



Progress Report

Improving Livelihoods and Agricultural Productivity through Integrated Watershed Management

March 2017 to Sept 2018

Submitted to
Mahindra & Mahindra
Zaheerabad Mandal, Sanga Reddy District



INTERNATIONAL CROPS RESEARCH
INSTITUTE FOR THE SEMI-ARID TROPICS

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Identification of Watershed Location

The first major activity, which was taken up, was the selection of appropriate sites for the watershed project. Following major criteria were considered in the selection of sites for the model watersheds.

- Representativeness in terms of Soils, Landscape (slope and terrain), Rainfall, Crops, Socio-economic conditions
- Cooperative farmers who are willing to take active part in the watershed program
- Good potential for increasing agricultural productivity, income and conservation of natural resources
- Strong need for watershed program
- Major area under rainfed
- Good accessibility even during rainy season

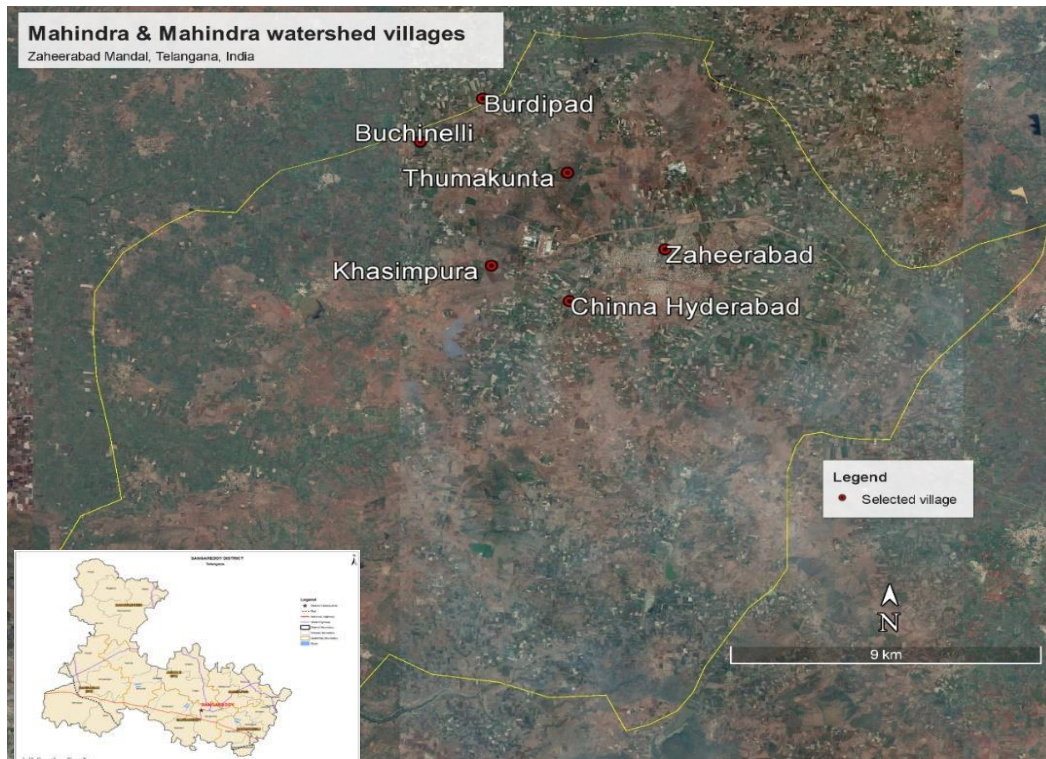


Figure 1. Project village(Buchinelli) in Zaheerabad mandal.

Considering the above key criteria, the two potential sites for watershed project were identified in Zahirabad mandal of Telangana. A field visit was under taken to select site for the watershed project with active involvement and participation of senior officials of Mahindra & Mahindra and

ICRISAT scientists in identifying potential site for the project. Based on these discussions and the observation collected followed by a transect walk, final selection of sites for the watershed project was made. Out of proposed three villages Buchinelli village was identified for the project with due involvement and consultation of Mahindra and Mahindra officials. This activity involved few visits and interaction with local farmers and gram panchayat members (Fig. 1 and 2; Table 1). Team collected the general information viz. demographic, land use details with total area, cultivated area, forest and wasteland etc. from the *gram panchayat* members and farmers in the village.



Figure 2. Senior officials of ICRISAT and Mahindra and Mahindra interacting with village sarpanch and farmers.

Basic Data Collections

The details of the visit to the potential sites are described below.

Table 1. Basic information of proposed project villages of Mahindra & Mahindra CSR project in Zaheerabad Mandal, Sangareddy District, Telangana.

