0	66026
	Actual sown	0	105	0	0	14105
Groundnut	Normal	0	0	1	1580	2780
	Actual sown	0	0	0	2000	3771
Sesame	Normal	0	1	53	0	4579
	Actual sown	4	1	236	498	13512
Chillis	Normal	67	105	6	0	22943
	Actual sown	90	425	39	0	39648
Vegetables	Normal	36	26	31	134	3725
	Actual sown	46	39	55	373	3507
Fodder crops	Normal	298	143	292	22	7515
	Actual sown	184	183	160	20	6726
Other crops	Normal	47	64	230	60	3498
	Actual sown	0	0	100	0	2707
Total area (ha)	Normal	8009	7900	910	1892	235857
	Actual sown	9721	6295	939	3132	238080
Perennial Crops	Normal	2015	1066	1827	630	80672
	Actual sown	3099	950	4870	540	91504
Gross area (ha)	Normal	10024	8966	2737	2522	316529
	Actual sown	12820	7245	5809	3672	329584
% of gross area sown		22	-24	53	31	4

Rainfall received and area sown in the pilot site villages during *kharif* 2016-17.

The rainfall received during 2016, normal and actual rainfall in Prakasham district is shown in appendix.

4.10 Srikakulam

4.10.1 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 of the district is 1162 mm, total net area sown 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, Sugarcane, Maize, Cotton, Green gram and Black gram are the other major 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 exist in the district. A total of 63,805 tons of marine fish, inland fish and prawns were produced during 2014-15. 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.

4.10.2 Pilot site profile

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 4.10.2.1; Table 4.10.2.1). 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 4.10.2.2.

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 from 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 mm with 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 during 2015. 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

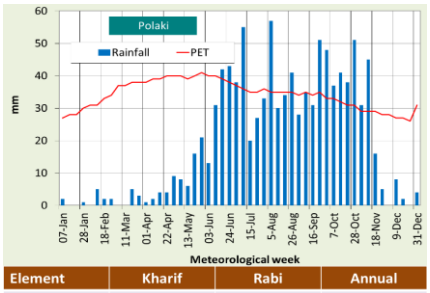
(35%), sulphur (74%), zinc (12%) and available boron (70%). A total of 641 soil samples were collected from horticulture plantations in 13 Mandals of Srikakulam district during 2016 to assess the soil fertility status as well as to develop soil test based nutrients recommendations to enhance productivity of the crops. These soil samples are deficient in organic carbon (90%), available phosphorus (41%), exchangeable potassium (40%), calcium (89%), magnesium (45%), sulphur (95%), zinc (59%), copper (63%) and available boron (85%).

Figure 4.10.2.1: Pilot site map of Srikakulam.

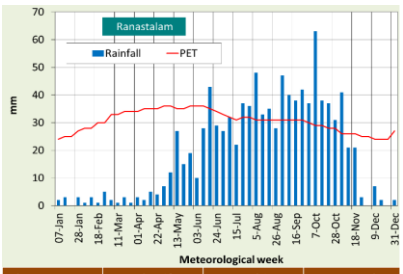
Frequent flooding, low productivity of paddy, imbalanced fertilizer application and severe infestation of BPH (Brown Plant Hopper), stem borer and blast, yellow mosaic disease infestation in green gram and black gram, low productivity of horticulture plantations, poor soils, low resource use efficiency, 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 husbandry sector for enhancing the milk production 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

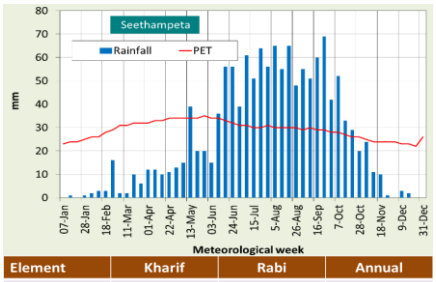
and rejuvenation of grazing lands for increasing fodder availability; for enhancing egg production: Providing backyard poultry units with supply of improved chicks, vaccination and good rearing practices will enhance egg production. For fisheries sector, the interventions proposed are: Rejuvenation of 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 4.10.2.2: Rainfall pattern and potential evapotranspiration (PET) in pilot mandals.

Table 4.10.2.1. Pilot village wise details																			
S. No	Village	Geographical area (ha)	Net cultivated area	Gross cultivated area		Irrigated area			Area under hort crops		Livestock population				Inland Fisheries		HHs		Population
				kharif	*rabi*	Canal	GW	Other	Vegetables	Fruits	Cattle	Buffaloes	Sheep	Goat	Area	Ponds	Small & Marginal	Total	
1	Priyagraharam	528	351	351	9	339	0	0	0	3	754	34	4	41	0	0		580	2249
2	Belamara Polavalasa	572	412	412	21	410	1	0	1	5	1227	113	2260	0	0	0		589	2325
3	Koduru	634	417	417	60	385	1	0	0	49	1923	113	2434	515	0	0		1405	5827
4	Rajapuram	54	39	39	25	42	0	0	0	2	115	0	0	0	0	0		246	976
5	Dandulakshmipu	2132	1253	1253	157	1128	4	0	4	88	1604	118	21	256	94	96		1129	4391
6	Susaram	196	116	116	39	102	0	16	0	0	546	268	24	135	0	0		461	1523
7	Ambeerupeta	200	156	156	91	149	0	0	0	5	187	8	83	186	0	0		248	865
8	Urjam	266	215	215	94	210	0	0	0	3	625	193	0	0	0	0		542	2086
9	Polaki	1004	634	634	96	620	0	2	0	15	2755	601	1261	716	12	20		1837	7089
1	Nandigam	187	100	100	57	94	0	0	0	5	162	0	1475	342	0	0		397	1526
1	Ampalam	255	200	200	86	194	0	0	0	3	159	0	1789	190	41	69		254	1066
1	Akkayyapalem	241	112	181	55	0	2	36	4	141	65	15	1215	15	0	0	227	232	544
1	Bantupalli	682	135	302	52	0	15	51	16	302	812	45	813	56	0	0	388	426	1520
1	Chillapeta Rajam	668	238	374	127	0	12	124	5	319	134	16	2710	248	0	0	593	632	2840
1	Kondamulagam	687	151	352	68	0	35	70	28	489	703	60	4431	486	0	0	552	566	1960
1	Kosta	362	105	260	82	0	33	115	20	237	290	40	346	335	0	0	409	424	3433
1	Kotapalem	1170	139	299	49	0	0	47	7	60	410	88	0	100	0	0	563	660	3452
1	Maruvada	499	137	280	63	0	0	51	6	232	147	0	0	0	0	0	247	266	568
1	Mentada	516	197	323	44	0	0	47	2	317	52	142	81	119	0	0	357	383	1313
2	Naruva	791	298	466	57	0	0	41	13	546	91	197	62	160	0	0	436	458	2058
2	Pydibhimavaram	391	38	98	4	0	4	47	0	4	200	167	103	52	0	0	159	173	3041
2	Ranasthalam	1088	213	638	250	0	113	182	82	319	518	139	374	278	0	0	995	1046	4991
2	Sancham	1075	155	579	252	0	40	158	37	78	201	37	1917	649	0	0	879	936	3099

2	Teppalavalasa	519	118	273	97	0	63	15	16	82	332	58	109	98	0	0	264	295	880
2	Varisam	470	139	295	27	0	8	90	4	188	256	0	614	0	0	0	291	320	1357
2	Puliputti	1197	165	228	5	0	13	107	3	70	1182	274	97	1118	0	0		378	1340
2	Billumada	110	62	56	1	0	1	19	0	28	121	23	24	115	0	0		38	107
2	Donubai	141	60	106	5	0	2	59	1	34	345	2	0	0	0	0		174	870
2	Pubbada	97	61	72	5	0	2	28	1	34	217	2	50	75	0	0		112	391
3	Haddubangi	432	138	251	3	0	9	71	1	158	696	40	248	410	0	0		379	1996
3	Somagandi	273	123	191	6	0	2	81	3	82	435	16	198	291	0	0		511	1963
3	Seethampeta	71	36	37	1	0	0	26	2	3	338	171	317	213	0	0		738	5305
3	Devanapuram	181	68	113	3	0	1	62	0	38	212	20	61	153	0	0		126	493
3	Pedarama	131	48	72	2	0	1	53	0	17	284	14	35	70	0	0		227	952
3	Chinarama	77	60	58	2	0	1	37	1	18	10	4	0	0	0	0		22	73
3	Antikonda	121	91	79	2	0	13	28	1	47	200	6	26	213	0	0		134	563
3	Pedduru	198	67	52	1	0	0	45	0	6	2	0	117	150	0	0		121	523
3	Kuddapalli	118	43	70	4	0	4	33	1	28	87	14	224	446	0	0		203	775
3	Valagedda	62	47	46	4	0	2	32	1	9	65	4	21	27	0	0		114	433
4	Addakulaguda	93	37	65	3	0	7	21	1	26	88	6	22	95	0	0		67	243
4	Santhamalli	131	96	81	5	0	2	38	2	38	130	14	82	155	0	0		156	1643
4	Kusimi	152	127	79	9	0	4	45	2	27	110	0	76	80	0	0		206	776
4	Jilledupadu	73	68	40	4	0	2	34	0	4	265	0	58	39	0	0		75	337
4	Mutyalu	95	85	9	0	0	1	2	0	6	78	0	43	38	0	0		86	536

Table 4.10.2.2: GVA Details												
Sector	Commodity (e.g.)	2014-15			2015-16			2016-17			% increase in GVA	
		Area	Production	Gross Value	Area	Production	Gross Value	Area	Production	Gross Value	2015-16 over 2014-15	2016-17 over 2015-16
				(₹ crore)	(ha)		(₹ crore)	(ha)		(₹ crore)		
Agriculture	PADDY	210201	664983	718	206794	718442	776	205316	897357	969	8.0	24.9
	MAIZE	14520	64533	63	16691	75231	74	15300	79889	78	16.6	6.2
	COTTON	9563	14201	37	8883	12880	43	7900	13509	45	14.1	4.9
	GROUNDNUT	8654	13575	22	8273	10762	29	6672	10874	29	34.5	1.0
	BLACKGRAM	42885	27439	76	41586	26199	84	47240	30233	97	9.7	15.4
	GREENGRAM	32224	20083	59	29914	18544	65	31860	19423	68	10.7	4.7
	SUGARCANE	7678	535616	98	11284	819635	119	8844	651671	94	21.6	-20.5
	OTHERS	15075	5021	13	14395	7822	15	15466	8100	16	12.8	6.1
	Total	340800	1345451	1086	337820	1689515	1203	338598	1711056	1396	10.8	16.0
Horticulture	Onion	980	23520	32.9	965	27020	49	965	33775	61	48.9	24.5
	Cashew	23897	14338	114.7	23880	7164	57	24087	14452	116	-50.3	103.5
	Mango	9312	111744	167.6	9313	46565	210	8961	80649	363	25.3	72.9
	Coconut	14645	1537	153.7	14643	1867	199.3	14645	1977	210	29.7	5.4
	Banana	2609	78270	62.6	2609	73052	87.7	2860	100100	120.1	40.1	36.9
	Papaya	52	3900	2.34	215	15050	12	320	25600	20.5	412.8	70.8
	Vegetables	1449	21740	28.3	5326	69238	111	5326	79890	128	292.2	15.3
	Total	52944	255049	562.14	56951	239956	726	57164	336443	1018.6	29.1	40.3
Livestock	Milk		444797	896		497672	1008		551000	1110	12.5	10.1
	Meat		16031	245		17460	273		19500	292	11.4	7.0
	Eggs		1309	22		1423	24		1600	27	9.1	12.5
	Total		462137	1163		516555	1305		572100	1429	12.2	9.5
Fisheries	Marine Fish (in Tons)		48984	321		51820	446		57634	519	38.9	16.3
	Inland Fish (in Tons)		10822	52		19750	130		24180	169	150.0	30.2
	Total Prawn (in Tons)		3999	121		5400	177		8025	273	46.3	54.2
	Total		63805	494		76970	753		89834	961	52.4	27.6

4.11 Visakhapatnam

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 63.54 lakh 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 farmer's income is not in tune with it. Increased labour cost, out-migration to nearby urban areas and inflationary pressures have added to the miseries of farmers' livelihoods. Another evidence of emerging crisis is the "Crop holiday" practiced by the farmers of East Godavari district in an area of 85,050 acres during *kharif* (rainy season) of 2011 (GOAP, 2014a). Even cloud seeding in some districts (of united Andhra Pradesh) during 2004-09 by incurring expenditure Rs 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 honourable Chief Minister, Government of Andhra Pradesh (GOAP), Sri N Chandrababu Naidu has committed to transform the primary sector and set the aspirational goal of best making Andhra Pradesh as one of the three top leading states in India through 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 sector, and then to operationalize it in a phased manner. For this, GOAP, through its agriculture department had requested the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) to prepare strategy plan for transforming agriculture in Andhra Pradesh during the five years (2014-2019). The Government of Andhra Pradesh (GOAP) and ICRISAT have signed a memorandum of understanding during 2015, in the presence of Honourable Chief Minister to transform the agriculture and allied sector through development of a new Primary Sector strategy by adopting the principles of convergence, collective action, consortium to build partnerships and capacity building to promote innovations, inclusivity and sustainable intensification. Double the productivity through integrated farming is the main objective of the programme.

4.11.1 District profile

Visakhapatnam District is one of the North Eastern Coastal districts of Andhra Pradesh and it lies between 17^{o}-15' and 18^{o}-32' Northern latitude and 18^{o}-54' and 83^{o}-30' in Eastern longitude. It is bounded on the North partly by the Orissa 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 42.88 lakhs. Red Loamy soils predominate with coverage of 70% of the villages. The annual rainfall ranges from 708 mm to 1700 mm. Agriculture is the main stay 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 12.02 lakhs of which working animals account for 2.14 lakhs while milch animals account for 3.10 lakhs. Fishermen population living in about 59 fishery villages and hamlets on coastline stretching to a length of 132 kms. The district domestic product (DDP) was Rs. 65,458 crores during 2013-14 with per capita income of Rs. 113,860.

The District presents two distinct Geographic divisions. The strip of the land along the coast and the interior called the plains division and hilly area of the Eastern Ghats flanking it on the North and West 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 other division is the plains division with altitude nowhere exceeding 75 meters watered and drained by Sarada, Varaha and Thandava Rivers and rivulets Meghadrigedda and Gambheeramgedda. Since no major Irrigation system exists significant sub regional agronomic variations exist in this division. Along the shore lies a series of salt and sandy swamps. The coast line is broken by a number of bald head lands, the important of them being the Dolphin's Nose which had afforded the establishment of Natural Harbour at Visakhapatnam, Rushikonda (v) Polavaram Rock and the big Narasimha Hill at Bheemunipatnam. Administratively, the District is divided into 3 Revenue Divisions and 43 Mandals.

According to the 2011 census, Visakhapatnam district has a population of 4,288,113. This gives it a ranking of 44th in India (out of a total of 640) and 5th in Andhra Pradesh. The district has a population density of 384 inhabitants per square kilometre (990/sq mi). 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%.Visakhapatnam district has a population of 4,288,113 people of which 57.95% is urban as of 2011 census. Out of the total population 21.41 lakhs are Males and 21.47 lakhs are Females.

Climate

The district has differing climatic conditions in different parts of it. Near Coast the air is moist and relaxing, but 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) gets down with the onset of South West Monsoon and tumbles to a mean minimum of 21.0^{o} C by January after which there is reversal trend till the temperature reaches mean maximum of 32.5^{o} C by the end of June. The District receives annual normal rainfall of 1202 mm of which south-west monsoon accounts for 55.99 % of the normal while North-East monsoon contributes 4.68 % of the normal rainfall. The rest is shared by summer showers and winter rains. Agency and inland Mandals receive larger rainfall from the South West Monsoon, while Coastal Mandals get similarly larger rainfall from North-East monsoon.

Soils

Red Loamy soils predominate with a coverage of 69.9% of the villages of the district. The Soils are poor textured and easily drained. Sandy loamy soils come next with 19.2% coverage, 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 come up next having sizeable chunks of area in K.Kotapadu, Devarapalli, Cheedikada, Paderu and Hukumpeta Mandals. 45% of the soils in the district are low in organic content and 55% in Phosphorous content.

Land use

The total geographical area of the district is 11.16 lakh hectares, of this 26.89% alone is cultivable area while 39.52% is forest area. The rest is distributed among "Barren and uncultivable land" about 11.7% and "Land put to non-agricultural uses" 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%.

Performance of primary sector: The analysis of last three year Subsector-wise DDP at current prices showed that Visakhapatnam district is among top in industry and service sectors while primary sector contributes poorly. The state had identified growth engines in each of the sectors. Forty-four growth engines contributes 82% (Rs 53674 crores GVA) in total DDP of Rs 65458 crores. In Agriculture and allied sector, 28 Growth Engines contributes 79.48% (Rs 4459 crores GVA) in total Agriculture sector DDP of Rs 5610 crores. In Industry sector, 6 Growth Engines contributes 99.45% (Rs 19794 crores GVA) in total industry sector DDP of Rs 19903 crores. In service sector, 10 Growth Engines contributes 73.65% (Rs 29421 crores GVA) in total service sector DDP of Rs 39945 crores.

Convergence of all Line Departments

Line departments representing agriculture and allied sectors have converged their activities at pilot sites to operationalize the strategy of convergence and holistic system approach. Maximum coverage of pilot site areas through various schemes would make the pilot areas as a live model for the success of the Primary Sector Mission. It will also be a site of learning for the Primary Sector Mission and enable scaling-up through refinement of policies and institutions based on the learnings and evidences.

Rainfall situation

During June 2016 to May 2017, Visakhapatnam district received 1000 mm against to 1094 mm. Across the Mandals the rainfall distribution is uneven and resulted in excess or scarce rainfall situation. In the three pilot Mandals viz., Chintapalle, Butchayyapeta and Padmanabham, the rainfall situation is considered as normal but Padmanabham Mandal received deficit rainfall which is almost 36% less than the normal rainfall (see appendix).

Monthly rainfall status is presented in Table 4.11.1.1. It was revealed that there is uneven pattern across the mandals. However, on average, June to September months received normal to excess rainfall in Butchayyapeta and Chintapalle mandals whereas it was normal to

deficit in Padmanabham mandal during the same period. October to December months experienced scanty rainfall in all three mandals except Chintapplle during November where it received normal rainfall.

Table 4.11.1.1: Rainfall status at the Pilot Mandals during June to December 2016.

Month	Rainfall	Mandal		
		Butchayyapeta	Chintapalle	Padmanabham
June	Actual (mm)	149	206	115
	Normal (mm)	122	166	156
	Deviation (%)	22	24	-26
	Status	Excess	Excess	Deficit
July	Actual (mm)	166	214	146
	Normal (mm)	168	248	172
	Deviation (%)	-1	-14	-15
	Status	Normal	Normal	Normal
August	Actual (mm)	152	296	109
	Normal (mm)	172	220	263
	Deviation (%)	-12	35	-59
	Status	Normal	Excess	Deficit
September	Actual (mm)	464	234	259
	Normal (mm)	197	159	224
	Deviation (%)	136	47	16
	Status	Excess	Excess	Normal
October	Actual (mm)	69	24	163
	Normal (mm)	206	173	287
	Deviation (%)	-67	-86	-43
	Status	Scanty	Scanty	Deficit
November	Actual (mm)	1	38	1
	Normal (mm)	82	39	139
	Deviation (%)	-99	-3	-99
	Status	Scanty	Normal	Scanty
December	Actual (mm)	1	1	2
	Normal (mm)	2	2	7
	Deviation (%)	-50	-50	-71
	Status	Deficit	Deficit	Scanty
Jun-Dec	Actual (mm)	1002	1013	795
	Normal (mm)	949	1007	1248
	Deviation (%)	6	1	-36
	Status	Normal	Normal	Deficit

4.11.2 Pilot site profile

ICRISAT along with district administration (line departments) identified three Mandals to develop as sites of learning. 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). The total number of households in the pilot villages is 10,120 with population of 41,474 including 42% working population. The overall literacy rate is about 47.48 with male literacy rate is 55.91 and female literacy rate is 39.01 per cent (Table 4.11.2.1). It has 10,516 ha of net sown area covering major crops like paddy, maize, sugarcane, ragi, pigeonpea, groundnut and horticulture crops like turmeric, mango, cashewnut. 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 (Table 4.11.2.1).

However, due to lack of fodder availability and storage facilities, major challenge is for realizing the potential milk yield. The annual average rainfall is about 1014 mm, 1377 mm and 1178 mm in Butchayyapeta, Chintapalle and Padmanabham Mandal respectively.

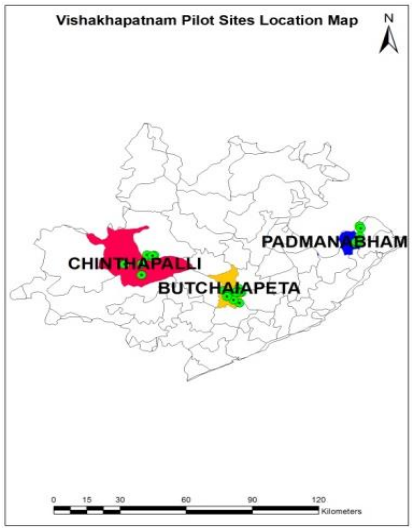


Figure 4.11.2.1: Location map of pilot Mandals in Visakhapatnam district.

The major constraints in the pilot sites are low crop and livestock productivity, low seed replacement rate, water and fodder scarcity, poor mechanization and management practices and lack of processing units. Major area is under single-cropping system of paddy grown with coarse grain variety which is not consumed in local market.

Table 4.11.2.1: Profile of pilot villages in Visakhapatnam district

S NO	Mandal	Village	Geographical Area(Ha)	Net cultivable area(area in ha)	Gross cultivated area(Area in ha)		Irrigated area(Area in acres)			Area under horti. crops (Area in ha)		Livestock Population				Inland Fisheries		HHs	Population
					Kharif	*Rabi*	Dug wells	Tube wells	other (Tanks)	Veg	Fruits	Cows	Buffaloes	Sheep	Goat	Area	Ponds		
1	Padmanabham	Ayinada	990	443	99	60	101	15	10	3	40	625	282	156	108	0	0	586	2300
2	Padmanabham	Bapirajutallavalasa	1194	379	216	70	254	4	23	0	32	1254	340	248	105	0	0	993	3992
3	Padmanabham	Korada	1782	687	146	67	163	37	9	35	42	1027	362	671	275	0	0	737	3025
4	Padmanabham	Pandrangi	3251	1669	496	190	91	68	6	0	63	1250	497	911	1180	0	0	1300	5398
5	Padmanabham	Venkatapuram	425	338	70	30	62	3	5	4	10	225	416	774	141	0	0	374	1575
6	Padmanabham	Revidi	1261	502	165	35	98	0	13	6	9	670	390	578	267	0	0	578	2400
7	Butchayyapeta	Gunnempudi	854	541	192	0	0	0	0	6	163	113	490	112	13	0	0	673	2623
8	Butchayyapeta	Kandipudi	302	210	183	10	0	0	0	5	6	132	197	466	210	0	0	377	1408
9	Butchayyapeta	Neelakantapuram	120	77	69	0	0	0	0	0	0	39	246	0	8	0	0	243	841
10	Butchayyapeta	Rajam	1172	948	465	8	0	0	0	6	268	115	306	63	157	0	0	787	3090
11	Butchayyapeta	Typuram	197	138	83	0	0	0	0	0	24	5	118	20	462	0	0	334	1343
12	Butchayyapeta	Chittiyyapalem	335	264	175	0	0	0	0	5	14	48	177	0	73	0	0	307	1246
13	Butchayyapeta	China Madina	420	323	164	8	0	0	0	16	25	0	98	0	0	0	0	154	663
14	Butchayyapeta	Turakalapudi	931	706	379	20	0	0	0	4	130	327	160	255	246	0	0	602	2054
15	Butchayyapeta	R. Sivarampuram	365	202	36	0	0	0	0	0	63	5	102	249	233	0	0	240	980
16	Butchayyapeta	R. Bheemavaram	701	605	188	0	0	0	0	0	142	31	88	0	79	0	0	382	1722
17	Chintapalli	Vangasari	228	150	68	2	0	0	0	0	0	42	0	32	53	0	0	185	1309
18	Chintapalli	Lumbasingi	967	542	129	12	0	0	0	0	0	98	50	0	54	0	0	403	1943
19	Chintapalli	Tajangi	1348	818	259	49	0	0	0	*	*	947	49	143	384	0	0	567	2126
20	Chintapalli	Pakabu	430	236	107	2	0	0	0	*	*	83	0	0	0	0	0	43	515
21	Chintapalli	Busulkota	547	286	81	1	0	0	0	*	*	166	0	0	180	0	0	89	326
22	Chintapalli	Sanivaram	742	396	159	2	0	0	0	*	*	0	203	0	82	0	0	114	389
23	Chintapalli	Anjalam	80	55	65	2	0	0	0	*	*	99	0	0	103	0	0	52	206

4.12 Vizianagaram

4.12.1 District profile

Vijayanagaram pilot sites cover 23 revenue villages in 2 Mandals spread over In Parvathipuram Mandal, 8 revenue villages and 15 Revenue villages in Pusapatirega were selected covering a total geographical area of 26550 ha having 7832 households and a total population of 35976. Paddy is the major crop grown in more than 80% of the area during *kharif*. Among horticultural crops, Banana, cashew nut, Mango, oil palm and chillies are major crops In 2 Mandals, Maize, cotton and paddy are the dominant crops in selected villages. Banana, coconut, cashew nut and papaya are the predominant horticulture crops in the pilot area. Poultry and sheep are the major contributors of total livestock population for the study area. Major soil type is red, sandy loam, sandy clay loam and alluvial soils in all the pilot villages.

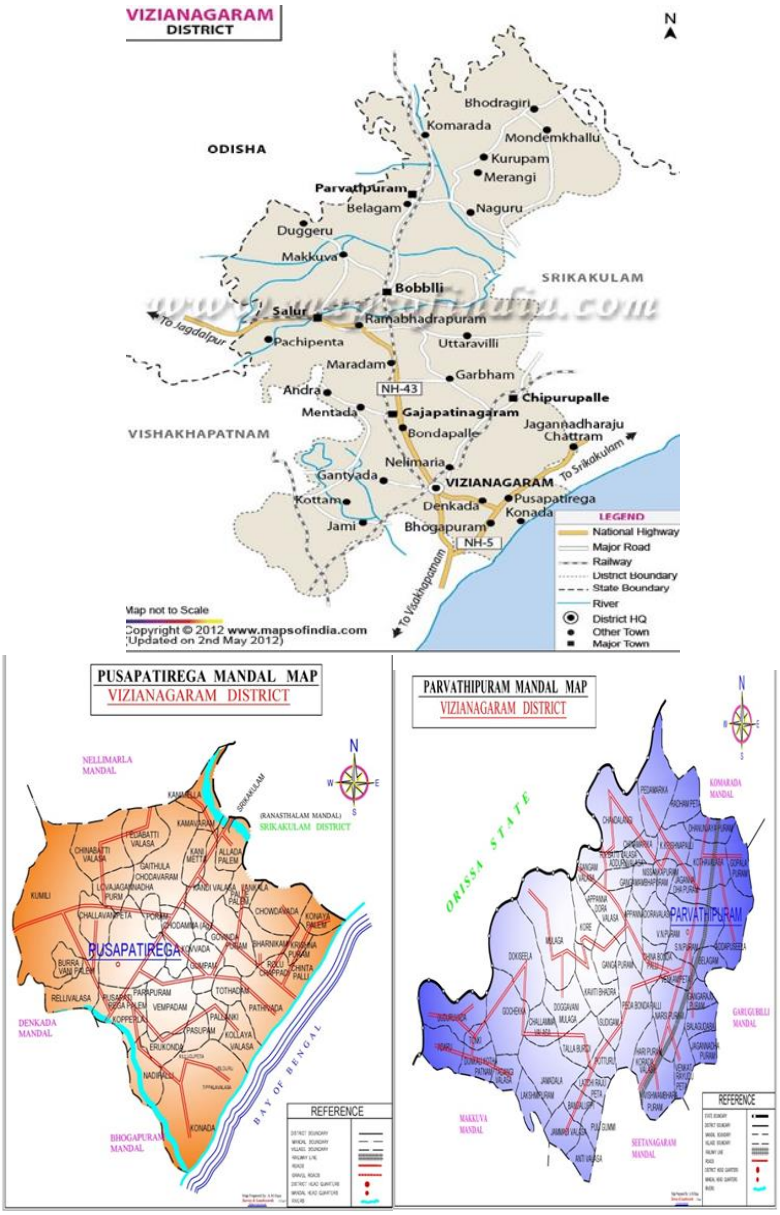


Figure 4.12.1.1: Vizianagaram Pilot site maps.

Table 4.12.1.1: Pilot Village wise details

S. No.	Village	Geographical area (ha)	Net cultivated area	Gross cultivated area		Irrigated area			Area under hort crops		Livestock population				Inland Fisheries		HHs		Population
				kharif	*rabi*	Canal	GW	Other	Vegetables	Fruits	Cattle	Buffaloes	Sheep	Goat	Area	Ponds	Small & Marginal	Other	
1	Gochekka	1085	993	822	94	0	0	352	0	0	117	78	0	159	0	0	248	57	872
2	Dokiseela	3496	1574	1298	132	0	0	455	0	0	1085	120	50	80	0	0	429	82	1734
3	Chalamvalasa	447	368	296	106	0	0	330	0	0	68	20	0	14	0	0	114	18	411
4	D.Mulaga	225	187	128	32	0	0	55	1	0	120	72	23	0	0	0	245	32	491
5	K.Mulaga	4834	3127	2766	198	0	0	610	4	0	290	519	46	53	0	0	580	160	2028
6	Kavitibhadra	595	498	402	132	0	0	268	0	0	119	42	14	28	0	0	226	13	421
7	Kore	1094	708	312	84	0	0	177	1	0	105	0	0	0	0	0	190	42	511
8	Gangapuram	871	676	588	126	0	0	405	0	0	180	58	45	637	0	0	343	34	657
		12647	**8131**	**6612**	**904**	**0**	**0**	**2652**	**6**	**0**	**2084**	**909**	**178**	**971**	**0**	**0**	**2375**	**438**	**7125**
1	Pusapatirega	1890	1780	1625	1248	16	0	6	11	179	586	253	689	445	0	0	1185	0	5683
2	Pasupam	560	489	362	116	0	0	5	1.5	84	124	26	244	154	0	0	166	0	1344
3	Pallanki	407	315	221	58	0	0	4	0.5	73	82	0	716	163	0	0	259	0	309
4	Vempadam	1540	1394	1195	786	0	0	12	0.8	86	611	175	502	225	0	0	1136	0	3566
5	Gumpam	809	718	599	284	0	0	8	1.2	81	119	92	310	268	0	0	461	0	1420
6	Kollayavalasa	975	855	721	402	19	0	12	1.3	66	98	6	287	4250	5	3	268	0	1549
7	Thottadam	499	401	295	49	13	0	16	0	66	110	14	323	125	0	0	241	0	913
8	Govindapuram	1031	913	786	418	16	0	5	2.25	189	405	52	196	210	0	0	264	0	1591
9	Chodwada	1023	942	801	485	69	0	18	2	102	74	38	422	488	0	0	522	0	326
10	Barrinkam	664	553	441	138	9	0	6	1.45	120	64	12	135	101	0	0	126	0	557
11	Pathivada	1340	1213	1106	794	20	0	23	2.1	113	315	35	168	145	0	0	892	0	4109
12	Rolluchappidi	201	152	69	36	0	0	3	1.35	88	46	15	102	98	0	0	216	0	641
13	Krishnapuram	282	186	88	49	3	0	3	1.8	63	219	16	109	101	0	0	183	0	587
14	Konayyapalem	483	355	216	75	6	0	5	1	85	189	18	78	87	0	0	142	0	539
15	Chinthapalli	1024	925	798	374	3	0	2	0	81	117	37	0	116	0	0	143	0	5717
	TOTAL	**13903**	**12189**	**10091**	**5572**	**174**	**0**	**146**	**22.25**	**229**	**3849**	**916**	**5525**	**7756**	**5**	**3**	**6848**	**0**	28851

Table 4.12.1.2: GVA Details.								
Sl.	GROWTH ENGINES	2015-16(AE)			2016-17			
No	Commodity (e.g.)	Area	Prod.	GVA	Area	Prod.	GVA	Growth %
I) AGRICULTURE AND ALLIED SECTOR								
a)	Agriculture							
1	Paddy	122631	461687	42559	123949	572123	52739	24
2	Maize	29659	146500	13454	33805	181542	16672	24
3	Sugarcane	14987	819921	15767	15848	1016046	19538	24
4	Cotton (kapas)	15599	17638	5593	14634	21857	6931	24
5	Sesamum (Gingelly)	11488	5715	1999	10781	7083	2477	24
6	Blackgram	19620	9658	2768	26259	11969	3430	24
7	Greengram	16739	7622	2274	17186	9445	2818	24
8	Groundnut	6095	10574	3415	4553	13103	4232	24
	Rest of Agrl. crops			9549			11833	24
	Agriculture (GVA)	236818		99240	247015		120670	22
b) Horticulture								
1	Papaya		37940	23		58940	41.26	81.24
2	Banana		375840	301		505120	404.1	34.4
3	Vegetables		85170	85		100170	100.17	17.61
4	Inter crop in Oil Palm		0	0		14250	10.69	#DIV/0!
5	Cashew Canopy		9182	83		9682	106.51	28.88
	(in 2500 Ha)							
6	Mango Rejuvenation		262176	498		266176	532.35	6.87
	(in 2000 Ha)							
	Rest of Hort. crops		153435	244		228435	278.23	13.92
	Horticulture GVA		923743	1233.61		1182773	1473.3	
C) Livestock								
1	Milk (MTs)		486914	98065		579000	116611	19
2	Meat (MTs)		23963	37256		27500	42755	15
3	Egg (Lakh No.)		3339	5658		3900	6609	17
	Others			2962			2890	-2
	Total Livestock			143941			168865	17
D) Fishing								
20	Marine Fish		16320	7558		17835	8260	20.04
21	Inland Fish		12300	7002		14128	8042	26.11
22	Prawns		4100	10844		5353	14158	11.55
	Total Fishing			25404			30460	20

4.12.2 Pilot Site profile

Figure 4.12.2.1: Pilot areas Agriculture GVA estimation for 2016-17 from Vizianagaram District													
			2015-16					2016-17				GVA difference	
			Area (ha)	Productivity(kg/Ha)	Production (q)	MSP (Rs/Q)	GVA (in Cr)	Area (ha)	Productivity (kg/Ha)	Production (q)	GVA (in Cr)	In Crores	In %
Parvathipuram	*Kharif*	Paddy	3210	3964	127244	1470	18.70	3542	4877	172736	25.39	6.69	35.75
		Maize	280	5840	16352	1360	2.22	220	8030	17667	2.4	0.18	8.041
		Cotton	58	1163	675	3860	0.26	65	1214	789	0.3	0.04	17.02
	Rabi	Black gram	934	275	2569	5000	1.28	1000	350.4	3504	1.75	0.47	36.42
		Green Gram	194	290	563	5225	0.29	250	328.8	822	0.43	0.14	46.11
puspatirega	*Kharif*	Paddy	1859	4120	76591	1410	10.80	1692	4877	82515	11.63	0.84	7.735
		Maize	423	5540	23434	1350	3.16	490	7897	38693	5.22	2.06	65.11
		G. Nut	156	1438	2243	3500	0.79	168	1726	2899	1.01	0.23	29.23
	Rabi	Greengram	356	223	794	5225	0.41	427	328.8	1405	0.73	0.32	76.93
		Blackgram	743	265	1969	5000	0.98	892	350.4	3124	1.56	0.58	58.67
		Maize	660	5150	33990	1360	4.62	730	8365	61065	8.3	3.68	79.65
	Total						43.54				58.75	15.22	34.95

Figure 4.12.2.2: Pilot area Horticulture GVA								
	2015-16				2016-17			
Crop	AREA	Porduction	Productivity	GVA	AREA	Porduction	Productivity	GVA
Mango	43696	559837	12.8	58579	43696	573000	13.1	59956
Banana	12528	274906	21.9	36755	12528	402816	32.2	53857
Cashewnut	15304	11421	0.7	7548	15304	12427	0.8	8214
Oil Palm	5635	93664	16.6	4426	5635	130000	23.1	6144
Coconut "000" nuts	2371	30780	13	1355	2371	30780	13	1355
	79534				79534			
PARVATHIPURAM	AREA	Porduction	Productivity	Q1 GVA	AREA	Porduction	Productivity	GVA
Mango	544	8364	15.4	875	544	8560	15.7	896
Banana	76	2001	26.3	268	76	2932	38.6	392
Cashewnut	1014	908	0.9	600	1014	988	1	653
Oil Palm	258	5146	19.9	243	292	8084	27.7	382
Coconut "000" nuts	747	11637	15.6	512	747	11637	15.6	512
PUSAPATIREGA	AREA	Porduction	Productivity	Q1 GVA	AREA	Porduction	Productivity	GVA
Mango	1014	15330	15.1	1604	1014	15690	15.5	1642
Banana	282	7302	25.9	976	315	11951	37.9	1598
Cashewnut	537	473	0.9	313	537	515	1	340
Coconut "000" nuts	747	11443	15.3	504	747	11443	15.3	504

Figure 4.12.2.2: Pilot site Animal Husbandry GVA					
	2015-16		2016-17		
PARVATHIPURAM	Prod.	GVA	Prod.	GVA	% Increase
Milk (MTs)	3532	711	4139	834	17.2
Meet (MTs)	42	65	53	82	25.8
Egg (Lakh No.)	1	1	1.3	2	
PUSAPATIREGA	Prod.	GVA	Prod.	GVA	
Milk (MTs)	5763	1161	6753	1360	17.2
Meet (MTs)	1348	2096	1708	2656	26.7
Egg (Lakh No.)	6	10	7.5	13	30

4.13 West Godavari

4.13.1 District profile

Sailent features of West Godavari district

West Godavari district is carved out of old Godavari district as it is the western delta of the river Godavari, it was appropriately named as west Godavari with headquarter at Eluru and came in to existence in the year 1925. The geographical, topographic, demographic and other socio economic aspects of the west Godavari district details.

Boundaries and Topography of the district

The district is bounded by the following districts on all the four sides in the East- Krishna district in North- Khammam district and in the South- Krishna district. The district is situated in tropical region between 16°-15'-00" to 17°-30'-00" northern latitude and 80°-55'-00" to 81°-55'-00" eastern longitude.it can be divided in to three natural regions viz., delta, upland and agency area.

Soil, climate and rainfall

The soil in the district are made up of alluvial, black reger and red ferruginous besides a small belt to arenaceous sandy soil along coastal belt. In the district the climate is moderate both in winter and summer season in delta area. In the non-delta area of the district the 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°c to 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 south west as well as north east monsoon, whose normal rainfall is 784.0 mm and 246 mm respectively. The receipt of actual; rainfall during 2009-10 from south west monsoon is 472mm, while 160.6 mm from north east monsoon. The agriculture activity in the district is deplorable owing to gambling monsoons, unreliable rainfall and much dependence in tank, well and M.I Sources for irrigation in upland and agency areas.

Demographic particulars

The district occupies an area of 7742 square km with a density of 491 per square km. it accounts 2.81 % of the total area of the state. There are many as 883 revenue village exist in the district of which 845 village are inhabited while the balance 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 3, 83,517. It account for 4.99% of the population of the state. The female population of the district is 18, 93,479 and this form 49.8 % of the district and 5.02 % of the state female population.

According to 2001 censes, rural population of the district is 30, 52,630 and it constitutes 80.3 % of the district population and 5.50 % to that of state rural population. Similarly the urban population of the district spread over in 8 towns is 7, 50,887 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 7, 28,963 which is 19.16 % of the district population and 5.90 state total SC population. Similarly, the ST population of the district is 96,659 and it accounts for 2.54 % of the district and 1.92 % of the state ST population. The SC and ST population are based upon 2001 census.

The decimal growth of population in the district from 1991 census to 2001 census was 8.12%. The density of population according 2001 census is 491 per square km, whereas it was 277 per square km 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 25, 71,589 forming 67.6% of the total population of the district and 3.37 % of the state population.

Industries

Rice, Sugar, jute, ceramic, oil, textile, flour, food processing, Agarbathi, Briks, Knitting, Coir industries etc. are the large, medium and small scale industries in the district.

Forestry

The total forest area in the district account for 81166 ha. Forming 10.48 % of the total geographical area. The species grown are bamboos and other wood use full for timber, fuel and other minor forest produce like Adda leave, Beedi leave, soapnuts. Tamarind, honey and fruits. In polavaram, buttayagudem jeelugumilli mandals. The coverage area under forest that appears in pedavegi, chinatalapudi, T. narasapuram lingapalem and kamavarapukota are of shrub types.

Agriculture

The net cultivated area 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 al the mandal in delta region, whereas pendyala, Gutala, Vegeswarapuram pumping scheme irrigate some part of Kovvur, Nadasdavole, Tallapudi, Polavaram and Gopalpuram mandals. The irrigation system of river Krishna irrigates entire portion of Eluru, Pedapadu mandals and parts of the area in Denduluru and Bhimadolemandals. In upland trak there are irrigation tanks, fed by hill stream beside other numbers of tubwells, dugwells and M.I scheme supplements the irrigation sources.On par with east Godavari and Krishna districts, west Godavari district is also having the distinction of being rice granary of Andhra Pradesh. Paddy forming 60 to 65% of the total area sown with an average yield of 4214 kg/ha in the district. The other predominant crops also raised in the district are Banana, Sugarcane, Chillies, Coconut, Maize, and Tobacco. Oil palm crop area is also increasing day by day due to fulfilling the requirement of oil palm factory established in Pedavegy mandal.

Rivers

Godavari is the important river flowing in the district. The river borders the entire eastern boundary of the district. At Vijjeswaram the river break in to two branches namely, the Gowthami Godavari (Eastern branch) and vasista Godavari,(western branch) and flows towards the south of the district before falling in to the bay of Bengal near Antarvedi. The

other minor rivers which feed the irrigation tanks in the upland area are Tammileru, Yarrakalva, Byneru, Kovvada, kalva, Jalleru, Rallamadugu, and Gunderu etc.

4.13.2 Pilot site profile

Government of Andhra Pradesh is targeting to achieve double digit growth in primary sector. Primary sector has huge untapped potential to harness by converging number of line department schemes, bringing technologies together from knowledge generating institute, research institute (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 contest, nearly 10,000 ha area is targeted to identify in each district of AP and therefore same in West Godavari as well. Pilot site should be representative to the district which largely cover major farming system and also representative to various sectors (Agriculture, horticulture, Animal Husbandry, Fisheries *etc.*) of the district, so that the learning got from these pilot site could be replicated to other areas of the district in future.

Following the above guideline, ICRISAT along with district administrators (District Collector, Chief Planning Officer) and line department officials has identified two mandals (Akivedu and K.Kota) as pilot sites of West Godavari. West Godavari comprises large upland areas which is largely covered by diversity of cropping system (agriculture and horticulture) in one hand; whereas delta is largely dominated by paddy and aquaculture practices. Akivedu mandal representing delta region and K.Kota as upland area (Figure 4.13.2.1).

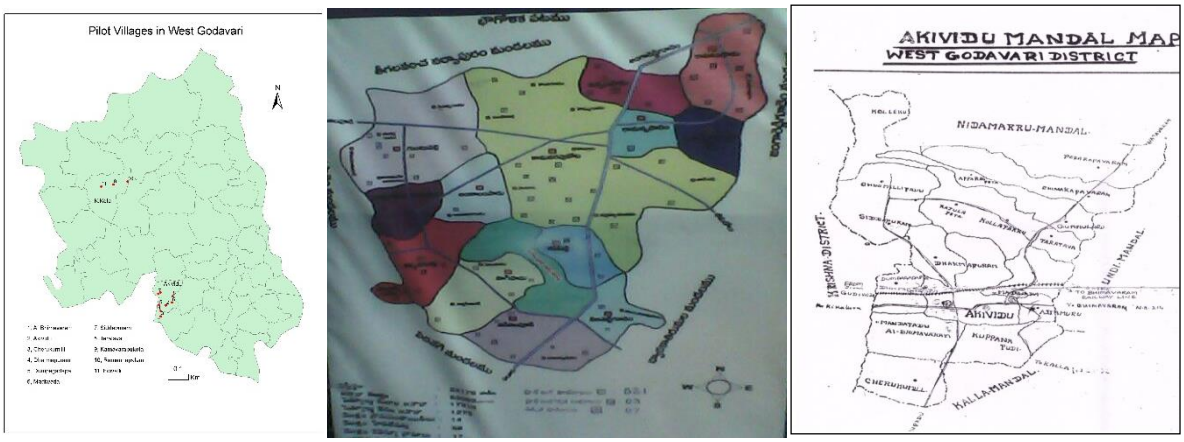


Figure 4.13.2.1: a) Location of pilot sites in West Godavari; b) KKota village cluster; c) Akividu village cluster.

Eleven villages (3 in K.Kota and 8 in Akividu mandals) are selected as pilot sites covering total 10,625 ha geographical area and those are home of nearly 75,000 people. Out of total land, nearly 60% area is covered by agricultural fields; 15 % by horticulture and 20% by fisheries and prawn culture. Farmers having land and land-less farmers are engaged in various animal husbandry (dairy, meat production and poultry) activities. Maize and Paddy is predominating cropping system in K.Kota and Akivedu mandal respectively. There are however other crops like sugarcane, groundnut are grown in K.Kota mandal but its extend is less than 10%. Oil palm is largest grown horticulture crop followed by coconut, cashew and mango. Cashew nut and mango area has been converted into oil palm subsequently in last decades due to assured marking opportunity and remunerative returns. Whereas Paddy is only major cropping

system cultivated in Akivedu mandal. Poor drainage, high salinity and flooding is the major issues bringing paddy yield lower compared to upland areas.

