



Bhoochetana



Mission to Enhance Productivity of Rainfed Crops in Karnataka

Importance of Rainfed Agriculture

Rainfed areas in India generate 60% of agriculture produce, 75% of pulses and more than 90% of sorghum, millet, and groundnut although these areas are the hot spots of poverty, water scarcity, droughts, land degradation, and low rainwater use efficiency. Rainfed agriculture productivity is even crucial for food security and economy of Karnataka as it has the second largest rainfed area in India.

Yield Gaps in Major Crops of Karnataka

An ICRISAT study reveals that the farmers' current crop yields are two to five times less than the achievable yields (Fig.1), with a huge scope to boost the yields through integrated and improved management practices.

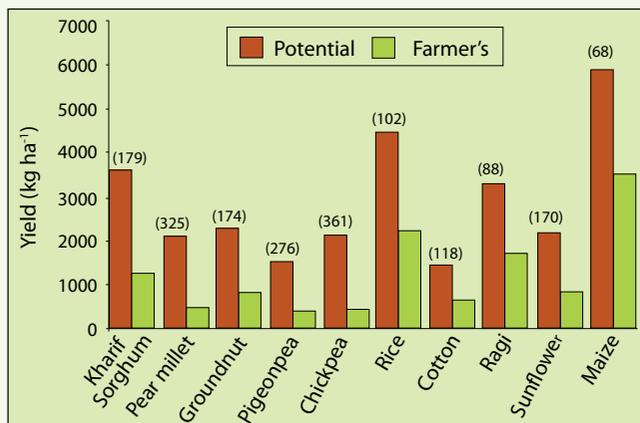


Figure 1. Yield gaps between current farmers' yields and potential yields in rainfed crops of Karnataka.

Hungry and Thirsty soils

Using a stratified sampling method 92,860 soil samples from farmers' fields in 30 districts were analyzed, and using a Geographic Information System (GIS) soil nutrient status maps were prepared. Karnataka soils were found critically deficient in micronutrients zinc (Zn), boron (B), and sulphur (S) along with nitrogen (N) and phosphorus (P). Taluk-wise fertilizer recommendations were developed based on soil analysis.

Seeds of Bhoochetana

A mission mode project, "Bhoochetana", was launched by the Department of Agriculture (DoA), and facilitated by ICRISAT to harness science for sustainable use of natural resources among farmers and increase rainfed crop yields by 20% in 30 districts of Karnataka. ICRISAT and DoA had sown the seeds of Bhoochetana, and signed an MOU with the GoK (Fig. 2) to provide technical backstopping to this pioneering project.

Bhoochetana Goal

The goal of Bhoochetana is to make a difference in the lives of smallholder and marginal farmers in 30 selected rainfed districts of Karnataka by increasing average crop productivity by 20% in four years.



Figure 2. DoA official delegation discussions with the DG, ICRISAT for MoU on Bhoochetana project.

Objectives

- To identify and scale-up best options (soil, crop and water management), including improved cultivars.
- Train DoA staff members to perform stratified soil sampling, analyze micronutrients, and prepare GIS-based soil maps.
- Improve skills of farmers and consortium partners in sustainable use of natural resources for enhancing crop productivity.

Strategies: Mission Mode Approach

- Adopt Integrated Genetic and Natural Resource Management (IGNRM) approach to boost rainfed crop yields on fields of small holder farmers fields in Karnataka.
- Establish farmers' participatory research and development (PR & D) approach to evaluate productivity enhancement technologies, "Seeing is believing".
- Build capacity of stakeholders at all levels including Farm Facilitators (FFs), and Lead Farmers, and provide exposure to technologies through field days and mass media.
- Assess the soil health in 30 districts, and provide taluk-wise nutrient recommendations, and ensure timely availability of quality inputs in villages.
- Scaling-up strategy to cover millions of smallholder farmers.

