Improving Rural Livelihoods through Integrated Watershed Management in Ballari District, Karnataka

ICRISAT
INTERNATIONAL CROPS RESEARCH INSTITUTE FOR THE SEMI-ARID TROPICS

IDC ICRISAT DEVELOPMENT CENTER

JSW FOUNDATION

GOVERNMENT OF KARNATAKA

Overview

The district of Ballari in Karnataka, India is drought prone and receives less than 700 mm of average rainfall per year. With low agricultural productivity, youth in the district are drawn to the mining and industrial sectors that provide them with instant employment opportunities. This has led to agriculture taking a backseat, with only the aged and women taking active part in it. The district is a hotspot of water scarcity, land degradation and poverty. The twin constraints of severe labor shortage and falling returns from low crop yields have had a debilitating impact on agriculture, resulting in nutrition insecurity in humans and livestock in the region.

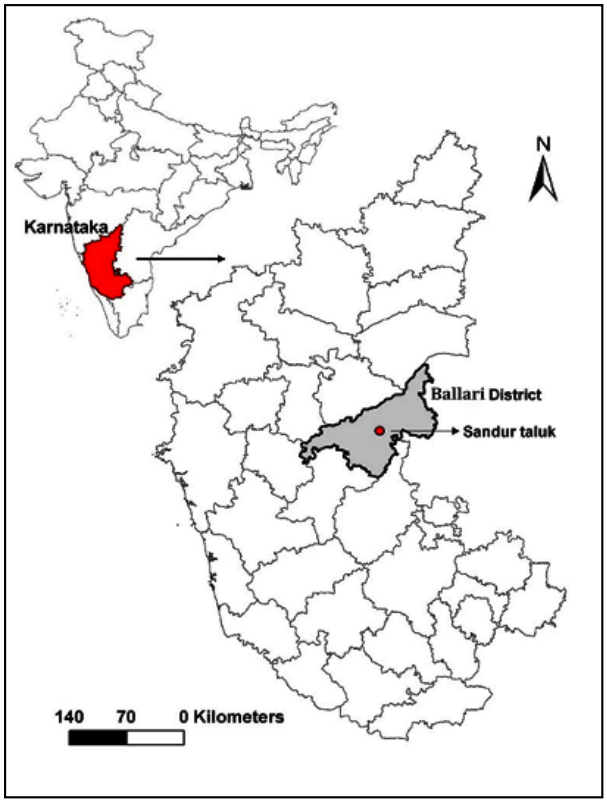
To address these issues, JSW Foundation and the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) have worked together on the project "Improving rural livelihoods through Integrated Watershed Management in Ballari district in Karnataka, India". This is being done in partnership with the Department of Agriculture and Watershed Development, Government of Karnataka, NGO partner, and the Basavajyothi Jalanayana Watershed Committee. The goal of the project was to establish a "Model Site of Learning" in the low-rainfall zone (<700 mm) to showcase how integrated watershed management interventions can enhance water availability, enhance productivity and diversify livelihoods.

Watershed management helps arrest soil erosion, improve soil moisture, harvest rainwater, reduce flooding, recharge ground water, reclaim eroded land, and revive greenery. It helps restore the environment, increase farm production, and thereby incomes, resulting in better livelihoods for smallholder farmers.

The four villages of Chikanthapur, Doddanthapura, Joga and Kodalu in Sandur taluk in the vicinity of the JSW steel plant were selected for the interventions. The villages house 2,223 families, of which 1,930 are engaged in agriculture and 293 are landless.

Objectives of the project

- To establish a Model Site of Learning in the low rainfall zone (<700 mm per annum) in Karnataka where the potential of rainfed areas can be demonstrated by adopting an integrated water resource management approach.
- To enhance water availability and its (green and blue water) use efficiency in order to diversify livelihood systems in the target villages.
- To build the capacity of farmers through a knowledge sharing and dissemination strategy.



