

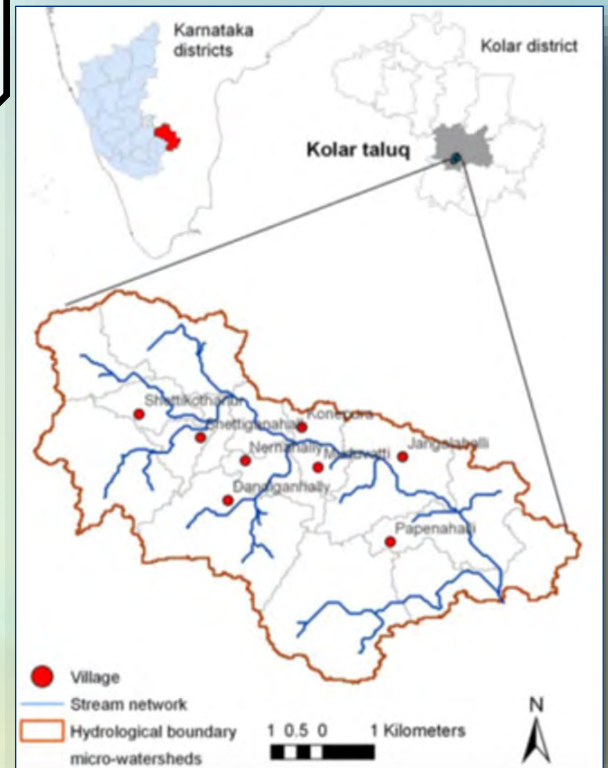
Integrated Water Resource Management for Increasing Agricultural Productivity and Improved Livelihoods in Kolar, Karnataka





Kolar watershed-Creating fresh hope for drought affected farmers

The Kolar watershed has been supported by **Coca-Cola India Foundation for Rural Water Infrastructure**. ICRISAT has spearheaded the consortium along with **MYRADA, the Government of Karnataka and farmers** in 8 villages. The project is spread over an area of 1333 hectares and has been a boon to 1411 households who have made use of the interventions initiated as a part of the project.





Before the initiation of the project, in the year 2012, great water scarcity existed and bore wells ran the risk of running dry, especially during drought years. After the initiation of the project in the year 2012-2013, new techniques such as mulberry plantation using tree method, distribution of mango and intercropping mango with finger millet, replacement of 40 per cent of eucalyptus plantations with trees such as *Milia Dubia*, teak and silver oak have all benefited farmers around the 8 watershed villages comprising of Konepura, Mudavatti, Shattiganahalli, Dandigenahalli, Jangalahalli, Shattikotanuru, Pappanahalli and Neranahalli.



Consortium Partners



Coca-Cola

India FOUNDATION

Anandana

ICRISAT
Science with a human face

COCA COLA - ICRISAT ಜಲಾನಯನ

ಸಮಗ್ರ ಜಲ ಸಂಪನ್ಮೂಲ ನಿರ್ವಹಣಾ ಕಾರ್ಯಕ್ರಮ ಕೋಲಾರ ಜಿಲ್ಲೆ, ಕರ್ನಾಟಕ.

ಕೃಷಿ ಉತ್ಪನ್ನಗಳ ಉತ್ಪಾದನೆ ಹೆಚ್ಚಿಸುವುದು ಮತ್ತು ಗ್ರಾಮೀಣ ಜನರ ಜೀವನೋಪಾಯ ಹೆಚ್ಚಿಸುವುದು.

ಒಳಪಡುವ ಗ್ರಾಮಗಳು: ಮುದುವತ್ತಿ, ಕೋನೇಪುರ, ಜಂಗಾಲಹಳ್ಳಿ, ಪಾಪನಹಳ್ಳಿ, ನೇನಹಳ್ಳಿ, ದಂಡಿಗಾನಹಳ್ಳಿ, ಶೆಟ್ಟಿಗಾನಹಳ್ಳಿ, ಶೆಟ್ಟಿಕೊತ್ತನೂರು.

ಒಟ್ಟು ಜಲಾನಯನ ಪ್ರದೇಶ: 1353 ಹೆ. ಮಳೆಯಾಶ್ರಿತ ಪ್ರದೇಶ - 484 ಹೆ. ಒಟ್ಟು ಮನೆಗಳ ಸಂಖ್ಯೆ: 959. ಒಟ್ಟು ಜನ ಸಂಖ್ಯೆ: 5314. ನೀರಾವರಿ ಪ್ರದೇಶ: 243 ಹೆ.

ಬಂಜರು ಭೂಮಿ: 264 ಹೆ. ಕೃಷಿಗೆ ಯೋಗ್ಯವಲ್ಲದ ಭೂಮಿ: 342 ಹೆ.