Rainfall and climate

Annual rainfall of selected two mandals are in 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 4.13.2.1). Weekly rainfall and PET pattern for selected mandals are shown in Figure 4.13.2.2 and Figure 4.13.2.3.

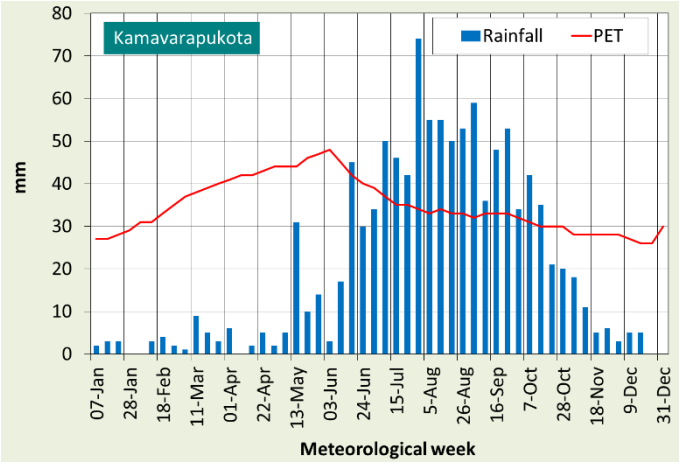


Figure 4.13.2.2: Rainfall and PET distribution in Kamavarapukota on weekly basis.

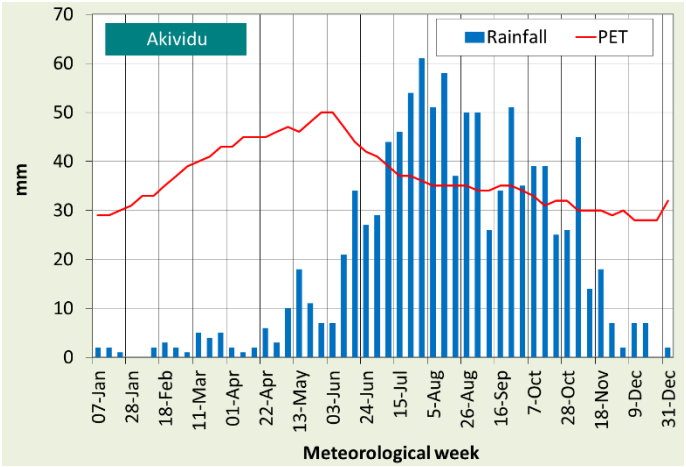


Figure 4.13.2.3: Rainfall and PET distribution in Akividu on weekly basis.

Table 4.13.2.1: Annual and season wise average rainfall and PET for K.Kota and Akividu mandals.				
Mandal	Parameter (mm)	*Kharif*	*Rabi*	Annual
K. Kota	Rainfall	899	94	1065
	PET	724	685	1809
Akividu	Rainfall	837	131	1033
	PET	763	728	1913

Actual rainfall received in 2016-17 in different months with average values both for Kamavarapukota and Akividu mandals. This indicates that rainfall received in year 2016-17 experienced with large variability than the long term average. Both the pilot sites received heavy rains during June but more than 50% deficient in July and August compared to normal years. Except September, other months also experienced with water scarcity situations, see appendix for actual and normal rainfall in West Godavari district..

Demographic details

Eleven villages (3 in K.Kota and 8 in Akividu mandals) are selected as pilot sites covering total 10,625 ha geographical area and those are home of nearly 75,000 people. Out of total land, nearly 60% area is covered by agricultural fields; 15 % by horticulture and 20% by fisheries and prawn culture. Farmers having land and land-less farmers are engaged in various animal husbandry (dairy, meat production and poultry) activities. Total population and demographic details for these villages are shown in Table 4.13.2.2 and Table 4.13.2.3.

Table 4.13.2.2: Number of households, total population and sector wise areas in selected pilot villages.

Sl	Villages	No of HHS	Population	Geographic 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	-	-
10	Rammanapalem	402	1520	510	451	263	-	-
11	Yadavalli	596	3571	804	706	259	-	-
	Total	20706	75010	10625	6647	1395	1560	517

Cropping system

Maize and Paddy is predominating cropping system in K.Kota and Akivedu mandal respectively. There are however other crops like sugarcane, groundnut are grown in K.Kota mandal but its extend is less than 10%. Oil palm is largest grown horticulture crop followed by coconut, cashew and mango. Cashew nut and mango area has been converted into oil palm subsequently in last decades due to assured marking opportunity and remunerative returns. Whereas Paddy is only major cropping system cultivated in Akivedu mandal. Poor drainage, high salinity and flooding is the major issues bringing paddy yield lower compared to upland areas.

Table 4.13.2.3: Animal, sheep/goat and poultry population in selected pilot villages.				
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

Micro-irrigation coverage

With increasing water scarcity situation, Government of AP is promoting micro-irrigation in agriculture and horticulture. Nearly 270 ha land in pilot villages have already adopted micro-irrigation covering diverse cropping pattern till year 2015. Table 4.13.2.4 shows crop and village wise coverage under micro-irrigation in pilot site.

Table 4.13.2.4: Crop and village wise coverage of micro-irrigation system in selected pilot villages of K.Kota mandal.				
Crop	K. Kota	Ramannagudem	East Yadavalli	Total
Acid Lime/ Sweet Orange	1	1	1	4
Maize/Baby Corn	12	3	0	15
Banana	32	2	3	37
Cashew	1	0	0	1
Oil Palm/Intercrop	74	48	42	164
Coconut/Intercrop	14	3	5	22
Sugarcane	3	0	0	3
Groundnut	4	19	1	24
	140	76	53	269

5. Major interventions in pilot sites

5.1 Weather monitoring & climate analysis

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. 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.

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 36 pilot Mandals are accumulated pentad-wise (5-day cumulative). Rainfall forecast bulletins and Observed pentad rainfall bulletins are prepared and shared. Information on district-wise actual and normal rainfall, deviation from normal and rainfall category (Excess or Normal or Deficient or Scanty) is also included in the Forecast bulletins which help in designing interventions in the pilots. See appendix for normal and actual rainfall during 2016 – 17. A SowingApp is also evaluated in Kurnool pilot sites.

5.2 Sustainable productivity & livelihood interventions

Soil test-based nutrient management

Soil fertility degradation, due to extensive mining and mismanagement over the years, is one of the major stumbling block for increasing agricultural productivity. Based on soil health mapping done during 2015, soil test-based recommendations, and specifically micro & secondary nutrients were evaluated and promoted as low hanging technologies. The micronutrients were supplied through DoA, and farmers were motivated and identified who adopted balanced nutrition. At maturity crop cuttings (CCs) were conducted in 3 m x 3 m or 5 m x 5 m area in BN and farmers' plots. 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} was interpolated.

In addition, soil health mapping was done in horticultural plantations as well during 2016-17, for which a detailed separate report is submitted to DoH, GoAP. Representative soil samples are collected from horticultural plantations across 7 districts viz. East Godavari, Guntur, Krishna, Srikakulum, Visakhapatnam, Vizianagaram and West Godavari. The analysis results showed low soil organic C levels between 43% to 90% orchards. With regard to available nutrients, multiple nutrient deficiencies are recorded like - sulphur (S; 19-96% orchards), calcium (Ca; 9-89%), zinc (Zn; 18-80%), boron (B; 7-85%, copper (Cu; 0-63%), iron (0-69%) and magnesium (Mg; 0-45%). Soils in general are adequate in exchangeable-K in majority orchards. GIS based soil health maps are generated for all 7 districts to indicate available macro & micro nutrient status, levels of soil C; soil reaction and electrical conductivity, and need based fertilizer recommendations are worked out.

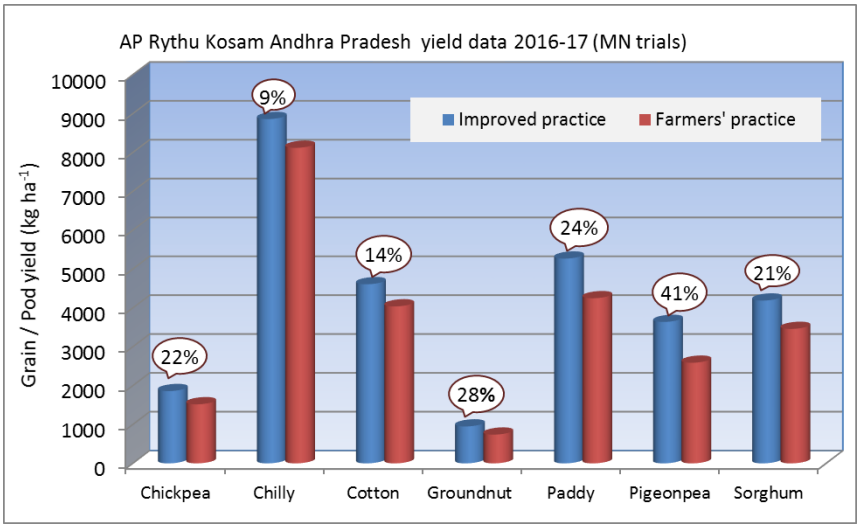


Figure 5.2.1: Yield benefit with soil test-based addition of micro & secondary nutrients in Andhra Pradesh during 2016-17.

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

Low levels detected of soil organic C are one of the major reasons for poor productivity on farmers' fields. 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.

Shredding machines are also operated in 8 districts for chopping of hardy biomass to facilitate ease in composting. The 8 districts where shredding machines are piloted and operated are - Anantapur, Krishna, Kadapa, Nellore, Srikakulum, Vijayanagaram**,** Chittoor and East Godavari.

For biomass generation from point of view of soil C-building, *Gliricidia* plantation on farm boundaries is also promoted and 62 kg seed is used in district pilots for raising plants for transplanting on bunds.

Climate smart crop & varietal evaluation

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 and high yield potential are evaluated during 2016-17. Improved varieties of crops like groundnut, pigenpea, pearl millet, sorghum, green gram, black gram, castor, maize, rajma, finger millet and foxtail millet are evaluated during *kharif* 2016 season (Table 5.2.1). Similarly, varieties of pearl millet, sorghum, finfer millet, pigeonpea, green gram, cowpea and black gram are evaluated during *rabi* 2016-17 (Table 5.2.2).

Table 5.2.1: Detail of crops and improved varieties evaluated during *kharif* 2016.		
Crop	Cultivar	Total Quantity (kg)
Groundnut	ICGV 91114	3080
Groundnut	ICGV 02266	90
Pigeonpea	ICPH 2740	524
Pigeonpea	ICPL 85063	80
Pigeonpea	ICPL 87119	920
Pigeonpea	ICPL 8863	420
Pigeonpea	ICPL-88039	15
Pigeonpea	ICPL 161	10
Pigeonpea	TS3R	60
Green gram	IPM 02-14	52
Black gram	PU 31	550
Black gram	T 9	652
Pearl millet	ICTP 8203-Fe	660
Pearl millet	HHB 67	60
Sorghum	CSV 23	100
Sorghum	PVK 801	230
Sorghum	ICSV 745	200
Castor	DCH 177	24
Castor	DCS 107	24
Castor	DCH 519	274
Castor	48-1 (Jwala)	24
Ragi	GPU 28	135
Ragi	MR 1	15
Maize	K-244+	100
Maize	HT 5402	88
Foxtail millet	Suryanandi	240
Rajma	Arka Komal	770

Table 5.2.2: Detail of crops and improved varieties evaluated during *kharif* 2016.		
Crop	Cultivar	Total Quantity (kg)
Black gram	PU 31	250
Black gram	LBG 752	50
Black gram	T 9	100
Cowpea	C 152	25
Green gram	SML 668	200
Green gram	LGG 460	100
Green gram	IPM 02-14	200
Pigeonpea	Maruthi (ICPL 8863)	30
Pigeonpea	TS3R	20
Safflower	PBNS 12	30
Pearl millet	HHB 67	30
Groundnut	ICGV 91114	200
Ragi	GPU 28	50

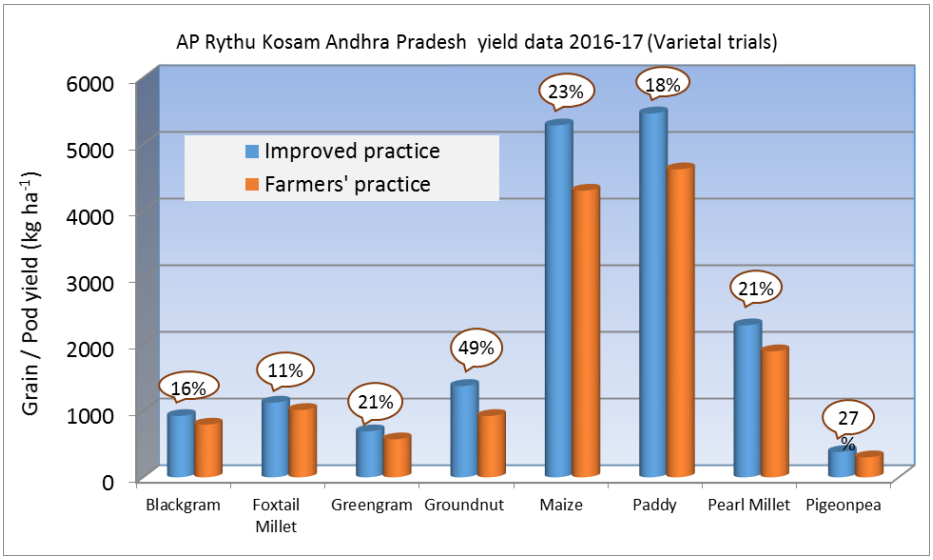


Figure 5.2.2. Yield benefit with improved crop varieties in Andhra Pradesh during 2016-17.

Seed production and seed systems

To strengthen de-centralized seed systems, a village-based seed Enterprises – a business model as an alternative seed delivery mechanism for present and future food and seed security is promoted in pilot sites.

ICRISAT has undertaken seed production in pilot sites under Rythu Kosam in AP, 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 are groundnut and pigoenpea crops (Table 5.2.3).

Table 5.2.3: Seed production in pilot sites.

Year	Variety	No of Farmers	Area of Extent (Acres)	Seed Distributed (kgs)	Production (tons)
2016 Khairf	Groundnut	158	177	10170	142
2016 *kharif*	Pigeonpea	10	15		10
2016 *Rabi*	Groundnut	25	50	3000	40
2017 *kharif*	Groundnut	150	200		

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

Broad Bed Furrow (BBF) and conservation furrow system of *in-situ* moisture conservation practice are evaluated in pilot sites. The "Tropicultors" are operated for this intervention and training on the use of implement and BBF system is also imparted to the farmers.

Evaluation of new products – Aquasap, humic acid

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 the 2015-16 *rabi* season, participatory on-farm trials were conducted on foliar application of aquasap with major crops in Andhra Pradesh; and 286 litres of solution are used in farmers' fields. 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.

Similarly, 'Lignite-Humic acid', a plant growth stimulant is also evaluated during 2016-17. It is organic water soluble humic substance which improves soil physical properties, ion exchange, water holding, and increases biological activity.

On-farm mechanization

On-farm mechanization is a scalable technology to improve productivity and incomes through efficiency in on-farm operations like sowing, inter-culture, harvesting, threshing and other. Taking note of availability and improper use of hardy biomass and left-overs in crops like pigeonpea, cotton, maize, pearl millet and sorghum, we recycling of this biomass through composting. This biomass is difficult to decompose and would take very long, therefore we piloted shredding machine in village/cluster of village level for chopping hard biomass. This has put a proof of concept of an efficient resource use while cutting cost of chemical production with harnessing of yield benefit.

Fodder promotion

Fodder scarcity is a major stumbling block for high animal productivity which is a prominent activity with farmers in pilot sites. Moreover, milk production is mainly in the domain of women and thereby contributes to mainstreaming women farmers and also improving family nutrition.

So, multi-cut sorghum variety CSH24MF and sweet sorghum (ICSV 25300 & ICSV 25301) is promoted and evaluated in pilot sites. As such 345 kg seed of CSH24MF sent to pilot sites is evaluated in the districts of Srikakulum, Anantapur, Vizianagarm, Nellore, Kadapa and W Godavari. Similarly, 100 kg ICSV 25300 & ICSV 25301 is evaluated in farmers' fields in Chittoor district.

Post-harvest

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. 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.

Therefore, Solar dryer technology in collabotation with Science for Society Technological Services, Mumbai, is promoted for processing of vegetable crops and fish. Science for Society is invited under the PPP model to demonstrate by installing solar driers in 5 pilot areas under Rythu kosam project.

Nutri kitchen gardens

For promoting family nutrition and incomes to women, small scale vegetable cultivation or kitchen gardening as women focussed activity is promoted in pilot sites. Demand-driven vegetable seeds were distributed during 2016-17. The details of seeds distributed during 2016-17 is given in Table 5.2.4. Similarly, 900 kits are promoted in Vizianagaram during *rabi* 2016-17.

Table 5.2.4: Detail of nutri-kitchen garden promoted during 2016 *kharif* season.

Crop	Cultivar	Chittoor	Srikakulam	Anantapur	Kurnool	Vizianagaram	Krishna	Guntur	Prakasam	East Godavari	Nellore	Kadapa	West Godavari	Visakhapatnam	Total (kg)
Tomato	Arka Vikas	100	100	50	200	100	400	300	200	500	200	65	100	100	2415
French bean	Arka Komal	100	100	50	200	100	200	100	200	200	50	90	100	100	1590
Bhendi	Arka Anamika	100	100	50	200	100	400	200	200	500	300	90	100	100	2440
Dolichos	Arka Jay	100	100	50	200	200	200	100	200	500	200	55	100	100	2105
Bitter gourd	Arka Harit	100	100	0	200	0	0	100	100	200	200	55	100	0	1155
Spinach (Palak)	Arka Anupama	100	100	50	200	150	400	300	200	500	200	45	100	100	2445
Amaranthus	Arka Suguna	100	100	50	200	150	400	300	200	500	200	35	100	100	2435
		700	700	300	1400	800	2000	1400	1300	2900	1350	435	700	600	14585

Capacity building

On daily basis, NGO and 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. The district and activity coordinator scientists from ICRISAT HQ visited on monthly basis or more for capacity building of line staff and ensure proper implementation of interventions and data recording. Thus, through meetings, trainings and demonstrations of technologies in the pilots, more than 40000 farmers/stakeholders (including ~11000 women) capacities are built during 2016-17.

6. Progress during 2016-17 (District & Sector wise)

6.1. Agriculture sector

6.1.1. Anantapur

Soil test-based nutrient management

ICRISAT continued recommending the balanced nutrition to all crops grown in Rythu Kosam areas based on the soil analysis that ICRISAT did in the beginning of Rythu Kosam Program in 2015. We continued to monitor yields in trials specifically taken for this purpose.

a) Crop Yields

This year too, we monitored some groundnut plots in Penukonda where famers tried improved package (with micronutrients 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 6.1.1.1. Groundnut grown with improved package yielded average 8% more pods, 5% more seed and 13% more stalk. The yield benefit recorded was far lesser than recorded in the last year. This could be because carry over effect micronutrients applied in earlier year in the whole field.

Table 6.1.1.1: Mean Groundnut yields obtained under Improved Practice (with micronutrients) VS Farmers' practice of crop cultivation, Penukonda & Raptadu mandals, Anantapur, *Kharif* 2016-17.

Mandal	Village	No. of field sampled	Improved Practice kg/ha			Farmers Practice kg/ha			% Benefit of IP over FP		
			Pod	Grain	Stalk	Pod	Grain	Stalk	Pod	Grain	Stalk
Penukonda	Bandlapalli	3	4068	2929	1020	3842	2689	944			
	Gonepeta	3	3006	2164	1331	2832	1982	1277			
	Settipalli	3	3530	2484	840	3068	2148	619			
	Mean		3535	2474	1064	3247	2273	947	9	9	12
Rapthadu	Ramnepalli	3	2148	1504	404	1980	1386	430			
_	Pesarakunta	3	2342	1318	555	2300	1610	405			
_	Pullalarevu	3	2503	1178	600	2380	1666	515			
_	Mean		2844	1854	799	2635	1844	699	8	1	14
Mean for pilot sites			3189	2164	931	2941	2059	823	8	5	13

Notes: 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 pigeonpea yields where plots had received micronutrients. The average yield recorded for intercrop pigeonpea at both the pilot sites are given Table 6.1.1.2. The pigeonpea yields were very low this year as there was terminal drought at the end of *Kharif* season severely affecting the flowering and podding in pigeonpea. Here too benefit from micronutrients applied was low (Av. 6.6%).

We in general, seeing the less benefit from micronutrients applied in soil, thought that these could best be tried as foliar applications. Some farmers who used these for foliar applications reported in general better yields. Farmers questioned the use of ZnSo4 and Boron in Groundnut for most of them who applied only gypsum also reported better yields, 10-15% higher than non-gypsum crops.

Table 6.1.1.2: Average yield of pigeonpea (6 ft R to R) in groundnut/ pigeonpea system in pilot areas, Anantapur, 2016-17.

Mandal	No. of farmers	Yield kg/ha		Benefit (%)
		Improved package	Farmer package	
Penukonda	4	253	240	5.4
Kottachervu	3	301	280	7.5
Raptadu	7	240	225	6.7
Mean	14	264.7	248	6.6

b) Micronutrients distribution and use

This time too, we advised the Department of agriculture to place micronutrients specially Sulphur, Zinc and Boron in the form of Gypsum, Zinc Sulphate and Borax in the beginning of the season. The quantity of Gypsum, Zinc Sulphate and Borax distributed in Rythu Kosam villages are given below in the Table 6.1.1.3.

Table 6.1.1.3: Micronutrients - Gypsum, Zinc sulphate and Borax distributed and used in Rythu Kosam villages, Anantapur 2016-17.

S. N	Name of the product	Distributed			Area covered in Ha.			No. of Farmers covered		
		Penukonda	Kottachrvu	Raptadu	Penukonda	Kottachrvu	Raptadu	Penukonda	Kottachrvu	Raptadu
1	Gypsum	304.5	400	41	365	380	57	540	580	60
2	Zinc Sulphate (MT)	41.64	5	4.64	106	40	45	170	80	75
3	Borax (MT)	2.75	1.5	2.74	126	96	118	200	90	130
	Total	348.89	406.5	48.38	597	516	220	910	750	265

Compared to the last year, more quantities of S, Zn and Bo were used in Rythu Kosam areas indicating that farmers have accepted the benefits of using these products. Most farmers mainly applied Gypsum for groundnut while Zinc sulphate for Paddy. Boron was reported used largely for vegetables. About 25% farmers are said to have used all these products in groundnut and paddy.

It was reported that some farmers (20%) used these products in foliar application and found good results in general than when used in basal application. In one of the discussion meeting that we conducted on micronutrients many felt that the best option, more particularly for drought prone areas like Anantapur, could be to go largely for foliar application of micronutrients when crops exhibit deficiency symptoms. Many chelated micronutrient products known for better results are now are available in the market. Still, more education and training to farmers is required on this so that they can have a better benefit/cost ratio in crop production.

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

a) Biomass Production

ICRISAT provided seeds of *Gliricidia* to partner NGOs and asked them to raise nurseries. In 2016-17, Samatha NGO distributed over 25000 plants to farmers of not only pilot sites but also farmers of other areas of Anantapur depending upon the demand.

Some earlier *Gliricidia* plantings which have now grown into trees on field bunds in some of the pilot areas will be pruned for biomass before the beginning of the *Kharif* 2017-18 and the biomass will be subjected to aerobic composting or otherwise for multching as per the interest of the farmer.

We will continue to raising *Gliricidia* nursery to meet the demands of farmers for saplings which is increasing every year.

b) Composting (Aerobic composting)

As against the vermi-composting which is, otherwise, commonly promoted and supported by the state government, ICRISAT this year too continued demonstrating aerobic composting of plant and animal wastes using microbial culture Madhyam®) not only in pilot villages but also in other villages where from the request came. As against 131 tons of plant and animal wastes composted in 2015-16, we composted 179 tons of wastes in 2016-17 (Table 6.1.1.4). Besides over 50 tons of materials is still under process of composting in different villages with compost getting ready in a month's time. Interesting some individual farmers composted as much as 10-40 tons of waste at a time.

Most farmers were the repeaters from the last year, some even practiced this 3 times from the time of adopting this method of composting. They have even successfully used this compost for growing their crops not only once but twice and thrice. All sorts of crop wastes and general plant wastes including mulberry straw, fruit and general tree wastes have been composted within 40-60 days.

Table 6.1.1.4: Plant and animal wastes composted by aerobic microbial culture in Pilot site and other

Village	Farmers (Nos.)	Waste material used Percentage	Quantity composted (tons)
Villages in Rythu Kosam pilot areas			
Bandlapalli	2	cowdung 45%, Paddy waste 55%	8
G.Kothapalli	2	cowdung 50%, Maize waste 50%	3
Gonipeta	2	Cowdung 20%,Maize waste 80%	3
Kondampalli	5	Cowdung 20-50%+Mz, Sorg, Gnut or Paddy wastes	10
Penukonda	1	Cowdung 10%+Coconut and other plant wastes	8
Pullalervu	2	cowdung 50%, Maize waste 50%	3
Settipalli	8	cowdung 50%+Maize or Paddy waste	22
Yerraballi	4	cowdung 50%, Paddy waste 50%	10
Villages not in Rythu Kosam pilot areas			
Anantapur	2	Cowdung 10%-50% Mushroom and plant wastes	5
Bojireddypalli	1	Cowdung 60%, Paddy waste40%	2
Eslapuram	3	Cowdung 20-50%+Mz, Sorg, Gnut or Paddy wastes	17
Hampapurum	1	Cowdung 50%+plant wastes (+mulberry)	10
Kadri	2	Cowdung 40%+Gnut and paddy waste 60%	4
Narasimpalli	1	Cow dung 60% and general crop/plant wastes	40
Somandepalli	2	cowdung 50%, Agri. waste 50%	25
Somuladoddi	2	Cowdung 60%, Paddy waste40%	4
Vepkunta	4	Cowdung 60%, Paddy waste40%	5
	44		179

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

The tractor shredder machine which we placed in the later part of 2015-16, was very effectively used by farmers of pilot villages and also other villages in 2016-17. Even, the shredder was sent to some villages as far as 70 km from Penukonda to help the interested farmers to shred their big size plant wastes. Our partner is also now considering to have one more machine to meet demand for such service. The request is likely to be made by NGO to the department of agriculture to consider supplying this machine on subsidy to farmers.

Figure 6.1.1.1: A tractor operated shredding machine used for shredding crop & plant wastes

Figure 6.1.1.2: A farmer applying culture mixed in cowdung slurry.

Further, our partner Samatha-NGO which created a rolling fund of Rs. 10,000/ last year for supplying microbial culture to farmers on cost is still continuing ordering packets of microbial culture directly from the supplier. A stock 50-100 packets culture is being maintained by NGO. Further, they are advising big farmers to purchase culture directly from the supplier.

Interestingly, farmers found the shredding machine that we provided useful not only for shredding big size plant waste for composting but also for shredding fodder crops like sorghum, maize etc. for animal feed. The shredded material can even be used as mulch without composting if farmers have any problem in composting.

We observed that some farmers are now seeing this as an opportunity to adopt this composting technology as an enterprise. A few of them would rather do it if they get some more on-hand training from technical people and some financial support from the government.

Figure 6.1.1.3: A Glimpse of Aerobic compost making activities in Anantapur area.

c) Benefit of Compost use

This year too, many farmers applied their home made compost to their crops. Like last year some of them compared the crop grown with compost and without compost in the same field. The average yield of some crops recorded by our staff from the treated and untreated plots are given in Table 6.1.1.5. Last year's and this year's data confirm the benefit of over 15% with the use of compost than just use of chemical fertilizers.

Table 6.1.1.5: Average crop yields recorded in compost treated and untreated plots in the same fields, Penukonda and Kottachervu mandals, Anantapur, 2016-17.

Villages	Crops	Fields studied (Nos.)	Season	Yield Q/ha		Benefit %
				Treated	Untreated	
Settipalli	Groundnut	4	*Kharif*	28.2	24	17.5
Kondampalli	Groundnut	4	*Kharif*	19.9	17.0	16.9
Yeraballi	Groundnut	4	*Rabi*	28.6	25	14.4
Settipalli	Groundnut	2	*Rabi*	25	22	13.6
Settipalli	Paddy	2	*Kharif*	20	18.5	8.1
Gonipeta	Paddy	2	*Rabi*	22	20	10.0
Yerraballi	Maize	2	*Rabi*	15	13	15.4
Kondampalli	Onion	3	*Rabi*	70	55	27.3
Mean				28.58	24.31	15.4

Climate smart crop & varietal evaluation

a) Integrated Crop management (ICM)

In 2016-17, we decided to convince farmers' on progressively reducing the use of chemical inputs and increasing the use of organic inputs so that they spend less money on crop cultivation and get at least same or more yield than they get from their normal method of crop cultivation.

In this regard, we conducted in the beginning of season a special training on Integrated Crop Management (ICM) for our field staff and five interested farmers of Penukonda mandal. One of the farmers' Mr. Balaji Naik who was advised on substituting some chemicals with organic inputs grew paddy crop on 0.50 ha with two treatments; half area with the changed practice (his ICM) and another half area with normal practice.

The differential package followed products followed by the farmer is given in (Table 6.1.1.6) below with expenses incurred on those products along with the yields obtained under two different packages.

The farmer used organic input- aerobic compost which he produced himself using microbial culture and Neem-cake and 'Panchkavya' along with some quantity of urea and SSP in ICM package as against the usual dosages of DAP, SSP, Urea also Potash under conventional package

Mr. Balaji Naik is now emphatically telling all the farmers that the ICM concept if followed, one can save lot of money and he can sustain good crop production. He and some of his friend

are going to try this year further improvement in ICM package – only compost application in soil and fertilizer chemicals only thru foliar application.

Table 6.1.1.6: Comparison of differential inputs and their costs along with yield and benefit from paddy grown under ICM as against Normal Practice, Settipalli, Penukonda Mandal, Anantapur, *Kharif* 2016-17.

ICM Practice		Conventional Practice	
Inputs used	Expenditure in 0.25 ha	Item	Expenditure in 0.25 ha
Aerobic Compost (2.4 tons) own	600	DAP (50 Kgs)	1200
Neem Cake (100 kg)	560	Zinc Sulphate(10 KGs)	200
Urea (20 Kgs)	160	Urea (25 Kgs)	200
SSP (16 Kgs)	400	SSP (50 Kgs),	1250
Panchagavya (2 liters)	300	MOP (20 Kgs)	450
Chemical Sprays (Sheethmar+Dursban)	460	Chemical Sprays (Dursban+Plantomycin+Sixer+ Plantomycin+ Antrocol)	1150
Total	2480	Total	4450
ICM Practice Yield		Normal Practice Yield	
Item	Income	Item	Income
11.50 Quintals	Rs. 27125	10.50 Quintals	Rs. 24850

We need to work on this in years to come so that we propagate this concept for all crops to help farmers to grow crop with low expenses and sustain the crop production.

b) Varietal Evaluation

This year too, we continued monitoring the performance of ICRISAT introduced three ground varieties ICGV 91114, ICGV 350 and ICGV 351 as against the most commonly grown groundnut varieties K-6 and K-9 in Anantapur. The average yield recorded by farmers for these varieties grown by over 30 farmers is shown in Figure below. Although the yield recorded this year was lesser than recorded in the last year for all varieties, there appeared that ICGV 91114 compares well with K-6, rather performs somewhat better. ICCV characters are almost the same as that of K-6 both in terms of seed size and colour, pod filling etc. The varieties ICGV 350 and ICGV 351 though grew well did not attract much attention of farmers except for their somewhat bold seeds. We will continue making the seed of ICGV 9114 available and try to convince AP State Seed Corporation to also multiply it for seed purpose as an alternative to K-6.

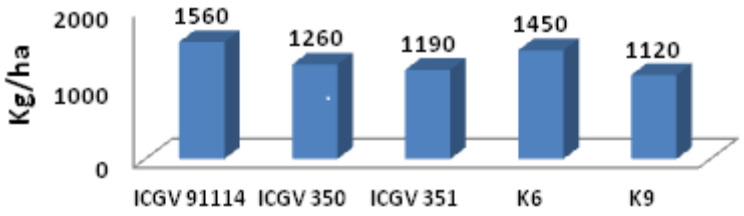


Figure 6.1.1.4: Average groundnut yield recorded for different varieties across different fields in pilot site, Kharif 2016-17, Anantapur.

Seed production and seed systems

As in the last year, we distributed the seeds of 3 identified ICRISAT groundnut varieties and identified this year some good farmers for seed production and procurement. We monitored the crop and linked the seed production and seed certification to the AP State Seed Corporation. The *kharif* produce was supplied to West Godavari district for further seed production in the *Rabi* thru the Seed System that ICRISAT is now trying to establish in AP. The seed distributed and procured in *Kharif* 2016-17 is given in Table 6.1.1.7.

Table 6.1.1.7: ICRISAT groundnut varieties seed distributed and Seed certified/procured from farmers of monitored fields, Rythu Kosam area, Anantapur 2016-17

Mandals	Distribution in kgs				Procurement in kgs			
	Farmers benefitted (No.)	Groundnut Varieties			Farmers benefitted (No.)	Groundnut Varieties		
		ICGV 350	ICGV 351	ICGV 9114		ICGV 350	ICGV 351	ICGV 9114
Penukonda/Kottachervu	10	420	480	510	5	500	3270	2234
Rapthadu	22	510	570	1050	5	1563	-	1705
Total	32	930	1050	1560	10	2063	3270	3939

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

a) Brodbed and Furrow/Ridges & furrows

We tried BBF method for growing groundnut in 2015-16 employing both a Bullock drawn Tropicultor and a Tractor drawn BBF maker, but could not convince farmers for its benefit. We found farmers here happy with their simple ridge and furrow system which gets formed with the use of Anantha Seed drill which is most popular in Anantapur (ANAGRU University Produced).

In 2016-17, we planted groundnut on BBF in 20 ha in Hamapuram village which is outside our pilot to see whether some big farmer would become interested in this. He harvested groundnut 1560 kg/ha from BBF as against 1540 kg/ha in the normal flat system. He also did not also get convince about the BBF system. Probably in dryland of Anantapur where drought is most common we cannot easily promote this system. However, by all logics the BBF is good and proves well in normal and good rainfall areas and particularly in black soils where drainage is problem.

Further, there is common practice in Anantapur to open a dead furrow after every 8-10 rows of groundnut in flat land. This system appears to be taking of water conservation as an when there is good rain.

b) Farm Ponds

Raptadu mandal villages are more drought prone than villages of Penukonda and Kottachervu. Our Partner NGO- AFEC here constructed 3 ponds (1 in Raminepalli, 2 in Gangalakunta, 1 in Pesarakunta villages) in 2016-17 so that rain water get collected in farm ponds and become available for supplementary irrigation. Here we have always advised the farmers to irrigate crops when necessary either thru drip or pipes.

This effort has helped the farmers to tackle the drought situation in their fields. Their groundnut and pigeonpea plots in general yielded them 20-50% more yields than their un-irrigated plots.

Figure 6.1.1.5: A Farm pond under construction

Figure 6.1.1.6: Supportive irrigation given to pigenpea

c) Rain guns

The government made a special effort this year to provide the services of rain gun machines portable with water tankers to give life-saving irrigation to groundnut crop in Anantapur district following the drought that occurred at the end of the season. This system became operational where water was available within 100-200 meters.

A total of 19 Rythu Kosam farmers of pilot areas of Penukonda mandal (Kondampalli 5; Settipalli 7; and Gonipeta 7) and 17 farmers of Kattachervu mandal (Bandalapalli 7 and Yerraballi 10) took the benefit of this service for protecting their groundnut crops.

In Raptadu 24 farmers of pilot area (Raminepalli 4; Pullalarevu 3; Gangalakunta 3; Ayyavaripalli 3; G.Kothapalli 3; Gandlaparthy 4; Palabavi 1; Gollapalli 2; Pesarakunta 1) took the benefit of rain-guns. It is likely that this service from the government will continue in future.

Figure 6.1.1.7: A typical use of rain guns in groundnut.

Evaluation of new products

This year we provided farmers with some more genuine plant growth regulator products so that they themselves judge the benefits of such products than believing the input dealers who usually sell them some unknown products. Three products are in trials in *Rabi* -Summer crops which are yet to be harvested (Table 6.1.1.8).

Table 6.1.1.8: Plant Growth Promoters given for trials in Rythu Kosam area, Penukonda and Kottachervu, Anantapur, 2016-17.					
S.No	Name of the Farmer	Village	Crop	Quantity in lts.	Crop condition (yet to be harvested)
1. Sea weed extract concentrate (SAGARIKA)					
1	Kesava	Baldlapalli	Floriculture	1	Crop growing well
2	Bhaskar Reddy	Kondampalli	Groundnut	1	Crop growing well
3	Ramakrishan Reddy	Kondampalli	Groundnut	1	Crop growing well
4	K.Sreedhar Naidu	Setipalli	Groundnut	1	Crop growing well
5	P. Balaji Naik	Settipalli	Tomato	1	Crop growing well
2. Humic acid					
1	Keasava	Bandlapalli	Floriculture	1	Crop growing well
2	H.Balakrishna Naik	Settipalli	Guava	1	Crop growing well
3	P.Santhi Bai	Settipalli	Mango	1	Crop growing well
4	Nagaraju	Sanipalli	Tomato	1	Crop growing well
3. Protein hydrolytes					
1	Ramakrishana Reddy	Kondampalli	Floriculture	1	Crop growing well
2	Chinna Venkramudu	Settipalli	Musk melon	2	Crop growing well
3	Mohan Naidu	Settipalli	Tomato	1	Crop growing well

We wanted to distribute materials to more farmers for trials in their different crops. However since the products consignments were delayed and there was very low cultivation in *rabi* - summer we could make only some farmers to take the trials. The crops are yet to harvest.

Integrated pest management IPM

The pest and diseases are always problems in crops. However, in drier area like Anantapur their incidences in general are low. The problems recorded in Rythu Kosam areas are listed in Table 6.1.1.9 below along with the recommendation that we made to farmers to follow. Most farmers who followed us reported good results with less expenses on pest and disease control than those who followed the pesticide dealers which farmers normally do.

Table 6.1.1.9: IPM recommendations made to Rythu Kosam village farmers, Anantapur, 2016-17		
Name of the crops	Name of the disease	Recommendations made
For all crops	Pests/Diseases	Neem oil as 1st spray any crop with any incidence
Chillies	White flies	Yellow sticky traps to control white flies - 5 to 8 traps per row
Chillies	Thrips	Fipronil @ 625 ml/ha
Chillies	Mites	Dicofol @ 1.25 ltr./ha
Pigeonpea	*Helicoverpa*	Grow crop always intercropped with groundnut.
		Coragen @ 1.5 ltr/ha for control of insect pests
Ground nut	Wilt	Thiophenate methyl (Roko) @ 2g/Litre
Paddy	BPH	Making walking strip in the field; follw proper row to row spacing

We even distributed 60 litres of Neem oil benefitting 60 farmers of Penukonda and Kottachervu mandals. The idea behind this was to help farmers realise the benefit of natural products like neem in pest control. Further, we gave 13 manually carried power sprayers to farmers under the watershed program which is running parallel in the same area.

Post-harvest

We have been educating farmers formally and informally on storage of grains and seeds at their places. We educated them on stored grain pests control and told them they can go even for a fumigant like Aluminium phosphide which is now available in the market in small ampoules that provide required safety in use. Besides, this year we promoted a especially designed 3-layer polythene bags for the storage of groundnut pods for the purpose of seed.

a) 3-Layered Polythene Bags for storage

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, we with our partner NGO-AFEC demonstrated 3-layered polythene bags for good storage of groundnut seed pods. In the demonstrations done in earlier years, farmers could see the benefit of this as they observed no insect attack and microbial infections over a period until the next season.

This year a total of 345 bags were distributed to farmers in Raptadu mandal (Raminepalli 25; Pullalarevu 36; Gangalakunta 28; Ayyavaripalli 42; Kothapalli 64; Gandlaparthy 78; Palabavi 28; Gollapalli 32; Pesarakunta 12).

Figure 6.1.1.8: Front view of bag, Back view of bag, packed bags ready for storage.

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. We have also begun to educate farmers of other areas too on this.

On-farm mechanization

a) Cycle weeder cum row seeder :

Cycle weeder was introduced by our NGO partner AFEC in Rapatdu area especially for the benefit of small farmers to reduce the cost and drudgery, particularly for women involved in weeding operations. Fifteen farmers of Raptudu area (Raminepalli 4, Gangalakunta 2, Ayyavaripalli 2, Kothapalli 3, Gandlaparthy 3 and Gollapalli 1) purchased this machine at the cost of just Rs. 1250. Farmers with irrigation facility in small landholdings found it very handy in weeding operations. Now, this machine with some modification is also used for sowing.

Figure 6.1.1.9: Cycle weeder cum row seeder used by woman, Cycle weeder cum row seeder used by man.

Farmer Producer Organisations

The Farmer Producers Organizations (FPO) are being formed in both the pilot sites. Several formal and informal meetings were organized between NABARD officials and farmers to create interest amongst farmers. Following the efforts made during 2015-16, we 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 the 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-AFEC as a first step created and registered a village-wise farmers' Cooperatives eventually to carry out some business activity in production and marketing of agriculture produce. They have now federated all 9-village co-operatives into a big Multipurpose Agriculture Co-operative Society (MACS) and elected its board of Directors from amongst all its 338 members (Raminepalli 40; Pullalarevu 20; Gangalakunta 40; Ayyavaripalli 40; Kothapalli 60: Gandlaparthy 64; Palabavi 24; Gollapalli 38; Pesarakunta 12). This year they started their activities first by purchasing 350 quintals of pigeonpea at the rate of Rs. 5050 from the member farmers and have a plan to process it to make dhal.

All these FPO initiators are now looking forward to NABARD and the Government of Andhra Pradesh to give further guidance and the financial support as they did promise in the state level meeting held in 2016.

Publicity

a) Press

Though media attention has come down than in the last year, our activities attracted attention of more not from only Rythu Kosam area but farmers of the other areas. Some local press coverage happened during 2016-17 are given below.

b) Leaflets and posters

Figure 6.1.1.10: The Digital Green our partner agency for the promotion of technology produced one video on composting.

Samatha NGO printed and distributed over 500 leaflets on aerobic composting and produced few display banners for the meetings. Some banners are displayed at 1-2 places where farmers do go for getting some knowledge and agri-inputs.

Figure 6.1.1.11: Aerobic compost making banner displayed at a horticulture nursery farm, Narasimpalli Village, Tadimarri mandal. where farmers do often visit for the purchase of seedlings.

Two-three case studies have also been written on very good success of farmers from Rythu Kodam area of Anantapur.

Capacity building

We conducted training and educational programs on topics of interest to farmers. The number of these conducted are given below in table. Further, lots of informal discussions were done in fields and villages during our visits.

Table 6.1.1.10: Training and educational programs conducted in Rythu Kosam areas, Anantapur 2016-17

Topics/Subject of training/education	Penukonda		Kottacheru		Raptadu	
	No. of Programs	Farmers attendance	No. of Programs	Farmers attendance	No. of Programs	Farmers attendance
Aerobic composting	3	98	2	86	1	25
Soil Health	2	52	1	45	2	40
Integrated Crop Management	2	50	48	36	2	65
FPO formations	3	210	150	85	3	180
General Meetings on crop condition	2	58	3	90	16	240
Field days	1	30	2	55	2	60
Total	13	498	206	397	26	610

6.1.1.12: Maize Farmers field day at Bandlapalli village; a meeting on FPO for Raptadu area at AFEC centre.

Field trials in partnership

Under Rythu Kosam program, efforts are being constantly made to seek partnerships with other institutions and organizations. In this regard we had trials from CIMMYT and Coromandel International.

a) CIMMYT maize trials

CIMMYT came forward in 2016-17 to test their elite maize materials in farmers' fields in Rythu Kosam area. They planted 33 maize entries in Penukonda and Kottachervu in 3 replicated stripes in 12 farmers' fields in the *Kharif* and a selected 16 out of these in 8 farmers' fields in the *Rabi*. They have now selected 8 best entries from the *Rabi* trials. They would be planting these 8 entries in *Kharif* 2017-18 and then selected 4 out of these in *Rabi* 2017-18.

The selection here is done inviting farmers to choose the best materials at the maturity of crop. The aim of CIMMYT is to finally identify 4 best entries, multiply their seeds and put them then for demonstrations in farmers' fields which could be during *Kharif* and *Rabi* 2018-19. The data of these on-farm trials are being compiled by a field staff of CIMMYT which care of these trials seeking our help.

Figure 6.1.1.13: A Glimpse of CIMMYT trials in Penukonda/Kottachervu mandals during 2016-17

b) Coromandel trials

In 2015-16 annual report, we reported the data on fertilizer trials in maize and paddy conducted by Coromandel International in *Rabi* 2015-16 indicating that the source of nutrients is more important in the make-up of the product that we use for fertilizing the crop. We reported Urea Ammonium Phosphate Sulphate (UAPS) better than Ammonium Phosphate Sulphate (APS) with the same content of nutrients 20:10:0:13.

This year in 2016-17, Coromandel has planted 4 trials in *Rabi* -summer on testing their ideal crop package and products in groundnut and tomato (Table 6.1.1.11)

Table 6.1.1.11: Coromandel field trials in Rythu Kosam area, Penukonda/Kottachervu, Anantapur *Rabi* - Summer 2016-17					
Crop	No. of trials	Treatment			Plot size
		T1	T2	T3	
Tomato	5	Calcium nitrate+ Boron	Speedfol	Control	500 sq.m
Groundnut	2	Coromandel package	Farmer's practice	-	500 sq.m
Groundnut	3	14:35:14 Zn B	Normal 14:35:14	-	500 sq.m
Groundnut	3	Granular gypsum	Without gypsum	Common gypsum	500 sq.m

However, the crops yet to be harvested and yields recorded. The crops are reported good showing some visible differences. The granulated gypsum has attracted the attention of farmers. However, we have to see how it performs as against commonly used gypsum powder visa-a-vis its likely cost.

