

**Progress Report
April 2015 – March 2016**

**Improving Rural Livelihoods through
Farmer-centric Integrated Watershed
Management**

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



**International Crops Research Institute
for the Semi-Arid Tropics**

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Executive Summary

Power Grid Corporation of India (POWERGRID), Gurgaon, India supported an ICRISAT-led consortium to improve rural livelihoods through farmer-centric integrated watershed management in Vijayapura district of Karnataka. During 2015-16, location specific interventions like soil and water conservation through farm ponds, masonry check dams, well recharge pits and drainage line treatment have been initiated. These soil and water conservation structures have created a net storage capacity of 5190 m³ resulting in total conservation of about 18,000 – 21,000 m³ of surface runoff water in 4-5 fillings in addition to increased groundwater table, while reducing the soil loss. Productivity enhancements through crop demonstrations, crop diversification with vegetable and flower crops and livelihood improvement activities like vermicomposting, goatery (goat rearing), kitchen garden and avenue plantation were introduced. This year has been one of very scanty and low rainfall, which has severely affected the *kharif* and *rabi* sowings, but rains received in the last week of August were harvested effectively in rainwater harvesting structures, which has helped recharge the groundwater and has been useful for livestock needs. Farmers were very happy and expressed that these rainwater conservation structures help them to sustain their crop production during long dry spells. Based on soil analysis results, balanced fertilizer application is followed to target optimum yields by adopting the principle of recommending full dose of a nutrient in case >50% of farmers' fields are found deficient and half dose if <50% of farmers' fields are found deficient. Participatory trials (90 farmers) were conducted during *kharif* and *rabi* 2015-16.

In order to make the initiative sustainable over the long run, capacity building is a focused activity in the watershed. During 2015-16, 20 formal capacity development programs and two field days were conducted in which capacity of around 899 farmers (425 men, 474 women) participated.

Background

In the Ukkali watershed, where the project target area is about 5000 ha, during April 2015–March 2016, various activities were undertaken such as soil and water conservation that includes farm ponds, well recharge pits, check dams, percolation tanks and broadbed and furrow system of in-situ moisture conservation; productivity enhancement initiatives like soil test based fertilizer application, improved crop varieties selection, multi nutrient sea weed extract Aqua Sap spray; crop diversification such as floriculture and vegetable cultivation; afforestation with *pongamia* and *gliricidia*; livelihood activities like supporting women SHGs for dairy, sheep and goatery, awareness and capacity building of farmers, etc.

Soil and water conservation

Various rainwater harvesting and groundwater recharge structures constructed were: four check dams, six farm ponds, three bore well recharge systems and two gully plugs (Figure 1). This year was a deficient rainfall year. *Kharif* season sowing was severely affected. Most of the bore wells dried up. However, rainfall in the last week of July (20 mm) and the 56 mm on 5 August 2015 have been harvested in both the check dams and well recharge pits were

very effective in recharging the groundwater levels. Farmers were very happy that the structures were useful. A farmer (Mr Sangamesh B Balki) who had sown pigeonpea in his field near the bore well, said that water in his bore well enabled him to save the crop. His bore well had water due to the check dam constructed near his field (Figure 1). Farmers mentioned that these check dams were the main source of water for animals in the village.



Figure 1. Water harvesting and groundwater recharge structures in Ukkali watershed (from top left clock wise: Check dam, check dam, farm pond and bore well recharge system).

Productivity enhancement

Ninety participatory trials were conducted during 2015-16 to evaluate various improved practices such as broad bed and furrow (BBF) landform, improved cultivars and “aqua sap” multi nutrient application (Table 1). The results showed productivity improvement by 7.9% in pigeonpea, 19% in groundnut and 9.2% in chickpea (Table 2). The scanty and low rainfall also severely affected the normal *kharif* sowings in the district as also in the watershed. During *kharif* 2015. Due to the delayed and scanty rainfall, short duration pigeonpea and pearl millet were sown, but due to the severe drought the pearl millet crop failed. Crop yields were very low due to drought. Since the rainfall during the first week of August was the only rains received in the watershed, most *kharif* cropping has been affected badly this year. In areas where BBF landform for moisture conservation was done for demonstration,

crop stand was better compared to the fields where the farmers used conventional methods (Figure 2).