== IWRMP ಕಾರ್ಯಕ್ರಮದ ಮುಖ್ಯ ಉದ್ದೇಶಗಳು ==

- ಈ ಕಾರ್ಯಕ್ರಮದಲ್ಲಿ ಮುಖ್ಯ ಗುರಿಯಾಗಿ 8 ಹಳ್ಳಿಗಳಲ್ಲಿ ಮಳೆ ನೀರು ಸಂಗ್ರಹಣೆ, ಬಾವಿ ಮತ್ತು ಬೋರ್‌ವೆಲ್‌ಗಳಿಗೆ ಮಳೆ ನೀರನ್ನು ಇಂಗುವಂತೆ ಮಾಡಿ ಮರು ಪೂರ್ಣ ಮಾಡುವುದು. ಹಳ್ಳಿಯ ಮನೆಗಳಿಂದ ಬರುವಂತಹ ಕೊಳಚೆ ನೀರನ್ನು ಬುದ್ಧಿವಂತಿಕೆಯಿಂದ ಆ ನೀರನ್ನು ಕೃಷಿ ಚಟುವಟಿಕೆಗಳಿಗೆ ಬಳಸುವುದು.
- ಮಳೆ ನೀರನ್ನು ಬಳಸಿಕೊಂಡು ಕೃಷಿ ಭೂಮಿಯ ಒಲವತ್ತನ್ನು ಹಾಗೂ ಅವರ ಉತ್ಪನ್ನ ಶಕ್ತಿಯನ್ನು ಹೆಚ್ಚಿಸುವುದು.
- ಇದ್ದಂತಹ ಮಳೆ ನೀರನ್ನು ಅವರವರ ಜಮೀನಿನಲ್ಲೇ ಇಂಗುವಂತೆ ಮಾಡುವುದು. ರೈತರ ಅರಾಯಕ್ಕಾಗಿ ಖುದ್ದಿ ತೋಟಗಾರಿಕೆ & ಕೃಷಿ ಅರಣ್ಯ ಸಸಿಗಳನ್ನು ನೆಡಲು ಪ್ರೋತ್ಸಾಹ ನೀಡುವುದು.

Consortium:

Coca-Cola India Foundation for Rural Water.

Infrastructure, Gurgaon, Haryana.

ICRISAT, Govt of Karnataka, NGO - MYRADA.

ಜಾನುವಾರು ಗೊಬ್ಬರ ಬಳಸಿ

ಬೆಳೆ ಉತ್ಪಾದಕತೆ ಹೆಚ್ಚಿಸಿ.....

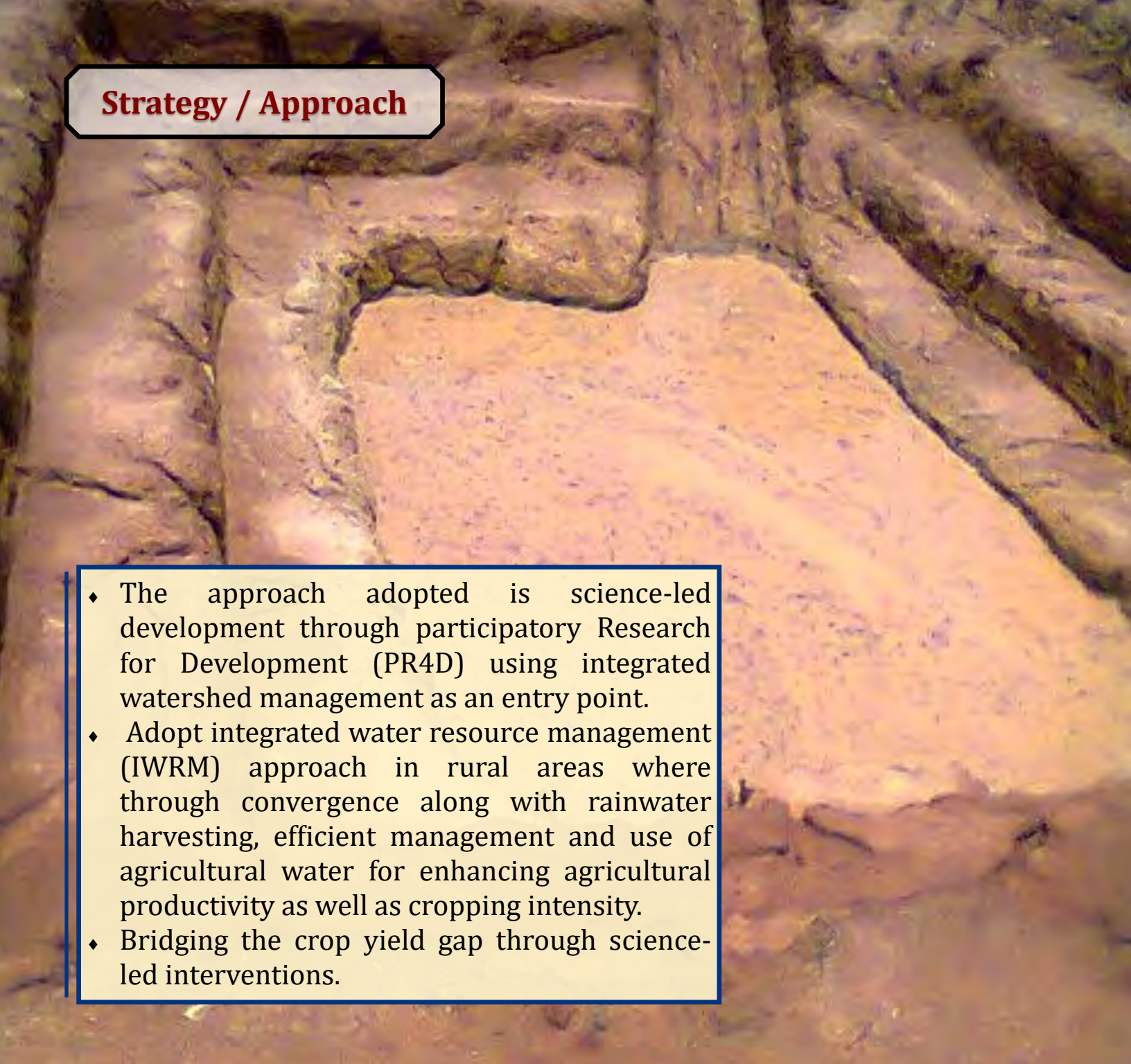
Objectives

- ♦ Enhance water availability in target villages through rainwater harvesting, recharging of the wells and reuse of wastewater to demonstrate that science-based interventions can increase water availability and improve groundwater quality;





- ♦ Enhance water use efficiency through various good agricultural practices (GAPs) for sustainable management of water and land resources and increasing overall agricultural productivity; and
- ♦ Establish a pilot project demonstrating impact within five years of its inception and transform them as model villages with more interventions in different phases.



