Annual Report (2013)

Strengthening Bhoochetana a Sustainable Agriculture Mission for Improved Livelihoods in Karnataka

Submitted to

Commissionerate of Agriculture, Government of Karnataka

International Crops Research Institute for the Semi-Arid Tropics

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Executive Summary

Based on the success of Bhoochetana Project phase-I, Government of Karnataka has decided to extend the science-led productivity enhancement initiative to cover not only rainfed areas in 30 districts but also to extend the initiative to irrigated crops in the state. The vision of Bhoochetana Mission Program of Phase-II is "sustainably improving livelihoods of small and marginal farmers in the state by developing farmers' centric science-led inclusive market oriented integrated farming systems participatory development approach". The specific objectives of the Bhoochetana Mission Program (BCMP) are:-

1. To strengthen the Bhoochetana consortium for increasing the crops (rainfed and irrigated) yields by 20 per cent over the first phase of Bhoochetana in five years in 30 districts of Karnataka through science-led development and new innovation systems.
2. To strengthen the institutional mechanisms such as seed villages, village seed banks, participatory research for development (PR4D), inputs supply, agricultural machinery hiring centres, farm extension through farm facilitators and communication systems for small and marginal farmers in the state for the DoA through capacity development, convergence, collective action, and partnerships.
3. To assess the impact of climate change in different agro-eco regions of the state in terms of anticipated shifts in the crop growing periods, water availability, major crop yields, and evaluate adaptation strategies for developing climate resilient farming systems.
4. To document the process of consortium functioning, learning, and impact of BCMP in terms of increased crop yields, institutional development and capacity building of different stakeholders in the state.

The BCMP continues to adopt the consortium approach through convergence, collective action and capacity building along with inclusivity, innovation, integration and intensification for achieving economic benefits, protecting environment, enhancing the efficiency through empowerment of the stakeholders. In this initiative, Inclusive Market Oriented Development (IMOD) approach has been integrated. Soil health assessment in the six districts of Sujala-watershed programs after four years of improved nutrient management practices have indicated that the percentage of deficient farmers' fields has decreased marginally for boron, sulfur, phosphorus and potassium, however, for nitrogen and zinc, number of deficient farmers' fields have increased. In irrigated areas, application of soil test-based nutrient management practices along with dry-seeded rice method as well as drip irrigation along with single eyebud planting material with wider row spacing have shown significant increase in the yields of paddy and sugarcane respectively. Field trials with improved cultivars of groundnut like (ICGV 91114) have shown maximum yield to 2.6 t ha^{-1} in Raichur district with average productivity ranging from 1 to 2 t ha^{-1} in different districts. Similarly, other improved varieties of groundnut like ICGV 00351, ICGV 00308 along with ICGV 02266 were also preferred by the famers in different districts. Similarly improved varieties of different crops namely finger miller, soybean, sorghum, pearl millet, caster and sunflower were preferred by the farmers as improved cultivars of these crops yielded significantly higher yields by 29 to 67% over the average yields of these crops in Karnataka. During 2013 seasons, total area coverage (rainfed and irrigated) was about 7.5 million ha with total number of farmers reaching to 3.1 million during rainy and post-rainy seasons.

In order to address the issues of climate variability, impacts of climate change on pigeonpea yield in Gulbarga was estimated and different adaptation strategies to minimize the impact on pigeonpea were evaluated. Since 1970, pigeonpea area in Gulbarga district has increased substantially due to climate change; temperature has shown an increase in trend particularly in winter which is affecting the yields of pigeonpea. Similarly unusual events of sudden drop in temperature in the nights also have caused considerable damage to pigeonpea. Convergence of different programs through public private partnership for example watershed development programs supported by JSW foundation in four village of Bellary district have provided good platform for scaling-up integrated approach in the Bhoochetana. To address the issues of climate change, Resilient Agriculture Investigators Network (RAIN) is formed with State Agricultural University scientists in Karnataka to develop and adopt common methods and approaches for assessing the impacts of climate change. The crop yields during 2013 were recorded varying from 28% in case of soybean, 43% in case of pearl millet, during the four years of Bhooochetana from 2009-2012, the net additional income for the farmers was estimated to be Rs. 1267 cores (US$ 243 million) Individual farmer gained additional income up to US$ 500 per ha per season with a varying benefit cost ratio of 2.6 to 14.6:1 depending on the type of crop, rainfall and soil type in the district. For the state, the B:C ratio for Bhoochetana program worked out to be 6:1 with improved management practices.

The detailed strategy for increasing the area coverage as well as impact was worked out through capacity-building, awareness raising and detailed and enhancing timely availability of inputs in the districts. During the season, 38 training courses were conducted at district level with 4050 participants, 184 trainings at taluk level to train 13,448 trainees and 6,966 village level trainings to train 4,95,700 farmers. A new initiative "Krishi Gyan Sagar (KGS) and Krishi Vani" for dissemination of information through ICT was launched by Hon'ble Minister Mr. Krishna Byre Gowda during July 2013. Farmer to farmer videos as well as tablet-based extension system was piloted in four districts during the year. Number of farmer to farmer videos, covering different topics have been prepared and uploaded on utube for sharing with other districts for training. State level Farmers Day was held at Davanagere on 14 September 2013 to share the information about the impact of Bhoochetana with the farmers. Hon'ble Minister of Karnataka Mr Krishna Byre Gowda as a Chief Guest highlighted the importance of soil health for increasing the productivity of agriculture in the state. About 1500 farmers and officials from 30 districts participated in this state level farmers day. A public private partnership through integrated watershed management program with funding support from JSW Foundation in Bellary district has been initiated and Farmers' Day in the JSW-GoK watershed was organized on 24 Oct 2013 at Bellary district. Number of new initiatives for participatory evaluation of improved varieties as well as for convergence of watershed activities in Bhoochetana has been planned during the coming rainy season.

In brief, the progress during the first phase of Bhoochetana is very impressive and as a result, number of visitors from Philippines have visited Karnataka to get first-hand information about the implementation of Bhoochetana by the Department of Agriculture. During the second phase, the greater challenge is to enhance area coverage as well as impact of Bhoochetana; the team is well prepared to meet the challenge.

Background

Government of Karnataka has taken innovative measures during the last five years such as launching a flagship mission project Bhoochetana (BC) in 2009 for increasing productivity of rainfed areas in the state by 20 per cent in four years, presenting a separate agriculture budget for the first time in the country during 2011-12, initiating a scheme to enable small and marginal farmers to shift from growing low-value crops to high-value crops with direct financial assistance in farmers' bank accounts under Suvarna Bhoomi Yojane (SBY) in 2011-12, conducting Global Investors Meet for enhancing private investments in agriculture thru public private partnerships (PPP) and increasing investments in agriculture in the state, etc. The International Crops Research Institute for the Semi-arid Tropics (ICRISAT) has conceived a mission mode project Bhoochetana and is technically supporting the department of Agriculture thru a consortium of University of Agricultural Sciences, Bengaluru, Dharwad, Raichur, Shimoga, Watershed Development Department, Department of Statistics and Economics, and Community-based organizations (CBOs) since 2009 for enhancing the productivity of rainfed areas by 20 per cent in four years initially in 20 districts and later extended to 24 and all the 30 districts covering 5.5 million ha including paddy and sugarcane.Bhoochetana is a science-led development approach launched by the GoK to improve livelihoods of million families of small and marginal rainfed farmers in the state through innovations thru DoA with the help and guidance from ICRISAT.

Based on the success of the Bhoochetana mission project, the GoK has decided to extend the science-led productivity enhancement initiative not only to 30 districts but also to extend the initiative to irrigated crops in the state. This is the best opportune time to harness the positive energy generated in the DoA and to adopt and institutionalize the science-led development approach in the state by bringing together the knowledge-generating academic institutions like the four state agricultural universities (SAUs) and the horticultural university with the knowledge translator agencies like DoA and operationalize the Research for Development (R4D) approach in the state for the first time in the country.

There is an urgent need to develop sustainable agricultural practices considering the vulnerability of the fragile rainfed agro-ecosystems while intensifying the systems. The intensification must be sustainable and able to build the resilience of the systems and the small and marginal farmers to cope with the impacts of climate change. The localized impacts of climate change need to be understood and assessed and the knowledge need to be shared with the farmers.

The soil health assessment initiative undertaken by the GoK need to be fully developed and harnessed to enhance not only the productivity but also to enhance the nitrogen use efficiency (NUE) and bring in the balanced use of nitrogenous and phosphatic fertilizers in the state to reduce the cost of cultivation for the farmers on one hand and also to minimize the damage to the environment through pollution of groundwater with the nitrates and release of the nitrous oxide which is 22 folds more damaging gas than the CO_2 .

With the global warming and associated impacts of climate change the available water resources will be adversely affected. It is estimated from our studies at ICRISAT that 3 million ha additional geographic area in Karnataka will become semi-arid and water availability per capita will be further decreased. With this scenario ahead of us we need to bring in urgent measures for enhancing the water use efficiency in agriculture for food production to achieve the target of inclusive growth and food security for all in the state.

Vision of Bhoochetana Mission Program (BCMP)

The vision of Bhoochetana Mission Program (BCMP) is to sustainably improve the livelihoods of small and marginal farmers in the state by developing farmers' centric, science-led inclusive market-oriented integrated farming systems participatory development approach.

Mission Goal of the BCMP

The goal of the Bhoochetana Mission Program (BCMP) is to operationalize an integrated and participatory knowledge-led farming systems development approach for increasing agricultural productivity by 20 per cent in five years through convergence and better coordination amongst different agriculture research-extension and development sectors in the state for sustainably improving the livelihoods of the farmers through empowerment, capacity development with knowledge-based and market oriented farmers' centric partnership approach.

Objectives

The specific objectives of the second phase of Bhoochetana Mission Program are:

1. To strengthen the Bhoochetana consortium for increasing the crops (irrigated and rainfed) yields by 20 per cent over the first phase of Bhoochetana in five years in 30 districts (Figure 1) of Karnataka through science-led development and new innovation systems.

2. To strengthen the institutional mechanisms such as seed villages, village seed banks, participatory research for development (PR4D), inputs supply, agricultural machinery hiring centres, farm extension thru farm facilitators and communication systems for small and marginal farmers in the state for the DoA through capacity development, convergence, collective action, and partnerships.

3. To assess the impact of climate change in different agro-eco regions of the state in terms of anticipated shifts in the crop growing periods, water availability, major crop yields, and evaluate adaptation strategies for developing climate resilient farming systems.

4. To document the process of consortium functioning, learning, and impact of BCMP in terms of increased crop yields, institutional development and capacity building of different stakeholders in the state.

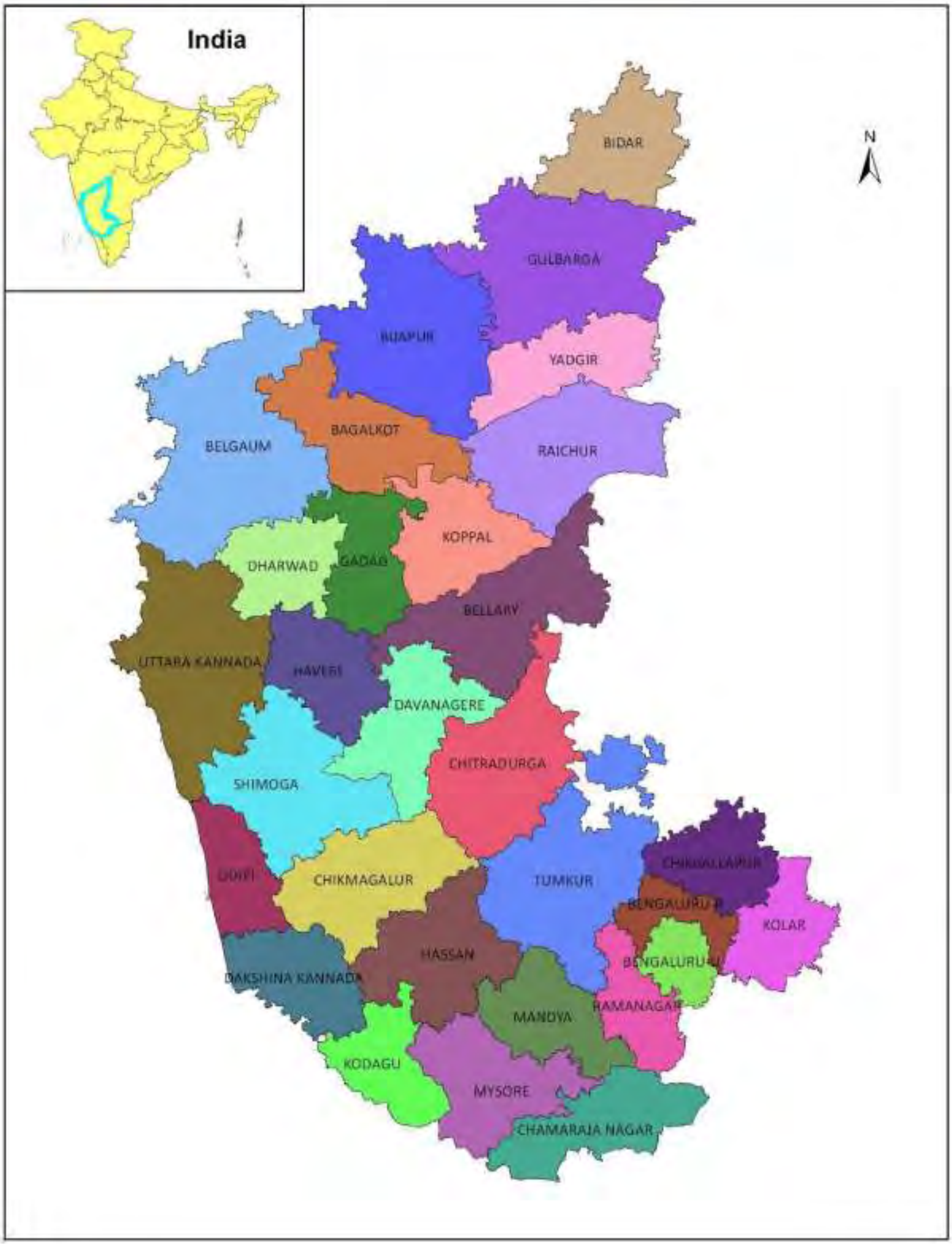

Figure 1. All 30 Districts included for productivity enhancement under the Bhoochetana II program.

Consortium Partners

The consortium comprised of Karnataka State Department of Agriculture, with its Commissioner and Director as the nodal officers for implementing the project and other partners include:

- Watershed Development Department with its Commissioner as focal person to co-ordinate activities.
- Four Universities of Agricultural Sciences (Bengaluru, Raichur, Dharwad and Shimoga) in the state of Karnataka with their Vice-Chancellors as SCC members supporting technical help from university scientists.
- Karnataka State Natural Disaster Management Cell
- Karnataka State Seed Corporation
- Department of Economics & Statistics
- Krishi Vigyan Kendras in the state
- Community-based Organizations (CBOs)
- Watershed Committees, user groups and watershed associations
- International Crops Research Institute for the Semi-Arid Tropics, (ICRISAT) for facilitation of improved technologies to all stakeholders along with participating farmers.
- Private companies

Project Strategy

The most important strategy for this initiative is to expanded and strengthen the consortium formed during the implementation of the first phase of the BC and translate the mission mode project in to Bhoochetana Mission Program (BCMP). The principle of convergence tried and found good during the first phase of BC will be institutionalized for successful implementation of the BCMP. The salient strategies for the mission mode program are as follows:

The conversion of the mission project in to mission program will involve the institutionalization of the principle of *convergence* of different line departments' agriculture related development programs through Bhoochetana. This will be a long process as to achieve the successful convergence in true sense calls for changing the mindset of different actors for which we will need the external drivers and enabling factors.

The mission program will adopt the principle of 4 ICEs as indiacted - **Is**: Innovative, Inclusive, Integrated, Intensification; **Cs**: Collective, Cooperation, Capacity-Building, Consortium; **Es**: Efficiency, Equity, Environmnet protection, Economic gain. The consortium will be of knowledge transforming development agencies such as line departments of state government viz; Department of Agriculture, Karnataka State Seeds Corporation (KSSC), Watershed Development Department (WDD), Department of Horticulture (DoH), Department of Economics and Statistics (DES) along with knowledge generating academic and research institutions like State Agricultural Universities (SAUs), University of

Horticultural Sciences (UoH) in the state, Karnataka State Disaster Management Center (KSDMC) and ICRISAT for improving the livelihoods of the rural poor in dryland area.

ICRISAT will lead the consortium and select suitable experts from the SAUs for addressing the issues of climate change for inclusion in the consortium. During the second phase of BCMP the SAUs and UoH will need to play more active role in supporting and institutionalizing the concept of convergence and consortium for capacity development.

The emphasis will be strengthened through capacity development which includes not only building the capacity of human resources through training but also building the capacity of the institutions, networking and building partnerships through enabling environment.

By adopting the principle of 4 Cs we will address the mission goal through 4 Es i.e, Efficiency, Economic gain, Equity and Environment protection, which are the important pillars of the sustainable intensification and inclusive development in the state. The emphasis will be on enhancing the efficiency of land and water resources along with the applied fertilizer nitrogen for sustainable intensification while maintaining the environment.

The approach of the mission will be to strengthen backward linkages to meet the 4 Es through 4 Cs by establishing seed villages, village seed banks, custom hire centres for agricultural equipment, ensuring timely supply, availability and access to the necessary vital inputs such as knowledge-based soil nutrient management options, acquiring micro nutrients, availability of good quality seed and necessary financial incentive to undertake best-bet options for increasing agricultural productivity through sustainable intensification. The institutionalization of CBOs and service providers is envisaged for enhancing the impact of the BCMP.

The new extension system piloted in the state during the first phase of BC using FFs and LFs for sharing the knowledge with farmers will be strengthened and efforts will be made to enhance its effectiveness through capacity development and building the partnerships for large scale scaling-up of the improved best-bet management practices.

ICT-tablet based knowledge information sharing systems will be piloted in selected RSKs of four districts.

The scientific approach of mapping soil nutrient deficiencies initiated during the first phase of BC need to be continued further by monitoring the changes in soil fertility status after adoption of best-bet management practices for five years. This approach not only will increase the productivity of the land, water and applied fertilizers thru sustainable intensification but also will reduce the cost of cultivation by advising the farmers not to apply the fertilizers, which are not required by their soils.

Along with the improving nutrient management the other best-bet practices such as rainwater management, pest management options and organic matter building practices will support the long-term sustainability and enhance productivity. The convergence of activities of the WDD and DOH will ensure increased water availability which is the important driver for sustainable intensification in the state.

The most important constraint in dryland areas is the establishment of good crop stand and availability of good quality seeds of high yielding, improved cultivars. The mission will emphasize integration of the KSSC's seed production program under BCMP to ensure production of improved quality of seeds with best-bet management practices (BBMPs) as well as ensuring timely supply of good quality seeds to the farmers in the villages through establishment of seed villages and village seed banks for the self-pollinated crops such as groundnut and chickpea as well as cross pollinated crops such as sorghum, pigeon pea etc., by training the farmers and providing opportunities for the producers to value addition in the villages.

Building soil organic matter is a great challenge in the tropical countries and through this innovative BCMP by integrating the income-generating activities sponsored under the integrated watershed development program (IWMP) women and landless members of the SHGs and AGs will produce vermicompost and *Gliricidia* seedlings for increasing the soil organic matter. This will also increase the income of the vulnerable groups in the villages.

The BCMP will have planning and monitoring mechanism at cluster, taluka, district and state levels. The ACS/APC will be the chair of the State Coordinators Committee (SCC) which will include the decision makers from the different consortium partners including line departments to pass on suitable government orders to all the concerned mission staff. The SCC will meet regularly for ensuring smooth convergence and CD through institutionalization process and to strengthen the consortium. Based on the learning from the first phase of BC implementation regular meetings and guidance from the SCC contributed immensely in success of the innovative approach adopted by the GoK for unlocking the potential of rainfed agriculture in the state.

The mission will have simple principle of accountability and delegation of authority at different levels without diluting the individual accountability to meet the mission goal collectively.

The mission would adopt in addition to the above, the rewarding mechanisms for the best performers i.e., the farmers at cluster, taluk, district and state level with appropriate personal recognitions. Similarly, the mission staff who will be having the outstanding performance will also be recognized by the state government suitably by adopting a predefined and transparent criteria.

Rainfed Agricultural Technologies

During Sujala-ICRISAT project and Bhoochetana first phase, farmers evaluated some of the improved technologies in different districts of Karnataka. Some of the technological options were found to be appropriate for enhancing productivity and income to farmers and rural poor. The technologies listed below have been popularized and recommended in different districts for enhancing the benefits.

In-situ Soil and Water Conservation Techniques

1. Conservation furrow system

Contour furrows are simple and efficient for conserving moisture (Figure 2). These are laid with the help of country ploughs on a gradient of 0.2 to 0.4% at the time of sowing.

Figure 2. Conservation furrow of land and water management system.

2. Cultivation across slope

Cultivation across the slope, or contour cultivation, is the most common practice for conserving soil moisture. In this method, all field activities including ploughing, planting, and intercultivation are done across the slope (Figure 3).

Figure 3. Contour cultivation.

3. Broad-bed and furrow (BBF)

For *in-situ* soil and water conservation, broad-bed (1 m) and furrow (0.5 m) system (BBF) has been found to be satisfactory on deep black soils. The BBF system is laid out on a slope range of 0.4–0.8% with an optimum of 0.6% slope. The BBF system (Figure 4) facilitates draining of excess rainwater as runoff and furrows act as traffic zones for plough bullocks. On Alfisols, raised beds are well-suited for groundnut cultivation as beds facilitate good aeration, store more moisture for the roots resulting in good crop growth. Deep tillage, shallow cultivation and application of organic residues are some of the other promising *in-situ* moisture conservation practices.

Figure 4. Groundnut crop on BBF and cultivation with Tropicultor.

4. Tropicultor

The ICRISAT-designed multipurpose wheeled tool carriers known as 'tropicultors', had been supplied to farmers during Sujala-ICRISAT watersheds initiative. So they were eight familiar to the farmers in Chitradurga, Kolar and other districts. Tropicultor usage saves not only hours of work in land preparation but it is also good for properly turning the soil as desired (Figure 5). Its use during sowing is effective as it has a metered mechanism for uniform application of fertilizer and for sowing of seed at uniform depth and uniform distance.

During sowing operation, labor saving is critical as sowing opportunity in rainfed areas occur intensely for a short period and this equipment is quite useful to complete sowing of large holdings in a short period, as it has a hitching arrangement to hook it to a tractor for speedier operations (Figure 5).

Figure 5. Line sowing of Ragi crop using tropicultor in Kolar (L); BBF shaping with Tropicultor.

Integrated Nutrient Management Techniques

1. Balanced nutrient application

Balanced use of plant nutrients involves correcting nutrient deficiency, restoring soil fertility of degraded lands (due to over exploitation), increases nutrient and water use efficiency, enhances crop yields and farmers' income, and improves crop and environmental quality. Hence we used soil analyses results and seasonal rainfall as the basis to recommend fertilizer doses. Availability of organic manures, crop residues, and biofertilizers, was also considered in order to provide taluk-wise recommendations for different crops in all districts.

2. Biofertilizers

Biofertilizers are very important, low-cost, eco-friendly organic agro-inputs, supplementary to chemical fertilizers. *Rhizobium, Azospirillum*, Azotobacter add nitrogen to the soil, and phosphate-solubilizing bacteria make citrate soluble phosphorous available to crops and also secretes certain growth promoting substances. Biofertilizers are considered a harmless and eco-friendly low cost agro-input, supplementary to chemical fertilizers. It improves soil structure (porosity) and water-holding capacity. It also increases soil fertility, fertilizer use efficiency (FUE) and ultimately helps by increasing yield by 15-20%. Due to a higher concentration of calcium in alkaline soils, large quantities of applied phosphatic fertilizers get fixed as citrate soluble tri-calcium phosphate and become unavailable to the crops.

Phosphate solubilizing bacteria (PSB) are useful for all crops i.e., cereals, cash crops, leguminous crops and vegetables, by secreting certain organic acids to make citrate soluble tri-calcium phosphate available to the crop in alkaline soils. The effective strains of PSB used increase the level of available P_2O_5 in the soil. About 10 to 15% increase of crop yield can be achieved with the use of this culture. Seed Treatment with 250 g 10 kg^{-1} of seed is advised. However, as suggested, PSB and *Trichoderma viride* were applied to soil in Bhoochetana project as seed treatment along with *Rhizobium* and fungicides for groundnut and soybean.

3. Biocontrol agents

Trichoderma viride is a fungus used for seed and soil treatment for suppression of various diseases caused by fungal pathogens through seed and soil. The procedure to treat seed is to mix ***Trichoderma*** *viride* with cooled rice gruel or Jaggery solution and thoroughly mix this solution with seeds required for an acre to have a uniform coating over the seeds. Dry these seeds for 30 minutes in shade and sow the treated seeds within 24 hours.

Integrated Pest Management

Farmers across all districts were trained on adopting cultural and biological methods of pest control, insect monitoring using pheromone traps, chemical control of insects on crossing threshold levels and growing tolerant cultivars.

Income-generating Rural Livelihoods

Income-generating activities which are started during Bhoochetana First phase are being continued to benefit farmers during Bhoochetana II phase as well. Some of the activities are listed below:

Custom hiring centers for agricultural machinery

Tropicultors, either animal drawn or tractor drawn; and animal drawn Penugonda ferti-cum-seed drill were placed in the control of each ADA to provide it to needy farmers on hire basis. This approach helped farmers who cannot afford to buy them in the season, but use them based on their operational efficiency and to reduce dependence on labor for timely operations, such as sowing-cum-fertilizer application.

***Gliricidia* planting on field bunds**

Farmers were encouraged to plant 3-4 month-old plants acquired from nursery or cuttings taken of tender branches of *Giyricidia,* at a spacing of 50 cm apart on field bunds. *The Gliricidia* plant produces green leaves and succulent green branches abundantly (Figure 6) which are rich in Nitrogen. Green leaf and loppings can be harvested, leaving one-year-old 1 m tall plants in place, and apply that to the topsoil for enriching organic carbon and nutrients in the soil. *Gliricidia* on bunds can be harvested thrice in a year and applied before sowing of rainy season crop, *Rabi* season crop and summer season crop.

Vermicomposting

A method known as vermicomposting that converts farm residues and organic waste in villages with the help of earthworms into valuable manure was introduced to farmers and rural women as a technology through the Sujala-ICRISAT project. Several compost pits were constructed in the watershed villages during the project period. Technology components mainly include selection and use of non-burrowing type of earthworms (*Eisenia sp*., *Eudrilus sp*.), and the use of materials like weeds, crop residues and sericulture residues, animal and poultry manure, and rock phosphate.

During trainings, farmers and field facilitators were briefed about the benefits of vermicomposting for enriching soil organic carbon and raising productivity, good storage quality of produce without toxic residues, and thereby fetching a higher price for organic produce in the markets. Training on scientific methods of vermicompost preparation were provided to rural women SHG members (Figure 6) and field facilitators during training programs under Bhoochetana project as a rural livelihood option.

Figure 6. Vermicompost preparation pits in JSW-ICRISAT watershed, Bellary.

Azolla Fern

Farmers grow azolla fern in small ponds to use as soil fertilizer as well as to enrich the feed for their livestock. Given the current drought in the state that has affected their livestock and deprived them of extra income for the family, farmers are enthusiastic to adopt this method as this has improved milk yield as well as fat content in the milk (Figure 7).

Figure 7. Farmers grow Azolla fern in their field in Shimoga.

Technology Adopted in Irrigated Paddy and Sugarcane under Bhoochetana Mission Program

Since the focus of Bhoochetana Mission Program is to expand it to irrigated crops, different technologies have been promoted to spread its benefits to farmers. The prominent technologies used in irrigated paddy during kharif season 2013 are System of Rice Intensification (SRI) in around 6830 ha, machine transplantation in 4278 ha and Dry Seeded Rice method in 15,435 ha in 14 major rice growing districts in Karnataka. Similarly, new technologies used in sugarcane are single eyebud demo (746 ha), wider row spacing (28925 ha), and drip irrigation (16075 ha) in 12 major districts. Apart from these technologies, few other technologies related to integrated nutrient management, integrated pest management were also adopted and as a result benefits are increasing.

Performance of Improved Varieties in Karnataka

As part of Bhoochetana Mission Program, ICRISAT verified the performance of some of the new improved crop varieties in almost all the districts of Karnataka. The major varieties supplied are Groundnut (ICGV 9114), Finger millet (MR 1), Soybean (JS 9560), Sorghum (CSV 15 and CSV 23), Pearl Millet (ICTP 8203 and HHB 67), Castor (DCH 177 and Jyothi) and Sunflower (DRSH 1). These traials were conducted with farmers' participation with close monitoring by ICRISAT staff in each district supported by Scientific Officers and Scientists. The yield performance of different varieties is provided below:

Groundnut (ICGV 91114)

Field trials for groundnut crop with cultivar ICGV 91114 were planned in twelve districts of Karnataka. Total 26 trials were taken on 9.2 ha area. Maximum yield (2590 kg ha^{-1}) was observed in Raichur district (Figure 8). Low grain yields in Bagalkot (1050 kg ha^{-1}) and Gadag (1140 kg ha^{-1}) were because of poor rainfall. Poor rainfall distribution also affected crop establishment in Dharwad, Davangere and Hassan districts. Excluding nine trials in these five districts, the average yield of trials in other districts was 1518 kg ha^{-1}.

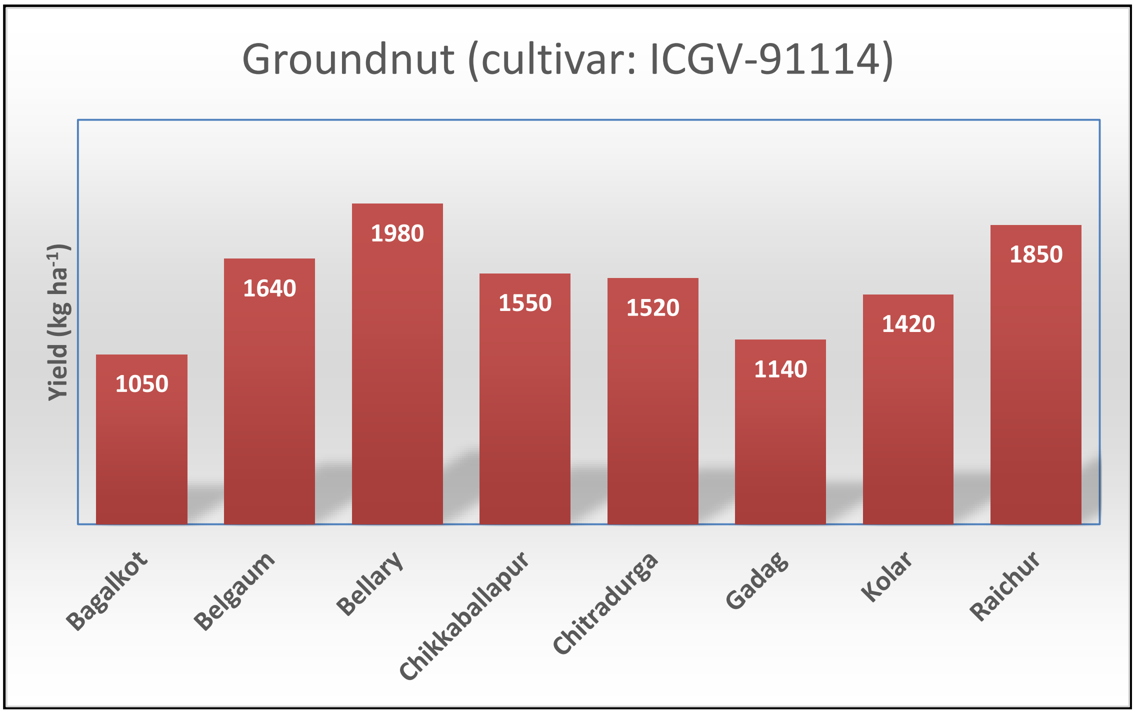

Figure 8. District-wise average grain yields of groundnut.

Figure 9. Groundnut crop variety ICGV 91114 at G. Muniayappa of Idapnur village of Gillesgur RSK, Raichur Taluk, Raichur district & Jagadish Kallanagoudar of Gokak taluk Belgaum district rainy season 2013.

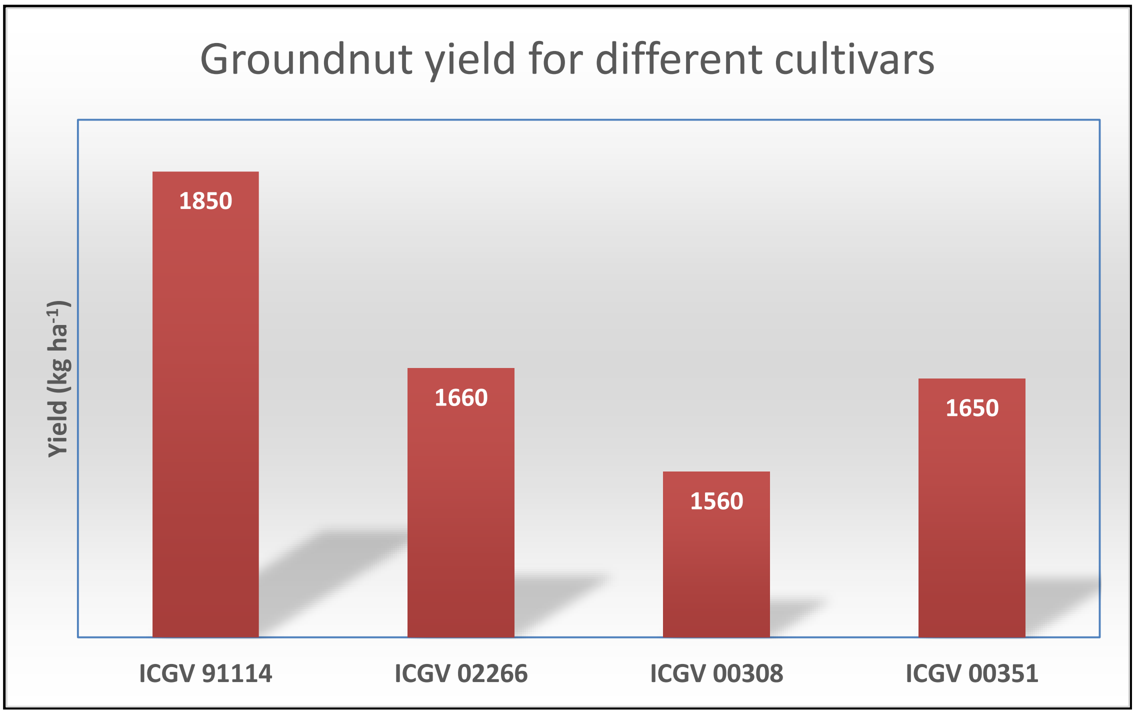

Figure 10. Groundnut variety ICGV 00351.

Figure 11. Groundnut variety ICGV 000351 grown at Gopal Basanna farmer field, Neeramanvi village of Manvi Taluk, Raichur district demo plot rainy season 2013.

Figure 12. Groundnut variety ICGV 00308 grown at Gopal Basappa Kallur of Neermanvi village, Manvi taluk and Groundnut variety ICGV 02266 grown at Muniyappa Naik of Idapnur village, Gillesugur RSK, Raichur district rainy season 2013.

Finger Millet (MR 1)

Trials for finger millet cultivar MR 1 were conducted in six districts. Total 56 trials were conducted on 28 ha area. Finger millet is a hardy crop required less water, but higher yield can be achieved with supplemental irrigation. Figure 13 shows the good growth of irrigated finger millet crop (MR 1). The average yield of all 56 trials was 2530 kg ha^{-1} (Figure 14) The yield data from Chamrajnagar district indicated that the observed grain yield of MR 1 cultivar (2210 kg ha^{-1}) was 20% more than the existing cultivar viz, GPU 28 (1850 kg ha^{-1}).

Figure 13. Finger millet (MR 1) under supplemental irrigation in Kolar district.

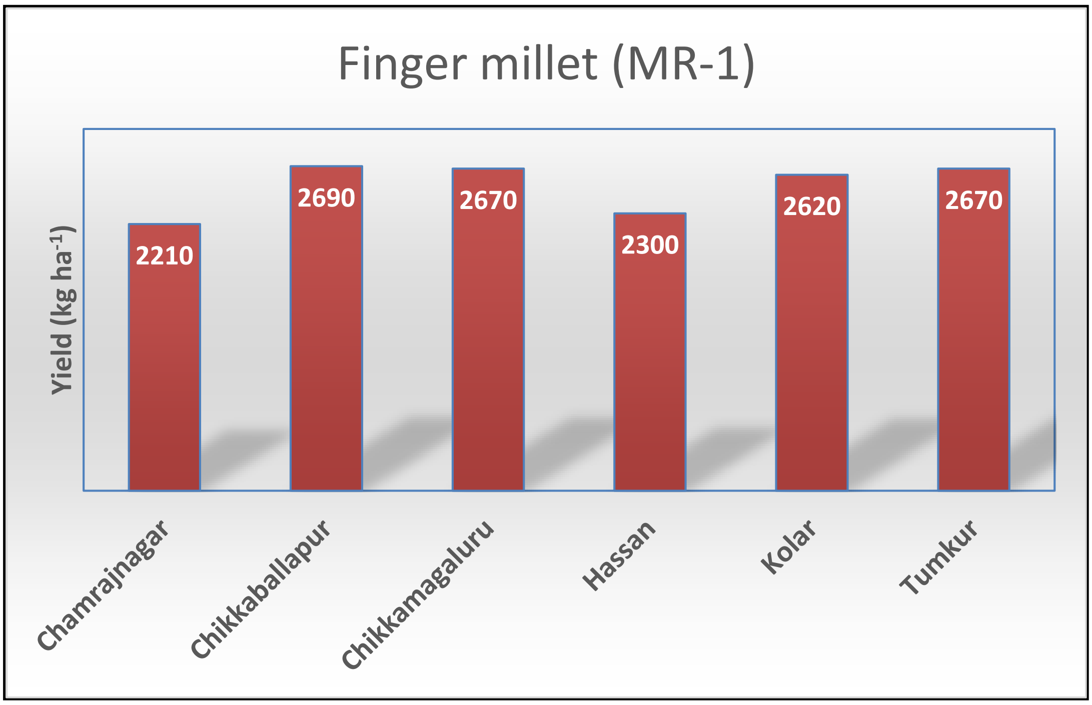

Figure 14. District-wise average grain yields of finger millet.

Soybean (JS 9560)

Total eight trials were conducted on 3.6 ha area. Average grain yield for these eight trials was 2320 kg ha^{-1} (Figure 15). Highest yield observed in trials from Dharwad district (2910 kg ha^{-1}). Soyabean trials were conducted in three districts (Figure 16).

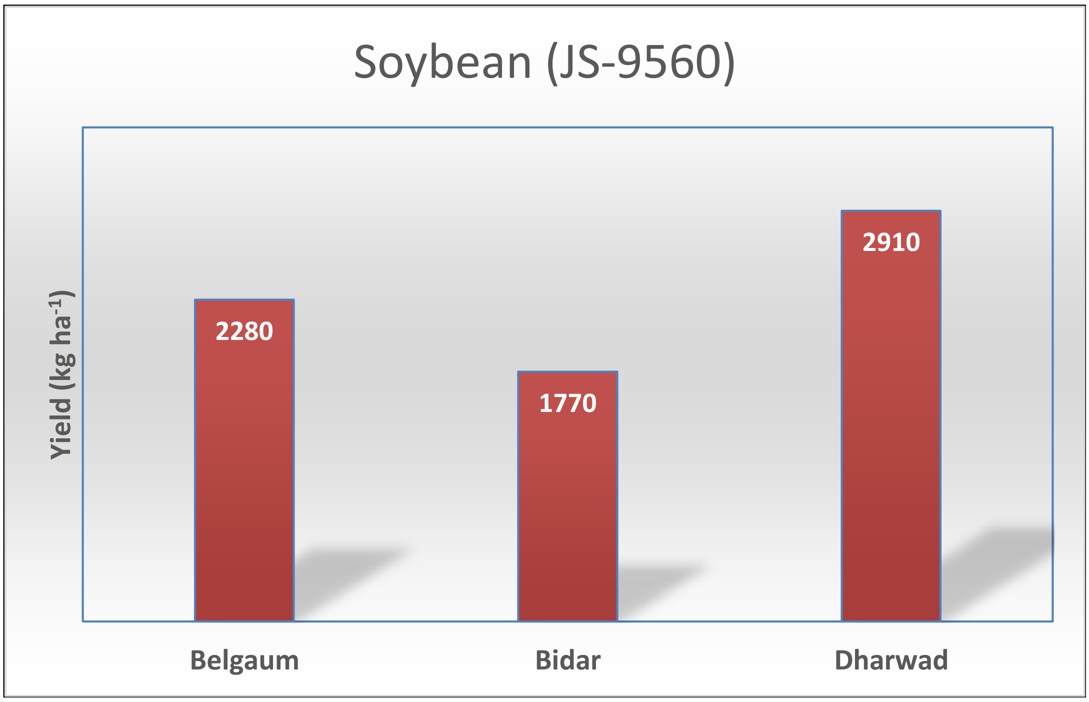

Figure 15. District-wise average grain yields of soybean.

Figure 16. Soybean Crop JS 9560 grown in Tippanna A Parmoji famer of Garag village Dharwad taluk and district of Karnataka during rainy season 2013.