6.1.2. Chittoor

Soil test-based nutrient management

In Chittoor district pilot mandals, 150 on-farm participatory trials were conducted and data were collected from 75 field trials for analysis and studying the impact of various interventions in the target villages. There results once more demonstrated the positive effect of the application of deficient S, B and Zn plus N and P as compared to farmer's practice (FP) of nutrients (only N and P). For example, the soil test-based balanced nutrient (BN) management increased groundnut grain and straw yield across the target villages as compared to farmers practice. The increase in grain yield in pilot villages from 29 % (Fig 6.1.2.1).

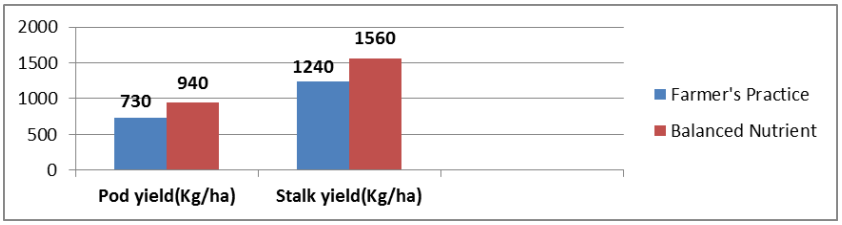


Figure 6.1.2.1: Effects of balanced nutrient (BN) and farmer's practice treatment applications on groundnut yield under rain fed conditions in Chittoor districts of pilot villages in 2016 rainy season.

Micro nutrient distribution along with DoA: The soil test-based recommendations including for secondary and micronutrients are provided to Agriculture department and are being promoted with farmers and below quantity distributed in pilot villages (Table 6.1.2.1).

Table 6.1.2.1: Micronutrients distribution & application in pilot villages.					
Mandal	No. of villages	Nutrients	Quantity(Mt)	No. of farmers	Extent(ac)
V.Kota	18	Zink	5	469	500
Santhipuram		Gypsum	468	575	468
		Borax	0.635	360	317
			Total	1404	1285

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

a) Compost: Mdhyam microbial culture was supplied to 45 farmers which were used for compost production. For this, they used the crop residues of banana, mulberry, vegetables, other crops and animal wastes to produce good quality compost that can be used later in crop production to increase the soil fertility (Table 6.1.2.2).

Table 6.1.2.2: Compost production status in pilot villages.

No. of mandals	No. of villages	No. of Madhyam packets distributed	No. of farmers benefited	No. of tons produced	Compost used in following crops cultivation
2	12	45	28	32	Tomato, Potato, Beans,

Figure 6.1.2.2: Compost preparation and Chipper shredder demonstration at Bellakogilla village.

b) Chipper shredder: Used to chop the mulberry and banana stems and agricultural wastes into small pieces which in turns fasten the decomposing while composting.

Climate smart crop & varietal evaluation

Breeder seeds of different improved varieties of groundnut varieties like ICGV91114, ICGV00350 and ICGV00351with varying crop duration between 95-120 days were distributed to the 128 progressive farmers. The crop cutting experiments were conducted and they yields were compared with local cultivars, Figure 6.1.2.3.

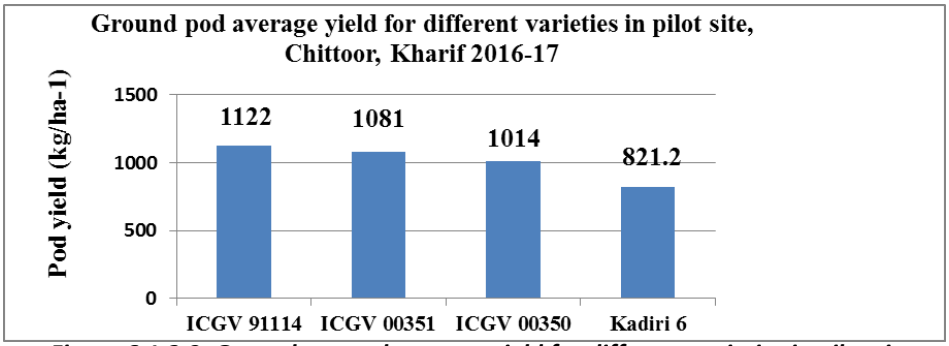


Figure 6.1.2.3: Ground nut pod average yield for different varieties in pilot site.

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) and ICRISAT, seed production of groundnut (Kadiri-6, ICGV-91114, ICGV-00350 and ICGV-00351) is being done during *Kharif* 2016 (Table 6.2.1.3).

Table 6.1.2.3: Groundnut seed production details in pilot and other than pilot villages.

Season	Variety	Mandals	No. of farmers	Extent(ac)	Quantity (qtls)
Kharif-2016	ICGV 91114	V.Kota	16	17.5	10.5
	ICGV00350	Santhipuram	20	25	15.3
	ICGV00351	Santhipuram	36	26	10.8
	Kadiri 6	V.Kota, Santhipuram	56	51.5	30
		Total	128	120	66.6

Evaluation of new products – Protein Hydrolysate:

During 2016-17, participatory on-farm trials were conducted on foliar application of protein hydrolysate on potato and sweet corn crops in pilot villages. In Chittoor district, 16 trials in each of the pilot sites across 9 villages were conducted during *Rabi* 2016-17season. Details were provided in the following table (Table 6.1.2.4).

Table 6.1.2.4: Protein Hydrolysate on farm trial details in pilot villages.

No.of mandals	No. of villages	No. of Litre distributed	No. of farmers benefited	No.of trails	Extent (ac)	
					Potato	Sweet corn
2	6	8	16	16	8	8

On-farm mechanization

a) Easy planter: This is a manually operated instrument, which is used for planting the seedlings on a mulched field or normal field. As this instrument can be easily operated, which reduces the labour cost and also saves a lot of time to the farmers (Table 6.1.2.5).

Table 6.1.2.5: Easy planter plantation statuses in Sathipuram and V.Kota pilot villages.

No. of mandals	No. of villages	Area covered(ac)		Total area(ac)	No. of farmers benefited	Mulching method(ac/Rs)	Easy planter method(ac/Rs)
		Tomato	Chrysanthemum				
2	12	38	15	53	50	2160	540

Figure 6.1.2.4: Easy planter tomato seedlings demonstration in pilot mandals.

b) Plastic mulch laying machine*:* Demonstration of tractor operated mulch laying machine used for summer vegetable cultivation. This is multifunctional plastic-mulch, and drip-pipe, with bed shape layer, multi hole and reduce the labour cost for mulching.

Table 6.1.2.6: Tractor operated plastic mulch laying machine demonstration in pilot villages.

Mandals	No. of villages	Total area(ac)	No. of farmers benefited	Manual method(ac/Rs)	Tractor method ac/Rs
V.Kota, Santhipuram	3	7	5	5400	1600


Figure 6.1.2.5: Mulch laying machine demonstration in V.Kota Mandal pilot villages.

Publicity

During the *Kharif* and *rabi season* 2016-17, Rythu Kosam project on farm activities and implementation in the pilot sites of Chittoor district have been well covered by the media. The performance of the project has been highlighted through different media channels like regional newspapers. Most popular newspapers like Sakshi, Eenadu, and AndhraJyothi covered different news clippings from Chittoor district pilot sites. The summaries of topics covered by the newspapers on Rythu Kosam project are as listed.

రైతుకోసం సద్వినియోగం చేసుకోండి

ఎంపీపీ సులోచనారంగనాథ్

విత్తనాలను అందజేస్తున్న ఎంపీపీ, ఇక్రిసాట్ ప్రతినిధులు

వి.కోట: ఇక్రిసాట్ ఆధ్వర్యంలో నిర్వహిస్తున్న రైతుకోసం ప్రాజెక్టును రైతులు సద్వినియోగం చేసుకోవాలని ఎంపీపీ సులోచనా రంగనాథ్ కోరారు. బుధవారం వి.కోటలో ఇక్రిసాట్, ఐఆర్‌డీఎస్ ఆధ్వర్యంలో పైలెట్ ప్రాజెక్టుగా ఎంపిక చేసిన గ్రామాల రైతులకు వేరుశనగ బ్రీడర్ విత్తనాలను పంపిణీ చేశారు. ఈ సందర్భంగా సాంకేతిక అధికారి రామాంజనేయులు మాట్లాడుతూ ఇక్రిసాట్ ఆవిష్కరించిన వేరుశనగ విత్తనాలను మండలంలో ప్రయోగాత్మకంగా పరీక్షించామన్నారు. తమ ప్రయోగాలు విజయవంతం కావడంతో ఈ దఫా ఎక్కువ ఎకరాల్లో వేరుశనగను సాగుచేసేందుకు సమాయత్తం అవుతున్నామన్నారు. ఇందులో భాగంగా ఐసీజీవీ91114, 00350, 00351 రకాలను పంపిణీ చేస్తామన్నారు. వీటితో పాటు కదిరి-6, కదిరి-9 రకాలను సైతం రైతులకు అందిస్తామని చెప్పారు. వేరుశనగతో పాటు ఇతర పప్పుధాన్యాలను సైతం అందుబాటులో ఉంచామన్నారు. రైతులకు అవసరమైన సమాయాల్లో అందుబాటులో ఉండి, వేరుశనగ సాగుపై క్షేత్రస్థాయి సూచనలు చేస్తామన్నారు. కార్యక్రమంలో అగ్రికల్చర్ ఏడీఈ విశ్వనాథరెడ్డి, ఏవో అప్పోజీ, ఐఆర్‌డీఎస్ పీవో మోహన్ కృష్ణ, ఎంపీడీవో రమేష్ తదితరులు పాల్గొన్నారు.

సాక్షి Thu, 26 May 2016
epaper.sakshi.com/c/10556726

నూతన వంగడాలపై దృష్టి సారించాలి

వి.కోట, న్యూస్‌టుడే: వ్యవసాయంలో ఆధునాతన పద్ధతులను అనుసరించడంతో పాటు సంప్రదాయ వంగడాలకు ప్రత్యామ్నాయంగా వస్తున్న నూతన వంగడాలపై రైతులు దృష్టి సారించాలని ఎంపీపీ సులోచన పేర్కొన్నారు మండల కేంద్రంలో బుధవారం ఇక్రిసాట్ ఆధ్వర్యంలో రైతులకు తల్లిరకం కే9 వేరుసెనగ విత్తనాలను పంపిణీ చేశారు ఈ సందర్భంగా ఆమె మాట్లాడుతూ ఈ విత్తనాలను ఎంపిక చేసిన రైతులకు అందజేయనున్నట్లు తెలిపారు మండలంలో 70మంది రైతులకు 140 బస్తాలను సాధారణ విత్తనాల ధరలకే అందజేస్తామన్నారు తిరిగి ఈ వేరుసెన కాయలను రైతుల వద్ద కొనుగోళ్లుచేసిన ధరకే కొనుగోళ్లు చేసే ఒప్పందంతో విక్రయించడం జరుగుతుందన్నారు వీటిని సాగు చేయడం ద్వారా రైతులకు వర్షాభావ పరిస్థితుల్లో సైతం అధిక దిగుబడులు సాధించవచ్చన్నారు ఈ సందర్భంగా రైతులకు వేరుసెనగ బస్తాలను అందజేశారు ఈ కార్యక్రమంలో వ్యవసాయశాఖ ఏడీఏ విశ్వనాథ్‌రెడ్డి వ్యవసాయశాఖ అధికారి అప్పోజీ ఎంపీడీవో రమేష్ ఏఈవో జైరంగ్ ఇక్రిసాట్ సిబ్బంది రామాంజనేయులు తదితరులు పాల్గొన్నారు

రైతులకు కే9 వేరుసెనగ తల్లి విత్తనాలు పంపిణీ చేస్తున్న ఇక్రిసాట్ అధికారులు

Figure 6.1.2.6: Kharif-2016 groundnut breeder seed distribution in pilot Mandals.

వ్యవసాయ వ్యర్థాలతో జీవన ఎరువు

- రైతులకు అందుబాటులో చిప్పర్ కట్టర్
- ఇక్రిశాట్ ఆధ్వర్యంలో చెంగుబళ్లలో డెమో

చిప్పర్ కట్టర్ పనితీరును పరిశీలిస్తున్న రైతులు

చిప్పర్ కట్టర్ పరికరం

Figure 6.1.2.7: Chipper shedder demonstration and compost preparation in Santhipuram pilot Villages.

మల్చింగ్ ఇక సులువు

ఇక్రిశాట్ నూతన ఆవిష్కరణ

వి.కోట: మల్చింగ్ వేసేందుకు సులువైన యంత్రాన్ని రైతులకు అందుబాటులో ఉంచినట్లు ఇక్రిసాట్ ఇన్‌చార్జ్ నరసింహరావ్ తెలిపారు. మండలంలోని గుమ్మిరెడ్డిపల్లె వద్ద బుధవారం మల్చింగ్ వేసే యంత్రంపై రైతులకు అవగాహన కల్పించారు. ఎకరా పొలం మల్చింగ్ వేసేందుకు దాదాపు రెండు రోజులు పడుతుందని, ట్రాక్టర్ సహాయంతో పనిచేసే యంత్రంతో రెండు గంటల్లో మల్చింగ్‌తో పాటు, డ్రిప్ లేటరల్ వేసి చూపారు. కార్యక్రమంలో సాంకేతిక అధికారి బాలసాయికృష్ణ, రైతులు పాల్గొన్నారు.

మల్చింగ్ వేసే యంత్రాన్ని పరిశీలిస్తున్న రైతులు, ఇక్రిసాట్ అధికారులు

సాక్షి Thu, 02 February 2017 epaper.sakshi.com//c/16539291

Figure 6.1.2.8: Tractor operated plastic mulch laying machine demo at Gummireddypalle Village, V.Kota.

Capacity building

As a part of mission we conducted village level awareness program in 18 villages in 2 pilot site mandals (V.Kota and Santhipuram). 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, red gram hybrid and sweet sorghum, procedure for compost preparation, advantages of integrated pest management and explained about the schemes in agriculture and allied departments(Table 6.1.2.7).

Table 6.1.2.7: Trainings conducted in two Mandals under Rythukosam program in the pilot site.

			Training Programme				Participants		
Mandal	No. of villages	Micronutrients	Seed production	Chipper shedder	Compost making	Biomass generation	Men	Women	Total
Santhipuram	11	10	6	8	11	8	645	88	733
V.Kota	7	6	6	5	7	5	722	127	849
Total	18	16	12	13	18	13	1367	215	1582

6.1.3. East Godavari

Soil test-based nutrient management

Along with Department of agricultural, ICRISAT and NGO staff have also been conducted several meetings on benefits of micro nutrients usage in the fields prior to crop sowing during *Kharif* 2016-17 in all the pilot villages. Display banners containing details of village level nutrient deficiencies were displayed in all the pilot villages at the main farmer's meetings place for farmer's convenience as shown in the figure 6.1.3.1.

Figure 6.1.3.1: Sample of Wall posters displayed in all pilot villages.

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

Due to water scarcity, farmers face problems in continuously maintaining moist environment for earthworms used in vermicomposting. Therefore, we are evaluating microbial consortia culture (Madhyam culture, which is tested on-station at ICRISAT) for recycling on-farm agricultural, household wastes. The composting activity using microbial consortia is piloted with 17 farmers in the Kusumarai village of Gangavaram mandal as given in Table 6.1.3.1. The compost is ready for utilising in *Kharif* 2017 and its benefits will be evaluated in next season.

Table 6.1.3.1: Details of farmers conducting aerobic Composting in Kusumarai village of Gangavaram Mandal in East Godavari District 2016-17.

SL No	Farmer Name	Waste material used Percentage	Results	Quantity (tons)
1	Tamu Suryanarayana	Buffalo dung 30%, Paddy waste and Local plants residues 70%	completed	1
2	Chavalam Ramanna dora	Buffalo dung 40%, Paddy waste and Local plants residues 60%	completed	1
3	Chavalam Bapiraju	Buffalo dung 30%, Paddy waste and Local plants residues 70%	completed	1
4	Chavalam Rajulamma	Buffalo dung 20%, Paddy waste and Local plants residues 80%	completed	1
5	Payam Tamannadora	Buffalo dung 40%, Paddy waste and Local plants residues 60%	completed	1

6	Karam Laxmi	Buffalo dung 30%, Paddy waste and Local plants residues 70%	completed	1
7	Payam Bapanamma	Buffalo dung 20%, Paddy waste and Local plants residues 80%	completed	1
8	Karam Baparaju dora	Buffalo dung 20%, Paddy waste and Local plants residues 80%	completed	1
9	Katumalla Ratnam	Buffalo dung 30%, Paddy waste and Local plants residues 70%	completed	1
10	Kalumula Pandudora	Buffalo dung 40%, Paddy waste and Local plants residues 60%	completed	1
11	Sarapu Tammanna dora	Buffalo dung 20%, Paddy waste and Local plants residues 80%	completed	1
12	Sarapu Laxmi	Buffalo dung 40%, Paddy waste and Local plants residues 60%	completed	1
13	Payam Neetya	Buffalo dung 20%, Paddy waste and Local plants residues 80%	completed	1
14	Tamu Chellann dora	Buffalo dung 50%, Paddy waste and Local plants residues 50%	completed	1
15	Chavalam Gangaraju	Buffalo dung 30%, Paddy waste and Local plants residues 70%	completed	1
16	Chavalam Chittamma	Buffalo dung 20%, Paddy waste and Local plants residues 80%	completed	1
17	Tamu Ganga	Buffalo dung 20%, Paddy waste and Local plants residues 80%	completed	1
			Total	17

Climate smart crop & varietal evaluation

a) Groundnut and Pigeonpea Varietal Evaluation during *Kharif* 2016

Foundation seeds of different improved verities of Pigoenpea and groundnut seeds have been distributed to the progressive farmers in Y Ramavaram and Gangavaram mandals to evaluate the performance and adoptability of varieties in the pilot villages. Pigoenpea Asha (2.5 acres ICPL87119-Asha) variety, which grows well in rainfed conditions in 140 -160 days has been tested during *Kharif* 2016 in the pilot villages as given in the Table 6.1.3.2. Similarly, two Ground nut ICRISAT varieties ICGV91114 and ICGV02266 with varying crop duration between 95-120 days were distributed to the 7 progressive farmers in 14.5 acres of land in different pilot villages. Crop cutting experiments have been conducted to evaluate yields compared with local cultivars and performance in poor rainfall scenarios as shown in Figure 19.

Figure 6.1.3.2. Evaluating Groundnut crop improved varieties ICGV 91114 and ICGV 02266 during Kharif 2016 in Gangavaram and Y Ramavaram Mandals.

Table 6.1.3.2: Evaluation of improved and New varieties of different crop during *Kharif* 2016						
S. No	Farmer Name	Village	Mandal	Crop	Variety	Area (Ac)
1	Pallala Vishwa Reddy	Yarlagadda	Y Ramavaram	Ground nut	ICGV-2266	1.00
2	PallalaVenkat Reddy	Yarlagadda	Y Ramavaram	Ground nut	ICGV-91114	2.00
3	Andala Veerapu Reddy	Yarlagadda	Y Ramavaram	Ground nut	ICGV-91114	1.00
4	Pallala Somalamma	Yarlagadda	Y Ramavaram	Ground nut	ICGV-91114	0.50
5	Velugula Veerayya	Yarlagadda	Y Ramavaram	Ground nut	ICGV-91114	1.00
6	Ondopu Sriramulu Reddy	Goragommi	Gangavaram	Ground nut	ICGV-91114	5.00
7	Sarapu Paparao dora	Barrimamidi	Gangavaram	Ground nut	ICGV-2266	4.00
8	Pasupuleti Kotaswamy	Melleru	Gangavaram	Pigeonpea	Asha	1.00
9	Thailam Laxmi	Ummetta	Gangavaram	Pigeonpea	Asha	0.50
10	Samel	Kusumarai	Gangavaram	Pigeonpea	Asha	1.00

b) Evaluation of Climate Smart Crop Varieties: Foxtail, Finger millets and Rajma *Kharif* 2016. Crops such as Pigeonpea, Foxtail millet, Finger millet and Rajma were used to be best suitable crops for Kondapotu “Hill slope lands” cultivation in the agency areas of Andhra Pradesh. Since couple of decades the area under these crops has vanished due to some unknown reasons. We have re-introduced Foxtail millet, Finger millet and Rajma (Kindey beans) this *Kharif* 2016 in Gangavaram mandal of East Godavari district. The Finger millet, Foxtail millet and Rajma crops were grown in 5.5 acres, 2.0 acres and 1.0 acre of land during *Kharif* 2016 as shown in Table 6.1.3.3. The crops found to be suitable for the agency area as grown earlier and crop cutting experiments were conducted to evaluate yield levels and to record the crops performance

Figure 6.1.3.3: a. Fox millet and b. Finger millet crops in Pilot sites of East Godavari district.

Table 6.1.3.3: Evaluation of improved and new varieties of different crop during *Kharif* 2016.						
S No	Farmer Name	Village Name	Mandal	Crop	Variety	Area (Acres)
1	Parada Venkateshwerlu	Amudalabanda	Gangavaram	Foxtail millet	Suranandi	0.50
2	Kalumula Akkamma	Gangavaram	Gangavaram	Finger millet	GPU-28	0.50
3	Kalumula Akkamma	Gangavaram	Gangavaram	Foxtail millet	Suranandi	0.50
4	Sarapu Paparao dora	Barrimamidi	Gangavaram	Rajma		0.50
5	Lotha Srinivas Reddy	Goragommi	Gangavaram	Finger millet	GPU-28	1.00
6	Yatla Chinnabbai Reddy	Lakkonda	Gangavaram	Rajma		0.50
7	Chinna MangiReddy	Lakkonda	Gangavaram	Foxtail millet	Suranandi	0.50
8	Ondopu Sriramulu Reddy	Goragommi	Gangavaram	Foxtail millet	Suranandi	0.50
9	Katram Abbulu Dora	Gangavaram	Gangavaram	Finger millet	GPU-28	4.00

In case of paddy crop, yield benefit with improved varieties varied between 15-19% over the farmers varieties.

Table 6.1.3.4: Effect of improved varieties in E Godavari district during 2016-17

District	Mandal	Crop	Yield kg ha^{-1}		Yield kg ha^{-1}		% Increase over FP	
			Grain	Straw	Grain	Straw	Grain	Straw
			FP	FP	IP	IP		
East Godavari	Gangavaram	Paddy	4610	4610	5480	5690	19	23
East Godavari	Yeleswaram	Paddy	4700	3050	5400	3150	15	3

c) Seed production and seed systems *Rabi* 2016-17

ICRISAT and DoA have taken the seed production program which has been started last year (*Rabi* 2015) in Yarlagadda village of Y Ramavaram mandal to further step by encouraging more farmers under this program during *rabi* 2016-17. Their encouragement made more number of farmers to participate into this program and to get more benefits. For this, ICRISAT has provided ICRISAT foundation groundnut varieties such ICGV 91114 and ICGV 351 to 30 farmers to cultivate in around 60 acres of land as shown in Table 6.1.3.5. Presently the *rabi* 2016-17 Groundnut Foundation Seed production program crops are in maturity stage, and farmers are given required suggestions on crop management by the both ICRISAT and DoA.

Table 6.1.3.5: Details of farmers under seed production program during *Rabi* 2016-17 in EG district.

S. no	Farmer Name	Father Name	Village	District	Variety	Area(Ac)
1	Pallala Venkat Reddy	Lachi Reddy	Yarlagadda	East Godavari	ICGV 91114	2.00
2	Andala veerapu Reddy	Somayya	Yarlagadda	East Godavari	ICGV 91114	2.00
3	Rolupalli Harinadh Reddy	Shekar	Yarlagadda	East Godavari	ICGV 91114	2.00
4	Pallala Papayamma	Chituku Reddy	Yarlagadda	East Godavari	ICGV 91114	3.00
5	Kadabala Somalamma	Simhachalam	Yarlagadda	East Godavari	ICGV 91114	2.00
6	Velguri Chinnaiah	Veeraiah	Yarlagadda	East Godavari	ICGV 91114	1.50
7	Palla Rami Reddy	Raja Reddy	Yarlagadda	East Godavari	ICGV 91114	2.00
8	Pallala Sanyasiamma	Devi Reddy	Yarlagadda	East Godavari	ICGV 91114	2.00
9	Siribala Samayya	Venkayya	Yarlagadda	East Godavari	ICGV 91114	1.00
10	Perishetti Bullabbai	Tatabbai	Yarlagadda	East Godavari	ICGV 91114	3.00
11	Pallala Gopal Reddy	Veerapu Reddy	Yarlagadda	East Godavari	ICGV 91114	3.00
12	Golisingh Kantharao	Lingaiah	Yarlagadda	East Godavari	ICGV 91114	3.00
13	Pallala Achiyamma	Potti Reddy	Yarlagadda	East Godavari	ICGV 91114	1.00
14	Batta Devaiah	Ramaiah	Yarlagadda	East Godavari	ICGV 91114	1.00
15	Dyagera Gangaraju	Balaiah	Yarlagadda	East Godavari	ICGV 91114	2.00
16	Gorle Srikanth	Yogendra	Y Ramavaram	East Godavari	ICGV 91114	4.00
17	Kakuri Parvathamma	Chinnarao	Yarlagadda	East Godavari	ICGV 91114	2.00
18	Veluguri Parvathamma	Chinnaiah	Yarlagadda	East Godavari	ICGV 91114	3.00
19	Velguri Veeraju	Chinnaiah	Yarlagadda	East Godavari	ICGV 91114	1.00
20	Pallala Mangi Reddy	Lachi Reddy	Yarlagadda	East Godavari	ICGV 91114	2.00
21	Murla Pandaiah		Y Ramavaram	East Godavari	ICGV 91114	1.00
22	Kakuri Chinnabbai Reddy	Nukayya	Yarlagadda	East Godavari	ICGV 0351	4.00
23	Pallala Venkataramana Reddy	Neelam Reddy	Yarlagadda	East Godavari	ICGV 0351	2.50
24	Pallala Pentamma	Jogi Reddy	Yarlagadda	East Godavari	ICGV 0351	1.00
25	Kadabala Bobbili	Balaiah	Yarlagadda	East Godavari	ICGV 0351	2.00
26	Pallala Abbai Reddy		Y Ramavaram	East Godavari	ICGV 0351	2.00
27	Madakam Babu rao		Gangavram	East Godavari	ICGV 0351	1.00
					TOTAL:	56.00

FOUNDATION FOR TRANSFORMATION

Seed initiative in tribal areas yielding fruitful results

SAMSON RAJ

Figure 6.1.3.4: A new paper clip on Rabi 2016-17 Groundnut seed production in East Godavari District.

d) Capacity building

There are total 128 training programs have been conducted in different aspects of farming activities in pilot and other villages of East Godavari districts. Nearly, 3000 male farmers and 1450 female farmers have been participated and benefited by these training programs in the district as given the Table 6.1.3.6.

Table 6.1.3.6: Number of training programs conducted to farmers in pilot and other villages in East Godavari district 2016-17

S. No	Location	Name of the Course	No.of Trainings	Male	Female	Total
1	East Godavari	Aerobic compost	27	498	255	753
2	East Godavari	Awareness program in ground nut	5	84	30	114
3	East Godavari	Finger millet demonstration	3	54	66	120
4	East Godavari	Foxtail millet demonstration	3	30	15	45
5	East Godavari	*Kharif* Groundnut seed production program	9	213	165	378
6	East Godavari	Micronutrients awareness in paddy	24	624	296	920
7	East Godavari	Pest & Disease management In groundnut	18	720	360	1080
8	East Godavari	Pigeon pea demonstration	3	57	39	96
9	East Godavari	Rajma demonstration	3	45	18	63
10	East Godavari	*Rabi* Groundnut Seed Production Program	21	435	138	573
11	East Godavari	Varietal Demonstration	12	249	69	318

6.1.4. Guntur

Rythu Kosam Project Activities during 2016 – 17

In this regard, ICRISAT is spearheading its awareness programs regarding productive and sustainable farming systems in rural villages. **Rythu Kosam** project is initiated by **ICRISAT**, to manage the valuable resources of rural communities in order to improve the welfare, biodiversity and rural ecosystems. As part of the project various institutions, research centers, NGOs were gathered on many occasions to talk about the possibilities of sustainable growth in agriculture. As an ongoing process several meetings were held and one such meeting was conducted, at ICRISAT headquarters on 20th August 2015, where agricultural scientists, professors, government officials, Agriculture & Horticulture departments, NGOs were invited to contribute their valuable insights. Some of the highlighted points were:

- To strengthen the FPOs and integrate students' research problems with on – farm situations.

- To encourage digital agriculture to bridge the gaps between farmers and Holistic agricultural practices.
- To accelerate research for development and achieve desired targets for betterment of farm – livelihoods in near future.
- To promote Integrated farming system and formulating marketing policies keeping in mind the welfare of the producers and consumers.
- To promote basic seed production units accessible to farmers.

Maize as a fodder:

Due to severe drought and non-availability of fodder scarcity raised in Rayalseema Districts and palnadu area of Guntur District, which is negatively affecting the animal feed.

In Kollur mandal many farmers growing Maize as winter crop which is commercial crop. Actually Maize is 120 -130 days crop. Due to severe drought situation in Rayalseema Districts, fodder suppliers /buyers are approaching the farmers of Kollur Mandal to sell maize as fodder at 100 days crop. Some of the farmers are selling maize fodder @ Rs.1800/- per ton. The Maize fodder yield per acre 22-26 tons approximately income is Rs.40000/- per acre. The farmers is benefitting is that saving 20 days, one or two irrigations. The cost of fodder cutting and rolling with Straw beller is taken care of by contractor.

If the farmers keep crop Maize crop until complete harvesting period of 120 days, the yield would be 35 quintals per acre which costs approximately Rs.49000-50000/-, but they have to spend around Rs.5000-6000/- for harvesting charges, therefore total income comes up to 45,000/-,. Here, farmers prefer saving 20 days crop time and irrigation.

Paddy Straw bellar machine is being used for wrapping up paddy straw to store fodder in organized manner. The cost is Rs.1200/- per acre, some of the progressive farmers using this machine for paddy straw wrapping.

Figure 6.1.4.1: Paddy straw bellar harvesting.

Fgure 6.1.4.2: Wrapped paddy straw at Ipuru.

Black gram epidemic

Due to drought (After November 15th no rains), black gram was affected in Vemur, Kolliparra and Kollur mandals. Those who has done seed sowing before 15th December 17 total black gram(PU 31) crop was damaged bud necrosis virus (Talamadau tegulu), white trips, Red Trips. Due to this virus problem yield reduced less than 50%, per acre 3 quintals instead of 6 quintals. Some of other varieties of black gram Nandi and Maruthi seed varieties resisted some extent. During this time local Agriculture officers and ICRISAT scientists visited to in these three mandals Dr. Kapil Entomologist, Dr. B.S Vivek Breeder, Dr. Nagesh Patne, Maize specialist from ICRISAT visited to Ipur, Davuluru, Chinapuleru, Rayakampadu and Chadalavawada on 9th Feb 2017 along with concerned Mr. Sri krishna Deverayalu Asst Director of Agricultrue Tenali, Mr. Premasagar Agriculture Officer Kollur and Mohan AEO and MPAEOs interaction meetings were held with farmers on Maize, Black gram problems,. Recommendations to the farmers:

- Application of 2 quintals of Neem cake per acre
- Deep ploughing during the summer season
- Application of Gandhakam
- Rain guns, sprinklers irrigation

Figure 6.1.4.3: Dr.Kapil, Dr.B.S Vivek, Dr.Nagesh Patne, from ICRISAT visited to Black gram and Maize fields on 9th Feb 2017

Crop diversification and multi cropping

Mr. Sridhar from Ipuru village, Kollur mandal grew multiple varieties of crops like 10 varieties of black gram, 5 varieties of sorghum, turmeric, ginger, and elephant yam, 4 varieties of banana (Karpur, shakkarkeli, vegetable banana and green banana). While most of his neighbors lost most of their black gram crops, Sridhar managed to salvage most of his black gram and got an average yield. Thus diversified crop system works like crop insurance for a farmer. It's a fact that because of situations like high rains or drought most farmers who follow mono cropping system lose their crop and diversified cropping system has the strength to withstand such calamities.

Figure 6.1.4.4: Sridhar (farmer) with his tamarind crop.

Turmeric Feedback: farmers are requesting for high Curcumin percentage in turmeric. Based on their request, Arnya NGO got the seeds of this variety from Mizoram & this year will put a trial for it.

Also the farmers cut the turmeric into smaller pieces in the hope to generate more saplings from less seeds. But their experience was that this technique did not work in the drought situation.

Mr. Kolli Ramakoteswarao from Potharlanka village grew pumpkin as inter crop in elephant yam. He earned an extra amount of Rs 80000 for his 25 ton pumpkin yield. This is an excellent example of diversified cropping system and crop rotations leading to better incomes.

Figure 6.1.4.5: Elephant yam and pumkin intercrop.

Seed exchange: Good seed exchange has happened between the Telangana and Andhra farmers. From Telangana, Ginger, Yellow sorghum, White sorghum, Turmeric and Banana were sent to Kollur and Sattenapalli farmers. From Kollur, Banana and elephant yam seeds were given to the Telangana Farmers.

Integrated Pest Management (IPM)

In selected five villages of Sattenapalli Mandal, 100 acres in each village, the Horticulture department recommended cotton and chilli farmers to grow maize as a border crop for IPM. However, our NGO Aranya motivated and oriented the farmers to IPM for cotton and chilli crops. Aranya taught the practices that have to be implemented before crop season; it also chose the farmers interested in practicing IPM. Orientation meetings were organized during the crop season in convergence with the Horticulture department. About 250 kg of sorghum seeds was distributed to the cotton and chilli farmers as border crop and they were motivated to set pheromone traps in their crops. Marigold saplings were also provided as one of the trap crops. These practices fetched results like reduced use of pesticides and sorghum worked as a fodder crop for the cattle and most importantly, making the farmers look at alternate practices.

Figure 6.1.4.6: Lam farm scientist Dr. Venkata Ramana visit to Chilli field.

Figure 6.1.4.7: Sorghum seed distribution for border crop for chilli fields by Horticulture

Figure 6.1.4.8: Marigold and sorghum trap crop planting around chilli fields.

Solar Dryer

As part of the ICRISAT – Rythu Kosam project, a solar dryer was provided to make the food storage with drying process. Solar dryer used to make gongura (Hibiscus) and Moringa powder. Mangoes and carrots dried to enhance preservation. Groundnut, sesame were dried and powders made at domestic level.

Figure 6.1.4.9: Solar drying of Moringa and Rose petals

Green manure crops

Last year soil test results of Sattenapalli mandal show that the soil needs organic matter. Our NGO Aranya motivated the farmers to grow sun-hemp as a green manure crop to increase organic matter content in soil. The chilli farmers started growing sun-hemp before sowing the chilli crop and this has resulted in increase of organic matter in soil.

Farmers Advisory Services

As a part of the Farmanet services, our NGO Aranya has been collecting data from Kattamuru and Potharlanka village's farmers. The data includes documentation of crop management practices, yields, net incomes, and use of pesticides and fertilizers. One-year analysis was done and report for each farm was shared with the respective farmer. This report helped the farmer understand the deficiencies and they could act accordingly.

Kitchen Ganrdening:

Vegetable seeds provided by ICRISAT to 62 farmers in Kollur and 74 farmers in Sattenapalli mandals, homestead gardens and kitchen gardens have sprung in convergence with Horticulture department. The Horticulture department shared seeds of gourds and leafy vegetables with the villagers and they started growing these seeds in their small patch of lands in front of their homes. The villagers got a good yield and the women are very happy to grow

their own vegetables in their homes. This has also given them an opportunity to share their seeds with other community members and also led to exchange to yield with others.

Figure 6.1.4.10: Vegetable seed Distribution for Kitchen gardens by Dr. Kodela Siva Prasad garu Hon'ble Speaker of AP.

ICRISAT Seed Distribution

132 Kg's of Pigeon pea seed distributed to 190 farmers for inter cropping in Cotton and on Paddy field bunds.

To encourage aerobic composting 20 packets of Madyam culture provided to 20 farmers.

Table 6.1.4.1: Distribution detail of Madyam culture to farmers.

S.No	Seed	Variety	No. of farmers
1	Pigeon pea	Asha	50
2		Maruthi	50
		ICPH2740	50
3	Pigeon pea	ICPL20338	10
4		ICPL151	15
5		ICPL88039	15
6	Compost Madyam culture		20

Aerobic composting and Shredder:

In Phanidam village, ICRISAT provided one shredder. This has helped the cotton and chili farmers attach the shredder to their tractor and shred chili and cotton agriculture residues to incorporating organic carbon in the soil.

In Settinapally mandal, 10 farmers are practicing aerobic composting and ICRISAT provided the "Madhyam culture", which fastened the decomposing process and because of this good culture is available at farmers. The quality of vegetable improved.

Figure 6.1.4.11: Aerobic composting.

Crop Cutting Experiments

As part of program, various on-farm demo trials were conducted. In the process, 25 farmers were selected from various villages and crop cutting experiments were conducted in paddy, cotton and chilli farmer fields.

Figure 6.1.4.12: Demonstratio of crop cutting experiment.

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.

Productivity Enhancement Micro-Nutrient Trails Yield Data

Guntur district micro nutrient trials crop cutting experiments yield data

The average paddy grain yield per hectare was 5880 Kgs in improved practice and 5100 kgs in farmers practice. The average cotton kapas yield per hectare was 4610 Kgs in improved practice and 4040 Kgs in farmer practice.

The average dry chilly yield per hectare was 8860 kgs in improved practice and 8120 Kgs in farmer practice.

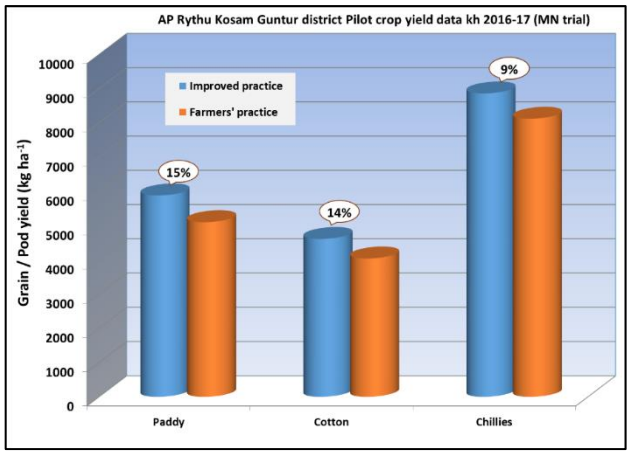


Figure 6.1.4.13: Guntur district crop yield data kharif 2016-17.

Maize Seed Trials – CIMMYT in Guntur district

Table 6.1.4.2: 7 Varieties and hybrids of maize seeds were tested by CIMMYT in 3 farmer fields.				
S. No	Mandal	Village	Farmer Name	Varieties
1	Kollur	Chinna pulivarru	Gorriparthi Srinivasa Rao	VH151777, VH12148, VH112877, VH112732
				VH112733, AH1222, VH131025
2	Kollipara	Davuluru	Gottimukkala Sreedhar	VH12305, VH125, VH112972, VH112888
				VH112926, AH1222, VH131025
3	Kollur	Ravikampadu	Doddapaneni Sivaprasad	VH 112924, VH113014, VH113026, VH112906,
				VH112944, AH1222, VH131025

Figure 6.1.4.14: Maize seed varieties provided by CIMMYT.

Training and capacity building

Training and capacity building has been an integral part of this project and the objective of the training is to impart knowledge on various farming systems/practices for enhanced incomes. Before initiating under taking training sessions were organized and created enabling environment by providing inputs and hand holding support to the farmers.

Table 6.1.4.3: Details of training conducted.			
Program	No. of trainings	Officials	Farmers
District level	2	200	
Mandal level	2	75	250
Village level	15	50	500

Figure 6.1.4.15: IPH capacity building meetings.

Publicity

Figure 6.1.4.16: paper clipping of different activities in pilot area, Guntur district.

Outcomes

- Application of soil-test based recommendations.
- Increased awareness on alternative agricultural practices such as Integrated Pest and Nutrition Management (IPNM).
- Stronger connections and relationships between farmers, agriculture and horticulture departments.
- Adoption and implementation of organic farming practices
- Conscious and precise use of pesticides and fertilizers

Increased buy-in for organic farming, reduced use of pesticides and fertilizers and increased belief in farmers to grow vegetables organically.

6.1.5. Kadapa

Progress during 2016-17

Soil test-based nutrient management

In diagnostic analysis the last year, widespread micro & secondary nutrient deficiencies are observed w.r.t Zn (20-95%), B (0-92%), S (0-100%), Ca (0-87%) along with P (0-47%) and low levels of soil organic C between 8-100% (Table 6.1.5.1). Based on soil analysis results, soil test-based recommendations are developed for all the cereals, pulses, oilseeds and vegetable crops. Adding deficient micro & secondary nutrients is not a normal practice by the farmers, and thereby considering the essentiality of micro & secondary nutrients, these are scaled-up in pilots and district as such along with the department of agriculture as incentivised inputs.

To evaluate the effects of soil test-based added micro & secondary nutrients, ICRISAT along with partners conducted participatory on-farm trials on application of micro and secondary nutrients in Kadapa pilot sites. 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 cuttings (CCs) were conducted in 3 m x 3m area in both the treatments. Groundnut is a major crop in Veeraballe and Sambepalle mandals and 10 crop cuttings were done in pilot villages in each of the 2 mandals during *kharif* season. Similarly, paddy is a major

crop in Porumamila and B Matam mandals and 10 crop cuttings were done in pilot villages in each of the 2 mandals during *kharif* season. 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.

Table 6.1.5.1: Village wise soil fertility status of pilot site in Kadapa district.

Mandal	% Low levels of org C	% deficiency of available nutrients										No of samples
		P	K	Ca	Mg	S	Zn	B	Fe	Cu	Mn	
B Mattam	48	17	2	5	0	18	71	8	4	2	0	133
Porumamilla	59	19	0	10	0	29	54	10	0	1	0	120
Sambepalli	86	15	18	71	0	88	65	74	0	21	0	107
Veeraballi	53	20	1	29	2	50	49	27	13	6	0	109
Kadapa Pilot	61	18	5	27	0	44	60	28	4	7	0	469

*Detailed village wise results presented in 2015-16 report

The results showed that with soil test-based application of micro and secondary nutrients during 2016-17, groundnut pod yield increased by 22-25%% and straw yield by 30-33%% over no application of micro and secondary nutrients (Figure 6.1.5.1, 6.1.5.4). Similarly, in case of paddy crop, grain yield increased by 22-25%% and straw yield increased by 14-22%% (Figure 6.1.5.2, 6.1.5.3). Similar benefits were noted in other crops like pearl millet (Figure 6.1.5.4).

In Kadapa district, there is about 80000 ha micro-irrigation systems and this a potential opportunity to be used for regulated supply of essential plant nutrients i.e. fertigation and soil test-based addition of micro- and secondary nutrients. So, during 2016-17, 30 participatory fertigation trials were done with tomato crop in Sambepalle mandal. The data was recorded from farmers which showed an yield benefit of about 8%.

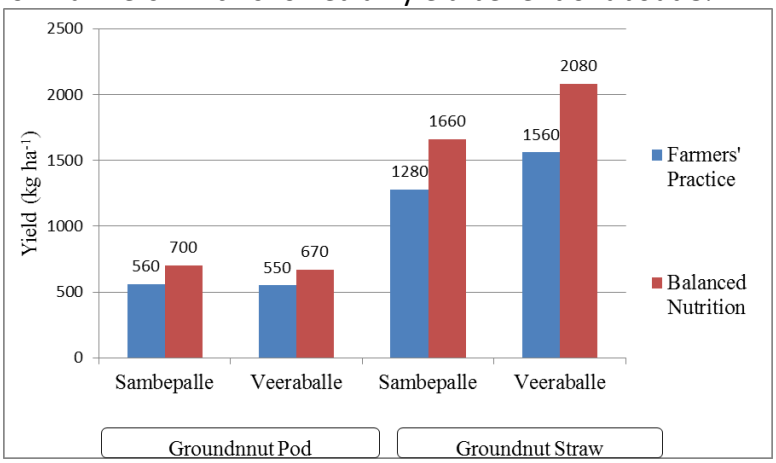


Figure 6.1.5.1: Effects of soil test-based addition of micro & secondary nutrients on groundnut yield in Kadapa during 2016-17.

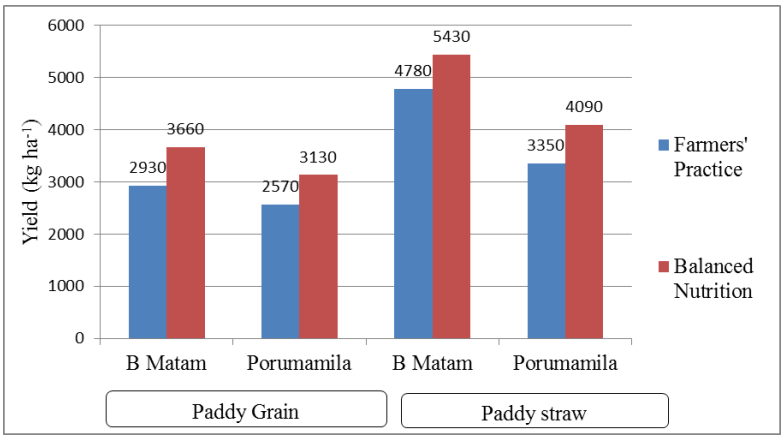


Figure 6.1.5.2: Effects of soil test-based addition of micro & secondary nutrients on paddy yield in Kadapa during 2016-17.

Figure 6.1.5.3: Paddy crop under soil test-based application of micro & secondary nutrients – Left: Mr Ravi in Tsallagirigella village, Porumamila mandal; Mr Ramasubbareddy in Godlaveedu village, B Matam mandal.

Figure 6.1.5.4: Crop under soil test-based application of micro & secondary nutrients – Left: Pearl millet crop by Mr Chennaya in Godlaveedu village, B Matam mandal; Right: Groundnut crop by Mr Narsimlu in Settipalli village, Sambepalle manda.

