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## Progress Report (April–December 2016)

# Improving Rural Livelihoods through Farmer-centric Integrated Watershed Management



*Submitted to  
Power Grid Corporation of India Ltd,  
Gurgaon, India*



**IDC** | ICRISAT  
DEVELOPMENT  
CENTER

INTERNATIONAL CROPS RESEARCH  
INSTITUTE FOR THE SEMI-ARID TROPICS

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## Executive Summary

Power Grid Corporation of India (POWERGRID), Gurgaon, India, supported ICRISAT-led consortium to improve rural livelihoods through farmer-centric integrated watershed management in Kurnool district of Andhra Pradesh. During 2015-16, based on the need appropriate watershed interventions were undertaken which comprised of activities like soil and water conservation through rock-filled dams, farm ponds, masonry check dams and recharge pits for wells. These soil and water conservation structures have created a net storage capacity of 41620 m<sup>3</sup> resulting in total conservation of about 60,000 m<sup>3</sup> of surface runoff water in 2-3 filling in addition to increased groundwater table, while reducing soil loss. One big percolation tank in Veeraipalli which has a net storage capacity of 30000 m<sup>3</sup> has been constructed which benefits several farmers in village. Productivity enhancements through crop demonstrations, crop diversification and livelihood improvement activities like vermicomposting, goatery (goat rearing), afforestation and avenue plantation were done. Based on soil analysis results fertilizer recommendations were given to target optimum yields by adopting the principle to recommend full dose of a nutrient in case of >50% farmers' fields are found deficient and half dose if <50% farmers' fields are found deficient. Thirty four participatory varietal trials and 100 training programs on balanced fertilizer management were conducted to evaluate soil test-based recommendations.

In order to make the initiative sustainable in the long run, capacity building was undertaken as a key activity in the watershed. During 2016-17, five formal capacity development programs were conducted for around 96 farmers in addition to one field day.

## Background

The Bethamcherla watershed project area encompasses 6,852 ha covering 10 villages four revenue villages viz. Pendekal, Muddavaram, Emboy, Bugganipalli in Bethamcherla Mandal of Kurnool district. During the year, various activities under taken are: soil and water conservation that include - farm ponds, well recharge pits, check dams, percolation tanks and in-situ moisture conservation system; land development; productivity enhancement initiatives like – soil test based fertilizer application, improved crop varieties selection; afforestation with *Pongamia* and *Gliricidia*; livelihood activities like supporting women SHGs for dairy, ram rearing, etc.

## Soil and Water Conservation

Various rainwater harvesting and groundwater recharge structures constructed during the April – December 2016 were: two check dams, 7 farm ponds, two percolation tanks and four rock-filled dams (RFD), 18 loose boulder structures (LBS) (Fig. 1). Land development of small farmers belonging to Schedule Castes (SC) was taken up. Activities like stone removal were supported by the project and silt transportation and spreading was taken up under MGNREGS. One big percolation tank in Veeraipalli which has a net storage capacity of 30000 m<sup>3</sup> has been constructed which benefits several farmers in village.



*Figure 1. Soil and water conservation structures in POWERGRID-ICRISAT watershed, Bethamcherla, Kurnool district.*

### **Productivity Enhancement and Crop Diversification**

During *kharif* 2016, participatory crop demonstration with improved practices was taken up with 267 farmers in 126 ha (Table1 and Fig.2) and crops included were foxtail millet, groundnut and pigeonpea. Various crop productivity enhancement like, improved cultivar seeds, micro nutrients amendment, crop growth regulator (Aqua sap), integrated pest management practices. Foxtail



millet and groundnut have been harvested and reported an increase in yield in improved practice of 9-28% over farmers practice, while the pigeonpea will be harvested next month (Table 2).