Crop	No. of demonstration fields	Remarks
Pigeonpea (ICPL 88039)	10	Soil-test based nutrient and pest management on BBF with herbicide to control weeds
Pearl millet (HHB67)	15	Soil-test based nutrient and pest management on BBF with herbicide to control weeds
Chickpea (Jaki 9118 and JG11)	50	100 farmers
Soil-test based nutrient management (Bhoochetana)	1000 ha	600 farmers
Aqua Sap	15	

Crop	Improved practice (IP)	Farmers Practice (FP)	% increase in IP
Pigeonpea	0.39	0.36	7.9
Chickpea (Jaki)	0.83	0.76	9.2



Figure 2. Pigeonpea with pearl millet intercrop on BBF landform in kharif, chickpea in rabi and crop sample collection, Ukkali

Aquasap 5X – organic nutrient liquid: Aquasap 5X is a 100% seaweed extract organic liquid which is used as foliar spray for commercial crops. Aquasap 5X contains macro and micro nutrients, essential amino acids and plant growth hormones that provide a major boost to crop yield by accelerating the metabolic function and enhancing its nutrition uptake capacity. Spray preparation of 1% is used for foliar application 3 times during crop season at after-establishment stage, pre-flowering and post-flowering stages of the crop. It can also be used for vegetable crops. The seedlings roots have to be dipped in 0.3% solution. The solution is available in 1 litre packs, which is sufficient for one acre. As the liquid is an organic product, it is hazard free and can be handled with bare hands for mixing with water for preparing the solution. Demonstrations were conducted on pigeonpea crop (Figure 3). The crop stand was quite good with good flowering (15-20% higher flowering found in sprayed field).



Figure 3. Aquasap organic fertilizer spray used on pigeonpea crop in watershed

An improved tractor drawn seed drill cum BBF making implement has been provided to cover more area during *rabi* 2015 in addition to one tractors provided last year. A hands-on training in the operation of this equipment was provided.

Crop diversification and intensification

The increased water availability due to harvesting structures encouraged the project farmers to diversify into high value crops like floriculture and vegetable crops (Figure 4). With the convergence of the Horticulture Department farmers are going in for drip irrigation system this year. In addition, to encourage school children to take up cultivation of vegetables and create awareness among them about the importance of vegetables in improving household nutrition, vegetable seed kits (350 units for 10 m² each) have been provided (Table 3).

Components provided from project: Organic Manure - 3 bags, BIO-NPK – 3 bottles, Trichoderma- ½ liter in convergence with the Horticulture Department.



Figure 4. Farmers in the watershed showing their horticultural crops, Ukkali watershed, 2015.

Table 3. Crop diversification demonstration, Ukkali watershed, 2015-16.		
Crop diversification	Area (ha)	No of farmers
Floriculture (Rose, Tube rose, Mogra)	8	8
Vegetable (Chilli, Brinjal, Tomato, Cluster bean)	10	10
Fruit crop (Clustered apple and lemon)	5	5

Wastewater management and re-use system

Mulasavalagi is a village identified (Lat: 16°53'19.6" N; Long: 76°01'26.5" E) for decentralized wastewater treatment system in Vijayapura district (Figure 5). The village has two drainage canals; the one which has been identified for the construction is a major drain and has about 900 households, the characteristics of water sampled are given in Table 4. With the approval of CEO, this

activity is carried on by the Panchayat Raj department. The design and estimation work is in process (Figures 6 and 7).



Figure 5. Google-Earth image of the location selected for the activity

Table 4. Wastewater characteristics for the samples collected from Mulasavalagi, Vijayapura.