Scaling-up: 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 36 t gypsum, 4.74 t zinc sulphate and 150 kg borax is distributed in the pilot site villages in *kharif* and *rabi* seasons during 2016-17 (Table 6.1.5.2).

Table 6.1.5.2. The quantities of secondary and micronutrients distributed during *kharif* and *rabi* seasons of 2015-16 in Kadapa pilot site villages.

Mandal	MNs distributed in t except kg for borax		
	Gypsum	Zinc sulphate	Borax
Veeraballe(Veeraballe, Matli)	12.5	1.65	-
Sambepalle (Settipalle, Devpatla, Guttapalle)	5.8	2.20	93
Porumamilla (Siddavaram, Ganugapenta, Challagirigella, Venkataramapuram)	8.7	0.42	30
B Matam (Godlaveedu, gundapuram, Dirasavancha, Nagisettipalle)	9	0.47	30
Total	36	4.74	153

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

Low levels of soil organic C is a major stumbling block in overall soil health and crop productivity. Therefore, efforts are put in pilots for soil C-building for improving productivity and resilience building by promoting recycling of on-farm wastes through vermi and aerobic composting. There are huge on-farm generated organic wastes which are not effectively used. In Kadapa pilot sites, the left- over of pearl millet, sorghum and maize after feeding to cattle are not economically used in any way. The hardy biomass as such is not easily and properly decomposed to be converted into compost for crop production. Therefore shredder machines are put on sharing basis to develop proof of concept for chopping hardy biomass for converting into useful compost. Further, 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.
During summer 2016, about 90 farmers participated in composting of hardy crop biomass using shredder machine in Tsallagirigella village in Porumamila mandal and recycled 90 t biomass (including 47 t hardy crop residues) into aerobic compost for use in crop production (Table 6.1.5.3).

Table 6.1.5.3. Aerobic composting demonstrations during summer 2016 in Tsallagirigella village, Porumamila mandal, Kadapa district.

S. No.	Crop	No of Farmers	Crop residue used in composting (kg)	Dung used in composting (kg)	Total biomass used in composting (kg)
1	Pearl millet	34	15000	19000	34000
2	Sorghum	46	22000	25500	47500
3	Maize	9	6100	2600	8700
	Total		43100	47100	90200

The summer season produced aerobic compost was used by farmers in paddy crop during *kharif* 2016 season. The data was recorded from about 40 farmers who recorded about 7% increase in grain yield along with about 25% saving in chemical fertilizer.

Similarly, during *kharif* 2016 season, participatory trials/demonstrations were done with 190 farmers across 4 mandals in the pilot sites (Table 6.1.5.4; Figure 6.1.5.5). The major biomass

converted into aerobic-compost included dung, and crop residues like sorghum, maize and pearl millet and as such 179 t of biomass was converted into aerobic compost.

Table 6.1.5.4: Aerobic composting demonstrations during *kharif* 2016.				
S. No.	Mandal	Village	Demonstrations	Biomass decomposed (t)
1	Porumamila	Tsallagirigella	45	42
		Ganugapenta	21	21
2	B Matam	Dirasavancha	4	4
		Godlaveedu	6	6
		Nagisettipalle	24	24
3	Sambepalle	Devapatla	28	25
		Guttapalle	5	5
		Settipalle	13	12
4	Veeraballe	Matli	44	40
	Total		190	179

Figure 6.1.5.5: Aerobic composting heaps in Kadapa pilot sites- Left: Mr B Ramaiah of Matli village, Veeraballe; Right: Mr C Vengalreddy of Ganugapenta village, Porumamila mandal.

Scaling-up soil organic carbon building: Through Department of Agriculture, green manure crop seed was distributed to farmers in the pilot site mandals for soil C-building - dhaincha (315 q), sunnhemp (23 q) and pillipesara (5 q received) (Table 6.1.5.5).

Table 6.1.5.5: The quantities of green manure crop seeds distribute in pilot sites during *kharif* 2016.			
Mandal	GM seed distributed (quintals)		
	Sunnhemp	Dhaincha	Pillipesara
Veeraballe	0	150	0
Sambepalle	0	0	0
Porumamilla	10	70	0
B Matam	13	95	5
Total	23	315	5

Climate smart crop & varietal evaluation

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 and high yield potential are evaluated during 2016-17 (Table 6.1.5.6). About 24 trials are conducted with pigeonpea varieties like ICP 8863, ICPL87119, ICPL 161 and ICPH 2740 in Porumamila and

B Matam mandals, and similarly about 14 trials are conducted with groundnut cultivar ICGV 9114 mainly in Sambepalle and Veeraballe mandals.

Table 6.1.5.6: Participatory trials on evaluating climate smart crop cultivars.

S. No.	Mandal	Village	Crop	Variety	Number of trials
1	Porumamila	Tsallagirigella	Pigeonpea	ICP8863	5
		Siddavaram	Pigeonpea	ICP8863	1
		Tsallagirigella	Pigeonpea	ICPL87119	7
		Tsallagirigella	Pigeonpea	ICPL161	3
		Ganugapenta	Pigeonpea	ICPL161	1
		Tsallagirigella	Pigeonpea	ICPH 2740	2
		Ganugapenta	Pigeonpea	ICPH 2740	1
		Siddavaram	Pigeonpea	ICPH 2740	1
		Siddavaram	Groundnut	ICGV 9114	3
		Challagirigella	Pearl millet	ICTP 8203	7
2	B Matam	Godlaveedu	Pigeonpea	ICPH 2740	3
		Nagisettipalle	Pearl millet	ICTP 8203	3
3	Sambepalle	Devapatla	Groundnut	ICGV 9114	8
4	Veeraballe	Matli	Groundnut	ICGV 9114	3
	Total				48

Crop cuttings in groundnut crop showed an yield advantage of 26-31% in case of pod yield and 24-57% in case of straw yield by using ICGV 91114 cultivar over local ones (Figure 6.1.5.6, 6.1.5.7). Similarly case of in pearl millet, the yield advantage in grain yield was 21-27% and in straw yield by 23-29% with ICTP 8203 variety over local ones (Figure 6.1.5.8, 6.1.5.9).

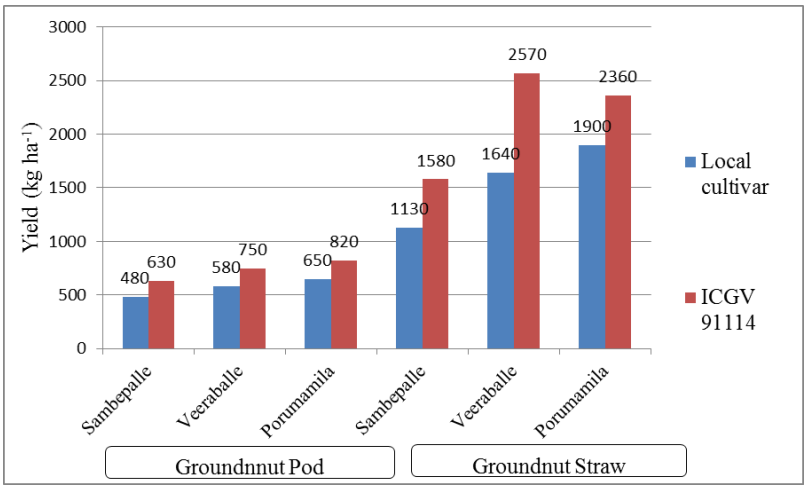


Figure 6.1.5.6: Evaluation of groundnut (ICGV 91114) cultivar vis-à-vis local cultivars in Kadapa during 2016-17.

Figure 6.1.5.7: Evaluation of groundnut (ICGV 91114) cultivar (Clock wise) – Mr Nagireddy in Devapatla village, Sambepalle mandal; Ms Lakshmi & Ms Amravati in Devapatla; Mr K Veeranjeneyulu in Matli village, B Matam; Ms Veeralakshmi in Siddavaram village.

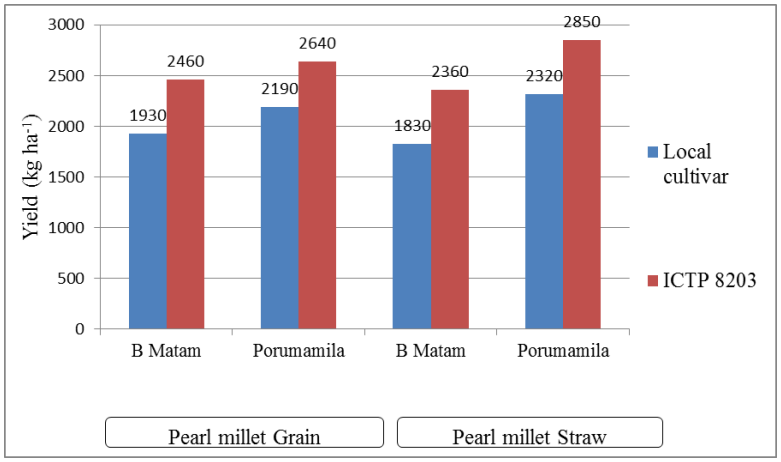


Figure 6.1.5.8: Evaluation of pearl millet (ICTP 8203) cultivar vis-à-vis local cultivars in Kadapa during 2016-17.

Figure 6.1.5.9: Evaluation of pearl millet (ICTP 8203) cultivar in Tsallagirigella, Porumamila mandal – Left: Mr Prasad; Right: Mr G Ramkrishnareddy.

Similarly, in case of pigeonpea crop, significantly higher productivity was recorded with improved cultivars – 560 kg ha^{-1}, with ICPH 2740, 230 kg ha^{-1} with ICPL 87119 and 290 kg ha^{-1} with ICP 8863 as compared with 210 kg ha^{-1} under local cultivars (Figure 6.1.5.10, 6.1.5.11). The yield levels are very low due to prevailing drought conditions because of no rainfall for a long period during the rainy season. In the trial sites, there was almost total loss with other crops like green gram, while pigeonpea crop and improved varieties ensured reasonable yield levels with showing of clear advantage of improved varieties. Similarly, the advantage was also seen in more straw biomass production, which makes a good raw material for aerobic composting using a shredder machine for chopping.

Figure 6.1.5.10: Pigeonpea varietal evaluation (Clock wise). Pigeonpea (ICPL 161) by Mr C Vengal Reddy in Ganugapenta village, Porumamila mandal; Pigeonpea (ICPL 87119) by Mr G Subbireddy in Tsallagirigella village, Porumamila mandal; ICP 8863 by Mr S Pandurangaiah in Tsallagirigella village (stony soil, good growth); ICP 8863 by Mr Venkateshwarlu in Tsallagirigella village.

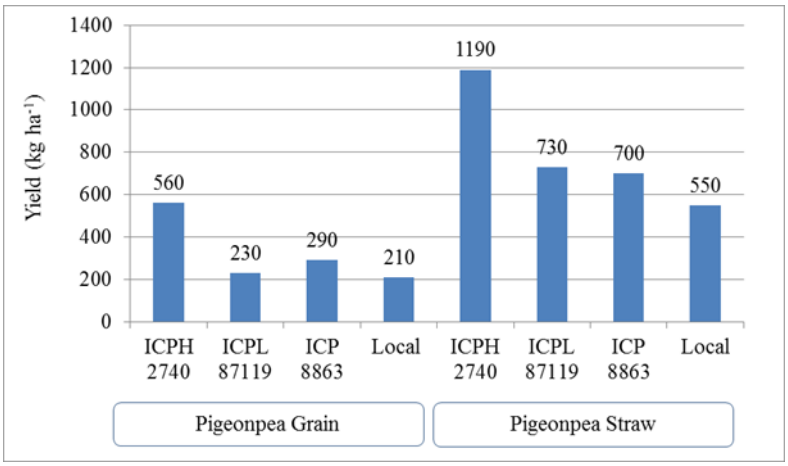


Figure 6.1.5.11: Pigeonpea yield under improved cultivars vis-à-vis local one in Kadapa during 2016-17.

Scaling-up of high yielding crop varieties: Through Department of Agriculture, improved crop seeds were distributed for varietal replacement in pilot site mandals during 2016-17 as given in Table 6.1.5.7.

Table6.1.5.7: The quantities of improved crop seeds distribute in pilot sites during *kharif* 2016-17.

Mandal	Improved seed distributed (quintals)				
	Groundnut	Paddy	Cotton	Pigeonpea	Other
Veeraballe	1240	0	0	140	
Sambepalle	2700	0	0	50	
Porumamilla	0	0	0	2	4
B Matam	0	0	0	2	15
Total	3940	0	0	194	19

Evaluation of new products – Aquasap & humic acid

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 2016-17 *rabi* season, 29 participatory on-farm demonstrations/trials were conducted on foliar application of aquasap with crops like groundnut, turmeric, brinjal, cotton and other (Table 6.1.5.8).

Table 6.1.5.8: Participatory trials on evaluating Sagarika-Aquasap during *rabi* 2016-17.

S. No.	Mandal	Village	Crop	Number of trials
1	Porumamila	Tsallagirigella, Siddavaram	Turmeric, pigeonpea, chillies	5
2	B Matam	Nagisettipalli, Dirasavancha	Brinjal, cotton, pearl millet	10
3	Sambepalle	Settipalli, Guttapalli, Devapatla	Groundnut, beans	7
4	Veeraballe	Veeraballe	Groundnut, blackgram, watermelon	7
	Total			29

There were two treatments – (1) Sagarika-Aquasap spray @ 750 ml/acre for 3 sprays and (2) Farmers practice (in adjoining/nearby field). Aquasap solution was sprayed thrice during crop season after establishment stage, pre-flowering and post flowering stage of crop. 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.

The crop cuttings for assessing yield benefits are under process. Last year, benefits realized with aquasap were 20% in groundnut pod and 30% in straw.

Figure 6.1.5.12: Participatory evaluation of Sagarika-Aquasap – Left: Mr Ravinder in guttapalli village, Sambepalle mandal; Right: Mr Bhaskar, Tsallagirigella village, Porumamila mandal.

Similarly, trials are under process for evaluation of humic acid in Devapatla village (Figure 6.1.5.13)

Figure 6.1.5.13: Participatory evaluation of Humic Acid in groundnut by Mr Ramanjula of Devapatla village in Sambepalle mandal.

On-farm mechanization

On-farm mechanization is a scalable technology to improve productivity and incomes through efficiency in on-farm operations like sowing, inter-culture, harvesting, threshing and other. However, considering majority of smallholders in the country, the concept of custom hiring centers through PPP mode may be more desirable.

Taking note of availability and improper use of hardy biomass and left-overs in crops like pigeonpea, cotton, maize, pearl millet and sorghum, we recycling of this biomass through composting. This biomass is difficult to decompose and would take very long, therefore we piloted shredding machine in village/cluster of village level for chopping hard biomass (Figure 6.1.5.14). This has put a proof of concept of an efficient resource use while cutting cost of chemical production with harnessing of yield benefit. An analysis indicate that if 50% of available hardy biomass i.e. 1350000 t across~ 8 L ha in Anantapur, Kadapa, Guntur, Krishna, Prakasam, Vizianagaram, West Godavari, East Godavari districts is recycled through composting means making available ~25000 t NPK for crop production with a potential to cut cost of chemical fertilizers like urea/DAP/MOP by Rs 70 crores. Taking into account, the cost of shredder machine @ Rs 80000/- for one machine per 500 t biomass in the region/village on sharing/custom-hiring basis plus cost of microbial culture (Rs 90/kg culture for 1 t biomass), shows a benefit cost ratio of 2:1 in the year 1 itself.

Figure 6.1.5.14: Shredding machine demonstration for chopping-off biomass in Charlagirigala village, Porumamila mandal, Kadapa district

Publicity

Important interventions in pilot villages are captured in local media which help disseminate information to large number of farmers. Few select paper cuttings are shown in Figure 6.1.5.15.

మన రాయచోటి

ఇక్రిశాట్ ఆధ్వర్యంలో

రైతులకు అవగాహన సదస్సు

Andhra Farmers Get Sowing Advice on App

Our Bureau

Hyderabad: Microsoft, crop research institute Icrisat and Andhra Pradesh government have developed an app to advise farmers on the time to sow crops based on weather conditions, and soil and other indicators.

In a statement on Thursday, Icrisat-said the tool with personalised village advisory dashboard was developed to enable AP officials to better manage programmes of scale. Bringing a lot of scattered data together and developing an analytical tool that is comprehensive and gives accurate predictions to the farmers was urgently needed, Icrisat director-general David Bergvinson said.

వాతావరణ మార్పులపై అవగాహన సదస్సు

రాయచోటిరూరల్, జూన్ 28(ఇఎన్ఎస్): సంబేపల్లి మండలంలోని దేవపట్లు, గుట్టపల్లి, శెట్టిపల్లె గ్రామాల్లో రైతు కోసం ప్రాజెక్టు లో భాగంగా వాతావరణ మార్పులు, వ్యవసాయంలో ఆదాయం పెంపొందించడం, ఇక్రిశాట్ చేపట్టిన కార్యక్రమాలపై అవగాహనా సదస్సులు ఏర్పాటు చేయడం జరిగింది. ఈ కార్యక్రమానికి రాష్ట్ర సీనియర్ సైంటిస్టులు, గిరీష్‌చందర్, కేశవరావులు ముఖ్య అతిథిగా హాజరుకావడం జరిగింది. ఈ సందర్భంగా కేశవరావు మాట్లాడుతూ గ్రామీణ ప్రాంతంలో ఎక్కువగా వ్యవసాయంపైన ఆధారపడి జీవిస్తున్నారని, కాని వారికి సరైన సాంకేతిక పరిజ్ఞానం లేకపోవడం వల్ల పంటల దిగుబడి అనుకున్నంత సాధించలేకపోవడం, ఖర్చులు ఎక్కువ కావడం తద్వారా ఆర్థికంగా ఇబ్బందులు పడటం జరుగుతోందన్నారు. ఈ క్రమంలో ప్రభుత్వం రైతు కోసం ప్రాజెక్టు ద్వారా రైతులకు అవగాహన కల్పించటకు ఇక్రిశాట్ సంస్థ పనిచేస్తుందన్నారు. అనంతరం గిరీష్‌చందర్ మాట్లాడుతూ గతంలో ఇక్రిశాట్

సమావేశంలో మాట్లాడుతున్న సైంటిస్టులు

ద్వారా ఈ ప్రాంత భూసార పరీక్షలు చేసి ఫలితాల మేరకు సూక్ష్మ పోషకాలు వినియోగించడం ద్వారా మంచి దిగుబడి సాధించుటకు వీలుందన్నారు. ఎప్పటికప్పుడు రైతులకు పంటలపై తగు సలహాలు, సూచనలు రైతుల చరవాణిలకు పంపడం జరుగుతుందన్నారు. ఈ సమావేశంలో ఎస్ఆర్‌టి రామక్రిష్ణ, వెంకటసుబమ్మ, అది, మధు, ఇక్రిశాట్ జిల్లా ఎస్ఎస్ పాపిరెడ్డి, హరిక్రిష్ణ ఆయా గ్రామాల రైతులు తదితరులు పాల్గొన్నారు.

Figure 6.1.5.15: Selected News Paper clippings capturing some interventions in Kadapa pilot sites.

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. 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.

During 2016-17, around 250 farmer meetings are conducted and trained around 2500 lead farmers (including around 650 women farmers) on technologies like soil test-based INM,

aerobic composting, fertigation, crop varieties, new products like Sagarika-Aquasap & humic acid, machines like shredder & easy planters, ICT like SowingApp.

6.1.6. Krishna

Crop cutting experiments (CCE):

Crop cutting experiments (CCE) were conducated in the pilot areas. There was significant increase in the yields of Paddy that received micro nutrient dosage by 27% over the control treatment (where no micronutrients were used). This was observed in both G.Konduru and Ghantasala mandals.

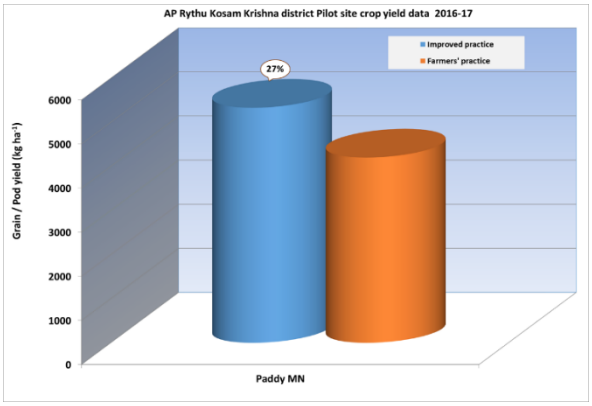


Figure 6.1.6.1: Krishna district crop field data – 2016-17.

Crop Diversification

Cotton, Pigeon pea is taken up in 37 hac of G. Kondur and Ghantasala mandals and the details are given in the table.

Table 6.1.6.1: 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

Recycling of on-farm waste:

20 kg's 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 6.1.6.2: Demonstration of Shredder at Chitturpu village, Ghantasala mandal.

Biomass generation for soil fertility:

5 kg's of Gliricidia seed is given to the framers 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.

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. Total 100 insect traps are placed in the pilot sites and are being monitored in pilot villages for proper guidance to farmers.

Figure 6.1.6.3: Setting of pheromone trap G.Kondur

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.

Inputs distribution:

148 Kg of Pigeon pea seed distributed to 30 farmers.

To encourage aerobic composting 16 packets of Madyam culture provided to 2 farmers.

Table 6.1.6.2: Seed distribution details.

s.no	SEED	variety	placement	Amount/kg	Distributed IN KG'S
1	REDGRAM	ASHA			48
		ICPH2740			100
2	COMPOST	MADYAM		45	16

Kitchen Ganrdening:

Vegetable seeds provided by ICRISAT to 200 farmers in Ghantasala and 200 farmers in G.Kondur mandals, homestead gardens and kitchen gardens have sprung in convergence with Horticulture department. The Horticulture department shared seeds of gourds and leafy vegetables with the villagers and they started growing these seeds in their small patch of lands in front of their homes. The villagers got a good yield and the women are very happy to grow

their own vegetables in their homes. This has also given them an opportunity to share their seeds with other community members and also led to exchange to yield with others.

Fertilizers distribution

Table 6.1.6.3: Micro nutrients distribution in pilot madals of Krishna district.						
S. No	Mandal	Village	No of farmers	Gypsum Kg	Boron Kg	Zinc sulphate Kg
1	G konduru	Kavuluru	36	2900	244	1080
2	G konduru	Koduru	42	100	380	2270
3	G konduru	G.Konduru	43	6350	406	1370
4	G konduru	Velagaleru	43	5100	271	1580
5	Gantasala	Gantasala	34	0	0	1950
6	Gantasala	Kothapalli	12	0	0	460
7	Gantasala	Kodali	12	0	0	530
8	Gantasala	Srikakulam	12	0	0	480
	Total		234	14450	1301	9720

Capacity building:

Capacity building and awareness programs were conducted in coordination with the line departments, NGO staff and ICRISAT staff in the pilot sites. 95 trainings have been conducted on new technologies being introduced and to scale-out good practices on large number of farmers' fields along with data recording and documentation.

Table 6.1.6.4: Details of training programs conducted in Krishna district.			
District	Mandal	No.of meetings	Number of farmers attended
Krishna	Ghantasala	43	1176
	G.Kondur	52	1426
Total		95	2602

Figure 6.1.6.4: Capacity building meeting.

Publicity

Figure 6.1.6.5: paper clipping – Reduction and chemical fertilizers.

6.1.7. Kurnool

Demonstration and evaluation of soil and water management practices

Drought are common features of agriculture at pilot villages in Kurnool. In-situ soil and water management interventions are required for effective management of soil and water in the field. The broadbed & furrow, conservation furrow and contour cultivation systems have been implemented on large numbers of farmers at both pilot sites (Fig 6.1.7.1). Few units of broadbed makers have been provided at both pilot sites. Necessary field trainings has been given to farmers at both locations. During 2016-17, total 235 farmers have implemented these *in-situ* moisture conservation systems at their fields.

Figure 6.1.7.1: Conservation furrow and Broadbed and furrow land and water management systems with groundnut at pilot village, Devanakonda mandal 2016.

Due to these soil and water management practices the groundnut yield increased by 27-35% compared to traditional flat cultivation system (Fig 6.1.7.2). Assisted District Watershed Department in implementing several ex-situ water harvesting structures at both pilot sites. During 2016-17 at Devanakonda pilot site total 5 check dams, 173 farm ponds and 3 dugout ponds have been constructed and are used for irrigation (Fig 6.1.7.3, Table 6.1.7.1 and Table 6.1.7.2). Rain guns have been successfully used to provide supplemental irrigation to several crops to save the crops from severe drought during Aug 2016 (Fig 6.1.7.4).

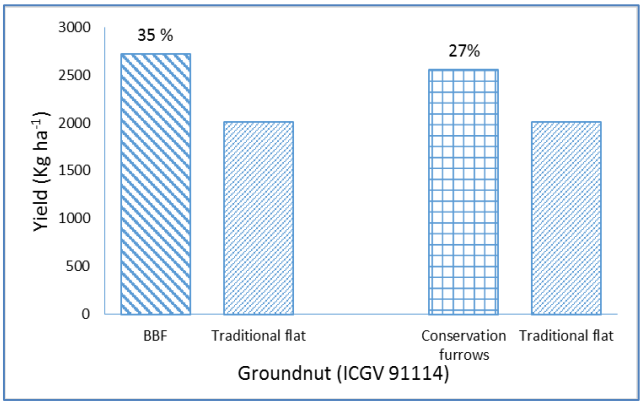


Figure 6.1.7.2: Effect of broadbed & furrow and conservation furrow systems on groundnut yield during 2016 at Devanakonda pilot villages.

Figure 6.1.7.3: Ex-situ water harvesting and soil conservation structures implemented by of Watershed Department at Devanakonda pilot villages during 2016-17.

Figure 6.1.7.4: Life saving irrgiagtion through Rain gun at Devanakonda pilot site during Aug 2016.

Table 6.1.7.1: Various watershed development activities implemented at Devanakonda pilot villages Kurnool district during 2016-17.

S No	Name of the work	Devanakonda	Nelathalamarri	Thippathalamarri	Bhiravanikunta	Kukatikonda	Singapuram	K.Venkatapuram	Burrakunta	Total
1	New Check Dam	3	2	0	0	0	0	0	0	5
2	Repairs to Existing Check Dam	1	1	0	3	3	1	7	10	26
3	Repairs to Existing Check Wall	0	0	0	0	0	0	1	2	3
4	Rock Fill Dam	1	0	0	0	0	0	0	0	1
5	Loose Boulder Structure	2	2	2	8	4	0	7	3	28
7	Farm Pond	20	44	4	5	61	24	7	8	173
8	Dugout Pond	2	0	0	0	1	0	0	0	3
9	Cattle Troughs	0	1	0	0	0	1	0	0	2
10	NADEP Compost pit	5	8	0	6	0	0	0	10	29
12	Water Absorption Trench at Foot Hills	0	1	0	0	0	0	0	0	1
	Total	34	59	6	22	69	26	22	33	271
13	Bund Plantation Take (In acres)	5	0	0	0	0	3	0	0	8
	Total	5					3			8

Table 6.1.7.2: Various watershed development activities implemented at Banaganapalle pilot villages Kurnool district during 2016-17.

S No	Name of the work	Nandavaram	Venkatapuram	Pandlapuram	Kaipa	Sankalapuram	Appalapuram	Total
1	New Check Dam	1	4	0	0	0	2	7
2	Repairs to Existing Check Dam	0	1	0	0	0	3	4
3	Rock Fill Dam	0	6	0	0	0	0	6
4	Loose Boulder Structure	3	0	0	0	0	0	3
5	Farm Pond	16	16	9	8	6	14	69
6	Dugout Pond	8	8	4	4	4	8	36
7	Solar Street Light (EPA)	7	0	0	0	0	0	7
	Total	35	35	13	12	10	27	132

Soil test-based fertilizer use including micronutrients

The rainfall at both the pilot sites are quite low and uncertain. The crop failure due to drought is quite common in these areas. Farmers are reluctant to use additional agricultural inputs viz. fertilizers including micronutrients. During 2016-17 major efforts were made to bring awareness about the soil health and use of fertilizer based on soil test. During 2015 total 443 soil samples were collected and analyzed. Total 443 farmers were given soil health card. 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. Soil test-based recommendations have been developed for all cereals, pulses, oilseeds and vegetable crops. The recommendations were shared with line-departments, NGOs and farmers. In context of observed deficiencies, the use of micronutrients have been promoted. During 2016-17 large numbers of farmers at the pilot sites have used the micronutrients and gypsum. Farmers have used gypsum for groundnut and zinc for paddy. The zinc application in paddy gave 24% higher grain yield compared to control. The gypsum application to groundnut increased the pod yields by 29% compared to control. Compared to year the number of farmers who have used micronutrients and gypsum have increased by 5 folds.

Improved crop varieties

Improved varieties of groundnut (ICGV 91114, ICGV 350 and ICGV 351), Pigeonpea (ICPH2740, ICP87119 (Breeder seed), ICPL87119), Korra/Foxtail Millet (Surya Nandi), Pearl millet (ICTP8203), Sorghum (PVK 801), and Castor (DCH 519) were taken up on 210 farmers' fields (Table 6.1.7.3 & Fig 6.1.7.5). Crop cutting experiments were conducted to evaluate yields compared with local cultivars (Fig 6.1.7.6).

Table 6.1.7.3: Improved crop varieties provided to farmers at pilot sites in Kurnool during 2016-17.

Crop	Variety	Village	Mandal	Area (ha)
Groundnut	ICGV 91114, ICGV 350, 351 (Breeder seed)	Devanakonda, Nelathalamarri,Kukatikonda, K Venkatapuram	Devanakonda	14
Pigeonpea	ICPH 2740, ICPL 87119 (Asha), ICPL 87119 Breeder seed	Devanakonda, Nelathalamarri,Kukatikonda, K Venkatapuram	Devanakonda, Banaganapalle	48
Castor	DCH 519	Nelathalamarri, Kukatikonda, K Venkatapuram	Devanakonda	13
Pearl Millet	ICTP 8203	Devanakonda, Kukatikonda	Devanakonda	50
Foxtail Millet	Surya nandi	Appalapuram, K Venkatapuram, Nandavaram, Pandlapuram, Devanakonda, Kukatikonda	Devanakonda, Banaganapalle	15
Green gram	IPM 02-14	Kypa, K Venkatapuram, Nandavaram	Banaganapalle	3
Black gram	T 9	Appalapuram, K Venkatapuram, Nandavaram	Banaganapalle	3
Chickpea	JJ11 (Breeder seed)	Appalapuram, K Venkatapuram, Nandavaram	Banaganapalle	4
Sorghum	PVK 801	Appalapuram, K Venkatapuram, Nandavaram	Banaganapalle	6

In groundnut the highest pod yield of 2297 Kg/ha was recorded in ICGV 350 which is 21 % higher than the local K6. Similarly the ICGV 351 and ICGV 91114 gave 16% and 12% higher pod yields compared to local K6. In pearl millet ICTP 8203 gave 25 % higher yield compared to local Kaveri while in finger millet Surya nandi gave 47% higher yield compared to local.

Figure 6.1.7.5: Demonstration & evaluation of improved crop varieties at pilot villages during 2016-17, Devanakonda mandal.

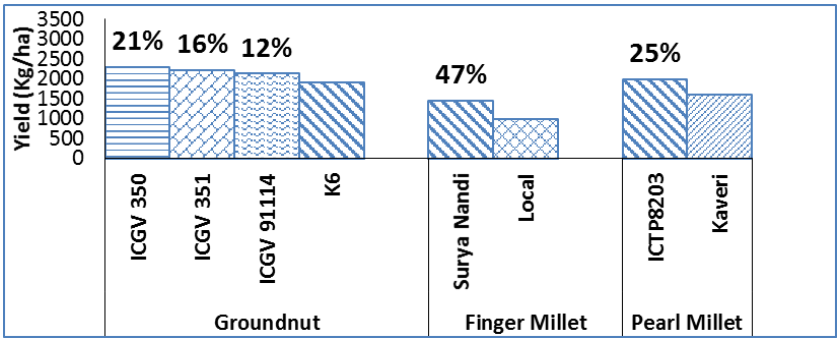


Figure 6.1.7.6: Performance of different varieties of groundnut, finger millet and pearl millet during 2016-17 at Devanakonda pilot villages.

Seed production

Availability of good quality seed is a major constraint in increasing agricultural production particularly in Rayalaseema region. During 2016 total 2010 Kg of groundnut breeder seeds (ICGV 91114 and ICGV 350) were given to 22 progressive farmers at Devanakonda pilot villages. During last two years, this activity has substantially increased the availability of quality groundnut seed at pilot villages. 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 (Table 6.1.7.4 and Table 6.1.7.5). During 2016-17 all the necessary formalities and certification process have been completed. During 2016-17, ICRISAT purchased back quality groundnut seed of 7091 Kg and Pigeonpea 9633 kg from the farmers by giving them higher price compared to market rate.

Integrated pest management (IPM)

In partnership with ANGRAU scientists from Ananatapur 42 pheromone traps were installed in the cotton fields at Devanakonda pilot sites (Fig 6.1.7.7). These scientist gave the training and visited fields and provided the information about the deadly bollworm for cotton crop. This allowed farmers to do the day to day monitoring of major insects & pests at the site.

Most of the farmers who have used this information feels that this was very useful in guiding about the plant protection measures.

Table 6.1.7.4: List of progressive farmers provided breeder seed for seed production during 2016-17 at Banaganapalle pilot site Kurnool.

S. No	Farmer name	Village	Crop	Variety	Area (Ac)
1	M.Khaja hussain	Nandavaram	Pigeonpea	ICPL-87119	1.5
2	R.Srinivasulu	Nandavaram	Pigeonpea	ICPL-87119	1.5
3	S.Venkat swamy	Nandavaram	Pigeonpea	ICPL-87119	2
4	Y.Srinivasulu	Nandavaram	Pigeonpea	ICPL-87119	3
5	M.Seshi reddy	Kaipa	Pigeonpea	ICPL-87119	2
6	M.Sekharreddy	Kaipa	Pigeonpea	ICPL-87119	2
7	M.Thirupathi reddy	Kaipa	Pigeonpea	ICPL-87119	2

Table 6.1.7.5: List of progressive farmers provided breeder seed for seed production during 2016-17 at Devanakonda pilot site Kurnool.

S. No	Farmer name	Village	Crop	Variety	Area (Ac)
1	B.Bheemanna	Devanakonda	Groundnut	ICGV 91114	3.50
2	B.Dastagiri	Devanakonda	Groundnut	ICGV 91114	1.50
3	K.Urukunda Reddy	Devanakonda	Groundnut	ICGV 91114	1.50
4	B.Murali	Devanakonda	Groundnut	ICGV 91114	2.00
5	B.Bajari	Devanakonda	Groundnut	ICGV 91114	2.00
6	M.Jakir Husen	Devanakonda	Groundnut	ICGV 91114	0.50
7	S.Krishna Reddy	Devanakonda	Groundnut	ICGV 350	0.50
8	A Mallikarjuna	Devanakonda	Groundnut	ICGV 91114	2.50
9	K Ramudu	Devanakonda	Groundnut	ICGV 350	1.00
10	J.Lakshmi	Devanakonda	Groundnut	ICGV 350	1.50
11	A.Sailaja	Kukatikonda	Groundnut	ICGV 350	2.50
12	GN.Ramudu	Nelathalamari	Groundnut	ICGV91114	2.00
13	C.Nagaraju	Nelathalamari	Groundnut	ICGV91114	1.00
14	C.Savitri	Nelathalamari	Groundnut	ICGV91114	1.00
15	Bd.Aruna	Nelathalamari	Groundnut	ICGV 350	2.00
16	M.Chandrasekar	Nelathalamari	Groundnut	ICGV 350	2.00
17	G.Veranjineyulu	Bairavanikunta	Groundnut	ICGV91114	1.00
18	G.Ramanjineyulu	Singapuram	Groundnut	ICGV 350	1.00
19	U.Nagaraju	Kukatikonda	Groundnut	ICGV 350	1.00
20	G.Satyanarayana	Kukatikonda	Groundnut	ICGV 350	1.50
21	U.Chakranna	Kukatikonda	Groundnut	ICGV 350	1.00
22	T.Mallikarjuna	K.Venkatapuram	Groundnut	ICGV 350	1.00
23	C Madhusudhana	Devanakonda	Pigeonpea	ICPL 87119	2.00
24	B Mallikarjuna	Devanakonda	Pigeonpea	ICPL 87119	1.00
25	Y Ramanjineyulu	Devanakonda	Pigeonpea	ICPL 87119	3.00
26	Dharmendra Singh	Devanakonda	Pigeonpea	ICPL 87119	2.50
27	M Ramudu	Devanakonda	Pigeonpea	ICPL 87119	1.00
28	B D Sri Rangadu	Nelathalamarri	Pigeonpea	ICPL 87119	1.00
29	C Narasanna	Nelathalamarri	Pigeonpea	ICPL 87119	2.00
30	B Nagaraju	Nelathalamarri	Pigeonpea	ICPL 87119	2.00
31	M Sahadevudu	Nelathalamarri	Pigeonpea	ICPL 87119	4.00
32	N Thikkanna	Nelathalamarri	Pigeonpea	ICPL 87119	3.00

Figure 6.1.7.7: Pheromone traps installed with the help of ANGRAU Scientist, Anantapur at Devanakonda pilot villages.

Recycling of on-farm wastes for improving soil health

Soils at both pilot sites are very low in organic matter. We are evaluating microbial consortia culture (Madhyam culture) for recycling on-farm agriculture and household wastes. The composting using microbial consortia is given to 6 farmers in the pilot sites. With this culture entire process of decomposition is very fast. In addition to this 4 farmers are making vermicomposting and using them for vegetables. To facilitate the program we have provided one shredder for chipping the agricultural wastes into small pieces (Fig 6.7.1.8).

Figure 6.1.7.8: Shredder is being used for chopping cotton stalks at Devanakonda, Kurnool.

Application of Humic Acid and Aquasap for increasing crop yields

During 2016-17, total 8 farmers at Devanakonda and 13 farmers at Banaganapalle pilot sites used aquasap for application on groundnut, Pigeonpea chickpea and chilli. Necessary information and trainings were given to farmers about its dosage and frequency of application. At both pilot sites the farmers were happy and they feel that the 2 applications of aquasap has improved their crop yields (Fig 6.1.7.9). Last year 2015-16, the aquasap was given free of cost to farmers. This year farmers came forward and purchased the aquasap. The application of aquasap gave 4-35% higher groundnut pod yields compared to control. In Pigeonpea 10-31% yield increase was recorded due to application of aquasap. This year humic acid was provided to 4 farmers at Banaganapalle and 7 farmers at Devanakonda pilot villages. Necessary gidence was given to farmers about its use. Farmers have applied humic acid on Pigeonpea, chickpea, chilli and vegetables. About 10-31% increase in crop yields were recorded.

Figure 6.1.7.9: Application of humic acid and aquasap for increasing crop yields at Kurnool pilot sites.

Rainfall and groundwater monitoring

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. The rainfall recorded during 2016-17 at Devanakonda and Banaganapalle pilot sites are shown in Fig 6.1.7.10. Devanakonda received low rainfall of 629 mm while the rainfall at Banaganapalle was 377 which is much below normal. At Devanakonda pilot village the groundnut suffered badly due to Aug 2017 drought while at Banaganapalle chickpea and Pigeonpea suffered moisture stress towards the pod tilling stage. One groundwater meter has been provided at Devanakonda 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.

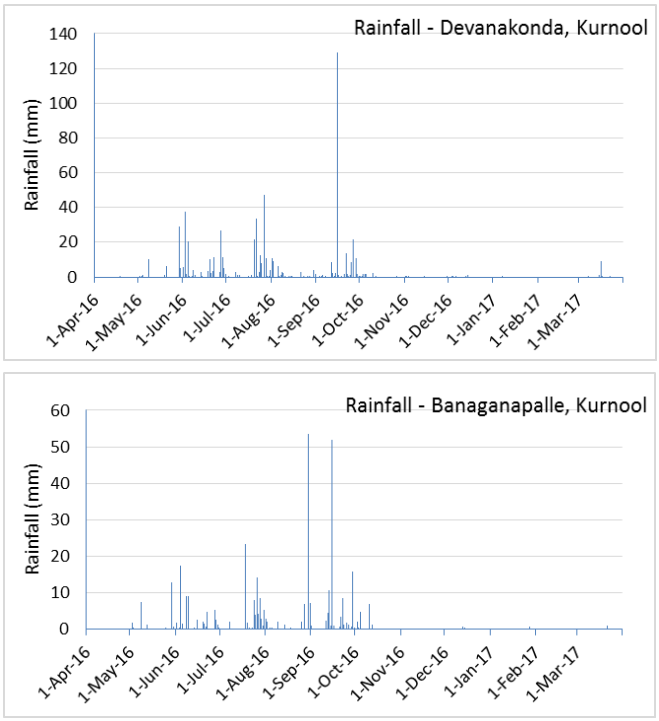


Figure 6.1.7.10: Rainfall recorded at Devanakonda and Banaganapalle pilot villages during 2016-17.

Weather-based advisories for rainfed groundnut farmers in Devanakonda

Under AP Rythu Kosam project, ICRISAT, Microsoft, aWhere and Chaitanya Youth Association have joined hands to take up a pilot project on dissemination of sowing advisories to rainfed groundnut farmers of Devanakonda Mandal in June 2016. The team visited Devanakonda and nearby five villages (Bhiravanikunta, Kukatikonda, K. Venkatapuram, Nelathalamarri and Singapuram), and interacted with farmers on the proposed weather-based sowing and crop advisory dissemination activity (Fig 6.1.7.11). Farmers were very enthusiastic and about 175 farmers have registered their mobile phone numbers for receiving the free advisories. Four dual-purpose raingauges were installed in Devanakonda, Kukatikonda, K. Venkatapuram and Nelathalamarri. Farmers were trained on rainfall measurement, data recording, displaying and sharing.

Using historic climate data of Devanakonda Mandal for 30-years (1986-2015) and following climatic water balance approach, rainfed growing season characteristics were identified. Crop-growth simulations based on past 30 years' data indicated optimum groundnut crop sowing window as the period between 20 June to 20 July for obtaining higher yields. With the help of a water balance based sowing application developed jointly by ICRISAT and Microsoft, beginning of groundnut crop growing period was identified based on 1) present Moisture Adequacy Index (MAI) and future MAI computed based on forecasted rainfall. Once the beginning of crop growing period is identified, sowing advisory was initiated. Advisories were prepared both in Telugu and English and ten advisories were disseminated to the registered farmers of Devanakonda area. In the first week of June 2016, Devanakonda received some rainfall and some non-registered farmers have sown groundnut; while the sowing application identified the optimum sowing period starting from 24 June. We have recommended sowings from 24 June and the registered farmers have followed and completed sowings by first week of July. During the 31-day period starting from 10 August 2016, Devanakonda received a meagre rainfall of about 8 mm and the groundnut crop sown in the first week of June was severely affected by lack of soil moisture and in some farmers' fields, the crop dried up. Rains received later did not improve the situation. On the other hand, crop sown during last week of June and first week of July recovered from the moisture stress after receiving rains from 11 September onwards. Dissemination of advisories continued till harvesting of crop. Advisories included recommendations on land preparation, soil-test based fertilize application, recommendation, farm yard manure application, sowing, seed treatment, optimum sowing depth, preventive weed management, maintaining proper plant density, observing Boron and Zinc deficiency in field and applying nutrients if needed, harvesting, shade drying of harvested pods and storage. Weather advisories brought climate awareness among registered groundnut farmers in Devanakonda and encouraged them to initiate sowing at the optimum time. They have also followed the weather-based agro advisories for proper crop management and obtained better yields and are out of loss compared to some of the farmers who have sown earlier. Crop cutting experiments at a few selected farmers indicated that some registered farmers who have sown as per our advisory have obtained about 30 per cent increase in groundnut yields compared to some of the non-registered farmers, who have sown in the first week of June 2016.

Figure 6.1.7.11. Farmers' Group Meeting on weather-based advisories and rainfall measurement by a woman farmer in Kukatikonda, Devanakonda, Kurnool.

Capacity building and awareness programs

During 2016-17 several capacity building and awareness programs were taken up at Devanakonda and Banaganapalle sites (Fig 6.1.7.13). Most of the awareness programs, trainings, field demonstrations and meetings were conducted in partnership with government line departments (Agriculture, watershed, and horticulture), local NGO and other agencies. The major focus was given on moisture conservation technology (broadbed and furrow system, conservation furrows, contour cultivation and farm ponds), integrated nutrient management, aquasap, humic acid, rain gun, kitchen gardening and high yielding varieties. Demonstration and trainings were given to farmers on use of improved farm implements and chipper shredder (Fig 6.1.7.13). During 2016-17, total 66 capacity building and 373 awareness programs were conducted at pilot villages and about 3744 farmers were oriented and trained on innovative and new technologies for implementation in their fields (Table 6.1.7.6). Several VIP'S from Department of Agriculture, Universities and ICRISAT have visited the pilot sites. The ICRISAT Governing board chair professor Chandra Mandramotto and Dr. Suhas P Wani, Director, Research Program-Asia have visited Devanakonda pilot villages and saw the various activities (Fig 6.1.7.12).

Table 6.1.7.6: Awareness & capacity building programs on various technologies at pilot sites in Kurnool during 2016-17.

S. No.	Villages	No of awareness programs	No of capacity building programs	Total participants
1	Devanakonda	58	9	654
2	Kukatikonda	32	8	339
3	Nelathalamarri	35	5	456
4	K Venkatapuram	30	5	400
5	Singapuram	27	4	245
6	Bhairavanikunta	23	4	270
	Total	205	35	2364
1	Sankalapuram	25	6	215
2	Appalapuram	26	5	235
3	Pandlapuram	20	4	140
4	Nandavaram	38	6	380
5	Kypa	39	6	225
6	Venkatapuram	20	4	185
	Total	168	31	1380
	Grand total	373	66	3744

Figure 6.1.7.12: Visit of ICRISAT Governing Board Chair Professor Chandra Mandramottoo, DR. Suhas P Wani and senior official from Department of Agriculture and Watersheds at Devankonda pilot sites during 2017.