Village:	Buchinelli	Khasimpura	Chinna Hyderabad	Burdipada & Tummakunta
Demographic information				
GPS reading:	17° 43' 20.45" 77° 32' 33.31"	17° 40' 27.58" 77° 32' 32.40"	17° 40' 9.70" 77° 35' 28.7"	17° 43' 43.39" 77° 33' 51.73"
Villages contacts nos.	Sarpanch 9553859691	VRO 9676171703	Ananth Reddy 9440550079	Sarpanch 9912935437
Total geo. Area (Acre)	2890.09	3135	1100.11	1791.14
Cultivable area (Acre)	2000	2800	1000	1500
Govt. land (Acre)	648	100		379

Village:	Buchinelli	Khasimpura	Chinna Hyderabad	Burdipada & Tummakunta
Irrigated area (Acres)	50%	800	70%	50%
Rainfed area (Acres)	50%	2000	30%	50%
Total No. of HH:	405	800	1347	470
No. of Landless HH:	20		347	
Total Population:	4028	4000	10341	2209
Existing SHGs (nos.)		55		37 Rythu Sangham 150 members
Livestock population				
Buffalo	50	200	70	50 Jersey+30 local
Cows	50	300	175	
Bullocks	30	100	10	
Small ruminants (sheep, goat)	600	2000	300	
Poultry Commercial		-		
Poultry backyard		1000	400	
Milk production (lit/day/animal)	3	2-4	2-3	8-10 Jersey 3-5 local
Tot. Milk production of village (l per day)	250-300	500	900	800
Organized Milk collection center	Zhb	Zhb	Zhb	Zhb
Average HH income (Rs/month):	5000-6000	3000	2000-3000	3000-4000
Major source of income:				
Agriculture	Yes	Yes	Yes	Yes
Livestock	~20%	~20%	~20%	~20%
Other (specify)	factory			
Biophysical Information				
Soil type & depth	40% black, 40% red, 20% laterite soil	2000 Ac black 100 ac red	90% black 10% red soil	90% black 10% red soil
Major Crops				
Irrigated crops	Sugarcane	Sugarcane, ginger	Sugarcane, ginger	Sugarcane, ginger
Rainfed crops	Pigeonpea, blackgram	Chickpea, sorghum, blackgram	Pigeonpea, maize,	Pigeonpea, Chickpea, sorghum, blackgram
Fertilizers used (kg/acre)				
Urea	150	100	200	50
DAP	100	50	150	25
SSP			150	150
Potash	150		100	

Village:	Buchinelli	Khasimpura	Chinna Hyderabad	Burdipada & Tummakunta
Zinc	10	10	50	10
Gypsum	nil	nil	nil	nil
Irrigation equipments				
Drip	NA	NA	80%	NA
Sprinkler	NA	NA	5%	NA
Flood	NA	NA	15%	NA
Water sources (nos. well depth)				
Tank	Kummari kunta 5ac WSA	Yallamma cheruvu	nil	Nil
Kunta	nil		nil	nil
Open wells	nil	60 (all defunct) (30')	32	15 (30')
Bore wells	400 (100'-500')	100 (350')	148	240 (400'-500')
Existing WHS (nos.)				
Check dam	6 CD	4 CD	4 CD	
Farm pond	nil	nil	nil	nil
Percolation tank	20 PT			9
No. of streams	1 big, 3 small	3 streams		1 big, 4 small
General slope (moderate, sloppy)	Moderate (<2%)	Moderate (<2%)	Moderate (<2%)	Moderate (<2%)
Constraints as perceived by farmers group				
Constraints	Low crop yields; water scarcity; Local/own seeds are used; low inclination in agriculture, prefers factory jobs	Low crop yields compared to neighboring villages Local / own seeds are used	Low crop yields; water scarcity; Local/own seeds are used; low inclination in agriculture, prefers factory jobs	Low crop yields; water scarcity; Local/own seeds are used; low inclination in agriculture, prefers factory jobs
Technical Assistance (Dep/ dealers/ any NGO etc	Least by Dep.	Least by Dep.	Least by Dep.	Least by Dep.
Soil test has been done?	No	No	No	No

Field Observation

- Most of the tanks have no proper drain connectivity;
- Declining groundwater;
- Predominantly mono cropping of sugarcane;
- No soil test has been done;
- Low crop yields due to lack of improved practice like seed replacement, mono cropping, improper water conservation and water use system;
- Low milk production; non-descriptive local breeds;
- Least technical support from department;
- Low inclination in agriculture, specially youths prefer factory jobs;
- In Buradipada village, one Rythu Sangham (Farmers Society) exists, it is performing good.