Strategy / Approach

- ♦ The approach adopted is science-led development through participatory Research for Development (PR4D) using integrated watershed management as an entry point.
- ♦ Adopt integrated water resource management (IWRM) approach in rural areas where through convergence along with rainwater harvesting, efficient management and use of agricultural water for enhancing agricultural productivity as well as cropping intensity.
- ♦ Bridging the crop yield gap through science-led interventions.



- ♦ Inclusive market oriented development (IMOD) strategy by enabling the farmers to grow high-value crops, to produce marketable surplus, and link them with the market to move them out of subsistence agriculture and poverty.
- ♦ Rainwater harvesting and *in-situ* conservation as an entry point activity.
- ♦ Soil-test-based nutrient management to improve soil health and sustainable crop production.
- ♦ Community participatory approach and capacity building as an important strategy for increasing sustainability.

Soil and Water Conservation activities



The average annual rainfall in Kolar district is 700 mm where most of onset of rainfall is unseasonal. The construction of low-cost water harvesting structures is one of the important interventions considered for groundwater recharge. These structures harvest substantial amount of surface runoff, allow them to percolate into aquifer and facilitate groundwater recharge. Through this project, farm ponds are promoted in these villages. The farm ponds serve as dual purpose as water storage and as groundwater recharge.

The water harvesting structures constructed so far are as follows: as many as 35 farm ponds and 4 check dams were constructed to store excess runoff water from farmers fields, which has created a net storage capacity of 13500 m³ and resulting in 33750 m³ of total rain water harvested depending on the rainfall during the year.



Also, field bunding work in 9000 cubic m covering an area of 65 ha and gully plugs (75 nos.), has ensured that soil erosion is at minimal.

Also in the year 2016, 1 nala plug, 7 cattle troughs, and 3 roof well harvesting structures have been constructed.

Wastewater treatment and reuse



Water scarcity is particularly acute in Kolar where an urgent need exists to enhance water resource availability and also for demand management. Water availability for food production is not only restricted to fresh water but wastewater re-use is also emerging as an integral part of demand management.

With increasing domestic water use, quantity of grey/wastewater is increasing in the same proportion. Almost 90% of total water supplied for domestic use gets generated as wastewater, which could be diverted for agriculture purpose. There are several benefits and challenges on wastewater use. Also, grey water is a valuable resource for encouraging plant growth because of its higher nutrient content. The use of grey water in agriculture contributes significantly to the supply of fresh fruit and vegetables to urban markets.

Therefore to harness the domestic wastewater and use it for vegetable cultivation after the primary treatment, as many as two wastewater treatment units have been constructed as a part of the project.



Constructed wetland for treating domestic wastewater at village level in Kolar

Use of micronutrients



To understand the soil nutrient status, important soil parameters such as organic carbon, available P, available K, Ca, Mg, Zn, B, Fe, Cu, Mn and S were analyzed. The farmer fields were found severely deficient in organic carbon (84%), sulphur (73%) and boron (61%). Appropriate soil test based balanced fertilizer recommendations for different crops were provided.

Soil health Status: Percentage of farmers fields deficient in nutrients, Kolar

District	% farmers fields deficient in nutrients					
	OC	Av P	Av K	Av S	Av Zn	Av B
Jangalahalli	75	0	0	75	0	38
Dandiganahalli	88	0	13	88	0	88
Konepura	100	0	13	100	0	88
Muduvatti	67	0	0	0	0	0
Nernahalli	86	0	0	71	0	71
Papenahalli	80	0	0	20	0	20
Shettiganahalli	81	6	6	69	0	63
Shettikottanuru	87	7	33	87	0	67
Mean of watershed	84	3	11	73	0	61



Productivity enhancement through improved cultivars and balanced nutrient management

In this context, farmers' participatory trials were conducted during *Kharif* 2012 to demonstrate the impact of micronutrients (zinc and boron) application on groundnut crop and fingermillet crop. Also, crop-cutting experiments were conducted for estimating crop yield in improved and farmers managed field practices. The farmers contributed 50% of fertilizer cost [Agribor (B) and zinc sulphate (ZnSO_4)] and local groundnut variety was grown. It was observed that application of B and Zn increased crop yields by 23-26 % over control plots. The integrated nutrient management technique in 600 ha of land has benefitted as many as 450 farmers.

Appropriate soil test based balanced fertilizer recommendations for different crops were provided. The crop yield data of productivity enhancement through improved varieties and balanced fertilizer application participatory trials were conducted during 2014-15. The results showed productivity improvement by 14% in groundnut, 17% in ragi (finger millet).

Farmer displays fingermillet crop grown with improved practice, 2014-15.



Table 1: Impact of balanced micronutrient application with improved variety on groundnut and ragi during *Kharif*.

Crop	Treatment	Yield (kg/ha)
Groundnut (ICGS 91114 and local var)	Improved Practice (IP) (RDF* + Agribor + zinc sulphate)	1780 (14)
	Farmers Practice (FP) (RDF)	1560
Ragi (GPU 28) with two irrigations	Improved Practice (IP) (RDF* + Agribor + zinc sulphate)	2650 (17)
	Farmers Practice (FP) (RDF)	2260

* RDF: Recommended Dose of Fertilizers; crop variety: local; * figures in parenthesis are % increase over control.