Figure 6.1.7.13: Capacity building & awareness program at Kurnool pilot site 2016-17.

Partnership with ANGRAU for control of pink bollworm on cotton

In partnerships with ANGRAU scientists Dr. Ravindranath Reddy Principal scientist & Head ARS, Anantapur and Dr. Radhika, Senior Scientist, ARS Anantapur, we organized awareness programs about the pink boll worm for cotton at Devanakonda pilot villages (Fig 6.1.7.14). ANGRAU scientists provided pheromone traps free of cost to several farmers and trained them on collecting the relevant information. These scientists visited several cotton fields and provided information to control this deadly insect which badly damaged cotton during 2015. They also gave information about other IPM technologies for other crops.

Figure 6.1.7.14: Farmer's interaction with ANGRAU scientist about Pink Bollworm on Cotton at Devanakonda, Kurnool.

Media coverage:

Our various Rythu Kosam activities at pilot villages and district were well covered by various newspapers and radio (Fig 6.1.7.15).

ఇక్రిశాట్ ..బాసట

తల్లి సాలు.. వేరుశనగకు నీటి పాదు..

ఇక్రిశాట్ బృందం పర్యటన

మొక్కలు నాటే యంత్రం దేవీమో తిలించిన శాస్త్రవేత్తలు రైతులతో ముఖాముఖి

'ప్రతి గ్రామంలో ఫారంపాండ్లను తవ్వించాలి'

ఈనాడు కర్నూలు

ఇక డిజిటల్ సేద్యం!

'సోయింగ్ యాప్' సక్సెస్ • దేవనకొండలో ఫలించిన ప్రయోగం

• 30 శాతం అధిక దిగుబడి సాధన

రైతులకు అన్ని విధాలా సహకరిస్తాం

ఇక్రిశాట్ చైర్మన్ చంద్రముద్ర మాటో

Figure 6.1.7.15: Newspaper coverage of various activities of pilot sites in Kurnool during 2016-2017.

6.1.8. Nellore

Progress on innovative interventions

Pilot site action plan preparation

In meeting with all line department heads and interactions with all stakeholders, action plan for pilot sites to be developed as sites of learning were discussed for all 11 villages across 3 mandals. 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. During 2016-17, there was sever drought which drastically affected the cropped area and productivity in dryland areas of Podalkur mandal. In all, there was ~70-75 per cent area left fallow because of very poor rainfall, which drastically affected GVA increase in this area.

Soil test-based fertilizer recommendation including for micronutrients

In order to promote soil test best balanced nutrient management, farmer meetings were conducted across all the 11 villages in pilot sites and farmers were oriented about soil health status of their soil and guided accordingly to use balanced nutrient management strategy. Similarly, the soil results were shared thru established wall writtings in the villages.

Figure 6.1.8.1: Wall writings at village gram panchayat/ School.

In order to create interest amongst the framers and to promote their active involvement in the project, the soil health cards were distributed along with agriculture department stffs during field days and exposer visits to live demonstrations in presence of Agriculture and horticulture department staffs.

Figure 6.1.8.2: Soil health crads distribution to farmers.

In paddy, focus was given to follow balnced nutrient management incluiding deficient Zn and B. Accordingly, nutrients were supplied thru agriculture department to farmers. The results clearly revealed that there has been 8.1 to 20.2 per cent increase in paddy yield compared to farmers practices of nutrient management (Table 6.1.8.1).

Table 6.1.8.1: Performance of paddy under different management conditions under on farm situation in

Mandal	Village	Paddy yield (q/ha)		Per cent increase over FP
		BN	FP	
T.P.GUDUR	Papireddypalem	79.7	73.3	8.1
	Peduru	74.6	68.3	8.4
	T.P.GUDUR	67.2	59.2	11.9
	Varigonda	78.9	62.9	20.2

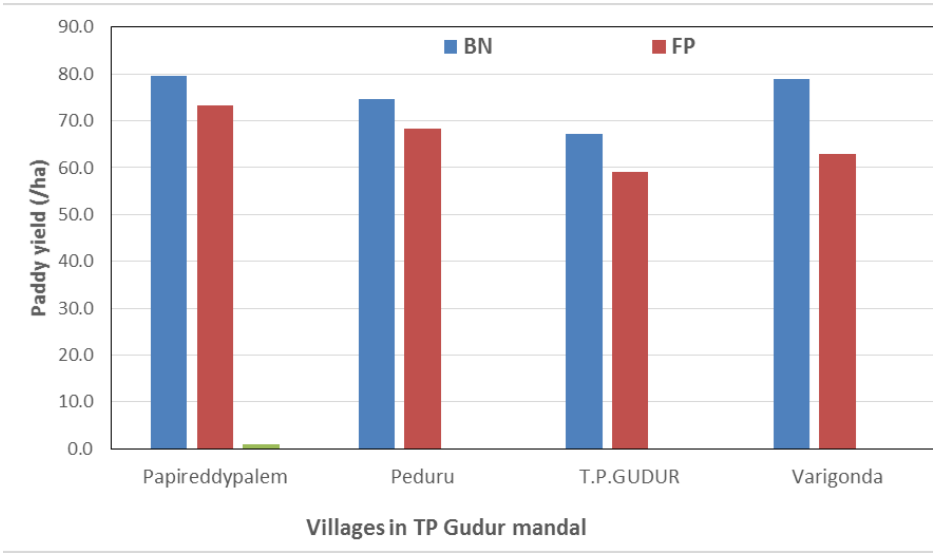


Figure 6.1.8.3: Performance of paddy under different management conditions.

Monitoring rain gauge

Automatic weather station installed during 2015-16 in Kanuaparthi village of Podalkur mandal, was monitored for actual rainfall. Similarly by using Indian meteorological data set, monthly actual and normal rainfall of Podalkur, Indukurpeta and Thotapalligudur mandals were analyzed, shared with stakeholders.

Figure 6.1.8.4: Monitoring of raingauge established in Kanuparthi village, Podalukuru mandal for rainfall.

See appendix for normal and actual rainfall in Nellore district.

Partnerships for scaling out in pilot sites

To develop pilot sites as sites of learning and as field laboratory for piloting new technologies, we have entered into partnerships with 2 local NGOs w.e.f. 1st July 2015 to facilitate linking with farmers for the larger impacts. The 2 NGOs are Haritha Society selected for Coastal belt of Indukurpeta and TP Gudur mandal whereas Rural Reconstruction & Development Society (RRDS) is selected for dryland belt of 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. 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) as shown in Layout 1.

Layout 1. Participatory varietal selection cum yield maximization trials in Nellore	
Traditional/local cultivars + Farmers' Inputs (FP)	HY Cultivar + Best-bet management (IP)

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 6.1.8.2). During season, crops evaluated include cereals and millets (paddy), pulses (greengram, blackgram, pigeonpea).

The activity is promoted through Rythu Kosam 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 6.1.8.2: Participatory evaluation of improved crop cultivars in Nellore district.		
Crop	Cultivar	Quantity
Black gram	PU 31	500
Black gram	T 9	600
Fodder Sorghum	CSH24MF	51
Green gram	SML 668	0
Green gram	LGG 460	0
Green gram	IPM 02-14	48
Pigeonpea	Maruthi (ICPL 8863)	30
Pigeonpea	TS3R	20
Sagarika (liters)	Sagarika plant nutrients	50
	Total	1299

Figure 6.1.8.5: Agriculture department and ICRISAT staffs during Blackgram, greengram seed distribution.

As regards to dryland area in Podalkur mandal, the severe drought affected crop sown area drastically. There was no crop on most of the area and filed was left fallow. However, we conducted very few demonstrations of black gram and green gram and the cultivars evaluated performed fairly good under prevailing drought situation viz, drought condition during earlier growth stage and also 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 8.4 to 13.7 per cent higher yield in green gram and 12.2 to 15.9 per cent increased yield in black gram over local cultivars (Table 6.1.8.3).

Table 6.1.8.3: Performance of green gram and black gram yield under different management conditions.			
Crops	Village	Aldhrthi	Kanpurthi
Green gram	PU 31	8.3	7.3
	Local seed	7.6	6.3
Per cent increase		8.4	13.7
Black gram	SML 668	7.4	6.3
	Local seed	6.5	5.3
Per cent increase		12.2	15.9

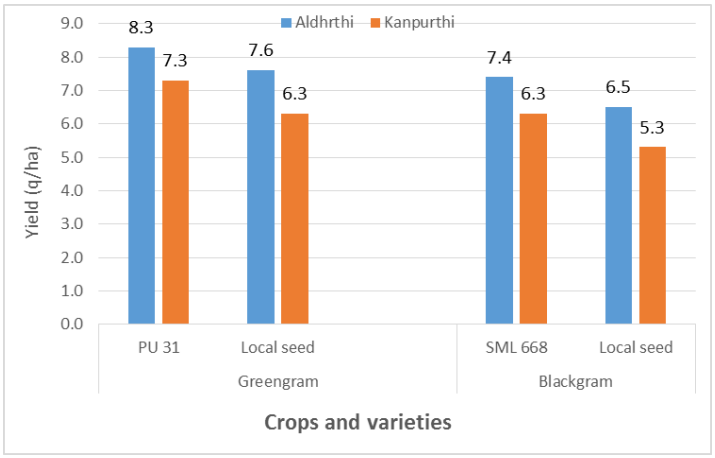


Figure 6.1.8.6: Performance of green gram and black gram yield.

Micro-Irrigation

Due to severe drought, ground water table went down and very few farmers had limited water availability for micro irrigation in citrus garden. SO the plan was to schedule irrigation properly so as to economize the water and survive the plants. The was targeted in convergence with DoA and DoH for effective implementation and higher returns. The important crops covered include Acid lime, mango, tomato, vegetables.

Figure 6.1.8.7: Awareness programe about proper irrigation management at Kanpurthi village Podalakur mandal.

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. On an average, farmers harvested 18 t/acre green fodder and are very happy about the cultivar.

Figure 6.1.8.8: A farmer from Varigonda village, P.P Gudur mandal showing his fodder sorghum field.

Improving soil fertility

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. Basically, 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, we are evaluating microbial consortia culture, Madhyam culture, which was tested on-station at ICRISAT last year in pilot mandals, for recycling on-farm agricultural, household wastes. This activity was promoted through lead farmers in the villages and capacity building. The composting activity using microbial consortia is piloted with 150 farmers field producing 150 t of compost.

Figure 6.1.8.9: Aerobic composting demonstrations using shredder machine and Madhyam culture in Nellore.

Demonstration of Sagarika- a sea weed extract

Sagarika is a Sea weed extract organic fertilizer which is used as foliar spray for commercial 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. 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 area for all together three times sprayings. 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 demonstrations are being conducted in pilot villages on organic paddy, maize, vegetables viz, brinjal, capsicum, okra, Bitter gourd, etc has resulted in good crop growth and vigour. The yield data revealed that there is significant yield improvement with Sagarika application. Overall, ICRISAT covered 50 Sagarika demonstrations.

Figure 6.1.8.10: Sagarika demonstrations

Women-centric small scale vegetable cultivation

For mainstreaming women in agriculture, small scale vegetable cultivation or kitchen gardening is being promoted through women farmers. Demand-driven vegetable seeds are distributed to about 100 women who are growing vegetables during *kharif* 2015.

Figure 6.1.8.11: (a) Vegetable seed distribution to school childrens at Gollapalem Village, Kodavalur Mandal. (b) Vegetable kits distributed to women groups at T.P.Gudur-2 village.

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. Altogether, about ~52 capacity building programs were conducted in pilot villages and about 1152 men and women farmers were oriented and trained on innovative and low hanging technologies for implementation in field (Table 6.1.8.4).

Table 6.1.8.4: Detail of capacity building programs conducted in pilot villages in Nellore during 2016.

District	Mandal	No of meetings	Number of Farmers		
			Men	Women	Total
Nellore	T.P.Gudur	22	460	125	585
Nellore	Podalakur	18	207	55	262
Nellore	Indukurpet	12	210	95	305

Progress in collaboration with line departments

Agriculture

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 6.1.8.4)

Table 6.1.8.4: The quantities of secondary and micronutrients indented, received and distributed, 2016-17.				
Mandal	Micronutrient	Indented (t)	Received (t)	Distributed (t)
T.P.Gudur	Zinc Sulphate	5.69	3.69	3.69
	Borax	0.94	0.94	0.89
	Gypsum	69.69	59.69	32.69
Podalakur	Zinc sulphate	50.69	20.69	20.69
	Borax	0.79	0.79	0.765
	Gypsum	80.69	80.69	75.69
Indukurpet	Zinc sulphate	5.69	3.69	3.69
	Borax	0.94	0.94	0.94
	Gypsum	45.69	34.69	34.69

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 (350 t received/260 t distributed and sunnhemp (200 t received/110 t distributed) and pillipesara (12 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.

6.1.9. Prakasam

Interventions

Based on the survey location-specific appropriate interventions have been identified.

- Soil test based balanced fertilizer management
- Improved crop varieties
- Use of organic and bio fertilizers
- Improved crop management (seed treatment, weed, pest and disease management)
- In-situ and ex-situ water conservation
- High density planting in cotton

Productivity enhancement through soil test-based nutrient management, climate smart crop & varietal evaluation, in-situ moisture and land management, Evaluation of new products – Aquasap, humic acid.

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%. Soil test based crop specific fertilizer recommandations were provided which includes secondary and micro nutrients. Table 6.1.9.1 shows the secondary and micro nutrients provided to farmers in pilot villages are shown.

Table 6.1.9.1: Micronutrients (tons) distribution status in the pilot site villages Prakasam during 2016.			
Mandal	Zinc sulphate	Gypsum	Boran
Konakanametla	10	101	0.810
Kanagiri	11	28	0.540
Kothapatnam	6	240	0.200
Ongole	11	63	0.375
District (Mean of all 56 mandals)	657.2	4735.9	40.022

Promising crop varieties were evaluated by farmers in a participatory mode, but due to poor rainfall the results may not reflect the performance. Various crop cultivars like pearl millet, pigeonpea, blackgram and multi cut-sorghum are provided in the pilot villages (Table 6.1.9.2). Crops sown during *kharif* has failed due to poor and scanty rainfall. The black gram during *rabi* has been conducted CCE and yield data reveals that the balanced nutrition has improved the crop yield by 36% over control field (Fig. 6.1.9.1) despite the drought kind of situation in the pilot villages of Prakasam district.

Table 6.1.9.2: Improved crop varieties seeds provided in pilot villages of Prakasam district during 2016.					
Mandal	Crop	Variety	Quantity (kg)	Extent (acres)	No of farmers
Konakanametla	Pigeonpea	ICPL 87119	125	25	12
Konakanametla	Pigeonpea	TS3R	20	4	4
Kanagiri	Pigeonpea	ICPL 87119	173	35	16
Kanagiri	Pigeonpea	TS3R	30	6	4
Kanagiri	Pearl millet	ICTP 8203	110	14	10
Kanagiri	Pearl millet	ICTP 8203	40	5	2
Konakanametla	Multi-cut Sorghum	CSH 24 MF	102	7	34
Kanagiri	Maize	6 Hybrid Varieties	6	2	3
Konakanametla	Black gram	LBG 752	28	3.5	5
Konakanametla	Black gram	PU31	25	3.2	5

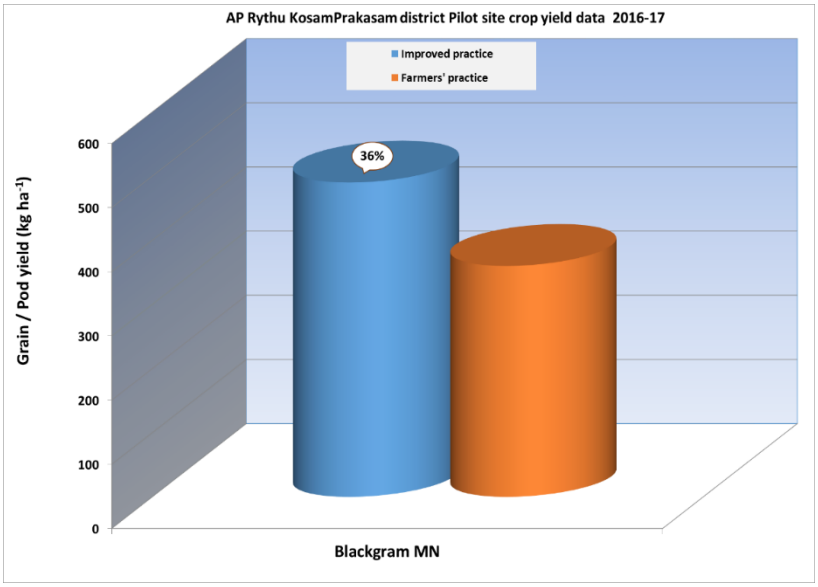


Figure 6.1.9.1: Effect of balanced fertilization on crop yield, Prakasam district, 2016.

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

Aerobic compost preparation to enrich soil organic carbon

To improve the soil health, cost effective on-farm prepartion of aerobic composting has been introduded in volving 65 farmers in pilot villages of Kanagiri and KK mitla mandal (Table 6.1.9.3). The contortia microbial culture was provided to prepare the compost of 180 ton using the crop resudu 10-12 weeks. The necessary demonstartion with trainings were provided (Fig. 6.1.9.2).

Table 6.1.9.3:. Aerobic compost prepared in Prakasam district during 2016.

Mandal	Material used for composting	Quantity produced (tons)	No of beneficiaries
Kanigiri	Crop residue 75%, buffalo dung 25%	60	20
Konakanamitla	Crop residue 75%, buffalo dung 25%	120	45

Figure 6.1.9.2: Demonstartion of shredder machine to chop hardy crop residue for compost preparation, Konakanametls, Prakasam, 2016.

The following Figure explains that the farmers who have produced aerobic compost have used average 1100 kg/ ha of compost along with recommanded ferilizers to chilli and pearl millet crop and it has reflected an increase of pearl millet yield by 15% and and marginal increase 5% in chilli (Fig 6.1.9.3). In subsequent years, farmers increase the compost preparation and reduce inorganic fertilizer gardually 15-20% a year.

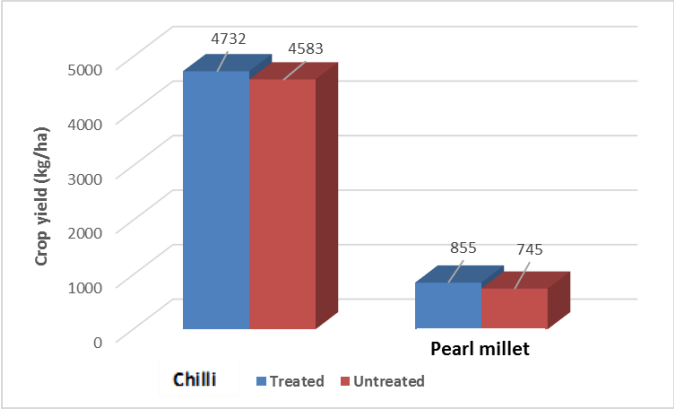


Figure 6.1.9.3: Crop yield due to application of aerobic compost in addition to the recommanded fertilizers, Prakasam, 2016.

Foliar application of Humic acid, a multi nutrient organic solution

Plant growth promoter Humic acid was used as a foliar application to pigeonpea and vegetable (okra) crops in three pilot villages by 6 farmers in three villages. Pigeonpea was affected by drought and average okra yield were 2945 kg/acre while untreated plot yielded 2523 kg/acre with an increase of 17% over control (Fig.6.1.9.4). The results were quite encouraging.

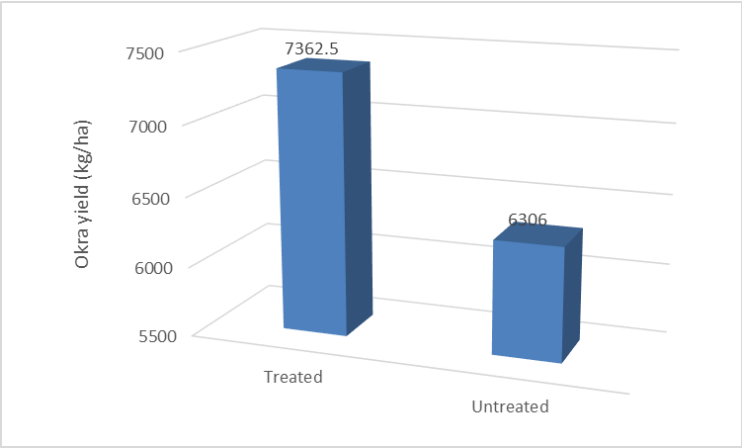


Figure 6.1.9.4: Effect of Humic acid application on Okra yield, Prakasam, 2016.

***Glricidia*- on-farm generation of N-rich green manure**

The soils in the pilot sites are 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 by PROTECT NGO (Fig. 6.1.9.5). But due to severe moisture tress Gliricidia could not be planted this year.

Figure 6.1.9.5: Gliricidia nursery raised by a SHG in pilot site, Prakasam.

Vermicomposting

Convergence with agriculture department scheme on vermin-compost preparation demonstration and training have been conducted in pilot site villages (Fig. 6.1.9.6).

Figure 6.1.9.6. Vermi-compost units in Punugodu village, Prakasam.

In-situ moisture and land management

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 contour (cultivation across slope) cultivation, conservation furrow system of moisture conservation practice BBF has been done with vegetable farmers in red soils of pilot sites.

Integrated pest management

As a convergence with the department of agriculture, 74 pheromone traps have been installed in six pilot site villages. Dr V Changal Rao a plant protection officer from Central Integrated Pest Management Center, Vijayawada has conducted trainings and visits to advise farmers to take appropriate measures at different crop growth stage (Fig. 6.1.9.7).

Figure 6.1.9.7: Pheromone trap installation and Dr V Changal Rao giving awareness to farmers in Nagampalli village, Konakanamitla mandal.

Training and capacity building

Training and capacity building has been an integral part of this project and the objective of the training is to impart knowledge on various farming systems/practices for enhanced incomes. Before initiating under taking training sessions were organized and created enabling environment by providing inputs and hand holding support to the farmers (Table 6.1.9.4). One district level, two mandal level and 45 village level training covering 1440 farmers (includes 135 women) were conducted during 2016-17 covering aspects like soil health management, compost preparation, humic acid application, best management practices in fisheries, various schemes of horticulture including use of easy planter, etc. (Fig. 6.1.9.8).

Table 6.1.9.4. Capacity building programs conducted in Prakasam during 2016-17.			
Program	No. of trainings	Officials	Farmers
District level	1	35	
Mandal level	2	28	250
Village level	45	45	1440

Figure: 9.1.9.8. Various capacity building programs in Prakasam district, 2016.

Publicity

కాలుష్యాన్ని నివారించండి

– ఇక్రిశాట్ ఆధ్వర్యంలో విద్యార్థులకు అవగాహన

సాక్షి Sat, 05 March 2016 epaper.sakshi.com/c/8938051

అజొల్లా సాగు పశువులకు మేలు

ప్రొటక్ట్ సంస్థ జిల్లా కార్యదర్శి చంద్రారెడ్డి

రైతులకు అవగాహన కల్పిస్తున్న చంద్రారెడ్డి

బ్రాహ్మణపల్లి(కొనకనమిట్ల): రైతులు తమ పశువులకు దాణాగా ఉపయోగించుకొనేందుకు అజోల్లా సాగు ఎంతో ఉపయోగంగా ఉంటుందని జిల్లా ప్రొటక్ట్ సంస్థ కార్యదర్శి చంద్రారెడ్డి అన్నారు. మండలంలోని చినమనగుండం పంచాయతీ బ్రాహ్మణపల్లి గ్రామంలో అజోల్లా ప్రయోగాత్మక ప్రదర్శన ద్వారా రైతులకు అవగాహన కల్పించారు. శుక్రవారం వ్యవసాయంలో అధిక ఉత్పాదకత సాధించేందుకు వివిధ పంట దశలలో కలిగే మార్పులను రైతులకు అవగాహన కల్పించారు. గ్రామానికి చెందిన పోలెబోయిన కాశయ్యకు గొట్లగట్టు పశువైద్యశాల తరపున అజోల్లా యూనిట్‌ను అందజేశారు. అజోల్లా యూనిట్ కావాల్సిన రైతులు పశువైద్యశాలలో సంప్రదించాలని లైవ్ స్టాక్ అసిస్టెంట్ అల్లూరయ్య, ప్రొటక్ట్ సంస్థ టెక్నికల్ డైరెక్టర్ ఎన్.రవి వివరించారు. కార్యక్రమంలో ప్రొటక్ట్ సంస్థ సభ్యులు పి.కృష్ణారెడ్డి, పశువైద్యశాల సబార్డినేటర్ రంగనాయకులు, రైతులు పాల్గొన్నారు.

సాక్షి Sat, 21 May 2016 epaper.sakshi.com/c/10448710

ఆధునిక పద్ధతులపై అవగాహన

గొట్లగట్టు, (కొనకనమిట్ల) ,న్యూస్‌టుడే: కొనకనమిట్ల మండలంలోని గొట్లగట్టు, బచ్చలకూరపాడు గ్రామాల్లో రైతులు సాగు చేస్తున్న పంటలను ఇక్రిశాట్ శాస్త్రవేత్త చెంగల్ రావు మంగళవారం పరిశీలించారు. పంటలు పూర్తయిన తరువాత కంది, పత్తి మిరప చేలలో పంట పూర్తయ్యాక మిగిలిన కర్రపుల్లలను కాల్చివేయకుండా యంత్రంతో చిన్న ముక్కలుగా కత్తిరించుకోవడం ఎలాగో రైతులకు ప్రదర్శించారు. ఈ ముక్కలను సేంద్రియ ఎరువుగా ఉపయోగించుకోవచ్చని రైతులకు సూచించారు. ప్రాజెక్టు అధికారి చంద్రరెడ్డి మాట్లాడుతూ రైతులు రసాయన ఎరువుల వాడకం తగ్గించాలని, సేంద్రియ ఎరువులతో పంటలపై తెగుళ్లను నివారించవచ్చని సూచించారు.

మట్టి నమూనాలతో మెరుగైన ఫలితాలు..

–సైంటిస్టు రాఘవేంద్రరావు

సలనూతలలో మినుము పంట పరిశీలన

కొనకనమిట్ల : రైతులు తమ పొలాల్లోని మట్టిని పరీక్షలు చేయించుకోవడం ద్వారా వ్యవసాయంలో మెరుగైన ఫలితాలు సాధించవచ్చునని ఇక్రిశాట్ సైంటిస్టు ఎస్. రాఘవేంద్రరావు పేర్కొన్నారు. మండల వ్యవసాయశాఖ, జిల్లా ఇక్రిశాట్ ఆధ్వర్యంలో మండలంలోని సలనూతలలో రైతు కోసం కార్యక్రమం శుక్రవారం నిర్వహించారు. రైతులు సాగు చేసిన మినుము పంటను పరిశీలించి రైతులతో మాట్లాడారు. రైతులకు వ్యవసాయంలో పాటించాల్సిన విషయాలపై రాఘవేంద్రరావు మాట్లాడుతూ సూక్ష్మధాతు లోపాలను ముందుగా రైతులు తెలుసు కోవాలన్నారు. రైతులు దుక్కిలో బోరాన్, జింక్ కలపాలని సూచించారు. సలనూతలలో రైతు రవీంద్రారెడ్డి సాగు చేసిన మినుము పంటను పరిశీలించిన అధికారులు ఎకరాలో కొంత భాగం మినుము పంటను సేకరించి గింజలు తీశారు. మెగా వాటర్‌షెడ్ పరిధిలోని కొనకనమిట్ల, కనిగిరి, కొత్తపట్నం, ఒంగోలు మండలాల్లో సీడ్స్ శాంపిల్స్ సేకరించి వివరాలను ప్రభుత్వానికి నివేదిక అందజేయనున్నట్లు సైంటిస్టు రాఘవేంద్ర రావు అన్నారు. కార్యక్రమంలో వ్యవసాయాధికారి కాశీవిశ్వనాధ్, ప్రొటక్ట్ సంస్థ కార్యదర్శి ఎస్.చంద్రారెడ్డి, సిబ్బంది కృష్ణారెడ్డి, జగజ్జీవన్, వెంకటేశ్వర్లు, ఎంపిఈఓ రమేష్, రైతులు పాల్గొన్నారు.

వ్యవసాయంలో ఆధునిక పద్ధతులు పాటించాలి

• సైంటిస్టు చెంగల్‌రావు

కొనకనమిట్ల : వ్యవసాయంలో రైతులు ఆధునిక పద్ధతులు పాటించి అధిక దిగుబడులు సాధించాలని సమగ్ర నష్టనిర్వహణ కేంద్రం ప్లాంటు ప్రొటక్షన్ సైంటిస్టు డి.వి.చెంగల్‌రావు పేర్కొన్నారు.

మండల వ్యవసాయశాఖ, జిల్లా ఇక్రిశాట్, ప్రొటక్ట్ సంస్థ ఆధ్వర్యంలో శుక్రవారం మండలంలోని గొట్లగట్టు, బచ్చలకూరపాడు గ్రామాల్లో రైతు కోసం కార్యక్రమంలో ఆయన మాట్లాడారు. రైతులకు వ్యవసాయంలో పాటించాల్సిన విషయాలపై అవగాహన కల్పించారు. సూక్ష్మధాతు లోపాలను ముందుగా రైతులు తెలుసుకోవాలన్నారు. అనంతరం ఆయా గ్రామాల్లో రైతులు సుబ్బయ్య, తీడుపతయ్య, సుబ్బారావు సాగు చేసిన కంది, మినుము, వంగతోటలను ఆయన పరిశీలించి తగు సూచనలు, సలహాలు అందజేశారు. కార్యక్రమంలో వ్యవసాయాధికారి వి.కాశీవిశ్వనాథ్, ప్రొటక్ట్ సంస్థ కార్యదర్శి చంద్రారెడ్డి, రైతులు కాశయ్య, పి.వెంకటేశ్వర్లు, ఓబులరెడ్డి పాల్గొన్నారు.

గొట్లగట్టులో కంది పంటను పరిశీలిస్తున్న సైంటిస్టు

సాక్షి Sat, 01 October 2016 epaper.sakshi.com/c/15134100

Figure 9.1.9.9: Paper clippings and media publicity.

6.1.10. Srikakulam

Soil test-based nutrient management

Soil test based balanced fertilizers application was adopted by farmers in pilot villages and about 13.5 tons of zinc sulphate and 44 tons of gypsum were used by farmers in 3 pilot Mandals (Table 6.1.10.1, and Figure 6.1.10.1) in paddy and groundnut crops in Srikakulam district during 2016-17. Groundnut pod yield increased by 21% in Ranasthalam whereas

paddy grain yield increased by 21%, 18% and 20% (Figure 6.1.10.2) in Polaki, Ranasthalam and Seethampeta respectively.

Table 6.1.10.1: Secondary and micronutrients distribution in pilot Mandals during 2016- 2017			
Pilot Mandal	Zinc sulphate (t)	Gypsum (t)	Borax (t)
Polaki	6	20.3	0
Ranasthalam	4	22	0
Seethampeta	3.5	2	0
Total	13.5	44	0

Figure 6.1.10.1: Balanced nutrition trials in Ranasthalam pilot villages in Srikakulam district.

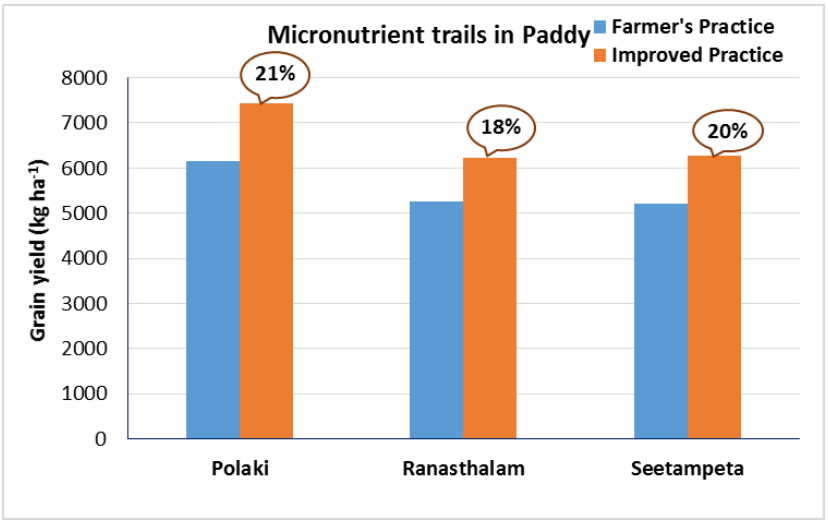


Figure 6.1.10.2: Mean grain yield of paddy under soil test based balanced nutrition trials in pilot mandals of Srikakulam district.

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

Aerobic composting: Aerobic compost was produced by farmers in the pilot villages (Table 6.1.10.2, and Figure 6.1.10.3) by using paddy straw waste, cow dung and microbial consortia culture. Total 50 beneficiary farmers produced about 43 tons in 3 pilot mandals in Srikakulam.

Table 6.1.10.2: Progress of aerobic composting in pilot villages during 2016-17.				
Name of the pilot Mandal	No of trials	Quantity produced (kg)	Material used	No of beneficiaries
Ranasthalam	25	20030	30% dung & 70% paddy waste	24
Seethampeta	8	6100	30% dung & 70% paddy waste	8
Polaki	25	17110	30% dung & 70% paddy waste	18
Total	58	43240		50

Figure 6.1.10.3: Aerobic composting in pilot villages in Srikakulam district

Usage of Shredder: During 2016-17, twenty farmers recycled farm wastes of oil palm and coconut by using shredder cum chipping machine (Figure 6.1.10.4) and produced 202 tons (Table 6.1.10.3) of compost in and around pilot mandals in the district. Arranged and conducted demonstrations of shredder in KVK, Amadalavalasa and other places in the presence of District Collector, officers of line departments, scientists and farmers during KVK Technical week event conducted during 1-4 February 2017 and on other occasions.

Figure 6.1.10.4: Use of shredder by farmers in the villages in Srikakulam district.

Farmers' participatory demonstrations on compost application (5 t/ha) in paddy crop was conducted in pilot villages and farmers got increase grain yield in the range of 15% to 21% (Figure 6.1.10.5) in pilot mandals in addition to 20% reduction in chemical fertilizers usage.

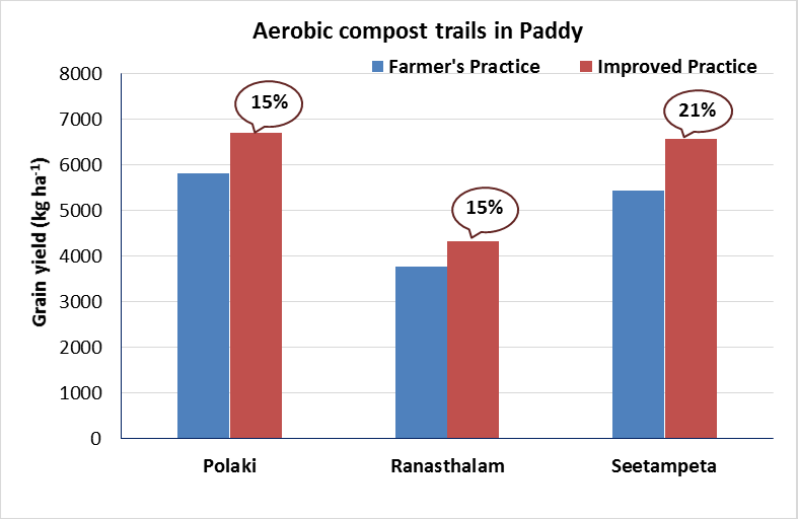


Figure 6.1.10.5: Farmers' participatory demonstration on compost use in pilot mandals.

Table 6.1.10.3: Progress of shredder usage in Srikakulam district during 2016-17.

S. No.	Name of the farmer	Village	Mandal	Material/CROP	Compost produced (t)	Mobile number
1	Kolli ramachandra rao	Pisini	Raanasthalam	Oil palm	4	9440291036
2	Pothuri Vivekvarma	Sathivada	Gara	Oil palm	5.5	9701778888
3	Simma Hanumanturao	Nijamabad	Gara	Oil palm	12	9440759772
4	Y.V.S.Ramamraochowdary	Jafarabad	Gara	Oil palm	3.5	9912003057
5	chukka venkata ramana	kotcherla	Ranastalam	Coconut	3	9959752858
6	Panchireddy Simhachalam	Gundivellipeta	Narasannapeta	Oil palm	20	9440459216
7	Manneti Raju	Boyapalem	Ranastalam	Coconut	6	
8	Alla Suri	Naruva	Ranastalam	Coconut	5	7286915151
9	P Appalanarasayya	Venkatarav peta	Ranastalam	Oil palm	5	
10	Ch Appalanaidu	Gopalapenta	Narasannapeta	Oil palm	10	
11	D.Samabamuty raju	D.L.Palavalsaa	G.Sigadam	Oil palm	11	9395122997
12	Kalisetti Prasad naidu	Ch.Rajam	Ranastalam	Oil palm	12	7658977788
13	Borusu Vasudha	NarsapurAgrahaarm	Etcherla	Oil palm	22	9133160319
14	R.Tavitibabu	Kesavanipalem	Laveru	Oil palm	12	9100024875
15	R.Prakasa rao	Kesavanipalem	Laveru	Oil palm	4	9100024875
16	A.Alivelumangamma	Sathivada	Gara	Oil palm	9	
17	A.Chakradaram	Sathivada	Gara	Oil palm	10	
18	K.Usha	Sathivada	Gara	Oil palm	6	
19	K.Venakataramana	Srikurmam	Srikakualam	Oil palm	20	
20	G.Lakshmidevi M.L.A	Srikakulam	Srikakualam	Oil palm	22	
					202	

Gliricidia planting: Gliricidia saplings were grown in social forestry nursery with the help of social forestry department officials and undertaken plantations in pilot villages. About 5000 saplings were planted in 18 villages benefiting 976 farmers (Table 6.1.10.4 and Figure 6.1.10.6).

Table 6.1.10.4. Details of Gliricidia plantation in Srikakulam district during 2016.			
Name of the mandal	No. of Villages	No of Plants	No of beneficiaries
Polaki	6	2220	432
Seethampeta	8	1200	236
Ranasthalam	4	1580	308

Figure 6.1.10.6: Nursery raising and planting of Gliricidia in pilot villages during 2016.

Climate smart crop & varietal evaluation

Farmers' participatory varietal evaluation trials were conducted by farmers in the pilot villages during *kharif* and *rabi* seasons of 2016-17 (Table 6.1.10.5 and Figure 6.1.10.1) and these cultivars performed better than the local varieties grown by farmers. Drought tolerant groundnut variety, ICGV 91114 performed better than local variety and pod yield increased by 23%, Pigeonpea hybrid, ICPH 2740 planted as inter crop as well as on paddy field bunds performed better than the local variety and grain yield increased by 18%. Similarly grain yield of ragi variety GPU 28 increased by 27%, green gram variety IPM 02-14 increased by 24%, black gram variety PU 31 increased by 16% and T 9 vaiety by 13% over local varieties grown by farmers in Srikakulam pilot villages.

Table 6.1.10.5: Improved cultivars evaluated in pilot villages during 2016-17.			
Crop	Cultivar	Seed supplied (kg)	No. of Beneficiaries
Groundnut (*Kharif*)	ICGV 91114	500	12
Pigeonpea	ICPH 2740	80	44
Ragi	GPU 28	15	4
Groundnut (*Rabi*)	ICGV 91114	200	3
Black gram (*Rabi*)	PU 31	100	20
Black gram	T 9	50	7
Green gram	IPM 02-14	100	14
Safflower	PBNS 12	30	11
Ragi	GPU 28	35	9

Figure 6.1.10.7: Groundnut (ICGV 91114) and green gram (IPM 02-14) planted in farmers' fields in Ranasthalam mandal.

Evaluation of new products – Aquasap, humic acid

Aqua sap foliar spay trials were conducted in paddy, chilli and other crops in pilot villages of Srikakulam district during 2016-17. Grain yields of paddy increased by 16% in Polaki and Ranasthalam mandals and 21% in Seethampeta mandal (Figure 6.1.10.8). Similar results were obtained in other crops (Table 6.1.10.6 and Figure 6.1.10.9).

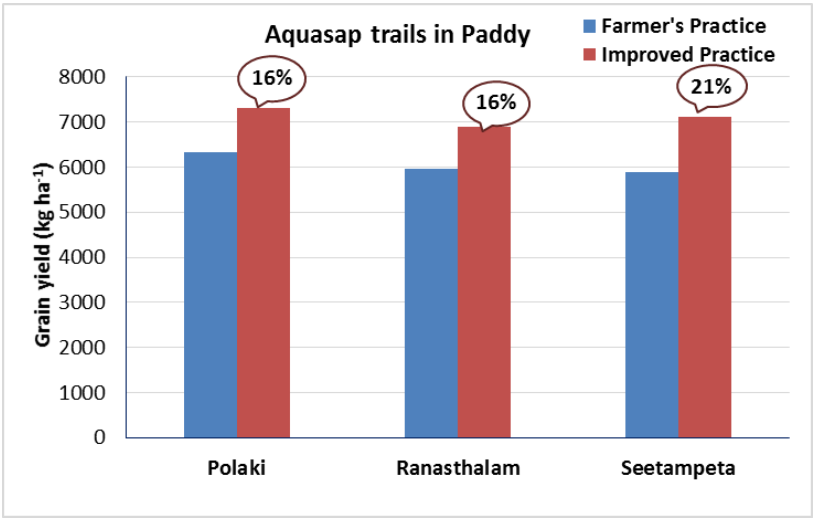


Figure 6.1.10.8: Performance of aqua sap foliar spray on paddy crop in pilot mandals of Srikakulam district.

Figure 6.1.10.9: Aqua sap foliar spray trials in Chilli (left) and Paddy (right) in Polaki pilot villages, Srikakulam district.

Table 6.1.10.6: Aqua sap foliar spray on different crops in pilot villages of Srikakulam district										
S. No.	Farmer	Village	Mandal	Season	Quantity (ml)	Crop	Area (ac)	Yield (kg/acre)		% increase over control
								Control	Aqua sap trial	
1	B.Sanyasappalanaidu	Kondamulagam	Ranasthalam	*Kharif*	2000	Groundnut	1	450	500	11
2	K.Jampunaidu	Ch.Rajam	Ranasthalam	*Kharif*	2000	Groundnut	1	480	520	8
3	M.Ramana	Ranasthalam	Ranasthalam	*Kharif*	2000	Paddy	1	1760	2000	14
4	G.Vijayakumar	Maruvada	Ranasthalam	*Kharif*	1000	Vegetables	1		30 % benefit	30
5	Alevelumangamma	MPDO ranasthlam	Ranasthalam	*Kharif*	1000	Vegetables	1		30 % benefit	30
6	Chellayivalasa	Palli Raja rao	Polaki	*Kharif*	1000	Vegetables	1		30 % benefit	30
7	Chellayivalasa	Ravada Endamma	Polaki	*Kharif*	1000	Vegetables	1		30 % benefit	30
8	Chellayivalasa	Bora	Polaki	*Kharif*	1000	Vegetables	1		30 % benefit	30
9	Koradalatcheyyapeta	Pyla Bhaskara rao	Polaki	*Kharif*	1000	Vegetables	1		30 % benefit	30
10	susaram	Tammineni Santha	Polaki	*Kharif*	1000	Paddy	1	1680	1920	14
11	V Simhachalam	santhamalli	Seethampeta	*Kharif*	1000	Paddy	1	1600	1840	15
12	P Tellayya	k.p.valasa	Seethampeta	*Kharif*	1000	Paddy	1	1680	1930	15
13	N Kurmarao	beeruguda	Seethampeta	*Kharif*	1000	Paddy	1	1730	1860	8
14	D Kurmarao	Ravivalasa	Ranasthalam	*Rabi*	250	Maize	1	500	600	20
15	V Ramachandra rao	Tallavalasa	Ranasthalam	*Rabi*	250	Papaya	1	Yet to be harvested		
16	P Rambabu	Sancham	Ranasthalam	*Rabi*	250	Maize	1	Yet to be harvested		
17	D Vasu	Derasam	Ranasthalam	*Rabi*	250	Ridge ground	1	700	900	29
18	P Narayana rao	Derasam	Ranasthalam	*Rabi*	250	Ridge ground	1	500	650	30
19	V Sriramulu	Pallipeta	Polaki	*Rabi*	250	Chilli	1	400	600	50
20	D Danesh	Pallipeta	Polaki	*Rabi*	250	Chilli	1	450	600	33
21	K Dushyanta rao	Magathapadu	Polaki	*Rabi*	250	Ground nut	1	500	620	24
22	S Simmayya	Gollalavalasa	Polaki	*Rabi*	250	Chilli	1	350	410	17
23	P Sriramulu	Gollalavalasa	Polaki	*Rabi*	250	Chilli	1	370	430	16
24	S Narayana	Gollalavalasa	Polaki	*Rabi*	250	Chilli	1	400	480	20
25	S Satyam	Gollalavalasa	Polaki	*Rabi*	250	Chilli	1	410	520	27

Integrated pest management

Integrated pest management (IPM) interventions were promoted in pilot villages in chilli, paddy and other crops by putting up bird perches, sticky traps and pheromone traps to monitor as well as to control pests (Table 6.1.10.7 and Figure 6.1.10.10).

Table 6.1.10.7: IPM interventions adopted by farmers in pilot villages in Srikakulam district.