Major Constraints identified

- Low crop productivity
- Water scarcity
- Fodder Scarcity
- Low technical source for adoption of improved practices
- Labor problem

Soil Health Mapping and Awareness/ Capacity Building

First field activity as knowledge based entry point activity was taken up to map the soil health and provide the soil test based fertilizer recommendation to farmers in order to maintain and enhance the soil health, reduce the indiscriminate use of fertilizer through use of balanced fertilizer application to reduce cost of cultivation while enhancing the crop productivity. Thirty-eight soil samples collected using stratified randomized soil sampling method to map the soil health across the village. Based on the nutrient status of farmers' field, farmers were provided soil health cards with crop specific fertilizer recommendations. In this regard, awareness/ capacity building formal and informal activities were organized (Figure 3). Soil health and percent farmers' fields deficient in nutrients are shown in (Figure 4 and Table 2).



Figure 3. Awareness/ capacity building program and hands-on training on soil sampling and soil health, Buchinelli.

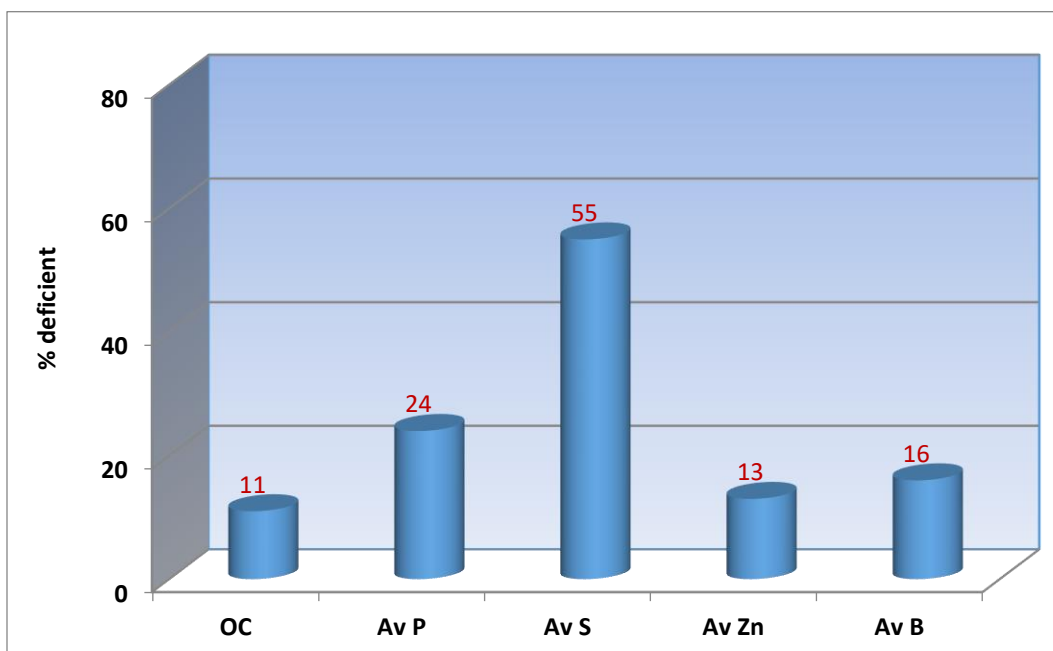


Figure 4. Percent of farmers field deficient in nutrients in Mahindra & Mahindra Watershed, Buchinelli

Parameter	pH	EC (dS/m)	OC %	Av P ppm	Av K ppm	Av Ca ppm	Av Mg ppm	Av S ppm	Av Zn ppm	Av B ppm	Av Fe ppm	Av Cu ppm	Av Mn ppm
% deficient			11	24	0	0	0	55	13	16	0	0	0
Mean data	7.2 1	0.36	0.70	10.3 4	219	4535	946	14.80	1.57	0.89	15.5 9	5.20	30.75
Range	6.1- 7.7 3	0.08 - 2.05	0.44- 1.23	2.87 - 41.6 5	78- 642	2256- 6426	395- 1380	2.72- 135.7 7	0.56- 5.98	0.48- 1.50	8.05 - 30.9 7	2.58- 11.08	9.53- 75.71

Identification/ Construction of Water Conservation Structures

Launching program of watershed project held on 31 May 2017 (Figure 5). Suitable location for a check dam was identified and constructed (Fig. 6). The check dam was constructed on major nala of village measuring 8 m wide with one-meter height with a net storage capacity of about 500 cum. Location for the second check dam and loose boulder structures is also identified. One feed channel which diverts the water from upstream of village to existing tank is also proposed (Fig. 7). Presently the drainage connectivity to the tank is disturbed. Few farmers around the structure gave very good feedback about the check dam. The location for the second proposed check dam

is around 400 m upstream of the 1st check dam. After the harvest of *rabi* crops structures construction works will be taken-up.



