# Bhoochetana

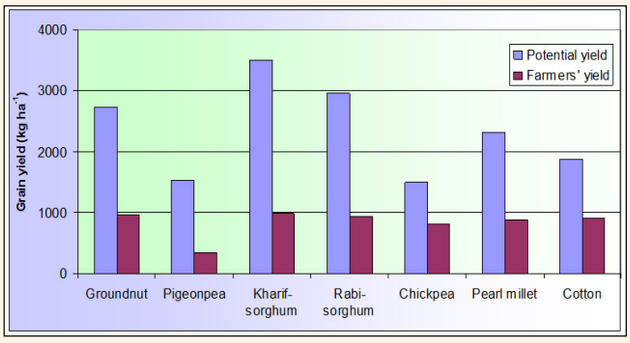
## Bridging Yield Gaps with Science-led Interventions in Andhra Pradesh

## Background

Current productivity of agricultural crops in Andhra Pradesh is lower by two- to four-folds as compared to the achievable potential yields. Long term studies at ICRISAT based at Patancheru have demonstrated a virtuous cycle of persistent yield increases through improved management in rainfed agriculture. The present scenario clearly points to the need for adoption of science-led interventions to improve agricultural productivity and livelihoods to alleviate poverty, hunger and malnutrition in rainfed regions. In this context, the Government of Andhra Pradesh has taken up an innovative approach to adopt science-based development of agriculture and capacity strengthening of stakeholders with technical support from the ICRISAT-led consortium called "Bhoochetana", which will increase productivity of target crops by 25% in 5 years. The strategy is to map out nutrient deficiencies in the soils, develop mandal-wise balanced nutrient recommendations and conduct demonstrations/ trials in a phased manner to scale out the technology to a large number of farmers in the state using improved cultivars and soil and water managemnet practices.

## Yield Gaps in Major Crops of Andhra Pradesh

ICRISAT study reveals that large gaps two- to four-times, between current farmers' crop yields and the achievable yields exist. The good news is that there is huge scope for improving rainwater use efficiency, employing balanced nutrition, improved cultivars and crop management practices.



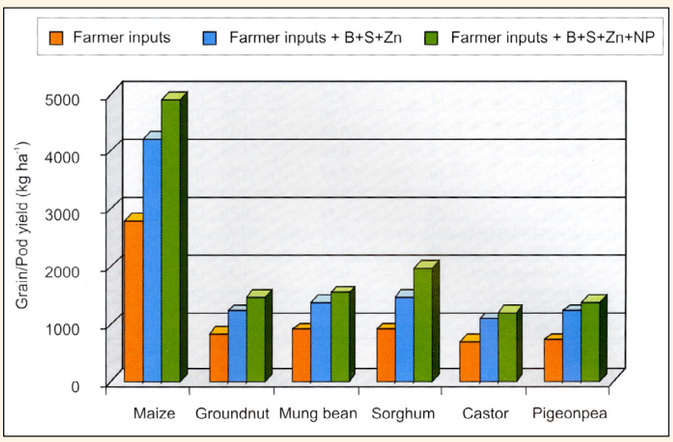

*Yield gap of different crops in Andhra Pradesh.*

## APRLP watershed project: a success story

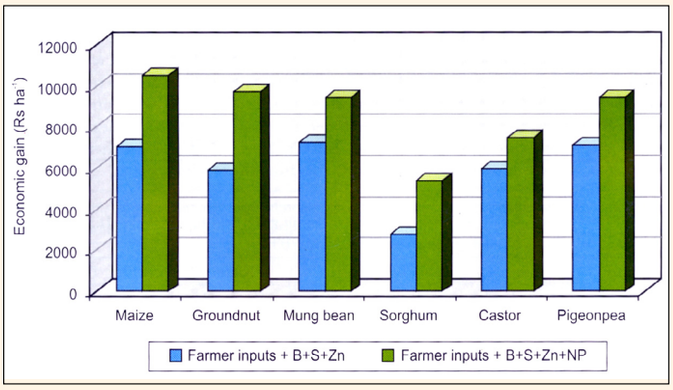
Andhra Pradesh Rural Livelihood Project (APRLP)-ICRISAT initiative during 2002-2004 was among the initial pilots to diagnose soil health in farmer's fields and identify widespread deficiencies of sulphur (S), boron (B) and zinc (Zn), apparently holding back the yield potential. Several farmer participatory on-farm trials were undertaken under APRLP, where we observed a good response in various prominent crops both for individual and combined application of S, B and Zn. The most significant observation was that the combined application of these nutrients, along with adequate nitrogen (N) and phosphorus (P) was the best, equal to or better than the additive response of individual nutrient elements.