Village	No. of farmers	Area (ha)
Bugganipalli	60	25
Pendekal	40	22
Marrikunta	43	15
Repalle	15	7
Muddavaram	45	25
Veeraipalle	50	25
Musalai Cheruvu	14	7
Total	267	126



**Figure. 2. Improved crop varieties of pigeonpea (ICPH 2740) and groundnut (K6), Aqua Sap Spraying and CCE, POWERGRID\_ICRISAT watershed, Kurnool.**

<b>Table 2. Crop yield with improved practice over farmers practice in watershed sites (Bethamcherla), Kurnool AP, 2016-17</b>			
Crop *	Improved Practice (kg/ha)	Farmer practice (Kg/ha)	Increase (%)
Foxtail millet	1050	820	28
Groundnut	1800	1650	9

\*Pigeonpea yet to be harvested

### **Intensification of Vegetable Crops**

Vegetable crops of onion were cultivated with application of micronutrients. Thirty four farmers were provided vegetable seeds and micronutrients for cultivating a total area of 2 ha (Fig. 3) by the project. In addition to this to create awareness among school children on cultivation of vegetables and their importance in improving household nutrition, vegetable seed kits (600 units of 10m<sup>2</sup> each) were provided. The students were encouraged to use them in the backyards of their homes.



***Figure 3. Vegetable cultivation in Bethamcherla watershed, Kurnool.***

### **Decentralized Wastewater Treatment System**

One decentralized domestic wastewater treatment unit has been constructed in M Pendekal (Fig.4). In this site wastewater flows under natural gradient and collects outside the village. The village has high NH<sub>4</sub>-N, NO<sub>3</sub>-N and phosphate compared to other three villages (Table 3). Panchayat land is available outside the village for construction of wetland. Design details are shown in Table 4 and Figure 5.



Table 3. Wastewater characteristics of watershed sites (Bethamcherla) near Kurnool AP									
Village name	Wastewater characteristics								
	pH	EC ms/ cm	NH <sub>4</sub> -N (mg/L)	NO <sub>3</sub> -N (mg/L)	COD (mg/L)	TDS (mg/L)	TSS (mg/L)	Sulphate (mg/L)	Phosphate (mg/L)
M Pendekal	7.6	1.1	73.05	6.10	64	1044	200	18.4	0.81
Marrikunta <i>nala</i> wastewater	7.5	0.8	67.64	7.41	112	767	688	12.3	0.64
Marrikunta wastewater+rain water	7.6	0.9	23.49	2.61	80	909	108	20.4	0
Musalaicheruvu	7.3	1.1	87.99	3.32	80	1113	476	22.04	0
Muddavaram	7.3	1.0	35.40	3.72	72	1020	68	17.23	0.37



Figure 4. Wastewater treatment unit in M Pendekal, Kurnool.

Table 4. Design parameters for wastewater treatment system at watershed village M Pendekal.	
Number of households connected to common drainage	400
Wastewater generation (m <sup>3</sup> /d)	51
Component of constructed wetland	
Required volume of wetland considering 3 day HRT and 0.5 porosity total volume in (m <sup>3</sup> )	307
Total depth of wetland (m)	0.8 m
Width of wetland (m)	3 m
Length (m)	56 m
Length of wetland total 56 m divided into 4 treatments each having length of 13 m.	
Vegetation	<i>Typha latifolia</i>
Inlet sedimentation tank has to be constructed before wastewater enters constructed wetland L x W x D	L (2m) x W (3m) x D(1.5 m)
Filter bed - quantity of gravel and sand required for filter bed	
Coarse sand (topmost layer)	Depth= 20 cm
20 mm gravel (0.2 m layer below 10 mm gravel layer)	Depth= 20 cm
40 mm gravel (0.2 m layer below 40 mm gravel layer)	Depth= 20 cm
Treated wastewater outlet storage tank	L (2m) x W (3m) x D (0.8m)
Construction of the wetland with concrete or stone pitching material	



## Livelihood Activities

Under revolving fund, SHG groups (Madhuri and Geetanjali) consisting 10 members in each group in three villages (Veeraiahpalli, Muddavaram and G Tanda) were supported to buy ram lambs, sewing machine, Xerox in 2016 to improve their livelihoods in addition to agricultural income (Figure 5). Other activities like one mini dall mill for value addition of grain pigeonpea as a source of higher income to farmers in a business model has been introduced. A shredder machine for compost preparation is introduced which will provide compost to farmers while reducing the cost on chemical fertilizer also improves soil health. Vermicomposting and aerobic composting has a multiple benefit like economic and environmental benefits.