Figure 5. Project launching (above) and Joint Director of Agriculture Medak is distributing soil health card (below), Buchinelli, 31 May 2017.



Figure 6. A check filled with water in August 2017.



Figure 7. Diversion drain (feeder channel) and village tank, Buchinelli.

Establish Crop Demonstrations, Monitoring of Works and Demonstration fields, Collection of Crop Yield Samples

Farmer participatory evaluation field trials to demonstrate crop productivity enhancement were taken up with improved cultivar of pigeonpea (ICPL 87117) as inter crop with green gram and sole crop. The improved practice involves improved cultivar, soil test based balanced fertilizer application including micro and secondary nutrients. Aerobic composting has been introduced to convert the crop residue into manure. Time to time Mahindra & Mahindra officials visit to take stock of the progress in the watershed (Figure 8). During interaction, farmers expressed their view that the improved cultivar pigeonpea crop growth at that stage of crop is superior to local cultivars and expects 20-25% higher yield.



Figure 8. Mr Suhas Kumbhar, Mahindra & Mahindra Plant Head visit to Watershed.

Activities/ Interventions Planned for Rabi 2017

Various activities like soil and water conservation, *rabi* crop demonstration, aerobic and vermin compost preparation, livelihood activities for women have been planned. Under soil and water conservation activities, check dam, rock filled dam, loose boulder structures, percolation tanks and diversion drains have been planned. A meeting with farmers and custom hiring center has been planned in the last week of October 2017.

Formation of watershed committee

Several gram sabha meetings were conducted with farmers to start the process of watershed committee (WC) formation. Out of 10 members two are women members and appropriate number of other landless and SC represent in the WC. Mr G Ameeth Kumar as a President, Mr G Govind Reddy as Vice Chairman and Mr Inayat Alia as secretary of Mahindra and Mahindra-ICRISAT Watershed Development project monitoring committee were elected unanimously by committee members, villagers and READS team (**Table 3** and **Fig 9**). The watershed committee represents the farmers view and acts as executive committee to undertake various watershed intervention through the consent of farmers through gram sabha.

Table 3. Details of Watershed committee members, Mahindra and Mahindra-ICRISAT watershed.

Sl. No.	Name of the member	Designation
1	Mr G Ameeth Kumar	Chairman
2	Mr G Govind Reddy	Vice chairman
3	Mr Md Inayatha Ali	Secretary
4	Mr M Bakkappa	Joint Secretary
5	Mr Md Younus Ali	Member
6	Mr S Naganna	Member
7	Mr N Manik Reddy	Member
8	Mr Syed Mujeeb	Member
9	Ms Shilal Bee	Member
10	Ms B Rangamma	Member



Figure 9. Watershed committee meeting, Buchinelli

Household baseline and livestock survey

A detailed household data collection and livestock status survey has been initiated. The project is based on primary data collected through focused group discussions (FGD) as well as through detailed household surveys. For the purpose of collecting primary data a set of questionnaire was prepared by ICRISAT scientists. The team visited the watersheds and conducted meetings with farmers and had elaborate discussions followed by field visits to collect the primary information such as general, agricultural, crop productivity, water conservation and socio-economic data (Fig. 10). The primary data collection through investigation of farmers with pre-tested questionnaires and about 15 percent households/farmers will be covered by stratified random sampling method. Data entry and processing is in progress. Data on bio-physical (such as agro-climatic characterization based on long term rainfall data, soils, drainage pattern, land use system, water resource, major crops and their productivity, livestock) and socio economic (such as family details, landholding category, income and infrastructural facilities) and GPS data collected for the preparation of DPR and separate publication is planned for baseline report after completing the detailed data analysis, which is in progress.



Figure 10. Baseline survey in progress, Buchinelli.