Increased crop yields



Table 2. Impact of balanced micronutrient application on groundnut and ragi (finger millet) during *Kharif* in the year 2013

Crop	Treatment	Pod yield (kg/ha)
Groundnut	Improved Practice (IP) (RDF* + Agribor + zinc sulphate)	2450 (26)
	Farmers Practice (FP) (RDF)	1950
Ragi	Improved Practice (IP) (RDF* + Agribor + zinc sulphate)	2860 (23)
	Farmers Practice (FP) (RDF)	2320

* RDF: Recommended Dose of Fertilizers; crop variety:

Table 3. Impact of balanced micronutrient application with improved variety of ragi (finger millet) during *Kharif* – 2015.

Crop	Treatment	Pod yield kg/ha
Ragi (GPU 28) with two irrigations	Improved practice (RDF * + Agribor+ zinc sulphate)	740 (26)
	Farmers practice (RDF)	580

* RDF: Recommended Dose of Fertilizers; crop variety: local; * figures in parenthesis are % increase over control.

Field demonstrations and *In-situ* moisture conservation

In 3 years, crop demonstrations were conducted in 40 ha of land and benefitted more than 100 farmers .

In-situ moisture conservation by using the Broad Bed and Furrow (BBF) method with the help of tractors was implemented in 25 ha land and has benefitted more than 20 farmers.





Table 4: Crop demonstration during the year 2015.

Crop	Area (ha)	No of Farmers
Groundnut	6	15
Finger millet	12	25
Pigeonpea	6	12
Castor	1	3

Agroforestry, Vermicomposting and Animal Husbandry Activities

Bund plantation with horticultural plants such as mango 4173 plants covering 18 ha benefitting 132 farmers and forestry species 4565 plants of silver oak, Gliricidia and neem covering 12 ha benefitting 40 farmers has been done. Vermicomposting has been done with forty farmers with vermi bed size of 3m x 1m x 1m, which can prepare 10-12 tons of manure in 8-10 weeks. In addition to this, with the convergence of department schemes, vermi beds have been provided to farmers. As many as four animal health camps were conducted in Dandiganahalli, Shettykottanur, Shettyganahalli and Jangalahalli, where more than 1,200 cattle were vaccinated. Also 4 silage making units have been constructed to help improve quality of feed.



Collective action—Women SHGs



Going Digital

An innovative digital extension system was introduced to reach large number of farmers using a hand held picco projector to show the videos of improved practices to farmers as an effective tool. As many as 13 video productions, have helped disseminate information to more than 400 beneficiaries.





Capacity Building and Improved Livelihood for Women through SHGs



As an entry point, community mobilization and rapport building has been achieved through formation of watershed committee in collaboration with MYRADA under guidance and support of ICRISAT. As a part of the project, conducting trainings to farmers including women and technology dissemination. An awareness program about cancer was also conducted by organising a women's day program as a part of the project.

Several SHGs activities have been adopted to improve the livelihoods with convergence and linkage of banks to SHG members for financial support. The watershed project coordinated to train thirteen SHG members on tailoring by Community Management Resource Center (CMRC) of MYRADA and linked SHGs to banks for financial support to buy sewing machines to improve their livelihoods.

Similarly the watershed project has facilitated farmers (4 groups consisting 15 members in each group) to avail loan from NABARD for the purchase of milching animals. To encourage women farmers to improve home nutrition and additional income, 300 fruit plants (sapota, jamun and lemon) were distributed on the occasion of International women's day celebration.

Sl No.	Details of Training	No. of Trainings	Participants (nos.)	
			Men	Women
1.	Training on improved agricultural practices, soil and water conservation, livestock management, etc. for farmers	28	165	55
2.	Training for SHGs activities, and watershed committee members	3	25	110
3.	Digital extension for watershed staff and lead farmers	1	10	4
4.	Exposure visits to farmers (Krishi mela, Kamasamudra watershed, milk federation)	5	30	12
5.	Jatha program with farmers and school children	1	75	35
6.	International women day	1	25	210



Success Stories

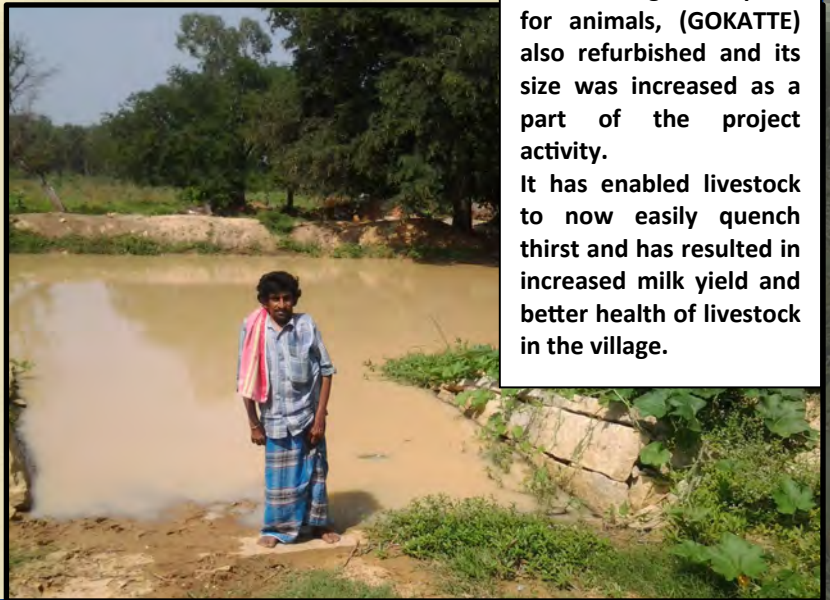
Use of micronutrients and reduction of inorganic fertilisers helps Muniswamy reap large rewards

Muniswamy who is a Gram Panchayat member and his wife who is the watershed treasurer have played a pivotal role in making the project a success. The couple who owns 2.02 ha of land in Konepura were mainly practicing dryland farming in their land and dependent on finger millet for their income.