Consortium Partners

- DoA, WDD, Government of Karnataka
- UAS Bengaluru, Dharwad, Raichur and Shimoga
- CBOs and watershed associations
- Digital Green
- ICRISAT, Patancheru, Andhra Pradesh, India

Rainfed Technologies for Farmers

Rainfed farming technologies, implemented to increase productivity, are as follows:

- Soil moisture conservation techniques *in-situ* such as contour cultivation, conservation furrows and broad-bed and furrow systems.

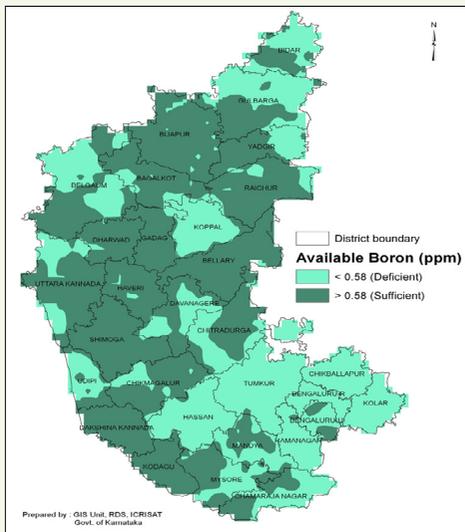


Figure 3. Nutrient status (Boron) map of districts of Karnataka.



Figure 4. A ragi farmer with improved variety (L-5) in his field in Kolar during kharif 2009.

Taluk-wise balanced nutrient management recommendations for various crops based on soil analysis of farmers' fields, preparation of nutrient status maps (Fig. 3).

- Seed treatment with biofertilizers (*Rhizobium*) and biocontrol agents (*Trichoderma viride*) and other fungicides for different crops.
- Gliricidia planting on field bunds to add organic N and prevent soil erosion, and vermicomposting.
- Identification of high-yielding short duration crop varieties of ragi (L 5 in Fig. 4, MR 1), groundnut (ICGV 91114, GPBD 4 in Fig. 5) and soybean (JS 93-05 in Fig. 6) and other crops through participatory research and development (Figs. 7 and 8).
- Training of farmers in IPM practices such as pheromone traps, nuclear polyhedrosis virus (NPV), cultural practice of shaking pigeonpea plants, tolerant cultivars and biological methods.
- Use of Tropicultor and other machinery for field operations
- Village Seed Banks to ensure timely availability of quality seeds of preferred varieties to farmers.

Regular Capacity Development for Sustainability

- Team building workshops were organized for nearly 2,500 stakeholders, including field staff and senior officials from WDD and DoA.



Figure 5. Groundnut plants with pods under improved management (GPBD-4, left) and farmers' management (right) in Haveri district during kharif 2009.

- District, taluk and cluster/village level trainings were held in all the districts for ADAs, AOs, FFs and lead farmers (about 61,687 participants) in the months of May and June 2012.

Cropping Targets

Table 1. Bhoochetana: Extent of area coverage				
Component	2009-10	2010-11	2011-12	2012 Kharif
Area (million ha)	0.2	1.2	2.85	3.73
No. of districts	06	16	30	30
No. of villages	1440	5030	14014	26293
No. of farmers (millions)	0.2	0.8	2.2	4.39
No. of farmer facilitators for extension activities	517	2500	5688	9700
No. of lead farmers	1867	10500		45000

- Contingency crops, including pearl millet, horsegram, and finger millet minimized losses in case of failure of early season rains.
- Castor and cluster beans were introduced in the cropping system for diversification.



Figure 6. A farmer in his soybean (JS 93-05) field during kharif 2009 in Dharwad district.



Figure 7. A farmer in his sorghum field showing his crop to other farmers during kharif 2011 in Gulbarga District.

Good Systems for Monitoring & Evaluation (M&E)

- State Level Coordination Committee (SLCC) chaired by Development Commissioner with senior members, Principal Secretary, Commissioner and Director of DoA and Director of WDD, Vice-Chancellors of the UASs Bengaluru, Raichur and Dharwad, Economic Advisor to the Chief Minister of Karnataka and ICRISAT Project Coordinator to monitor and evaluate activities regularly.
- District and taluk level committees for regular M&E.
- Speedy measures to tackle operational and technical issues through weekly video-conferencing and reporting.