Sl. No.	Bijapur-1 water sample analysis data	Unit	Concentrations (mg/L)
1	Alkalinity (Total)	(mg/L as CaCO ₃)	213
2	Arsenic	(mg/L)	Below Detection Limit
3	Boron	(mg/L)	0.25
4	Cadmium	(mg/L)	Below Detection Limit
5	Calcium	(mg/L)	78
6	Chlorides	(mg/L)	307.50
7	Chromium	(mg/L)	Below Detection Limit
8	Cobalt	(mg/L)	Below Detection Limit
9	Chemical Oxygen Demand	(mg/L)	640
10	Copper	(mg/L)	Below Detection Limit
11	Electrical Conductivity	mS/cm	1.33
12	Fluorides	(mg/L)	2.13
13	Hardness (Total)	(mg/L as CaCO ₃)	360.00
14	Lead	(mg/L)	Below Detection Limit
15	Magnesium	(mg/L)	36.00
16	Manganese	(mg/L)	Below Detection Limit
17	Nickel	(mg/L)	Below Detection Limit
18	Nitrogen-Ammoniacal	(mg/L)	60.07
19	Nitrogen-Nitrate	(mg/L)	2.47
20	pH at 25° C		7.67
21	Phosphates	(mg/L)	2.72

Sl. No.	Bijapur-1 water sample analysis data	Unit	Concentrations (mg/L)
22	Potassium	(mg/L)	10.20
23	Sodium	(mg/L)	67.10
24	Sulfate	(mg/L)	92.90
25	Sulfur	(mg/L)	27.00
26	Total Dissolved Solids	(mg/L)	798
27	Total iron	(mg/L)	0.04
28	Total Suspended Solids	(mg/L)	34.00
29	Zinc	(mg/L)	0.06
30	Sodium Adsorption Ratio (SAR)		2.22

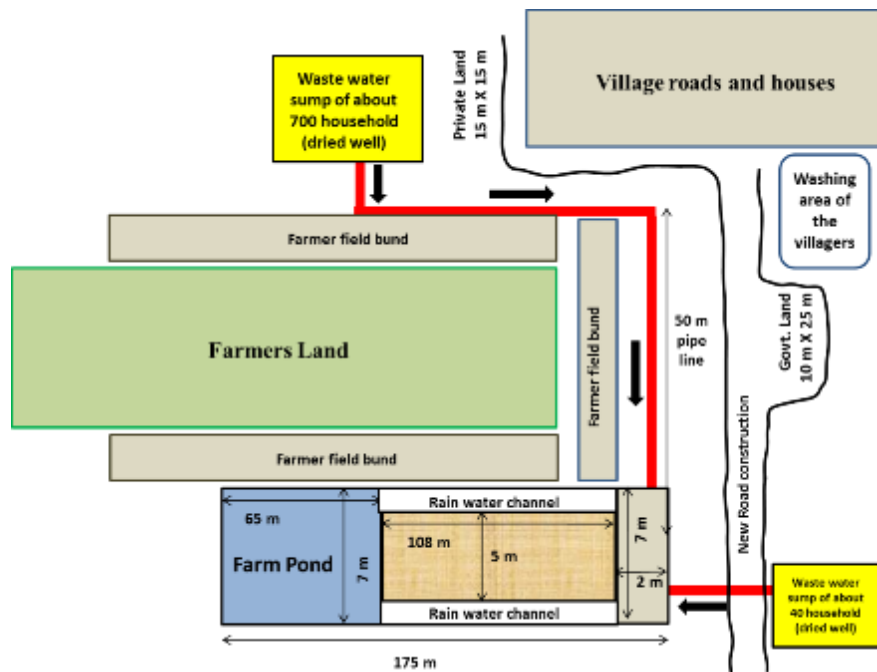


Figure 6. A layout of the village and the proposed site for the activity.