After staff from MYRADA NGO and ICRISAT visited their fields they decided to apply micronutrients and used the recommended amounts of 12 kg zinc sulphate, 4 kg borax and 100 kg of gypsum per hectare. The results have been phenomenal as the dependence on inorganic fertilisers such as DAP has been reduced to 18 kg per hectare from 100 kg per hectare and Urea to 36 kg per hectare from 100 kg per hectare.

Increased yield

The yield for finger millet has increased by 1230 kg per ha and the farmer harvests 2470 kg per ha and sells at ₹ 21 per kg. Having had severe labour shortages, the farmers decided to share the labour in field and the expenditure on harvesting has reduced. The farmer needs to spend only ₹ 24700 per ha as overall expenditure. The net income-generated for 2.02 ha is ₹ 65,000 for finger millet alone and earlier it used to be only ₹ 20-25,000 for 2.02 ha.



The drinking water pond for animals, (GOKATTE) also refurbished and its size was increased as a part of the project activity.

It has enabled livestock to now easily quench thirst and has resulted in increased milk yield and better health of livestock in the village.



Feeding *Milia Dubia* leaves as a part of the diet has improved health of sheep and has promoted better growth rate

Diversification in farming

It has also enabled the farmer to try methods such as mango-finger millet as intercrop and with the increased income the farmer has diversified his goat rearing business and also his small dairy unit. By selling the lambs he earns almost ₹1,00,000 additional income per year and also after planting 50 *Milia Dubia* saplings as a part of the project, milk yields per cow has increased to 8 litres per day per cow after feeding the leaves as compared to 6 litres per day per cow before feeding *Milia Dubia* leaves. The monthly expenditure on the dairy unit is ₹ 15,000 and the net income-generated from 4 HF-crossbred cows is approximately between ₹ 8000-10,000 per month.



Milk yield has also increased by 2 litres per animal due to better methods adopted as a part of the project

Farm pond beneficiaries witness windfall gains due to improved water availability

In the same village, **Venkatappa** who is aged 55 years, owns 1 ha of land and followed the same trend of growing dryland crops such as finger millet and was also selling milk to earn his income. After the initiation of the project, the farmer decided to pay a 5 per cent contribution to build a farm pond in his field. The results of the farm pond by increasing water stored in his field, has enabled to diversify farming activities and now to help enhance his dairy business the farmer grows maize fodder in 0.202 ha of land along with crops such as finger millet .

Venkatappa's farm pond was completely full after the late rains that lashed Kolar district in the year 2015.



The farm pond (9*9*3 m) constructed in the year, enabled the farmer to harvest water during the late rains that lashed Kolar in the year 2015 and even with the intense summer of 2016, his farm pond has collected atleast 5 feet of water.

The farmer checks the depth of his farm pond in the dry month of March 2016



Also, distribution of 50 *Milia Dubia* saplings as a part of the project, has enabled the farmer to improve the feed given to cattle and maize fodder combined with *Milia Dubia* leaves has raised milk yields by 3 litres per cow per day. The 3 milching animals he has at present produce 25 litres of milk per day. In the past the yield was only 15 litres per day and the farmer would also need to spend ₹ 5000 per month for fodder and ₹ 3200 for water to help keep the cows hydrated.

Maize fodder and *Milia Dubia* leaves have increase milk yields by 3 litres per cow



His overall expenses on the dairy unit were ₹ 15,000 per month. But now with increased water availability and better quality of fodder, the expenses are only ₹ 5,000 per month. The increased net additional income from the dairy unit has been ₹ 15,250 per month and before the watershed, on most occasions he would be under a loss from the sale of milk.

Watershed project helps farmer diversify activities and gain increased rewards

In **Jangalahalli** village, progressive farmer Srinivas B, aged 40, proves the benefits of the watershed project through the diversification in his farm. The farmer who owns 2.42 ha of land in the village at present is growing maize and Napier grass fodder in 0.60 ha, marigold in 0.202 ha and, mango (Alphonso and Mallika variety) in 1.61ha.



As a part of the project, the farmer contributed only 10 per cent towards the construction of a vermibed in his field and also constructed a slurry mixing tank for biodigester. The use of chemical fertilisers has decreased by almost 35 per cent after these interventions.

After the initiation of the project, the farmer decided to construct a farm pond through the project and the benefits have been extremely positive. After the farm pond construction, water availability improved drastically in comparison to other farmer fields and Srinivas decided to grow fodder crops such as Maize and Napier grass. He also decided to convert the farm pond under the Krishi Bhagya -Government of Karnataka scheme and now the farm pond has a tarpaulin sheet to help retain more water.





Also, after using maize fodder and napier grass, the milk yield per cow has increased by 3-4 litres per day and from 5 milching animals the farmer receives about 100 litres per day. Earlier he would receive only 60 litres per day and the net additional income due to the extra 40 litres sale per day is ₹ 27,600 per month.

With the 200 mango trees in 1.61 ha, the farmer now receives about 2 tons per year and earlier before the watershed interventions, he would receive only about 1.3 tons per year depending on the rainfall. The expenditure on mango is ₹ 7,000 per year for 1.61 ha. The net income-generated is ₹ 43,00 per year and earlier it was only ₹ 25,500 per year.