Range of interventions

Watershed management approach

Rehabilitating ecosystems and building resilience of farming communities

Community meetings
to identify key interventions and implement capacity building

Climate

Entry point activity:
Watershed Committee formation

- Install weather stations, rain gauges and equipment to collect data on rainfall, air and soil temperature, monitor runoff rate, soil loss in watershed, etc.
- Train farmers to monitor and use data and make cropping decisions

Soil

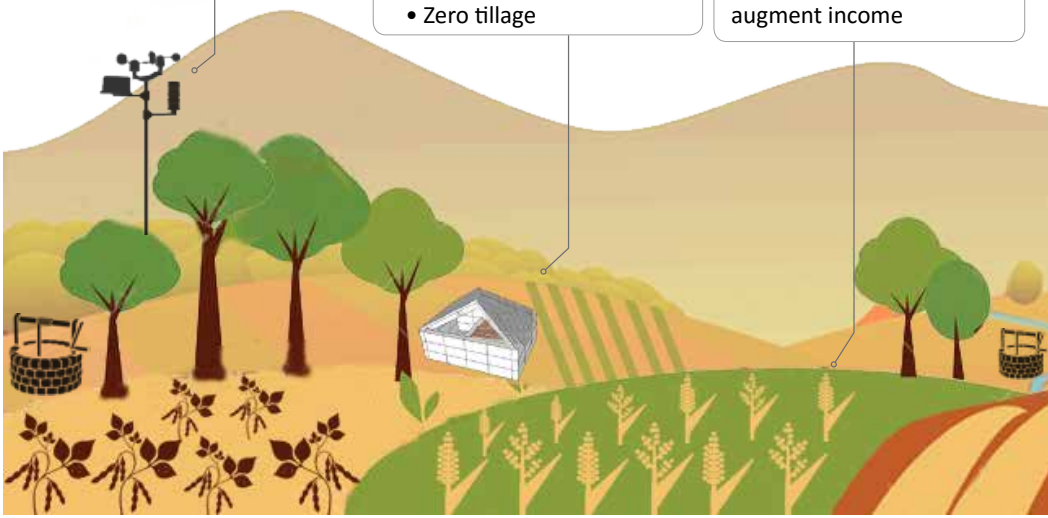
Entry point activity:
Soil health testing

- Improve fertility:

1. Reduce synthetic fertilizer
   - Use prescribed dose of chemical fertilizers
   - Green manure
   - Vermicomposting
   - Tank silt
2. Moisture conserving techniques
   - Broad Bed and Furrow
   - Zero tillage

Crops

Entry point activity:
Farmer interviews
Introduce climate-smart crops and varieties that are drought and heat tolerant, disease resistant, early maturing, nutrient rich, improve soil health and augment income



CROSSCUTTING ISSUES: • **Integrating gender** • **Attracting youth**

Water

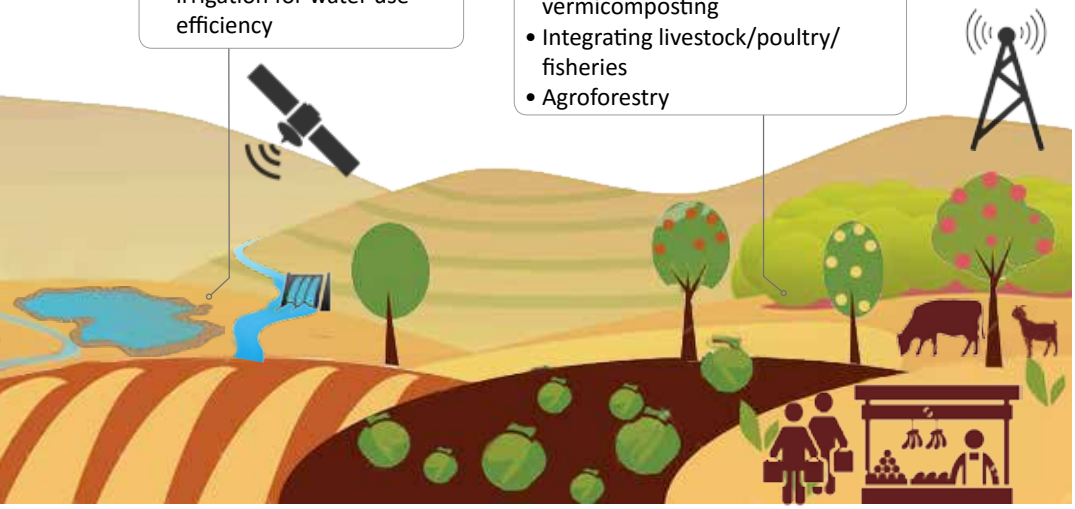
Entry point activity:
Geospatial analysis