Achievements

- Progressively covered 3.1 m ha area by rainy season (kharif) 2012 and mobilized key inputs (improved cultivar seeds, fertilizers, micronutrients, seed treatment material) by DoA. Tropicultors and seed cum fertilizer drills (*kurgi*) were custom hired to farmers.
- Introduction of groundnut (ICGV 91114), pigeonpea, chickpea cultivars, pearl millet hybrids and soybean cultivars.
- Trained cadre of FFs and Lead Farmers made a big difference in reaching millions of farmers.
- Soil nutrient status Atlas, soil health cards, wall-writings and internet media used effectively to share soil health status and balanced fertilizer recommendations taluk-wise for all crops.

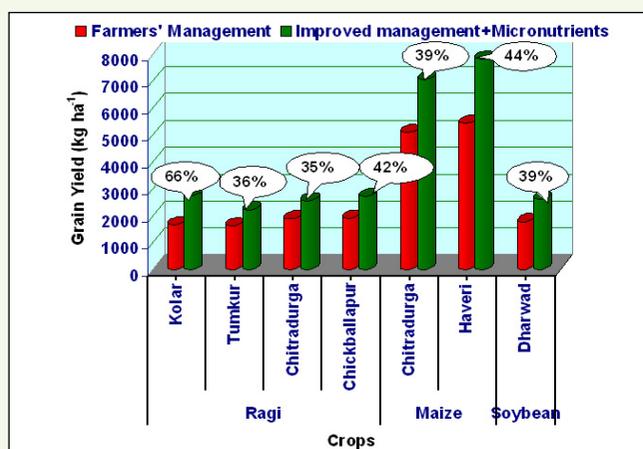


Figure 9. Crop yield increase in ragi, maize and soybean with improved management compared to farmers' management in different districts of Karnataka during kharif 2009.



Figure 8. ICRISAT scientists and DoA officials in a maize field during a field day in Haveri, 2009.

- A joint team of officials of DoA, UASs and ICRISAT undertook thousands of crop cutting experiments along with participation of individual farmers and stakeholders for yield estimation for selected crops in the state.

Increased Crop Yields and Economic Gains

- During four years with improved management, yields of cereals (maize, sorghum, pearl millet, finger millet, paddy), pulses (greengram, blackgram, pigeonpea, chickpea, beans, cowpea), oilseed crops (groundnut, soybean, sunflower, safflower), cash crops (cotton) increased by 22 to 60% and in case of sugarcane by 10% (Figs. 9, 10 and 11).
- During 2012 rainy season despite a severe drought year (-26 % rainfall) farmers harvested increased crop yields by 22 to 48% and sugarcane by 10% with improved management.
- Smallholder farmers in rainfed areas earned additional income of ₹ 1.2 to 14.6 with every additional rupee invested on improved management under Bhoochetana during 2010-11.
- During 2011 rainy season alone three million farmers in the state increased their gross income by ₹ 646 crores (Table 2), equivalent to US\$ 129 million, with additional production of 0.55 m tons of crop yields.
- Innovative extension approach using Farm Facilitators and Lead Farmers enabled the DoA to reach millions of smallholder farmers in the state. Empowered FFs and LF provide a strong extension service in the state.

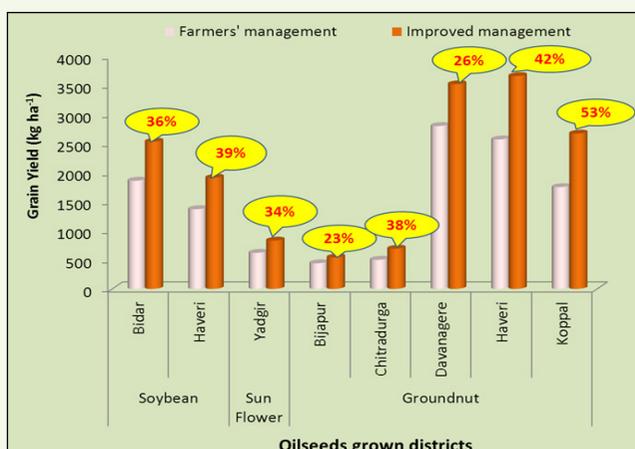


Figure 10. Groundnut pod and other oilseeds yield increase with improved management compared to farmers' management in different districts of Karnataka during kharif 2011-12.