**Figure 5. Various livelihood activities (from left click wise: Dal Mill, Shredder, vermicompost and Xerox machine) supported by the project.**

## Afforestation

Forest tree species viz. teak, red sandal and *Gliricidia* (19500) plants grown in nursery (Fig. 6). Avenue plantation with 3900 plants and on bunds of water harvesting structures about 3000 plants have been planted. About 2600 plants of teak have been planted on field bunds.



**Figure 6. Nursery for raising *Gliricidia*, red sandal and teak in Muddavaram, POWERGRID\_ICRISAT watershed, Kurnool.**

## Capacity Building Activities

Several capacity building activities like trainings, scientist-farmers interactions were conducted (Table 5 and Fig. 7). Wall writings in prominent location were displayed. An innovative digital extension system was introduced to reach large number of farmers using a handheld pico project to show videos of improved practices to farmers. Exposure visit to participate in National Farmers day at ICRISAT and training were organized during 22-23 Sep 2016, where in farmers from 7 states attended that gave a good opportunity to interact with other watershed farmers.

<b>Table5.Capacity building activities in Bethamcherla watershed, Kurnool.</b>				
<b>Sl No.</b>	<b>Details of Training</b>	<b>No of Trainings</b>	<b>Participants</b>	
			<b>Men</b>	<b>Women</b>
1	Training on improved agricultural practices (Shredder m/c, Aqua Sap, easy planter)	4	45	5
2	Watershed implementation (soil & water conservation)	1	25	-
3	Farmers day	1	35	15





**Figure 7. Capacity building activities through meeting and farmers- scientist interaction, POWERGRID-ICRISAT watershed, Kurnool.**

## Annexure 1

### POWERGRID – ICRISAT watershed activities in Kurnool, Andhra Pradesh, April – December 2016.

Sl. No	Activities	Unit	April 2016 – December 2016	Total Achievements	No. of farmers Benefited
<b>A</b>	<b>Soil and Water conservation structures</b>				
1	Farm/dugout pond (FP)	No.	7	22	22
2	Check Dam (CD)	No.	2	8	170
3	Check wall	No.	-	2	8
4	Rock-filled dam (RFD)	No.	4	16	16
5	Loose boulder structures	No.	18	28	25
6	Open well recharge system	No.	-	4	4
7	Mini percolation tank	No.	2	4	80
8	Land development (stone removal and silt spreading)	ha	2	7	12
9	Stone Field bunding	ha	8	12	15
10	Wastewater treatment unit	No.	1	1	10
11	Diversion (feeder) channel	Rmt	50	50	Several
<b>B</b>	<b>Horticulture and income generating activities</b>				
1	Vermicomposting	No.	8	13	13
2	Ram lamb distribution	No.	-	30	150
3	Revolving fund to SHGs (sewing m/c, Xerox, daal mill)	Group	3	7	50
4	Field road formation	Km	0.8	0.8	Several
<b>C</b>	<b>Afforestation, horticulture and livestock improvement</b>				
1	Bund plantation	No	19500	19500	Several
2	Field bund & WHS planting of forest trees	No.	5100	5600	Several
3	Avenue plantation forest trees	No.	1900	3900	several
4	Vegetable seed distribution to school children for kitchen gardening (350 units of 10 m <sup>2</sup> each)	No.	600	950	1600
5	Vegetable cultivation	ha	3	8	60
6	Horticulture plants provided	No.	90	240	250
<b>D</b>	<b>Productivity enhancement trials</b>				
1	Participatory varietal demonstration	No.	67	101	101
2	Soil test based micronutrients	ha	200	300	300
<b>E</b>	<b>Capacity building /training/awareness conducted</b>				
1	Farmers' trainings	No.	5	15	250
2	Farmers day	No.	1	1	50
3	Wall writing	No.	4	54	several
4	Exposure visit to ICRISAT	No.	1	2	75
5	Video documentation	No.	3	4	Several