Sorghum (CSV 15 and CSV 23)

Trials for two sorghum cultivars (viz, CSV 15 and CSV 23) were demonstrated in eight districts. Maximum yield observed for CSV 15 is 2640 kg ha^{-1} in Koppal and for CSV 23 is 2880 kg ha^{-1} in Raichur (Figure 17). Heavy rainfall during crop season damaged trials of both the cultivars in Bidar and Gulburga districts and CSV 23 cultivar in Koppal and Haveri districts. Overall average yield for CSV 15 cultivar is 2240 kg ha^{-1} and for CSV 23 is 2580 kg ha^{-1}. Observed data from Belgaum and Davangere indicated that CSV 23 has 18-22% more grain yield than CSV 15 cultivar.

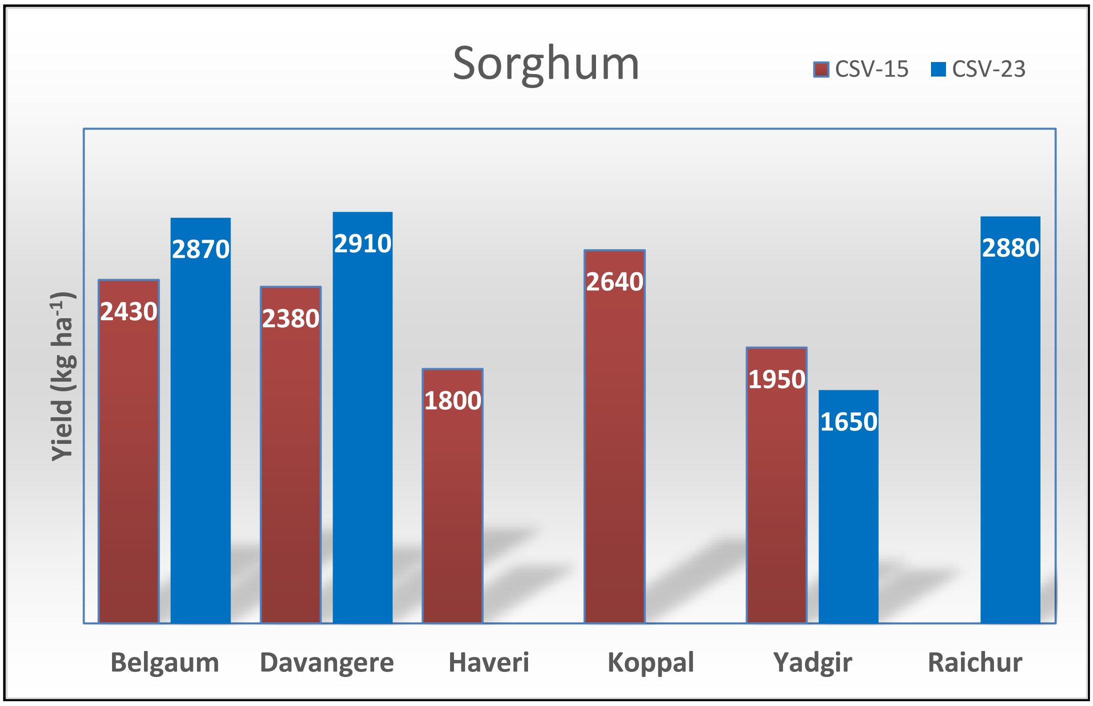

Figure 17. District wise average grain yields of sorghum.

Pearl Millet (ICTP 8203 and HHB 67)

Total 36 trials were taken on 19.2 ha area for which 120 kg was supplied from ICRSIAT. Maximum yield (2325 kg ha^{-1}) was observed in Yadgir district (Figure 18) whereas lowest grain yield was recorded in Yadgir. Average yield for cultivar ICTP 8203 is 1370 kg ha^{-1} and for HHB 67 is 1420 kg ha^{-1}. Trial for pearl millet crop with two cultivars (ICTP 8203 and HHB 67) were conducted in seven districts (Figure 19).

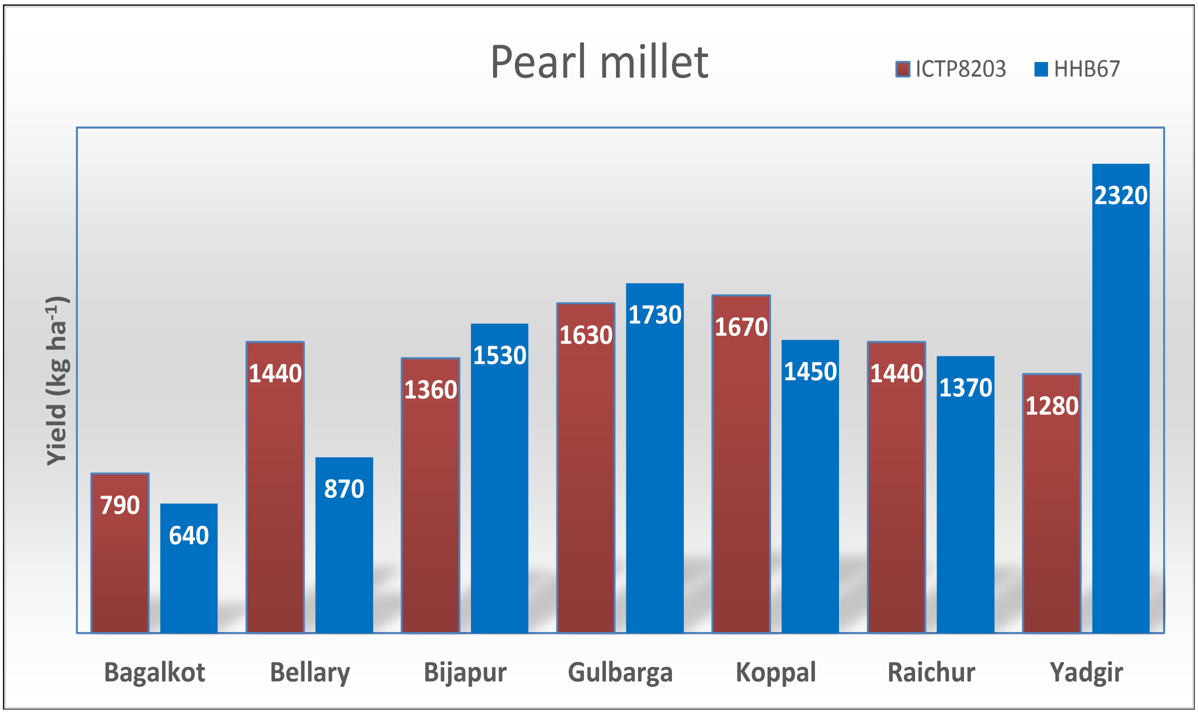

Figure 18. District wise average grain yields of Pearl millet.

Figure 19. Pearl millet Hybrid HHB 67 grown in Aiyappa Batangi farmer field at Doddi village Lingsugur taluk and Variety ICTP 8203 at Basappa Pujar farmer field at Neermanvi village of Manvi taluk, Raichur Distirct Rainy season 2013.

Castor (DCH 177 and Jyothi)

Trials for castor cultivars DCH 177 and Jyothi were conducted in eight districts, out of which trials were successful in six districts. Total 58 trials of cultivar DCH 177 were taken on 20.8 ha area for which 140 kg seed was supplied from ICRSIAT. Similarly, 10 trials of cultivar DCH 177 were taken on five hectare area. Grain yields for these trials are shown in Figures 20 and 21. Maximum yield was observed in Raichur. Yield for DCH 177 is 5-19% more than cultivar Jyothi.

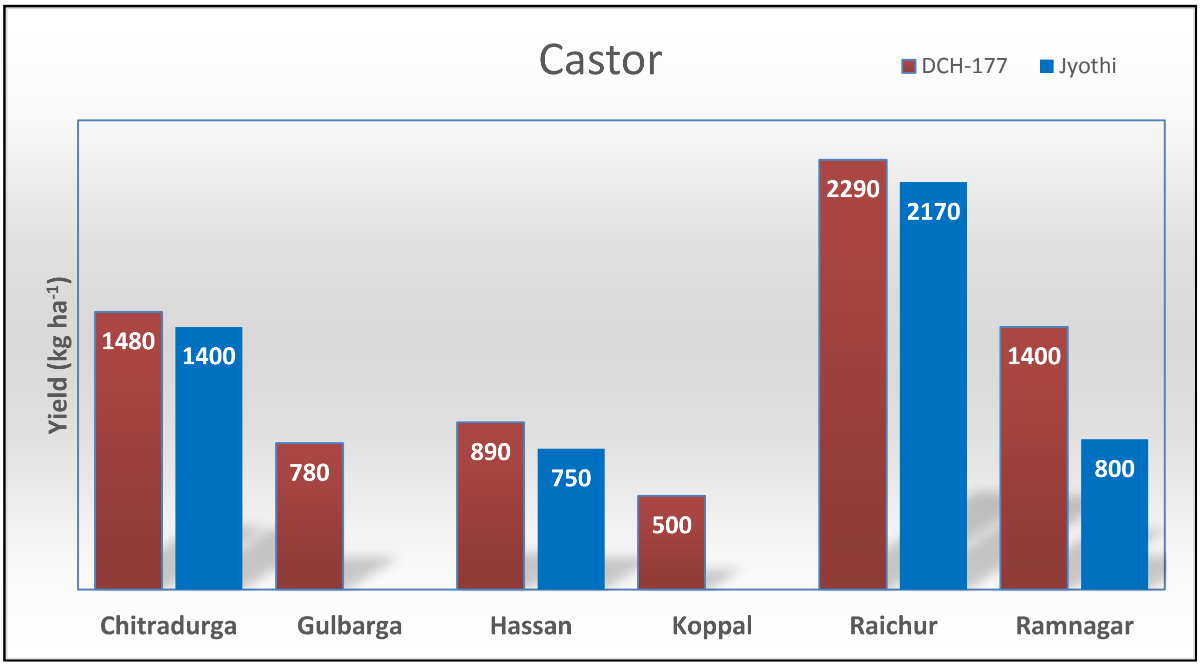

Figure 20. District-wise average grain yields of castor.

Figure 21. Castor variety Jyothi grown at Bheemaih field at Idapnur village of Gillesgur RSk Raichur district.

Sunflower (DRSH 1)

Trials for sunflower cultivars DRSH 1 were conducted in four districts out of which trials were successful in two districts. Total eight trials were taken on 3.4 ha area for which 24 kg seed was supplied from ICRSIAT. Grain yields for these trials are shown in Figures 22 and 23. Maximum yield was observed in Raichur district (1570 kg ha^{-1}).

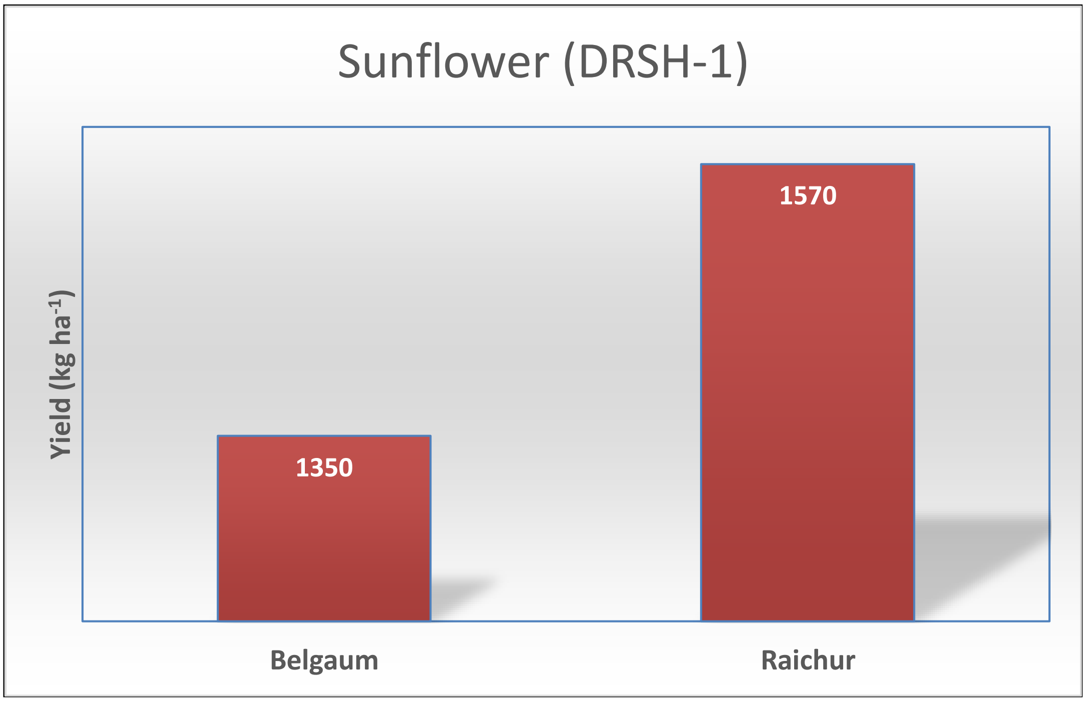

Figure 22. District-wise average grain yields of sunflower.

Figure 23. Sunflower Hybrid DRSH 1 grown in Aiyappa Batangi farmer field at Doddi village Lingsugur taluk Raichur district rainy season 2013.

A comparison of yield performance of ICRISAT supplied varieties with national and state averages provided in Table 1**.** Due to unavailability of data for the current season at national and state level we have compared current yield of different varieties with 2012 national and 2011 state level averages. The comparision of yield performance of ICRISAT varital trails with national and state level yield indicated that the performance of ICRISAT supplied varieties performed well in terms of yield. The yield increase over national average is ranging between 22 per cent in pearl millet and 144 per cent in Soybean and 29 per cent in finger millet and 167 per cent in sunflower over state average respectively. This reveals that there is ample scope to increase the potential yield of different varieties in the state of Karnataka to benefit small and marginal farmers.

Table 1. Average crop yields of various varieties during rainy season 2013 in Karnataka and average yields of Karnataka state during rainy season 2011 and average yields of different crop s during rainy season 2012 at all India level.

S. No	Crop	Variety	ICRISAT, varietal trial Average yield 2013 (kg ha^{-1})	National Average yield 2012 (kg ha^{-1})*	% increase over national average	Karnataka average yield 2011 (kg ha^{-1})**	% increase over Karnataka average
1	Groundnut	ICGV 91114	1517	985	54	665	128
2	Finger millet	MR 1	2527	1514	67	1966	29
3	Soybean	JS 9560	2321	950	144	950	144
4	Sorghum	CSV 15	2240	1070	109	1556	44
5	Sorghum	CSV 23	2579	1070	141	1556	66
6	Pearl millet	ICTP 8203	1372	1124	22	1025	34
7	Pearl millet	HHB 67	1417	1124	26	1025	38
8	Sunflower	DRSH 1	1462	544	169	547	167
9	Castor	DCH 177	1225	1329	-8	926	32
10	Castor	DCH 32	1280	1329	-4	926	38

*State of Indian agriculture 2012-13

**Final advance estimates of area, production and yield of important agricultural crops in Karnataka 2011-12 - Directorate of Economics and Statistics, Government of Karnataka

Karnataka: Rainfall Situation in 2013

Karnataka is divided into four regions viz., South interior Karnataka (SIK), North interior Karnataka (NIK), Malnad and Coastal region (Table 2). Southwest monsoon was set in over parts of SIK and coastal regions on 01 Jun 2013 and covered the entire state by 07 June. During June 2013, the monsoon was active and the state as a whole received an amount of 216 mm of rainfall as against the normal rainfall of 195 mm. In July, the monsoon was active over Karnataka except for some parts of SIK and NIK; and the state as a whole received about 350 mm of rainfall as against the normal of 278 mm. In August 2013, the monsoon was relatively weak over Karnataka and the state as a whole received only 163 mm of rainfall as against a normal of 205 mm. During September 2013, the monsoon was active and the state as a whole received a rainfall of about 205 mm compared to the normal of 158 mm. In summary, it is observed that the year 2013 is a good year for Karnataka as the state received about 934 mm of rainfall in the southwest monsoon period against the normal of 835 mm; and the percentage departure is +12%, termed as “Normal”. Rainfall received was normal in June, excess in July and September and deficit in August. During the post-monsoon period

(Oct-Dec), the state as a whole recorded an actual amount of 128 mm of rainfall as against the normal of 188 mm; percentage departure was -32% and classified as under "Deficit" category. Thus, Karnataka received normal rainfall during the southwest monsoon period and deficit rainfall during post-monsoon period.

Table 2. Region-wise rainfall in Karnataka for the year 2013

Region	Southwest Monsoon (Jun-Sep)			Post-monsoon (Oct-Dec)		
	Normal (mm)	Actual (mm)	Percentage departure	Normal (mm)	Actual (mm)	Percentage departure
South Interior Karnataka	357	412	15	210	124	-41
North Interior Karnataka	493	533	8	145	100	-31
Malnad	1469	1816	24	228	135	-41
Coastal Karnataka	3048	3206	5	261	266	2
State	835	934	12	188	128	-32

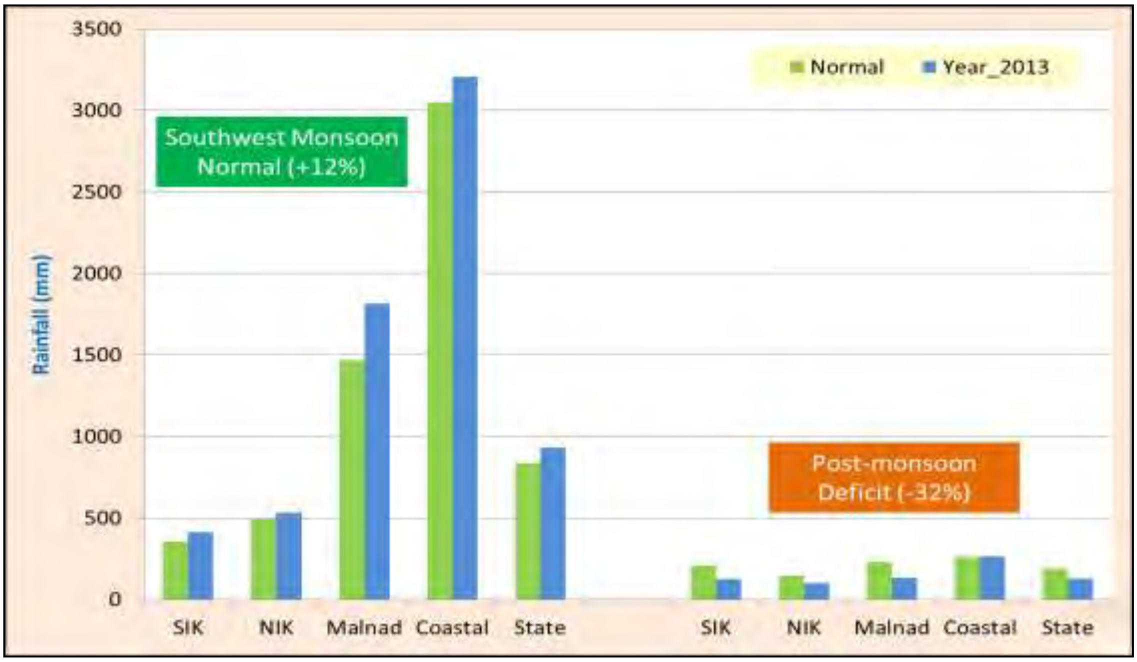

Figure 24. Normal and actual rainfall received in different regions of Karnataka in the year 2013.

It is observed from the weekly rainfall departures from normal during Jun to Dec 2013, that rainfall was either normal or above normal in the southwest monsoon period, except for two weeks in August (Figure 25 and Table 3). On the other hand, during the post-monsoon period, rainfall departures were always negative except on one week ending on 28 October. The deficit rainfall situation in the post-monsoon period 2013 has impacted water availability to crops to some extent.

Table 3. District-wise rainfall in Karnataka for the year 2013

District	Southwest Monsoon (Jun-Sep)			Post-monsoon (Oct-Dec)		
	Normal (mm)	Actual (mm)	Percentage departure	Normal (mm)	Actual (mm)	Percentage departure
Bagalkot	353	351	1	114	144	-21
Belgaum	656	601	9	88	153	-42
Bellary	343	361	-5	98	150	-35
Bengaluru Rural	513	445	15	143	229	-37
Bengaluru Urban	515	457	13	158	234	-32
Bidar	798	683	17	135	116	17
Bijapur	461	428	8	90	141	-36
Chamarajanagar	358	317	13	175	257	-32
Chikkaballapur	394	399	-1	148	222	-34
Chikkamagalur	1692	1239	37	104	228	-55
Chitradurga	357	276	29	67	160	-58
Dakshina Kannada	3683	3441	7	434	367	18
Davanagere	440	362	21	56	173	-68
Dharwad	483	499	-3	86	159	-46
Gadag	392	382	3	101	162	-37
Gulbarga	659	608	8	85	127	-33
Hassan	924	689	34	132	225	-42
Haveri	549	496	11	64	168	-62
Kodagu	2656	2333	14	213	288	-26
Kolar	358	387	-8	162	236	-32
Koppal	392	374	5	135	142	-5
Mandya	344	297	16	142	233	-39
Mysore	447	377	19	150	211	-29
Raichur	572	450	27	113	143	-21
Ramanagara	456	433	5	147	238	-38
Shimoga	2228	1869	19	126	202	-38
Tumkur	448	360	24	115	204	-43
Udupi	3939	4460	-12	356	299	19
Uttara Kannada	2725	2374	15	156	198	-21
Yadgir	594	592	0	118	150	-21
State	**934**	**835**	**12**	**128**	**188**	**-32**

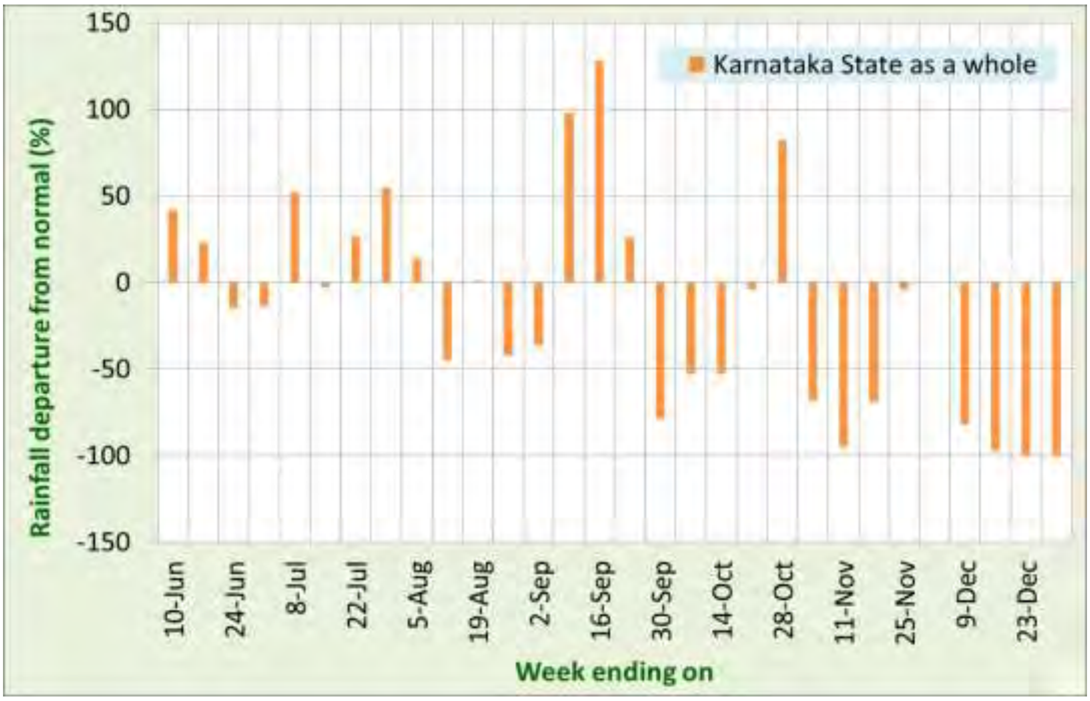

Figure 25. Weekly departure from normal rainfall during June to December 2013 in Karnataka.

Farmers' participation and area covered in Bhoochetana in Karnataka

During four year of Bhoochetana program, the farmers' participation rate and area coverage has increased significantly (Figure 26). Total number of farmers participated in the program ranging between 0.18 million and 3.1 million during 2009 to 2013-14 and the area coverage has reached to 7.4 million ha during kharif (5.1 million ha) and rabi (2.3 million ha) seasons in the same period.

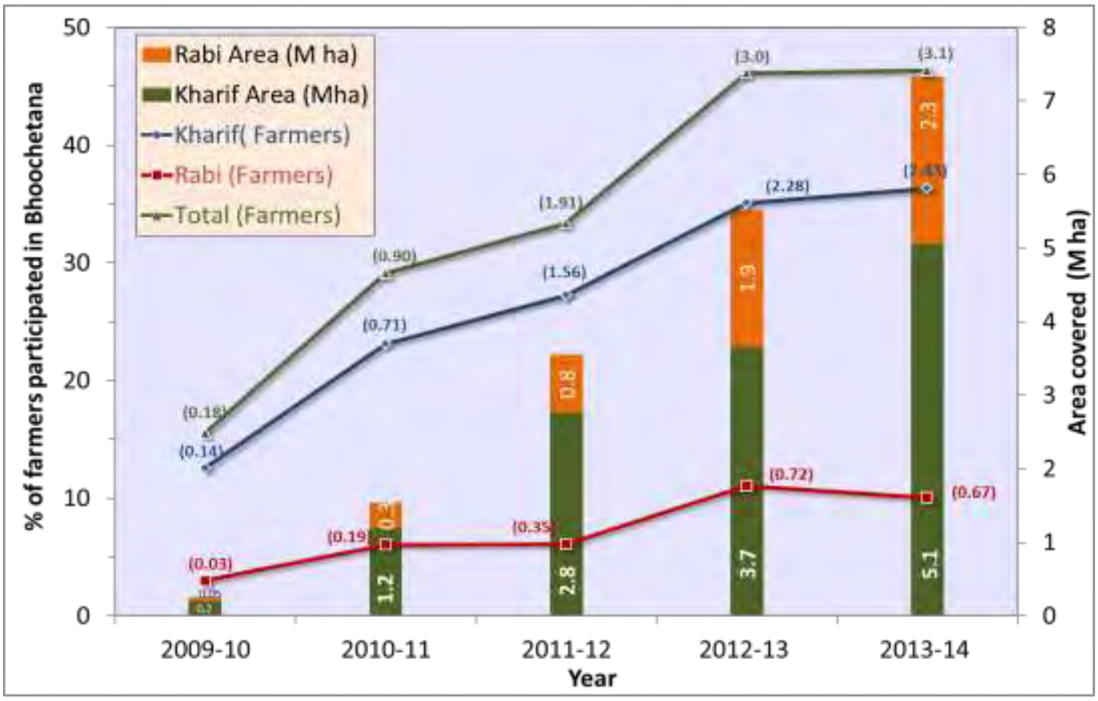

Figure 26. Number of Farmers Participated and Area Covered in Bhoochetana in Karnataka

Repeat soil analysis in Bhoochetana districts

An effort has been made to assess the quality of soil in first year district with a proposition that whether adoption of micro and secondary nutrient has resulted in improving soil health in these districts. We analysed soil samples from four districts and the results indicated a positive trend in terms of improving soil health.

With soil-test based nutrient management strategy, the soil fertility status in farmers' fields in Karnataka is improving as is evident from decreased per cent defieicny on farmers' fields in Potassium, Phosphorus, Sulphur, and Boron (Figure 27). However, in case of organic carbon and zinc the percent deficiency increased indicating still gaps in covering large areas.

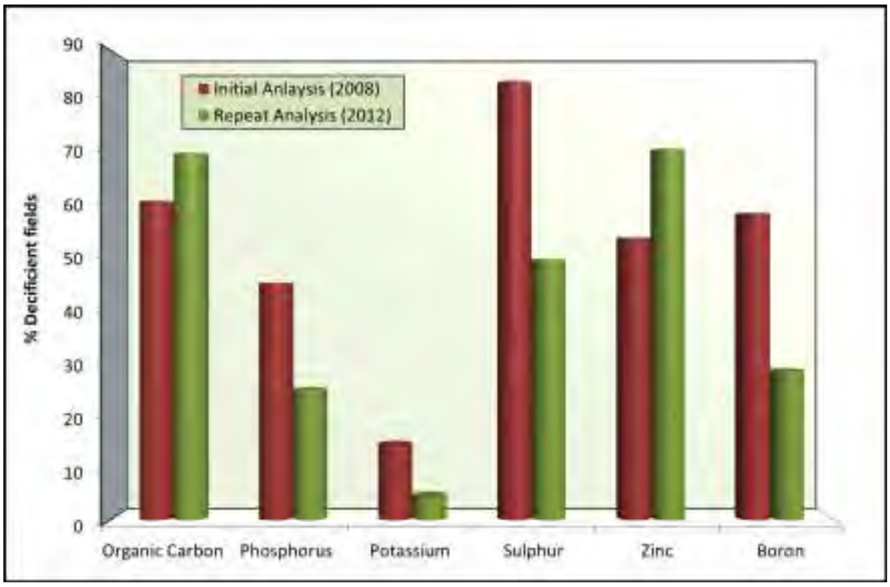

Figure 27. Per cent deficient fields in micro and secondary nutrients in Karnataka

In Chitradurga, the soil fertility status is improving in case of Potassium, Phosphorus, Sulphur, zinc and Boron (Figure 28). However, in case of organic carbon the percent deficiency increased indicating still gaps in covering large areas.

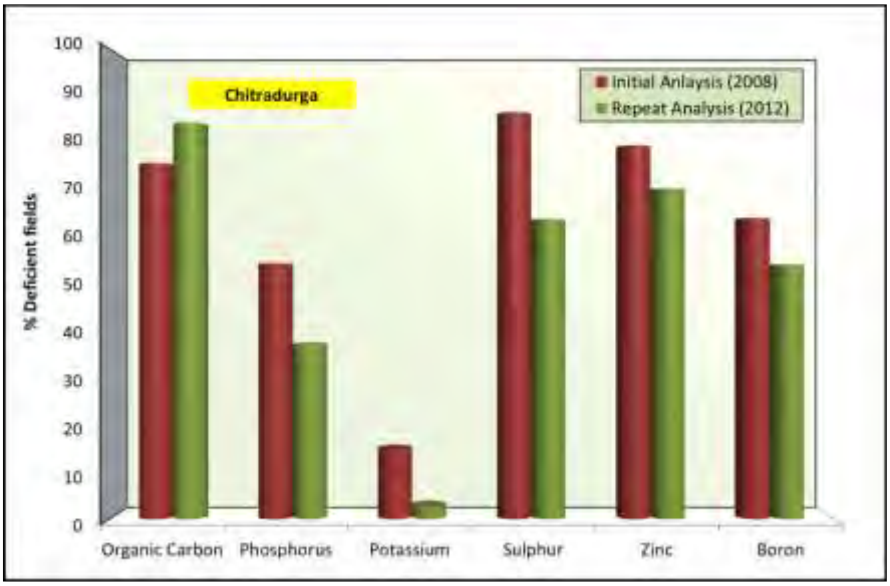

Figure 28. Per cent deficient fields in micro and secondary nutrients in Chitradurga

In Haveri, the soil fertility status in farmers' fields is improving as is evident from decreased per cent defieicny on farmers fields in Potassium, Phosphorus, Sulphur, and Boron (Figure 29). However, in case of organic carbon and zinc the percent deficiency increased indicating still gaps in covering large areas.

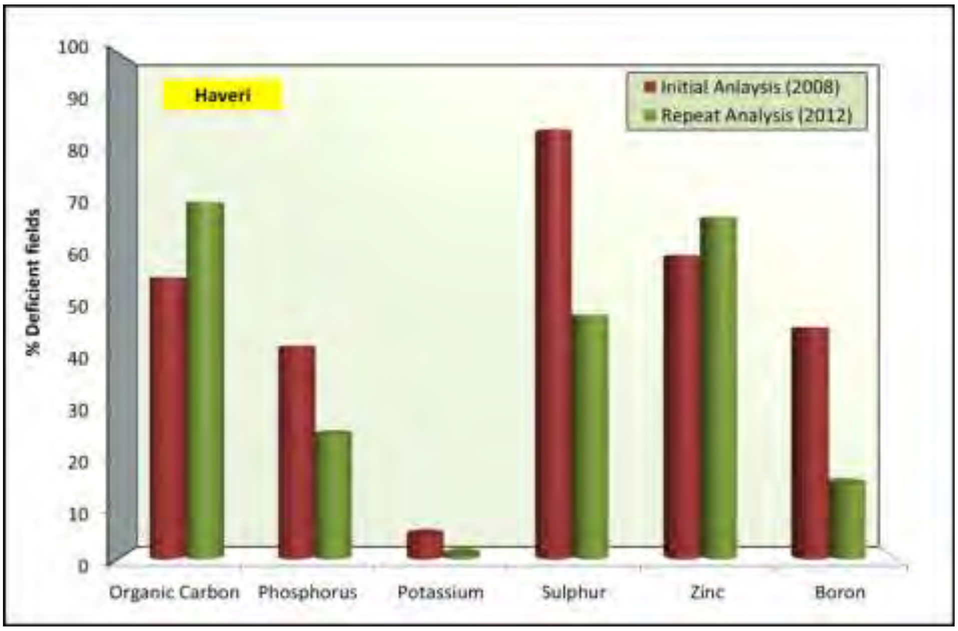

Figure 29. Per cent deficient fields in micro and secondary nutrients in Haveri

In Kolar, in case of zinc the percent deficiency increased indicating still gaps in covering large areas (Figure 30).

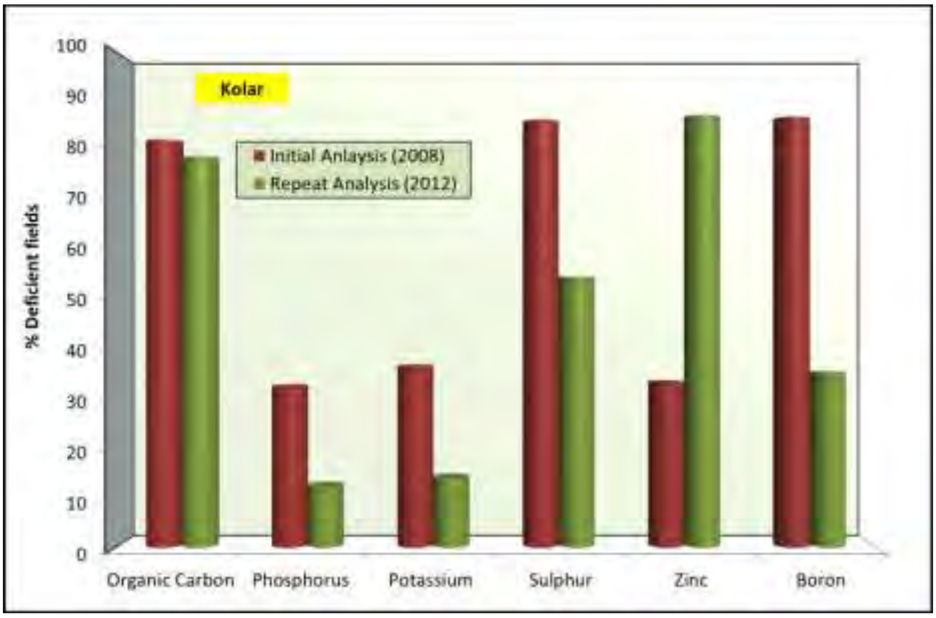

Figure 30. Per cent deficient fields in micro and secondary nutrients in Kolar

In Dharwad, the soil fertility status in farmers' fields is improving in terms of Potassium, Phosphorus, Sulphur, and Boron (Figure 31). However, in case of organic carbon and zinc the percent deficiency increased indicating still gaps in covering large areas.

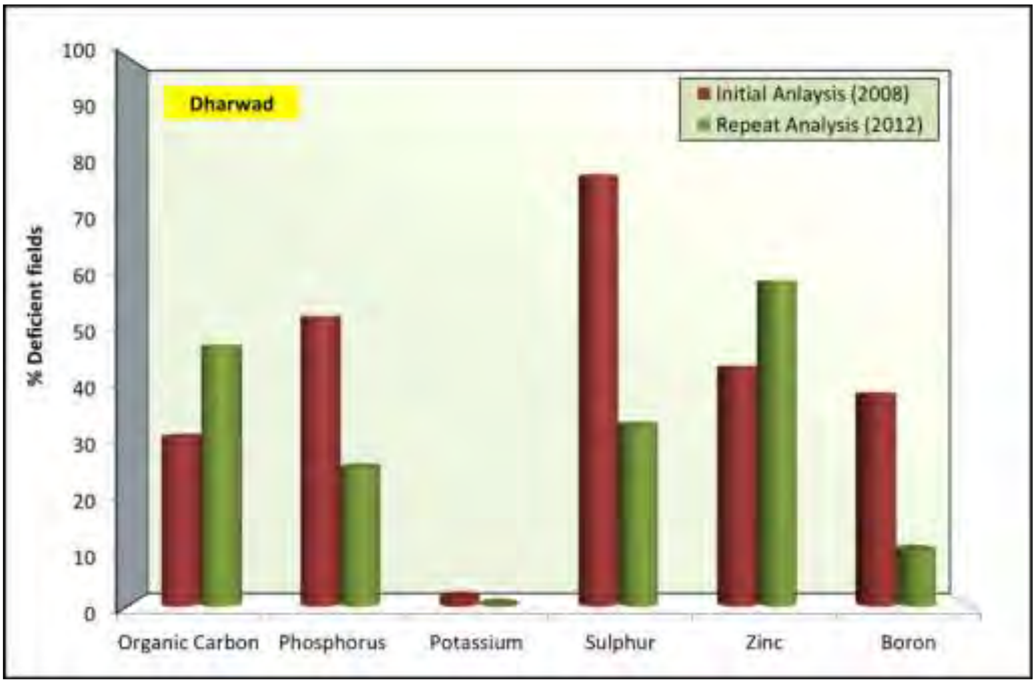

Figure 31. Per cent deficient fields in micro and secondary nutrients in Dharwad

In terms of mean availability of soil nutrients, there is positive improvement in terms Potassium, Phosphorus, Sulphur, zinc, organic carbon and Boron (Figure 32). However, in case of other nutrients, efforts are needed.

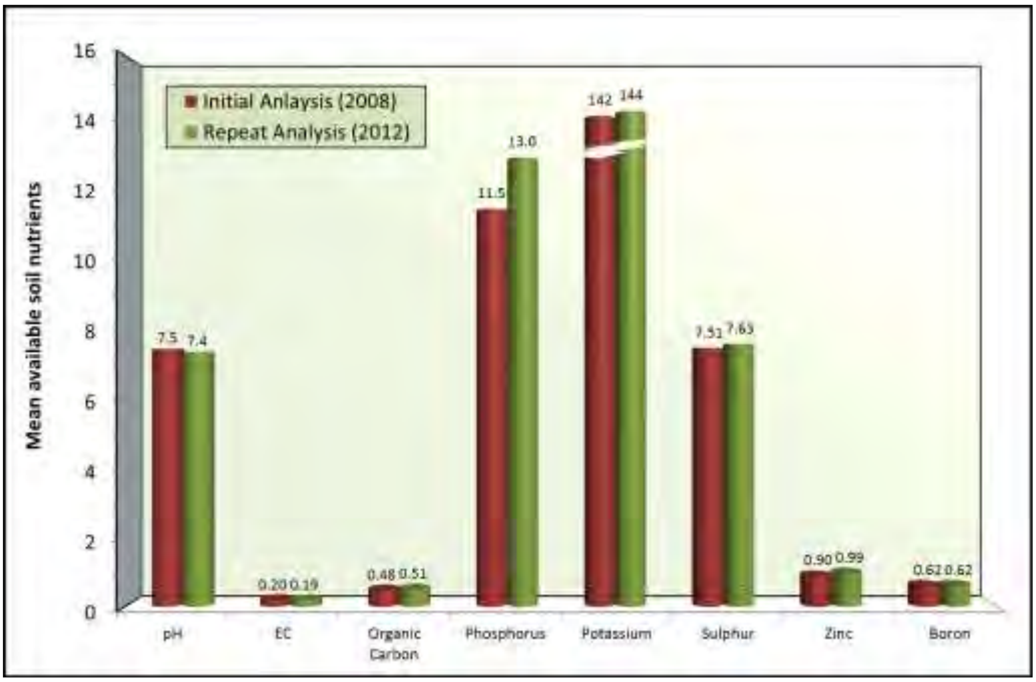

Figure 32. Mean available soil nutrients in farmers' fields in Karnataka

Assessing projected climate change impacts on pigeonpea at Gulbarga using crop-growth simulation models

Climate variability and the likely change is a great concern to the State of Karnataka. More than 50 per cent of population in the state depends on agriculture. Almost 80 per cent of agricultural land is under rainfed conditions and is sensitive to droughts and floods, thus to climate. Impacts of climate variability and change on agriculture are to be assessed and adaptation strategies need to be developed for bringing resilience in agriculture to climate. An attempt is made to assess the impacts of climate change on pigeonpea at Gulbarga.

Details of field experiments

Four varieties each for pigeonpea were selected and field experiments at Farhatabad, Gulbarga and at ICRISAT, Patancheru during 2011-12, 2012-13 and 2013-14. Pigeonpea variety ICP 8863 (Maruti) is a medium duration (170-180 days) variety with a yield potential of 1.5 t ha^{-1} and is popular in AP, Karnataka and Maharashtra. ICP 87119 (Asha) is a medium duration (160-200 days) variety with a yield potential of 1.5 - 2.0 t ha^{-1} and is suitable for Karnataka, Maharashtra and Gujarat. ICPH 2671 (Hybrid) is a medium duration (170-180 days) hybrid having a higher yield potential of 2.7 t ha^{-1} and is suitable for Maharashtra and Karnataka. Variety TS-3R was developed by the University of Agricultural Sciences, Raichur and is very popular in Gulbarga region. It is a medium duration (150-160 days) variety with higher yield potential (1.0 -1.25 t ha^{-1}) and is resistant to wilt and tolerant to fog.