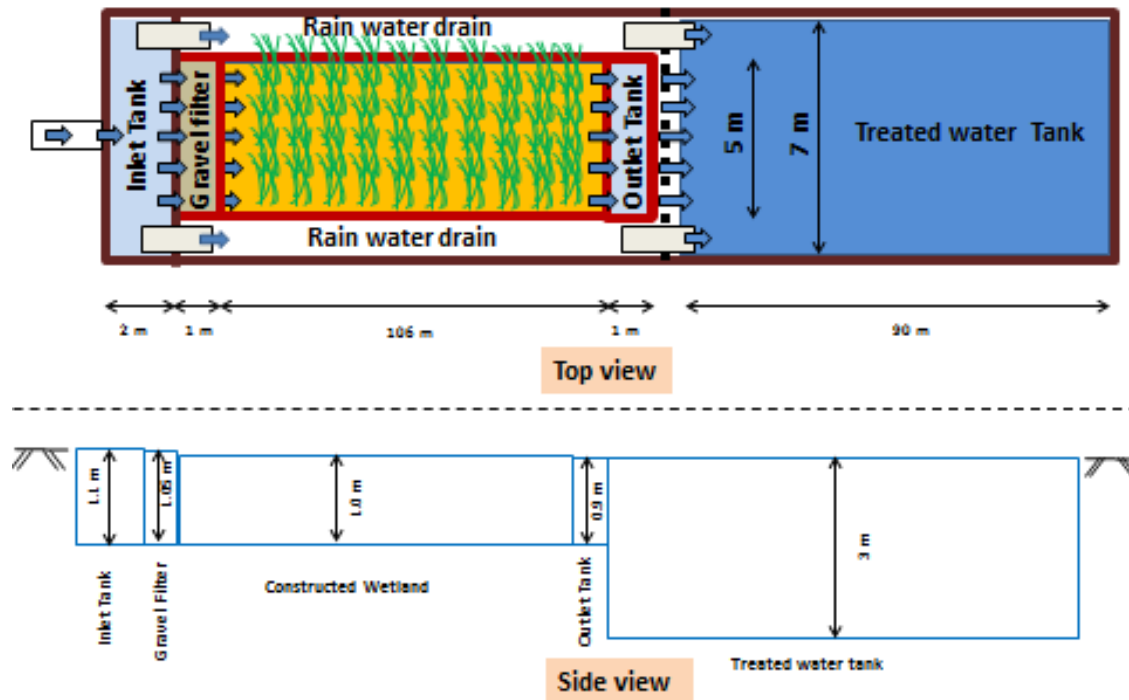


Figure 7. Line Design of the dimensions of the whole wastewater treatment system.

Livelihood and other activities

Vermicomposting has been done with ten farmers with vermi bed size of 3 m x 1 m x 1 m, which can prepare 10-12 tons of manure in 8-10 weeks (Figure 8). N-rich *Gliricidia* nursery has been raised. Avenue plantation and afforestation in common land is done. For 30 SHG groups, kitchen garden kits have been provided to improve the nutrition and income (Figure 9). One Sirohi buck (male goat) has been brought to the watershed to improve the local goat breed. Two rain gauges were installed in POWERGRID-ICRISAT watershed in Ukkali, Vijayapura for continuous monitoring of rainfall (Figure 10).



Figure 8. Vermicomposting and *Gliricidia* nursery in Ukkali watershed, 2015-16.



Figure 9. Kitchen gardening as a source of livelihood and to improve home nutrition activity in Ukkali watershed, 2015-16.



Figure 10. Dual type automatic-cum-manual rain gauge installed in Ukkali watershed.

Awareness and capacity building activities

Capacity building activities play a very critical role in effective participation and implementation of the watershed program. Several awareness and capacity building activities have been taken up in the watershed for effective dissemination and wider implementation of watershed interventions. Various activities in this direction include need based trainings on different topics, field day, farmers' day, information through display of wall writings and video screenings using pico projectors (Table 5 and Figure 11). An innovative digital extension system was introduced through the hand held pico projectors,

which were used as an effective tool to show videos of improved practices to a large number of farmers.