- Build structures to harvest rainwater and increase groundwater levels
- Use techniques like drip irrigation for water use efficiency

New livelihoods & market links

Entry point activity:
Self-Help Group formation

- Livelihood diversification through farm enterprises - selling vegetables, fruits, vermicomposting
- Integrating livestock/poultry/ fisheries
- Agroforestry



Monitoring, Learning & Evaluation

ICRISAT records and analyzes climate, crop data and increase in farm incomes

• Nutrition • Communication • Partnerships

Source: Building Climate-Smart Villages, 2015

Community mobilization

- Formation of watershed committee
- Project launch
- Gram sabhas (village gathering)

Soil and water conservation

- 168 rainwater harvesting structures (check dams, ponds, and field bunds) built
- 1.5-2.0 m increase in groundwater recharge
- Increased carbon sequestration
- *In situ* conservation of water -100 ha
- Greening of wastelands (7000 plants)

Total water impounded

- Net storage capacity: 45,000 m^3
- Total water conserved: 9000 - 100,000 m^3 due to refilling in the rainy season.

Soil fertility assessment

Around 1000 soil samples were collected from farm lands and analyzed in the soil testing laboratory at ICRISAT. Majority of the samples revealed significant zinc deficiency (Table 1). Based on the results of the tests, fertilizer recommendations were made for different crops and a diagnostic soil health card given to individual farmers.

Table 1. Village-wise soil chemical analysis.

Village	Deficiencies (%)[1]					
	OC	Average P	Average K	Average S	Average Zn	Average B
Chikanthapur	0	20	0	0	90	0
Doddanthapura	27	13	0	10	77	10
Joga	5	15	0	5	80	15
Kodalu	18	4	0	21	75	7

[1] OC=Organic carbon; P=Phosphorous; K=Potassium; S= Sulphur; Zn= Zinc; and B=Boron.

Soil test-based nutrient management

Once the soil diagnosis was done, balanced fertilizer trial demonstrations were conducted on farmers' fields to show them the advantage of applying sulphur (S), zinc (Zn) and boron (B) in addition to the application of nitrogenous, phosphorus and potassium (NPK) fertilizers (improved practice). Farmers applied 200 kg gypsum, 12.5 kg zinc sulphate and 2.5 kg borax per hectare as an improved practice. The demonstrations have provided evidence of yield improvement ranging from 8% to 22% in different crops (Table 2). This enhanced input use efficiency and reduced the cost of production by 8-10%.

Table 2. A comparison of grain yield and total biomass yield of major crops under farmer practice (only NPK) and improved practice (NPK+Zn+S+B), 2013-14.

Crop	Grain yield (kg/ha)		Total biomass yield (kg/ha)		Increase in grain yield (%)	Increase in total biomass yield (%)
	FP	IP	FP	IP		
Pearl millet	1120	1220	2490	2920	8	14
Sorghum	2920	3580	1980	2820	18	30
Maize	4230	4730	3810	4520	10	16
Groundnut	1980	2260	1660	2010	13	18
Sunflower	1150	1460	1120	1350	22	17

Introducing improved cultivars

Participatory demonstrations of different cultivars of sorghum, green gram, pearl millet, pigeonpea, groundnut, and castor were conducted in farmers' field, in the watershed villages.