Layer-wise soil sampling was done at Farhatabad. Soil samples were analysed in the lab to estimate pH, EC, Organic carbon and nutrients P, K, S, Zn and B and the results were used to apply balanced nutrition as per the recommended package of practices. BBF system and recommended crop spacing were followed. At Farhatabad (Pigeonpea experiment), soils have a pH of 8.3, EC of 0.35 dS/m, OC of 0.68 %, available P of 6.8 mg kg^{-1}, K of 279 mg kg^{-1}, Zn of 1.46 mg kg^{-1}, Fe of 8.7 mg kg^{-1} and B of 2.10 mg kg^{-1} soil.

Figure 33. Farmer-participatory soil sampling at Farhatabad

To assess status of moisture availability to crops, soil moisture observations were taken at fortnightly intervals by gravimetric method (0-30 cm depth). Crop observations were taken at different growth stages for evaluating experimental data with simulation model outputs. APSIM version 7.4 was used for pigeonpea crop growth simulation. Most of the soil and crop data required for generating genetic coefficients was generated at ICRISAT watershed and the observations are made following standard procedures specifically prescribed for simulation models.

Figure 34. Pigeonpea growth observations at Farhatabad

Fourteen morphological parameters were taken for both crops from a sample area of 1.0 x 0.5 m at an interval of 15 days during crop growth stage. Six phenological observations for pigeonpea were taken during crop growth period. Five yield parameters were taken at harvest stage from a sample area of 4x3 m.

Assessing impacts of projected climate on pigeonpea crop at Gulbarga

In Karnataka, pigeonpea is largely grown in the northern parts of the state especially in Gulbarga, which is known as "Pulse Bowl of Karnataka". Pigeonpea occupies an area of about 0.38 M ha in Gulbarga with a production of about 0.22 M tonnes and thus the district average productivity is 0.57 t ha^{-1}. Major soils of the district are Vertisols and associated intergrades (deep black, medium black, shallow black) and lateritic, with water holding capacity of 200-230 mm, and are suitable for pigeonpea cultivation. Gulbarga district experiences a typical semi-arid climate. Normal annual rainfall for Gulbarga station is 834 mm received in 48 rainy days (IMD, 2010). *Kharif* (Jun-Oct) rainfall is about 720 mm, which is 86 per cent of the annual rainfall. May is the hottest month with an average maximum temperature of 40 °C and December is the coldest month with an average minimum temperature of 15.9 °C.

Climate change due to global warming is posing a serious threat to agriculture which is one of the major challenges presently faced by agriculture in India, more so in the Semi-Arid Tropics (SAT) of the country. A decreasing trend in the annual rainfall @ 3.44 mm per year for Gulbarga district was reported by earlier researchers based on data for 1961-2008. Variations in rainfall amount and distribution, increased temperatures, depleting soil productivity and disturbing water balance are affecting pigeonpea productivity in Gulbarga. Daily weather data on maximum temperature, minimum temperature and rainfall were procured from the India Meteorological Department for the period 1969-2009 (41 years). Pigeonpea data of Gulbarga were collected from 1970 to 2009 for assessing the changes in area, production and productivity of the crop.

In the present study, pigeonpea simulation model in APSIM 7.4 version was used to assess the impacts of projected climate change. Pigeonpea variety TS-3R was developed by the University of Agricultural Sciences, Raichur and is very popular in Gulbarga region. It is a medium duration (150-160 days) variety and is resistant to wilt and tolerant to fog.

Ten climate change scenarios and the present were considered (Table 4) for assessing impacts of projected climate on pigeonpea using the calibrated APSIM model. The scenarios included 1 °C, 2 °C increase in both maximum and minimum temperatures and with 10% and 20% decrease and increase in rainfall.

Table 4. Projected climate scenarios

Sl. No.	Climate scenario description
1	Present
2	Present + 1 °C Temp.
3	Present + 1 °C Temp.-10% Rainfall
4	Present + 1 °C Temp.-20% Rainfall
5	Present + 1 °C Temp.+10% Rainfall
6	Present + 1 °C Temp.+20% Rainfall
7	Present + 2 °C Temp.
8	Present + 2 °C Temp.-10% Rainfall
9	Present + 2 °C Temp.-20% Rainfall
10	Present + 2 °C Temp.+10% Rainfall
11	Present + 2 °C Temp.+20% Rainfall

These climate change scenarios are incorporated in the model by increasing daily maximum and minimum temperatures and multiplying the rainfall by specified change.

Results and Discussion

District-wise data shown that pigeonpea area has increased by three-folds from about 0.14 M ha in 1970 to 0.43 M ha in 2007 (Figure 35). There has been a sharp and steady increase in area under pigeonpea since 1995. Average pigeonpea productivity was 0.42 t ha^{-1}. In 1992, due to severe infestation of pod borer, the lowest productivity of 0.023 t ha^{-1} was recorded.

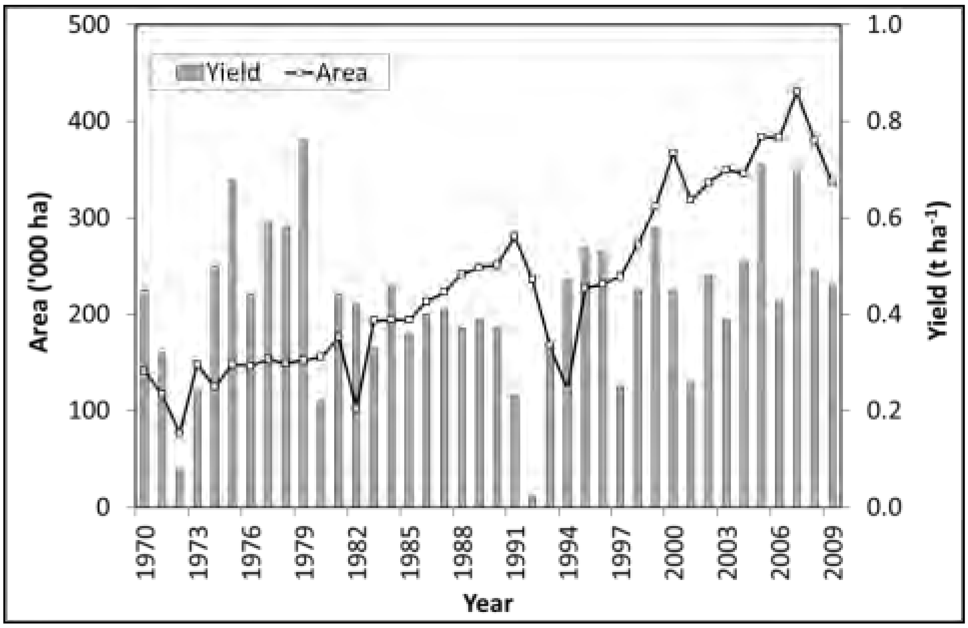

Figure 35. Area and productivity of pigeonpea at Gulbarga

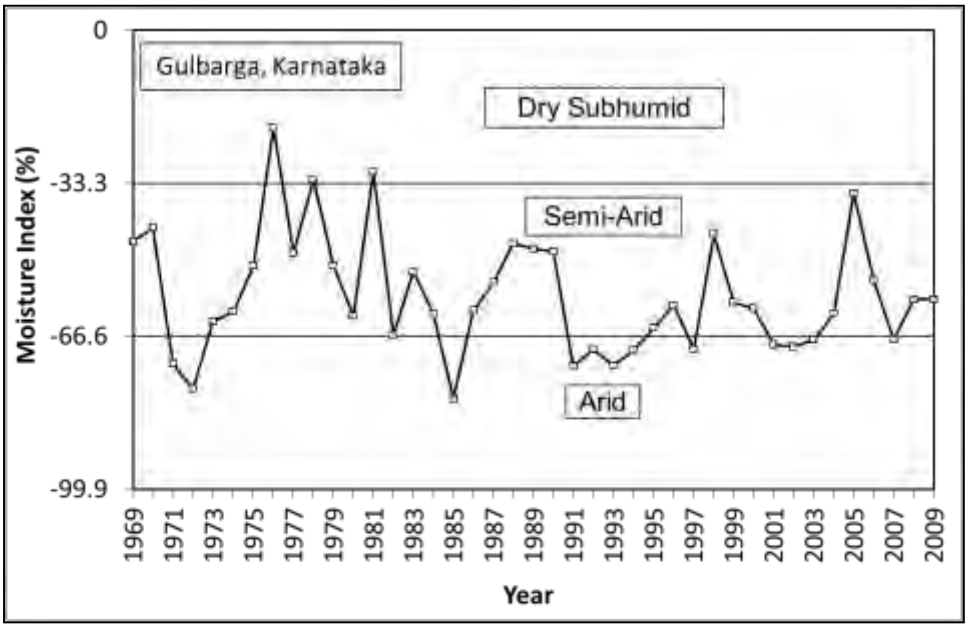

Figure 36. Climatic shifts at Gulbarga

Climate of Gulbarga was more or less stable in the semi-arid type except for a few years when it changed to dry sub-humid and arid types of climate (Figure 36). Analysis of seasonal rainfall indicated that no significant trend exists in southwest monsoon rainfall during the period 1969-2009.

Due to climate change, temperatures have shown an increasing trend, particularly in winter. Maximum temperature during *Rabi* season (Nov-Feb) at Gulbarga shown statistically significant increasing trend (Figure 37).

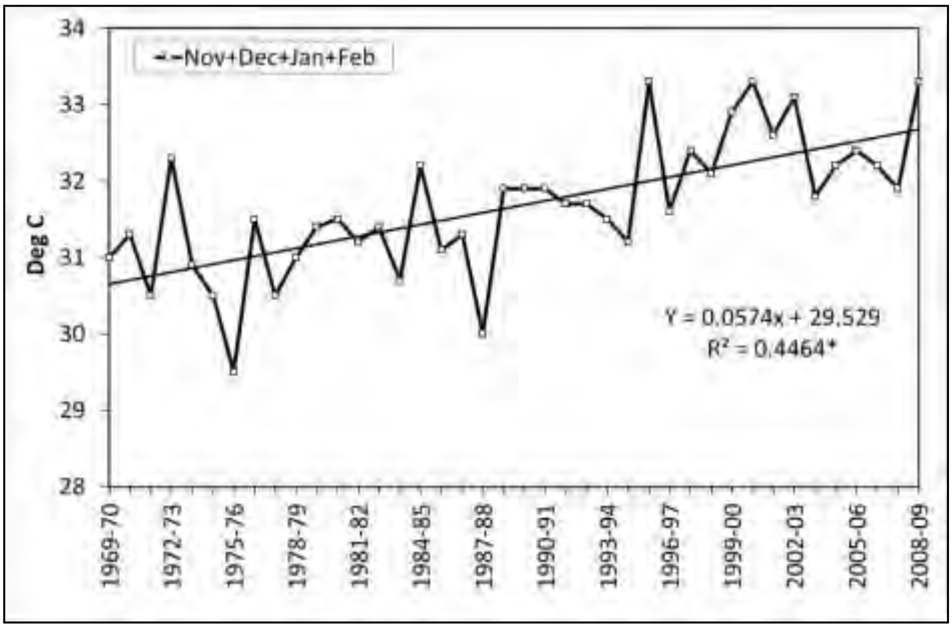

Figure 37. Maximum temperature during Nov-Feb at Gulbarga

Estimation of pigeonpea genetic coefficients

Genetic coefficients for variety TS-3R were estimated based on observed phenology and crop growth data from the field experiments at ICRISAT, Patancheru during 2011. APSIM simulated growth parameters fairly matched with the observed data. Observed and simulated total biomass shown in the Figure 38 indicate that the APSIM pigeonpea model could simulate well and can be used for assessing the impacts of climate change on pigeonpea at Gulbarga. Other crop growth parameters like grain yield, pod yield and leaf area index simulated by the model were within acceptable range, when compared with the observed values. Observed and simulated grain yields were 1780 and 1570 kg ha^{-1}, respectively. Simulated flowering and maturity days were 89 and 162 days and well compared with the observed values of 88 and 164 days, respectively.

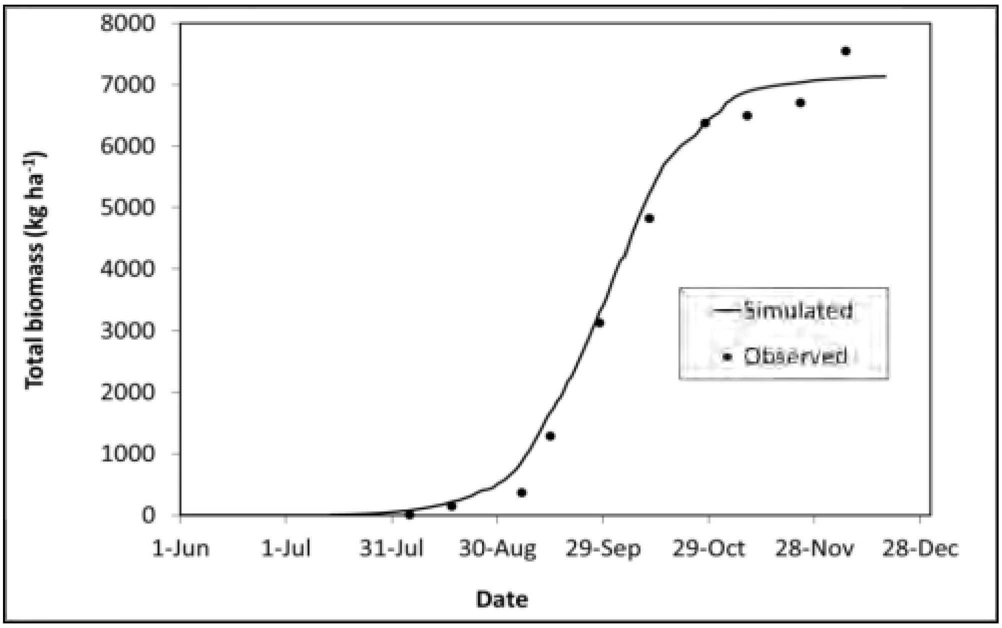

Figure 38. Observed and simulated total biomass of pigeonpea cv. TS-3R

Climate change impacts on pigeonpea

Climate change is likely to alter the growing conditions of crops due to increase in temperature and changes in the rainfall pattern. In semi-arid tropics, the duration of growing period generally decreases and the abiotic and biotic stresses are likely to increase. Such adverse conditions in future climate will impact the crop yields negatively.

Simulated pigeonpea grain yield and total biomass at Gulbarga were 2057 and 8708 kg ha^{-1}, respectively under baseline (present) climate. Increase in temperature by 1 and 2 °C could decrease grain yield by 9 and 16%, respectively (Table 5). Similarly, total biomass decreased by 5 and 9% with increase in the temperature by 1 and 2 °C. Decrease in rainfall by 10% coupled with increase in temperatures by 1 and 2 °C could further reduce grain yields by 5 and 4% making the total reduction at 14 and 20%. The situation could further worsen with reduction in rainfall by 20%, making the loss of grain yields by 21 and 28% with increase in temperature by 1 and 2 °C, respectively. Increased rainfall scenarios could benefit the crop to some extent, particularly in the low rainfall years, but net effect still remained negative.

Increased temperature could shorten the crop duration. Days to flowering shortened by 2 and 4 and the total crop duration by 5 and 9 days with increase in temperature by 1 and 2 °C, respectively (Table 5). The increase in temperature causes more transpiration per day which results in water stress during the dry periods. Water balance outputs have shown that decrease in rainfall by 10 and 20% resulted in less plant water use by 18 and 45 mm, respectively with increase in temperature by 2 °C (Table 6). Slight reduction in runoff and drainage with increased temperatures is due to shortened crop duration. Increments in rainfall by 10 and 20% will result in more rainfall only for the days having rainfall and will not affect non-rainy days. Thus, additional rainfall has contributed more towards runoff and drainage than evapotranspiration. Simulated water use efficiency of pigeonpea reduced from 7.2 kg ha^{-1} mm^{-1} in the baseline by 6.6 and 6.0 kg ha^{-1} mm^{-1} with temperature increase of 1 and 2 °C, respectively.

Table 5. Effect of projected climate on phenology and productivity of pigeonpea cv. TS-3R

Climate scenario	Days to flower	Days to maturity	Total biomass (kg ha^{-1})	Grain yield (kg ha^{-1})	Change in yield (%)
Present (P)	103	157	8708	2057	0
P+1°C	101	151	8286	1875	-9
P+1°C-10%RF	99	150	7798	1771	-14
P+1°C-20%RF	99	150	7090	1615	-21
P+1°C+10%RF	101	151	8659	1961	-5
P+1°C+20%RF	101	152	8866	2005	-3
P+2°C	99	148	7943	1734	-16
P+2°C-10%RF	98	147	7465	1636	-20
P+2°C-20%RF	98	147	6763	1486	-28
P+2°C+10%RF	100	149	8302	1809	-12
P+2°C+20%RF	99	148	8525	1854	-10

Table 6. Effect of projected climate on water balance of pigeonpea

Climate Scenario	Rainfall (mm)	Runoff (mm)	Drainage (mm)	Evapo-transpiration (mm)	Soil Evaporation (mm)	Plant use (mm)
Present (P)	594	66	103	475	187	287
P+1°C	589	65	102	472	186	286
P+1°C -10%RF	522	48	70	449	181	268
P+1°C -20%RF	457	33	45	420	178	242
P+1°C +10%RF	650	84	135	487	188	299
P+1°C +20%RF	710	104	171	498	191	307
P+2°C	587	64	99	474	187	287
P+2°C -10%RF	520	47	68	450	182	269
P+2°C -20%RF	455	33	43	420	179	242
P+2°C +10%RF	648	82	132	490	190	300
P+2°C +20%RF	709	102	167	501	192	309

Summary

The simulation results have shown that the selected temperature and rainfall change scenarios could reduce pigeonpea grain yields by 3 to 28%. Days to flowering and maturity reduced by 5-10 days under different climate change scenarios. Increased temperature by 2 °C coupled with 20% reduction in rainfall could reduce water use by 45 mm. Increased rainfall could help to recoup the yield losses in the low rainfall years. Results of study indicated that, better water and nutrient management approach is the key and Integrated Watershed Management plays a major role in sustaining pigeonpea productivity under future climate scenarios. Adoption of varieties tolerant to high temperature could also play a major role in sustainable pigeonpea yields. Water stress during the end of season could be avoided by sowing the short and extra-short duration varieties. Breeding of varieties which can put extra root mass is required for sustainable pigeonpea production in the future.

Project Activities

District, Taluk and Cluster/Village Level Trainings

District level trainings were organized at different levels to senitise Department staff, Farm Facilitators and ICRISAT staff located at different districts. The trainings were attended by DoA officials (JDA, ADAs, AOs, AAOs), Scientists from Universities, KVKs, and Scientsist and Scientific officers and Research Technicans of ICRISAT. District level trainings were attended by ADAs, AOs, AAOs, Farm facilitators and lead farmers. Wide range of topics was included in the trainings. Thirty eight trainings were organized at district level and 4049 staff trained through these trainings (Table 4).

Figure 39. Participants at the district level training held in Gadag district (L); DoA staff and ICRISAT staff visiting field and interacting with farmers in Ramanagar (R).

Taluk level trainings were organized for agricultural assistants, newly appointed field facilitators and lead farmers in each taluk during different intervals in all the districts. These trainings were organized with the objective of hands-on training and demonstration of technologies, such as sed treatment, soil sampling, use of tropicultor, crop harvest sampling, and village level record keeping by field facilitators. In all the 30 districts, 184 taluk level trainings were conducted and a total of 13448 men and women were trained on Bhoochetana technologies (Table 7).

Figure 40. Farm facilitators training in Raichur.

Cluster/village level trainings were organized by AOs of DoA and research technicians of ICRISAT who were sometime assisted by resource persons, either scientists or scientific officers from ICRISAT. These were even informal gatherings of a group of farmers in a village to discuss the issues of input distribution or specific soil/crop related issues in their villages. These trainings were conducted in large numbers covering more than 4.9 lakhs farm men and women before the start of the season during crop season in all 30 districts which were generally very effective in communicating technologies.

Figure 41. Farm facilitators' trainings at Tumkur district during Kharif season.

Table 7. Trainings conducted in all districts under Bhoochetana Mission Program

District	Taluks	District-level		Taluk/village-level			
		No. of Trainings		No. of trainings			
		District level	Partici-pants	Taluk level	Partici-pants	Village level	Partici-pants
Bagalkote	Badami, Bagalkot, Bilagi, Hungund, Jamakhandi, Mudhol	1	60	6	296	193	15625
Bellary	Bellary, Kudligi, Sandur, Hospet, Siryguppa, H.B.halli, Hadagali	1	77	7	566	528	24572
Bengaluru Rural	Devanahalli, Nelamangala Doddaballapura, Hoskore	1	71	03	194	121	4362
Bengaluru Urban	Anekal, Bengaluru (S), Bengaluru(N), Bengaluru(E)	1	45	04	302	55	2303
Belgaum	Athani, Bailhongal, Raibag, Chikodi, Belgaum, Gokak, Hukkeri, Ramdurg, Khanapur, Soundatti	1	100	10	775	469	14475
Bidar	Bidar, Bhalki, Aurad, Humnabad, Basavakalyan.	1	380	5	935	451	22045
Bijapur	B. Bagewadi, Bijapur, Indi, Muddebihal, Sindagi	1	60	5	635	638	562
Chamarajan agara	Chamarajanagara, Kollegal, Gundalpet, Yelandur	1	52	4	200	105	8600
Chikkaballa-pur	Chickballapur, Bagepalli, Shidlagatta, Chintamani, Gouribidanur, Gudibandae	1	84	6	648	275	8525

District	Taluks	District-level No. of Trainings		Taluk/village-level No. of trainings			
		District level	Partici-pants	Taluk level	Partici-pants	Village level	Partici-pants
Chikkama-galuru	Chikkamangaluru, Kadur, Tarekere	1	56	7	322	204	8160
Chitradurga	Challakere, Chitradurga, Hiriyuru, Holalkere, Hosadurga, Molakalmuru	2	214	6	546	535	21400
Davangere	Davanagere, Harapanahalli Harihar, Honnali, Jagaluru Channagiri	2	370	12	596	580	260870
Dharwad	Dharwad, Hubli, Kalghatgi, Kundgol, Navalgund	1	299	5	597	314	22306
Dakshina Kannada	Mangalore, Bantwal, Belthangady, Puttur, Sulia	2		05	289	74	754
Gadag	Gadag, Ron, Mundargi, Shirahatti, Naragunda	1	205	5	349	104	4000
Gulburga	Aland, chincholi, Gulburga, Sedam,	1	350	07	840	184	750
Hassan	Alur, Arklgud, Arsikere, Belur, Chanrayapatna, Hassan, Holenarsipura	1	138	07	834	30	2186
Haveri	Haveri, Hangal, Savanur, Hirekerur, Ranebennur, Byadagi, Shiggaon	2	190	07	490	135	12150
Kolar	Kolar, Mulbagal, Malur, Srinivaspura, Bangarpet,	1	69	5	551	201	6432
Kodugu	Somwarpet, Madikeri, Virajpet	2	69	6	242	64	3852
Koppal	Gangaavathi, Koppala. Kustagi, Yalburga	1	48	4	465	20	1347
Mandya	Mandya, Malavalli, Maddur, Pandavapura, Srirangapatna, K R Pet, Nagamangala	1	75	7	236	212	7940
Mysore	H D Kote, Piriyapattana Hunasuru, Mysore, K R Nagara, T Narasipura, Nanjanagudu	2	200	7	612	371	12985
Raichur	Manvi, Lingasugur, Raichur, Sindhanur, Devadurga	1	157	5	203		
Ramnagara	Ramanagera, Magidi, Chanapatatna, Kankapura	1	95	4	250	206	5690
Shimoga	Bhadravathi, Hosanagar, Sagara, Shikarpur, Shimago, Soroba	1	180	08	715	138	12500
Tumkur	Tumkur, Tiptur, Turuvekere, Cnhalli, Gubbi, Kunigal, Sira, Koratagere, Madugiri, pavgada	2	80	10	900	510	18726
Udupi	Udupi, Kundapura, Karkala	2	120	3	259	88	3427
Uttara Kannada	Karwar, Ankola, Bhaktal, Kumta, Honnavar, Sirsi	1	58	11	250	11	2522
Yadgir	Shahapur, Shorapur, and Yadgir	1	300	03	550	150	1600
Total		**38**	**4049**	**184**	**13448**	**6966**	**495709**

Resilient Agriculture Investigators Network (RAIN)

Rainfed agriculture is very much prone to the vagories of the monsoon and the market forces which are keep the small farm holders poverty, although there is a vast untapped potential of the rainfed agriculture as different farmers' yields are lower by two to four fields than the achievable yields. The other hand, the researchers have developed number of technologies and improved products like high-yielding cultivars, bio-control agents, nutrient mobilizers etc., still the vulnerability of the farmers to the shocks of drought, low temperature (frost), high temperature and excess rains. In this context, the Resilient Agriculture Investigators Network (RAIN) was formed to address the challenges of rainfed agriculture in the state of karnataka. Part of the Government of Karnataka–ICRISAT Bhoochetana project, the network is aimed at forming a team of investigators to identify common priorities for developing resilient agriculture systems.

Figure 42. Participants of the RAIN workshop.

The RAIN partners – University of Agricultural Sciences, Bengaluru, Dharwad, Shimoga, Raichur; University of Horticultural Sciences, Bagalkot; KSNDMC, Indian Space Research Organisation, Department of Agriculture, Department of Horticulture and ICRISAT – met to work out the details of the activities to be undertaken by the network (Figure 42). As leader of the network, ICRISAT will form a team of investigators and identify common priorities for developing resilient agriculture systems; discuss common sets of data, methods and simulation modeling to be adopted to undertake studies; and prepare the workplan and bring together teams in each district to work towards developing resilient systems.

Inaugurating the workshop, Dr KV Sarvesh, Director, Department of Agriculture, Government of Karnataka, highlighted the need to develop resilient agriculture to protect farmers from climate variability and climate change. He underlined the importance of convergence among researchers and between related departments such as those of horticulture, watershed, animal husbandry and water resources. Dr VS Prakash, Director, KSNDMC explained his organization's role in providing short range forecasting as well as support through online phone calls. Dr DL Maheswar, Director, Department of Horticulture also highlighted the need for RAIN. Describing Karnataka State's excess rains this year which have damaged plantation crops, he said there was an urgent need to empower farmers through capacity building.

In his presentation on "Resilient Agriculture Investigators Network (RAIN) 4 Sustainable Development in Karnataka", Dr SP Wani stressed the need for depicting the lens of resilience and vulnerability which calls for change in the mindset of all the actors to provide support to farmers. About 50 participants deliberated on topics such as: Resilient agriculture – Concept, principles and current status in the State; Standard data needs to develop resilient agriculture; Resilient agriculture through adaptation and mitigation strategies; and Social and institutional lens to build resilience. Outcomes were presented and ways to move the initiative forward were explored. Vice-Chancellors from each Agricultural University have nominated a team of four scientists as the primary network members. Dr Sarvesh concluded by stressing the need for the network partners to meet regularly with Department officials in order to establish a mechanism to provide information to extension officers and work out ways to reach farmers.

State Level Farmers' Field Day in Karnataka

New interventions like building climate resilient agriculture, ICT-based innovative extension system, and irrigated agriculture under the Bhoochetana – Phase II implementation (2013-2018) are envisioned to further boost agricultural productivity and improve the livelihoods of millions of smallholder farmers in the state of Karnataka, India. To showcase these new interventions, a state-level farmers' field day was held on 14 September in Davanagere under this mission project by the Government of Karnataka and ICRISAT. Karnataka's Minister of Agriculture, Mr Krishna Byregowda speaking as Chief Guest highlighted the importance of soil health for increasing the productivity of agriculture in the state (Figure 43). He explained to the gathering of 1500 farmers and officials from 30 districts the importance of soil with balanced nutrition and good health in overcoming short dry spells due to climate change and variability. He also appreciated the initiatives of ICRISAT and other partners in the consortium for taking up the difficult task of unlocking the potential of rainfed agriculture in the state. The Minister also inaugurated the exhibition participated by the different consortium partners like government line departments, state agricultural universities, private companies and ICRISAT showcasing new technologies and products which can help smallholder farmers increase their productivity and profits.

Figure 43. Minister of Agriculture, Mr Krishna Byregowda addresses farmers and state officials during the field day (L); Mr Krishna Byregowda, inaugurates the ICRISAT stall during the field day in Devangere, Karnataka (R)

Speaking on behalf of Director General William D Dar, Dr Suhas P Wani (Assistant Research Program Director – Resilient Dryland Systems), discussed the various initiatives under Bhoochetana which have benefitted the farmers in Karnataka over the last four years. He also addressed the need to strengthen the convergence of different activities like integrated watershed management and livestock management to build the resilience in agriculture of the state. In the last four years, the Bhoochetana initiatives contributed an estimated Rs. 1268 crores (US$ 230.5 million) as net benefits for the farmers. Karnataka's Commissioner, Watershed Development Department, Mr HG Shivananda Murthy and Commissioner, Agriculture Department, Mr V Chandrashekhar also addressed the gathering highlighting the need for more concerted efforts to enhance the benefits further in the next four years.

Public-Private Partnership highlighted at Farmers' Day in Karnataka

An enthusiastic group of 1,100 farmers gathered to share their experiences as part of a pilot watershed program being implemented in four villages in Bellary district (Kodalu, Chikka Anantapur, Dodda Anantapur and Joga), state of Karnataka, India. This program is a public-private partnership between Jindal Steel's JSW Foundation, ICRISAT and the Government of Karnataka, aimed at improving the sustainability and livelihoods of smallholder farmers. Addressing the gathering of farmers and officials during the Farmers' Day held on 24 October, Director General William D. Dar highlighted the farmer-centric thinking approach of the JSW Foundation, and the importance of a public-private partnership model for the sustainable development of natural resources and to improve the livelihoods of smallholder farmers in drought-prone Bellary district (Figure 44).

Figure 44. Dr William Dar, Mrs and Mr Jindal family and Dr Wani at the farmers' day in Bellary.

In his address, Mr Sajjan Jindal, Managing Director of JSW Foundation, stated that the partnership would not only transform the four villages covered by the program but also all of the rainfed farms in Bellary district. He and Mrs Sangita Jindal, Chair of JSW Foundation, visited the fields where farmers have grown cotton and pigeonpea using improved soil test-based nutrient management. Mr Jindal expressed commitment to help farmers in the district increase their incomes through science-led development with the help of ICRISAT. During the interactions, farmers explained how various interventions such as planting of *Gliricidia* on bunds to generate N-rich organic matter for improving soil health, vermicomposting for safe recycling of farm residues, farm ponds for harvesting rainwater for supplemental irrigation as well as conservation of soil moisture for better crop growth, had benefited them. Mr Mallikarjuna, a farmer, said he harvested 1.6 tonnes of cotton last year, and is expecting additional yields from adoption of improved management practices.

Dr SP Wani, Acting Research Program Director – Resilient Dryland Systems, explained the integrated watershed development program and the novelties of the public-private partnership initiative in which wastewater treatment will enable farmers to use safe water for agriculture and also to improve sanitation in the village. The project covers 7000 ha in four villages and is benefiting 1260 farm families.

The farmers also visited the exhibition stalls of ICRISAT, DoA and private seed companies, where they gathered information on improved management practices and new high-yielding cultivars of crops. Dr Ramappa, Joint Director of Agriculture, Department of Agriculture, Bellary district and the Director of the Watershed Development Department were also present at the event. The activity was jointly organized by ICRISAT and Karnataka's Department of Agriculture.

Annual Review and Planning Workshop for Bhoochetana and Bhoochetana Plus - Increasing Adoption and Area Coverage

Annual review and planning meeting for Bhoochetana mission program (Bhoochetana II) and Bhoochetana Plus program was held at ICRISAT headquarters during 5-8 February. About 300 participants from 30 districts of Karnataka representing Directorate of Agriculture, Watershed Development Department and Horticulture, farm facilitators and farmers participated in the meeting through seven technical sessions (See Annexure I).

Important dignitaries in the workshop includes Dr. William D Dar, Director General, ICRISAT, Dr. CLL Gowda, Deputy Director General (Research), ICRISAT, Dr. Suhas P Wani, Research Program Director (Acting) Resilient Dryland Systems, M/s Kaushik Mukherjee, Chief Secretary, GoK, GVK Rau, Additional Chief Secretary and Development Commissioner, Bharatlal Meena, Principal Secretary, Subodh Yadav, Commissioner, Agriculture, Shivananda Murthy, Commissioner, Watershed Development Department, BK Dharmarajan, Director, Agriculture, DL Maheswar, Director, Horticulture, VS Prakash, Director, KSNDMC, Anand Krishna, Managing Director, KSSC and UAS and UHS representatives.

Dr. William D Dar, Director General, in his inaugural address acknowledged that the success in Karnataka was largely due to the teamwork of the Department of Agriculture and the strong political will of high-level policy makers in the State. He further appreciated the team work by Eight CG centers and AVRDC for coming together to help smallholder farmers in the state which is a unique model to improve livelihoods of farmers.

Dr. CLL Gowda, Deputy Director General (Research) while acknowledging the efforts of Government of Karnataka emphasized on the need to strengthen the partnership to achieve large number of farmers in the state as well as to upscale the strategy for greater impacts.

Dr Suhas P Wani, presented an overview and the objectives of the workshop, highlighting the program achievements of covering about 7 million ha in four years with increased crop productivity from 23 to 66% in different crops. He also highlighted challenges in increasing adoption, area coverage and achieving impact in 2014. He raised issues of vulnerability of rainfed agriculture to increasing climate risks, food insecurity challenges and sustainability and pointed that Bhoochetana is a potential sustainable approach for solving the problems.

Mr Kaushik Mukherjee, Chief Secretary, GoK, stressed on the reach of the Bhoochetana in terms of area coverage and adoption of new technologies to boost the productivity in the state. He acknowledged Director General, Deputy Director General and the ICRISAT team led by Dr. Wani for their passion and persistence which has improved livelihoods of small farm holders in the state. He emphasized on praradigm shift to adopt holistic approach of farming system through integrated effort of watershed and agriculture department. He further opined to address equity issues arising by development through non-land based activities for landless. He stressed its high point for stake building in Bhoochetana and Bhoochetana Plus by considering farmers need-based technology options.

Mr. GVK Rau, Additional Chief Secretary and Development Commissioner, emphasized about the evident impact of interventions and also showed concern about negligence of water budgeting in the program. He stressed on the climatic variability across the regions and urgent need to address water storage to utilize every drop of water. He urged to adopt integrated effort of land, water and nutrient management to improve the livelihoods of small farm holders.

Mr BharatLal Meena, Principal Secretary, Agriculture, emphasized on bringing in synergy among all of the activities of different line department to happen for the desired impact. He further opined that this partnership involves administrative machinery at the top engaging with different departments and scientists from NARS and international organisations will be useful cocktail of knowledge for strengthening rural livelihoods. He said that the real challenge lies in scaling up and transformation of technologies and experiences.

Mr. Subodh Yadav, Commissioner, Agriculture emphasized on the need to increase area coverage for reaching the unreached. He persistently provoking participants to come up with problems faced during the implementation of these programs and innovative ideas to tackle those problems in their respective districts. He advised that one has to have the determined mindset to help the farmers and urged district level officers to be more proactive to achieve the intended goal.

Dr BK Dharmarajan, Director, Department of Agriculture presented an overview of the Bhoochetana mission project (Bhoochetana II) and Bhoochetana plus, involving four benchmark sites – Bijapur, Raichur, Tumkur and Chikmagalur, stressing the need to increase the adoption and area coverage and also overcome bottlenecks at the implementation level.

Mr HG Shivananda Murthy, Commissioner Watershed offer to converge IWMP with Bhoochetana and focused to address equity in watershed and livelihood options. In his opinion, convergence of various programs of GoI (RKY, National Food Security Mission, National Horticulture Mission, ATMA, National Dairy Plan, KVKs, National Fisheries Development Board program, MNREGA, NABARD etc) is required. He also added that effective monitoring mechanisms at different levels are critical and focused on Green India Mission to enhance ecosystem services through afforestation.

Dr.DL Maheswar, Director, Horticulture, emphasized on the clear roles and responsibilities of partner institutions and issues that are to be addressed during the program. He also mentioned BC plus program should need to think how to address the special situations such as droughts and flood years during the program period. He suggested that this program should have monitoring points that to be checked with frequent intervals.

All 8 CG centers and AVRDC presented their work progress during 2013 and proposed plan of action for the forthcoming season. ICRISAT, CIMMYT, IRRI, IWMI, ILRI, ICARDA and AVRDC focal points were present in the workshop and highlighted their achievements in terms of area coverage, productivity, crop diversification, knowledge dissemination and value chain efforts in four benchmark locations in the state.

The representatives of University of Agricultural Sciences and Horticulture opined that Bhoochetana and Bhoochetana Plus programs are important to improve rural livelihoods. They emphasized on post harvesting processing technologies in BC plus and pointed that all new technologies should reach farmer as a package for better utilisation. They also emphasized on placing students in Bhoochetana program to train them and translate their education to the farmers such as collecting soil samples, understanding soil test results and soil health of their farm etc through KVKs.

The participants were organised into eight major theme-wise groups to discuss and deliberate on the issues of capacity building of farm facilitators, Enhancing awareness and publicity, Input mobilization and quality monitoring and availability, Innovative monitoring and evaluation, documentation and reporting, enhancing involvement of women and youth in Bhoochetana, improving convergence in the districts and strengthening sustainable extension thru ICT-PPP and convergence.

Figure 45. Dr. William D Dar, Director General, ICRISAT addressing Workshop participants

The dignitaries chaired different sessions, provided their suggestions and recommendations for implementation of the programs during 2014. The main theme of this year workshop was to increase adoption and area coverage under Bhoochetana and Bhoochetana Plus.

- It was recommended that all-out efforts need to be made by all the partners for increasing adoption rates from 46 per cent of farmers to 75 per cent farmers and consumption of inputs for improved management practices should be increased from 20 to 40 per cent.
- For building climate change resilience the RAIN network need to be strengthened through active involvement of SAUs. For building resilience, integrated approach (soil, water, crop and nutrient management) to be adopted and scaled up.
- Synergy among all line departments and partners should be brought in scaling up and transformation of technologies to achieve desired impacts.
- Various programs of state and central government need to converge for effective implementation as well as achieving system level outcomes.
- Effective monitoring and evaluation mechanisms at different levels are critical and should focus on Green India Mission to enhance ecosystem services through afforestation.
- Bhoochetana Plus concerned CEOs need to bring in convergence and integration to develop climate smart agriculture using existing resources.
- CEOs need to prepare detailed program without taking into account financial constraints for Bhoochetana Plus districts.
- Innovative proposals from ICRISAT for PR4D are to be taken up for GoKs consideration and necessary approvals.
- State Universities need to integrate RAWE program with BC districts for effective training as well as scaling up. UAS Dharwad and Raichur suggested number of students to undertake research in Bhoochetana sites. Role of KVKs need to be strengthened in on-farm trials, organizing training programs, and monitoring and evaluation of Bhoochetana program.
- Promoting women and youths in Bhoochetana program on alternate livelihood options.
- Taking into account, anticipated drought, we need to undertake aquifer recharging in pilot villages in each district through IWMP.
- Cost effective suitable land-water-nutrient management interventions need to be promoted.
- Color coded soil health card linked with color coded fertilizer formulations can be explored for easy understanding and technology dissemination.
- Protocol for need based irrigation scheduling need to be designed for different crops in different ecological zones.
- Strengthening post-harvesting technology, value chain and market linkages.
- Only additional resources can be made available for the activities which are innovative and not covered under different ongoing schemes of the department.
- For up-scaling DSR method, required machinery should be made available by the department through appropriate arrangements.

Farmer-to-Farmer Videography through Digital Green

With the aim to use new technologies to share agricultural knowledge on timely manner, ICRISAT in collaboration with DigitalGREEN have initiated farmer-to-farmer videography in Karnataka. During the first phase this technology was pilot tested in two distrcts viz., Hassan and Dharwad. After the success of this technology in disseminating information in these two districts, ICRISAT with the help of DigitalGREEN have extended this technology to another four benchmark districts to spread the benfits. The districts are Bijapur, Chikmagalur, Raichur and Tumkur districts. In each district, three RSKs selected for video production and dissemination. DigitalGREEN has organized training programs to impart knowledge about video production, dissemination and data management. The Farm Facilitators, Agricultural Officers of RSKs and ICRISAT Research Technicians and Scientific Officers were trained regularly on different aspects of video production and dissemination.

Chikmagaluru district

In Chikmagaluru District the activities of digitalGREEN were started with a formal meeting with Mr. M. Raju, JDA on 5 September, 2013 in the presence of Drs. KH Anantha, Kaushal Garg, Rajesh Nune of ICRISAT and Mr KJ Ashok Kumar of digitalGREEN. For the activities of digitalGREEN three RSKs of Chikmagalur taluk have been selected. The selected are Kasaba (Beekanahalli, Indavara, Teguru), Amble (Amble, Giddenahalli, Malaluru) and Lakya (Ganadalu, Lakumanahalli, Hosahalli). Three villages from each RSK were opted for dissemination of short films produced and the FFs of respective villages were trained for video production. Following are the villages against respective RSKs selected for the activities of digitalGREEN. Orientation and the video production trainings have been completed in Chikmagalur. The orientation programme was organized on 8 November, 2013 while the Video production training was conducted from 18 to 21 November 2013.

Orientation Programme

In orientation programme, digitalGREEN's Mr Ashok briefed about the role of FFs, AOs, AAOs and ICRISAT staff to be played in video production and dissemination. He also highlighted how dissemination of short films is more effective method than any other extension method to reach more farmers and convince them easily. The programme was attended by Mr. Lokeshappa ADA Chikmagalur, Technical Officer at JDA office, AO/AAOs/FFS of concerned RSKs and ICRISAT staff (Figure 46).