Maize fodder intercropped in the mango fields



With marigold under plastic mulching, the farmer receives a yield of 7.5 tons for 0.202 ha and earlier before the watershed project, he would receive only about 6 tons. The overall expenditure is ₹ 25000 and the rates vary from ₹ 10 per kg to ₹ 60 per kg depending on the market fluctuations.

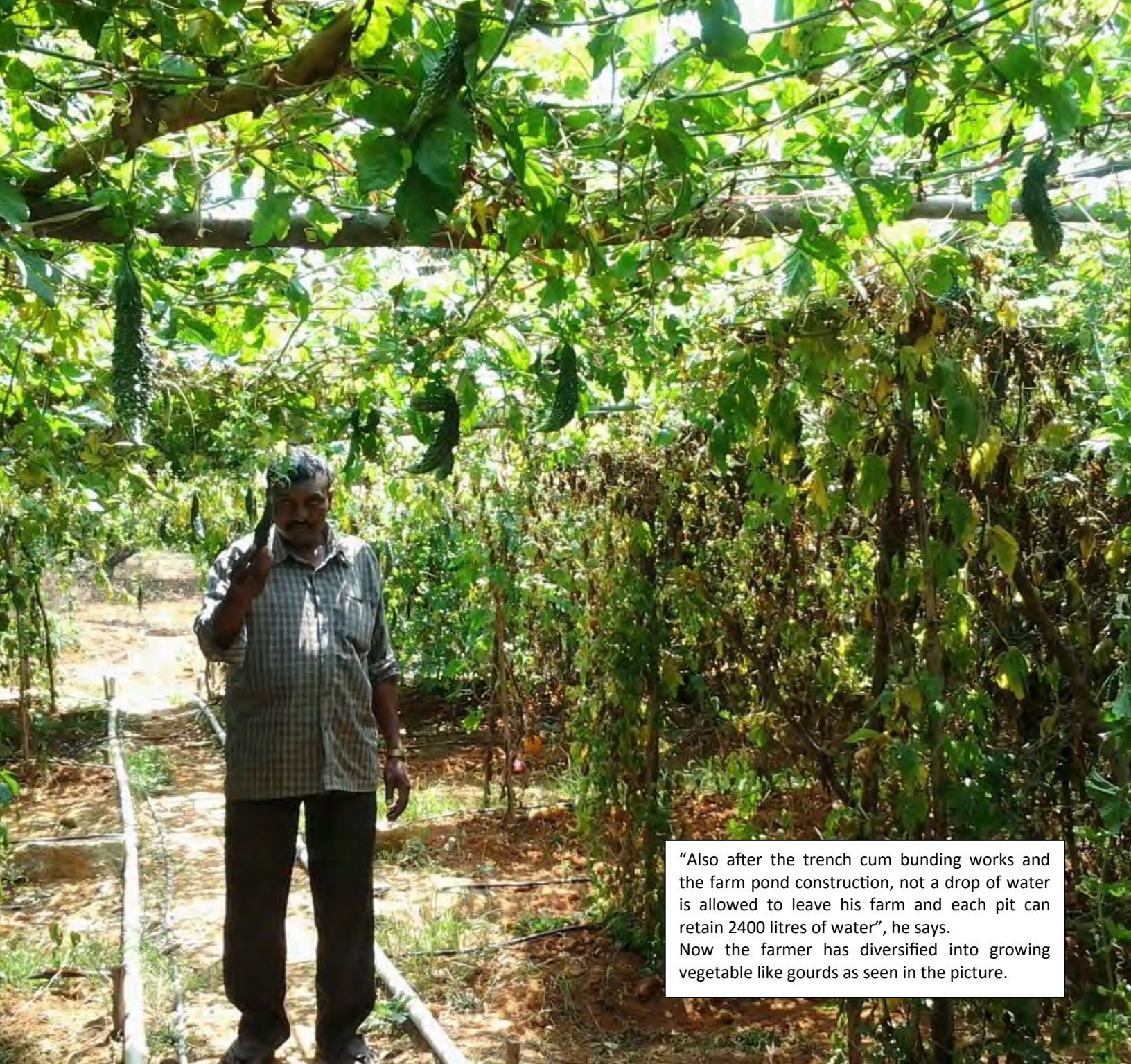
Trench cum bunding works helps farmer make windfall gain

In Shattyganahalli village, Muniyappa has a land holding of 3 ha. Earlier, like most farmers he depended on mango trees and dryland crops for income and the yields were very poor. After the initiation of the watershed project in his village, his life slowly began to change.

At present the farmer has 700 fruit bearing mango trees and the yield after the use of the interventions is 50 tons per year in comparison to only 35-40 tons before the watershed interventions. Each ton is sold at ₹ 5000-6000 depending on the market and the overall expenditure is ₹ 1,50,000 for mango. The net income from mango at present is ₹ 2,00,000 from mango alone.



Mr Muniyappa planted 180 mango saplings were distributed and also trench cum farm bunding works were initiated. He was also taught to apply micronutrients as per the recommendations and also a farm pond was constructed with the farmer contributing 10 % of the amount.



“Also after the trench cum bunding works and the farm pond construction, not a drop of water is allowed to leave his farm and each pit can retain 2400 litres of water”, he says. Now the farmer has diversified into growing vegetable like gourds as seen in the picture.



He has also started growing maize fodder to increase milk productivity in the 3 milking cows he has purchased. After maize fodder use, he says that the milk yields have increased by 2-3 litres per cow and has helped him receive 25 litres per day from 3 cows while earlier he was receiving only 15 litres per day from 3 cows.