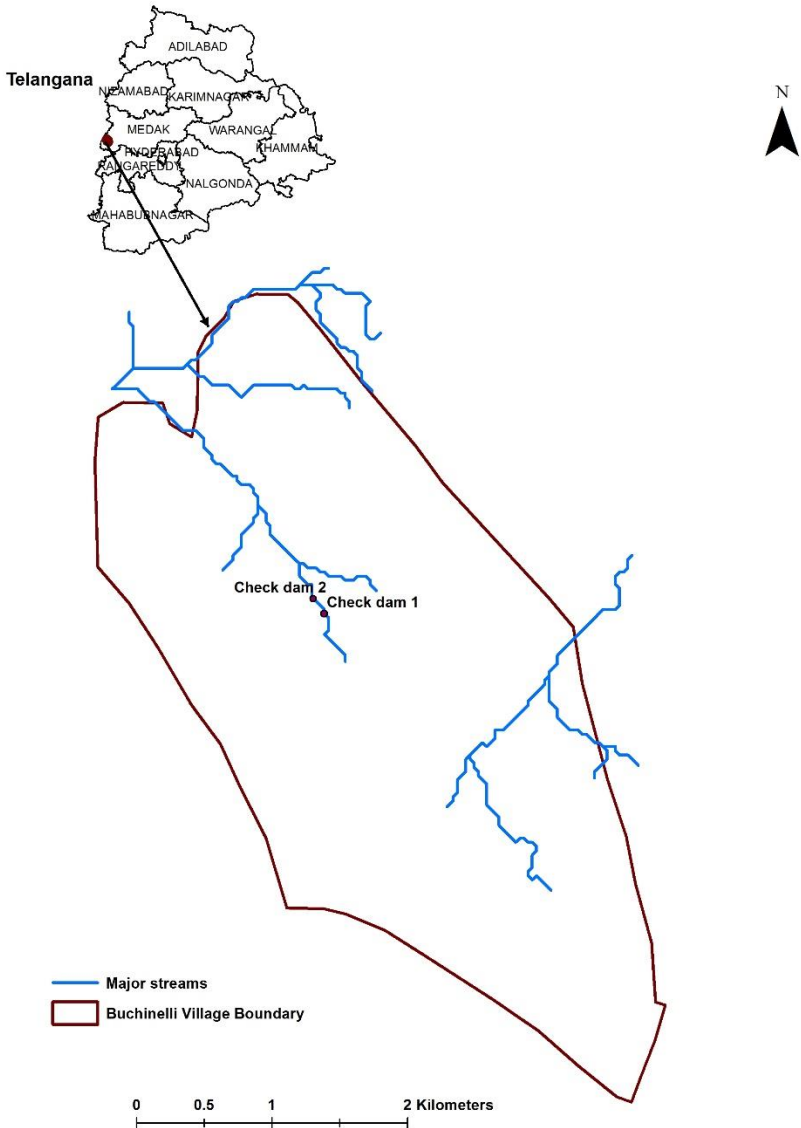
Livestock survey has been conducted in the Buchinelli and other adjacent villages of watershed with an objective of improving livestock productivity (Table 4). Based on this data livestock activities like animal health camps, fodder development, spent malt as income generating activity for women and other activities will be introduced.

Table 4. Livestock details of Mahindra-ICRISAT watershed and adjacent villages.