Figure 46. Mr. Ashok Kumar interacting with participants at Orientation Programme.

Video Production Training

The video production training was conducted at JDA, office from 18 to 21 November 2013. digitalGREEN's Dr. Nadagouda and Mr. Ashok Kumar trained the participants for video production and editing (Figure 47). First two days the participants were made to understand the concept digitalGREEN to reach more farmers and convincing them through visual medium of short films. On third day the participants were asked to produce the videos on assigned topics. On the final day, the editing of the produced videos was explained by Dr. Nadagouda.

Figure 47. Mr. Ashok Kumar explaining the participants about the video production techniques (left) FFs are being trained about handling of instruments for video production (Right).

DigitalGREEN's team assigned to complete one short film to each RSK. The video production of assigned short films is under progress. The list of the short films assigned is as follows:

- Groundnut seed treatment using *Rhizobium* and Trichoderma
- Seed germination test using blotting paper
- Zinc, Borax and Gypsum usage in Tomato

Tumkur district

In Tumkur district three RSKs viz., Honavalli, Kasaba and Biligere of Tiptur taluk are selected for DigitalGREEN's farmer-to-farmer videos. One day orientation program held on 17 September 2013. Around 26 participants participated in the orientation program including CEO, JDA, DDs of line departments, staff of DoA, ICRISAT and Farm facilitators. The production training program was organized for three days attended by 14 participants including Staff of ICRISAT, DoA and Farm Facilitators. Dissemination and data management training were organized two and one day respectively with DoA staff, ICRISAT staff and Farm facilitators (Figure 48 & 49).

These training programs will be useful for participants to produce videos independently. Twelve contents are identified for making videos. Screenings have been initiated in three RSKs and these are reported on the digital green website. Two films have been produced during training period-Soil testing sample collection and Banana bunch feeding.

Figure 48. Participants ate the Digital Green orientation program on 17-09-2013 at JDA office, Tumkur.

Figure 49. Digital Green dissemination Training program on 21-11-2013 to 22-11-2013 at Tiptur taluk, Tumkur.

Raichur district

Digital green staff Dr Nadagouda and Mr Ashok Kumar provided one day orientation training to Agriculture, ICRISAT and other line department staff about pico projector and importance of farmer-to-farmer videos. Around 17 participants including ADA, staff of DoA, ICRISAT and farm facilitators participated (Figure 50). Three days production training to ICRISAT staff, Farm facilitator and Agriculture staff regarding handling of camera and story writing about contents for film production was organized. About 12 participants participated. Also training regarding handling of Pico projector and dissemenation of films based on their requirement to farmers/self-help groups in selected villages. To test the technology visit was made to Matamari village and told farm facilitator to show one film regarding seed treatment to sorghum based on problem faced by the farmer to farmer in that 20 farmer**s** attend**ed** the programme and appreciate the method of disseminating the technology.

The main aim of the training programme is to train the participants to produce the video independently and in that we are identified 12 content for video production viz., (1) DSR method of paddy cultivation; (2) Use of yellow trap for white flies in cotton; (3) Seed treatment in sorghum; (4) *Rhizobium* treatment in chickpea; (5) Use of pheromone trap in cotton; (6) Mechanical harvesting in paddy; (7) Dairy farming; (8) Vermicomposting; (9). Preparation of nursery bed in paddy; (10). Benefits of RSK to farmer; (11) Use of cotton weeder in cotton; and (12) *In situ* incorporation of Dhaincha in paddy.

Pico projector were distributed to nine farm facilitators and two films have been produced during training period on seed treatment of Jowar and yellow trap for white flies in Cotton.

Figure 50. Agriculture official, ICRISAT staff and Farm facilitator attended the dissemination training in JDA office at Raichur.

Bijapur district
In Bijapur District, the activities of digitalGREEN were started with a formal meeting with Mr Lingamurthy, JDA on 29 August, 2013 in the presence of Mr Sudi Raghavendra Rao and Mr KJ Ashok Kumar of digitalGREEN.

For the activities of digitalGREEN three RSKs of Bijapur Tq. have been selected. The selected are Bijapur (Malbagayata, Jumnal, Kavalgi), Tikota (Ittangihal, Tikota, Kotyal) and Babaleshwar (Kambagi, Nidoni, and Arjunagi). Three villages from each RSK were opted for dissemination of short films produced. And the FFs of respective villages were trained for video production. Following are the villages against respective RSKs selected for the activities of digitalGREEN. Till now the Orientation programme, video production trainings and video dissemination trainings have been completed. The orientation programme and video production training was conducted from 16 to 20 September 2013.

Orientation Programme:
In orientation programme, digitalGREEN's Mr. Ashok briefed the gathering about the role of FFs, AOs, AAOs and ICRISAT staff to be played in video production and dissemination. He also highlighted how dissemination of short films is more effective method than any other extension method to reach more farmers and convince them easily. The programme was attended by Mr. Sangamesh, ADA Bijapur, TOs at JDA office, AO/AAOs/FFS of concerned RSKs, line department officials and ICRISAT staff (Figure 51 & 52).

Video Production Training
The video production training was conducted at ADA, office from 17 to 20 September 2013. digitalGREEN's Dr. Nadagouda and Mr. Ashok Kumar trained the participants for video production and editing. First two days the participants were made to understand the concept digitalGREEN to reach more farmers and convincing them through visual medium of short films. On third day the participants were asked to produce the videos on assigned topics (Figure 53&54). On the final day, the editing of the produced videos was explained by Dr. Nadagouda. During production training period we produced two final films viz., fertilizer testing and seed germination test.

Figure 51. Mr. Ashok Kumar briefing about digitalGREEN program to JDAs.

Figure 52. Mr. A.P. Biradar welcoming participants for DigitalGREEN orientation program.

Figure 53. Hands on training on video shooting at Bijapur.

Figure 54. Hands on training on video shooting at Bijapur.

Video Dissemination Training

The video dissemination training was conducted at ADA, office from 11 to 13 November 2013. digitalGREEN's Dr. Nadagouda and Mr. Ashok Kumar trained the farm facilitators for video dissemination and data entry training for AOs/AAO and ICRISAT staff. First day farm facilitators were made to understand the importance of video dissemination and steps to be taken during dissemination, on Second day we went to Ittangihal village for dissemination of the produced video. Farm facilitator Mr. S. Kulkarni disseminated film lime water feeding to milch animals then interacted with farmers. Third day Dr. Nadagowda and Mr. Ashok Kumar trained AO's, AAO and ICRISAT staff regarding data management of disseminated videos and adopted farmers name in the digitaGREEN website.

Tablet-based Extension System

Krishi Gyan Sagar (KGS)

Innovative tablet based extension system 'Krishi Gyan Sagar' was launched by Hon. Minister Sri Krishna Byre Gowda on July 4th 2013. Krishi Gyan Sagar (KGS) in android based application developed by ICRISAT with help of software development firm NUNC Systems. The main objective of KGS is to enhance the information dissemination processes as well as establish simplified communication channel with farmers. The important tool in this initiative is tablet device. As a pilot, we have provided tablets to selected farm facilitators and department staff (Table 8).

Brief description of KGS app:
First version of KGS application contents four modules: soil fertility maps, fertilizer recommendation, farmer's registration and package of practices.

Soil fertility maps: GIS maps of soil fertility for pH, electrical conductivity, organic carbon, potassium, phosphorous, sulfur, boron, and zinc are included in KGS app. These images will be available in application based on users credentials. For example, farm facilitator from Bijapur district will able to see only Bijapur images.

Package of practices: Information about package of practices for different crops is collected from UAS, Raichur. Information is available in Kannada language. User can select required crop from the list to see the information.

Farmers' registration: In this module Farm Facilitator can register the farmers. In this, we can collect basic information of farmer; his/her land holding, cropping practices, etc. Multiple farms can be registered under one farmer.

Fertilizer recommendation: The KGS application is backed back soil test based fertilizer recommendation database for each taluk in Karnataka state. Location, size and crop of registered farm (Farmers' Registration module) will be used to estimate fertilizer requirement.

Table 8. Distribution of tablet device in four pilot districts

District	Taluk	RSK	Villages	No. of DoA Staff	No. of Farm facilitators
Raichur	Raichur and Manvi	Gillesugur, Mallat, Neermanvi	Gillesugur, Idapanur, Kurkunda, Vadavatti, Betadur, Karadigudda, Haravi, Mallat	7	9
Bijapur	Bijapur	Babaleshwar, Bijapur, Tikota	Kambagi, Arjunagi, Sangapur, M.Bagayat, Jumnal, Kavalagi, Kotyal, Tikota, Itangihal	5	9
Tumkur	Tiptur	Biligere, Honnavalli, Kasaba	Kadashettihalli, Kallushettihalli, Ayarahalli, Paruvagondanahally, Suragondanahalli, Rudrapura, Mattihalli, Chikkabidire, Karikere	5	9
Chickman galur	Chickmang alur	Lakya, Kasaba, Amble	U.Hosahalli, Lakkamanahalli, Lakya, Beekanahalli, Indavara, Tegur, Amble, Mugulavalli, Marle	6	9

Figure 55. Launch of the Krishi Gyan Sagar and Krishi Vani by Hon Agricultural Minister Sri. Krishna Byre Gowda

Training Programs for Krishi Gyan Sagar

Four training programs were conducted at four pilot locations. During these training programs Krishi Gyan Sagar (KGS) was explained in detail like synchronization process, importance of data flow from app – server and server – app, farmer and farm registration and editing the saved information, searching a particular farmer in the list, fertilizer recommendation, production package and soil maps. User privileges were explained like FF can register – edit farmers and cannot delete entered record. All other app users can only view entered data after synchronizing. Three ODK (Open Data Kit) collect forms (CCE: crop cutting experiment, GPS, Field visit) were explained to VS and RT to collect field data with GPS location and picture to send over to the server, from where it can be accessed globally with secure username and password. To secure the tablets from virus attacks, anti-virus app was installed in all tablets. All the trainings were conducted in JDA and ADA offices of the respective districts so that government officials can also be part of the trainings. All help and support was provided my government officials to conduct trainings at their venues. In trainings, we aim to provide the best environment to all participants by following the concept of interactive teaching where all the questions were addressed and possible issues were noted down, so that an advanced version of KGS can come up with all the neglected features integrated in it.

Figure 56. Raichur Training Session. Dated – 29 Oct 2013

Figure 57. Bijapur training participants. Dated – 25 Nov 2013

Figure 58. Tiptur, Tumkur Training Session. Dated – 02 Dec 2013

Figure 59. Chikmagalur Training Session. Dated – 03 Dec 2013

Challenge: The application requires data to and from the server through internet to complete its initial full synchronization and partial synchronizations later. There is need to have Wi-Fi broadband connection or a Wi-Fi hotspot at each JDA/ADA office. And right at this point all JDA/ADA offices and KVKs are not well equipped with Wi-Fi.

Krishi Vani

Krishi Vani is voice message service. Hon. Minister Sri. Krishna Byre Gowda has sent message through Krishi Vani while launching the service. Krishi Vani SIM cards were distributed to selected farm facilitators in pilot sites. This service is part of PPP between BC team, IKSL, and Airtel. Airtel and IKSL are having green SIM card program. Green SIM card holder can receive four free voice messages about agriculture information. These short voice messages contain information about farming practices of seasonal crop, weather forecast, agricultural related schemes, and other public information. Pre-recorded messages sent from IKSL server; however experts can record the message on phone and can send the messages to all community.

Figure 60. Launch of Krishi Vani by Hon. Agriculture Minister Shri Krishna Byre Gowda.

Free voice messages will be transmitted to the registered holders. Voice messages transmitted in a district will be different from other districts. Voice messages will directly focus on particular district's agricultural needs plus health and other public issues. 28 voice messages per week and 4 voice messages per day will be sent to the sim owner, all free of cost, whereas other companies are charging for this kind of voice messages. 2 Voice messages will be related to local agricultural needs, 1 will be related to dairy and animal husbandry and 1 will be related to health in rural areas and food nutritional subject. In total there will be 16 different categories of messages – contents of these messages will be provided by scientific partners like ICRISAT. Kisan call center has been established where farmers can call during working hours to have solutions to their agricultural problems. Three different levels of expert teams are there in call center to resolve farmer issues: team one: agriculture graduates, team two: scientists and team three: agriculture directors. Missed messages of the day can be heard again on a call back number. Farmers were explained that IFFCO and Airtel have no private motive in this project, and no messages promoting IFFCO or Airtel sale will be aired.

Other Tools on Tablet Device

ODK Collect
ODK Collect is a free android application being used for data collection. This app used by ICRISAT staff placed in Karnataka to send information about their field visits. The field visit data contains GPS coordinates, photograph, and observation during field visit. The data is being collected on tablet devices and sent to remote server. From remote server the data is being archived on local server at ICRISAT. Selected photographs with description can be shared through free web services like Flickr.com. All Research Technicians and Scientific Officers are trained to use the ODK Collect app on their tablet device.

Whatsapp
Recently a Whatsapp group has been created for Karnataka Bhoochetana staff including RT, SO, and district incharge, and scientists. Members on ground are sharing photographs and their field observations through this group.

Facilitation of Project Activities in the Mission-mode

To provide good beginning for the II phase activities, a kharif season planning workshop was held at ICRISAT, Patancheru during January-February 2013 to discuss and understanding of the mission-mode approach to the project. Planning of activities, execution of trainings schedules, awareness campaigns and field publicity was organized in quick succession with the active participation of DoA and ICRISAT staff. Coordination with DoA staff for inputs mobilization, especially expediting the procurements or placing inputs at the disposal of field staff for easy distribution to farmers in a timely manner was harmonized. ICRISAT facilitated timely procurement of groundnut (ICGV 91114), pigeonpea cultivars, bajra hybrids, and soybean cultivars by DoA. ICRISAT staff participated and facilitated weekly review meetings in each district to provide update of field activities and to provide any assistance for farmers' problems.

Format for weekly progress reporting developed by ICRISAT for Bhoochetana I phase was used and ICRISAT staff facilitated regular feedback weekly from districts to ICRISAT and SCC through a comprehensive checklist format.

As in Bhoochetana Ist phase, intense monitoring of field trials were continued by DoA and ICRISAT SCC members through direct contact with ICRISAT staff, farmers and field facilitators, and DoA officials in districts using the pocket telephone directory published by DoA in Bengaluru.

Awareness and Field Publicity Campaigns on Bhoochetana II for Farmers

In Bhoochetana II phase also the Department of Agriculture staff ensured that wall writings (Figure 61) and exhibition of posters in the local language were set up in all villages before the onset of monsoon, pointing out the main objectives of the program and areas to be covered by the program. Additionally thousands of brouchures and handouts were published and distributed widely in each district on improved management practices, information on nutrients status, and nutrients recommended taluk-wise (Figure 62).

Figure 61. Wall writing in Gowribidanur, Chikkaballpur district.

Figure 62. Bhoochetana Ratha for awareness building in Shimog (L) and Brochure on Bhoochetana in Ramanagar (R)

Rainfed Crop Planning during 2013

Target Area Sown to Major Crops in Rainy Season

During kharif season under Bhoochetana II phase, farmers were motivated to cover a large area under Bhoochetana activities for possible benefits to participating farmers in the technology uptake of the project. During rainy season, Bhoochetana activities were targeted to cover an area of 56 lakh ha with improved management to enhance rainfed as well as irrigated crop productivity in all 30 districts. The project implemented crop productivity enhancement technologies on 50.4 lakh ha in Karnataka, which was 89.9% of the target area with major creals, legumes and oilseed crops (Table 9).

Table 9. District-wise target cropping area (hectares) sown to major crops during Kharif crop season 2013.

S.No	District	Major rainfed crop	Target area	Area sown	% Achieved
1	Bagalkot	Sorghum	1500	1500	100
	Bagalkot	Perl millet	22000	18535	84
	Bagalkot	Maize	34000	25011	74
	Bagalkot	Pigeonpea	5000	5000	100
	Bagalkot	Green gram	26500	26500	100
	Bagalkot	Sunflower	5000	4230	85
	Bagalkot	Soybean	3000	3000	100
2	Bengaluru Rural	Ragi	44000	39314	89
	Bengaluru Rural	Maize	10000	12500	125
3	Bengaluru Urban	Ragi	20000	20000	100
4	Belgaum	Rice	64000	62579	97.8
	Belgaum	Jowar	23000	21934	95.4
	Belgaum	Maize	40000	52655	131.6
	Belgaum	Bajra	15000	8680	57.9
	Belgaum	Tur	5000	254	5.1

	Belgaum	Black gram	3000	3000	100.0
	Belgaum	Green gram	24000	15077	62.8
	Belgaum	Cowpea and others	2000	1383	69.2
		Groundnut	35000	32827	93.8
	Belgaum	Sunflower	5000	1744	34.9
	Belgaum	Soybean	80000	79037	98.8
	Belgaum	Cotton	30000	23144	77.1
5	Bellary	Paddy	70000	65643	94
	Bellary	Jowar	25000	19598	78
	Bellary	Maize	59000	70853	120
	Bellary	Bajra	12000	16700	139
	Bellary	Tur	9000	9321	104
	Bellary	Groundnut	56000	48021	86
	Bellary	Sunflower	28000	11933	43
	Bellary	Cotton	15000	30992	207
6	Bidar	Sorghum	58075	38860	66.9
	Bidar	Maize	2900	2022	69.7
	Bidar	Pearl Millet	6420	4540	70.7
	Bidar	Black gram	35282	23352	66.2
	Bidar	Green gram	33334	23186	69.5
	Bidar	Pigeonpea	65765	72013	109.5
	Bidar	Soybean	85864	112699	131.2
7	Bijapur	Maize	35000	65225	186
	Bijapur	Bajra	28500	35600	125
	Bijapur	Redgram	175000	152575	87
	Bijapur	Sunflower	20500	13515	66
	Bijapur	Green gram	12000	6839	57
	Bijapur	Groundnut	27000	16000	59
8	Chamarajanagara	Ragi	14550	13775	94.67
	Chamarajanagara	Maize	26450	32792	123.98
	Chamarajanagara	Sorghum	18000	13577	75.43
	Chamarajanagara	Ground	18000	16457	91.43
	Chamarajanagara	Sunflower	16050	8092	50.42
	Chamarajanagara	Green Gram	2600	2716	104.46
	Chamarajanagara	Black Gram	5000	4650	93
	Chamarajanagara	Avare	3250	1910	58.77
	Chamarajanagara	Cowpea	3000	2608	86.93
	Chamarajanagara	Cotton	5100	10740	210.59
9	Chikkaballapur	Ragi	41000	45117	110
	Chikkaballapur	Maize	39000	44827	114
	Chikkaballapur	Pigeonpea	8000	4950	61
	Chikkaballapur	Field Bean(Avare)	5000	4173	83
	Chikkaballapur	Groundnut	32500	19263	59
10	Chikkamagaluru	Paddy	31100	32210	103.6
	Chikkamagaluru	Ragi	46500	41335	88.9
	Chikkamagaluru	Maize	24700	33950	137.4
	Chikkamagaluru	Groundnut	3300	5950	180.3
	Chikkamagaluru	Sunflower	4940	4493	91.0

11	Chitradurga	Groundnut	146000	106860	73
	Chitradurga	Maize	81000	80913	100
	Chitradurga	Ragi	35000	30990	89
	Chitradurga	Redgram	11000	8331	76
	Chitradurga	Green gram	3000	2975	99
	Chitradurga	Cotton	9000	8350	93
12	D. Kannada	Paddy	25000	25000	100
13	Davanagere	Sorghum	11000	13211	120
	Davanagere	Ragi	11000	4725	43
	Davanagere	Maize	154000	176833	115
	Davanagere	Redgram	4000	9081	227
	Davanagere	Fieldbean	1000	1151	115
	Davanagere	Groundnut	12000	6872	57
	Davanagere	Sunflower	4000	1114	28
	Davanagere	Cotton	30000	20485	68
	Davanagere	Paddy	55000	55312	101
	Davanagere	Sugarcane	3000	4519	151
14	Dharwad	Soyabean	34000	32602	96
	Dharwad	Groundnut	29000	26750	92
	Dharwad	Greengram	27000	20930	78
	Dharwad	Maize	20000	23900	120
	Dharwad	Paddy	20000	19000	95
	Dharwad	Hy. cotton	24500	31318	128
15	Gadag	Maize	17000	10768	63
	Gadag	Bajra	2000	1385	69
	Gadag	Jowar	7000	4885	70
	Gadag	Green gram	70000	67186	96
	Gadag	Tur	3000	1971	66
	Gadag	Groundnut	55000	36545	66
	Gadag	Sunflower	14000	5381	38
	Gadag	Cotton	12500	7275	58
16	Gulbarga	Blackgram	54000	34369	64
	Gulbarga	Greengram	41000	17741	43
	Gulbarga	Pigeonpea	320000	344625	108
	Gulbarga	Sunflower	46000	23517	51
	Gulbarga	Pearl millet	18000	15759	88
17	Hassan	Ragi	69765	68530	98
	Hassan	Paddy	52350	46380	89
	Hassan	Maize	66325	65890	99
	Hassan	Jowar	2350	1805	77
	Hassan	Black gram	2200	1375	63
	Hassan	Green gram	12100	4295	35
	Hassan	Cowpea	12700	13460	106
	Hassan	Avare	4625	3513	76
	Hassan	Red gram	2175	1415	65
	Hassan	Groundnut	1260	407	32
	Hassan	Sunflower	650	280	43
	Hassan	Castor	1450	927	64

	Hassan	Cotton	50	5	10
	Hassan	Sugarcane	2000	1610	81
	Hassan	Cotton	50	5	10
18	Haveri	Cotton	79000	79000	100
	Haveri	Groundnut	15000	14750	98
	Haveri	Maize	133150	108500	82
	Haveri	Soybean	53000	19618	37
	Haveri	Sorghum	8000	6256	78
	Haveri	Paddy	9850	9040	92
	Haveri	Pulses	8500	4998	59
19	Kodagu	Paddy	29500	29051	98
	Kodagu	Maize	3000	3000	100
20	Kolar	Ragi	60000	44987	75
	Kolar	Groundnut	12000	6599	55
	Kolar	Pigeonpea	4000	2133	53
	Kolar	Cowpea	2000	1172	59
	Kolar	Avare	9000	4054	45
21	Koppal	Maize	19000	38720	204
	Koppal	Jower	10000	2419	24
	Koppal	Pearl millet	54000	54814	102
	Koppal	Tur	13000	9983	77
	Koppal	Horse gram	6000	2169	36
	Koppal	Green gram	12500	20853	167
	Koppal	Groundnut	25000	9143	37
	Koppal	Sunflower	20500	15926	78
	Koppal	Paddy	35000	32775	94
22	Mandya	Ragi	62500	32046	51
	Mandya	Maize	4000	2680	67
	Mandya	Cowpea	4500	3580	80
	Mandya	Groundnut	1000	770	77
	Mandya	Paddy	55000	55312	101
	Mandya	Sugarcane	20000	11734	59
23	Mysore	Ragi	44000	28869	66
	Mysore	Cotton	44000	46274	105
	Mysore	Maize	32000	31656	99
	Mysore	Cowpea	26000	28061	108
	Mysore	Fieldbean	18000	7774	43
	Mysore	Black gram	10000	8066	81
	Mysore	Groundnut	6000	3553	59
	Mysore	Sorghum	5000	4821	96
	Mysore	Redgram	3000	2717	91
	Mysore	Green gram	6000	5063	84
	Mysore	Sunflower	1000	785	79
	Mysore	Paddy	90000	99244	110

	Mysore	Sugarcane	7000	7049	101
24	Raichur	Bajra	50,000	44,100	88
	Raichur	Tur	40,000	40,762	102
	Raichur	Sunflower	30,000	36,410	121
	Raichur	Groundnut	5,000	2,026	41
	Raichur	Cotton	30,000	24,744	82
	Raichur	Paddy	96,000	90,009	94
25	Ramanagara	Red gram	4000	3944	99
	Ramanagara	Ragi	75000	73550	98
	Ramanagara	Cowpea	2500	2450	98
	Ramanagara	Fieldbean	4000	3925	98
	Ramanagara	Maize	1500	1400	93
	Ramanagara	Groundnut	7000	5130	73
26	Shimoga	Maize	55000	55000	100
	Shimoga	Paddy (rainfed)	20000	20000	100
	Shimoga	Paddy (irrigated)	60000	59800	99.6
	Shimoga	Sugarcane	2000	1975	96.25
27	Tumkur	Green gram	12000	9,117	75.98
	Tumkur	H. Maize	20000	12,841	64.21
	Tumkur	Ragi	184000	137,688	74.83
	Tumkur	Groundnut	151000	76,540	50.69
	Tumkur	R.Gram	23000	11,478	49.90
	Tumkur	Avare	13500	6,690	49.56
	Tumkur	Cowpea	3500	2,482	70.91
28	Udupi	Paddy	45000	44367	99
29	Uttara Kannada	Paddy	68500	66157	96.58
	Uttara Kannada	Maize	4000	4000	100.00
	Uttara Kanada	Cotton	2000	1400	70.00
	Uttara Kanada	Sugarcane	4000	4000	100.00
30	Yadgir	Pigeonpea	50250	55288	110.03
	Yadgir	Cotton	17350	25476	146.84
	Yadgir	Paddy	13000	34700	99.14
	Yadgir	Greengram	36600	24850	67.90
	Yadgir	Pearl millet	14200	25485	179.47
Total	**30 Districts**	**All crops**	**5609830**	**5041300**	**89.9**

Input Distribution during Kharif Season

Distribution of fertilizers and micronutrients to farmers did not follow any particular pattern and in all the districts use of one nutrient or the other is high as balanced and recommended usage of nutrients was not achieved. Since Bhoochetana was operationalized in all the 30 districts, farmers purchased inputs knowing the advantage of inputs. However, better efforts of DoA and ICRISAT staff to create awareness among farmers about the advantage of correcting nutrient deficiencies might have helped in changing farmers' interest in the use of micronutrients to enhance their crop productivity and incomes (Table 10).

Table 10. District-wise micronutrients (requirements based on soil analysis) actual distribution to farmers during *Kharif* 2013.

S No.	District	Crops	Target quantity (tons)			Quantity distributed (tons) & % target		
			Gypsum	$ZnSO_4$	Borax	Gypsum	$ZnSO_4$	Borax
1	Bagalkot	Sorghum, Pearl millet, maize, Pigeonpea, Greengram, Sunflower	9700	485	242.5	4150	400	185
2	Belgaum	Paddy, Jowar, Maize, bajra, Pigeonpea, Blackgram, Greengram, Cowpea, Groundnut, Soybean, Cotton	32601	1630	815	8616	1340	262
3	Bellary	Paddy, Sorghum, Pigeonpea, Cotton, Sunflower, Maize, Pearl Millet, Groundnut	27400	1370	685	4363 (15.9)	388 (28.3)	86 (12.5)
4	Bengaluru—R	Ragi, maize	5400	99	45	1064 (19.7)	51.32 (51.8)	17.56 (39.0)
5	Bengaluru—U	Ragi	1000	100	40	453.2 (45.3)	44 (44.0)	19 (47.5)
6	Bidar	Maize, Sorghum, Green gram, Black gram, Pigeonpea, Soybean,	31200	1745	779	3820 (12.2)	685 (39.3)	240 (30.8)
7	Bijapur	Maize, bajra, Redgram, Sunflower, Greengram, Groundnut	29800	1801	715	3762	403.5	71.9
8	Chamarajanagara	Ragi, Maize, Sorghum, Green Gram, Black gram, Avare, Cowpea, Cotton	13200	660	261	3181 (77.1)	106.38 (50.5)	56.45 (48.8)
9	Chikkaballapur	Ragi, maize, pigeonpea, field bean, & Groundnut	3000	194	51	1808.5 (60)	93.9 (48)	32.3 (63)
10	Chikamagalur	Paddy, Ragi, Maize, Groundnut, Sunflower	13450	672.50	336.25	4600 (34.2)	365 (54.3)	122 (36.3)
11	Chitradurga	Groundnut, Maize, Ragi, Redgram, Greengram, Cotton	28500	2850	1425	3010 (11.0)	493 (17.0)	154 (11.0)
12	Dakshina Kannada	Paddy/Rice	6250	312.5	31.25	1693 (27)	46.4 (14.8)	30 (95)
13	Davanagere	Sorghum, Ragi, Maize, Redgram, Fieldbean, Groundnut, Sunflower, Cotton, Paddy, Sugarcane	15675	784	314	9754 (62.0)	686 (88.0)	262 (83.0)
14	Dharwad	Soybean, Groundnut, Greengram, Maize, Paddy, Hy.Cotton	7725	772.5	250	4249	827.1	137.13
15	Gadag	Maize, Bajra, Jowar, Greengram, Pigeonpea, Groundnut, Sunflower, Cotton	1800	900	360	2389	302	89
16	Gulbarga	Blackgram, Greengram Pigeonpea, Sunflower Pearl millet,	49000	1877	938	5330 (12.02)	1070 (2.4)	348 (0.8)

S No.	District	Crops	Target quantity (tons)			Quantity distributed (tons) & % target		
			Gypsum	$ZnSO_4$	Borax	Gypsum	$ZnSO_4$	Borax
17	Hassan	Fingermillet, paddy, maize, Jowar, Blackgram, Greengram, Cowpea, Avare, Redgram, Groundnut, Sunflower, Castor, Cotton	23000	1150	575	3494 (15.2)	307 (26.7)	112.77 (19.6)
18	Haveri	Paddy, Maize, Sorghum, Pulses, Groundnut, Soybean, Cotton	26100	1305	653	2564 (10)	478 (37)	89 (14)
19	Kodagu	Paddy, Maize	3520	163	65	698 (21)	24.75 (15)	15.25 (23)
20	Kolar	Ragi, pigeonpea, field bean, avare, and groundnut	8700	435	217	1589.0 (18)	55.3 (13)	33.2 (15)
21	Koppal	Hy. Jawar, Maize, Bajra, Sunflower, Ground nut, Green gram, tur and Horsegram	39000	1950	975	2950 (8)	425 (22)	125 (13)
22	Mandya	Ragi, Maize, Cowpea, Groundnut, Paddy, Sugarcane	14700	735	368	1543 (10)	122 (17)	36 (10)
23	Mysore	Ragi, Cotton, Maize, Cowpea, Fieldbean, Blackgram, Groundnut, Greengram, Redgram, Sunflower, Sorghum, Paddy, Sugarcane	29200	1460	5847	4356 (15.0)	428 (29.0)	150 (3.0)
24	Raichur	Bajra, Pigeonpea, Sunflower, Groundnut, Cotton, Paddy	15500	387.5	775	737 (5.0)	45.5 (12.0)	687 (89)
25	Ramanagara	Redgram, Ragi, Cowpea, Fieldbean, Maize, Groundnut	9400	470	235	3546 (38)	207 (44)	120 (51)
26	Shimago	Maize, paddy	7500	188	375	5425 (72)	170 (90)	342 (91)
27	Tumkur	Greengram, Hy.maize, Finger millet, Groundnut, Redgram, Avare, Cowpea	40700	844	2110	3100 (7.62)	35.63 (4.22)	150.9 (7.15)
28	Udupi	Paddy	4500	225	90	796 (18)	43 (19)	9 (10)
29	Uttara Kannada	Paddy, maize, Cotton, Sugarcane	3925	392.5	196	1100 (14.56)	40.01 (0.53)	12 (0.15)
30	Yadgir	Pigeon pea Cotton Paddy Green gram Pearl millet	17050	853	426	630 (3.7)	310 (36.3)	16 (3.7)

Target Area Sown to Major Crops in Rabi Season

During Rabi season under Bhoochetana II phase, farmers were motivated to cover a large area under Bhoochetana activities for possible benefits to participating farmers in the technology uptake of the project. In this season, Bhoochetana activities were targeted to cover an area of 25 lakh ha with improved management to enhance rainfed as well as irrigated crop productivity in all 30 districts. The project implemented crop productivity enhancement technologies on 22.6 lakh ha in 15 districts of Karnataka, which was 91% of the target area with major creals, legumes and oilseed crops (Table 11).

Table 11. District-wise target cropping area (ha) sown to major crops during Rabi season 2013-14

Districts	Crops	Target	Area sown	% achieved
Baglkote	Rabi jowar, Cowpea. Sunflower. Sugarcane	145000	137679	95
Belgaum	Rabi jowar, Cowpea. Wheat	200000	183353	92
Bellary	Rabi jowar, Cowpea. Sunflower. Sunflower	145000	96026	66
Bidar	Rabi jowar, Cowpea. Sunflower, Sunflower, Wheat	100000	90292	90
Bijapur	Rabi jowar, Cowpea	325000	301014	93
Chikkmanglore	Rabi jowar, Cowpea	20000	26607	133
Chithrdurga	Rabi jowar, Cowpea	20000	17631	88
Davngere	Rabi jowar, Cowpea. Wheat, Maize	10500	14949	142
Dharwad	Rabi jowar, Cowpea. Wheat. Sunflower	137000	135357	99
Gadag	Rabi jowar, Sunflower, safflower, Wheat, Cotton	220000	198237	90
Gulbarga	Rabi jowar, Sunflower, safflower, Wheat.	450000	409747	91
Haveri	Rabi jowar, Sunflower, Cowpea	44000	32913	75
Koppal	Rabi jowar, Sunflower, safflower, Wheat. Cotton. Mize	132000	127717	97
Raichur	Rabi jowar, Sunflower, Safflower, Wheat, Cotton, Paddy, Groundnut	411500	378580	92
Yadgir	Rabi jowar, Sunflower, Safflower, Wheat, Groundnut	140000	113730	81
Total	**All crops**	**2500000**	**2263832**	**91**

Input Distribution during Rabi Season

Bhoochetana was operationalized in 15 districts where Rabi season crops were grown, farmers purchased inputs knowing the advantage of inputs in all these districts. However, better efforts of DoA and ICRISAT staff to create awareness among farmers about the advantage of correcting nutrient deficiencies might have helped in changing farmers' interest in the use of micronutrients to enhance their crop productivity and incomes (Table 12).

Table 12. District-wise micronutrients (requirements based on soil analysis) actual distribution to farmers during Rabi 2013-14.

District	Target quantity (tons)			Quantity distributed (tons) & % target		
	Gypsum	$ZnSO_4$	Borax	Gypsum	$ZnSO_4$	Borax
Bagalkot	14500	725	290	4650 (32)	340 (47)	110 (37.9)
Belgaum	20000	1000	400	3000 (15)	650 (65)	95 (23.8)
Bellary	14500	725	290	1025 (7)	10 (1)	146 (50.3)
Bidar	10000	500	200	1886 (19)	252 (50)	140 (70.0)
Bijapur	32500	1625	650	1857 (6)	239 (15)	40 (6.2)
Chikmagalur	2000	100	40	300 (15)	60 (60)	12 (30.0)
Chitradurga	2000	100	40	361 (18)	91 (91)	31 (77.5)
Davanagere	1050	53	21	650 (62)	244 (465)	112 (533.3)
Dharwad	13700	685	274	110 (1)	112 (16)	31 (11.1)
Gadag	22000	1100	440	1854 (8)	655 (60)	146 (33.2)
Gulbarga	45000	2250	900	3500 (8)	102 (5)	590 (65.6)
Haveri	4400	220	88	280 (6)	36 (16)	14 (15.3)
Koppal	13200	660	264	2450 (19)	180 (27)	72 (27.3)
Raichur	41150	2058	823	457 (1)	488 (24)	16 (1.9)
Yadgir	14000	700	280	2800 (20)	380 (54)	85 (30.4)
TOTAL	250000	12500	5000	25180	3839	1639

Yiled Analysis of Major Crops in Karnataka

During rainy 2013 season in Karnataka, certain farmers were selected for participatory trials out of those who followed improved management in their fields in order to evaluate the effects of improved crop management. The improved management also involved soil test-based balanced nutrient management which similarly included the application of deficient S, B and Zn in addition to only N, P and K plus other best practices. There were two treatments—(1) farmers practice (FP) of application of N, P and K, and traditional crop cultivation; (2) Improved management comprising soil test-based nutrient management (application of N, P and K plus deficient S, B and Zn) plus other improved crop practices. The soil test-based balanced nutrient management protocols were developed based on the soil test results at the taluk level. The basis used was to recommend full rate of a nutrient in case more than 50% of farmers' fields were deficient in that nutrient, and recommend only half the rate of the nutrient in case less than 50% farmers' fields were deficient in that particular nutrient. During the end of the season, crop cutting experiments were conducted with all prominent crops, such as chickpea, sorghum, sunflower and safflower.

In Karnataka as a whole, the cereals yield increase was significant during rainy season 2013 (Figure 63). The yield increase was ranging between 20 to 53 per cent across different cereals. The highest yield was recorded in maize but in terms of incremental yield pearl millet recorded highest as the difference between farmers practice and improved practice was about 43 per cent. Similarly, legumes also have performed significantly over farmers practice. The yield increase was between 28 to 37 per cent.

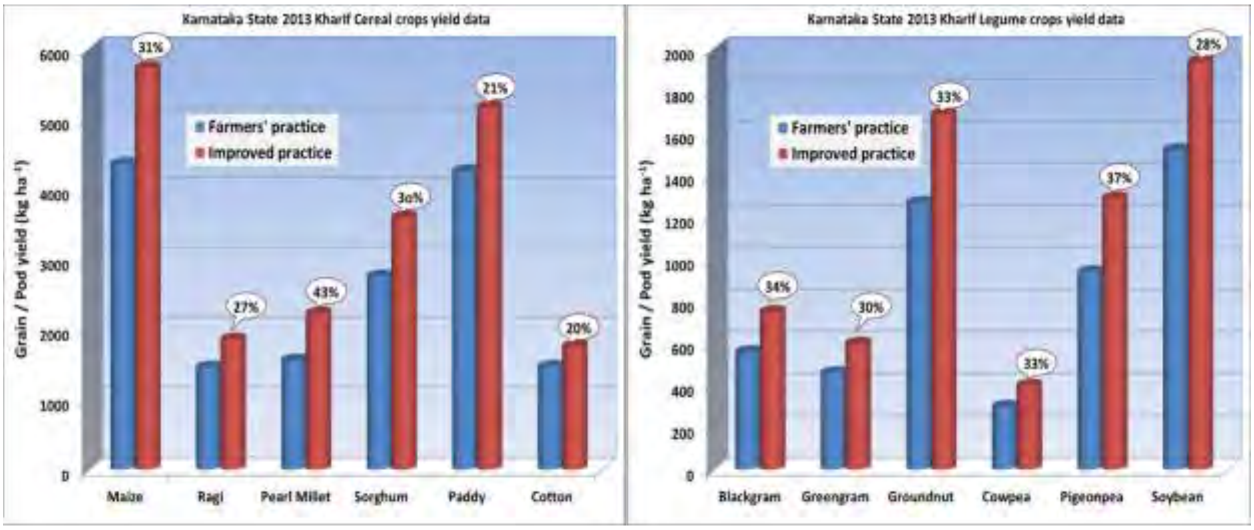

Figure 63. Cereals and legumes yield during rainy season 2013 in karanataka

The district-wise analysis indicates the similar trend across different rainfall zones in the state (Figure 64-76).