Water retention after trench cum bunding works improves overall farm productivity

In Shattyganahalli, former priest S R Basavalingaiah has always been practicing dryland farming in 1.41 ha. After the initiation of the project, he noticed the field bunding works along with trenches in the mango fields of many farmers and decided to implement it in his own field.



As a part of the project, he planted 128 mango saplings of different varieties and the trench cum bunding work in his field was also done for 1.21 ha.



Each $50 \times 0.80 \times 0.60 \text{ cm}^3$ pit has the capacity to retain 2400 litres of water and it has enabled the mango saplings to grow in a healthy manner, says the farmer. With renewed hope, the farmer is hoping for a bumper mango crop in the future and is confident of increased income from his land.

Mango, millet and animal husbandry in watershed villages receive positive impact in comparison to surrounding villages

In Neeranahalli village, Bayanna aged 45, has been practising farming in 1.61 ha of land. Earlier he was mainly into dryland cultivation and concentrated his efforts on millets. But after the watershed program and the installation of 8 gully checks in the village, soil has been conserved and also slowly but surely, water retention has also improved.

As a part of the project distribution program, the farmer planted 200 *Milia Dubia* saplings in the year 2014, 20 Silver oak saplings and 16 teak saplings. The farmer realised the benefit of *Milia Dubia* to help increase milk productivity in cattle and has noticed an increased yield of 2-3 litres per cow per day. The farmer has 3 milking cows and 1 buffalo and has noticed that milk yield which was ranging from 5-6 litres per day is now almost 8-9 litres per day per animal.



***Milia Dubia* trees as a part of the distribution of the project, has helped improve milk yields**

After feeding the leaves of *Milia Dubia*, the farmer also noticed robust growth in the Jamunapari goat variety and now he has slowly diversified into selling the goats. With every goat the farmer sells, he makes a profit of ₹ 10,000 and due to improved health of goat variety, he manages to sell atleast 2 or 3 goats every month.



Milk yield per cow has increased by 2-3 litres per day after using *Milia Dubia* leaves as a part of their diet





Use of micronutrients and increased water availability has helped the farmer fetch increased yield for ridge gourd

Initial yield for finger millet was only 2.5 ton per ha before the watershed project, but now he receives almost 3.38 ton per ha. He sells finger millet at ₹ 14-18 per kg and incurs an expense of ₹ 20,000 for 1.61 ha. The net income made by the farmer is ₹ 55,000 from finger millet alone and earlier before interventions, he would receive only ₹ 40,000 for 1.61 ha.

Also for vegetables like ridge gourd, he receives a yield of 20 tons for 1.61 ha and earlier he would receive only 15 tons for 1.61 ha. The farmer now earns anywhere between ₹300000-400000 net additional income from ridge gourd alone but before he would earn only between ₹1,50,000 to ₹2,60,000 for 1.61 ha.

Vermicomposting activity and micronutrient application helps women farmer to sustain her livelihood



Also as a part of the project, she received 28 mango saplings, 4 silver oak trees and a kitchen garden kit. She has also been taught to apply micronutrients and says that she receives a yield of 6.17 tons per ha for finger millet after applying micronutrients and before she would only harvest 4.44 tons per ha. After an expenditure of ₹ 15,000, she still manages to bag a net income of ₹98,800-1,23,500 per ha.

In Shettykottanuru, many farmers have taken up to idea of initiating vermibeds in their land and Kemapamma is one such example.

After having contributed 10 percent for 2 vermibeds as a part of the project, she says that great improvements can be seen in her field of 0.30 ha and it has helped her family sustain their lives.

Vermicomposting activities increase after watershed project

For S C Vemanna from Shettykotannuru village, the Watershed project helped make him the Committee President and also helped him play a role in initiating 6 farm ponds and 13 vermibeds in the village.

Vemanna who holds 4.45 ha of land, has been predominantly growing mangoes in 4.04 ha and of late after the project, he is growing vegetables in 0.404 ha.



In his own farm, he has planted 320 mango saplings distributed as a part of the project and by using the recommended micronutrients; he says that the growth and health of the trees have been robust.



Also, 300 silver oak trees distributed by as a part of the project will fetch him atleast ₹5,000-8,000 depending on the size in the next few years.

With fresh hope, he also has also started a poultry unit and today he has 51 birds, which can sell from anywhere between ₹ 600-700 per bird.



Kitchen gardens and Self Help activities receive major attention after initiation of watershed project

For V Jayappa, who has 0.60 ha in Dandigenahalli village, the watershed project initiated by Coca-Cola and the technical help provided by MYRADA NGO and ICRISAT staff, has been a boon for his livelihood. Before the project, there was no water in his borewell and the farmer mainly depended on subsistence farming by growing dryland crops such as finger millet.

With the initiation of the project in the year 2013, staff from ICRISAT and MYRADA approached him and advised him about the benefits of rainwater harvesting. Based on the advice provided, the farmer constructed rainwater harvesting roof well tank. Also as a part of the project, as many as 60 mango saplings were distributed and the farmer had to pay only a 10 per cent contribution.

Rainwater harvesting tank, has enabled farmer to diversify farming activities



After initiation of the project, he was also advised to grow silver oak trees and at present, he has 75 trees. He hopes to fetch a good price in the next 2 years, as the market for silver oak has always been profitable.



Silver oak trees will help the farmer with increased income in the coming years



His wife, who is a SHG member, was also given a kitchen garden kit as a part of the project and due to which she now grows vegetables such as beans, brinjal, greens, chillies, lime, gooseberry and flowers. The availability of food within their own space has helped the farmer save at least ₹1000 per month on basic nutrition.