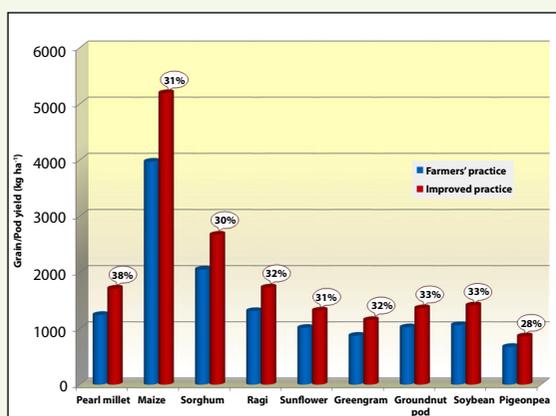


Figure 11. Karnataka State 2012 kharif crop yield data.

Crop	Production with FM (Million t)	Production increase with IM (Million t)	Price (₹ t ⁻¹)	Increase economic value with IM (₹ in crores)	Total production (Million t)
Grand Total (Pulses)	0.22	0.02	33,000	73.34	0.24
Grand Total (Cereals)	4.05	0.48	9,700	463.56	4.53
Grand Total (Oilseeds)	0.35	0.05	23,967	109.81	0.40
Total	4.62	0.55		646.71	5.17

- Farmer to farmer videos for effective dissemination (Fig. 12) and tablet-based knowledge sharing approach to empower FFs are piloted in two districts (Fig. 13).
- Innovative extension systems are pilot such as Pico projector and tablet-based knowledge sharing approach.



Figure 12. Farmer to farmer video using Pico projector.

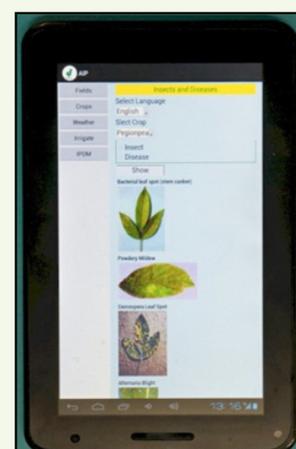


Figure 13. Tablet-based knowledge sharing.

What does Bhoochetana mean to farmers?

For farmers like Devaraju of Kolipalya village, Chamarajanagara district, Karnataka, who owns 1 ha, boosting yield is considerably important and Bhoochetana created a big boon. With the guidance and timely inputs of farm facilitators, other departmental staff, and ICRISAT staff he has been able to scientifically use micronutrients and other improved technologies to cultivate maize (Fig. 14). Consequently, he obtained 6.25 t ha⁻¹ as against 4.5 t ha⁻¹ through traditional practice, a 39% increment (about 1.8 t ha⁻¹). He received ₹ 16,600 net additional income ha⁻¹ by selling maize at the rate of ₹ 9000 t⁻¹. Now, he is a happy man and is willingly sharing his good experiences of Bhoochetana with other farmers. Devaraju is one of the many success stories of Bhoochetana – a program enriching the soil and lives of farmers.



Figure 14. Mr Devaraju from Kolipalya village proudly displaying a good maize crop.

About ICRISAT



The International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) conducts agricultural research for development in Asia and sub-Saharan Africa with a wide array of partners throughout the world. Over 2 billion people, of whom 644 million are the poorest of the poor, live in the semi-arid tropics, which cover 55 countries. ICRISAT (a non-profit non-political organization) and its partners help empower these poor people to overcome poverty, hunger, malnutrition and a degraded environment through better and more resilient agriculture.

ICRISAT is headquartered in Patancheru near Hyderabad, Andhra Pradesh, India, with two regional hubs and five country offices in sub-Saharan Africa.

ICRISAT is a member of the CGIAR Consortium. The CGIAR is a global research partnership for a food secure future.

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