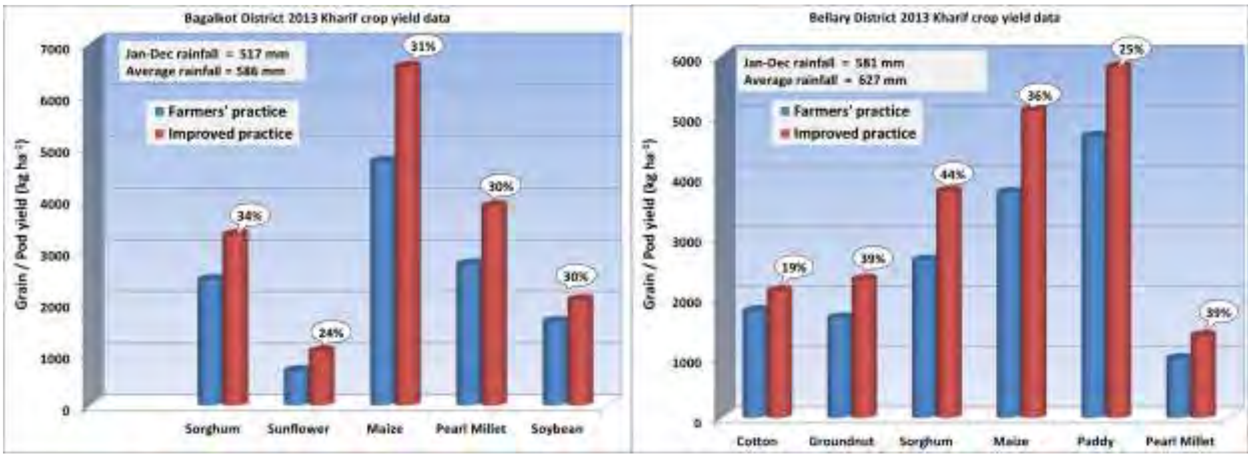

Figure 64. Crop yield in Bagalkot and Bellary districts during Rainy season 2013

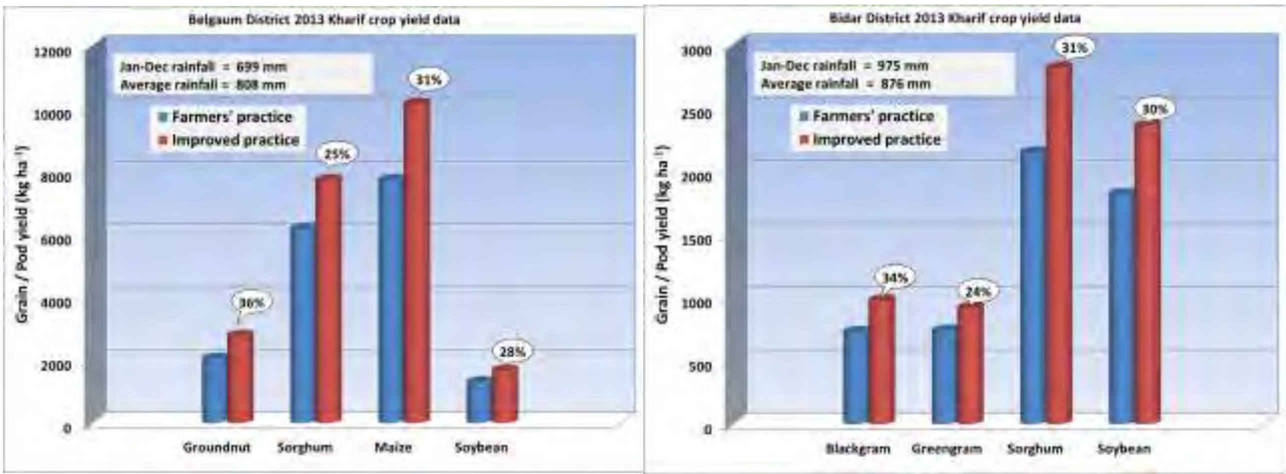

Figure 65. Crop yield in Belgaum and Bidar districts during Rainy season 2013

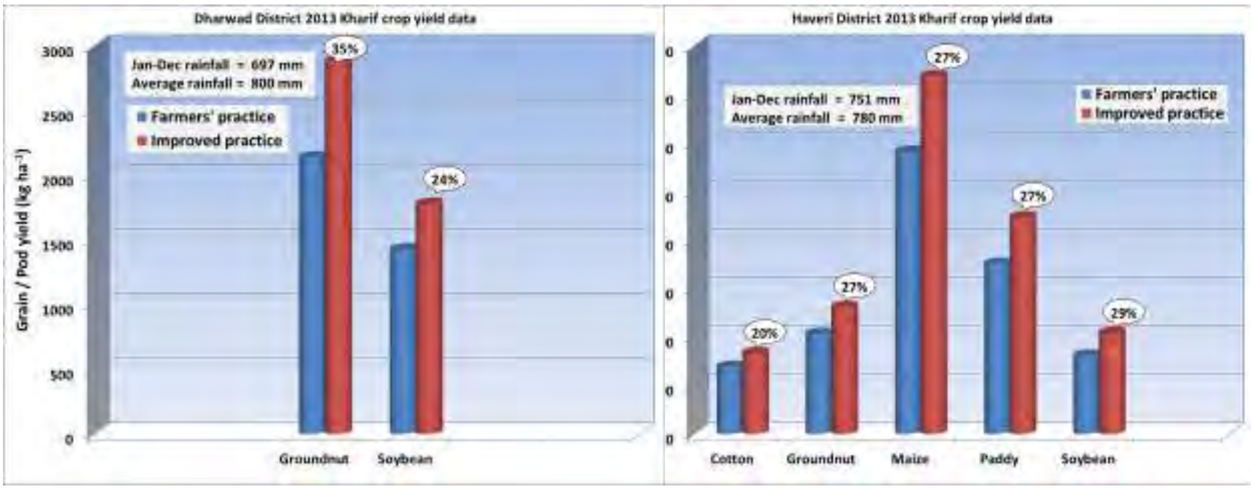

Figure 66. Crop yield in Dharwad and Haveri districts during Rainy season 2013

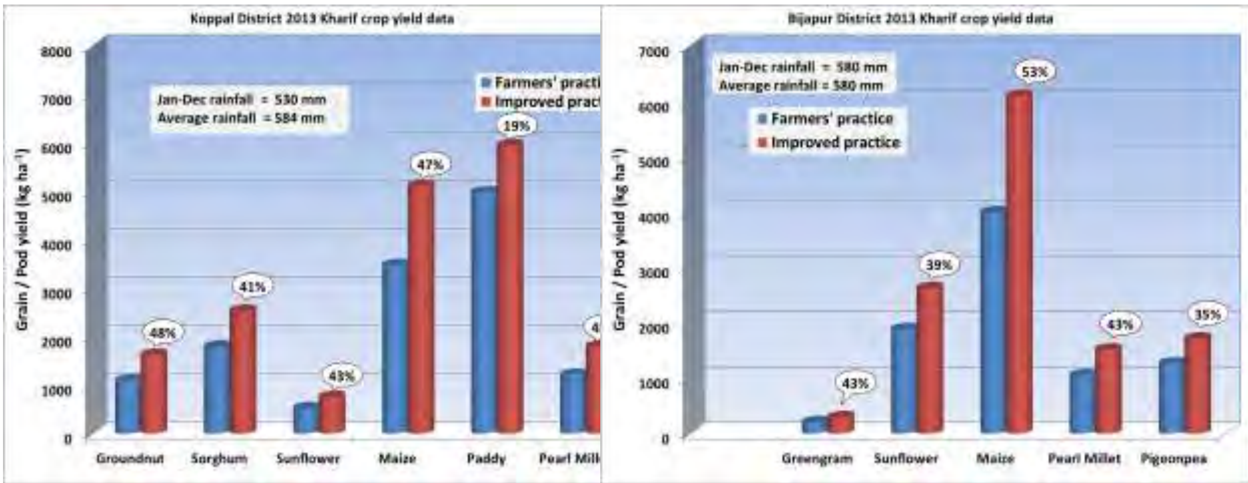

Figure 67. Crop yield in Koppal and Bijapur districts during Rainy season 2013

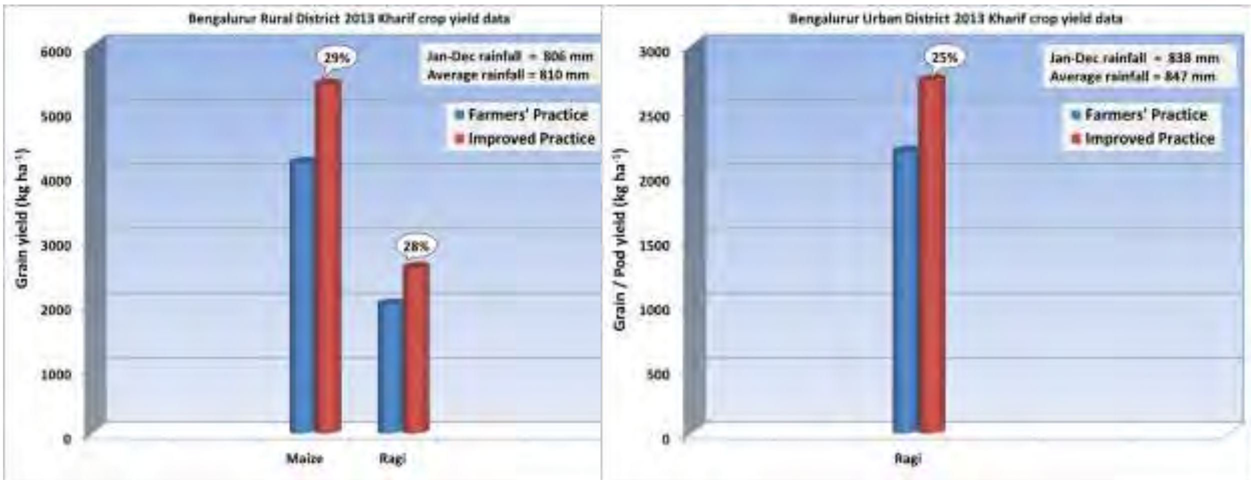

Figure 68. Crop yield in Bengaluru (R) and Bengaluru (U) districts during Rainy season 2013

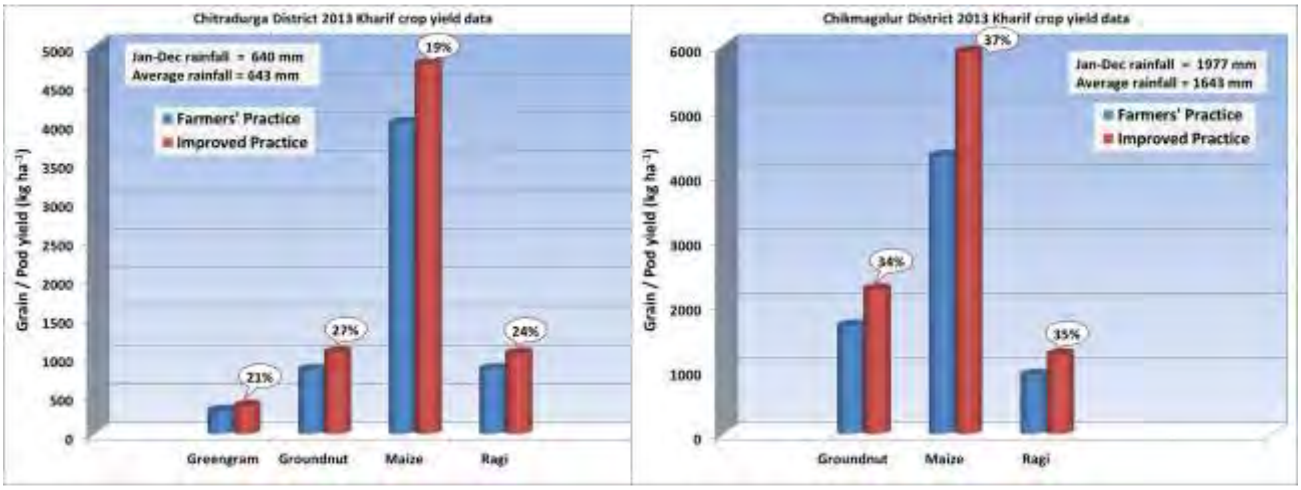

Figure 69. Crop yield in Chitradurga and Chikmagalur districts during Rainy season 2013

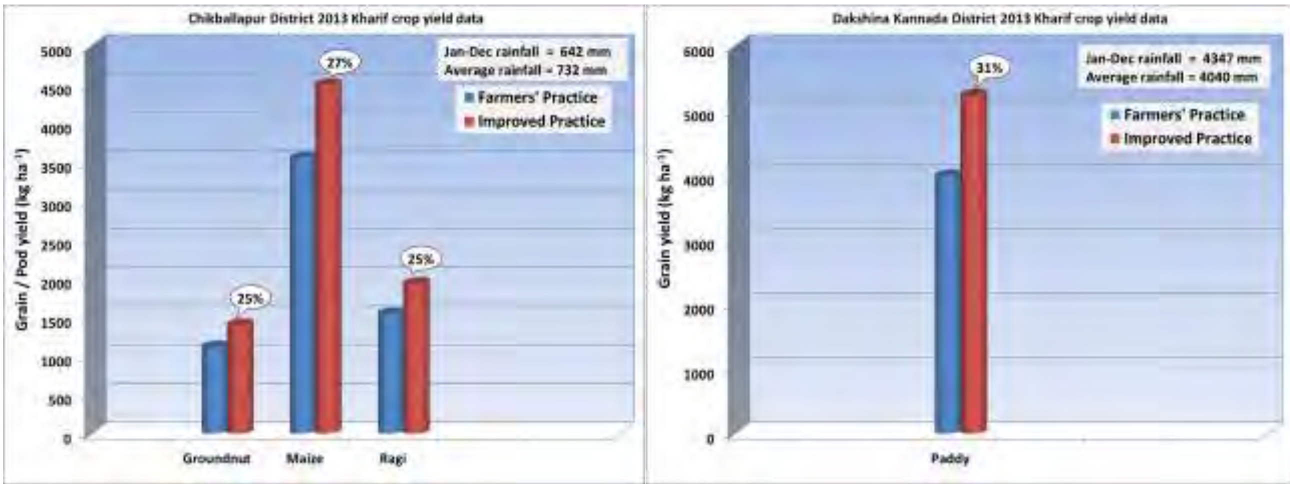

Figure 70. Crop yield in Dakshina Kannada and Chikballapur districts during Rainy season 2013

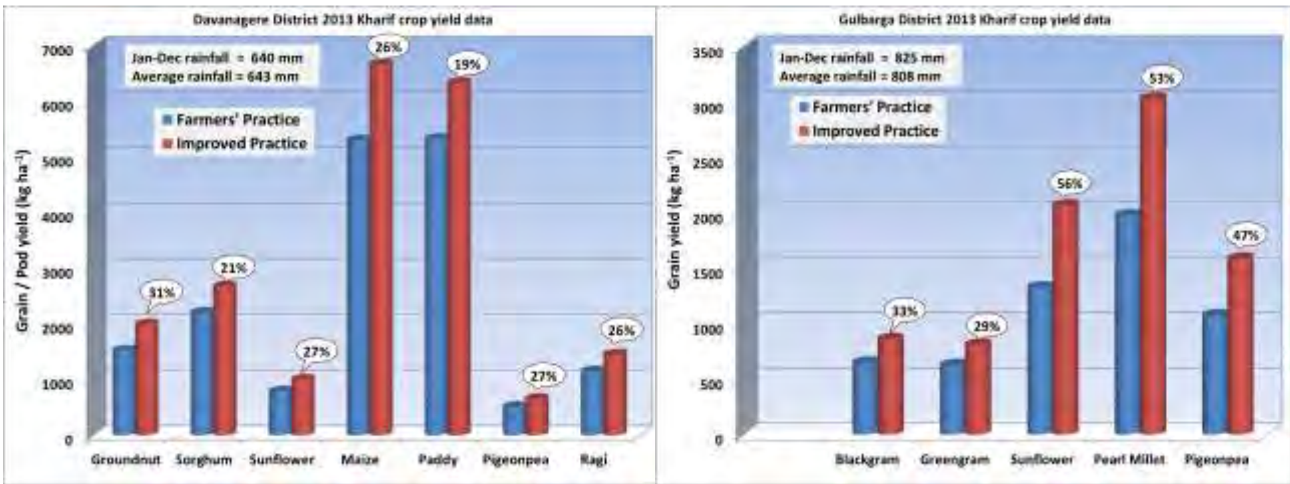

Figure 71. Crop yield in Davanagere and Gulbarga districts during Rainy season 2013

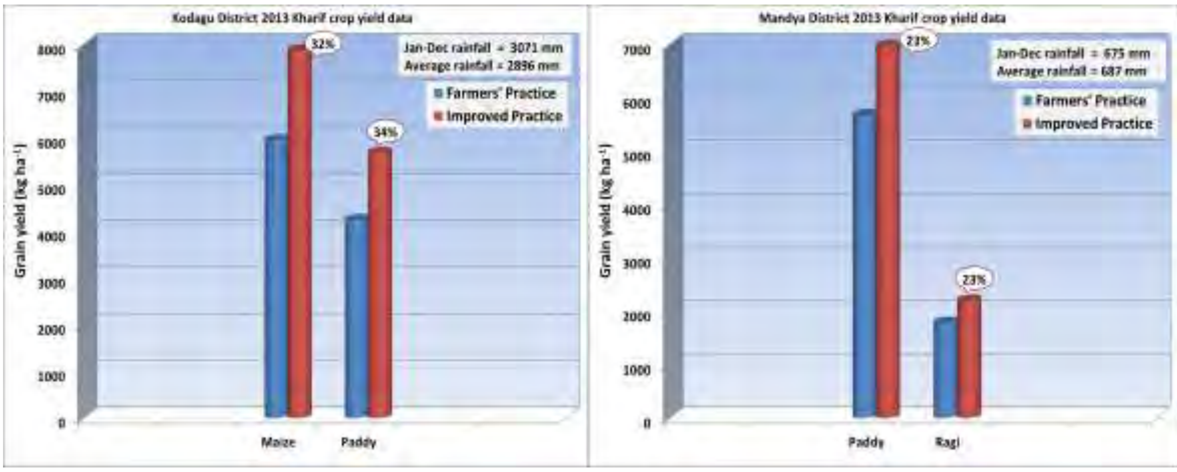

Figure 72. Crop yield in Kodagu and Mandya districts during Rainy season 2013

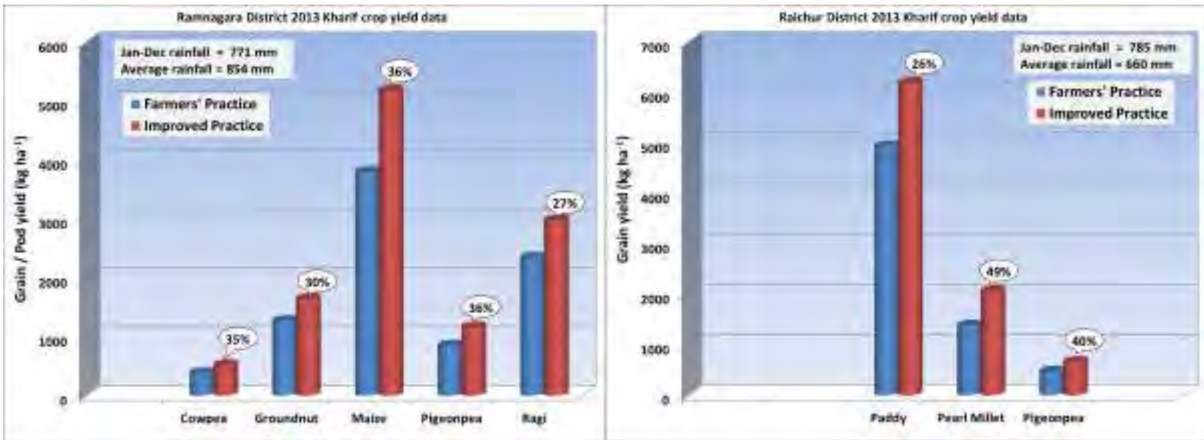

Figure 73. Crop yield in Ramanagar and Raichur districts during Rainy season 2013

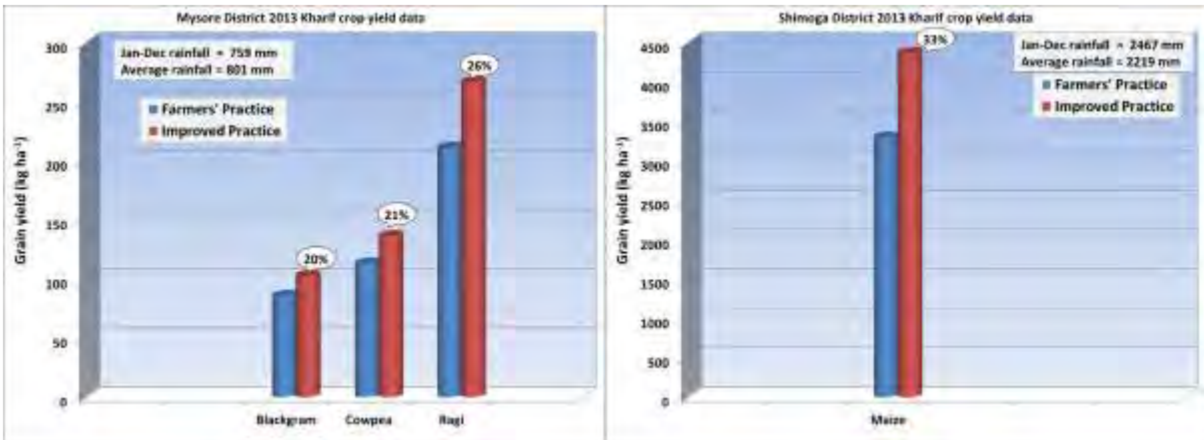

Figure 74. Crop yield in Mysore and Shimoga districts during Rainy season 2013

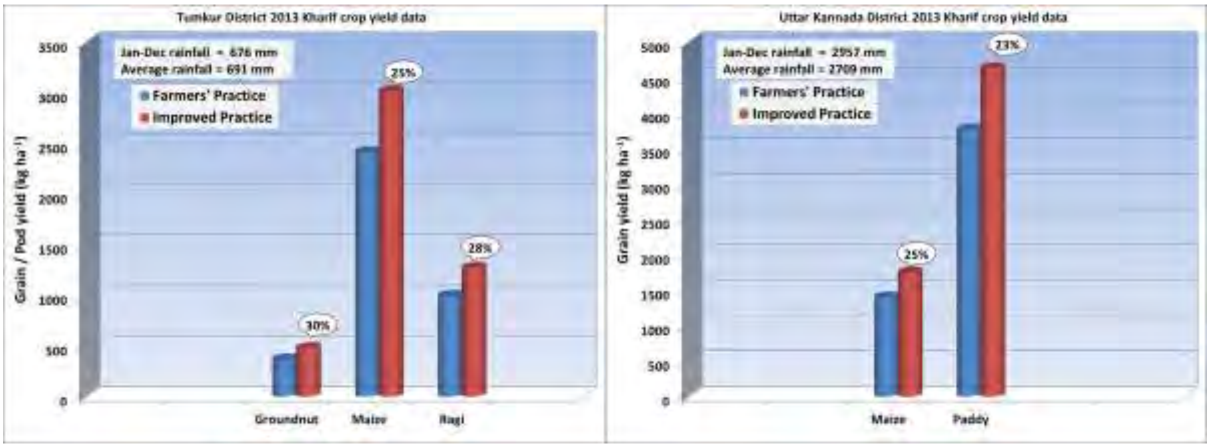

Figure 75. Crop yield in Tumkur and Uttara Kannada districts during Rainy season 2013

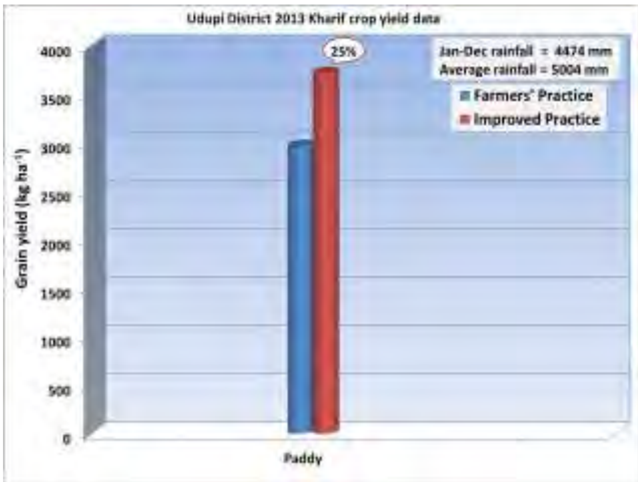

Figure 76. Crop yield in Udupi district during Rainy season 2013

Field days

ICRISAT Staff coordinated field days in all 30 districts with the full support and participation of DoA district-level staff during the cropping season. Whereever long season kharif crops (pigeonpea and cotton) and rabi crops (chickpea and rabi sorghum) were grown, field days were still to be organized to demonstrate crop growth and yield enhancement with improved management including use of micronutrients and suitable improved varieties in different districts (Table 13). Besides, ICRISAT-DoA staffs were making several field visits to contact farmers and guide them on crops management to ensure proper sowing and appropriate plant stand which are more important for higher productivity.

Nearly 2300 field days were organized in 30 districts of Karnataka under Bhoochetana II phase during the crop season 2013. Nearly 141,541 farmers were exposed to science-led improved technologies to enhance crop productivity on drylands. These farmers include nearly 39,385 women farmers in Karnataka.

Table 13. Details of field days held in different districts of Karnataka during 2013 kharif cropping seasons.

S. No	District	No. of field days held	No. of farmers participated	Men	Women
1.	Bagalkote	60	8600	6300	2300
2.	Bellary	103	4827	4300	527
3.	Bengaluru Rural	100	5678	4733	945
4.	Bengaluru Urban	58	2567	2201	366
5.	Belgaum	120	11668	7148	4520
6.	Bidar	42	2305	1892	413
7.	Bijapur	119	5950	3650	2300
8	Chamarajanagara	07	2000	1580	620
9.	Chikkaballapur	112	6109	4758	1351
10.	Chikkamagalur	239	8365	6931	1434
11.	Chitradurga	48	4856	2680	2176
12.	Davangere	77	7602	5248	2354
13.	Dharwad	13	1323	1039	284
14.	Dakshina Kannada	50	3250	1788	1462
15.	Gadag	3	185	165	20
16.	Gulburga	40	1900	1600	300
17.	Hassan	177	8519	3245	5274
18.	Haveri	28	2486	1813	673
19.	Kolar	158	10948	8004	2944
20.	Kodugu	32	1173	742	431
21.	Koppal	10	981	730	251
22.	Mandya	121	14641	13251	1390
23.	Mysore	68	3984	3672	312
24.	Raichur	10	375	305	70
25.	Ramnagara	77	2920	2470	450
26.	Shimoga	180	13200	9000	4200
27.	Tumkur	37	2408	1887	521
28.	Udupi	85	5100	3845	1255
29.	Uttara Kannada	98	6669	3793	2876
30.	Yadgir	25	1900	1590	310
Total		**2297**	**141541**	**97598**	**39385**

Integrated Water Resource Management in Kolar

With the help of Coca Cola India foundation along with Government of Karnataka, a new initiative on integrated water resource management to improve the livelihood was initiated in Kolar district. The aim of this initative is to improve the availability of water resources by adopting watershed approach and improve the crop yield and enhancing the water use efficiency. Kolar is the hotspot of water scarcity. The watershed covers an area of 1,333 ha and divided into 4 micro watersheds with a population of 5556 that has an average family size 4.7 and population density of 4.01 persons per ha. About 67 per cent of household belongs to small, 27 per cent in medium, 3 per cent in big and landless category respectively.

Kolar area falls in the hot moist semi-arid Agro Ecological Sub Region (AESR) with medium to deep Red loamy soils. Available water capacity is low and the rainfed length of growing period is about 120-150 days. Summer showers are experienced at Kolar in May. Though the southwest monsoon sets by the first week of June, rainfall more than the PET is received only during middle of September to third week of October. This period has potential for runoff water harvesting and storage for use by *Rabi* crops. Annual PET is 1638 mm and the annual average rainfall is 711 mm.

Major land area is under rain-fed agriculture, while with bore well as a main source vegetable cultivation is coming up. The present land use is 88% cultivated (46 % rain-fed, 31 % under vegetable and irrigated annual crops) 12% under other uses that includes habitat, forest, road and drains. Community-based organizations like watershed committee with 15 members have been formed representing each village, women members and small farmers. There are 30 SHGs in the watershed. A watershed committee monitors and executes the watershed activities. As per the guidelines seven are women members and appropriate number of other landless and scheduled caste represent in the committee.

Table 14. General information of proposed locations for project in Kolar taluk, Karnataka.

Villages	Area (ha)	Population*	Households*	Family Size (No.)	Population density (persons/ha)
Muduvatti	303.51	2100	710	3.0	6.92
Jangalahalli	87.23	310	78	4.0	3.55
Konepura	67.79	255	46	5.5	3.76
Papenahalli	66.90	NR	NR	NR	NR
Shettiganahalli	260.24	968	208	4.7	3.72
Shettikothanuru	214.92	1115	221	5.0	5.19
Dandiganhally	179.32	361	63	5.7	2.01
Nernahally	153.08	447	85	5.3	2.92
Total	**1332.99**	**5556**	**1411**	**4.7#**	**4.01#**

* Population and household data is present time data mentioned by GP members and others.

\# Mean of villages

Several activities are initiated in the watershed. Two farm ponds are constructed in watershed area for rainwater harvesting and groundwater recharge (Figure 77). Exposure visits were organized to farmers to better understand the advantages of new and innovative technologies. Community based institutions such as Self Help Groups are formed and meetings are held continuously to discuss the watershed issues along with their savings and micro-enterprises activities.

Figure 77. Farm pond constructed and used for irrigating tomato crop in Kolar.

In the watershed various farmer participatory are conducted with different new technologies such as border planting and intercropping. Finger millet demonstration with improved cultivars MR 1 and GPU 28 is undertaken in 19 acres. Similarly, castor with improved variety of Jyothi and DCH 177 was undertaken as border plating and pigeonpea (ICPL 85063) as intercrop and groundnut ICGV 91114 are used to demonstrate in the watershed.

Wastewater Reuse in Agriculture

The major settlement in the watershed is Mudavatti. This village has a masonry drainage canal of about 2000 m, which collects domestic wastewater from about 400 households and the rainwater. Another 500 m length of drain is proposed to be constructed. We identified two farmers who are using untreated wastewater for irrigation. They have constructed water collection pond to collect wastewater. Collected wastewater is being reused for the cultivation of vegetables (Figure 78). One farmer Mr Govindappa has adopted drip irrigation with 3 hp diesel engine pump and cultivated vegetables (bitter gourd, ridge gourd and tomato in one acre of land during the post-rainy season. Another farmer Mr Nagaraj has also constructed a pond (15x20x2 m) and uses sewage water by flood and ridge and furrow method to irrigate one acre of land grown with brinjal, ridge gourd and tomato. We have collected wastewater samples from these water collection ponds and analysed for various parameters (Table 9). We propose to convert present water collection pond into constructed wetland for treating the wastewater.

Other than this location, few more sites were identified in Kolar taluk and wastewater samples were collected for quality check. However, at other sites, wastewater is not being used for irrigation purpose.

Figure 78. Wastewater collection pond and wastewater irrigated field at Muduvatti village, Kolar.

Table 15. Characteristics of wastewater collected from Muduvatti village.

Parameter	Values
pH	7.7-8.0
EC (mS)	1.8-3.2
TS (mg/L)	1600-2600
TDS (mg/L)	400-1600
TSS (mg/L)	200-1800
NH_4-N (mg/L)	11.2-19.9
NO_3-N (mg/L)	0.32-4.74
Total N (mg/L)	12.5-24.7
Bacteria CFU/ml	158000-266000
Actinomycetes CFU/ml	200-10000
MPN Index/100 ml	28000-170000
BOD_5 (mg/L)	54.4-112.0
COD (mg/L)	128-352
Bicarbonate (mg/L)	2.8-8.0
Chloride(mg/L)	9-86 me/l
S (mg/L)	12-196
Boron (mg/L)	0.12-0.28
Calcium (mg/L)	45-86*
Magnesium(mg/L)	28-153*
Sodium (mg/L)	348-4452*
Potassium (mg/L)	65-389*
Manganese(mg/L)	0.13-0.85*
Iron(mg/L)	0.19-2.99*

Integrated Watershed Management in Bellary district

Integrated watershed management approach is proved to be the suitable strategy for achieving holistic development in these regions through collective action. The very purpose of the watershed development programs is to reduce water related risks in rainfed agriculture by improving the local soil-water balance by implementing both in-situ and ex-situ interventions. Since, water and soil are important components of agricultural development, proper management of these resources is crucial to build the resilience of these systems to cope with varying climatic risks and to improve livelihoods. In this background, JSW foundation supported a project on integrated watershed management. This project is jointly implemented by Government of Karnataka, Community-based organisations, farmers with technical backstopping by ICRISAT.

Target area for the proposed study is Sandur taluk of Bellary district in Karnataka state. The district is the hotspot of mining and related industrial activities which caused most of the surrounding villages to face severe resource endowment and utilization problems. As a result of mining activities agriculture was on the verge of abandoning coupled with unavailability of labor force and falling returns due to yield and price constraints. Land degradation and improper water management along with poor market and infrastructure facilities are the root causes for imbalanced development in this area.This project target to cover four villages namely Doddanthapura, Chikkanthapura, Kodalu and Joga in Sadhur taluk with 1,930 families engaged in agriculture and 293 families are landless.

The specific objectives of the project are:

1. *To establish* a " Model Site of Learning" in low-rainfall rainfall zone (<700 mm rainfall per annum) in Karnataka for demonstrating the potential of rainfed areas by adopting integrated water resource management approach;
2. *To enhance* water availability and its (green and blue water) use efficiency for diversifying the livelihood systems in the target villages by adopting integrated water resource management approach; and
3. *To build* capacity of the farmers in the region for improving rural livelihoods through knowledge sharing and dissemination strategy

Several activities are undertaken in the watershed viz., Baseline survey; Soil testing; Soil water conservation; and Productivity enhancement. Major soil water conservation activities included rain gauge installation, hydrological gauging station, avenue plantations and rubble checks.

Accurate determination of runoff volume, peak runoff rate, soil loss and other related information from small and medium watersheds invariably requires the continuous recording by using Automatic Runoff Recorder and Automatic micro-processor based Sediment Samplers, which monitor the temporal changes in the suspended sediment concentration during the runoff event. Hydrological gauging station consisting of automatic runoff recorder and microprocessor-based sediment sampler along with an appropriate masonry hydraulic measuring structure (viz. broad-crested rectangular weir or notch) was installed (Figure 79-81). Training was provided to the local staff for the data collection and day-to-day operation and maintenance of the equipment. The hydrological data generated are useful to assess the impact of watershed interventions (runoff and soil loss), potential of runoff water harvesting and groundwater recharge in the watershed.

Rain gauges in each village were installed to monitor the rainfall. Most of the rainfall in Bellary district is received in the three month period Aug-Oct; with September being the rainiest month with about 135 mm of rainfall. Year-to-year variability in rainfall is very high and the coefficient of variation of rainfall in these three months varies from 53 to 66%. Seasonally, the southwest monsoon period (Jun-Sep) receives about a rainfall of 352 mm with a CV of 28% and the post-monsoon period (Oct-Dec) receives a rainfall of 144 mm with a CV of 56%. There is also considerable spatial variability in rainfall in the Bellary district. The above clearly shows the importance of rainfall measurements at watersheds to help quantify the amount of moisture availability in different phenophases of crop growth and to relate with the crop water requirements. Therefore, rainfall monitoring is also necessary to assess runoff, soil loss and groundwater recharge. Most importantly it helps the community to understand about crop water usage and for irrigation scheduling.

Figure 79. Installation of Hydrological gauging station at JSW villages.

Figure 80. Installation of rain gauges at four villages of JSW watershed.

Figure 81. Avenue plantations and rubble checks activities at JSW watershed villages.

Productivity Enhancement Activities

Farmer's participatory demonstration trials were designed in each village on:
Improved practices

- Varietal Trial (40 farmers)
- Intercropping (22 farmers)
- Fertilizer trials (20 farmers)
- Soil and Moisture conservation practices with using improved instrument like Tropicultor (one farmer)
- Vermicomposting bed (2) provided to Kodalu village farmer

Improved implements/instruments provided to villages

- Tropicultor (4)
- Ground water measurement (3)
- Rain gauge installation in all the villages
- Runoff recorder installed in the Doddaanthapur village

The road side plantation around 750 plants planted (*Gliricidia* and *Pongamia* sp.) at Chikkantapur village.

Results from Farmers Field Trials

Micronutrient trials

Results from farmer's field trials indicate that crop yield can be increased with improved agronomic practices. Table 16 indicates grain yield increase from 8-33% and biomass yield increase from 14-30% for all the crops with the application of micronutrients (NPK+Zn+S+B).

Table 16. Grain yield and total biomass yield of major crops under farmers practice (NPK only) and improved practice (NPK+Zn+S+B)

Crop	Grain yield (kg ha^{-1})		Total biomass yield (kg ha^{-1})		% increase grain yield	% increase total biomass yield
	FP	IP	FP	IP		
Pearl Millet	1125	1224	2494	2917	8	14
Sorghum	2918	3576	1976	2824	18	30
Maize	4235	4729	3812	4518	10	16
Groundnut	1976	2259	1659	2012	13	18
Sunflower	1146	1463	1118	1350	22	17

Phosphorous (P) trials

During the meetings with farmers, ICRISAT scientists realized that there is injudicious use of P fertilizer (DAP). Further soil tests revealed that sufficient amount of phosphorous in the soils. Based on this P fertilizer trials were designed (with P and without P application) for different crops to investigate the effect on crop performance. Table 17 reveals that similar grain yield and biomass yield were reported under both treatments.

Table 17. Grain and Biomass yield of different crops with and without P application.

	Grain yield (kg ha^{-1})		Biomass yield (kg ha^{-1})	
	With P	**Without P**	**With P**	**Without P**
Pearl millet	3120	3240	3000	3240
Sunflower	2880	3120	3360	3360
Sorghum	3120	3120	3360	2880
Maize	3120	3312	3216	2976

Capacity-building Programs to Improve Livelihoods

Farmers' Day at Watershed Villages

Farmers Day was conducted in four villages where 1,100 farmers gathered to share their experiences as part of a pilot watershed program. This program emphasized a public-private partnership between Jindal Steel's JSW Foundation, ICRISAT and the Government of Karnataka, aimed at improving the sustainability and livelihoods of smallholder farmers. Mr Sajjan Jindal and Mrs Sangita Jindal, Chair of JSW Foundation, visited the fields where farmers have grown cotton and pigeonpea using improved soil test-based nutrient management. Mr Jindal expressed commitment to help farmers in the district increase their incomes through science-led development with the help of ICRISAT. During the interactions, farmers explained how various interventions such as planting of *Gliricidia* on bunds to generate N-rich organic matter for improving soil health, vermicomposting for safe recycling of farm residues, farm ponds for harvesting rainwater for supplemental irrigation as well as conservation of soil moisture for better crop growth, had benefited them. Mr Mallikarjuna, a farmer, said he harvested 1.6 tonnes of cotton last year and is expecting additional yields from adoption of improved management practices. The farmers also visited the exhibition stalls of ICRISAT, DoA and private seed companies, where they gathered information on improved management practices and new high-yielding cultivars of crops.

Besides this a number of training programs were conducted for farmers such as (i) Improved technology and dry land field demonstration at ICRISAT; (ii) The DATC conducted training programme for JSW village women for three days (22 women) at Kampli. During training programme information was provided about agriculture, dairy, poultry and Sheep rearing; (iii) Vermicomposting pits were demonstrated and materials and methods for vermicomposting were explained; (iv) The Animal Husbandry Training Programme was conducted in JSW village (38 women) in Torangallu, Kurekoppa farm; (v) Training programme on Balanced inorganic fertilizer application to crops in Torangallu, kurekoppa farm. (40 farmers attended); and (vi) Exposure visit to Dharwad (10 farmers) and Raichur (4 farmers) in Krishimela.

Visit of the Phillipines Delegates to Kolar

The success of Bhoochetana has travelled across the countries to make impact. This approach is followed not only in India but also in the Philippines. As the Philippines implementing the Bhoochetana apperoach in four provinces to improve rainfed agriculture, a team of provincial level agricultural officers visited Kolar during 13 November 2013 to experience and understand the nuances of Bhoochetana approach. The delegates visited Chowdenahalli (Narsapura Hobli), Naganala and Chitnahalli (Sugutur Hobli) in ragi, maize and pigeonpea demonstration fields (Figure 82). In ragi crop, moisture conservation practice was adopted in form of dead furrow and line sowing was done using tropicultor. During their visit, met DoA staff, ICRISAT staff and farmers and farm facilitators and interacted with them. During the visit, farmers indicated that line sowing practice is more economical as required seed rate is less as compare to farmers' practice. In maize field, clear advantage of micronutrient application was observed with respect to plant height, cob size and length. Similar results were observed in pigeonpea fields. Delegates also participated in video conference and expressed their experiences of field visits.

Figure 82. Philippines delegation visiting Kolar Bhoochetana field.