As an SHG member she was also helped as a part of the project, to avail a loan of ₹ 10,000 through NABARD linkage and purchased 3 baby lambs. After rearing them for 5 months, she sold them and made a profit of ₹ 5000 per sheep. She has repaid her loan and with the extra income, she still continues the sheep rearing business.

Training in tailoring helps improve livelihood of women

Pavithra, who lives just next door, was also linked to NABARD through the project and procured a loan to help buy one sewing machine. Also, free training on how to use the machine was taught for 3 months to help her learn how to stitch. She says that, during marriages and festivals, she manages to get many orders and her income has increased by ₹4000 per month due to stitching alone.



Pavithra is now earning an increased income due to the tailoring training provided as a part of the project

With the 2 buffaloes, she has been rearing for milk purposes, the milk yield before the watershed project was only 6 litres per animal. But after being trained on how to prepare lime water for cattle use, the milk yield has increased by 2 litres per animal per day.

She sells the milk to Karnataka Milk Federation at ₹ 23 and makes an increased additional income of ₹ 2,760 per month due to the increase in milk yields.



Situation of surrounding villages

The villages surrounding Mudhavatti watershed village have also been crippled by drought and the villages include **Vadageri, Parshaganahalli, Korgandenhalli** near Konepur have all faced drought with low rainfall (below 700mm in the year 2014) and the lack of farm ponds, gully plugs, trenches with field bunding has caused 30 percent reduced yields in mango and crops such as finger millet (ragi). Only through the Krishi Bhagya scheme, few farmers have initiated the construction of farm ponds and use it for drip irrigation in their mango orchards.

In Mudhavatti watershed village, Nagarajappa decided to go ahead with the construction of the farm pond, after he heard about the project initiated by Coca-Cola and with technical backstopping from ICRISAT and MYRADA NGO, a to 15*9*3 m farm pond was constructed, that has helped conserve water in his land and field bundings with trench has enabled the farmer to conserve water in his land of 1.61 ha. After farm pond construction, bunding work and micronutrient use as per recommendation, yield for finger millet has increased to 3.2 ton per ha from 2.5 ton per ha and pigeonpea yield has increased to 2.20 tons per ha from 1.35 tons per ha.

After seeing farmers having success with cultivation of mulberry using the trench method, he plans to implement the method disseminated from farmer to farmer during the course of the watershed project.



Farmer with mulberry grown using trench method and conventional method in the background



In **Papannahalli** watershed village, farmer- Chikkamuniyappa who has 1.21 ha of mango plantation, has been witnessing an increase in yield from 120 mango trees (Mainly a mix of totapuri, badami, mallika and rajagiri). After field bunding along with trenches, the yield for mango has increased to 36000 kg per year and earlier, before the intervention, the yield was only about 28,000 kg. The farmer says that “one ton of mango sells at anywhere between ₹ 5000-8000, depending on the variety and also the markets. After deduction of labour and overall expenditure of ₹ 74100 per ha, I make a net income ranging from ₹ 1,60,000 to ₹ 1,90,000 from 1.21 ha”.



Trench cum field bunding works have enabled farmers to reap increased mango yields around watershed villages



Way forward

- ♦ To ensure increased convergence with government schemes, improved planning and funding
- ♦ To push for further mechanization in farming methods and promote drip irrigation systems
- ♦ To promote and increase wastewater harvesting and roof top harvesting structures
- ♦ To promote more climate smart cultivars in millets and ensure higher yields
- ♦ To link farmers with the market by using Karnataka's e-markets system
- ♦ To improve livelihoods of women through increased convergence and linkage of banks to help financially support SHG members
- ♦ To improve fodder quality by promoting more silage making units and different varieties of green fodder.



Summary

In the semi-arid district of Kolar in Karnataka, agriculture has in the recent past been suffering due to frequent droughts and depleting water resources. After witnessing these changes, The Coca-Cola India Foundation for Rural Water Infrastructure and ICRISAT in consortium along with MYRADA, the Government of Karnataka and farmers in the 8 chosen watershed villages of Konepura, Mudavatti, Shattiganahalli, Dandigenahalli, Jangalahalli, Shattikotanuru, Pappanahalli and Neranahalli initiated the Kolar watershed project also known in the year 2012.

The main objective was to enhance the water availability in target villages through rainwater harvesting, recharging of the wells, reuse of waste water, improved cultivars and balanced nutrient management to demonstrate that science-based interventions can increase water availability, improve groundwater quality and also provide farmers with increased yields due to better soil health and improved practices. As a part of the project, as many as 35 farm ponds, 4 check dams and 75 gully checks were constructed to store excess runoff water from farmers fields, which all together created to harvest 13500 m³ of net storage capacity resulting in total rainwater harvested is 33750 m³.

Also to understand the soil nutrient status, soil health mapping at entry level was performed and it was observed that application of B and Zn increased crop yields by 23-26 % over control plots. The integrated nutrient management technique in 600 ha of land has benefitted as many as 450 farmers.

Apart from the above various agroforestry distribution of mango, teak, silver oak, milia dubia saplings etc., animal health camps, income-generating activities such as vermicomposting and capacity building by setting up of SHGs have been initiated as a part of the project. The project is spread over an area of 1333 hectares and has been a boon to 959 households who have made use of the interventions initiated as a part of the project.

For further details :

Mr Himanshu Thapliyal,
Program Manager,
Coca-Cola India Foundation
Tel: +91-0124-2348041; 09711988571
Email: hthapliyal@coca-cola.com

Dr Suhas P Wani
Research Program Director, Asia and
Director, ICRISAT Development Center (IDC)
ICRISAT, Patancheru
Tel: +91 40 30713466
Email: s.wani@cgiar.org