SI No.	Details of training	No of trainings	Participants	
			Men	Women
1	Training on improved agricultural practices	4	65	32
2	Watershed Implementation (soil & water conservation)	3	70	30
3	Tropicutor and BBF landform	3	150	5
4	Food process (traditional crop utilization for food) training	1	0	60
5	Refresher tailoring training	1	0	10
6	Digital extension for watershed staff and lead farmers	5	50	10
7	Composting	1	40	5
8	International Women’s day	1	30	320
9	Field day	1	20	2



Figure 11. Wall writing showing the soil test based fertilizer recommendation and a media clipping.



Figure 12. Hands-on trainings to women SHGs on livelihood activities, Ukkali, Karnataka. International Women's Day at POWERGRID-ICRISAT watershed, Ukkali

International women's day was celebrated wherein a large number of women farmers and SHG members (500 women and 100 men) from the watershed and neighboring villages participated on 15 March 2016 (Figures 12 and 13). Mr J Anjaneyalu, Dy. General Manager, POWERGRID (NTPC Kudagi) from Vijayapura inaugurated the function and addressed the women. Successful women leaders in the field of education, health services, etc, along with taluka panchayat members participated in the event. Prof. Dr D Vijaya Devi from Women's University and Dr Malini P Patil, Medical Officer, ZP member Ms Kamalabai A Patil spoke during the event to inspire women farmers. The event also included cultural programs for participants. Other line department officers including Joint Director of Agriculture Mr Manjunath, Dy. Forest Conservator Mr Tara Prasad and Extension Specialist UAS Dr RB Belli, also participated.



Figure 13. International Women's Day, Ukkali watershed, Vijayapura (Mr Anjaneyulu of POWERGRID addressing the gathering).

POWERGRID_ICRISAT Watershed Ukkali
Basavana Bagewadi Taluka, Vijayapur District, Karnataka, India

Progress of Activities from April 2015 to March 2016

Sl. No	Activities	Unit	April 2015-Mar 2016	Total Achievements	Total Beneficiary Farmers
A	Soil and water conservation structures				
1	Farm pond (FP)	No.	6	11	11
2	Bore well recharge pit	No.	3	03	03
3	Mini percolation tank	No.	4	04	12
4	Field bunding	ha	220	220	115
5	Check Dam (CD)	No.	4	06	40
6	Gully plugs	No.	2	2	04
7	Silt removal from existing tank	No.	1	1	12
8	Wastewater treatment unit	No.	1	In progress	
B	Income generating activities				
1	Vermi composting	No.	10	10	10
2	Vegetable seed distribution to SHG women for kitchen gardening	No	30	60	180
3	Horticultural plants provided to SHG women (Convergence with dept.)	No	500	150	150
4	Horticulture plants planted in farmers land (Convergence with dept.)	No	10 ha	12 ha	50
5	Vegetable seed kit to school children	No	320	320	1800
C	Afforestation and other planting				
1	Planting on bund forest trees	No	500	500	100
2	Avenue plantation	No	1600	2000	several
3	Plantation in community land	No	1000	1000	100
D	Livestock Improvement				
1	Goat breed development (Sirohi buck)	No	1	1	10
E	Productivity Enhancement trials				
1	Crop demonstration (variety, INM and balanced fertilization)	Ha	100	150	75
2	Improved implement-Seed drill cum BBF maker	no	2	2	25
3	Broadbed and furrow landform	Ha	5 ha	5 ha	5
F	Capacity building /training/awareness				
1	Farmers trainings	No.	12	18	590
2	SHGs capacity building training	No.	6	16	640
3	International Women's day	No	1	02	1100
4	Field day	No	1	01	22
5	Environmental day	No.	1	01	60
	Wall writing	No	20	30	Several
G	Exposure visits				
1	Vijayapur Krishimela at Hitnalli farm	No	1	02	50
2	Exposure Visit to ICRISAT	No	1	01	10