Farmers observed a 12% increase in pearl millet yield following the adoption of improved cultivar ICTP 8203. Similarly, improved cultivars of pigeonpea (ICPL 87119), groundnut (ICGV 91114), maize, and foxtail millet introduced through on-farm demonstrations during the project period improved yields by 21%, 20-25%, 25%, and 13%, respectively compared to prevailing cultivars used by farmers.

Safe use of wastewater for irrigation

The construction of a wastewater treatment unit for crops through the filtration of municipal wastewater generated in Doddanthapura village was used by five farmers to irrigate their land to grow cotton. The constructed wetland, a bio-treatment technology, was adopted for this wastewater treatment unit. It consists of a filter bed of locally available sand/gravel and vegetated with wetland species such as *Canna indica* and *Typha*. It requires less maintenance except for regularly harvesting above ground biomass.

Afforestation and horticultural activities

To increase greenery and reduce dust from mining activities, the following were taken up:

- Avenue plantation
- 18,500 saplings planted
- 4125 teak saplings were planted in 12 farmers' fields
- 200 farmers planted 19,300 *glyricidia* plants on field bunds
- 52 farmers planted 1950 neem, silver oak and teak saplings on the roadside
- 7000 *Pongamia* saplings planted on hills and common areas
- 4000 *Glyricidia* and *Pongamia* saplings planted around watershed structures.

Animal health camps

- 6 animal health camps conducted
- 1200 livestock benefit
- Artificial insemination of 13 cows through cross breeding
- Vaccination for foot and mouth disease and deworming
- Growing azolla fern for cattle feed.

Automatic weather station and hydrological monitoring

An automatic weather station was set up in Chikanthapur village to collect data on rainfall, air and soil temperature, solar radiation, and wind velocity and direction. A rain gauge was installed in each of the four villages.

A hydrological gauging station consisting of an automatic runoff recorder and microprocessor-based sediment sampler was installed in Doddanthapura to monitor runoff, peak runoff rate, and soil loss from the watershed.

Income generating activities

- Vermicomposting taught to 61 households, earning them ₹1000 per month
- Reduced chemical fertilizer use by 25-30%
- Training in preparation of compost culture benefited 14 farmers.

Integrating gender

- Promoted collective action through the formation of Self-Help Groups (SHGs)
- Promoted backyard nutri-kitchen gardens (for household consumption) through the distribution of vegetable kits to 450 families
- Micro enterprises such as tailoring, petty shops and rearing of livestock set up
- SHG services used to source seedlings for afforestation program, which provided additional income to SHG members.

Revolving fund helps SHG beneficiary start small enterprise

G Basamma from Chikantapur village has been a part of the Shrishti SHG. Before the watershed project, her group was struggling to make money and Basamma would stitch clothes to help earn a meagre income.

As part of the JSW project, her 12-member group was given a revolving fund of ₹30,000. She borrowed money and started a textile shop. She also purchased 2 sewing machines which she has rented out. She currently earns ₹400 a month teaching tailoring to villagers.

After she started the cloth business, her income was in the range of ₹10,000 to ₹15,000. This has also helped her easily pay off the loan.

As of today, the SHG has a saving of ₹150,000.

Capacity development

- For women SHGs and farmers
- Exposure visits to ICRISAT, agricultural and horticultural research institutes, interaction with farmers practising organic farming and visit to candle making factory
- More than 450 farmer beneficiaries.

Field days and farmer training

- Watershed committee training programs
- Wall writings
- Farmers day
- Field days for farmers and women SHGs
- 3,500 farmers benefited.

Communication

In partnership with Digital Green, an NGO, farmer-to-farmer videos were shown by farmer facilitators using battery-operated Pico projectors.