Mandal	Village	Farmer Name	Crop	Practices adopted
Polaki	Pallipeta	V Srirammurty	Chilli	Bird Perches/Sticky Traps/Pheramone Traps
Polaki	Pallipeta BC colony	N Sanyasi rao	Chilli	Bird Perches/Sticky Traps/Pheramone Traps
Polaki	Magathapadu	Ch Lavanna	Paddy	Bird Perches/Sticky Traps/Pheramone Traps
Ranasthalam	Ranasthalam	M.Govinda rao	Paddy	Bird Perches/Sticky Traps/Pheramone Traps
Ranasthalam	Mukthumouram	K Appalanidu	Chilli	Bird Perches/Sticky Traps/Pheramone Traps
Ranasthalam	Kondamulagam	B Sanyasppanaidu	chilli	Bird Perches/Sticky Traps/Pheramone Traps
Ranasthalam	D Vasu	Derasam	Brinjal	Bird Perches/Sticky Traps/Pheramone Traps
Seetampeta	Peddarama	A Mohanarao	Paddy	Bird Perches/Sticky Traps/Pheramone Traps
Seetampeta	Peddarama	A Sureedu	Paddy	Bird Perches/Sticky Traps/Pheramone Traps
Seetampeta	Devanapuram	K Sayam	Paddy	Bird Perches/Sticky Traps/Pheramone Traps

Figure 6.1.10.10: Bird perches in Chilli (left) and pheromone trap in Brinjal (right) installed in pilot villages of Srikakulam.

On-farm mechanization

Under on-farm mechanization, dry seeding of paddy in Polaki pilot villages where canal irrigation is there and drum seeding in Ranasthalam pilot villages under bore well irrigation was promoted to save irrigation water as well as to reduce labour requirement. DSR method along with soil test based balanced nutrition performed better than farmers' practice and grain yield increased by 18% in Polaki and 14% in Ranasthalam pilot villages (Figure 6.1.10.11 and 6.1.10.12). Whereas drum seeding alone has increased grain yield in the range of 3% to 9% in Ranasthalam pilot villages as compared to normal practice of transplanting by labourers (Table 6.1.10.8).

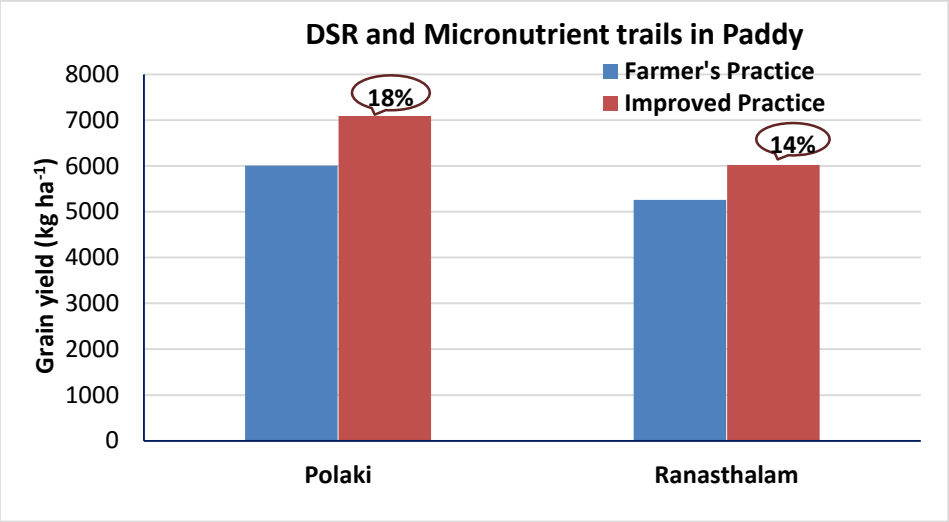


Figure 6.1.10.11: Performance of dry seeding in Polaki and drum seeding of paddy in Ranastham pilot villages in Srikakulam.

Table 6.1.10.8: Drum seeding of Paddy in *Kharif* 2016.

S. No.	Mandal	Village Name	Farmers names	Crop	Area (ac)	Trial plot Yield (q)	Normal practice Yield (q)	% increase in yield
1	Rasnasthalam	Naruva	Nid*rabi* ngi Tata	Paddy	2.5	80	76	5
2	Rasnasthalam	Naruva	Kurimina Ramachandra	Paddy	1	25.6	23.5	9
3	Rasnasthalam	Naruva	M Ramana	Paddy	2	53	51	4
4	Rasnasthalam	Naruva	Geeru Gurunaidu	Paddy	1.5	39.2	37	6
5	Rasnasthalam	Saragadapeta	Kolli Suri	Paddy	1	25	24	4
6	Rasnasthalam	Sancham	Pathivada Eswra rao	Paddy	2.5	78	76	3
7	Rasnasthalam	Sancham	K Ramunaidu	Paddy	1.5	40.5	38	7
8	Rasnasthalam	Sancham	Akula Gopi	Paddy	2	55.2	53.1	4

Figure 6.1.10.12: Drum seeding of paddy in Ranasthalam mandal in Srikakulam district

Publicity

Publicity on ICRISAT interventions were undertaken in the form of pamphlets (Figure 6.1.10.13 and Figure 6.1.10.14) and newspapers coverages (Figure 6.1.10.15) to create awareness amongst farmers as well as to adopt new interventions in Srikakulam district.

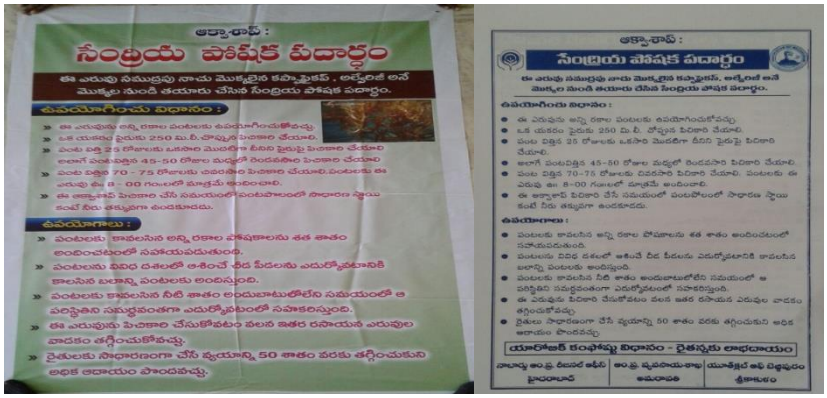


Figure 6.1.10.13: Pamphlets about aqua sap on how to use and advantages of usage.

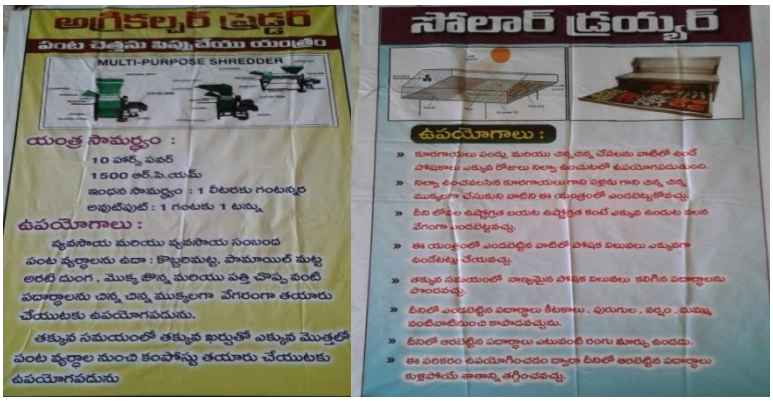


Figure 6.1.10.14: Pamphlets on shredder (left) and solar dryer (right) on how to use and benefits.

Figure 6.1.10.15. Media coverage on soil testing, ICRISAT cultivars, shredder, cocoa as intercrop and aqua culture.

Capacity building.

Various capacity building programs like formal and informal training programs, meetings with farmers for awareness creation, field days, field demonstrations, putting up ICRISAT stall in capacity building programs of line departments etc. conducted during 2016-17 and about 18565 farmers (12488 men and 6077 women) (Table 6.1.10.9, Figure 6.1.10.16 and Figure 6.1.10.17) participated in these activities.

Table 6.1.10.9: Farmer's participation in capacity building programs in pilot mandals.

Pilot Mandal	Capacity building programs		Total
	Men	Women	
Polaki	5583	3436	9019
Ranasthalam	2457	915	3372
Seethampeta	3248	1481	4729
Srikakulam (District level)	1200	245	1445
Total	12488	6077	18565

Figure 6.1.10.16: Visit of Sri Nara Chandrababunaidu, Honorable Chief Minister, Govt. of Andhra Pradesh in KR stadium, Srikakulam on 4th May 2016.

Figure 6.1.10.17: Visit of elected representatives (MLAs, MPs and other VIPs) of district to ICRISAT stall during farmers' meetings.

6.1.11. Visakhapatnam

Demonstration of Improved crop varieties

Improved seeds of different crops majorly groundnut, finger millet, Pigoenpea, pearlmillet and Rajma have been distributed to the progressive farmers in pilot mandals to evaluate the performance and adoptability of cultivars in the pilot villages. Different Pigoenpea varieties like ICPL 85063 (Lakshmi) and ICPL87119 (Asha) with varying crop duration between 135-180

days and groundnut varieties like ICGV91114, with varying crop duration between 95-120 days were distributed to progressive farmers in different pilot villages. Crop cutting experiments have shown that improved crop varieties along with management practices have performed better and the yield ranges between 10% and 83% across different crops (Figure 6.1.11.1). The yield from improved groundnut variety ICGV 91114 was 31% higher over farmers' practice and finger millet was 49%. Similarly, pigeonpea yield was 10% and 39% higher over farmers' practice for ICPL 87119 and ICPL 85063 respectively. Improved variety of Rajma (Arka Mangala) recorded 83% higher yield compared to farmers' practice.

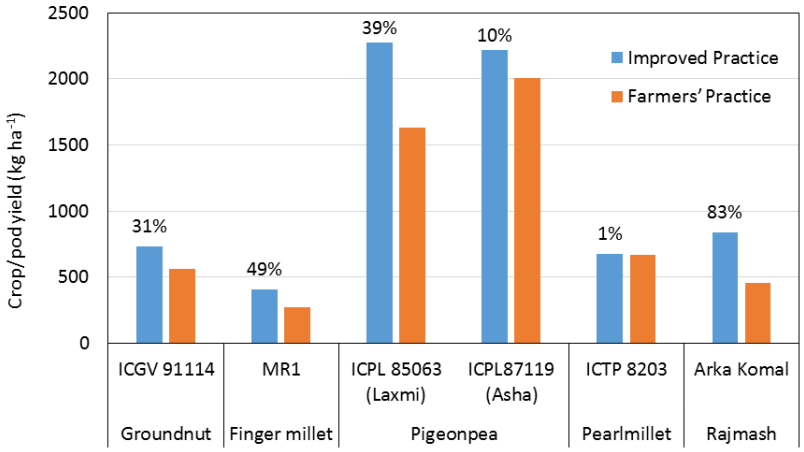


Figure 6.1.11.1: Performance of improved crop cultivars in selected Mandals of Visakhapatnam district.

Paddy is one of the important crops in the selected Mandals. During *kharif* 2016, new varieties of paddy were demonstrated with improved management practices. Crop cutting studies revealed that nearly 25% higher grain yield was achieved with improved management practices over farmers' conventional practice (Figure 6.1.11.2). Similarly, straw yield was also higher by 25% compared to farmers' practice. This clearly revealed that there is a potential to bridge the yield gaps with improved management practices.

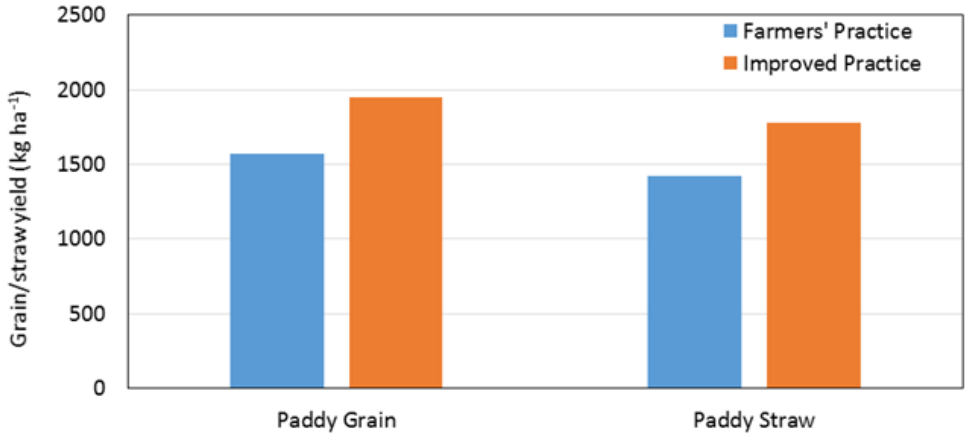


Figure 6.1.11.2: Paddy grain yield with improved management practices in pilot Mandals in Visakhapatnam district.

Farmer participatory evaluation of Maize hybrids

In collaboration with CIMMYT, different maize hybrids were evaluated with farmers' participation to identify farmers' preferred hybrids for upscaling. About 15 farmers were identified in Padmanabham Mandal and provided seeds with 3 entries with one check plot. Some trials were provided with 2 entries with one check plot.

Crop cutting studies revealed that the cob yield ranges between 2000 to 12000 kg ha^{-1} across different hybrids. CAH 1421 and CAH 1423 hybrids performed well compared to other hybrids with cob yield of more than 12000 kg ha^{-1} (Figure 6.1.11.3 & 6.11.1.4 and Table 6.1.11.1).

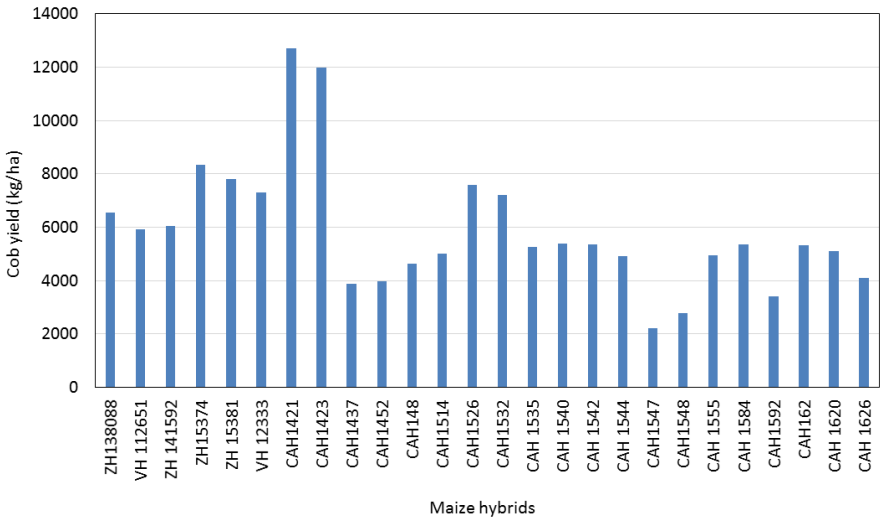


Figure 6.1.11.3: Cob yields of maize hybrids in pilot Mandals in Visakhapatnam district.

Figure 6.1.11.4: Maize demonstrations in pilot Mandals of Visakhapatnam district.

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

Glyricidia seedling distribution

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 we have distributed 300 Glyricidia seedling to Pilot villages of Padmanabham mandal i.e Korada and Venkatapuram (Figure 6.1.11.5).

The benefits of Gliricidia plants are: Improved crop yields, enhanced soil productivity and increase in crop yields were found with the addition of Gliricidia leaf manuring in several rainfed crops. Yields of different rainfed crops due to Gliricidia leaf manuring improved significantly in many regions.

Figure 6.1.11.5: Gliricidia Plant distribution to farmers in Padmanabham Mandal, Visakhapatnam district.

గ్లైరి సీడియా మొక్కలతో పంటలకు మేలు

మొక్కలు పంపిణీ చేస్తున్న సందీప్ నాయక్

పద్మనాభం : గ్లైరిసీడియా మొక్కలను పెంచి వీటి కాండాలను భూములో కలియ దున్నడం వల్ల భూమిలో సేంద్రియ పదార్థం ఏర్పడి పంటలు బాగా పండుతాయని ఇక్రిశాట్ సంస్థ ప్రతినిధి సందీప్ నాయక్ చెప్పారు. మండలంలోని కోరాడ, వెంకటాపురం గ్రామాల్లో రైతులకు 350 గ్లైరిసీడియా మొక్కలను ఆయన పంపిణీ చేశారు. ఈ సందర్భంగా సందీప్ నాయక్ మట్లాడుతూ నాటిన ఏడాది తర్వాత వీటి లేత కాండాలను భూమిలో కలియ దున్నాలని సూచించారు. గ్లైరి సీడియా ఆకుల్లో కాల్షియం, పొటాషియం, నత్రజని ఉండడం వల్ల పంటలు ఏపుగా పెరుగుతాయన్నారు. వికాస్ స్వచ్ఛంద సంస్థ అధ్యర్యంలో జరిగిన ఈ కార్యక్రమం ఆ సంస్థ ప్రతినిధి రాజు, మాజీ సర్పంచ్ కోరాడ లక్ష్మణరావు, ఇక్రిశాట్ సంస్థ టెక్నీషియన్ శివాజీ పాల్గొన్నారు.

ఆవు మూత్రంతో పోషక విలువలు

పప్పలవానిపాలెం (ఆనందపురం): రసాయనిక ఎరువులను కాకుండా ఆవు మూత్రాన్ని పంటలకు వినియోగించడం వల్ల ఎంతో ఉపయోగమని వ్యవసాయ శాఖ భీమిలి డివిజన్ ఏడీ సి.హెచ్.సుబ్రహ్మణ్యం చెప్పారు. బుధవారం కోలవానిపాలెం పంచాయతీ పప్పలవానిపాలెంలో ప్రకృతి వ్యవసాయంపై శిక్షణ కార్యక్రమం ఏర్పాటు చేశారు. ఈ సందర్భంగా సుబ్రహ్మణ్యం మాట్లాడుతూ పంటలపై రసాయనిక పురుగు మందులు, ఎరువులు వాడడం వల్ల దుష్పరిణామాలు సంభవిస్తున్నాయని చెప్పారు. ఆదర్శ రైతు పప్పల వెంకట రమణ పంచామృతం, జీవామృతం ఎలా తయారు చేయాలో రైతులకు వివరించారు. కార్యక్రమంలోవ్యవసాయాధికారి పి.రంగాచారి, ఎంపీఈఓలు జ్యోతి, శ్రీను, రైతులు పాల్గొన్నారు.

Figure 6.1.11.6: Polularization of Gliricidia in pilot mandal.

Evaluation of Climate Smart Crop Varieties: Rajma

As the part of Primary sector mission and Double digit growth ICRISAT has introduced Arka Komal Rajamsh seed to Pilot area of Chinthapalli mandal. There is long quality seed lacuna, even though Chinthapalli Red, Chinthapalli White existed, these varieties are poor breeding

quality, low yielding less exporting values. To overcome these constraints ICRISAT has initiated seed production of Arka Komal Variety in agency area of Chintapalli.

More than 750 kgs of Rajma seeds were districbuted to tribal farmers of Vangasari, Busalakota, Tajangi, and Lammasingi Villages. The crops found to be suitable for the tribal area as grown earlier and crop cutting experiments were conducted to evaluate yield levels and to record the crops performance during *kharif* 2015. However, due to long dry spells during 2016 *kharif* season, ajmash crop failed. Very few farmers able to harvest the crop (Figure 6.1.11.7 & 6.1.11.8).

Figure6.1.11.7: Seed distribution of Rajma at Chinthapalli.

Major characteristic of Arka Komal are:

- Pure line selection from IIHR-60 (Collection from Australia).
- Plants erect and bushy, Photo insensitive Flat, green straight pods. Seeds light brown, oblong and large.
- Good transportation and cooking qualities.
- Seed yield 1500 kg/ha
- Duration 70 days
- Pod Yield 20 t/ha
- Good export quality

Figure 6.1.11.8: Rajma Arka Komal variety line sowing, and harvesting at Busulakota area of Chinthapalli Mandal, Visakhapatnam district.

Value Addition through Solar drier

Normally tribal people collects non timber forest produces from forest i.e. Amla, marking nut, tamarind, and other fruits. Usually they keep amla in sun light for drying. It became black in colour. To address these issue ICRISAT provided solar drier and conducted awareness camps and trainings to the local community. The pilot villages covered were located in Paderu, G.K. Veedhi and Chintapalli mandals in Visakhapatnam district. The total number of demonstrations in the district were 17 encompassing various commodities like Coffee, Pepper, turmeric, ginger and fishes to over 200 farmer.

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 (Figure 6.1.11.9). 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.


ఆర్థిక స్వావలంబన

అటవీ ఉత్పత్తులను కాపాడుకోవా

Figure 6.1.11.9: Paper clippings on the importance of Solar dryer in Visakhapatnam district.

Capacity building

Details of capacity building programs are presented in Table. More than 100 training programs have been organised in different aspects of farming activities in pilot and other villages of Visakhapatnam district. A total of 3776 farmers have been participated and benefited from these trainings. About 2600 male farmers and 1144 female farmers have been participated and benefited on various aspects of agriculture and allied sector practices (Table 6.1.11.1).

Table 6.1.11.1: Awareness meeting conducted across pilot sites – Visakhapatnam 2016.

s no	Location	Name of the Course/training	Male	Female	Total
1	Padmanabham	Training on mango, Cashew, vegetables crops for soil sampling in 6 mandals	345	154	499
2	Padmanabham	Training on Maize CIMMYT trails in padmanabham crop production, protection (4)	150	43	193
3	Chinthapalli	Training on solar drier - Amla, coffee in Sanivarm and Busalukota (6)	190	87	277
4	Padmanabham, Chinthapalli	Training on Micronutrient zinc, Boron, in paddy and Gypsum in Ground nut awarness meetings in 3 mandal	450	230	680
5	Padmanabham	Awareness meeting on seed production Chickpea in Padmanabham (3)	150	56	206
6	Padmanabham	Awareness training programme on organic farming in horticulture crops Banana, Cashew, Mango alone with Horticulture Dept. (4)	134	43	177
7	Padmanabham	Seed production demo training on Red Gram, G nut -ICRISAT verities	132	23	155
8	Padmanabham	Awareness meetings on Red gram on Paddy fields along with department officers	54	23	77

9	Padmanabham	Awareness meetings on drum seeded technology with Zinc Application	31	12	43
10	Padmanabham	Training programme on Kitchen Gardening in Schools (6)and rural SHG woman group(4)	14	84	98
11	Padmanabham	Awareness programme at Padmanabham mandal on Glyricidia compost, Production of Glyricidia	67	24	91
12	Chinthappli,Padmanabham	Training on Zero Based Natural Farming Trainings along with department in Korada, Padmanabham, (5), Chinthapalli (6)	190	110	300
13	Padmanabham	Awareness programme on Easy Planter in Chilli, Vegetables at Padmanabham mandal (2)	76	23	99
14	Padmanabham	Training on Plant Shredder in Padmanabham	30	13	43
15	All pilot Mandals	Training on Madhyam Culture in Chinthapalli, Padmanabham, Buchayapeta (10)	430	128	558
16	Chintapalli	Training on Rajma Cultivation on new ARKA KOMAL	39	24	63
17	All Pilot Mandals	Yield estimations (CCE) in paddy, maize, Rajma	150	67	217
		Grand Total	2632	1144	3776

6.1.12. Vizianagaram

Pilot Site Interventions 2016-17

- Total 869 soil samples are collected from 23 mandals in Vijayanagaram district in horticulture area were collected from farmers' fields and analyzed in ICRISAT laboratory.
- In Parvathipuram Mandal 95% samples are deficient in organic carbon, 81% samples deficient in available phosphorus, 20% samples deficient in available calcium, 95% samples deficient in available suphor, 95% samples deficient in available zinc and 98% samples deficient in available boron.
- In Pusapatirega Mandal 98% samples are deficient in organic carbon, 5% samples deficient in available calcium, 95% samples deficient in available suphor, 60% samples deficient in available zinc and 65% samples deficient in available boron.
- Dissemination of soil test 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 Pilot villagesvillages.
- Soil health cards were printed in Telugu language and distributed to farmers in the pilot villages.

Figure 6.1.12.1: Soil collection and health card distribution.

Micronutrients distribution Details at pilot Mandals during 2016 and 2017

- Total of 7.5 metric tons of zink sulphate and 27.7 mts of gypsum and 0.9 mts of borax had distributed in Parvathipuram and Pusapatirega pilot mandals.

Figure 6.1.12.1: Details of micronutrients distribution.			
Mandal	Zinc sulphate (mt)	Gypsum (mt)	Borax (mt)
Year	2016-17	2016-17	2016-17
Parvathipuram	4.5	15.7	0 .5
Pusapatirega	3	12	0 .4
Total	7.5	27.7	0 .9

The yield benefit with INM varieties varied between 13-31% over the FP.

Table 6.1.12.2: Effect of INM in Vizianagaram district during 2016-17								
District	Mandal	Crop	Yield kg ha^{-1}		Yield kg ha^{-1}		% Increase over FP	
			Grain	Straw	Grain	Straw	Grain	Straw
			FP	FP	IP	IP		
Vizianagaram	Parvathipuram	Paddy	3890	3820	4400	4350	13	14
Vizianagaram	Parvathipuram	Maize	1810	940	2370	1080	31	15
Vizianagaram	Parvathipuram	Paddy	4760	3780	5520	4860	16	29
Vizianagaram	Pusapatirega	Paddy	4700	6890	5470	8400	16	22
Vizianagaram	Pusapatirega	Maize	6790	4500	8200	5190	21	15
Vizianagaram	Pusapatirega	Paddy	4720	6310	5330	7740	13	23
Vizianagaram	Pusapatirega	Paddy	3950	7480	4550	9480	15	27

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

In the year of 2016 – 17 we planned 28 tons of recycle farm wastes by using Shredder cum chipping machine. Now we reached the 15 tons of farm wastes with 4 Farmers in on around village.

Figure 6.1.12.2: Training farmers on shedder machine at pilot site.

Table 6.1.12.3: Chaff cutter using farmers in Vizianagaram 2016-17.							
Sl	Name of farmer	Village	Mandal	District	Season	Crop	Producing tones
1	B Satyaprasad	Konayyapalem	Pusapatirega	Vizianagaram	*Rabi*	Coconut	5
2	Bose	Peda Pathivada	Pusapatirega	Vizianagaram	*Rabi*	Coconut	3
3	Varma Raju	Thottadam	Pusapatirega	Vizianagaram	*Rabi*	Coconut	3
4	K Satyam	Peda Pathivada	Pusapatirega	Vizianagaram	*Rabi*	Coconut	4

Aerobic compositing demonstrations and Beneficiaries details:

- Total No of demos 68 with 68 beneficiaries
- Total Quantity of waste material(30%: 70% Dung,paddy) used for preparing is 118000

Total Quantity of manure produced from waste is 96350 kgs.

Table 6.1.12.4: Details of aerobic compost trails in pilot sites.					
Mandal	No Of Trails	Quantity used (kg)	Quantity produced (kg)	Waste material used	No of beneficiaries
Pusapatirega	27	63000	49200	30%: 70% Dung,paddy	27
Parvathipuram	41	55000	47150	30%: 70% Dung,paddy	41
Total	68	118000	96350		68

Figure 6.1.12.3: Training farmers on aerobic composting.

Climate Smart Crops and Varietial Evolutions:

Figure 6.1.12.4: Demonstration of pesticides usage messures.

Table 6.1.12.5: Details of varietial trails of different crops in pilot sites.			
Crop	Cultivar	Quantity (kg)	Beneficiaries
Groundnut	ICGV 91114	420	14
Pigeonpea	ICPl 7119	53.5	17
Fodder sorghum	CSH24MF	40	5
Ragi	GPU 28	40	9
Aqua sap (liters)	Sea weed extract	36	36
Microbial culture for aerobic composting	Madyam	68	119
Compost production by using Shredder machine	Chipper Shredder	15	4
Transplanting vegetables by using Easy planter	Easy planter	4	4
Gliricidia saplings planted		670	654

The yield benefit with improved varieties varied between 21-23% over the farmers varieties.

Table 6.1.12.6: Effect of improved varieties in vizianagaram district during 2016-17								
District	Mandal	Crop	Yield kg ha^{-1}		Yield kg ha^{-1}		% Increase over FP	
			Grain	Straw	Grain	Straw	Grain	Straw
			FP	FP	IP	IP		
Vizianagaram	Parvathipuram	Groundnut	310	550	380	660	23	20
Vizianagaram	Pusapatirega	Groundnut	190	1220	230	1500	21	23

Sagarika Aqua Sap Demo Farmer List

Total No of 24 trails were conducted in two pilot mandals in brinjal maize papaya, chilli etc. The data is being processed.

Figure 6.1.12.5: Demonstration of Aqua sap trails.

INTEGRATED PEST MANAGEMENT Trails Details:

Figure 6.1.12.6: Phermone traps demonstrations in the farmer's fields.

- 5 No of ipm trails conducted Brinjal chilli and paddy in Pusapatirega Pilot mandal.

Figure 6.1.12.7: INTEGRATED PEST MANAGEMENT						
S. No	District	Mandal	Village	Farmer Name	Crop	Proparties
1	Vizianagaram	Pusapatirega	Pathivada	P Narayana	Brinzil	Bird Perches/Sticky Traps/Pheramone Traps
2	Vizianagaram	Pusapatirega	Vempadam	K Appalanaidu	Chilli	Bird Perches/Sticky Traps/Pheramone Traps
3	Vizianagaram	Pusapatirega	Govindapuram	V Paparao	Paddy	Bird Perches/Sticky Traps/Pheramone Traps
4	Vizianagaram	Pusapatirega	Chodavada	S Rambabu	Paddy	Bird Perches/Sticky Traps/Pheramone Traps
5	Vizianagaram	Pusapatirega	Vempadam	P Sarswathi	Paddy	Bird Perches/Sticky Traps/Pheramone Traps

On-farm mechanization

Here we promoting various technologies in our one pilot site those are Drum seeder (5), Shedder (3), Azolla (2), and drip irrigation (9) In Papaya, Maize, Chilli.

Table 6.1.12.8: AZOLLA KITS for Animal Husbandry.				
S.NO	MANDAL	VILLAGE	NAME OF THER FARMERS	No. of units
1	Pusapatirega	Gumpam	G Pydithalli	1
2	Pusapatirega	Perapuram	Thalada Aruna	1

Table 6.1.12.9: Easy Planter trails.						
S.No	Farmer Name	Father name	Village	Mandal	District	Crop
1	K Narayanappadu	Satyam	Vempadam	Pusapatirega	Vizianagaram	Brinzil
2	K Ramnaidu	Jaganaddam	Vempadam	Pusapatirega	Vizianagaram	Chilli
3	P Appalanaidu	Sanyasiappadu	Vempadam	Pusapatirega	Vizianagaram	Brinzil
4	K Apparao	Adanna Late	Vempadam	Pusapatirega	Vizianagaram	Brinzil

Table 6.1.12.10: Drumseeding Paddy in Karif							
						Yielding	
S. No	Mandal	Village Name	Farmers names	Crop	Area in Acrs	Trail(qt)	Notmal (qt)
1	Pusapatirega	Pusapatirega	Emmandi Appalakonda	Paddy	2	62	54
2	Pusapatirega	Perapuram	B Narayana	Paddy	1.7	53	47
3	Pusapatirega	Govindapuram	P Ramakrishna	Paddy	1	29	26
4	Pusapatirega	Yerukonda	G Ramunaidu	Paddy	2	64	55
5	Pusapatirega	Pusapatirega	B Pydinaidu	Paddy	1.7	51	44

Table 6.1.12.11: Fertigation trials 2016-17						
S. No.	Farmer	Village	Mandal	District	Crop	Area(acre)
1	Vali sanibabu	Pasupam	Pusapatirega	Vizianagaram	Coconut	3
2	V Sriram	Pasupam	Pusapatirega	Vizianagaram	Maize	5
3	V Ramnaidu	Thallapeta	Pusapatirega	Vizianagaram	Papaya	6
4	K Ramana	Pasupam	Pusapatirega	Vizianagaram	Coconut	3
5	P Sudhakar	Konayyapalem	Pusapatirega	Vizianagaram	Coconut	8
6	B Satya Prasad	Konayyapalem	Pusapatirega	Vizianagaram	Coconut	12
7	P Tatarao	Pathivada	Pusapatirega	Vizianagaram	Chilli	0.5
8	P Narayana	Pathivada	Pusapatirega	Vizianagaram	Maize & Chiil	7
9	G Pandodu	Gumpam	Pusapatirega	Vizianagaram	Coconut	4

Farmer Producer Organization: ICRISAT Team was supported Ngo's to form FPO's

Table 6.1.12.12: Details of PFOs under formation and established.						
S. No.	Department	Commodity	NGO name	Name of the NGO Head	Mandal	Remarks
1	Agriculture	Paddy	Jattu	PariNaidu	Garugubilli	FPOs majorly supported by NABARD
2	Agriculture	Minor millets	Sabala	Saraswathi	Kottavalasa	
1	Horticulture	Coconut	-	Srinivasa Rao	Pusapatirega	
2	Horticulture	Vegetables	Sabala	Saraswathi	Kottavalasa	
3	Horticulture	Vegetables	Deeksha	Santhi	Ramabadrapuram, Badangi	

Publicity: We had prepared the Flexes for Aerobic- Composting, Sagarika Aquasap, Shadder, Solar dryer and printed the Bio-culture and Sagarika Hand pamphlets for the use of farmers.

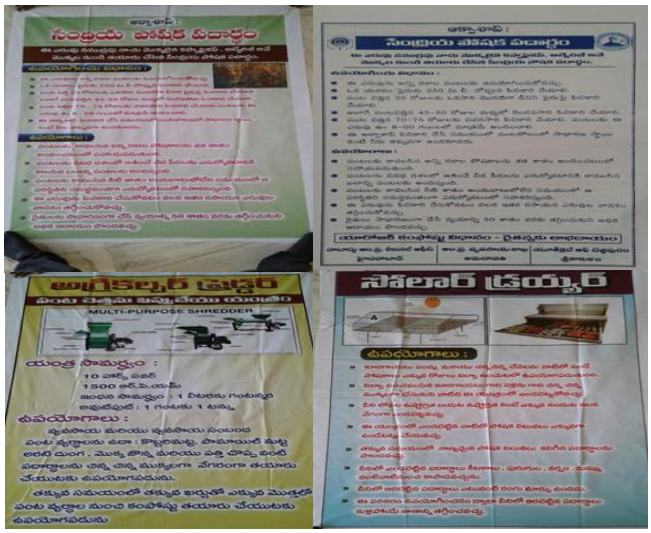


Figure 6.1.12.7: Publicity through pamplets on different interventions.

Capacity building in the period of 2016 – 17 *Kharif* and *Rabi* season conducted 218 awareness programs were conducted in our three pilot mandals on our activities and Departments activities. Now mainly we are conducting the awareness on soil test based nutrient management.

Figure 6.1.12.8: Awareness programs on micronutrient usage.

6.1.13. West Godavari

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 and crop diversification (introducing millet, sorghum, and 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 BBF demonstrated 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 (millet, sorghum, pigeon pea,) were provided to farmers in pilot villages under crop diversification activities (Table 6.1.13.1, Table 6.1.13.2). Moreover department of Agriculture is consistently putting efforts for promoting improved variety seeds. Crop cutting experiments have been undertaken to map the crop yield.

Table 6.1.31.1: Farmers participatory field trials on crop diversification.

Crop	Cultivars	Duration	Scale	Yield
Pigeon pea	ICPH 2740	180-190	70 farmers/ each for one acre field bund	• Hybrid Performance was good • 60-70 grain yield Kg/acre bunds • Additional income of Rs. 4000-6000/HHs
	ICPH 2671	180-190		
	ICPL 87119	180-190		
	ICP 8863	150-160		
	ICP 85063	140-150		
	CSH 24MF	120-140	12 Farmers	4- cuttings for fodder use

Sorghum	CSV 23	110-120	4 farmers	1.2 ton/ha
Pearl Millet	ICTP 8203	100-110	5 farmers	1.70 ton/ha

Table 6.1.13.2: Improved cultivars provided for participatory varietal evaluation during *Kharif* 2015.

Crop	Variety name	Seed supplied (Kg)	Characteristics of variety
Pigeonpea	ICPH 2740	40	Medium-duration, wilt and sterility mosaic resistant, cytoplasmic male–sterility based hybrid. It is indeterminate type and its height is around 230-260 cm. It flowers in 120-125 days and matures in 160-180 days. . This hybrid yields around 2.7-3.0 t ha^{-1} and exhibits about 30% superiority over Asha check. Released for cultivation in AP.
Pigeonpea	ICPH 2671	20	Hybrid ICPH 2671 (180-184 days) has recorded high level of resistance to major pigeonpea diseases such as wilt (0%) and sterility mosaic (8%) under severe disease pressure conditions. Moderately susceptible to *Helicoverpa armigera* pod borer and it is similar to control Maruti.
Pigeonpea	ICPH 87119	30	Medium-duration, wilt and sterility mosaic resistant, cytoplasmic male–sterility based hybrid. It is indeterminate type and its height is around 230-260 cm. It flowers in 100-115 days and matures in 150-170 days. The seeds are dark brown and bold seed. This hybrid yields around 3.0-3.5 t ha^{-1} it is about to release for cultivation.
Pigeonpea	ICPH 8863	10	Fusarium wilt resistant variety released for cultivation in southern states of India. High yielding, Medium duration(150-160 days), Semi-spreading and indeterminate, Suitable for peninsular India, Suitable for sole cropping and intercropping. Medium-sized brown seeds
Pigeonpea	ICPH 85063	20	This is medium duration (120-130 day) pigeon pea variety and suitable to grow in costal AP districts with potential seed yield of 1800-2000 kg/ha.
Sorghum	CSH 24MF	20	Recommended for release and cultivation under irrigated and rainfed conditions of *kharif*. Early maturity, 105- 110 days.
Pearl Millet	ICTP 8203	24	As pearl millet is a hardy crop & grows even in drought situations and degraded soils returns good nutritional values. Pearl millet is not much tested in these mandals and there is a need to promote pearl millet as a alternative cereal crop in drought situations and high temperatures hence verities like Dhan Shakti: ICTP8203-Fe promoted based on performance & climatic suitability.

Evaluation of Maize cultivars: Farmers participatory field trials were undertaken to evaluate different Maize cultivars developed by CIMMYT. Three farmers (Madakam Sesharao, Penibeli Somaraju, Midiyam Vijay Kumar) from three locations i.e. Jeelugumilli, Bhuttaigudem and Polavaram Mandals, were selected, respectively. Each location has been given five hybrids and two check verities for evaluation (Figure 6.1.13.1; Table 6.1.13.3).

Table 6.1.13.3: Field details on maize cultivar evaluation.			
S. No	Name of the Farmer	Location	Date of Sowing
1.	Midiyam Vijayababu	Kothachegonapalli(V), Plavaram (Mandal),	20 Dec 2016
2.	Madakam Sesha Rao	Datlavarigudem(V) Jeelugumilli (Mandal)	31 Dec 2016
3.	Penibeli Somaraju	Bandarlagudem (V), Kamayyakunta Panchyathi, Buttaigudem(Mandal),	09 Jan 2017

Figure 6.1.13.1: Farmers participatry field trails to evaluate differnet maize cultivars developed by CIMMYT and partners.

Table 6.1.13.4: Performance of Maize cultivars at Jeelugumilli Mandal.

SN	Maize cultivar	Sowing date	Harvesting date	Sub-sample details				Cob yield (kg/ha)
				Area (m2)	No. of plants	No. of cobs	Dry weight of cobs (kg)	
1	VH1 51777	01 Jan 2017	09 May 2017	5 m x 3 m	98	92	10.28	6850
2	VH1 2148	01 Jan 2017	09 May 2017	5 m x 3 m	97	94	14.40	9600
3	VH1 12877	01 Jan 2017	09 May 2017	5 m x 3 m	94	82	11.62	7747
4	VH1 12732	01 Jan 2017	09 May 2017	5 m x 3 m	92	73	10.3	6867
5	VH1 12733	01 Jan 2017	09 May 2017	5 m x 3 m	125	104	15.58	10400
6	VH1 23015	01 Jan 2017	09 May 2017	5 m x 3 m	75	73	14.72	9813
7	VH1 25	01 Jan 2017	09 May 2017	5 m x 3 m	70	69	13.38	8920
8	VH1 12872	01 Jan 2017	09 May 2017	5 m x 3 m	72	72	14.54	9693

Crop cutting results showed that cob yield among different maize cultivars is found between 6850 and 10400 Kg/ha (Table 6.1.13.4). Performance of VH1 12877, 12733, 12872 is found good.

Green manuring for enhancing soil fertility

Considering low levels of soil organic matter in farmers' fields, we promoted planting of N-rich green manure plant Gliricidia on field bunds. Nearly 30,000 seedlings of Glaricidia plants were raised on nursery bed with help of department of agro-forestry (Figure 6.1.13.2). 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 We distributed Bio-culture (Madyam Culture) for rapid composting to nearly 80 number of farmers in Akiveedu, Kamavarapukota Mandals. The Bio Culture demonstration was done in various villages with fodder waste and cow dung. Total 300 bio-culture packets were distributed. To facilitate compose making, electric operated shredder Machine was made available at pilot village such that it can trash unwanted biomass material (such as Oil pam leafs) and could be utilized for

compost making using bio-culture. Number of trainings and demonstrations (18 numbers) were undertaken in Pedavegi Mandal particularly in Oil Palm Fields.

Figure 6.1.13.2: Glaricidia nursery raised at K.Kota mandal; demonstration of aerobic composting using Madhyam culture.

Kitchen garden (vegetable cultivation) for nutrition security: To address the issue of malnutrition in children and women, vegetable cultivation at backyard is promoted. Kitchen garden kits are distributed to nearly 100 women in KKota villags Mandals (Figure 6.1.13.3). Each kit comprises of 7 to 10 vegetable seeds like okra, tomato, ridge- gourd, beans, amaranths, bitter- gourd, bottle gourd, cluster beans, and brinjal.

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 were placed in the pilot sites and are being monitored in pilot villages for proper guidance to farmers. Pheromone Traps and Yellow and White Sticky Traps were demonstrated in vegetable crops like Bringal and Okra.

Figure 6.1.13.3: Kitchen garden activities promoted in Dhumpagadapa village of Akiveedu mandal, West Godavari district.

Weather monitoring

Monitoring rainfall and temp is important meteorological parameters in agriculture. A dual type tipping bucket rain-gauge along with temperature sensors was supplied at KKota mandal was established (Figure 6.1.13.4). This instrument monitors minimum and maximum temperature and rainfall at hourly basis.

Figure 6.1.13.4: Raingauge installed in Ramanapalem village of KKota mandal.

Crop cutting experiments in year 2016-17

Crop cutting experiments were conducted in pilot villages (Figure 6.1.13.5). Yield obtained under improved management practice with traditionally managed practices in different farmers field are compared. Paddy yield (*Kharif*) increased by applying micro-nutrients 10-20% compared to controlled fields clearly indicates the importance of balanced fertilizer application (Figure 6.1.13.6). Straw yield is also found higher with increasing yield levels.

Figure 6.1.13.5: Crop cutting experiment undertaken in pilot sites comparing yield under improved and farmers' practices.

Similarly, impact of balanced fertilizer application in paddy during *Rabi* 2016-17 was evaluated. Grain and straw yield measured for both farmers' practices and improved management practice in 10 farmers' field through crop cutting method (Table 6.1.13.5 and table 6.1.13.6). Results showed that Average grain yield obtained from farmers practices and improved practices was 4977 kg/ha and 5720 kg/ha, respectively. It indicates that yield

increased due to application of balanced fertilizer application was nearly 700-1000 kg/ha which is 10-15% higher than the farmers' practice.

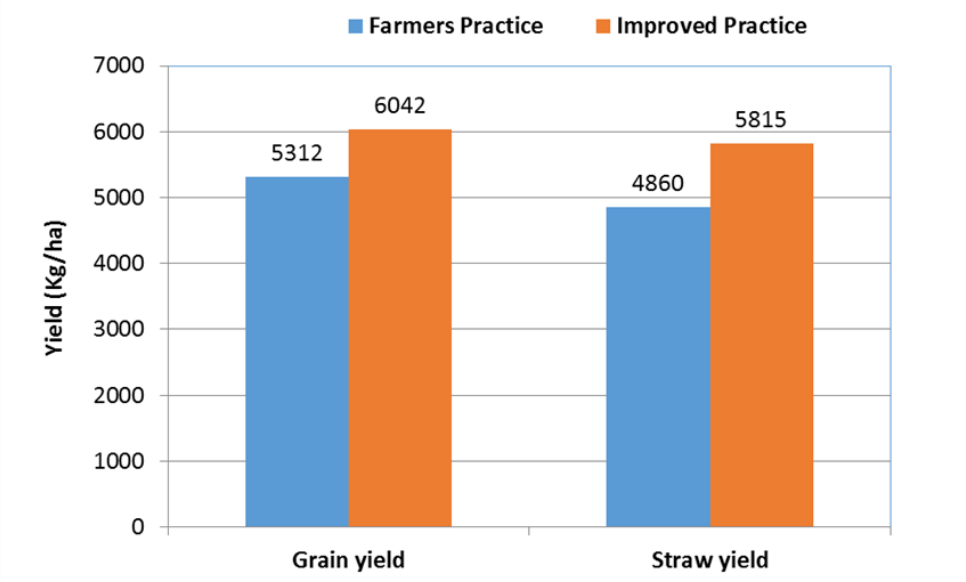


Figure 6.1.13.6: Comparison of paddy a) crop yield, b) straw yield in response to balanced fertilizer application in selected fields; FP= Farmers practice, IP= Improved practice

Table 6.1.13.5: Crop cutting experiment undertaken at Akivedu mandal showing paddy yield under improved management practices (balanced fertilizer application) during *Rabi* 2016-17.