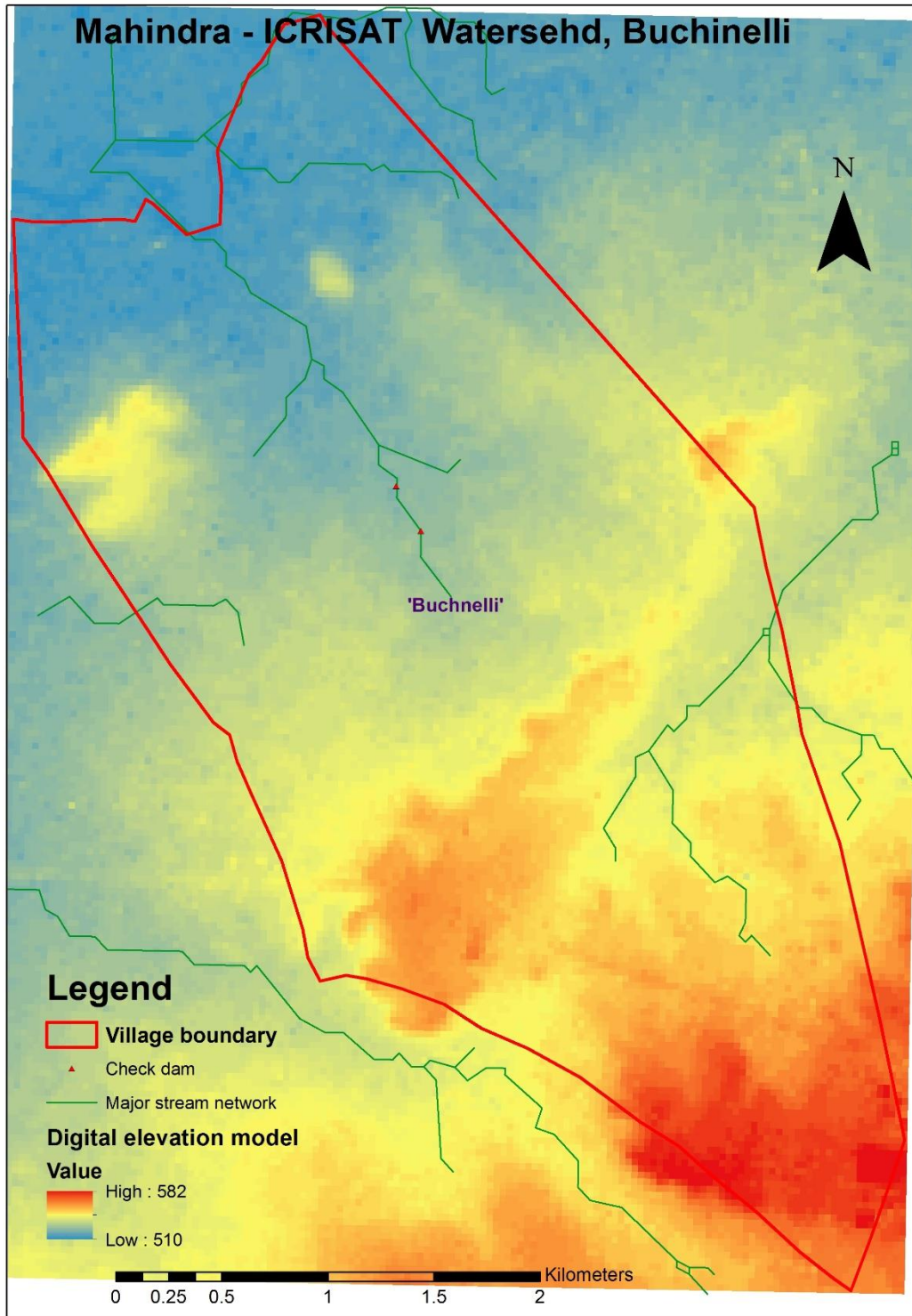
Sl. No.	Villages	Livestock population (nos.)					Milching animals (No.)		
		Cow	Buffalo	Bullock	Other	Total	Cow	Buffalo	Total
1	Buchinelli	68	56	26	36	186	42	44	86
2	Buradipada	172	116	8	28	324	108	94	202
3	Kashimpura	196	219	46	22	483	152	166	318
4	Chinna Hyderabad	69	78	12	24	183	52	57	109
	Total	505	469	92	110	1176	354	361	715

Geo-referenced maps preparation

Geo-referenced map has been prepared using ArcGIS software (Fig. 11). These maps will be used for identification of location for structures depending on the stream network.



(a) Major stream network



(b) Digital Elevation Model (DEM)

Figure 11. Geo-referenced maps with (a) stream network and (b) DEM.

Rainwater harvesting structure construction

One check dam was constructed in May 2017, construction of second check dam is in progress (Fig. 12). This is the period most of the construction of water harvesting structures will be taken up as the field are free after the harvest of rabi crops. A diversion drain to collect rainwater from the upstream area to divert the water to the existing lake has been identified and work will be started immediately.



Figure 12. Construction of second check in progress, Buchinelli

Participatory demonstration trials and collection of crop yield samples

Participatory Research and Development field demonstration were conducted during kharif and rabi season of 2017-18. During kharif, eight farmers in 28 acres have participated in improved cultivar of pigeonpea as test crop (Fig. 13), while during rabi season, five farmers with five acres improved cultivar of chickpea have taken up (Table 5). Soil test based balanced fertilizer application with micronutrients were taken up by farmers (Table 6). The crop yields in improved management has increased by 24% in pigeonpea and 21% in chickpea during 2017-18 (Table 7)



Figure 13. Pigeonpea (ICPL 87119-Asha) with improved practice, Buchinelli

Table 5. Participatory field demonstration in Mahindra & Mahindra-ICRISAT watershed, Buchinelli, 2017-18.

Sl.no.	Name of the Farmer	Quantity of seeds provided (kg)	Area (acre)
Pigeonpea (ICPL 87119)			
1	Gaddameedi Mallappa	15	5
2	N Manik Reddy	15	5
3	Govardhan Reddy	10	4
4	G Amith Kumar	10	4
5	Basappa	10	4
6	Kulakarni Kishore	5	2
7	Gudupally Srinivas Reddy	5	2
8	Abdul Aziz	5	2
	Total	75	28
Chickpea (NBeG44)			
1	K Baganna	10	1
2	Govind reddy	10	1
3	S Naganna	10	1
4	Adivappa	10	1
5	Thukkppa	10	1
	Total	50	5

Table 6. Soil test based micro nutrients application demonstration in Buchinelli, 2017-18.