*Mr Raghuveera Reddy then Agriculture Minister in field day at Karivemula, Karnool district, 2004.*

Combined application of micronutrients at optimum N and P level gave the maximum response and the additive response to each deficient element at this level was obtained. At farmer input level, the full potential of S, Zn and B would not have been obtained because of inadequate supply of N and P. This was proved by an increased response in yield of various crops to application of S, Zn and B along with N and P. Thus in maize 50% and 76%, in sorghum 41% and 61%, in groundnut 47% and 78%, in mung bean 41% and 61%, in pigeonpea 71% and 90% and in castor 54% and 70% responses were obtained by combined application of B, Zn and S at farmer nutrient input level and at optimum N and P level.




*Yields of various crops with micronutrients and other inputs in the APRLP watersheds, Andhra Pradesh, during 2003 rainy season.*




*Economic gains due to micronutrient application to various crops in the APRLP watersheds in three districts in Andhra Pradesh, during 2003 rainy season.*

## Hungry and Thirsty soils

Soil test report reveals that these soils are not only thirsty but also hungry for major and micro nutrients. The scarce nutrients were nitrogen, phosphorus, sulfur, boron and zinc.

| Percent nutrient deficiency fields. | | | | | | |
|---|---|---|---|---|---|---|
| | % deficient | | | | | |
| District | OC* | Av P | Av K | Av S | Av Zn | Av B |
| Anantapur | 82 | 3 | 2 | 58 | 45 | 53 |
| Guntur | 89 | 16 | 1 | 22 | 39 | 4 |
| Karimnagar | 60 | 29 | 9 | 27 | 62 | 62 |
| *OC: Organic Carbon. | | | | | | |

Soil test base fertilizer recommendations were provided to the farmers.

| Soil test based fertilizer (kg ha$^{-1}$) recommendations. | | | | | | | |
|---|---|---|---|---|---|---|---|
| District | Crop | Urea | DAP | MOP | Gypsum | $ZnSO_4$ | Borax |
| Karimnagar | Maize | 196 | 54 | 33 | 100 | 50 | 5 |
| Guntur | Paddy | 172 | 60 | 33 | 100 | 25 | 2.5 |
| Anantapur | Groundnut | 27 | 43 | 42 | 500 | 25 | 5 |

## Goal

The overall goal of the project is to increase average productivity of target crops in the selected districts by 25% in five years and identify suitable adaptation strategies for coping with the likely changes associated with climate change.

## Objectives

- To identify best-bet crop management options (soil, crop and water management) including improved varieties to enhance productivity of the selected crops in seven targeted districts by 25%.
- To undertake representative soil sampling (stratified sampling method for farmers in villages in a district) to prepare GIS-based soil maps depicting micro- and macro-nutrient status of the soils.
- To assess the likely impacts of climate change in the target seven districts and identify suitable adaptation strategies to cope with climate change
- To build capacity of the stakeholders (farmers and consortium partners) in sustainable management of natural resources, enhancing crop productivity in dryland areas and adaptation strategies to cope with climate change.

## Strategy

- Integrated Genetic and Natural Resource Management (IGNRM) approach to boost rainfed crop yields in Karnataka.
- Establish farmers' participatory research and development (PR & D) approach to evaluate productivity enhancement technologies.
- Capacity building of stakeholders at all levels field facilitators and lead farmers exposing them to technologies through field days and mass media.

## Consortium Partners

- Department of agriculture (DoA), Government of Andhra Pradesh
- Acharya NG Ranga Agricultural University (ANGRAU)
- District administration
- District watershed management agency (DWMA)
- ICRISAT, Patancheru, Andhra Pradesh
- Andhra Pradesh State Remote sensing Application Center

## Review and planning meeting

A review and planning meeting of the Bhoochetana initiative was conducted at ICRISAT on 22 May, 2012. The planning meeting was attended by DoA staff from all the 14 districts in addition to Commissionerate of Agriculture staff. Mr K Madhusudan Rao, Commissioner also participated in the meeting. A review indicated that during rabi (postrainy) season 2011-12, Bhoochetana trials were conducted in 5 districts.

*Bhoochetana Review and planning meeting held on 22 May 2012 at ICRISAT.*

## Rainfed Technologies for Farmers

- Rainfed farming technologies, which are being 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, which are simple and efficient
- Mandal-wise balanced nutrient management recommendations for various crops based on soil analysis of farmers' fields
- Biofertilizers (*Rhizobium* etc.) and biocontrol agents (*Trichoderma viride etc.)* and other fungicides for different crops
- Planting of Gliricidia on field bunds to add organic N and prevent soil erosion, and vermicomposting
- Integrated Pest Management: Farmers were trained in pest control using 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 farmers with timely availability of quality seeds of preferred varieties in their villages.

## Building Skills for a Stronger Future

- Capacity strengthening of all concerned stakeholders is very crucial. Team building workshops were organized for field staff and senior officials from DoA and DWMA

Training was held in 14 districts for government staff besides lead farmers and rural families.