Bhoochetana in Limelight

ರೈತರ ಜೀವನ ಸುಧಾರಣೆಗೆ ಯೋಜನೆ

ಕೃಷಿ ರಥ: ಅನ್ನದಾತನಲ್ಲಿ ಮೂಡಿದ ಆತ್ಮವಿಶ್ವಾಸ

ಮಣ್ಣಿನ ಗುಣದ ಬಗ್ಗೆ ರೈತನಿಗೆ ಅರಿವು ಮುಖ್ಯ

Annexure: Workshop Presentations

Bhoochetana: Increasing Adoption, Area Coverage and Impact: A Challenge to Meet

Suhas P Wani and Team
5 January 2013

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International Crops Research Institute for the Semi-Arid Tropics

Why We Need to Take a Challenge

- Increased vulnerability of rainfed agriculture due to climate change
- Food security is at risk
- Sustainable development is in question

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Bhoochetana

Potential Sustainable Development Approach

- Science-led
- Participatory R4D
- 4 I

4 I	C	Es
Innovate	Collective	Efficiency
Inclusive	Cooperation	Equity
Integrated	Capacity building	Environment Protection
Intensification	Consortium	Economic gain

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What We Have Achieved

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Achievements

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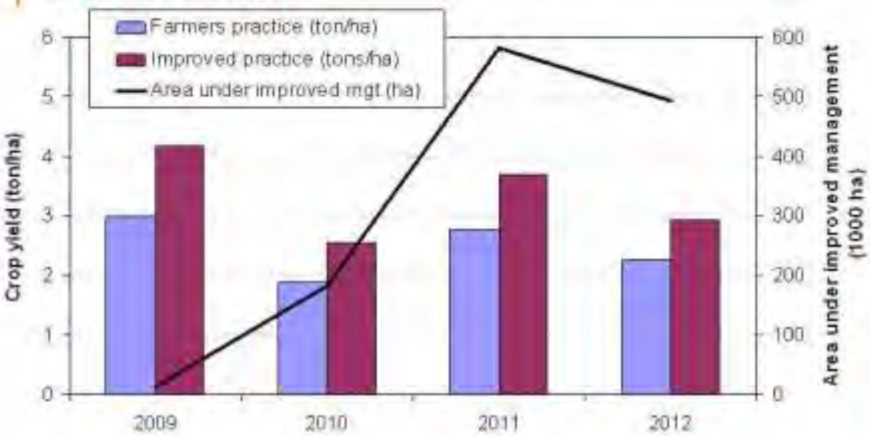
Improved Agricultural Practices Increased Crop Yields and Incomes in Karnataka: Bhoochetana



Year	2009	2010	2011	2012	Total
Net income (Rs in Crores)	11.49	204.81	599.45	451.80	1267.60
Net income (Million US$)	2.52	45.72	112.48	82.44	243.16

Example: Bhoochetana

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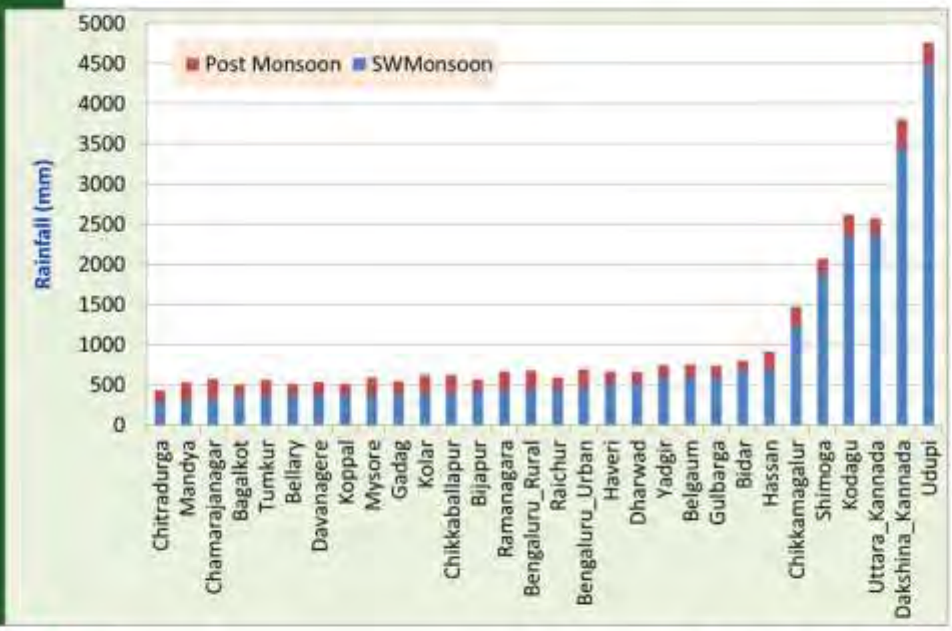
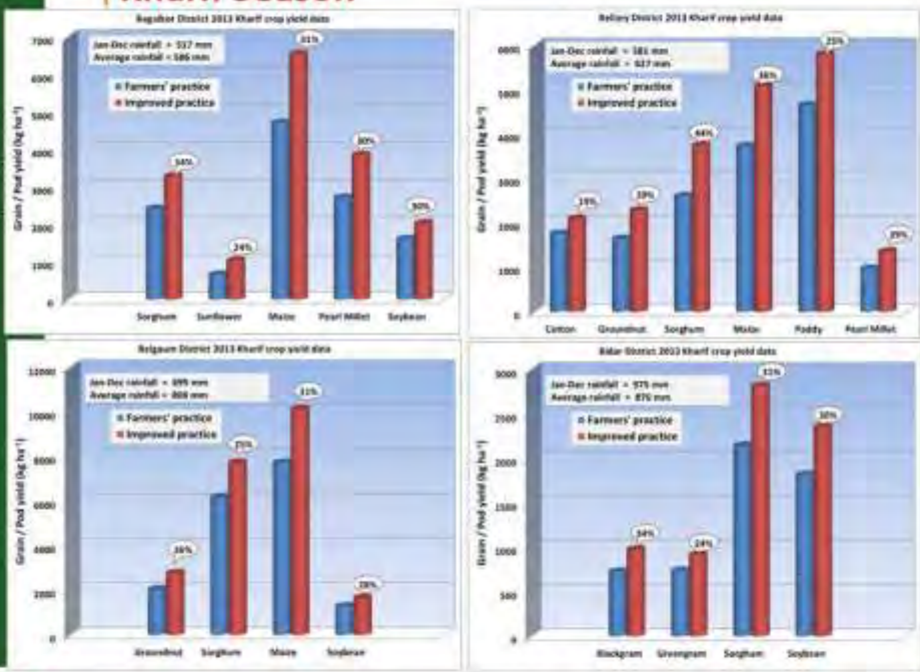
Karnataka: District-wise Rainfall in 2013

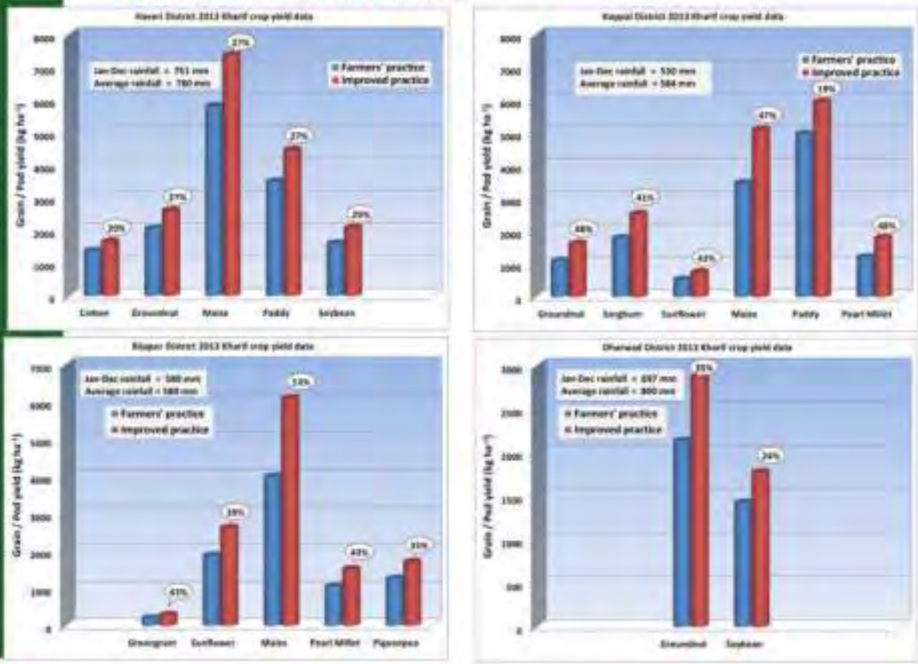


Data source: KSNDMC

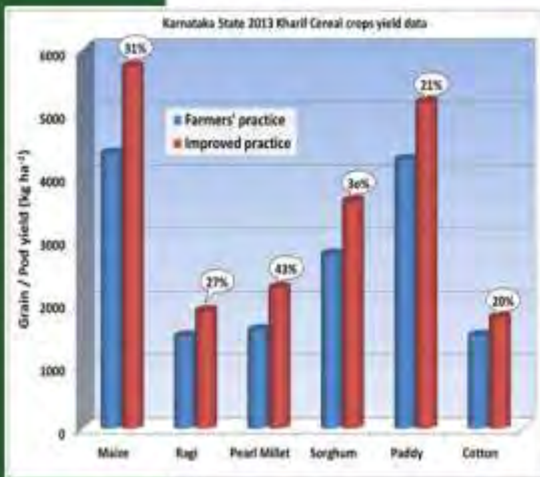
Crop Yields in Different Districts under Bhoochetana in Karnataka during 2013 Kharif Season

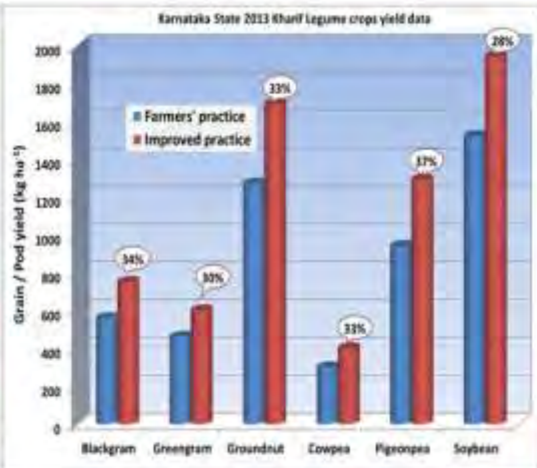


Crop Yields in Different Districts under Bhoochetana in Karnataka during 2013 Kharif Season *(Contd..)*



Increased Mean Crop Yields in the State during Rainy Season 2013





Distribution of Micronutrients in Total (tons) and Per Hectare (kg) under Bhoochetana Project

Year consumed	Season	Area covered (Lakhs ha)	Quantity Consumed (t)			Nutrient used (kg ha^{-1})		
			$ZnSO_4$	Gypsum	Borax	$ZnSO_4$	Gypsum	Borax
2009	*Kharif*	2.25	372	4309	53	1.65	19.15	0.23
	Rabi	0.59	-	-	-	-	-	-
2010	*Kharif*	12.72	2723	35376	389	2.27	29.50	0.32
	Rabi	3.70	362	5595	113	1.09	16.86	0.34
2011	*Kharif*	28.44	8775	96234	2781	3.46	37.90	1.10
	Rabi	6.60	1678	12475	432	2.94	21.87	0.76
2012	*Kharif*	35.70	6803	59935	3104	2.25	21.5	0.77

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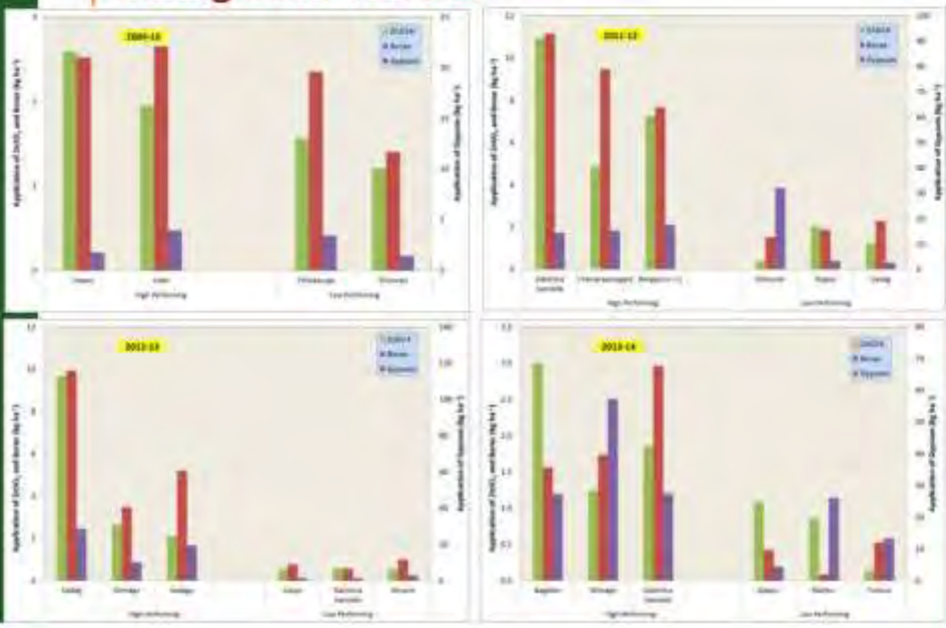
Nutrient Consumption-based High and Low Performing Districts under Bhoochetana during 2009 to 2013



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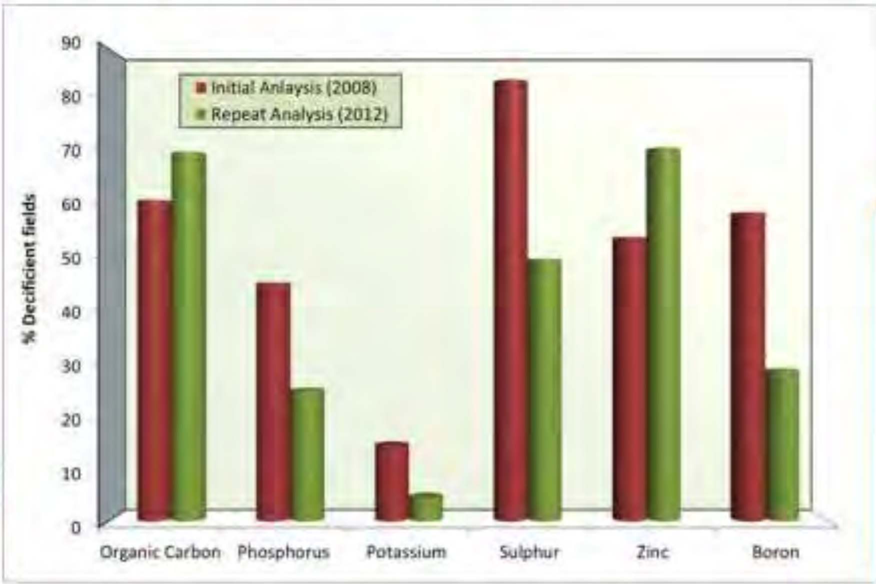
Number of Farmers Participated and Area Covered in Bhoochetana in Karnataka

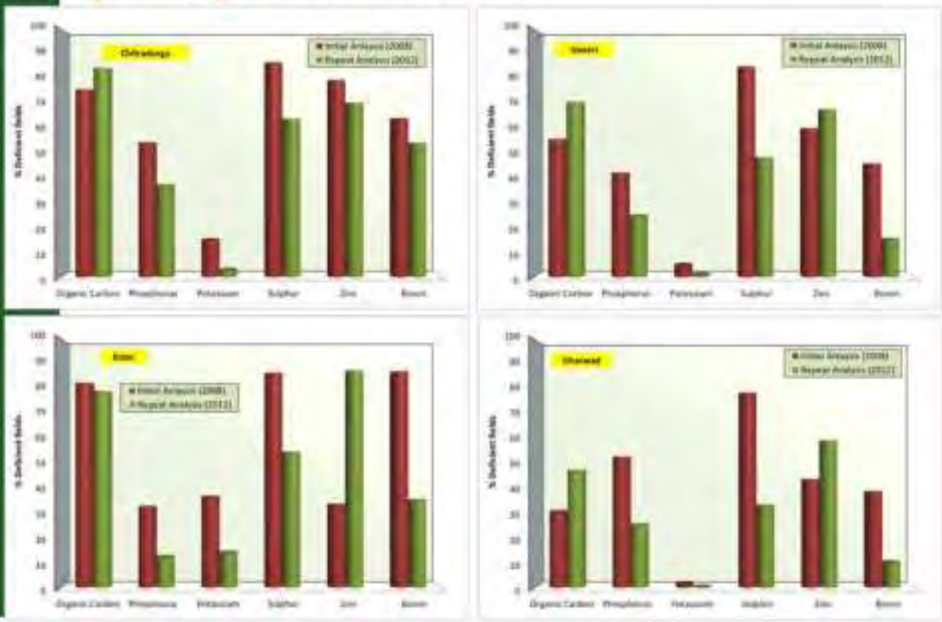
*Figures in parentheses indicate No. of farmers (million) participated

Decreased/Increased Soil Nutrient Deficiencies in Fields under Bhoochetana in Karnataka during 2008 and 2012

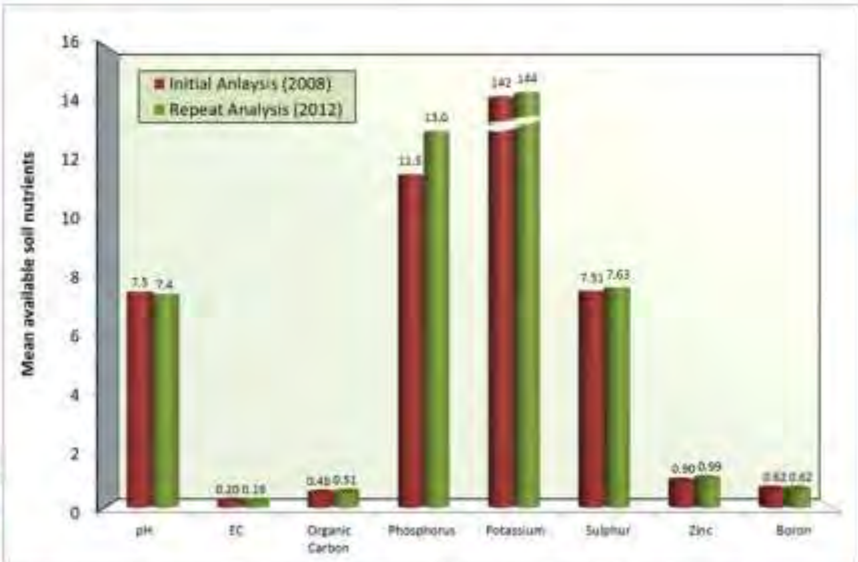


*Facts are based on analysis of four sample districts viz. Chitradurga, Haveri, Kolar and Dharwad

Changes in the Soil Nutrient Deficiencies in Four District under Bhoochetana in Karnataka during 2008 and 2012



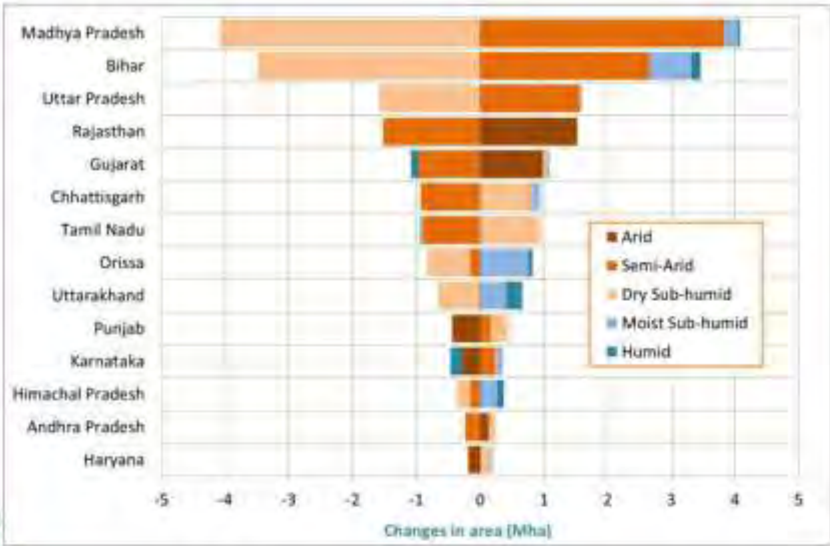
Soil Nutrient Status in Fields under Bhoochetana in Karnataka during 2008 and 2012



*Facts are based on analysis of four sample districts viz. Chitradurga, Haveri, Kolar and Dharwad
** Units for OC is % ; for P, K, S, Zn, B are mg kg^{-1} soil ; and for EC is dS m^{-1}

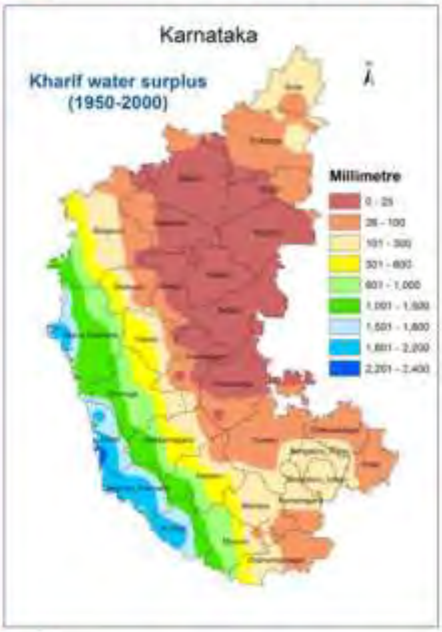
Climate Change Increasing Vulnerability

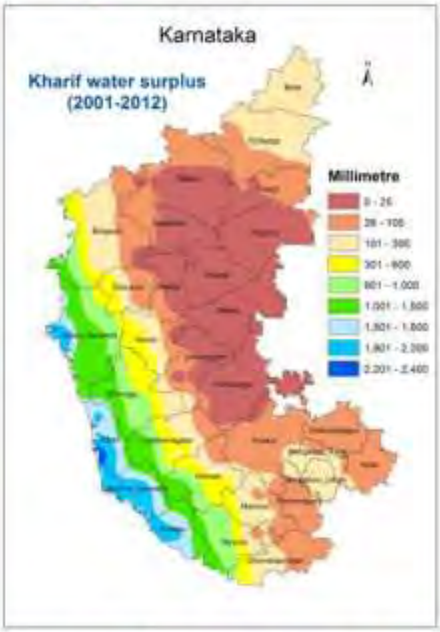
Increasing Dryland Agriculture Areas



In Karnataka 0.23 M ha area is added to SAT

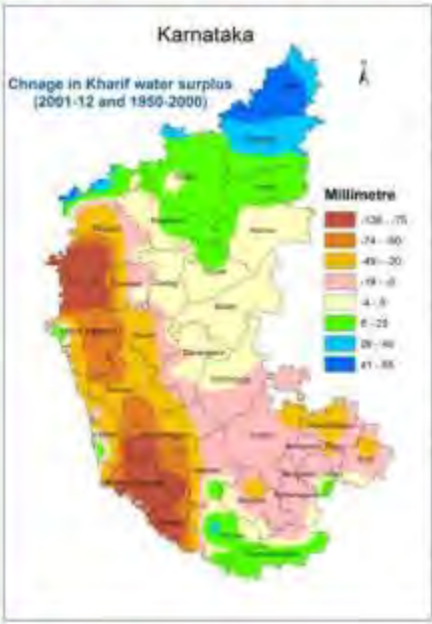
Changing Water Surplus in Karnataka due to Climate Change





Climatic water balances computed using CRU TS 3.21 (2013) 0.5 degree gridded monthly data of University of East Anglia

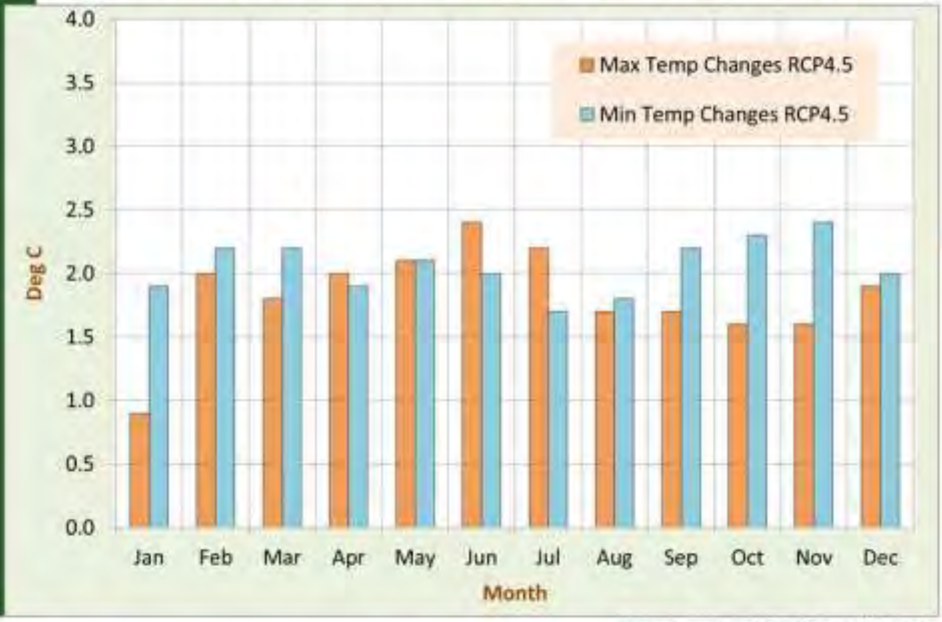
Changes in Climatic Water Surplus in Karnataka



- As a whole, reduction is observed
- Large spatial variability
- NE Karnataka shows an increasing trend
- No much change in the central dry zone
- Except parts of Chamarajanagar and Mysore, southern dry zone shows little reduction
- Much of the Malnad region shows decreasing water surplus ranging from 20 to 125 mm
- Coastal zone has mixed changes

Increasing Temperatures in Koppa, Chikkamagalur

Difference between projected (2050) and base (1950-2000)



RCP: Representative Concentration Pathways

Based on HadGEM2-ES Model

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Balanced Nutrient Management

Millets respond to balanced nutrient management even in below average rainfall years 2011 and 2012

Balanced nutrient management of millets provide resilience against drought through enhanced water productivity

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Promising Legumes in Drought Years

Benefit : Cost ratio

	2010	2011	2012
Green gram			
NE Trans Zone	4.4	5.5	5.5
NE Dry Zone	2.0	3.6	4.4
N Dry Zone		1.9	1.9
Soybean			
N Trans Zone	3.6	4.5	1.3
NE Trans Zone	4.8	5.9	5.9
Pigeon pea			
N Dry Zone	3	3	5.1
NE Trans Zone	6.2	6	
NE Dry Zone	5.9	5.7	6.9

- Need to increase legume production in Northern and North-Eastern regions
- Short duration varieties
- Address market niches

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Our Challenges

- Developing climate resilient agriculture
- Sustainable intensification using scientific methods
- Increasing adoption rate, area coverage and impacts

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Building Partnerships

Increasing Awareness and Visibility

Rigorous Monitoring & Evaluation

Empowerment of Stakeholders

- Farm Facilitators (FF) and Lead Farmers (LF)
  Every 500 ha one FF and 2-3 LFs
- Training and empowering FFs and LFs
- Certified and quality assurance
- We need to strengthen this novel extension approach

New Innovative Extension Systems

PPP for Innovative Delivery System

- ❖How to make it work to benefit farmers?
- ❖How to facilitate quick and effective implementation

How to Ensure Inputs Availability

❖ Right
- time
- quality
- quantity
- price

Boron Products Approved under the FCO, 1985

Five boron sources are approved under Schedule 1 of Fertiliser (Control) Order 1985

- Boric Acid 17% boron
- Disodium Tetraborate Decahydrate ($Na_2B_4O_7.10H_2O$) with 10.5% boron (approved in Bhuchetana)
- Disodium Octaborate Tetrahydrate ($Na_2B_8O_{13}.4H_2O$) 20% boron
- Disodium Tetraborate Pentahydrate ($Na_2B_4O_7.5H_2O$)- Granular form - 14.6% boron
- Disodium Tetraborate Pentahydrate ($Na_2B_4O_7.5H_2O$)- Crystalline form - 14.6% boron

Disodium Tetraborate Pentahydrate ($Na_2B_4O_7.5H_2O$) Also Known as Borax Pentahydrate

- Largest selling boron fertiliser in the world
- Both granular as well as crystalline forms are registered under the Fertiliser Control Order after testing at ICAR institute.
- This is recommended for direct soil application in crops

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Slide 33

Sustainable Intensification thru Diversification

- From 1 acre farmer has harvested coriander worth Rs. 15000
- 1.2 t castor worth Rs. 50,000 is expected
- Farmer grew pigeonpea as a intercrop where farmers applied Bhoochetana package with micronutrients

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Improving Covnergence

❖ How to - converge and what to converge?
- share?
- synergise?
- make it work

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Thank you!

CGIAR

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International Crops Research Institute for the Semi-Arid Tropics

BHOOCHETANA : Progress and Challenges ahead

Dr.B.K.Dharmarajan

Director of Agriculture

MISSION GOAL OF BHOOCHETANA-PHASE 2

Empowerment, capacity development with knowledge-based and market oriented farmers' centric approach.

INCREASE YIELD BY 20%

Convergence of Schemes

Co-ordination amongst different agriculture research-extension and development sectors

OBJECTIVES

- Increasing the crops (irrigated and rain-fed) yields by 20 per cent over the first phase of Bhoochetana in five years in 30 districts.
- To strengthen the institutional mechanisms such as seed villages, village seed banks, inputs supply, through farm facilitators .
- To assess the impact of climate change in different agro-eco regions of the state in terms of anticipated shifts in the crop growing periods, water availability, major crop yields, and evaluate adaptation strategies for developing climate resilient farming systems.

PROGRESS OF 2013-14

Progress of Bhoochetana during 2013-14

Component	Program	Progress	Program	Progress
	KHARIF		RABI	
Area-Dry land (lakh ha)	58.0	52.00	25.00	22.00
No of Farmer facilitators	11600	9700	5000	2516

Trainings/ Workshop	KHARIF	RABI
District level	30	13
Taluk level	173	70
Hobli level	725	237
Cluster level	7336	1105

Input consumption

NO	INPUT	2012-13 DISTRIBUTION (TONNES)	2013-14 DISTRIBUTION (TONNES)
	KHARIF :		
1	Gypsum	72524	89730
2	Zinc Sulphate	9314	10555
3	Borax	2691	3312
	RABI :		
1	Gypsum	39746	25180

IMPORTANT EVENTS OF 2013-14

State level Bhoochetana Field Day, Davangere

State level Bhoochetana Field Day , Hon'ble Agriculture Minister's field visit

RAIN Workshop regarding Climate Change

Visit to Mandya district by central team w.r.t PM Award

Philippines team visit: Kolar Dist.

Rainfed farming policy meeting at Vikasa soudha

OUTSTANDING PARTNERSHIP AWARD

ICRISAT has awarded 'Outstanding Partnership Award' to Government of Karnataka for successful extension efforts carried out to take the technologies to farmers and to improve their livelihoods through increased yields

Progress of Bhoochetana during Kharif 2013-14

Programme	Total allocation	Release	Exp(dec 31, 2013)	Comitted Expe (Jan end 2014)
FARM RELATED ACTIVITIES (IAES)	6600	5175	3011 (58%)	3382(65%)
TSP	750	422.55	201(48%)	243(58%)
Gen	5850	4752.75	2810(59)	3139(66%)
RKVY	4700	3000	1687 (56%)	1975(66%)
SDP	1000	1000	590(59%)	639(64%)
SCP	800	500	272(54%)	327(65%)

SHORTCOMINGS

- **2013-14 Financial expenditure is not in accordance with programme**
- Utilization of services of Farmer facilitators and their duration is not as per provisions of guideline
- Farmer fields school : Monitoring is poor
- Stocking of all inputs in time especially biofertilizers and seed treatment chemicals is not taken care.

POINTS FOR DISCUSSION

- Requirement of trainings for capacity building of farmer facilitators
- Requirement of lead farmer
- Micronutrient consumption against total requirement
- Cilmate change Action plan
- Seed production programme in BC areas

Challenges Ahead

- Tackling the whole targeted dry land area.
- Micro Nutrient application in the entire area to increase the consumption level up to recommendation

INPUTS	Recommandation Kg/ha	Actual consumption Kg/Ha 2013-14	Actual consumption Kg/Ha 2012-13
Gypsum	200 kg /Ha	20 kg/Ha	19.34 Kg/Ha
$ZnSO_4$	10 Kg/ Ha	2.48 kg/Ha	2.48 Kg /Ha

Challenges Ahead cotd.,

- To enhance communication levels from Farmer facilitator to farmers .
- Capacity Building of Farmer Facilitators.
- Transformation of Awareness to Adoption
- Documentation and reporting of actual adoption levels
- To come out with district plan in relation to climate change


THANK YOU


Bhoochetana
(Mission to Boost
Productivity of rainfed
agriculture)
ಭೂಚೇತನ


Birds View
Bhoochetana-I
2009 – 12
Dharwad dist
Shri. S.M.Gadad,
Joint Director of
Agriculture
Dharwad.


Main Objective
To increase the yield by 20% by adoption of dry land farming technologies by efficient utilization of natural resources and improving rural livelihoods through sustainable agriculture.


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ಧಾರವಾಡ
ಉತ್ತರ ಕನ್ನಡ
ಗದಗ
INDEX
- TALUK
-CLUSTER VILLAGES
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C¼ÀªÀrPÉ
Watershed Map of Dharwad District

2013-14 General Information of the District.

Geographical Area (Ha.)		427329		
Cultivable Area (Ha.)		342975		
Normal Rainfall (mm)		800.4		
		Total	Rainfed	Irrigated
Cultivable Area (Ha.)	Kharif	208900	177667	40630
	Rabi	191115	147902	34325
	Summer	4015	0	1870
Land Holdings		No.	Area (Ha.)	
	Marginal Farmers	36383	21675	
	Small Farmers	49355	71640	
	Others	57487	249660	
Total		143225	342975	
Major crops of Kharif–Paddy, Maize, Jowar, Greengram, Soybean, Groundnut & Cotton				
Major crops of Rabi – Jowar, Wheet ,Bengalgram ,Saflower, Sunflower & Cotton				

DHARWAD DISTRICT RAINFALL DATA (IN m.m.)

MONTH	NORMAL	2010	2011	2012
JAN.	2.0	10.1	0.2	0.0
FEB.	3.0	0.6	2.7	0.0
MAR.	6.2	0.1	1.3	0.1
APR.	44.7	30.1	65.6	35.5
MAY	81.1	78.1	74.3	26.8
JUN.	115.9	115.0	121.0	46.3
JUL.	154.7	157.0	101.7	61.4
AUG.	105.2	178.1	128.0	81.7
SEP.	120.9	126.8	61.2	67.4
OCT.	119.7	100.3	139.2	52.7
NAV.	39.6	121.7	4.4	67.9
DEC.	5.9	1.3	0.3	3.8
TOTAL	800.4	919.3	699.9	443.6

GRAPHICAL REPRESENTATION OF RAINFALL (m.m.)

	JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEP.	OCT.	NAV.	DEC.
NORMAL	2	3	6.2	44.7	81.1	115.9	154.7	105.2	120.9	119.7	39.6	5.9
2010	10.1	0.6	0.1	30.1	78.1	115	157	178.1	126.8	100.3	121.7	1.3
2011	0.2	2.7	1.3	65.6	74.3	121	101.7	128	61.2	139.2	4.4	0.3
2012	0	0	0.1	35.5	26.8	46.3	61.4	81.7	67.4	52.7	67.9	3.8

Bhoochetana-I (Kharif)

Crop wise area Coverage 2009-2012(Ha)

Sl No.	Crop	2009-10	2010-11	2011-12	2012-13
1	Soyabean	12,000	21,700	10,000	25,785
2	G.Nut	1,000	15,200	19,000	10,329
3	Maize	-	-	19,750	17,087
4	G.Gram	-	-	7,750	3,023
5	Paddy	-	-	-	11,000
6	Cotton	-	-	-	15,441
Total		13,000	36,900	56,500	82,635
%		6.25	17.7	27.1	40

% Increase in Yield by Adopting Technology (Phase-1)

Crop	Avg Yield Qt/Ha (2008-09)	B.Chetana Plots Yield Qt/Ha	Best Yield Qt/Ha	% Increase in Yield
Soybean	9.80	13.1	25.5	33
G.Nut	9.0	12.6	22.5	40
Maize	24.0	28.6	53.0	19
G.Gram	5.0	6.3	12.6	26.0
Cotton	11.3	14.8	22.6	31
Rabi				
B.Gram	9.5	11.0	18.0	15.7
Rabi Jawar	10.0	11.5	16.0	15.0

2009-2012 Total area and Micronutrient distributed (Tns) BC-I

Year	Area covered (ha)	Families Covered (No)	Zinc Sulphate (Tn)	Zinc kg/Ha	Bora (Tn)	Borax kg/Ha	Gypsum (Tn)	Gypsum kg/Ha
2009-2012 (Kharif)	2,79,000	198065	1179.02	4.22	11.83	0.43	5396.5	19.34
2009-2012(Rabi)	351990	325721	558	1.58	118.3	0.32	2333.3	6.62

Training Programmes 2009-12

	District	Taluka	Hobli	Cluster
	3	5	5	65
	2	8	10	16
	2	10	28	120
	2	7	15	177
	4	8	15	35
Total	13	38	73	413

Strategies for implementation

Farm Facilitators are selected to transfer the technology at Village Level

Adoption of Improved technologies like Soil and water conservation, Improved varieties, INM,IPM, practices through wall writings, Andolans, field days and FFs.

Quality input distribution through RSKs and also at cluster level in time.

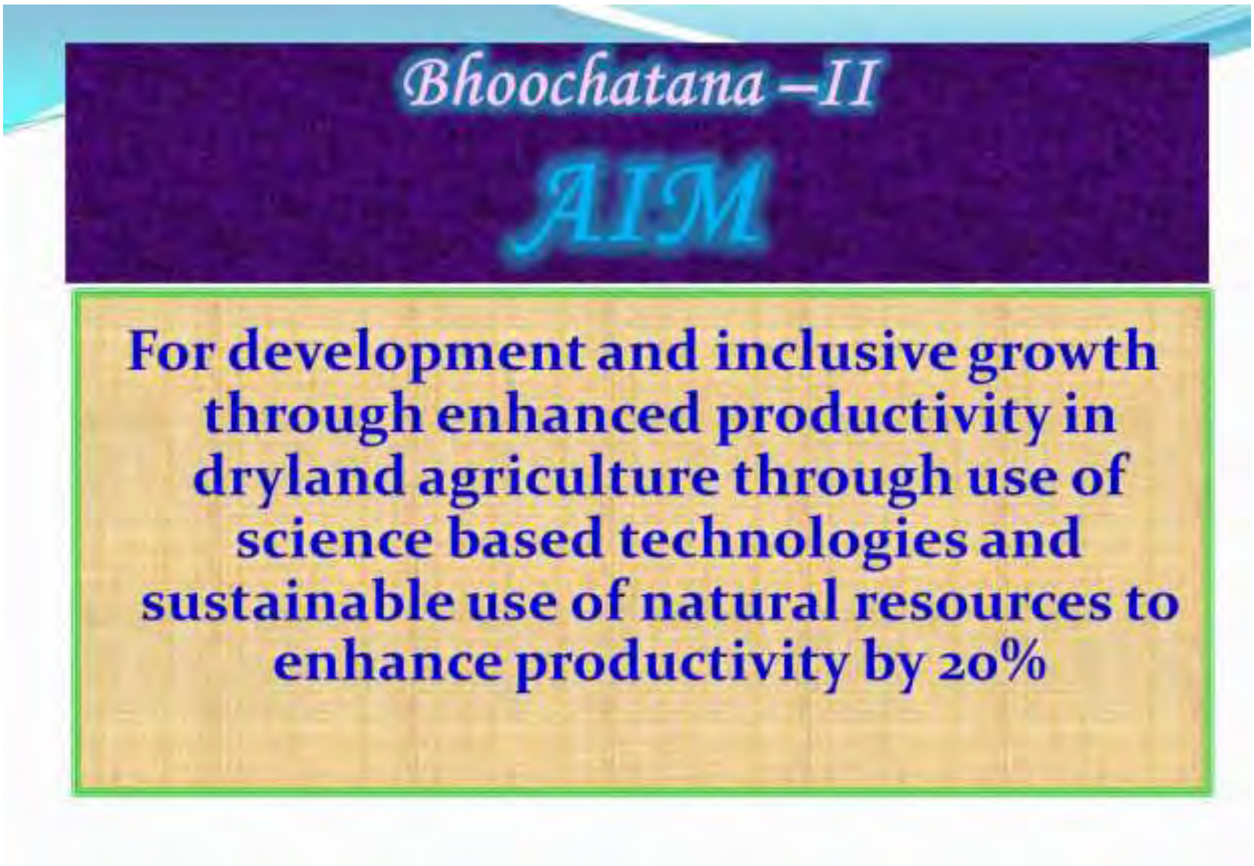
LEARNINGS

1. Farmers fecilitators are able to identify the difference between micronutrient deficiency symptoms and disease symptoms.
2. Role of micronutrient has been visualized by farmers in production
3. Application of gypsum contributed to quality parameter in grains (Soyabean- colour, oil content, grain filling).
4. Along with recommended micronutrient additional use of organic manures like Vermi Compost, City Compost and Agri gold-crops have been better performed even in drought condition.
5. Awareness created among farmers to boost yield by wall paintings , Trainings and farmer facilitators – (technologies and inputs)

CHALLENGE

1. Uncertain climatic conditions.
2. Creating a right market for Agricultural commodities at cluster level.
3. Labour problem

Wel-Come Bhoochetana-II


Bhoochatana –II
AIM
For development and inclusive growth through enhanced productivity in dryland agriculture through use of science based technologies and sustainable use of natural resources to enhance productivity by 20%


Bhoochetana-II Objective

2013-14 General Information of the District.

Geographical Area (Ha.)		427329		
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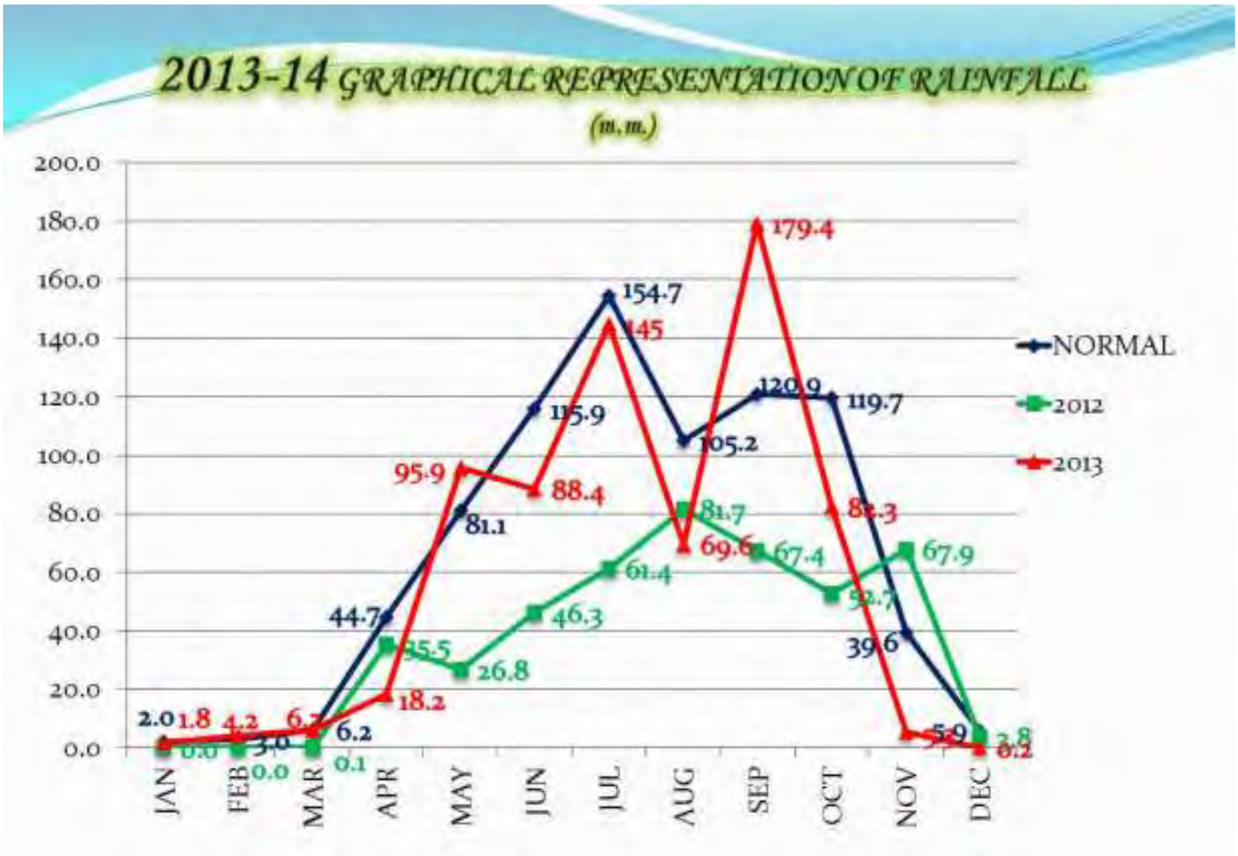
DHARWAD DISTRICT RAINFALL DATA (IN M.M.)