Slno	Name of the Farmer	Zinc (kg)	Boran (kg)	Area (acres)
1	Gaddameedi Mallappa	50	5	5
2	N Manik Reddy	50	10	5
3	Govardhan Reddy	40	4	4
4	G Amith Kumar	30	3	4
5	Basappa	15	-	4
6	Kulakarni Kishore	15	-	2
7	Gudupally Srinivas Reddy	30	3	2
8	Abdul Aziz	20		2
	Total	250	25	28

Table 7. Crop yields in improved practice over farmers practice, Buchinelli, 2017-18.

Crop (variety)	Improved Practice (t/ha)	Farmer practice (t/ha)	Increase (%)
Pigeonpea (ICPL 87119)	1.54	1.24	24
Chickpea (NBeG 44)	1.15	0.95	21

Nutri-kitchen gardening

To improve nutrition of households, nutria-kitchen garden initiative has been introduced with 42 farmers (Fig. 14). Different 8 types of vegetable seeds viz. leafy vegetable, bringal, tomato, beans and gourds were provided.



Figure 14. Nutri-kitchen garden initiative in Buchinelli.

Income generation activities

Aerobic compost preparation and vermin-compost preparation training has been imparted to farmers, particularly women farmers. Compost preparation units will be established in second week of March 2018.

Farm mechanization

Enhancing efficiency of smallholder farmers who are affected by increasing labor costs is needed to make agriculture more profitable. Declining availability of animal power and labor scarcity for agriculture, modernizing agriculture will attract youth back to agriculture. Farm mechanization reduces crop production costs and post-harvest losses, and boosts crop output and farm income. Under this project, farm mechanization will be encouraged among stakeholders by way of on-field and off-field training and demonstrations.

A meeting was conducted to collect information on requirement depending on crops grown in watershed village to introduce farm mechanization. As part of mechanization, initially started with pigeonpea harvester and thresher, which is very efficient in terms of cost and time. A multi-crop harvester and a thresher has been provided by ICRISAT to use in pigeonpea crop in Mahindra-ICRISAT watershed in Buchinelli village (Fig. 15). Operator from ICRISAT imparted hands-on training to farmers in operation of equipment. Further, possible mechanization will be extended for sugarcane crop too.



Figure 15. Multi crop harvester and thresher in use in pigeonpea crop, Buchinelli.

Capacity building

Several capacity building activities were conducted to enhance the awareness and knowledge dissemination activities about improved watershed interventions (Fig. 16). Various activities in this direction include need based trainings on different topics, exposure visits and informal meeting/ awareness programs (Table 8). An exposure visit for women farmers was organized to ICRIAT and other villages where spent malt as income generating activity for women SHGs.

Table 8. Various capacity building activities done in Buchinelli, 2017-18.

Sl. No.	Topic	Number of events	Participants
1	Gram sabha	4	48
2	Watershed Committee meetings	5	50
3	Training- Soil sample collection	1	30
4	Soil Health card information dissemination	2	60
5	Hands-on training on micronutrient application	1	25
6	Vegetable cultivation in kitchen garden	1	32
7	Pigeonpea thresher	1	22
8	Orientation for farm mechanization	1	27
9	Water harvesting and site identification	2	14
10	Compost preparation	1	12



Figure 16. Various capacity building activities in Buchinelli



Impact of various NRM interventions between April 2017 and Sept 2018:

- Water harvesting structures (check dams, gully plugs, sunken pits, mini pits, farm ponds, recharge units, etc.) has created nearly 8,000 cubic meter harvesting capacity which can harvest nearly 25,000-30,000 cubic meter surface runoff in a normal year and facilitate for groundwater recharge. This is evident by enhanced groundwater table in pilot village.
- Soil test based fertilizer application and its knowledge has reduced the chemical load and reduced the cost of cultivation minimum by 2000 Rs/ha. On the other hand, introduction of improved crop varieties of pigeonpea along with best management practices enhanced the crop yield by 20-25%.
- Bore well Recharge Pits: The excess and pipe leakage water during pumping of a bore well has been diverted to an adjacent recharge pit for recharging same bore well. This water was damaging nearby roads and also creating unhygienic environment through the year at surrounding places, which has been controlled by making Bore well recharge pit.
- Feeder channel: A house hold channel was damaging roads and creating unhygienic environment at the surroundings, which was diverted to a pond nearly 500 m away. Also a long cement pipe was laid to pass the water safely which was clogging at the junction of the streets.
- Created a storage tank and diverted household waste water into it, the water storage from this tank has been used by the nearby farmers for two acres of land as supplemental irrigation for the crops, which increased crop yield by 15-20%. This year we proposed to make a waste water treatment unit to reduce the contamination before using it for the irrigation purpose.
- Various capacity building program in the targeted village has enhanced the capacity of self-help groups towards their ability to do various jobs in the villages and elsewhere.
- Introduction of various afforestation program will be helpful in terms of strengthening various ecosystem services and carbon sequestration over the period.
- Kitchen garden activities and back yard fruit plantation has been helpful for addressing nutrient deficiency and malnutrition issue especially in kids and women
- Animal health camp and water trough intervention in pilot village has helpful for reducing the fatigue and stress of milch animal and improved the productivity.