Success snippets

Replenished groundwater for a resilient livelihood

As a laborer working in a factory nearby, Mr Thimappa from Chikantapur village made a mere ₹6000 per month. He owns 2.8 ha of land and was struggling to make ends meet before the watershed project. The project team convinced him to construct a pond in his field. A check dam was also constructed near his field. Together, these two water harvesting interventions enhanced groundwater availability through bore wells.

The increase in water availability allowed Mr Thimappa to grow irrigated chillies on 1.20 ha, which provided an income of ₹1,50,000. From another 1.20 ha, he harvested 3 tons of maize worth of ₹20,000. Mr Thimappa was a traditional cotton grower on 0.60 ha and harvested 800 kg per season. He now also grows pigeonpea on 1.60 ha and harvests about 1 ton. From both these crops, he makes a tidy income of ₹60,000. The abundance of water has encouraged him to use 0.40 ha to grow vegetables. The days of scarcity and bad crops are all water under the bridge now!

A dream dairy

Gangamma K T from Kodalu village has benefited immensely from the JSW-ICRISAT watershed project. She owns 5 ha of land and was earning ₹50,000 per year harvesting dryland crops. After the initiation of the watershed project in her village, she single handedly developed SNEHA SHG and became the leader of the group.

She took a loan of ₹30,000 from the revolving fund and purchased a cow of local breed. Through artificial insemination, she increased her herd strength to 4 Holstein Friesian, 1 Jersey, 2 local breeds and 4 calves.

This enabled her to clear her loan. With another loan of ₹250,000 through a local bank, she built a shelter for the livestock. As part of the project, seeds of multi-cut sorghum cultivar were supplied for her to grow fodder crops on 0.40 ha. The fodder has ensured milk yields of 30 liters/day from her 4 milching animals, which she sells to nearby factories at ₹40 per liter. She now earns ₹24,000 per month. The project has reaped rewards for her in terms of sustainability.

When worms bring prosperity

Chillies, maize and cotton have always been Nagabhushan's sources of income. This farmer from Kodalu village owns 2.83 ha of land, which used to earn him about ₹300,000 per year.

As part of the watershed project, Nagabhushan was advised to take up vermicomposting to reduce the use of chemical fertilizers. He constructed two vermicompost pits as part of the project.

Before the watershed project, Nagabhushan would spend more than ₹50,000 on inputs and grew chillies on 0.81 ha. He has been following the project's recommended dosage of micronutrient use (25 kg zinc sulphate/ha, 2.5 kg borax/ha and 250 kg gypsum/ha).

Adopting these new practices, his 0.81 ha of maize has yielded 6,000 kg, which he sells at ₹13/kg to make a tidy sum of ₹78,000. His 0.81 ha of cotton yielded 4000 kg, which he sold at ₹45/kg to earn a whopping ₹180,000. Nagabhushan also grows chillies on 1.21 ha which have yielded 3,000 kg. Selling it at ₹170/kg has brought him an income of ₹510,000.

Following a spend of ₹150,000 on inputs, Nagabhushan is sitting pretty with his income of ₹618,000 from a mere 2.83 ha.

Goats lead the way to income security

It was hard times for Hanumantamma of Chikanthapur village before the watershed project was initiated in her area. With no land to call her own and a meagre income of ₹8000 from her husband's earnings as a laborer, it was a struggle to make ends meet. Moreover, the search for employment was unfruitful.

The watershed development program changed all that. It facilitated her training in forming an SHG. Soon she was heading the Maramma Devi SHG. She borrowed ₹30,000 from the revolving fund and bought 10 goats. She sells each goat at ₹4,000-5,000 depending on its weight. Her monthly income now averages ₹10,000. During festivals, demand for her goats goes up; so does her income.

She understands that the well-being of her goats is inextricably linked to that of her family. So taking care of them is very essential. She spends about ₹15,000 per year in ensuring they are free of disease. Hanumantamma also sells the goat droppings that serve as organic fertilizer to nearby farmers, from which she earns ₹300 per month.

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