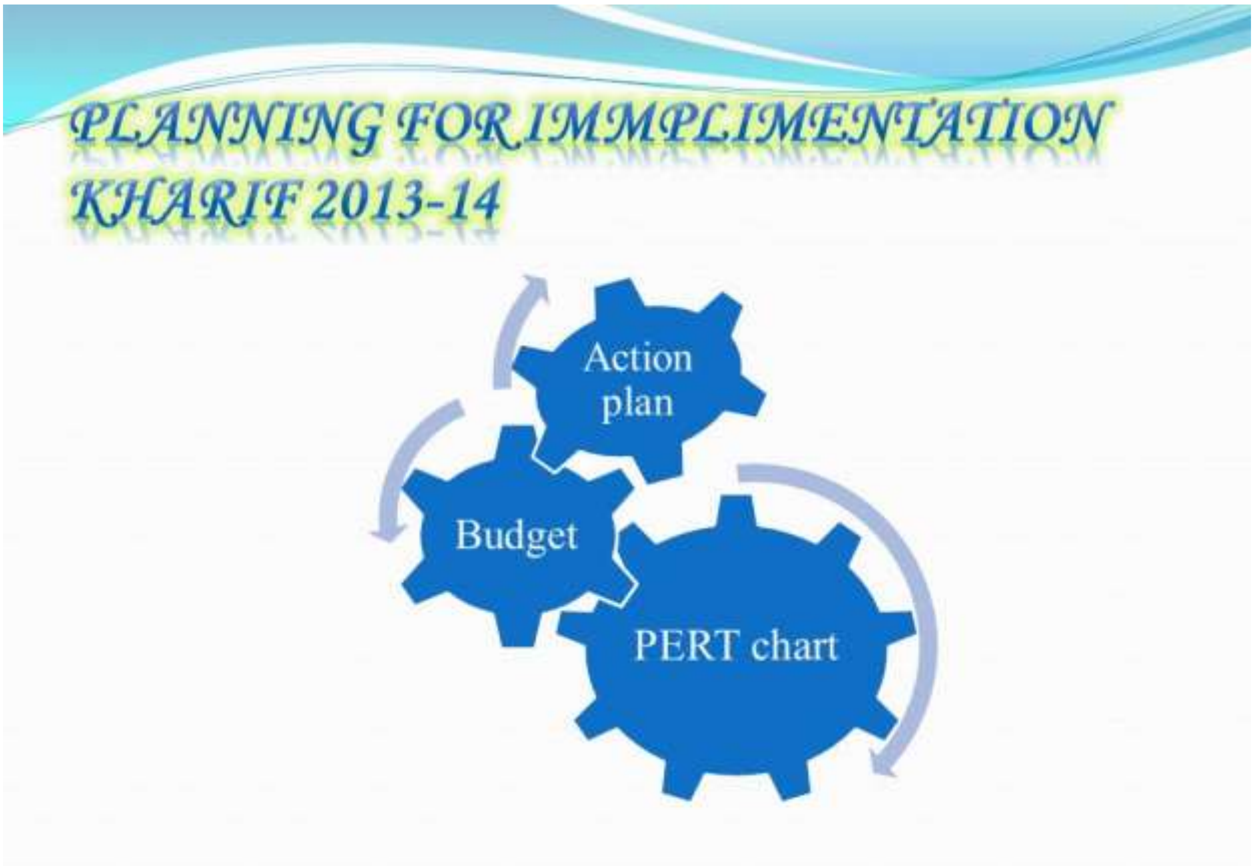
MONTH	NORMAL	2012	2013
JAN.	2.0	0	1.8
FEB.	3.0	0	4.2
MAR.	6.2	0.1	6.2
APR.	44.7	35.5	18.2
MAY	81.1	26.8	95.9
JUN.	115.9	46.3	88.4
JUL.	154.7	61.4	145.0
AUG.	105.2	81.7	69.6
SEP.	120.9	67.4	179.4
OCT.	119.7	52.7	82.3
NAV.	39.6	67.9	5.3
DEC.	5.9	3.8	0.2
TOTAL	800.4	443.6	696.8



Taluka wise Soil status

(Based on ICRISAT)

Taluka	Zinc Sulphate		Boron		Sulphur	
	% Deficiency	ZnSo4 Recommendation (Kg/Ha)	% Deficiency	Borax Recommendation (Kg/Ha)	% Deficiency	Gypsum Recommendation (Kg/Ha)
Dharwad	27	10	47	2.50	64	200
Hubli	36	10	50	2.50	83	200
Kalghatgi	15	10	72	5.00	62	200
Kundgol	69	15	12	2.50	94	200
Navlgund	80	15	6	2.50	89	200


PLANNING FOR IMMPLIMENTATION
KHARIF 2013-14
Action plan
Budget
PERT chart


PERT CHART

2013-14 Kharif Area Coverage (Ha)

Sl. No	Crops	Area		%
		Target	Achivement	
1	**Soyabean**	34000	32602	96
2	**Ground Nut**	29000	26750	92
3	**Green Gram**	27000	20930	78
4	**Maize**	20000	23900	120
5	**Paddy**	20000	19000	95
6	**Cotton**	24500	31318	128
Total		154500	154500	100

2013-14 Crop Wise Activities

Sl No	Talukas	Bench Mark Villages	Farmer Regisrn	Area (Ha)	Cluster Village	Farme Facilitator	FFS
1	Soyabean	124	22062	32602	10	62	62
2	G.Nut	70	23214	26750	8	51	51
3	G.Gram	79	18239	20930	5	41	41
4	Maize	130	16474	23900	6	46	46
5	Paddy	32	7210	19000	3	36	36
6	Hy Cotton	95	20781	31318	9	60	60
Total		530	107980	154500	41	296	296


Farmer Registration
Identification of Technology
Selection of Farm facilitators
Soil Sample Collection
Selection of FFS Donor


Capacity Building Farm Facilitators
Training
Field Visit
Method Demonstration & Record Keeping .
Teaching Materials (Book , Pamphlets, CD, Videos)


Dist Level (1)
Hobli Level (14)
Taluka Level(5)
Training
Village Level (242)
Extn.Officers (1)
Inst.Level(6)


Publicity
Safe use of Pesticide
Soil Fertility
Crop Technology
Wall Writing


Andolana
Krushi Mela
Paper publication
Krushi Mela
Bhoo Chetana to be implemented in 44,000 hectare
Publicity
Akashvani Dharwad
Pamplates
Radio
Video


Monitoring the supply Plan
Pre position of Inputs in Time
Gowdan identificatio n
Input

Distribution of Inputs

Input Progress (Kharif 2013-14) Area -1,54,500 Ha

Inputs	Target kg/Ha	2008-09	2009-12 kg/Ha	2013-14 Kg/Ha
Gypsum(Tn)	100	0	19.34	27.24
Boron(Tn)	1.00-2.00	0	0.40	0.89
Zinc (Tn)	5.00-7.50	0	4.22	5.35
Bio Pesticides(kg)	-	0	-	42.46
Pesticides(Lit)	-	0	-	-
Bio Fertilizer	-	0	-	-

Farm Field Schools

Training, Group Dynamics

Seed Treatment, Seed Germination Test

Farm Field Schools

Short Term Experiment on shoot weevil in cotton crop

1) **check plot**
- 2) 1ml **Nuvon + 5ml Water - Injecting to the Plants**
- **3)Spraying 2ml Prophenophos + 1ml Nuvon**
- **4) Spraying 2ml Quinalphos + 1ml Nuvon**
- **Village : Chabbi**
- **Dated : 10-08-2013**
- **Result: Spraying with 2ml Prophenophos + 1ml Nuvon is better compared to other treatments**

% Increase in Yield by Adopting Technology (Phase-II)

Crop	Avg Yield Qt/Ha (2008-09)	(Phase-I) B.Chetana Plots Yield Qt/Ha	2013-14 Best Yield Qt/Ha	% Increase in Yield
Soybean	9.80	13.1	15	14.5
G.Nut	9.0	12.6	12.67	1.0
Maize	24.0	28.6	42.25	47.0
G.Gram	5.0	6.3	8.45	34.0
Cotton	11.3	14.8	13.00	Picking contd.


Success Story's


ttttt

ಭೂಚೇತನದಿಂದ ಲಾಭ ಪಡೆದ ರೈತ «gÀÄªÀPÀÄªÀiÁ ¸ÉÆÃV UËqÀ¥ÀÄ CªÀgÀ UÉÆÃ¼À

¨sÀÆZÉÃvÀ£À AiÉÆÃd£É C¼ÀªÀr¸ÀzÉÃ ¨É¼ÉzÀ ¨É¼É «ªÀgÀ	CAvÀgÀ ¨É¼É	«¹ÛÃtð	¨É¼É	¢£ÁAPÀ		E¼ÀÄªÀj (Qé/ºÉ)	ªÀiÁgÀÄPÀ mÉÖ ¨É¯É (¥Àæw QéA.UÉ)	MIÄ DzÁAiÀÄ (gÀÆ.UÀ¼À°è)	¸ÁUÀÄªÀ¼À ªÉZÀÑ (gÀÆ.UÀ¼À°è)	¤ªÀé¼À DzÁAiÀÄ (gÀÆ.UÀ¼À°è)
				©vÀÛ£É	PÀmÁªÀÅ					
	ºÀwÛ:ºÉ¸ÀgÀÄ 1:1	1 ºÉ	ºÉ¸ÀgÀÄ	22/06/2013	27/08/2013	6.5	4000	26000	38000	70125
			ºÀwÛ	22/06/2013ºÀwÛ	£ÀªÉA§gï-13 ¢AzÀ d£ÉÃªÀj-13	18.25	4500	82125		
PÀÈ¶ E¯ÁSÉ¬ÄAzÀ ¥ÀqÉzÀ ¸ÀªÀ®vÀÄÛ	®WÀÄ ¥ÉÆÃµÀPÁA±ÀU¼ÀzÀ ¥ÀæªÀiÁtÀvÀ ©Ãd, ¨ÉÆÃgÁ£ï, fAPï, f¥ÀìA ¥ÀqÉAiÀÄÄ¯ÁVzÉ.									
C¼ÀªÀr¹gÀÄªÀ ¸ÀAzsÀåvÀ ¨sÀÆZÉÃvÀ£À vÀAvÀæPÀvÉ	®WÀÄ ¥ÉÆÃµÀPÁA±ÀU¼À §¼ÀPÉ, §¯É ¨É¼ÉAiÀÄiÁV vÉÆUÀj, ¨ÉAr ¨É¼É, ಬದು ಬೆಳೆಯಾಗಿ ªÉAPÉì eÉÆÃ¼À.									

INNOVATIONS:

1. Dissemination of agricultural Technologies ,Weather forecast, Input details(Stock,Sub.rate),Market intelligence's, other Departmental messages, through mobile SMS (Thomson Reuters,Mumbai).

2. Application of Numeria relii in soyabean crop against spodoptera in 200 acrs of 5 adopted ATMA villages. (to reduce cost of cultivation 3 times).

3. Collaboration with ICRISAT Agricultural officers and farmer facilitator were given hands on documentation which is further useful to disseminate the technologies from farmer to farmer through video. (12 video,3 video dissiminatrd to 600 farmers).

4. Frequent onset and offset of monsoon weed control is a major challenge- Turga super weedicid came as a boon to Groundnut soya bean farmers in Hubli tq.(soya bean,groundnut covered 30,000 Ha)
5. Seed treatment campaign conducted to cover 70,000 Ha.

Bhoochetana Expenditure *Jan-2014, Rs-Lack*

	IEAS (2401-00-109-0-21)		RKVY (2401-00-800-1-57)	
	Release	Expenditure	Release	Expenditure
Input	25.00	24.7885	72.07	71.02
Non Input	123.55	116.76	63.00	17.578
Total	148.55	141.5485	135.07	88.598
	95.2%		65.59%	

Annexure-4A

DISRICTWISE ACTION PLAN OF EXISTING COMPONENTS FOR 2014-15Kharif(Total)

Sl.No.	Area	Taluks	RSK's	Farmer facillitator		Wall writing		Godwon rent		Farmer Field School		Vehicle transportation	
				phy	fin(lakhs)	phy	fin(lakhs)	phy	fin(lakhs)	phy	fin(lakhs)	phy	fin(lakhs)
1	50000	Dharwad	4	96	30.24	250	5.00	48	2.88	96	9.6	4	0.4
2	30000	Hubli	3	60	18.9	200	4.00	30	1.8	60	6	3	0.3
3	36000	Kalghatgi	3	72	22.68	150	3.00	36	2.16	72	7.2	3	0.3
4	29000	Kundgol	2	58	18.27	150	3.00	29	1.74	58	5.8	2	0.2
5	30000	Navlgund	2	40	12.6	150	3.00	20	1.2	40	4	2	0.2
	175000	5	14	326	88.02	900	18.00	163	9.78	326	32.6	14	1.4

Annexure- 4B

2014-15 Input physical and financial requirement (Kharif)

Sl.No.	Taluka	Area	Physical as per recommendations			Physical @ 50% of requirement			Financial for 50% of requirment (Rs.in lakhs)			
			Gypsum @200kg/ha(Tns)	ZnSO4 @10Kg/ha (Tns)	Borax @5kg/ha (Tns)	Gypsum @100kg/ha (Tns)	ZnSO4 @5Kg/ha (Tns)	Borax @2kg/ha (Tns)	Gypsum @100kg/ha	ZnSO4 @5Kg/ha	Borax @2kg/ha	Total
1	Dharwad	50000	9800	480	240	4800	240	120	88.8	52.8	34.8	176.4
2	Hubli	30000	6000	300	150	3000	150	75	55.5	33	21.75	110.25
3	Kalghatgi	36000	7200	360	180	3600	180	90	66.6	39.6	26.1	132.3
4	Kundgol	29000	5800	290	145	2900	145	72.5	53.65	31.9	21.025	106.575
5	Navigund	30000	4000	200	100	2000	100	50	37	22	14.5	73.5
	Total	175000	30900	1545	772.5	15450	772.5	386.25	285.825	170	112.013	567.788

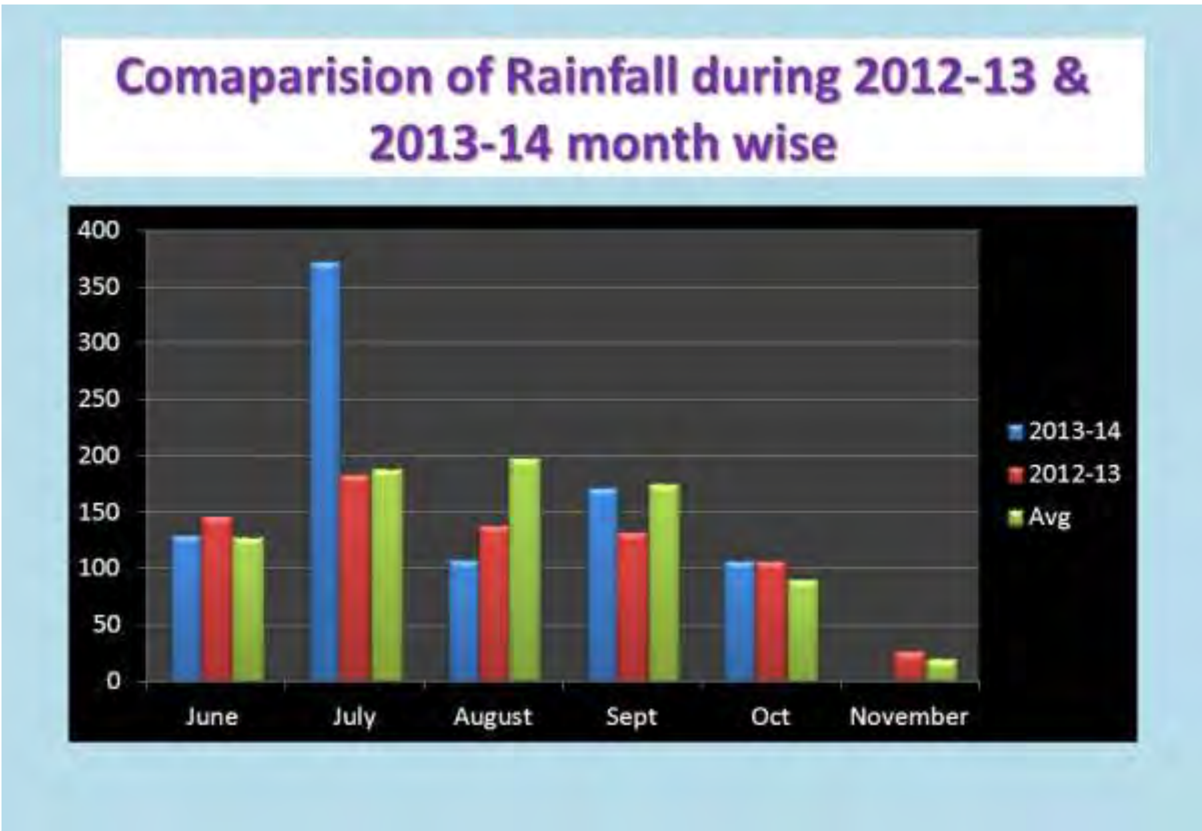
Annexure- 4C

Fin in Lakh Rs

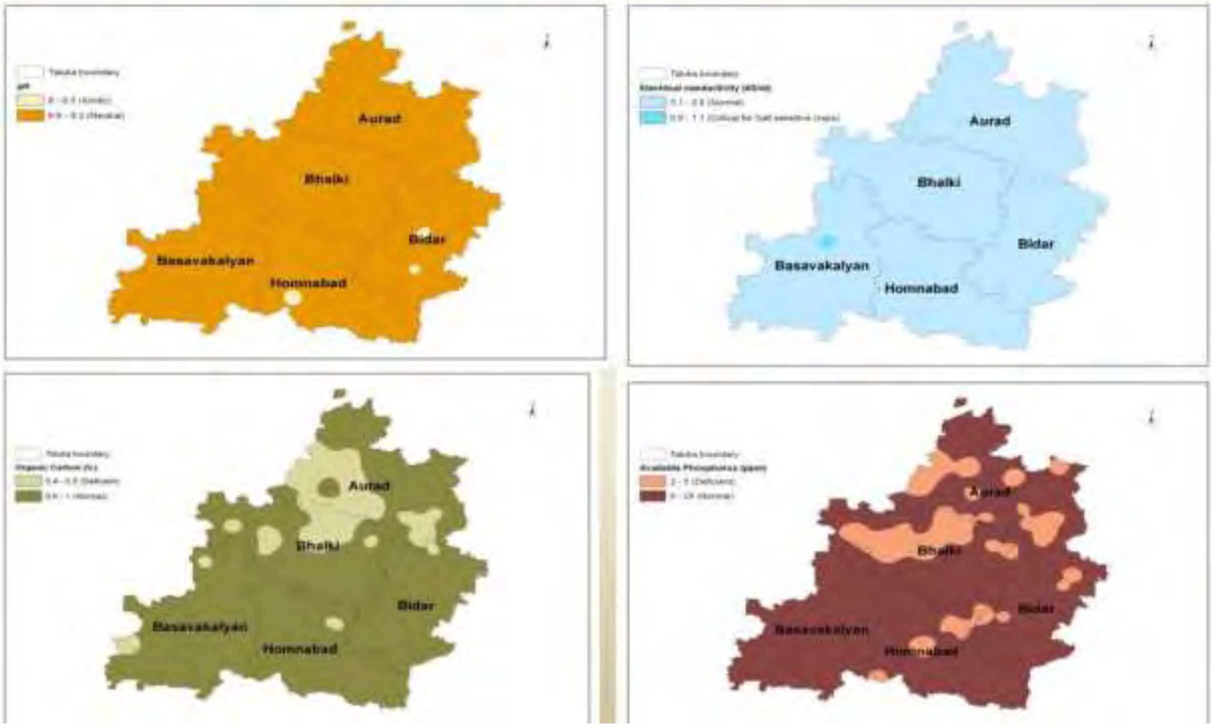
DISTRICT WISE 2014-15 (Kharif) ACTION PLAN FOR BHOOCHETANA TRAINING PROGRAMME

Sl. No.	Taluk	Training/Workshop										Field days						Institutional training for farmer facilitators		Trng for extn officers on FFS and climate change studies		Grand total	
		Diistrict		Taluk		Hobli		Cluster		Total		Taluk		Hobli		Total							
		Phy	Fin	Phy	Fin	Phy	Fin	Phy	Fin	Phy	Fin	Phy	Fin	Phy	Fin	Phy	Fin	Phy	Fin	Phy	Fin	Phy	Fin
1	Dharwad	1	0.15	1	0.15	8	0.8	96	1.68	106	2.78	1	0.25	4	0.2	5	0.45	6	3.6	1	0.3	118	7.13
2	Hubli			1	0.15	6	0.6	60	1.2	67	1.95	1	0.25	3	0.15	4	0.4					71	2.35
3	Kalghatgi			1	0.15	6	0.6	72	1.44	79	2.19	1	0.25	3	0.15	4	0.4					83	2.59
4	Kundgol			1	0.15	4	0.4	58	1.14	63	1.69	1	0.25	2	0.1	3	0.35					66	2.04
5	Navigund			1	0.15	4	0.4	40	0.72	45	1.27	1	0.25	2	0.1	3	0.35					48	1.62
	Total	1	0.15	5	0.75	28	2.8	326	6.18	360	9.88	5	1.25	14	0.7	19	1.95	6	3.6	1	0.3	386	15.73

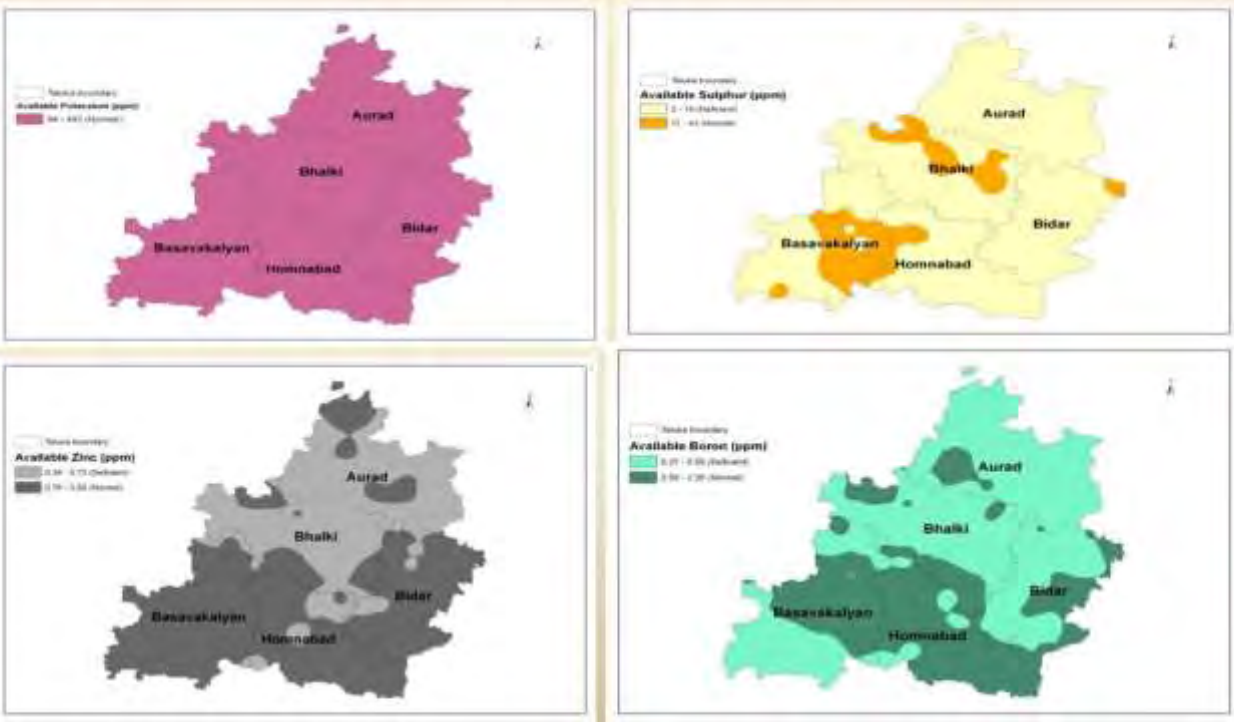

KSDA
WEL COME
TO
BIDAR DISTRICT
Aurad
Bhalki
Bidar
Basavakalyan
Humnabad


Comaparision of Rainfall during 2012-13 &
2013-14 month wise
400
350
300
250
200
150
100
50
0
June
July
August
Sept
Oct
November
2013-14
2012-13
Avg

Soil Fertility Status of Bidar District



Soil Fertility Status of Bidar District



KHARIF AND RABI Inputs consumption for 2010-11, 2011-12 , 2012-13 and 2013-14

Sl .No	Inputs	2010-11	2011-12	2012-13	2013-14
1	Seeds (qtls)	21592	32888	55400	57427
2	Gypsum (MT)	2367	4562	7511	7245
3	Boron (MT)	59	286	504	520
4	Zinc Suplhate (MT)	265	502	820	1134

STATEMENT SHOWING THE CONSUMPTION OF MICRONUTRIENT UNDER 2010-11, 2011 – 12 ,2012-13 AND 2013-14 IN BIDAR DISTRICT

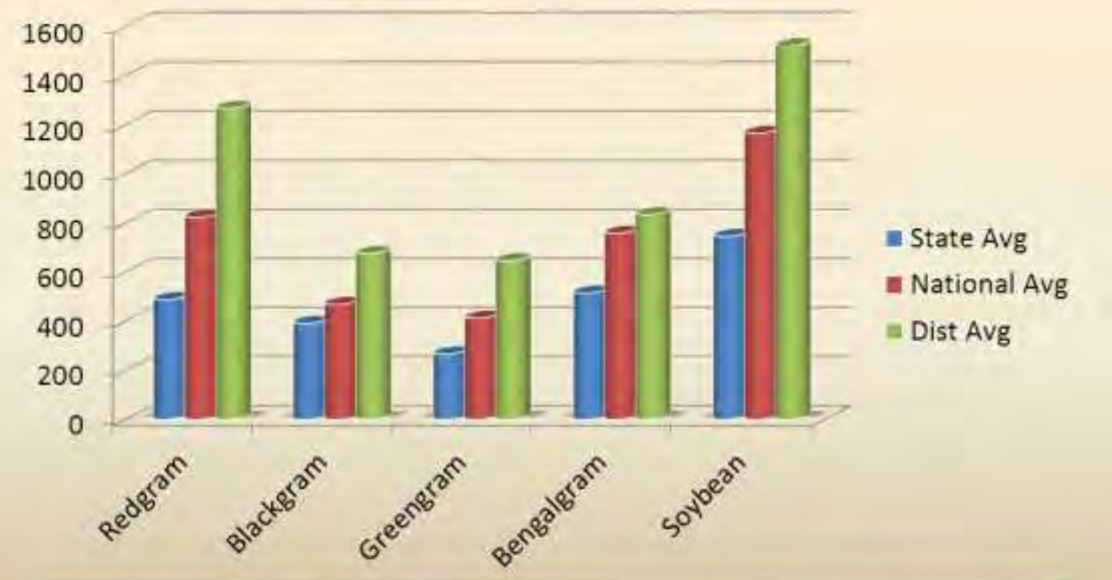
SL. NO.	Name of the Micronutrient (Kharif & Rabi)	2010 - 11 (kg/ha)	2011 - 12 (kg/ha)	2012-13 (Kg/ha)	2013-14 (Kg/ha)
1	GYPSUM	22.70	25.00	25.72	24.81
2	ZINC	2.54	2.75	2.80	3.88
3	BORON	0.56	1.56	1.72	1.78

Major Achievements

Crops	Area (ha)	State Avg. Productivity (kg/ha) (2011-12)	National Productivity (kg/ha)	2011-12 District productivity	2012-13 District productivity (Kg/ha) *
Redgram	68000	488	824	623	1268
Blackgram	44000	392	469	349	677
Greengram	42000	267	413	315	647
Bengalgram	52000	515	759	520	835
Soybean	77000	746	1166	1100	1520

* As per CES conducted by DE&S

Major Achievement



* As per CES conducted by DE&S

Bhoochetana CCE Yields for 2013-14

Sl no.	Crop	Farmer practise Yield kg/ha	Bhoochetana Yield kg/ha	% Yield increase over Farmer practice
1`	Black gram	582	758	29
2	Green gram	564	728	29
3	Soya bean	1286	1617	26
4	Kharif Sorghum	1723	2193	27

Activities undertaken by the dept that contributed to the increase in productivity

1 (a). Publicity


ರಿಯಾಯಿತಿ ದರದಲ್ಲೇ ಗೊಬ್ಬರ, ಬಿತ್ತನೆ ಬೀಜ


ಬೀಜ, ರಸಗೊಬ್ಬರಕ್ಕೆ ಕೊರತೆ ಇಲ್ಲ

1 (b). Trainings

2. SEED TREATMENT CAMPAIGN CONDUCTED IN DIFFERENT VILLAGES

ಬೀಜೋಪಚಾರದಿಂದ ಇಳುವರಿ ಹೆಚ್ಚಳ: ಡಾ. ಪುತ್ರ

3. Adoption of package distribution system comprising all the three micronutrients.

4 (a). Demonstrations

4 (b). Farmer's Field School sessions

Farmer field school video clip

5. Timely advisories to Farmers

ನಿರಂತರ ಮಳೆ: ಕೃಷಿಕರಲ್ಲಿ ಆತಂಕ

ಸತತ ಮಳೆ; ಬೆಳೆ ಹಾನಿ ಭೀತಿ

ರೈತರಿಗೆ ಸಲಹೆ

ಕೃಷಿ ಇಲಾಖೆ ಬೀದರ

6. Regular pest surveillance by rapid roving method

ತೊಗರಿ, ಕಡಲೆಗೆ ಕೀಟಬಾಧೆ: ರೈತರಿಗೆ ಸಲಹೆ

2013-2014

7. Krishi Utsav in Bidar

Hon’ble Agriculture Minister Addressing in Bidar Krishi Utsav 2013

Hon’ble Bhalki MLA addressing in Bidar Krishi Utsav 2013

Hon’ble Bhalki MLA addressing farmers

Flag off by district incharge minister of krishi ratha on Independence day & tableau on Karnataka Rajyotsava

8 (a). Visit of Dr J.S.Sandhu, Agriculture Commissioner, GOI & Dr S.B.S Tikka to Redgram Demonstration field

8 (b). Visit Of National Level Monitoring Team To Redgram Demonstration Field

Field Days

9. BHOOCHETANA Crop Cutting Estimation

Activities of the department during RABI
1.Publicity

ಪ್ರಜಾ ವಾಣಿ ದಿನಾಂಕ 02-10-2013

ಔರಾದ್: ಹಿಂಗಾರು ಬಿತ್ತನೆ ಬೀಜ ವಿತರಣೆ

ಪ್ರಜಾ ವಾಣಿ ದಿನಾಂಕ 01-10-2013

ಮನ್ನಳ್ಳಿಯಲ್ಲಿ 'ಗುಚ್ಛಗ್ರಾಮ' ಕಾರ್ಯಾಗಾರ

ಲಘು ಪೋಷಕಾಂಶಗಳಿಂದ ಇಳುವರಿ ಹೆಚ್ಚಳ

2. Trainings

3. Seed Treatment Campaign

4. Farmer's Field School



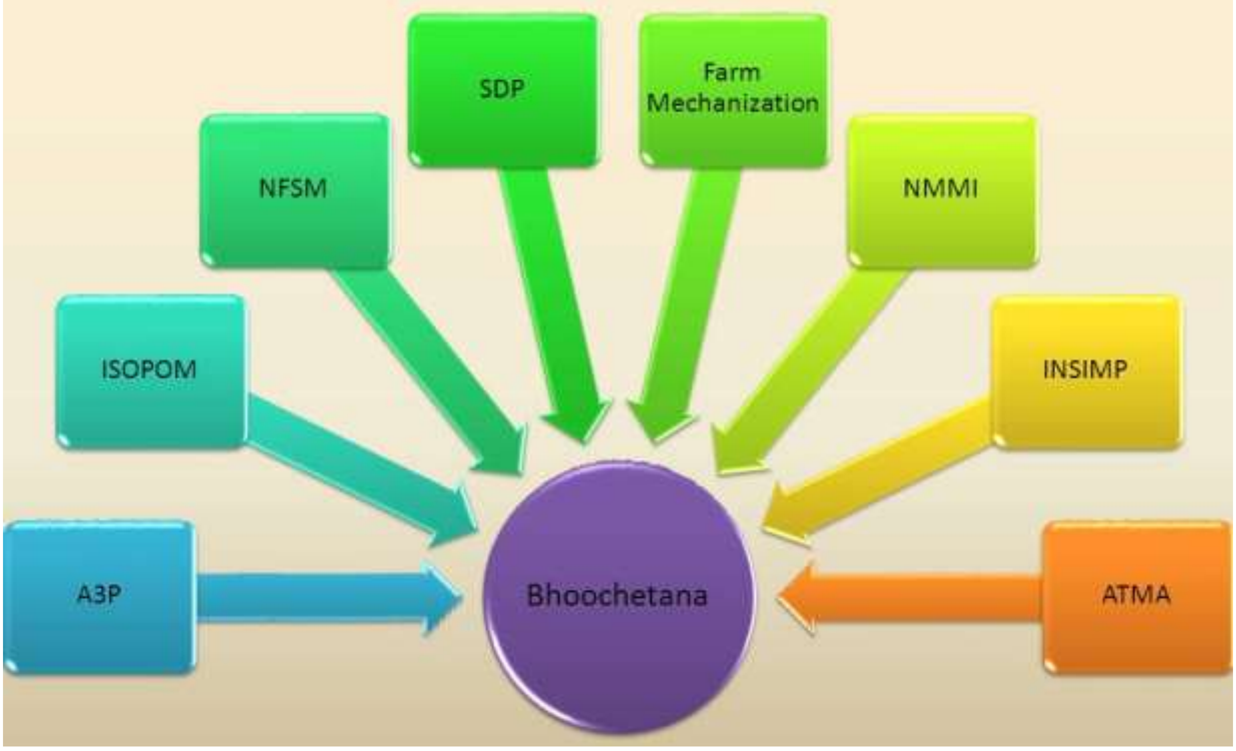

5. Redgram & Sugarcane crop field day


6. Bhoochetana Rabi Crop Cutting Estimates

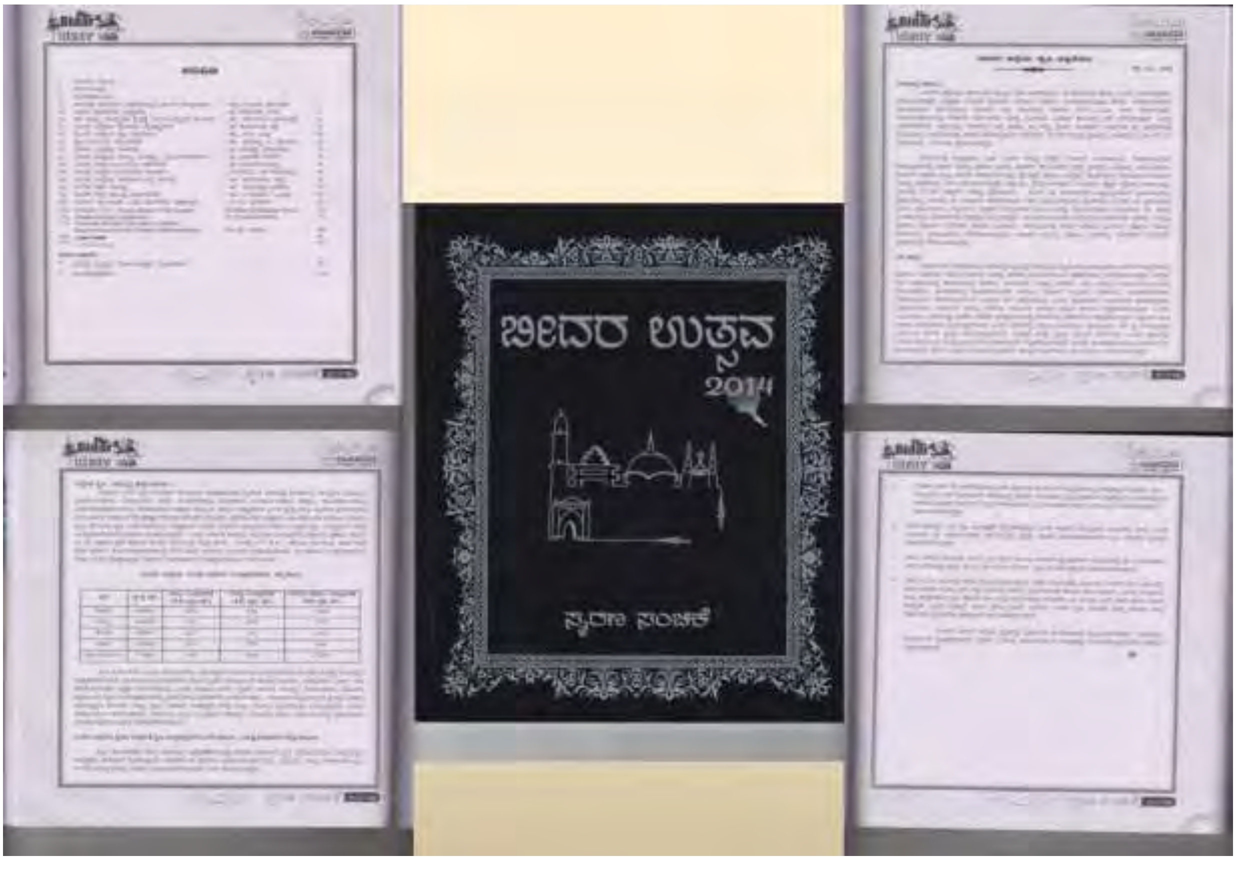
Other Events during rabi

Workshop on National Mission on Food Processing

Convergence of All schemes with Bhoochetana



Hon'ble Chief Minister releasing the Bidar Utsav Souvenir

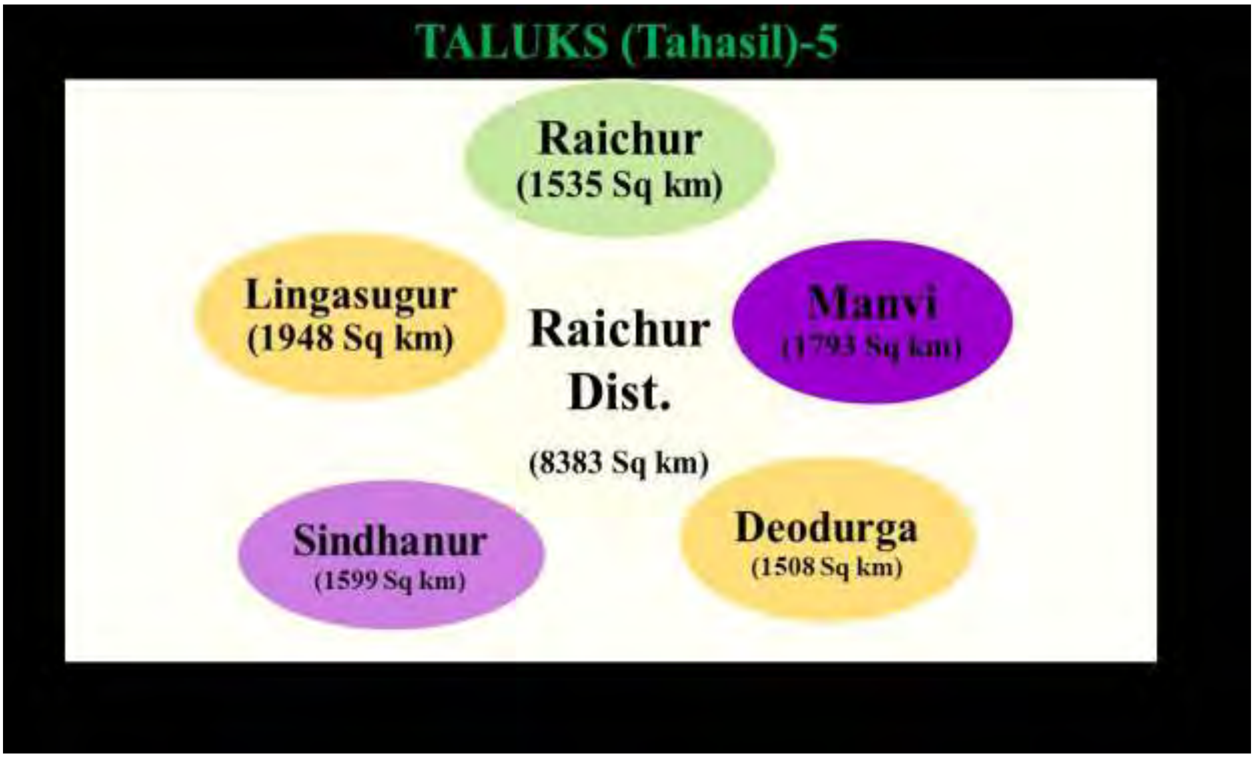


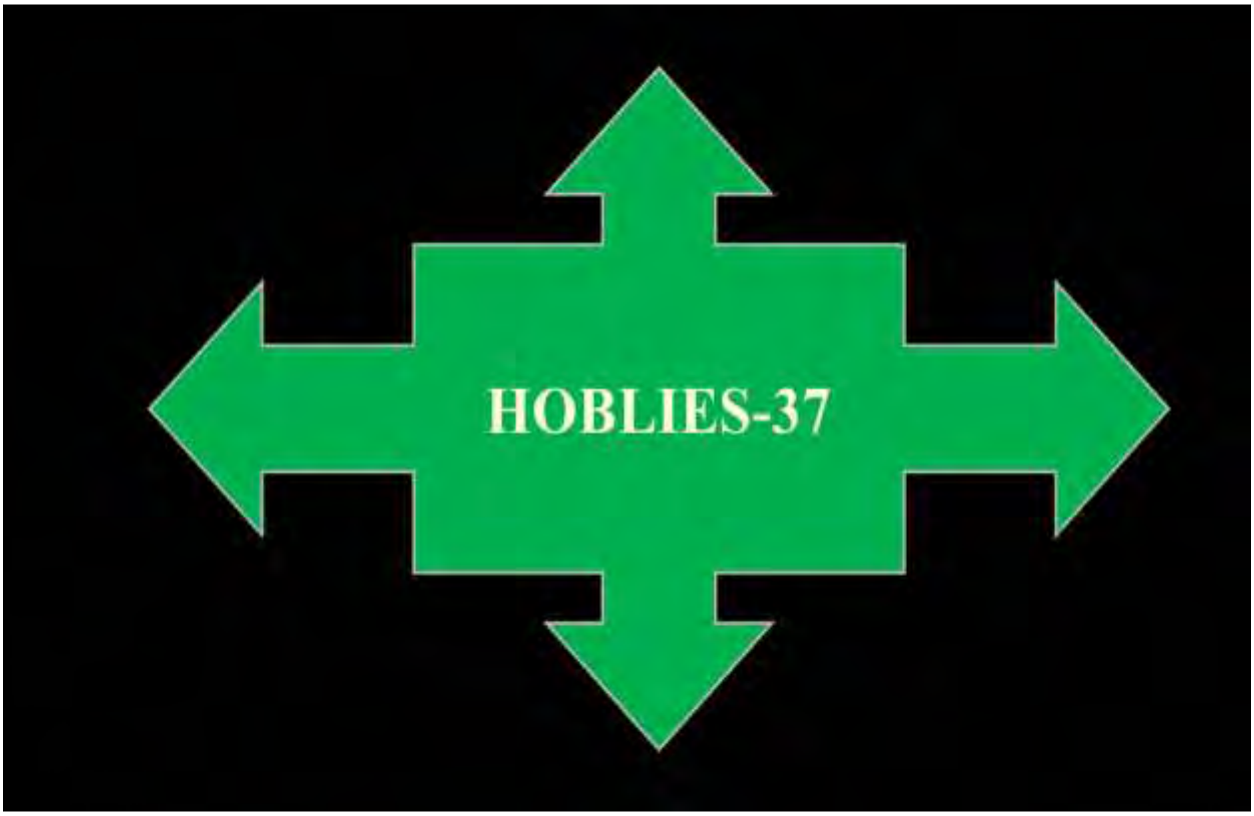
Participation of the department in various events