SN	Farmer Name	Village	Variety	Grain yield (kg/ha)	Straw yield (kg/ha)
1	Kuna Peddiraju	Darmapuram	MTU1121	5796	7084
2	Nammi Edukondalu	Akiveedu	Swarna	8316	10164
3	Mudde Raviteja	Dumpagadapa	MTU1064	5166	6314
4	Addala Veerabadrarao	Madivada	Swarna	5544	6776
5	Illapu Apparao	Akiveedu	MTU1061	7056	8624
6	Nakkina Paidiraju	Siddapuram	MTU1064	4914	6006
7	Palli Chandrakumari	Akiveedu	MTU1121	5292	6468
8	Chittibomma Sambaiah	Dumpagadapa	Swarna	4788	5852
9	Nakka Suresh	Madivada	MTU1062	5418	6622
10	Peram Prasad	Akiveedu	MTU1064	4914	6006
			AVG	5720	6992

Table 6.1.13.6: Crop cutting experiment undertaken at Akivedu mandal showing paddy yield under farmers practices (balanced fertilizer application) during *Rabi* 2016-17.

SN	Farmer Name	Village	Variety	Grain yield (kg/ha)	Straw yield (kg/ha)
1	Badugu Gangadhar	Dumpagadapa	MTU1121	4914	6006
2	Majji Srinivasarao	Akiveedu	MTU1064	5418	6622
3	Surampudi Rambabu	Dumpagadapa	MTU1061	5418	6622
4	Naidu Sreenu	Akiveedu	MTU1121	4788	5852
5	Illapu Satyanarayana	Madivada	Swarna	4158	5082
6	Gopala Venkata ratnam	Dumpagadapa	MTU1064	4914	6006
7	Illapu Chinna Apparao	Akiveedu	MTU1061	4914	6006
8	Addala Satyanarayana	Madivada	Swarna	5796	7084
9	Madde Krishnamurthy	Dumpagadapa	MTU1121	4914	6006
10	Nakkani Apparao	Akiveedu	MTU1064	4536	5544
			AVG	4977	6083

Capacity building and Awareness campaigns:

Soil test results shared with officials at DoH, other stakeholders and fertilizer recommendations are made accordingly. To promote advantage of micro nutrients usage as basal application both in Agricultural and horticultural field, we have conducted more than 30 trainings/meetings at pilot sites. 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 (Table 6.1.13.7).

Fertigation is one of the important activity in Rythukosam Project 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 (Table 6.1.13.7).

Table 6.1.13.7: List of capacity building/Awareness program undertaken at pilot site in 2016-17.

SN	Activities	No of training	No of farmers
1	Training on mango , Cashew , vegetables crops for crop management practices	6	50
2	Training on Maize CIMMYT trails in JEELUGUMILLI,POLAVARAM AND BUTAIGUDEM crop production , protection	6	25
4	Training on Micronutrient zinc, Boron in paddy and Gypsum in Ground nut awareness meetings in 3 Mandal	10	100
5	Awareness meeting on seed production Chickpea in VEERAMPALLEM	8	50
6	awareness training program on organic farming in horticulture crops Banana, Cashew , Mango along with Horti. Dep	10	100
7	seed production demo training on Red Gram, G nut -ICRISAT verities	15	50
8	awareness meetings on Red gram on Paddy fields -ICPH VARIETY along with department officers	15	50
9	awareness meetings on paddy machine transplanting with Zinc - Application	10	100

10	training programme on Kitchen Grdeing in Schools (6)and rurla SHG woman group(4)	10	150
11	awareness programme at east yadavalli village on Glyricidia comost, Production of glyricidia	15	100
12	training on Zero Based Natural Farming Trainings along with department in nachugunta village	5	100
13	awareness programme on Easy Planter in Chilli, Vegetables in k.kota and chagallu	5	50
14	training on Plant Shredder in gangannagudem	5	50
15	Training on Madhyam Culture in akividu and kmavaraoukota ,jeelkaragudem	20	50
16	Irrigation scheduling card for different plantation crops (Oil palm, Coconut, Mango, Cocoa, etc.)	20	200
17	Backyard poultry	10	40

6.2. Animal Husbandry sector

6.2.1 Anantapur

There is fairly a good animal population in both the pilot areas. Together there are 1502 cattle, 13492 buffalos, 11769 sheep and 2195 goats. These animals are a major source of income for many households, particularly the landless labourers (about10% population).

a) Fodder promotion

Maintaining animals is really difficult in Anantapur district not only for the scarcity of water but fodder. Farmers do grow some sorghum crop varieties for fodder but often do not get good quality yields. This year, we provided 150 kg seed of one of the commercially available multi-cut sorghum hybrid CSH 24 MF to 28 farmers in 3 villages of Penukonda and Kottacheru. The crop raised in *Kharif* was harvested by 3 cuttings - first after 60 days, then after every 20-25 days while providing irrigation to the crop as required. Average green fodder yield of 31 ton/ha was obtained from 17 ha planted under this fodder crop (Table 6.2.1.1).

Figure 6.2.1.1: Sorghum CSH 24 MF grown; fodder stored & cut as required; and fed to animal, Settipalli village.

Table 6.2.1.1. Fodder multi-cut Sorghum (CSH 24 MF) harvested in 3 cuttings and increase in milk production of animals recorded by farmers feeding this fodder as the main constituent of the feed, Penukonda Mandal, Anantapur 2016-17.

S. No	Villages	No. of farmers	Seed distributed (kg)	Area planted (ha)	Green fodder yield (ton/ha)	Average milk/day yield Before	Average milk/day yield After
1	Kondampalli	22	120	13	36	7	8.5
2	Kottachervu	2	9	1.5	20	6	7.2
3	Settipalli	4	21	2.5	36	6	7.5
		28	150	17	31	6.3	7.7

1. Seed was distributed to interested farmers
2. Average three cuttings were taken by farmers, providing some irrigation to crop
3. Most of farmers here have 2-5 *Holstein friesian* cows ane local buffalos

Further, the farmers who fed their cows and buffalos with this fodder reported higher yields of milk with higher percentage of fat (>0.5% more) than the milk they used to get before. Farmers reported they got better price for their milk than other farmers who fed their animals with normal sorghum fodder.

b) Animal Production promotion

We reported the benefit of growing sorghum CSH 24 MF to the Department. They have now included it in the list of the fodder crop seeds they do usually supply to farmers. In March-April 2017, they have rather planted this sorghum under tank-bed cultivation which they have also taken in the tank of Settipalli village which is under our pilot area.

Poultry is almost nil in the pilot site villages of Rythu Kosam. We along with NGO partners have requested the department of animal husbandry for implementing the poultry supply schemes in our areas. A total 50 units (25 cheeks 4 weeks old) have already been sanctioned for Penukonda and Kottachervu.

c) Capacity Building

We ourselves conducted 2-educational programs on fodder crops in general at our SAMATHA-NGO center, Penukonda where we grew this year a multi-cut grass variety CO-5 supplied by KVK-Anantapur. We were not very much impressed by its performance.

6.2.2. Chittoor

Fodder: Fodder scarcity is major stumbling block for high animal productivity which is a prominent activity with farmers in pilot site. So, multi-cut sweet sorghum hybrid is being evaluated with the farmers in pilot villages. The details as given below table (Table 6.2.2.1).

Table 6.2.2.1: Sweet sorghum distribution details in pilot mandals

Mandal	Village	No of	Area/ac	Fresh fodder yield (kg/ha)
V.Kota	6	36	36	19200
Sathipuram	11	64	64	21500

Figure 6.2.2.1: Sweet sorghum fodder evolution in Chinnaridoddi Village, Santhipuram Mandal.

Animal health camp: Animal health camp and awareness program was conducted with the help of animal husbandry department. Vaccinations against the foot& mouth disease, deworming, mineral deficiency was given to the cattle.

Promotion of backyard poultry: Manakodi scheme with the help of Animal husbandry department, we distributed Giriraja and Vanaraja chick units for meat and egg purpose supplied the pilot site villages, which can acts as a source of secondary income to the farmers. The details as given below table (Table 6.2.2.2)

Table 6.2.2.2: Manakodi unit's distribution in pilot villages

No.of mandals	No. of villages	No. of units distributed	No. of farmers benefited	Total chicks(1unit=40)
V.Kota, Santhipuram	5	23	13	920

6.2.3. 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.

6.2.4. Kadapa

Fodder promotion

Fodder scarcity is a major stumbling block for high animal productivity which is a prominent activity with farmers in pilot sites. Moreover, milk production is mainly in the domain of women and thereby contributes to mainstreaming women farmers and also improving family nutrition.

So, multi-cut sorghum variety CSH24MF is promoted and evaluated with 31 farmers during 2016-17 (Table 6.2.4.1; Figure 6.2.4.1). Farmers were provided incentivised seed to cultivate about 500- 1000 m^2 area. The detail of trials/demonstrations is given in Table 6.2.4.1.

Table 6.2.4.1: Participatory trials on evaluating Sorghum (CSH24MF) for fodder promotion in Kadapa pilot during *rabi* 2016-17.				
S. No.	Mandal	Village	Number of trials	Area (m^2)
1	Porumamila	Siddavaram	7	4700
2	B Matam	Godlaveedu, Dirasavancha	9	5600
3	Sambepalle	Guttapalle	15	10000
	Total		31	20300

Data recorded from farmers showed that farmers realized per hectare productivity of 7-20 t in Sambepalle mandal (700-1700 kg net produced in given area), 25-30 t in B Matam and Porumamila mandals (1400-2800 kg net produced in given area).

Figure 6.2.4.1: Participatory evaluation and demonstrations on fodder promotion (multi-cut sorghum variety CSH24MF) – Left: Ms Jayamma, siddavaram village, Porumamila mandal; Right: Mr J Ragavendra, Dirasavancha village, B Matam mandal.

Scaling out of good practices through Department of Animal Husbandry (DoAH) in pilot site villages has recorded boost in milk meat and egg production in the pilot site villages (Table 6.2.4.2, 6.2.4.3, 6.2.4.4).

Table 6.2.4.2: Milk production in Kadapa pilot site, 2014-15 to 2016-17.			
Village	Milk production(Litres)		
	2014-15	2015-16	2016-17
Siddavaram	409530	421550	432750
Ganugapenta	362445	382550	390720
Challagirigella	482895	512330	532730
Venkataramapuram	168630	179550	179550
Godlaveedu	121545	131215	139743
Gundapuram	19710	21950	23470
Dirasavancha	304410	322510	333950
Nagisettipalle	257325	269550	277130
Veeraballe	525600	533790	493651
Matli	623055	642350	653215
Settipalle	902280	875000	937006
Devapatla	1117995	1152650	1192640
Guttapalle	270465	291210	283625
Total	5565885	5736205	5870180

Table 6.2.4.3: Meat production in Kadapa pilot site, 2014-15 to 2016-17.									
Village	Sheep meat(kg)			Goat meat(kg)			Poultry meat(kg)		
	2014-15	2015-16	2016-17	2014-15	2015-16	2016-17	2014-15	2015-16	2016-17
Siddavaram	14226	14870	15750	1562	1580	1750	498	510	530
Ganugapenta	12370	13520	14200	3663	3790	3900	823	890	920
Challagirigella	5663	5870	6200	3500	3700	3960	1013	1040	1120
Venkataramapuram	20097	21500	22270	1763	1870	1950	431	460	470
Godlaveedu	17860	18970	19850	616	630	690	289	300	320
Gundapuram	3826	3980	4306	380	395	420	49	50	60
Dirasavancha	30240	31280	33150	3374	3570	3780	1119	1150	1250
Nagisettipalle	9311	9500	10900	513	520	570	339	370	390
Veeraballe	29972	30120	29651	7520	7770	7875	8396	8570	8690
Matli	31824	32150	32168	9257	9520	9630	5089	5590	5687
Settipalle	89511	92150	92710	6236	6460	6325	4960	5000	5700
Devapatla	125601	129000	129620	931	1000	960	2501	2730	2635
Guttapalle	9494	9800	9705	490	500	530	349	370	350
Total	399995	412710	420480	39805	41305	42340	25856	27030	28122

Table 6.2.4.4: Egg production in Kadapa pilot site, 2014-15 to 2016-17.			
Village	Poultry Eggs(Number)		
	2014-15	2015-16	2016-17
Siddavaram	33225	33548	35200
Ganugapenta	54863	53569	56250
Challagirigella	67500	69745	71200
Venkataramapuram	28725	30123	31200
Godlaveedu	19275	20173	21150
Gundapuram	3263	3345	3400
Dirasavancha	74625	79456	80600
Nagisettipalle	22613	22345	24325
Veeraballe	559763	576544	574654
Matli	339263	312345	324562
Settipalle	330675	345676	350424
Devapatla	166763	177654	172161
Guttapalle	23250	24567	23971
Total	1723803	1749090	1769097

6.2.5. 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 6.2.5.1.

Table 6.2.5.1: Progress of activities in Krishna district pilot sites.				
Mandal	Growth	Intervention	Activity	Beneficiaries
Ghantasala 10 pilot villages	Milk	Suphalam scheme	14 health camps were conducted in the mandal covering 10 pilot sites villages	490 animals were treated
		Fodder Development SSG-825	59 Fodder Mini Kits were given @5kg seed per kit	46 farmers
	Meet and Eggs	Manakodi scheme	26 units are approved @45 chicks per units	26 farmers.
G.Kondur 13 pilot villages	Milk	Suphalam scheme	13 health camps were conducted in the mandal covering 13 pilot sites villages	325 animals were treated
		Fodder Development SSG-593	135 Fodder Mini Kits were given @5kg seed per kit	83 farmers
		Ksheerasagar	Concentrated feed of 600kgs for 25 animals	56 farmers
		Sunandini	Caring for calves	21 farmers

6.2.6. 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:
100 Progressive dairy farmers and 56 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. 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 6.2.6.1: Details of Horticulture department schemes converged 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

Mass sheep and Goat deworming program:

Mass sheep and goat deworming program was completed in these mandals during Aug-2015.

Mass Foot and Mouth Disease Vaccination program:

Mass Foot and Mouth Vaccination campaign is going on now in these villages to protect the livestock against Foot and mouth disease.

6.2.7. Prakasam

Interventions

Milk

- Increase the number of high yielding cattle
- Good quality feed (green fodder availability) with better digestibility
- Better feeding practices

Meat

- Introduce breeds that produce more meat
- Regular health care of animals
- Rejuvenating grazing land

Egg

- Back yard poultry
- Strengthening support to poultry farms

Livestock productivity enhancement / development

Multi-cut sorghum CSH 24 MF was introduced in 10 ha covering 35 beneficiaries as a sources of green fodder to enhance the milk productivity (Fig. 6.2.7.1). Average 22 tons of green fodder has been harvested in two cutting and another two cuttings are expected. The milk yield increased was about 0.5-1.0 lit/day/animal.

Figure 6.2.7.1: Mr Basi Reddy of Punugodu village in Kanagiri mandal with Multi-cut sorghum in his field.

Another initiative promoted was azola as nutritious feed for livestock with the convergence of Animal Husbandry department in two villages Bhahmanapalli and Gotlagattu (Fig. 6.2.9.2).

Figure 6.2.7.2: Azola demonstration in Gotlagattu village, Prakasam.

6.2.8. Srikakulam

i) Fodder promotion

Azolla units (Table 6.2.8.1) as well as multi cut fodder sorghum hybrid was promoted in pilot villages to improve animal nutrition and to increase milk production during 2016-17. About 15 tons sorghum green fodder produced during *kharif* and harvesting is still going on during *rabi* (Table 6.2.8.2 and Figure 6.2.8.1) in Srikakulam district.

Figure 6.2.8.1: Multi cut fodder sorghum hybrid (CSH24MF) grown in pilot villages of Srikakulam district.

Table 6.2.8.1: Azolla units promoted in pilot villages as animal feed.				
S No	Mandal	Village	Name of the farmers	No. of units
1	Ranasthalam	Kondamulagam	A. Ramakrishna	1
2	Ranasthalam	Mukthumpuram	K Appalanaidu	1
3	Ranasthalam	Kondamulagam	B Sanyappalanaidu	1

Table 6.2.8.2 Promotion of multi cut fodder sorghum hybrid in pilot villages during *kharif* and *rabi* 2016-17.							
Kharif							
S No	Farmer name	Village	Mandal	Hybrid	Quantity (kg)	Area (ac)	Yield (kg)
1	Seerapu Satyanarayana reddy	Mentada	Ranasthalam	CSH24MF	3	0.6	2000
2	Reddy Sudhakar	Pisini	Ranasthalam	CSH24MF	3	0.7	2500
3	Konathala Lakshmanareddy	Ch.Rajam	Ranasthalam	CSH24MF	3	0.5	1500
4	I Prasad	Akkayyapalem	Ranasthalam	CSH24MF	3	0.3	1200
5	P Srinivasa rao	Kambalipeta	Ranasthalam	CSH24MF	3	0.5	1600
6	T Ramu	Pallipeta	Polaki	CSH24MF	3	0.5	1600
7	S Varaprasad	Ampalam	Polaki	CSH24MF	6	0.8	1900
8	K Bhashara rao	Ampalam	polk	CSH24MF	3	0.5	1400
9	D Danesh	Pallipeta	Polaki	CSH24MF	3	0.3	1250
	Total				30		14950
Rabi							
S No	Farmer name	Village	Mandal	Hybrid	Quantity (kg)	Area (ac)	Yield (kg)
1	K Somulu	Ch.Rajam	Ranasthalam	CSH24MF	3	0.5	1st cutting done
2	K Lakshmnareddy	Ch.Rajam	Ranasthalam	CSH24MF	3	0.3	1st cutting done
3	A Appanna	Ch.Rajam	Ranasthalam	CSH24MF	2	0.3	1st cutting done
4	I Prasad	Akkayyapalem	Ranasthalam	CSH24MF	3	0.3	1st cutting done
5	M Srinivasa rao	Kambalaipeta	Ranasthalam	CSH24MF	3	0.5	2nd cutting done
6	M Chinnarao	Kambalaipeta	Ranasthalam	CSH24MF	3	0.3	2nd cutting done
7	V Ramesh	kondamulagam	Ranasthalam	CSH24MF	3	0.15	1st cutting done
8	D Rammohan rao	kondamulagam	Ranasthalam	CSH24MF	3	0.15	1st cutting done
9	B Bhaskara rao	Ampalam	Polaki	CSH24MF	3	0.5	1st cutting done
10	N Sanyasi rao	Pallipeta bc colony	Polaki	CSH24MF	3	0.5	1st cutting done
11	K Appalaram	Polaki	Polaki	CSH24MF	3	0.5	1st cutting done
12	T Ramu	Pallipeta	Polaki	CSH24MF	3	0.5	1st cutting done
	Total				35		

Other

Five backyard poultry units were provided to farmers with the support of KVK Amudalavalasa to improve livelihoods of farmers in pilot villages during 2016 (Figure 6.2.10.2).

Figure 6.2.8.2: Distribution of backyard poultry units in pilot villages.

6.2.9. Vizianagaram

Fodder promotion

We have motivated 40 farmers to raise fodder sorghum (CSH 24 MF) in 2016-17 *Kharif* and *Rabi* and also supported Sugar gage, Nutri feed and Co - 4. We have mobilized seed and fodder culture from dept. of AH and conducted training to 27 farmers on using of Sunandini and Ksherasagara feed Azolla kits for improving production of milk. Now the results are coming up and the productivity of milk was increased more than 45%.

Figure 6.2.9.1: Demonstration of Azolla kits and fodder for improving production of milk.

Capacity building

On the process of fodder promotion we conducted 20 awareness meetings in pilot villages in 2 mandals and we addressing the Government providing schemes to the farmers.

6.2.10. W Godavari

Backyard poultry and Apiculture

Backyard Poultry: Nearly 200 birds of were distributed to 40 Households (@ 5 birds /HH) as a part of Rural Nutrition Programme with support of K.V.K. Venkatramannagudem (Figure 6.2.10.1). Moreover we trained 36 members of Tribals women (6 days training) on bee cultivation in Velerupadu Mandal with the support of K V K Venkatramannagudem and the distributed 3 honey boxes to each participants.

Figure 6.2.10.1: Distribution of back yard poultry chicks.

6.3. Fisheries sector

6.3.1. Guntur

Fisheries department officials conducted three capacity building meetings

Figure 6.3.1.1: River Krishna Meenotsavam at new capital of AP Amaravathi.

6.3.2. Krishna

For the fishery sector in the Krishna district pilot sites the following area is selected for specific interventions detailed in the table.

Table 6.3.2.1: 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 farmers. The department of fisherie's has provided guidelines to indentify clusters for the formation of FPOs. While exporters of aquaculture are through big commercial farms, small and marginal farmers 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. The challenges are multifold as the investments are high due to requirements of fish nets, cold chain, landing centres, cold boxes, and ice factory and market linkage to farmer groups.

Figure 6.3.2.1: Samyuktha Fisheries Producer Company at Etimandipallepallu, Kruttivennu mandal

6.3.3. 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. Joined the meetings conducted by the Department of Fisheries comprising farmers interaction work shop, selection of quality seed, feed and adoption of Good Management Practices; focus was given on Hatchery operators of the District and stress the need of producing SPF L. Vannamei seed and Bio security methods. 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 and efforts towards 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 >200 number of farmers applied for license for regularization of their hatcheries.

Sericulture:
As regards to sericulture, focus was on Capacity building and promoting new mulbery plantation through method demonstration to attract farmers. Bascially, it was targeted to promote wild silk rearing in convergence with MGNAREGAs. 30 new demonstrations are put in place in pilot villages with all proper management practices.

6.3.4. Prakasam

Interventions

- Strengthening the participation of officials from Fisheries department and MPEDA
- Strict enforcement of policy on the stake holders to purchase seed from CAA approved hatcheries
- Introduction of improved sp. Like sea bass, thalapia. Etc.
- Proposed for a mobile lab for water quality testing for aqua farmers
- Supply of quality SPF brooder seed

6.3.5. Vizianagaram

Capacity building
We mainly work on solar dryer fish formers and conducted 19 awareness and trainings So we identified the 15 members of farmers in Pusapatirega mandal, finally selected 6 farmers for this activity 152 members were participated in this activity and also we addressing technical information to the fishery farmers and linked with the Govt fishery scientists for the clarification of farmer's doubts.

Figure 6.3.5.1: Demonstration of solar drier in pilot village.

Publicity

సోలార్ డ్రయ్యర్లతో నష్టాలకు చెక్

రైతులకు, జాలర్లకు పలకరాలు అందుబాటులో ఉంచిన ఇక్రిశాట్

Figure 6.3.5.2: Publicity through News papers on solar dirers.

6.4. Horticulture sector

6.4.1 Anantapur

Anantapur is drought prone district where crop failures due to poor monsoons, erratic and scanty rainfall is a phenomenon as the district is located in the scanty rainfall zone and is a rain shadow district. Sweet Orange, Sapota, Pomegranate, Ber, Mango, Banana, Papaya, Guava, Melons and Vegetables & Flowers are the Major crops grown in the District over an area of 144617 ha.

In pilot sites, horticulture crops particularly vegetables are grown on small scale, about 72 ha in Penukonda and Kottachrvu and 332 ha in Rapadu. Tomato is mainly grown with some Chillies, Bhendi, Brinjal and Musk melons. The plantation crops including sweetlime, mango, and pomegranate occupy around 251 ha in Penukonda and Kottacheru and 609 ha in Raptadu.

a) Easy Planter

ICRISAT introduced manually operated 'Easy planter' for planting seedlings of vegetable crops in the fields. The demos successfully carried out in 4 farmers' fields of Penukonda mandal are indicated in Table 6.4.1.1 along with the area covered with ease (0.4 ha/day covered). The farmers obtained good crop establishment with reduced cost of labor. It is likely that the

Department may provide this planter on subsidy from the next year as farmers indicated interest to purchase this.

Table 6.4.1.1: Easy planter demonstration and use for planting vegetables, Rythu Kosam villages, Anantapur 2016-17.

S. No	Name of the Farmer	Village	Mandal	Crop	Extent(ha)
1	Ramanjineyulu	Gonipeta	Penukonda	Mirchi(Chillies)	0.2
2	Sudhakar	Settipalli	Penukonda	Tomoto	0.4
3	Ramappa	Settipalli	Penukonda	Tomoto & Mirchi	0.4
4	Umapathi	Narayanapuram	Penukonda	Tomoto	0.4

Figure 6.4.1.1: Easy Planter demo in Penukonda, 2016-17.

b) Nutri Kitchen gardens

This year we gave 100 vegetable-seed kits for kitchen gardening to schools and to farmers including women who were interested to grow vegetables in their backyards. The aim was to create awareness about the possibilities of their growing vegetables for home consumption. The kit consisted of seeds of tomato, French bean, bhendi, Dolichus, Amaranthus, Spinach and bitter gourd was planted by recipients in 40-50 sq.m area as per their convenience for maintaining garden. The average aggregate yields obtained from each kit in different villages are given in Table 6.4.1.2.

Table 6.4.1.2: Average yields reported by kitchen garden beneficiaries of Rythu Kosam area, Penukonda and Kottachervu mandals, 2016-17.

S.No	Name of the Village	Beneficiaries (No.)	Kits Distributed (No.)	Average Yield Kg/Kit
1	Kondampalli	32*	35	18.0
2	Settipalli	14	14	13.5
3	Gonipeta	10	10	14.0
4	Yerrapalli*	19*	26	11.0
5	Bandlapalli*	13*	19	11.5
		88	100	13.6

1. Kichen garden kit cosnsisted of the packed seeds Tomato (0.5 g), French bean (12 g), Bhendi (5 g), Dolichus (1 g), Bitter gourd (1 g); Spinach (6 g) & Amaranthus (2 g).

2. Area of 35-50 Sqm was utilized per kit

* More than 1 kit given to schools

All the kitchen garden crops could not survive for largely for the want of water which was scare in Rythu Kosam area in the later part of the crops. However, almost all recipients got some crop yields which they used for their own consumption

c) Horticulture development Assistance

The Horticulture department helped farmers of Pilot sites thru various schemes from the state and central governments. The number of farmers that were benefitted with different things in Penukonda and Kottachervu are given in Table 6.4.1.3.

Table 6.4.1.3: Pilot Site Rythu kosam farmers benefitted under various Horticulture schemes of the state government, Penukonda and Kottachervu mandals, Anantapur 2016-17

S. No	Name of the Village	Tarpaulins (No.)	Packing Houses constructed	Plastic crates (Boxes)	Multching sheets (for Acres)
1	Kondampalli	12	2	40	2
2	Settipalli	6	1	50	0
3	Gonipeta	6	0	0	0
4	Bandlapalli	0	1	80	5
5	Yerrapalli	22	0	70	2
Total		46	4	240	9

About 25% of fruit crops are under drip irrigation in pilot sites and farmers are seen increasingly opting for drip system. This year, four new farmers established fruit orchards with subsidy on drip provided by the government.

d) Capacity building

The department of horticulture with our support conducted two training and educational programs - one on Integrated Pest Management in fruits and vegetable crops and second on the Mushroom cultivation. The IPM program was organised in Kondampalli with the participation of 35 farmers from Kottachervu and Penukonda mandals. The mushroom program was attended by over 15 farmers at each of the two places.

Further, we always browsed with the officials of the department of horticulture the subject of possibility of Dates cultivation in Anantapur referring to its success in Kutch area of Gujarat which is still a drier area than Anantapur receiving an annual rainfall of 330 mm.

It is learnt that now this subject has created an interest in horticulture department. The department has recently the financial sanction of the state government for arranging a visit of 36 members including 18 selected farmers to Kutch during May-June 2017.

6.4.2. Chittoor

Nutri kitchen gardens: Small scale vegetable cultivation or kitchen gardening was being promoted through women farmers and schools to meet the local requirements. Details were provided in the below table (Table 6.4.2.1).

Table 6.4.2.1: Vegetable seed distribution details in pilot villages.					
Mandal	No. of villages	No. of benefited women	Vegetable yield (Kg/ha)	Market price(kg)	Each family benefited(Rs)
V.Kota, Santhipuram	15	78	15-20	18-20	270-400

Capacity building: In these program we addressed about benefits of soil test based nutrient recommendations, advantages of using easy planter for vegetable plantation ,tractor operated plastic mulch laying machine, procedure for compost preparation, advantages of IPM and explained about the schemes in horticulture departments (Table 6.4.2.2).

Table 6.4.2.2: Capacity building training g programmes of different Villages in pilot Mandals.									
							Participants		
Mandal	No. of villages	Micronutrients	Chipper shedder	Compost making	Plastic mulch laying machine	Easy planter	Men	Women	Total
Santhipuram	7	6	3	4	1	7	345	15	360
V.Kota	4	4	2	2	3	4	321	28	349
Total	11	10	5	6	4	11	666	43	709

6.4.3. East Godavari

Nutri-kitchen gardening for mainstreaming women and family nutrition 2016-17

Demand-driven vegetable such as Amaranths, Spinach, Dolichos bean, Bitter guard, French beans, Okra, and Tomato seeds were distributed in 7 villages of Gangavaram mandal and 5 villages of Yeleswaram mandal. In each village we have distributed around 500 samples of individual packets of all 7 vegetable crops during *Kharif* 2016-17. The data indicates that, each family have harvested nearly.

1. Tomato's – 15 kg,
2. Okra – 15 kg,
3. Bitter guard - 15 kg,
4. Spinach and Amaranths - 6-8 kg,
5. French beans - 8-10 kg, and
6. Dolichos bean - 8 kg.

Overall, farmers in the villages who have has kitchen garden and taken proper care of vegetable crops have benefited with continuous vegetable for 2 months in the pilot villages.

6.4.4. Guntur

Capacity building meetings were conducted in Sattenapalli mandal to encourage to follow IPM in chilli crop.

In November 2015 along with commissioner horticulture visited vegetable growing farmer fields and poly house nurseries. IBM team visited Guntur and Krishna districts FPO's to suggest the commercial model FPO

Figure 6.4.4.1: IBM team with Hon'ble Chief Minister of Andhra Pradesh.

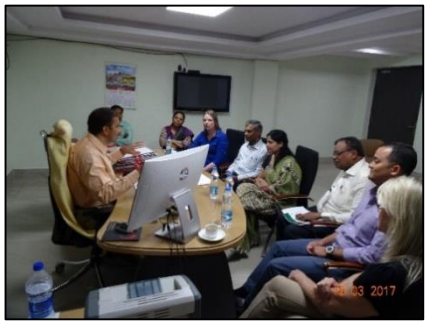


Figure 6.4.4.2: IBM team with Commissioner of Horticulture, Andhra Pradesh.

Soil Sample Collection for Horticulture orchard fields in 2016:

In month of May soil sample collection was done in the villages. Awareness meetings were conducted with farmers about the importance of soil health by farmer participatory soil sample collection and its analysis. Around 300 soil samples were collected for Banana, Lime, Mango, Sapota, Turmeric and Chilli horticulture crops.

During visit where ever farmers are interested to make aerobic compost with farm waste and MADHYAM culture were encouraged and Madhyam culture provided to them.

Figure 6.4.4.3: Soil Sample Collection for Horticulture orchard fields, Guntur district.

Soil Health Awareness Program

Table 6.4.4.1: AP Primary Sector Guntur district, mandal wise Horticulture orchards Initial soils nutrient % deficient data

Mandal	OC	Av P	Av K	Av Ca	Av Mg	Av S	Av Zn	Av B	Av Fe	Av Cu	Av Mn	No of samples
Bellamkonda	100	0	0	100	0	0	33	100	0	0	0	3
Bhattiprolu	38	0	0	0	0	0	6	6	0	0	0	16
Chebrolu	24	3	6	73	0	91	30	33	0	3	0	33
Duggirala	21	0	0	0	0	7	14	7	0	0	0	14
Durgi	100	0	0	0	0	0	33	0	0	0	0	3
Kollipara	29	0	0	0	0	13	6	4	8	0	0	78
Macherla	100	0	0	0	0	0	0	0	100	0	0	1
Mangalagiri	44	0	0	0	0	0	0	0	44	0	0	9
Phirangipuram	100	0	0	0	0	100	100	0	0	0	0	2
Rajupalem	0	0	0	0	0	50	50	0	0	0	0	2
Savalyapuram	100	0	0	0	0	0	0	0	0	0	0	2
Tenali	35	0	0	0	0	18	35	0	0	0	0	17
Vemuru	100	0	0	0	0	0	38	0	0	0	0	8
Vinukonda	50	63	0	0	0	63	100	0	0	0	0	8

Kollur	58	2	0	0	0	5	14	2	2	0	0	66
Thadepalle	50	0	0	0	0	0	0	0	0	0	0	6
Tsundur	50	0	0	0	0	0	11	0	0	0	0	18
Bollapalle	50	50	0	0	0	0	0	0	0	0	0	2
Ipuru	25	0	0	0	0	0	0	0	0	0	0	4
Edlapadu	100	100	0	0	0	100	100	100	50	0	0	2
Guntur Total	**43**	**3**	**1**	**9**	**0**	**19**	**18**	**7**	**4**	**0**	**0**	**294**
Acid Lime	54	0	0	5	0	9	20	6	0	0	0	65
Banana	38	0	0	0	0	7	10	2	7	0	0	138
Coconut	100	0	0	0	0	0	0	0	0	0	0	1
Gauva	67	0	0	0	0	0	0	33	0	0	0	3
Mango	36	57	0	7	0	86	71	14	7	0	0	14
Paddy	75	6	0	0	0	0	6	0	0	0	0	16
Red Gram	33	0	0	0	0	33	67	0	0	0	0	3
Sapota	27	0	6	70	0	82	30	36	0	3	0	33
Sweet Orange	60	10	0	0	0	0	10	0	10	0	0	10
Turmaric	27	0	0	0	0	9	18	0	18	0	0	11
Guntur Total	43	3	1	9	0	19	18	7	4	0	0	294

6.4.5. Kadapa

Nutri kitchen gardens

For promoting family nutrition and incomes to women, small scale vegetable cultivation or kitchen gardening as women focussed activity is promoted in pilot sites. Demand-driven vegetable seeds were distributed during 2016-17 to about 76 women farmers for cultivating 5-15 m^2 (on an average 8.5 m^2) with vegetables like Okra, Amaranthus, Tomato, Brinjal, Dolichos, Bitter gourd, Spinach, Frenchbean (Table 6.4.5.1; Figure 6.4.5.1). Data from farmers during the season showed that they harvested on an average 10-30 kg vegetables for primarily household consumption.

Table 6.4.5.1: Women-focussed nutri-kitchen gardens in Kadapa pilot during 2016-17.

S. No.	Mandal	Village	Number of trials	Area (m^2)
1	Porumamila	Tsallagirigella	33	250
2	B Matam	Nagisettipalle	12	100
3	Sambepalle	Devapatla, Guttapalli	22	210
4	Veeraballe	Matli	9	80
	Total		76	640

Figure 6.4.5.1: Nutri-kitchen gardens in backyards of households in Tsallagirigella village in Porumamila mandal – Left: Ms S Subbulakshmi; Right: Ms Beeramma.

Shift to high value agriculture

Through Department of horticulture, cultivation of vegetables and fruits is promoted (Table 6.4.5.2), which has not only increased farmers' incomes but also enabled regular source of income. This expansion is facilitated to a considerable extent through collective working and promotions of rainwater management and promotion of micro-irrigation by other departments like watershed and Irrigation.

Table 6.4.5.2: Detail of area under vegetables and fruit plants during 2014-15 to 2016-17.

Village	Vegetable area(Acre)			Area under Fruits(Acre)		
	2014-15	2015-16	2016-17	2014-15	2015-16	2016-17
Siddavaram	16	41	61	0	0	0
Ganugapenta	15	30	45	5	10	10
Challagirigella	15	40	65	10	10	10
Venkataramapuram	10	25	35	0	0	0
Godlaveedu	2	4	7	0	0	0
Gundapuram	1	3	5	0	0	0
Dirasavancha	10	30	50	0	0	5
Nagisettipalle	2	13	33	0	0	5
Veeraballe	4	4	15	850	880	880
Matli	3	3	22	440	440	440
Settipalle	55	120	197	440	460	460
Devapatla	63	132	213	380	400	400
Guttapalle	14	32	52	50	50	50
Total	210	477	800	2175	2250	2260

For strengthening water resources, the Watershed Department has constructed in pilot site villages during 2016-17 533 new farm ponds, 22 check dams, 7 check walls and 48 dug-out ponds. Repair of 9 check dams and 3 percolation tanks is done (Table 6.4.5.3).

Table 6.4.5.3: Progress on implementation of repair and construction of water harvesting structures, 2016.

Village	Repair - Check dam		Repair - Check wall		Repair-Percolation tank		Repair - Med percolation tank		New - Check dam		New - Check wall		Farm pond		Dug-out pond		New - Percolation tank	
	2015-16	2016-17	2015-16	2016-17	2015-16	2016-17	2015-16	2016-17	2015-16	2016-17	2015-16	2016-17	2015-16	2016-17	2015-16	2016-17	2015-16	2016-17
Godlaveedu	3	3								6				67				
T.Soudrapalli	3																	
Dirasavancha										1				103		2		
Nagisettipalli	1	1								4				41		1		
Gundapuram	1	3												42		45		
Settipalli									3	2	2		1				1	
Guttapalli									4	2	1						1	
Devpatla	3	1			1	1			1				1					
Veeraballe													1					
Matli																		
Gangapenta	5				3				1	4	1	3	20	109				
Challagirigella	5	1			3	1				2	1	4	25	114				
Venkatrampuram	2				1					0			1	16			1	
Siddavaram						1				1	1		4	41				
Total	23	9			8	3			9	22	6	7	53	533		48	3	

Similarly with an objective to promote judicious use of water resources, drip and sprinkler irrigation systems are promted in pilot sites. (Table 6.4.5.4). Drip system is promoted with 229 farmers covering an area of 483 acres and sprinkler system is promoted with 32 farmers covering an area of 57 acres.

Table 6.4.5.4: Progress on implementation of micro-irrigation systems in Kadapa pilot sites, 2016-17.									
Mandal	Village	Drip				Sprinkler			
		2015-16		2016-17		2015-16		2016-17	
		No	Area (acre)	No	Area (acre)	No	Area (acre)	No	Area (acre)
Porumamila	Siddavaram	6	25	11	25				
	Ganugapenta			6	12				
	Challagirigella			6	13				
	Venkataramapuram			3	7				
BMatam	Godlaveedu					10	18	1	2
	Gundapuram								
	Dirasavancha			3	7	20	22		
	Nagisettipalle			2	4				
Veeraballe	Veeraballe	8	15	8	15			2	4
	Matli	12	65	25	48			3	5
Sambepalle	Settipalle	37	76	84	170			20	42
	Devapatla	23	59	56	130			1	2
	Guttapalle	11	31	25	52			5	12
	Total	97	271	229	483	30	40	32	67

6.4.6. Krishna

Based on the major growth engines identified for the double digit growth, the following crops and interventions were taken up in the pilot site villages.

Soil Sample Collection for Horticulture orchard fields in 2016:

In month of May soil sample collection was done in the villages. Awareness meetings were conducted with farmers about the importance of soil health by farmer participatory soil sample collection and its analysis. Around 2710 soil samples were collected for Banana, Cocoa, Coconut, Mango and Acid Lemon horticulture crops. It took over two months of rigorous exercise through the participation of department of horticulture and the NGO partner in the district. District officials including ADHs, Horticultural officers and MPEOs participated actively during the exercise lead by ICRISAT.

Figure 6.4.6.1: Demonstration of soil sample collection in Koduru village in G.Konduru mandal.

Table 6.4.6.1: AP Primary Sector Guntur district, mandal wise Horticulture orchards Initial soils nutrient % deficient data.												
Mandal	OC	Av P	Av K	Av Ca	Av Mg	Av S	Av Zn	Av B	Av Fe	Av Cu	Av Mn	No of samples
Bapulapadu	77	20	8	98	0	100	88	26	0	28	0	65
Chatrai	76	11	0	100	0	100	76	0	0	4	0	45
G.Konduru	62	34	0	82	1	59	45	21	0	16	0	215
Gannavaram	100	0	1	100	0	100	100	76	0	67	0	67
Musunuru	0	0	0	47	0	92	0	1	0	1	0	247
Mylavaram	49	24	7	46	0	62	55	30	0	15	0	300
Thotlavalluru	100	79	7	43	0	57	100	36	0	0	0	14
Tiruvuru	99	23	0	100	0	100	99	6	0	48	0	82
Agiripalle	99	0	0	100	2	93	39	69	0	85	0	379
Vijayawada (Rural)	93	60	4	97	3	94	81	72	0	63	0	220
Jaggayyapeta	100	0	0	100	0	100	100	100	0	100	0	11
Kruthivennu	100	50	0	100	0	100	100	79	0	100	0	14
Nuzvid	80	39	2	95	1	70	80	40	0	27	0	623
Penuganchiprolu	100	13	0	99	0	100	99	96	0	29	0	69
Reddigudem	72	40	2	50	0	54	76	26	0	12	0	204
Vissannapet	2	0	0	72	0	93	0	0	0	10	0	153
Krishna Total	68	25	2	80	1	79	59	38	0	33	0	2708

Acid Lime	100	50	0	100	0	100	100	100	0	50	0	2
Banana	40	31	3	63	0	80	40	14	0	3	0	35
Cocoa	100	89	0	100	0	100	89	0	0	0	0	9
Coconut	40	17	0	71	0	100	40	21	0	27	0	52
Mango	69	24	2	81	1	79	59	39	0	34	0	2610
Krishna Total	68	25	2	80	1	79	59	38	0	33	0	2708

6.4.7. Kurnool

Kitchen gardening

To meet the nutritional requirements of family and for mainstreaming women in agriculture, small scale vegetable cultivation or kitchen gardening is being promoted at the pilot villages. During 2016-17 vegetable seeds were distributed to about 99 women who have grown vegetables (Tomato, bitter guard, ridge guard, okra, leafy vegetables etc) during *kharif* 2016 (Fig 6.4.7.1). Necessary trainings has been given to women on cultivation of these vegetables on broadbed & furrow with balance nutrients. Some of women have enlarged this activity and now growing vegetables on large area and making good income by selling them in market.

Figure 6.4.7.1: Vegetable cultivation by women at pilot sites, Kurnool during 2016-17.

6.4.8. Nellore

In Horticulture sector, focus was to promote balanced fertilizer management (particularly secondary & micro nutrients), promoting improved vegetable/ fruits crop varieties, encouraging cultivation of Tissue culture banana (20 demos). Implementing the planned work plan, about 50 acre new area is being brought under vegetable cultivation and similarly about 25 acres under fruit plantations. The prominent vegetables consist of tomato, brinjal, okra and bitter gourd and prominent fruit plants comprises of mango, banana, papaya etc.

6.4.9. Prakasam

Interventions.

- Improved varieties fruit plants for higher yield
- Vegetable crops
- Good quality seed
- Efficient water management through drip irrigation
- Encourage to grow high value vegetables in shade nets
- Balanced fertilizer and use of organic and bio fertilizers
- Integrated crop management

Kitchen garden to improve home diet nutrition and additional income

Seven hundred different vegetable seed packets were provided to women farmers in eleven pilot villages in Kanagiri and Konakanamitla mandal covering 162 beneficiaries (Fig. 6.4.9.1). Each of beneficiary households grew vegetables and after consumption, remaining about 20-25 kg were sold which got them about an average of Rs 800 as additional income.

Figure 6.4.9.1: Vegetable seed kit distribution to women farmers for kitechen gardening, Prakasam.

6.4.10. Srikakulam

Nutri kitchen gardens

To address the issue of malnutrition, kitchen gardens with 7 crops (Tomato, French bean, Okra, Dolichos, Bitter Gourd, Palak and Amaranthus) were promoted in the pilot villages during 2016-17 (Appendix 3). In Ranasthalam pilot villages 36 kitchen garden units were promoted and about 1250 kg vegetables were produced by the beneficiary farmers and consumed. In Polaki villages 24 units were promoted and about 760 kg vegetables were produced and consumed. Similarly in Seethampeta villages 20 units were promoted and 650 kg vegetables produced and consumed by the beneficiary families (Table 6.4.10.1 and Figure 6.4.10.1).

Table 6.4.10.1: Details of kitchen gardens in the pilot Mandals during 2016-17.

Name of the Mandal	Units promoted	Vegetables kits supplied	Area grown (m^2)	Quantity produced (kg)
Ranasthalam	36	229	380	1250
Polaki	24	156	250	760
Seethampeta	20	166	205	650
Total	80	551	835	2660

Figure 6.4.10.1: Kitchen gardens grown in pilot villages during 2016-17.

Capacity building

Capacity building programs were conducted on soil samples collection in horticulture plantations, promotion of horticulture plantations, growing of vegetables, micro irrigation, fertigation, pest and disease control, compost production with horticulture waste, FPOs etc. in coordination with horticulture department in the district (Figure 6.4.10.2).

Figure 6.4.10.2: Visit of commissioner of horticulture (left) and district officials (right) for promotion of horticulture crops.

Other

Easy planter was used by farmers for transplanting vegetables and chilli crops by covering large area in less time in addition to saving labour cost in the pilot villages (Table 6.4.10.2). Fertigation trials were conducted in horticulture crops and farmers harvested more yields as compared to normal practice (Table 6.4.10.3 and Figure 6.4.10.3).

Table 6.4.10.2 Easy planter trials in the villages during 2016-17

S.No	Farmer Name	Father name	Village	Mandal	Crop
1	V Ramachandara rao	Papaprao	Tallavalsa	Laveru	Tamoto
2	B Vasu	tahata rao	Pisini	Ranasthlam	Chilli
3	K Chitti	Bhaskara rao	Vedullavalsa	Polaki	Chilli
4	A Appanna	somulu	Ambeerupeta	Polaki	Vegetables

Figure 6.4.10.3: Drip irrigation and fertigation adoption in Srikakulam district.

Figure 6.4.10.4: Soil samples collection in horticulture plantations during 2016.

Table 6.4.10.3: Fertigation trials in the villages during 2016-17.