Physical Summary of year-1

Targeted activities	Remarks
Knowledge-based Entry Point Activity (KB-EPA); Soil sampling works	38 - Soil sample Analyzed/ card distributed
Topographic Survey and Preparation of Geo-referenced maps & selection of sites for rainwater harvesting	-
PRA & Baseline Survey (socioeconomic & biophysical) & Impact	Completed
Formation of Community-based Organizations (CBOs)/ mobilization	Completed
<i>In-situ</i> Moisture Conservation Measures	-
<i>Ex-situ</i> Rainwater Harvesting through Low-Cost Structures (2 Check dam; 1 Feeder channel; 4 Rock-fill damL; 14 loose boulders; 1 mini percolation tanks; 1 sunken and farm ponds; 4 well recharge)	Completed
Establishment of Hydrological gauging stations	-
PR&D INM and IPM trials: (Productivity enhancement trails, backyard fruit plants, fodder and crop interventions)	33 - acres of crop demonstration on chickpea and pigeonpea
Rehabilitation of wastelands	-
Capacity Development & Training Materials Preparation	2 - exposure visits (total 150 farmers) to ICRISAT and Kothapally watershed
Field Days & Workshops	
Technical support	ICRISAT staff and NGOs salary
Income-generating Activities (Stitching, vermicomposting, SHG activities)	Tailoring two batches (84 women); two - vermicomposting prepared;

SN	Line items	Activities	Physical Target/ Milestone	Expected benefits	Monitoring indicators
1	<i>In-situ</i> Moisture Conservation Measures	Introduction of Broad bed and furrow (BBF) using Tropicultor	10 acre	<ul style="list-style-type: none"> Increased soil moisture availability minimum by 50-80 mm of water Increased crop yield by 10-15% 	<ul style="list-style-type: none"> Crop cutting experiment minimum in 5 fields
2a	<i>Ex-situ</i> Rainwater Harvesting through Low-Cost Structures	Check dam	3	<ul style="list-style-type: none"> Creation of nearly 10,000 m³ water harvesting capacity These structures would harvest 3-4 times runoff during normal years to their capacity Will facilitate for groundwater recharge 	<ul style="list-style-type: none"> Runoff recording system established for understanding water balance Water table in 25 wells monitored on monthly time scale to understand impact
Loose boulders structures		10			
Farm pond		2			
Percolation tank		2			
2b	Establishment of Hydrological gauging stations	Installation of gauging station; data downloading and processing and water balance estimation	1	<ul style="list-style-type: none"> Measuring water harvesting amount 	
3	PR&D INM and IPM trials	<p>Introduction of improved crop cultivars;</p> <p>Introduction of integrated nutrient management practices;</p> <p>Introduction of pest management activities</p>	30 acres (10 + 10+ 10)	<ul style="list-style-type: none"> Increased knowledge and awareness about improved crop management practices Improved crop yield by 20-30% 	Crop cutting experiment minimum in 15 fields

SN	Line items	Activities	Physical Target/ Milestone	Expected benefits	Monitoring indicators
4	Wastewater treatment at village community scale	Construction of Engineering Constructed wetland for for safe reuse of wastewater in agriculture	1	<ul style="list-style-type: none"> • Treated nearly 10000 cubic meter of wastewater and regenerated for safe use in agriculture • This will facilitate to provide supplemental irrigation in nearly 2-3 acres areas both Rabi and summer • Reduce groundwater pollution 	Water quality assessment of treated water
5	Capacity Development & Training Materials Preparation	Computer basic training to women members in village	30 Women (every three months)	Increased computer skills of rural women	
6	Field Days & Workshops	Rabi season	1+1	Improving Knowledge on agricultural practices	
7	Technical support		<ul style="list-style-type: none"> • 10 % time of two scientists; • one RT; • NGO 		
8	Income-generating Activities	<ul style="list-style-type: none"> • Promoting kitchen garden; • Stitching activities; • Agro-forestry 	50 HHs 50 Women 1000 plants		<ul style="list-style-type: none"> • Amount of vegetable harvested in selected HHs • Plant Survival rate