- DoA staff members from 14 districts were oriented during Andhra Pradesh Bhoochetana Planning Meeting

*Mr Girija Shankar district collector Mahbubnagar in the capacity building workshop, 2012.*

- All consortium partners had a good team building exercise at ICRISAT
- 14 scientists/scientific officers are responsible in specific districts to cater to required technical support and capacity strengthening
- The responsible scientists/scientific officers have conducted awareness and capacity building programs of DoA staff and farmers in each of 14 districts.

## Field Days

Field days were conducted in districts for different crops involving local leaders, farmers and the press

*Medak district collector visits during field day, 2013.*

*Field day program at Addakula, Mahabubnagar, 2012.*

## Cropping Targets

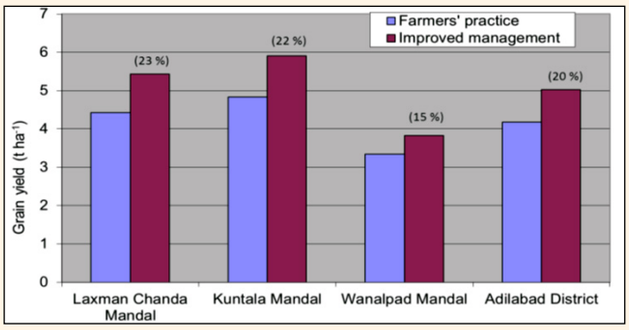
Progressive inclusion of districts (7 to 14 to 22) in three years along with incremental area coverage in the selected districts during four years .

## Good Systems for Monitoring and Evaluation

A state- level coordination committee comprising principal secretary (Ag), commissioner and director of agriculture, and representatives from the ICRISAT-led consortium comprise the guiding force for proper implementation in the state. Similarly, at district level, the district collector, joint director of agriculture and representatives of consortium are responsible for providing guidance. At the mandal level, the deputy director of agriculture and his team of agricultural officers along with ICRISAT technicians are responsible. There is a mechanism of state level coordination committee meetings to periodically monitor the progress of Bhoochetana and undertake desired steps for its achievement.

## Successful Achievements
## On-farm trials during rabi 2011

After awareness and capacity building of line staff and farmers, on-farm demonstrations/trials (in 0.4 to 1 ha area in a trial) were conducted along with DoA as the nodal agency in the 7 districts covering an area of 400 ha with 450 farmers.

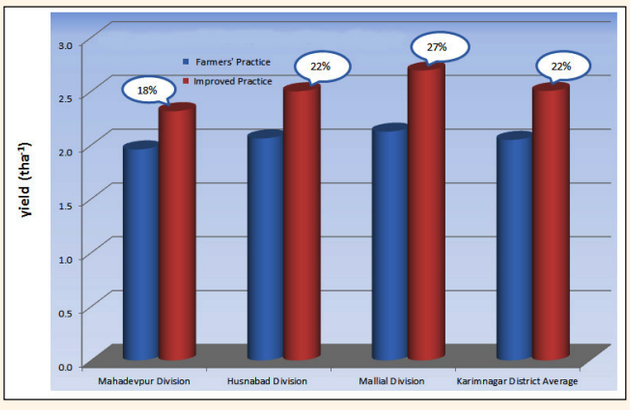



*Effects of improved management on paddy grain yield in rabi 2011-12, Adilabad, Andhra Pradesh*

## On-farm trials during kharif 2012

Participatory on-farm demonstrations/trials are being conducted in 14 districts covering 1200 ha with 1400 farmers.

The inputs zinc sulphate, borax/agribor, gypsum were provided by ICRISAT. In addition to basal applications of S, B and Zn, trials are also being conducted to demonstrate and evaluate foliar application of Zn and B. Whereever basal application could not be taken, farmers applied zinc sulphate (0.5%) and agribor (0.1%) solution as foliar application.




*Cotton yield in Karimnagar district during kharif 2012.*


*Paddy crop with improved management in Imbrahimpatnam, Rangareddy district.*

*Good cotton crop with improved management in Chevella, Rangareddy district.*

## Crop yield estimastion

The crop cutting experiments across the districts showed the benefits of improved management in enhancing grain productivity by 15 to 27% over the farmers practice.

*Paddy crop yield data recording in Adilabad, rabi 2011-12.*

*Good Sunflower crop hervest in Kadapa district rabi 2011-12.*

## What does Bhoochetana mean to farmers?

For farmers like Neduram of Rangareddy district, 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. 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. Neduram is one of the many success stories of Bhoochetana – a program enriching the soil and lives of farmers.

*Maize crop with improved management in Neduram, Rangareddy district.*

## About ICRISAT

ICRISAT
Science with a human face

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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