S. No.	Farmer	Village	Mandal	Crop	Season	Area (acre)	Yield (kg/acre)		% increase
							No fertigation	Fertigation	
1	P Tavitinaidu	Venkataraoprta	Ranasthalam	Papaya	*Karif*	2	17000	18000	6
2	V Ramchanadara rao	Tallavalasa	Laveru	Brinjal	*Karif*	1	2200	2400	9
3	A Krishna	Pallipeta	Ranasthalam	Chilli	*Karif*	1	650	800	23
4	L Krishana rao	Ravada	Ranasthalam	Tissue banana	*Karif*	3	Yet to be harvested		
5	L Krishana rao	Ravada	Ranasthalam	Coconut	*Karif*	4	Yet to be harvested		
6	A Gopi	Pathapanukuvalasa	Seethampeta	Papaya	*Karif*	1	7000	9000	29
7	S Seedu	Kondapalli	Seethampeta	Papaya	*Karif*	0.5	3400	4200	24
8	V Ramchanadara rao	Tallavalasa	Laveru	Papaya	*Rabi*	1	Yet to be harvested		
9	V Ramchanadara Rao	Tallavalasa	Laveru	Chilli	*Rabi*	1	850	1000	18
10	P Srinivasa Rao	Kambalipeta	Ranasthalam	Banana	*Rabi*	3	Yet to be harvested		
11	V Sreeramulureddy	Pallipeta	Polaki	Chilli	*Rabi*	1	Yet to be harvested		
12	N Sanyasi rao	Pallipeta	Polaki	Chilli	*Rabi*	0.8	Yet to be harvested		
13	Datala Danesh	Pallipeta	Polaki	Chilli	*Rabi*	1	Yet to be harvested		
14	S Simmyya	Gollalavalasa	Polaki	Chilli	*Rabi*	1	Yet to be harvested		

A total of 641 soil samples were collected in horticulture plantations from 13 Mandals of Srikakulam district during 2016 to assess the soil fertility status as well as to develop soil test based nutrients recommendations to enhance productivity of horticulture crops.

6.4.11. Visakhapatnam

Horticulture soil and leaf sample collection

Total 35 revenue villages were selected from 10 Mandals of 6 divisions for soil sample collection. Altogether 208 soil samples have been collected for detailed analysis consisting 98 cashew, 24 tomato, 6 coconut, 80 mango samples (Table 6.4.11.1).

Table 6.4.11.1: Details of horticulture soil samples in Visakhapatnam district.

Divisions	Mandal	No. of samples by crop				Total no. of samples
		Cashew	Mango	Tomato	Coconut	
Bheemunipatnam	Anandapuram	46	8	0	0	54
	Bheemunipatnam	0	0	0	6	6
	Padmanabham	0	21	0	0	21
Anakapalli	Anakapalli	4	0	16	0	20
	Kasimkota	16	9	0	0	25
Chodavaram	Ravikamatham	5	0	0	0	5
Visakhapatnam (Rural)	Paravada	4	0	0	0	4
	Subbavaram	10	5	0	0	15
Devarapalli	Devarapalli	9	0	0	0	9
K Kotapadu	K Kotapadu	4	37	8	0	49
Total no. of samples		98	80	24	6	208

Figure 6.4.11.1: Horticulture soil sample packing and transporting.

Vegetable seeds distributed to small women farmers and elementary schools:

For mainstreaming women in agriculture, small scale vegetable cultivation or kitchen gardening is being promoted through women farmers. Demand-driven vegetable seeds are distributed to about 125 beneficiaries in Padmanabham and Butchayyapeta mandals for growing vegetables during *kharif* 2016 (Table 6.4.11.2). Vegetable seed distributed to 9 elementary and one high school in Padmanabham and 10 schools covered in Butchayyapeta mandal (Figure 6.4.11.2).

Table 6.4.11.2: Details of kitchen garden seed distribution in pilot mandals, Visakhapatnam district.			
Crop	Variety	Quantity (kg)	No of beneficiaries
Tomato	ArkaVikas	0.1	50
French bean	ArkaKomal	1.3	75
Bhendi	ArkaAnamika	0.6	25
Dolichos	Arka Jay	0.1	20
Spinach (Palak)	ArkaAnupama	0.8	30
Amaranthus	ArkaSuguna	0.2	25
	Total	3.1	125

Figure 6.4.11.2: Vegetable seed distribution to women farmers as well as primary schools in pilot Mandals.

6.4.12. Vizianagaram

Kitchen garden Vegetable Seed Distribution and Beneficiaries details

- Total No of 436 Vegetables seed kits packets provided in 31 pilot villages to improve home nutrition

Table 6.4.12.1: Details of Kitchen garden seed packs in pilot villages			
Name of the mandal	No.Of Villages	Quantity	No of beneficiaries
Pusapatirega	19	300 Packets	300
Polaki	12	136 Packets	136
Seethampeta	31	436 Packets	436

6.4.13. W Godavari

Intervents / Technologies Demonstrated.

Soil fertility mapping in Horticulture areas

Soil test based fertilizer application is one of the important intervention is targeted as an entry point activity in pilot villages. Total 633 soil samples from 12 Mandals were collected (Figure 6.4.13.1) with help of Department of Horticulture; analyzed at state of art laboratory of ICRISAT. Samples covered wide range of horticulture crops, soils, and social and economic status of the farmers.

Figure 6.4.13.1: Soil sampling in horticulture fields.

Table 6.4.13.1: Soil test results of important nutrient parameters for different horticulture crops. Values shows per cent number of fields deficient in essential nutrients.

Crops	low Org-C	% deficiency of available nutrients										No of samples
		Av P	Av K	Av Ca	Av Mg	Av S	Av Zn	Av B	Av Fe	Av Cu	Av Mn	
Acid Lime	88	0	41	94	35	88	29	88	0	41	0	17
Banana	80	7	40	87	17	80	37	70	7	40	0	30
Cashew	90	38	51	87	52	87	43	79	0	60	2	63
Cocoa	85	12	36	82	18	73	49	75	6	57	1	67
Coconut	73	19	28	71	13	80	37	67	1	36	1	275
Mango	75	26	28	84	24	80	45	78	1	43	1	116
Oil palm	86	11	47	86	28	84	48	78	0	38	0	64
Total	78	19	34	79	22	81	41	73	2	42	1	633

Total 633 soil samples from 12 mandals were collected those widely covered cropping system, soils, and social and economic status of the pilot area. Table 6.4.13.1 shows soil test results of important nutrient parameters in different pilot villages. It summarize per cent field deficient in specific nutrient in selected crops at the district. The analysis indicated that farmers' fields are deficient with sulphur (80 %), boron (75 %), calcium (80%) and highly deficient in organic carbon (>80% fields).

Need based irrigation scheduling using Water Impact Calculator

Need based irrigation scheduling (through Water Impact Calculator) is targeted for enhancing water use efficiency especially in 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) 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. Irrigation scheduling cards were distributed to farmers and trained them on its use (Figure 6.4.13.2).

ICRISAT Science with a human face

IRRIGATION CALENDAR

ICRISAT DEVELOPMENT CENTER

Irrigation calendar is developed as per water balance approach. Soil moisture availability and crop water requirement at different stages are compared and irrigation quantity was estimated. Irrigation scheduling protocol is prepared for two important soil types (Alfisol and Vertisol) on weekly time scale.

Location

Taluk	District	State
K. Kota	West Godavari	Andhra Pradesh

General Information

Alfisol (Red soil)		Vertisol (Black soil)		Irrigation method
FC*	PWP*	FC	PWP	
0.20	0.08	0.35	0.15	Drip

*FC: *Field Capacity*, PWP: *Permanent Wilting Point*

User Instructions

- Irrigation amount is given in terms of i) water depth (mm); and ii) in Liter/plant/day (for orchard crops)
- This information could be converted in terms of pumping duration using **Table II** as shown below:
- Pumping duration for 1 mm water application in one hectare area can be estimated with the help of **Table II** by matching pump HP (in Column) and water table depths (in rows)

Example

- If irrigation water requirement of a crop = 20 mm/week; farmer uses 5 HP engine and pumping from 100 m depth
- Required pumping duration for 1 mm water application in 1 ha= 63 Min **(Table II)**
- Total pumping duration = 20 mm/week x 63 Min/mm = 1260 Min/week or 21 Hours/week; or 3 Hours/day

Crops Information

Particulars	Coconut	Oil palm	Banana	Acid lime	Mango	Sapota	Papaya
Plant spacing (m)	7.5 X 7.5	9 X 9	1.8 X 1.8	5 X 5	5 X 5	5 X 5	1.8 x1.8
Plant population	178	123	3086	400	400	277	3086
Planting area (ha)	1.0	1.0	1.0	1.0	1.0	1.0	1.0

**Irrigation scheduling for orchard crops is designed based on above plant population*

Table I. Irrigation recommendation

Month	Week	Avg. Rainfall (mm)	Coconut				Month	Week	Avg. Rainfall (mm)	Coconut			
			Red soil		Black Soil					Red soil		Black Soil	
			Irrig. (mm/ Week)	Irrig. (Lit/plant/ day)	Irrig. (mm/ Week)	Irrig. (Lit/plant/ day)				Irrig. (mm/ Week)	Irrig. (Lit/plant/ day)	Irrig. (mm/ Week)	Irrig. (Lit/plant/ day)
Jun	1	**12**	22	174	22	174	Dec	1	**16**	-	-	-	-
Jun	2	**19**	-	-	-	-	Dec	2	**11**	-	-	-	-
Jun	3	**37**	15	118	17	139	Dec	3	**0**	13	102	4	33
Jun	4	**20**	13	104	8	63	Dec	4	**0**	14	111	-	-
Jul	1	**29**	6	49	5	42	Dec	5	**5**	16	125	-	-
Jul	2	**58**	4	35	6	49	Jan	1	**1**	10	84	5	37
Jul	3	**34**	4	35	3	21	Jan	2	**12**	16	125	12	98
Jul	4	**53**	4	34	6	49	Jan	3	**0**	13	107	15	121
Jul	5	**61**	4	34	2	14	Jan	4	**0**	15	123	16	125
Aug	1	**31**	-	-	-	-	Feb	1	**0**	21	170	17	140
Aug	2	**74**	-	-	-	-	Feb	2	**0**	22	180	18	145
Aug	3	**72**	-	-	-	-	Feb	3	**8**	22	180	19	151
Aug	4	**88**	-	-	-	-	Feb	4	**0**	18	147	18	145
Sep	1	**55**	-	-	-	-	Mar	1	**0**	25	200	23	189
Sep	2	**55**	-	-	-	-	Mar	2	**0**	28	223	27	216
Sep	3	**60**	-	-	-	-	Mar	3	**0**	28	223	29	230
Sep	4	**16**	-	-	-	-	Mar	4	**0**	28	223	26	209
Sep	5	**50**	-	-	-	-	Apr	1	**0**	27	216	28	223
Oct	1	**30**	4	35	-	-	Apr	2	**0**	26	209	27	216
Oct	2	**28**	-	-	-	-	Apr	3	**0**	28	223	28	223
Oct	3	**59**	5	41	-	-	Apr	4	**11**	25	202	28	223
Oct	4	**26**	4	32	-	-	Apr	5	**1**	20	164	22	178
Nov	1	**33**	4	33	4	29	May	1	**27**	33	263	25	201
Nov	2	**12**	-	-	4	33	May	2	**12**	23	187	21	171
Nov	3	**8**	-	-	-	-	May	3	**31**	15	122	18	146
Nov	4	**2**	4	33	4	33	May	4	**3**	6	49	12	97

Month	Week	Sapota				Papaya			
		Red soil		Black Soil		Red soil		Black Soil	
		Irrigation mm/week	Irrigation Lit./Plant/day	Irrigation mm/week	Irrigation Lit./Plant/day	Irrigation mm/week	Irrigation Lit./Plant/day	Irrigation mm/week	Irrigation Lit./Plant/day
Jun	1	20	71	20	71	21	10	21	10
Jun	2	-	-	-	-	-	-	-	-
Jun	3	14	51	16	57	16	7	17	8
Jun	4	12	44	8	27	9	4	8	4
Jul	1	5	19	5	20	5	2	5	2
Jul	2	6	23	7	27	6	3	7	3
Jul	3	4	15	-	-	4	2	-	-
Jul	4	6	23	10	34	6	3	7	3
Jul	5	11	41	9	34	9	4	7	3
Aug	1	-	-	-	-	-	-	-	-
Aug	2	-	-	-	-	-	-	-	-
Aug	3	5	18	-	-	4	2	-	-
Aug	4	5	18	5	19	4	2	-	-
Sep	1	-	-	4	13	-	-	-	-
Sep	2	-	-	-	-	-	-	-	-
Sep	3	-	-	-	-	-	-	-	-
Sep	4	-	-	-	-	7	3	-	-
Sep	5	4	14	-	-	6	3	4	2
Oct	1	4	14	-	-	18	8	6	3
Oct	2	5	17	-	-	19	9	9	4
Oct	3	7	26	5	17	20	9	12	6
Oct	4	8	27	4	13	14	6	11	5
Nov	1	8	27	4	14	11	5	10	4
Nov	2	4	13	-	-	9	4	6	3
Nov	3	4	13	-	-	17	8	12	5
Nov	4	5	17	4	15	18	8	11	5
Dec	1	9	32	4	14	20	9	18	8
Dec	2	14	48	4	15	22	10	16	7
Dec	3	13	46	5	18	22	10	22	10
Dec	4	20	70	8	30	25	12	22	10
Dec	5	21	76	22	78	30	14	24	11
Jan	1	25	89	14	48	23	11	23	11
Jan	2	22	80	22	77	27	12	27	12
Jan	3	24	86	19	69	22	10	21	10
Jan	4	23	82	19	69	25	11	24	11
Feb	1	26	94	32	116	33	15	34	16
Feb	2	31	111	31	111	32	15	30	14
Feb	3	31	110	31	110	29	13	32	15
Feb	4	24	85	24	85	28	13	27	12
Mar	1	27	98	27	95	32	15	34	16
Mar	2	30	106	31	110	35	16	35	16
Mar	3	29	103	29	103	35	16	35	16
Mar	4	30	107	29	103	36	16	34	16
Apr	1	30	107	32	113	32	15	31	14
Apr	2	29	103	27	97	29	14	32	15
Apr	3	29	103	29	103	31	14	29	14
Apr	4	27	98	28	100	30	14	26	12
Apr	5	22	80	23	84	24	11	25	11
May	1	27	95	25	90	26	12	30	14
May	2	26	93	19	67	27	13	25	12
May	3	16	57	18	63	22	10	22	10
May	4	10	37	10	37	7	3	8	4

Table II. *Time required (in Min) to pump 1.0 mm water for one ha land (considered 30 m head loss from the drip irrigation setup in one ha)*

Water table depth (meter)	Pump (horse power)					
	2.0 HP	2.5 HP	3.0 HP	5.0 HP	7.0 HP	10 HP
	Pumping time (Min)					
10	49	39	32	19	14	10
20	61	49	41	24	17	12
30	73	58	49	29	21	15
50	97	78	65	39	28	19
100	158	127	105	63	45	32
200	280	224	187	112	80	56
300	401	321	268	161	115	80

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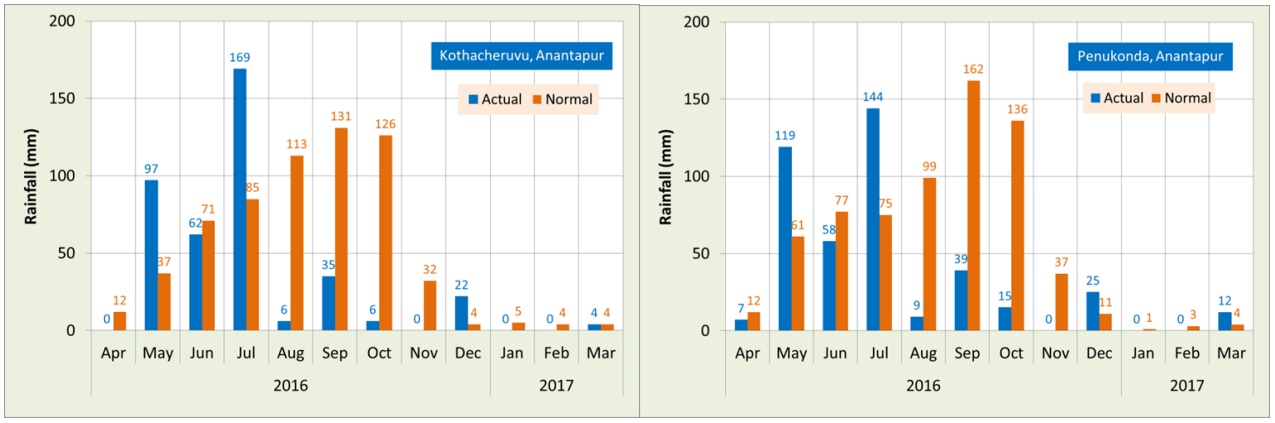
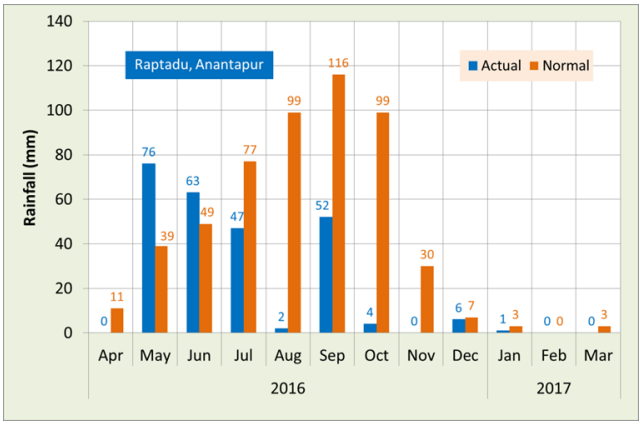
Figure 6.4.13.2: Irrigation scheduling card (weekly schedule includes amount of water to be applied) for different crops based on water balance approach.

7. Appendix

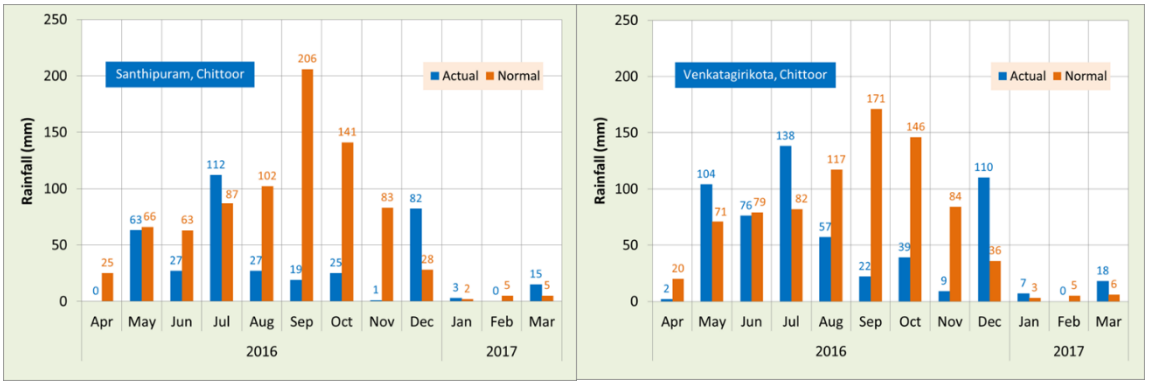
Monthly actual and normal rainfall in 13 districts of Andhra Pradesh state.



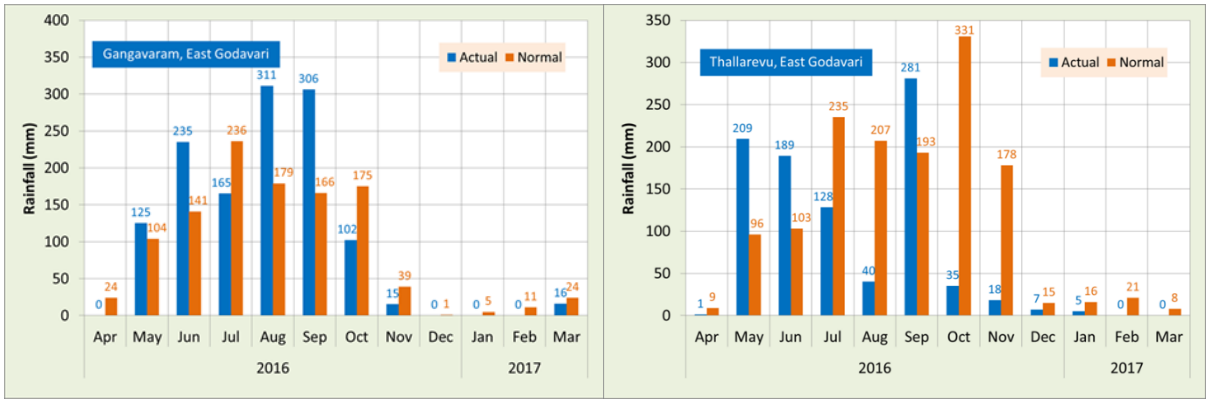
Monthly actual and normal rainfall of Kothacheruvu and Penukonda mandals, Anantapur district



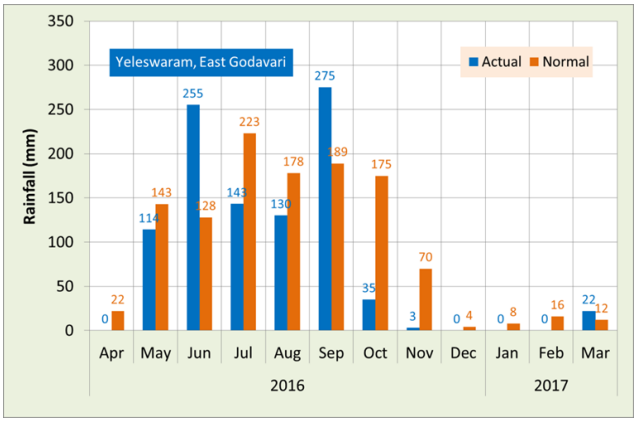
Monthly actual and normal rainfall of Raptadu mandal, Anantapur district



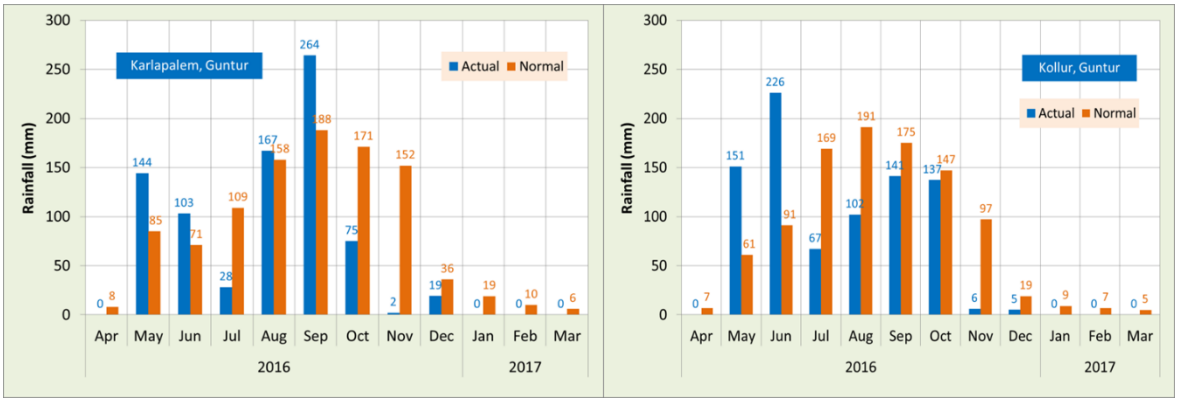
Monthly actual and normal rainfall of Santhipuram and Venkatagirikota mandals, Chittoor district.



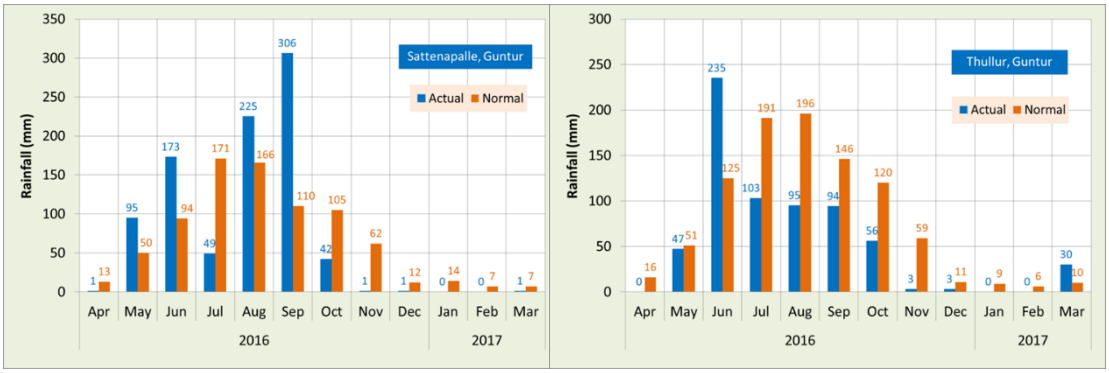
Monthly actual and normal rainfall of Gangavaram and Thallarevu mandals, East Godavari district.



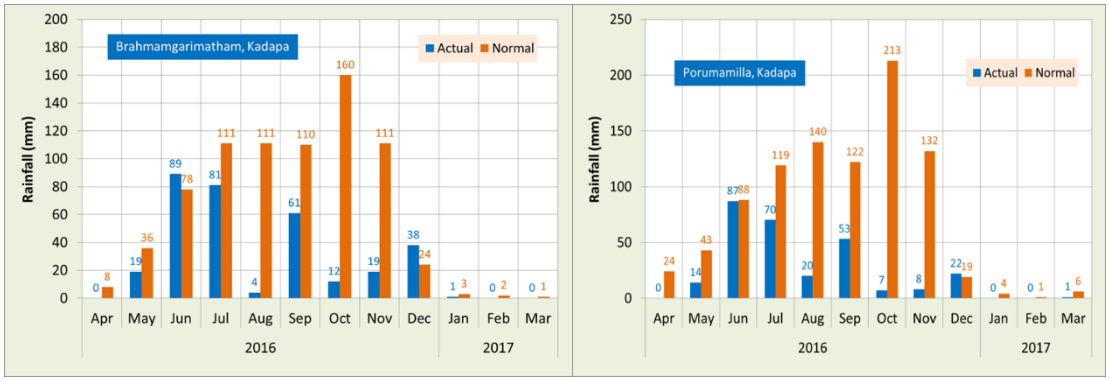
Monthly actual and normal rainfall of Yeleswaram mandal, East Godavari district.



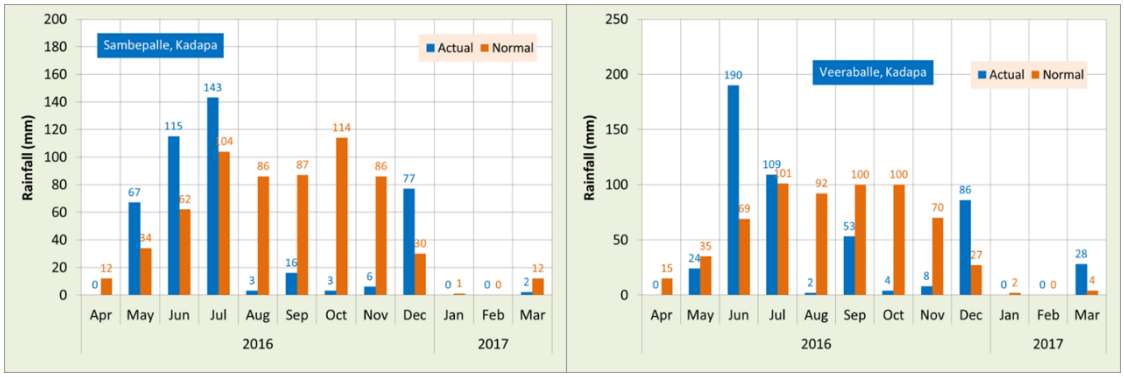
Monthly actual and normal rainfall of Karlapalem and Kollur mandals, Guntur district.



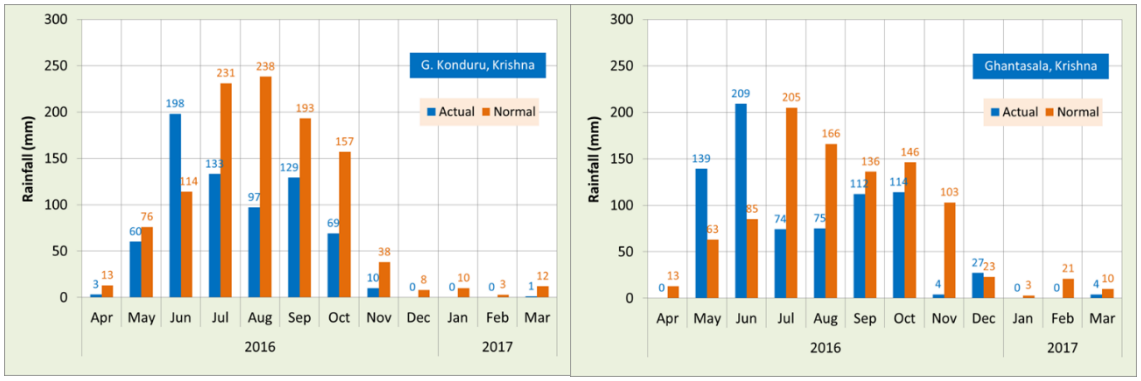
Monthly actual and normal rainfall of Sattenapalle and Thullur mandals, Guntur district.



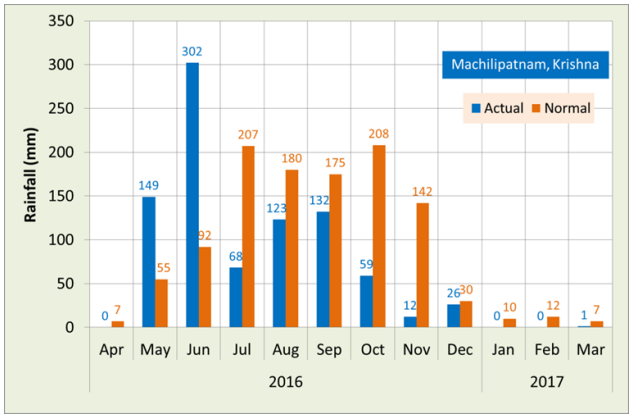
Monthly actual and normal rainfall of Brahmamgarimatham and Porumamilla mandals, Kadapa district.



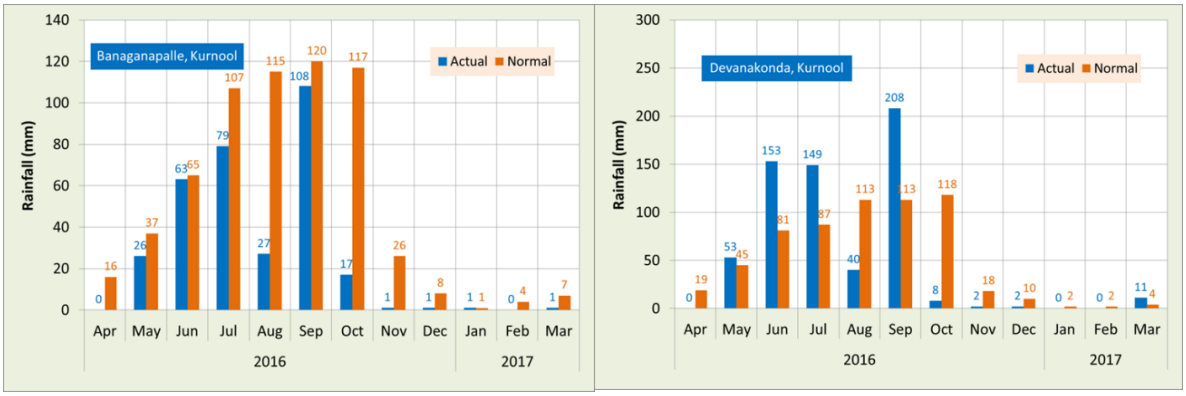
Monthly actual and normal rainfall of Sambepalle and Veeraballe mandals, Kadapa district.



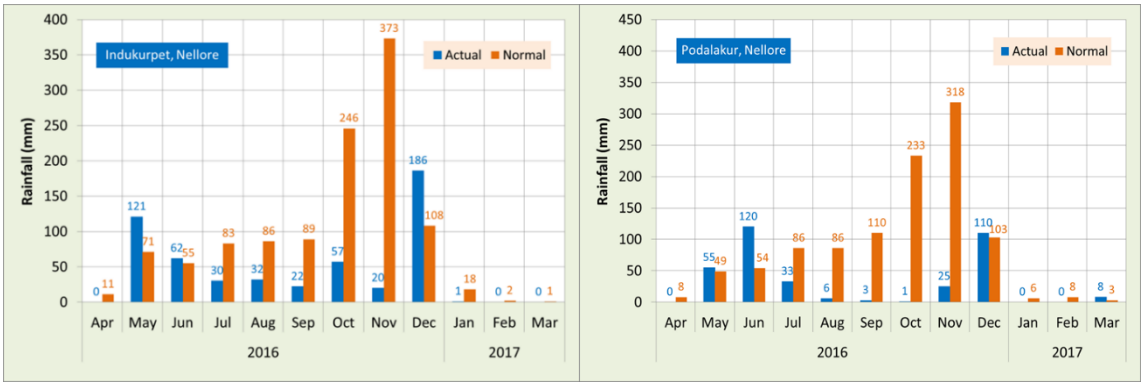
Monthly actual and normal rainfall of G. Konduru and Ghantasala mandals, Krishna district.



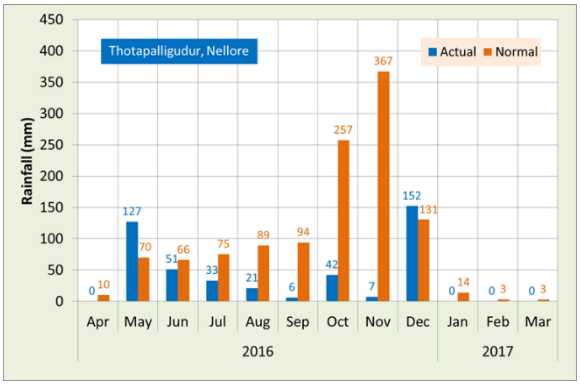
Monthly actual and normal rainfall of Machilipatnam mandal, Krishna district.



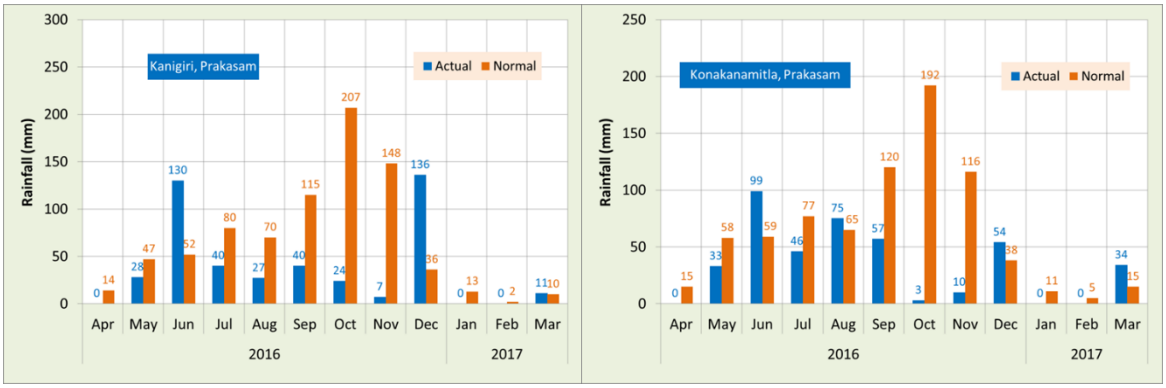
Monthly actual and normal rainfall of Banaganapalle and Devanakonda mandals, Kurnool district.



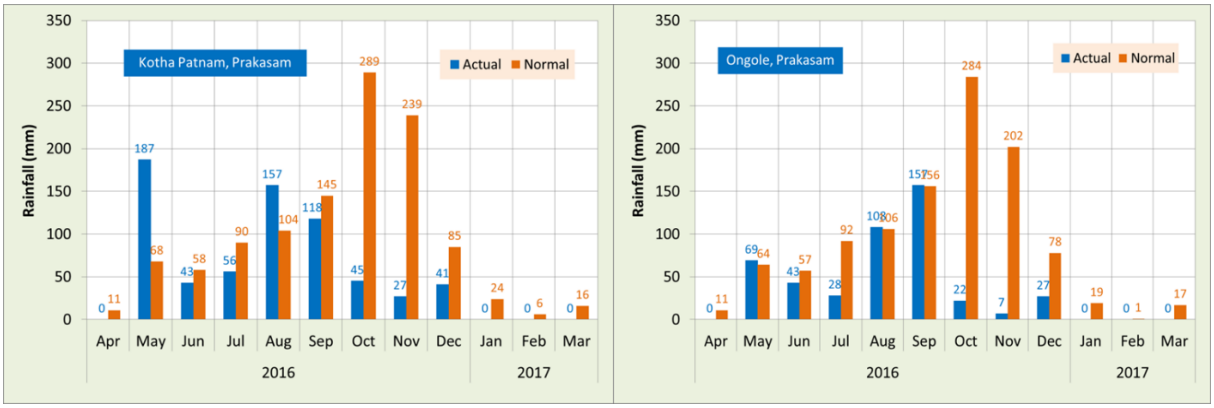
Monthly actual and normal rainfall of Indukurpet and Podalakur mandals, Nellore district.



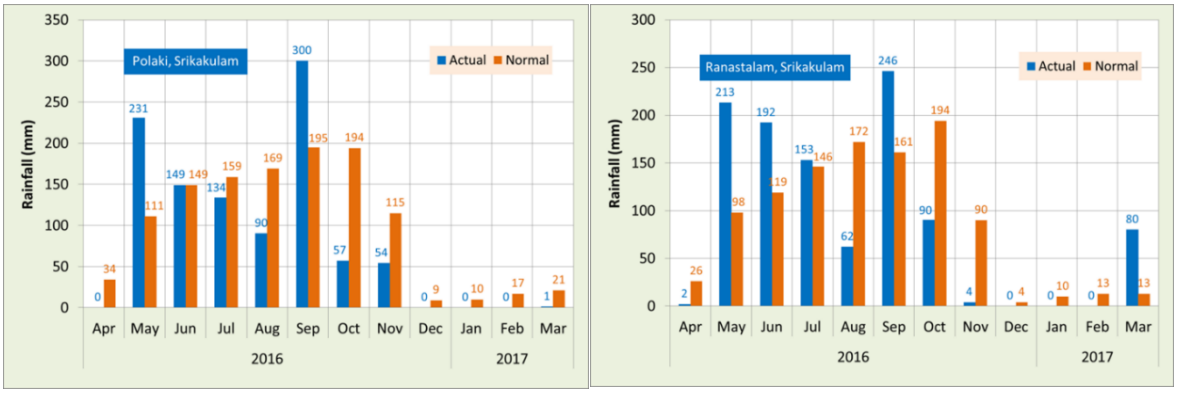
Monthly actual and normal rainfall of Thotapalligudur mandal, Nellore district.



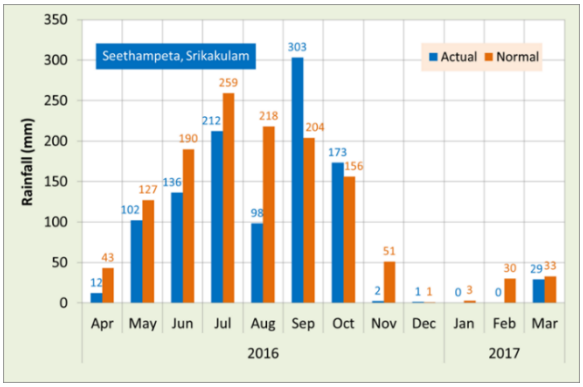
Monthly actual and normal rainfall of Kanigiri and Konakanamitla mandals, Prakasam district .



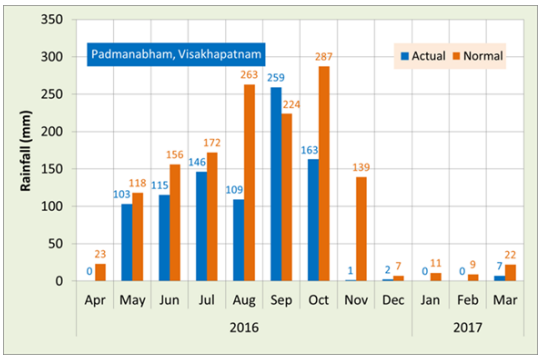
Monthly actual and normal rainfall of Kotha Patnam and Ongole mandals, Prakasam district.



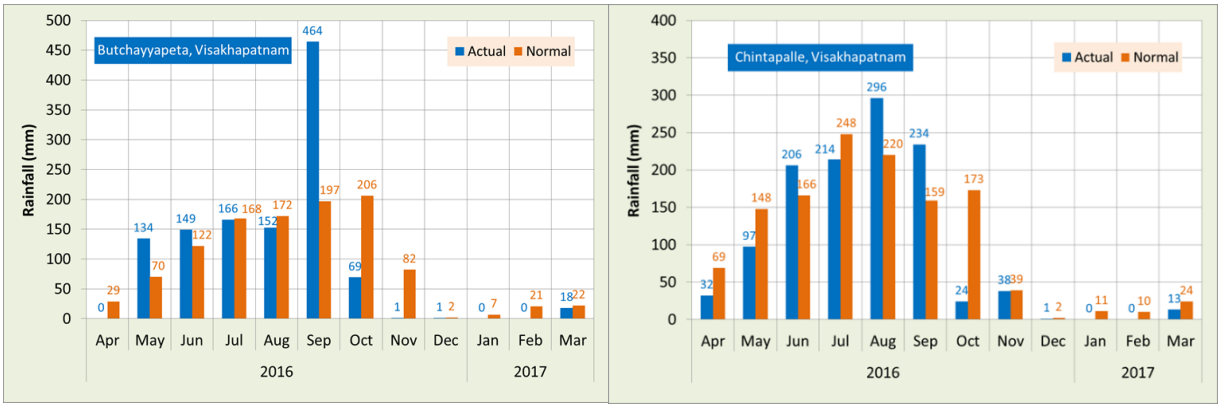
Monthly actual and normal rainfall of Polaki and Ranastalam mandals, Srikakulam district.



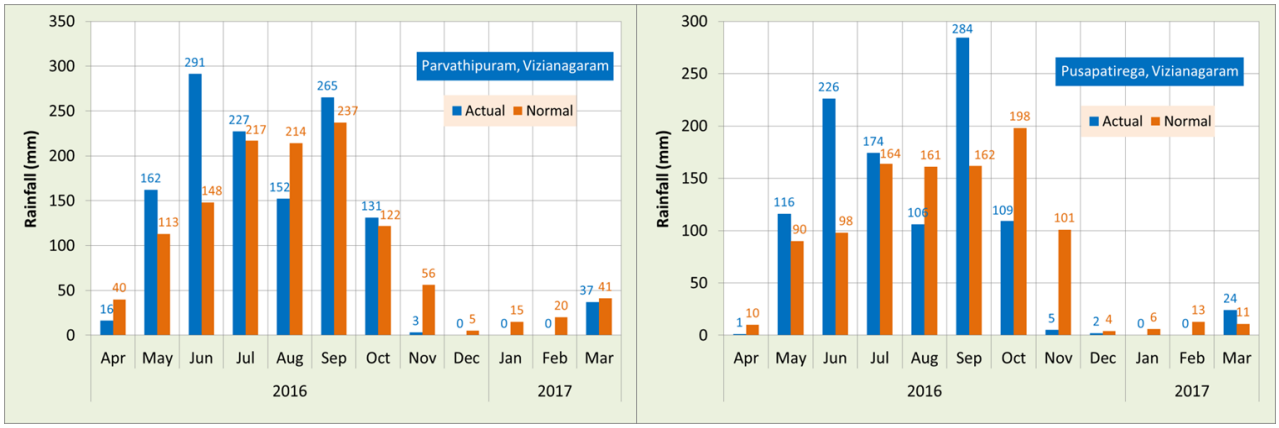
Monthly actual and normal rainfall of Seethampeta mandal, Srikakulam district.



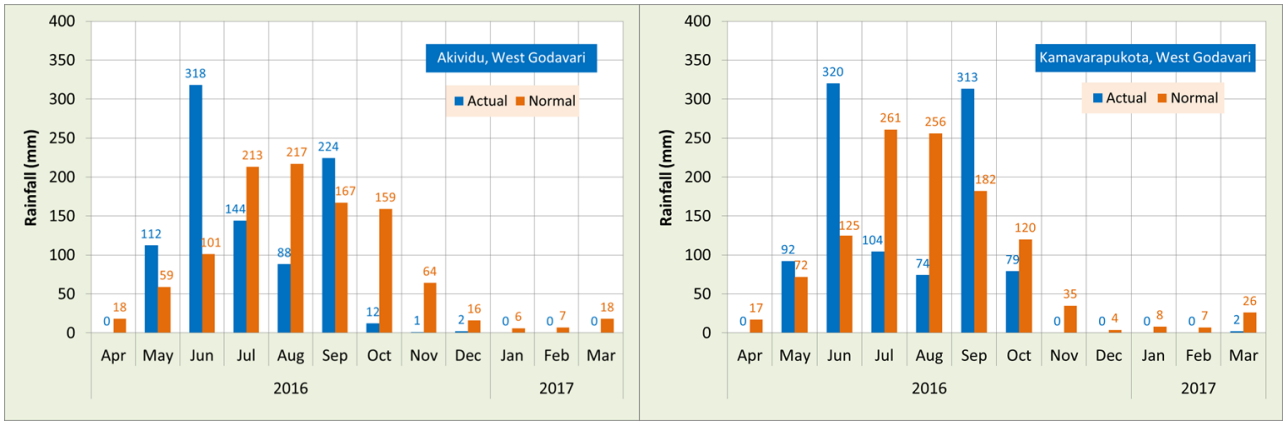
Monthly actual and normal rainfall of Padmanabham mandal, Visakhapatnam district.



Monthly actual and normal rainfall of Butchayyapeta and Chintapalle mandals, Visakhapatnam district.



Monthly actual and normal rainfall of Parvathipuram and Pusapatirega mandals, Vizianagaram district.



Monthly actual and normal rainfall of Akividu and Kamavarapukota mandals, West Godavari district.