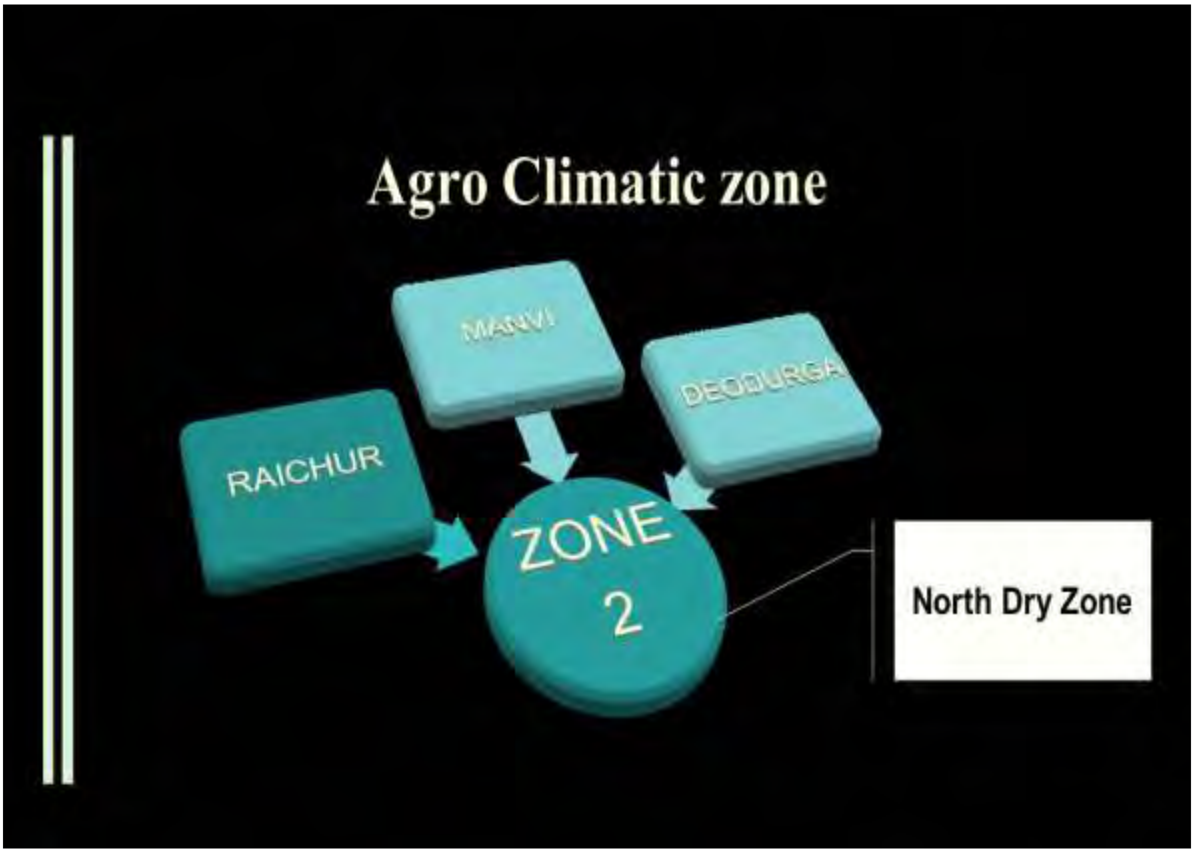
Experience:

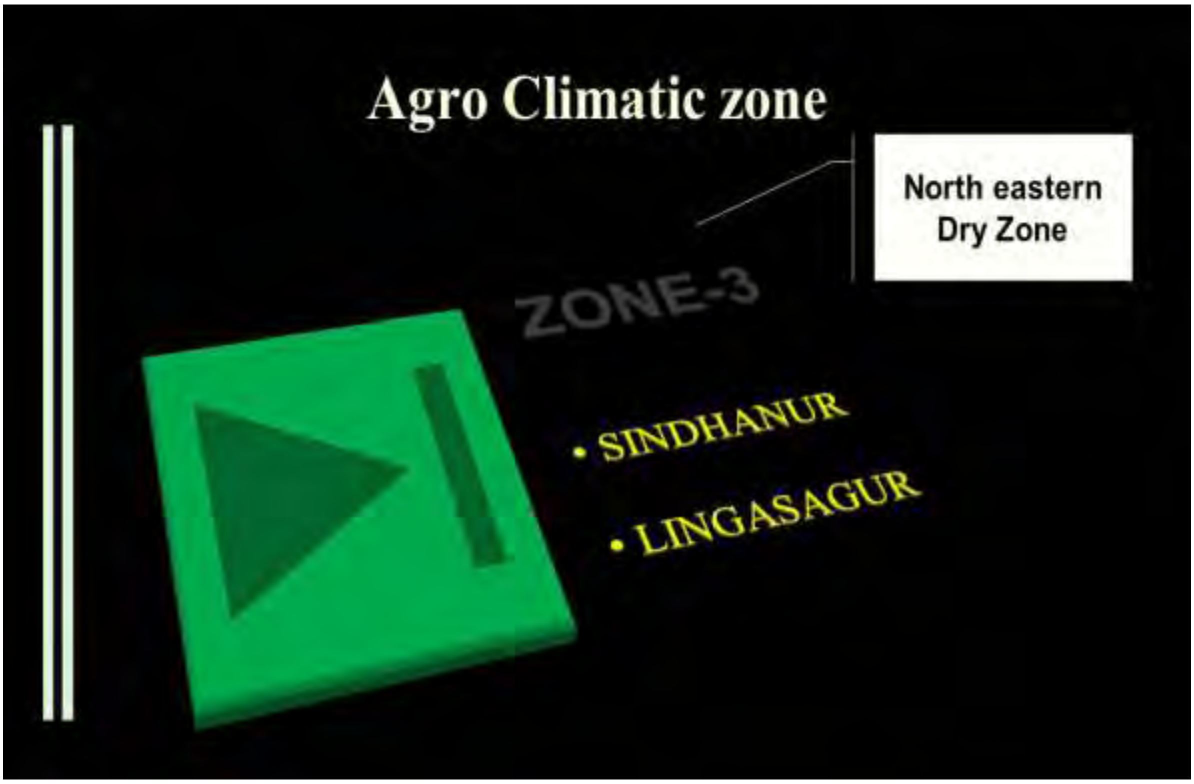
- Timely inputs prepositioning in RSK's and Cluster points.
- Involvement of Facilitators in the implementation of Bhoochetana helped in convincing the farming community.
  (Technology transfer from farmer to farmer)
- Targeting the poor and marginal soils of the district helped in boosting the Greengram, Blackgram, Soybean, Red gram and Jowar crops.
- Farmers field school helped the farmers in solving local need based problems like sudden attack pest and disease etc.
- Role of micronutrients in increasing the yield of the crops.
- Timely awareness of the programmes to farming community and elected representatives

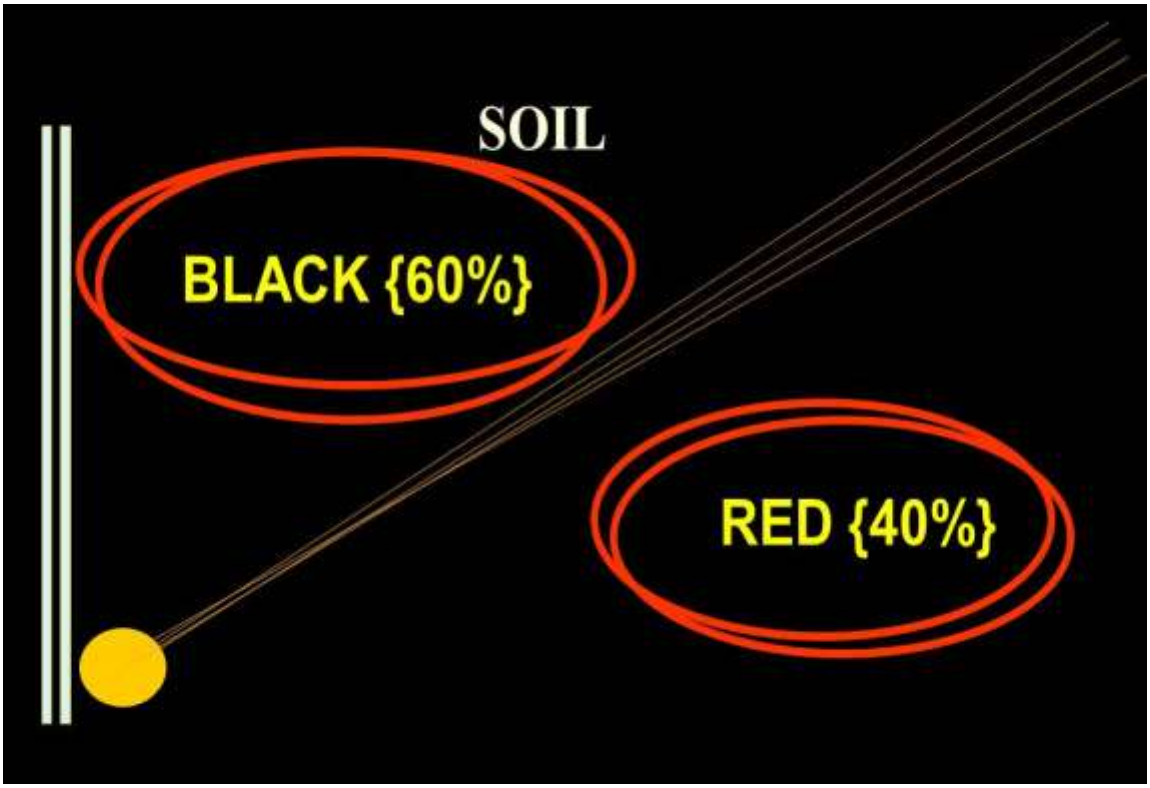
Strategies for Kharif 2014 : Soil fertility mapping of the entire district


TALUKS (Tahasil)-5
Raichur
(1535 Sq km)
Lingasugur
(1948 Sq km)
Raichur
Dist.
(8383 Sq km)
Manvi
(1793 Sq km)
Sindhanur
(1599 Sq km)
Deodurga
(1508 Sq km)

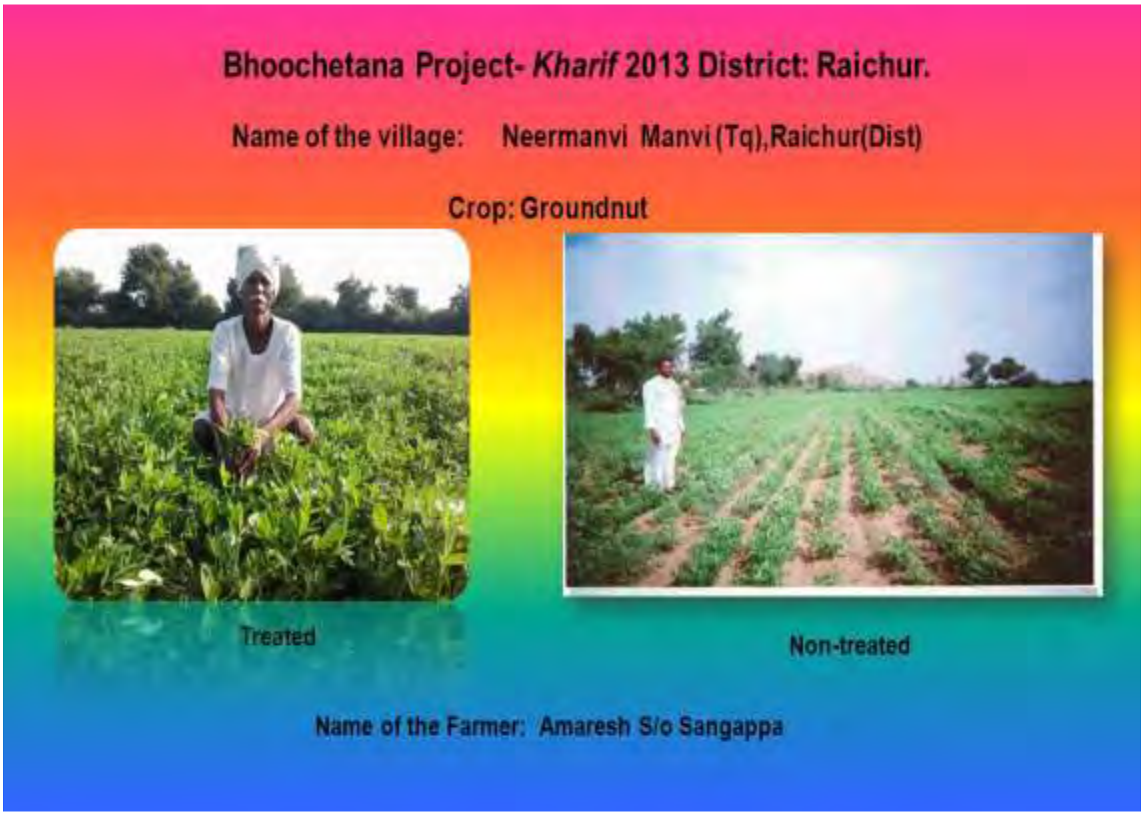

HOBLIES-37

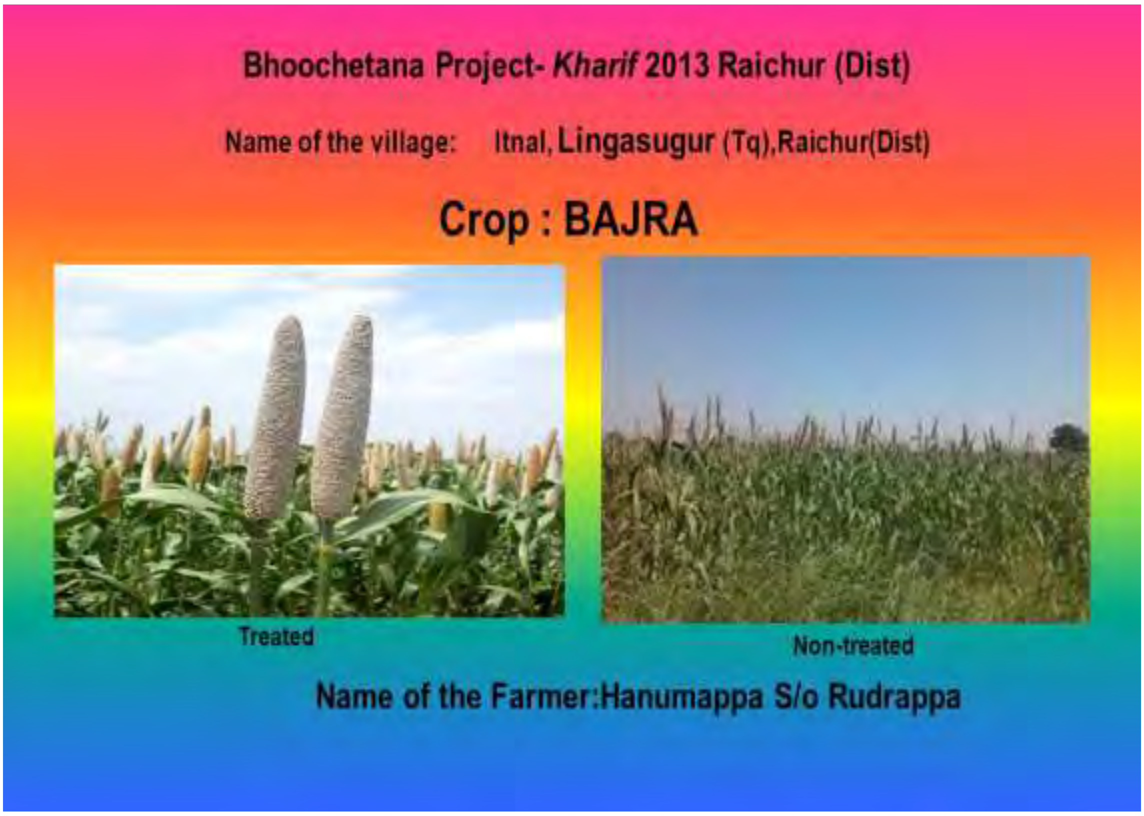

Agro Climatic zone
MANVI
DEODURGA
RAICHUR
ZONE
2
North Dry Zone


Agro Climatic zone
North eastern
Dry Zone
ZONE-3
• SINDHANUR
• LINGASAGUR


SOIL
BLACK {60%}
RED {40%}


Farm Families -3,04,330


Bhoochetana Project- Kharif 2013 District: Raichur.
Name of the village: Neermanvi Manvi (Tq),Raichur(Dist)
Crop: Groundnut
Treated
Non-treated
Name of the Farmer: Amaresh S/o Sangappa


Bhoochetana Project- Kharif 2013 Raichur (Dist)
Name of the village: Itnal, Lingasugur (Tq),Raichur(Dist)
Crop : BAJRA
Treated
Non-treated
Name of the Farmer:Hanumappa S/o Rudrappa

welcome

BHOOCHETANA WORKSHOP Feb 2014

JOINT DIRECTOR OF AGRICULTURE CHAMARAJANAGAR

District Profile

Sl.No	Details	Area
1	Geographical Area	569901 Ha
2	Forest Area	2,75,610 Ha.
3	Cultivable Area	1,86,845 Ha.
4	Small Farmers	51967
5	Marginal Farmers	120028
6	Others	25786
7	Most Backward Taluk	Chamarajanagar
8	More Backward Taluks	Gundlupet & Kollegal

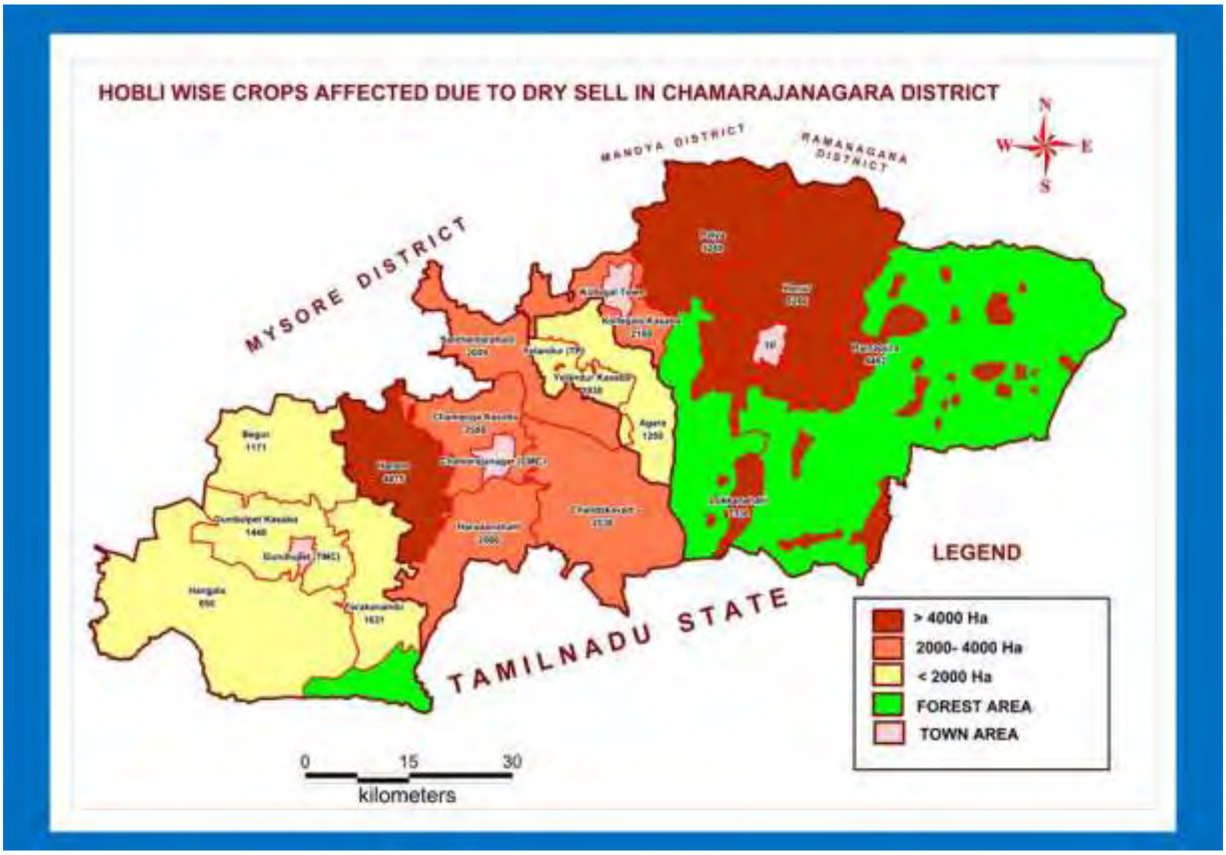
Brief Historical Background:

Chamarajanagar district is continuously suffering from scanty rain fall in the last few years resulting in heavy damage to crops

2002-03	Declared partially drought affected- Gundlupet and Kollegal Taluks.
2006-07	Entire district was declared as drought affected.
2009-10	Declared partially drought affected- chamarajanagar, Gundlupet and Kollegal Taluks
2011-12	Entire district was declared as drought affected.
2012-13	Entire district was declared as drought affected.
2013-14	Entire district is declared as drought affected.

Area Sown During Kharif 2013

Sl. No	Crops	Targetted Area (Ha)	Area Sown (Ha)	Per Centage	Area Affected (Ha)
1	Cereals	88834	80348	90	33755
2	Pulses	27513	21197	77	8328
3	Oilseeds	35113	27287	78	5122
4	Comm. Crops	13971	15812	113	1952
		165431	144644	87	49157



Soil Fertlity Status

Nutrient	Percentage of Deficiency
Organic Carbon	73
Phosphorus	40
Potash	3
Sulphur	90
Zinc	62
Boron	57

Bhoochetana Programme Kharif -2013-14

1. Area

Targetted Area	Area under Bhoochetana	Total Number of Farmers
165431	126160	124609

2. Farmer Facilitators

Targetted Bhoochetana Area	Total FFs'	Actual FFs'	Duration (Days)
1,32,000	264	224	120 days

Bhoochetana Programme Kharif -2013-14 (contd.,)

3. Lead Farmers

Total LFs as per Targetted Area	Total number of FFs	Total Number of Lead Farmers	Reasons
528	224	0	Less amount and duration

4. Farmer Field School

Total No. Farmer Facilitators	Total FFS	Actual FFS conducted	Reasons
264	264	137	Less Farmer facilitators,drought situations

Farmer Field School

Bhoochetana Programme Kharif -2013-14 (contd.,)

5. Wall writings

Total No as per Programme	Total No written
600	600

6. Godowns

Total No as per Programme	Total Nos taken	Reasons
108	86	Inputs were stocked in Societies

WALL WRITINGS

Godowns

Bhoochetana Programme Kharif -2013-14 (contd.,)

7. Transport of Inputs

Total No RSKS	No. of RSKs availed transport	Reasons
16	11	Some firms directly supplied the inputs to Godown points

Bhoochetana Programme Kharif -2013-14 (contd.,)

8. Tranings

Trainings Type	Target	Acht	Reasons
Cluster Village	98	91	Due to Assembly Election
Hobli Level	16	15	
Taluk	4	4	
District	3	3	
Institutional	9	9	
Field Day (Hobli)	16	7	Due to Drought conditions
Field Day (Taluk)	4	2	Due to Drought conditions


TRAININGS


Publicity

Distribution of Inputs during Kharif -2013-14

Sl. No	Inputs	Total Requirement (MTs)	Total Stock (MTs)	Total Distribution (MTs)
1	Gypsum	13200.00	4123.5	3181.00
2	Zinc Sulphate	660.00	210.63	106.38
3	Borax	261.00	115.52	56.45

Crop Cutting Experiments

Yield Data (as Per Crop Cutting Experiments)

Crop	% increase in Yield
Jowar	15
Maize	16
Ragi	11
Groundnut	10
Sunflower	13
Paddy	11

Bhoochetana Progress (Financial) -2013-14

Sl. No	Component	Target		Progrss		Grants released	Percentage
		PHY	FIN	PHY	FIN		
1	Trainings	212	14.14	121	7.371		
2	Farmer Facilitators	264	80.77	224	39.88		
3	Wall Writings	600	12.00	600	12.00		
4	FFS	260	25.98	137	8.06		
5	Inp. transport	16	1.6	11	0.54		
6	Godowns	122	7.35	86	2.62		
7	Field Day	20	4.80	9	0.25		
8	Publicity	4	4.00	4	1.85		
9	Inputs	246	6.01	0	0		
10	Lead Farmers	122	1.76	0	0		
Total		**1867**	**155.43**	**1185**	**72.57**	**125.59**	**58**

REASONS FOR LOW PROGRESS

- Prevailed Drought Situations
- More small and marginal Farmers - financial problems
- Farmer Facilitators left the work in the middle
- Less Staff Strength
- Administrative Problems (retirement/transfers)

MMR PROGRESS

Month	Grants Released	Expen diture	Perce ntage	Bhoochetana		
				Grants Released	Expen diture	Percen tage
September	681.58	85.66	12.6	120.26	22.43	19
October 13	848.88	180.65	21.3	120.26	22.87	19
November 13	1110.43	481.69	43.4	125.59	41.30	33
December 13	1270.36	684.53	53.9	125.59	53.85	43
January 2014	1289.00	795.53	61.7	125.59	72.57	58

Staff Strength in Chamrajanagar District

Sl.No	POST	Sanctioned	Filled	Vacancy	Percentage (filled)
1	JDA	1	1	0	
2	ADA(Hqa)	1	1	0	
3	ADA (SMS)	2	2	0	
4	ADA(Taluks)	4	4	0	
5	ADA(FW)	1	0	1	
6	AO	25	8	17	
7	AO(FW)	3	1	2	
8	AAO	32	17	15	
9	AA	26	3	23	
Total Technical Staff		96	38	58	39.5
	Ministirial Staff	54	38	16	70.0


Thank You

Government of Karnataka
Zilla Panchayat, Davangere
Department of Agriculture

KSDA

BHOOCHETANA – A Mission to be Accomplished

RETROSPECTION

ICRISAT
PATANCHERU
HYDERABAD
DATE:5&6:02.2014

Image Building

- Best performing District
- Best DATC
- Best ADA office
- Best Farmer facilitators honoured

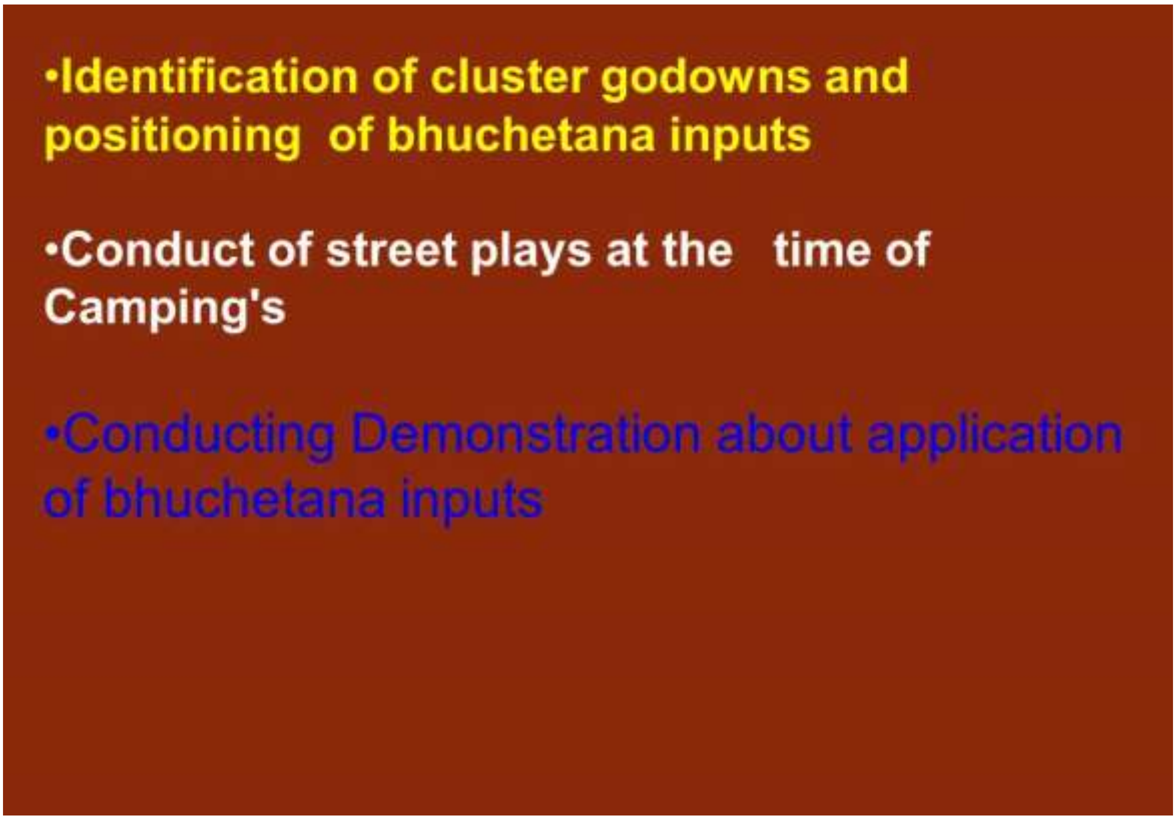
Inspiration & Motivation

- State level Bhuchetana field day in Davanagere
- Visit of principal Secretary (Agri) , A.P. State
- Exposure visit by ATMA team , A.P. State
- Exposure visit by ICRISAT delegates from Tanzanaia & other Country

Publicity propaganda through

- Establishment of models plotos .
- ADA Office & RSK premises
- Govt seed farm with Bhuchetana Treatment
- Bus shelter, school Compounds & other office premises


Action points for successful implements of Bhuchethana
➢ Selection of Bhuchetana faclitors well in time
1.After Hyderbad work shop
2.Experience facilitators renewed
3.New facilitators identified
➢ Refresher trainer to facilitators
❖ At DATC Kadajji
❖ At TKVK Davanagere
❖ At ADA Office
❖ At RSK level


•Identification of cluster godowns and positioning of bhuchetana inputs
•Conduct of street plays at the time of Camping's
•Conducting Demonstration about application of bhuchetana inputs

❖Convincing about Bhuchetana

1.About ourselves
2.Farmer facilitators
3.Elected representatives
4.Preachers/ heads of different community peeta's

- Action points for Successful implementation of Bhuchetana during Kharif-2014
- Selection of new farmer facilitators and Continuation of best performance facilitators
- Orientation, refreshing and training to selected farmer facilitators at DATC Kadajji, TKVK , Davanagare
- Village level Trainings ,street plays and kharif Campaign's

- Identification of godowns at Cluster village , RSK & Taluk level
- Prepositioning of Bhuchetana materials in godowns
- Village survey, farmer interaction and Convincing about Bhuchetana technology
- Grand inauguration of input distribution involving elected representatives

- Press release and publicity propaganda
- Publicity about place & price of Bhuchetana materials
- Demonstration on application of Bhuchetana inputs in road side.
- Exhibiting flex chart containing details of farmer date of planting, Quantity of inputs applied.

Government of Karnataka

Zilla Panchayat Davangere

Department of Agriculture

BHOOCHETANA JOURNEY

BHOOCHETANA TOUR- A RETROSPECT

- Selection of Villages, Collection of Soil samples: First Letter from DoA, No. UKruNi/AaBe/Bhoochetana/2009-10 Dtd:30.06.2009, Training for Soil Health Centre Personnel.
- Training for Facilitators on soil sampling: 3rd & 4th July,2009.
- First Look at Bhoochetana : Video Conference on 13th Jan.2010, 10.02.2010.
- Indents for and Preposition of Bhoochetana Inputs : March 2010.
- Selection and Training of Farmer Facilitators: March 2010.
- Bhoochetana Workshop – Jointly for Agri & WSD Depts: IAT, Bengaluru on 5.04.2010.
- Training for Facilitators on Use of Soil Test Results, Laying out Bhoochetana Demo.: May 2010
- Bhoochetana : Field Based Approach: July 2010
- Moderate Efforts - Best Year 2011-12.
- Best Efforts- Moderate Season 2012-13.
- Best and Determined Approach – More RAINS All is Well, but for Cotton – 2013-14

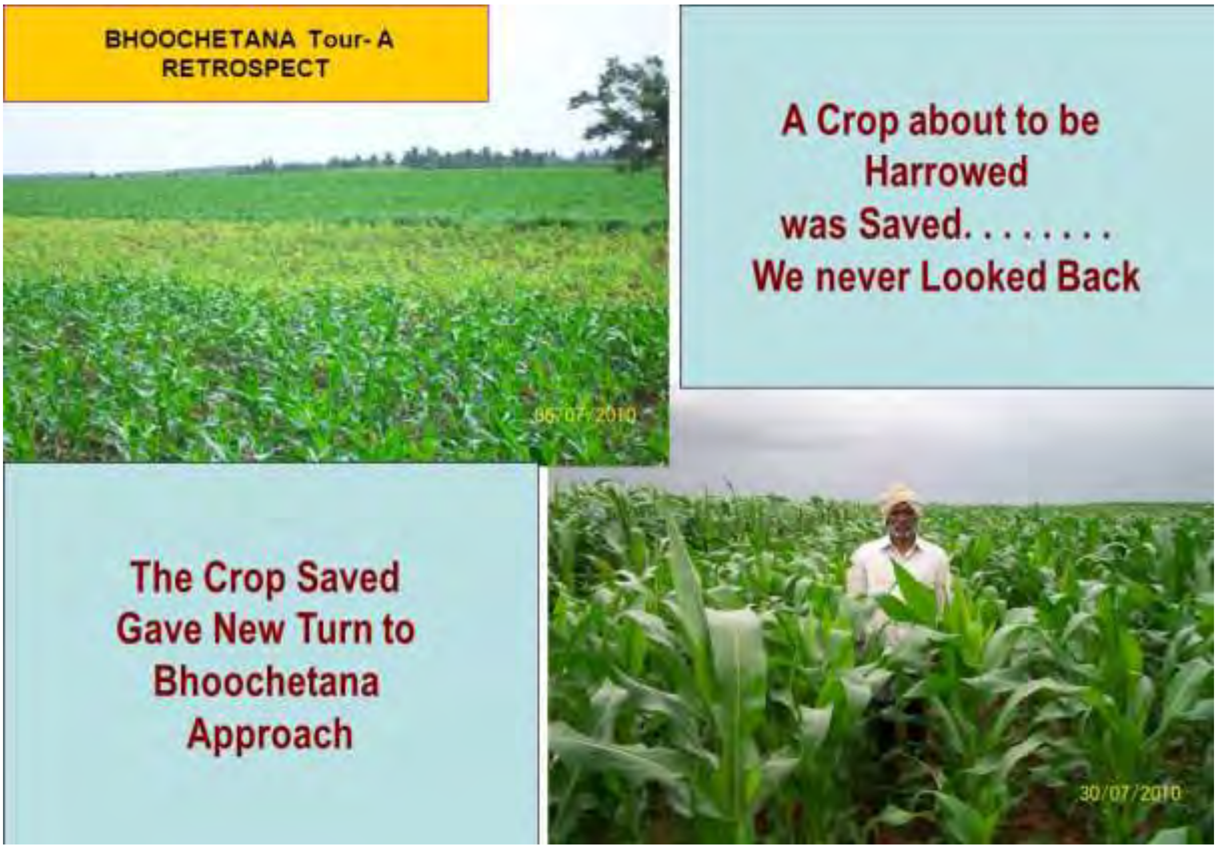
ZILLA KRISHI UTSAV 2010

GAVE A GOOD FORUM TO UNDERSTAND BHOOCHETANA


A VIEW OF KRISHI UTSAV


BHOOCHETANA TOUR- A RETROSPECT

Visit to Bhoochetana Plots by Bi-Monthly Workshop Team


BHOOCHETANA Tour- A RETROSPECT
A Crop about to be Harrowed was Saved. . . . . We never Looked Back
The Crop Saved Gave New Turn to Bhoochetana Approach
30/07/2010


PUBLICITY THRU MEDIA
E Tv and Tv 9
BHOOCHETANA Tour- A RETROSPECT
15/07/2010
30/07/2010

BHOOCHETANA Tour- A RETROSPECT

Kadajji and Alur Villages of Davangere Taluka are our Role Model Villages.

Sri Devikere Nagappa Family's Effort Lent able support to Bhoochetana Mission.

THIS WAS OUR TRUMP CARD SUCCESS

BHOOCHETANA FIELD DAY IN KADAJJI
REDUCED OUR BURDEN AND TOOK US TO NEW HEIGHTS

Government of Karnataka
Zilla Panchayat, Davangere
Department of Agriculture

BHOOCHETANA JOURNEY 2011-12

We made a Grand Entry in to the BHOOCHETANA Journey 2011-12
Thru KRISHI UTSAVs WITH

BHOOCHETANA CHAITANYA RATHs AS AN INTEGRAL PART
- A VAN WITH PORTRAITS OF 2010-11 SUCCEESSES

We turned Every Stone that was Instrumental in our Effort
to make Bhoochetana a Mission and not Just a Scheme

KEREGUDIHALLI ,
HARAPANAHALLI TQ.

Here is Sri Swamiji of Arasikeri Math
Busy in sowing Greengram

Government of Karnataka
Zilla Panchayat, Davangere
Department of Agriculture

WALL PAINTINGS HELPED US TO CREATE AWARENESS AMONG FARMER BRETHREN

Integration of Bhoochetana with SBY

Unique District Level Function Arranged at Honnali: Soratur Village had 72 Groundnut Growers as SBY Beneficiaries.

BHOOCHETANA – SHOW CASED

A View of 2010 Kannada Rajyothsav Tableau

CONVERGENCE

Integration of Schemes - ISOPOM, INSIMP and Institutions – KSDA,TKVK


Government of Karnataka
Zilla Panchayat, Davangere
Department of Agriculture
KSDA
FRUITS OF 2011-12


2010-11 –Kadajji : 2011-12 Belagutti
KSDA
16/08/2011

2010-11 –Kadajji : 2011-12 Belagutti

PANAROMIC VIEW OF TRG CUM FILED DAY AT TIRTHA RAMESHWAR

FIELD DAYS

Fecilitation to the Participant Farmer by Hon'ble MLA during Cotton Field Day at Rangapur , Jagalur Taluk

FIELD DAYS

Cotton Field Day conducted at Kodihalli, Davanagere tq

FIELD DAYS

Field day Conducted at Anaburu ,Jagalur tq


FIELD DAY
KSDA
Field days conducted at Belludi & Amaravati village of Harihara tq

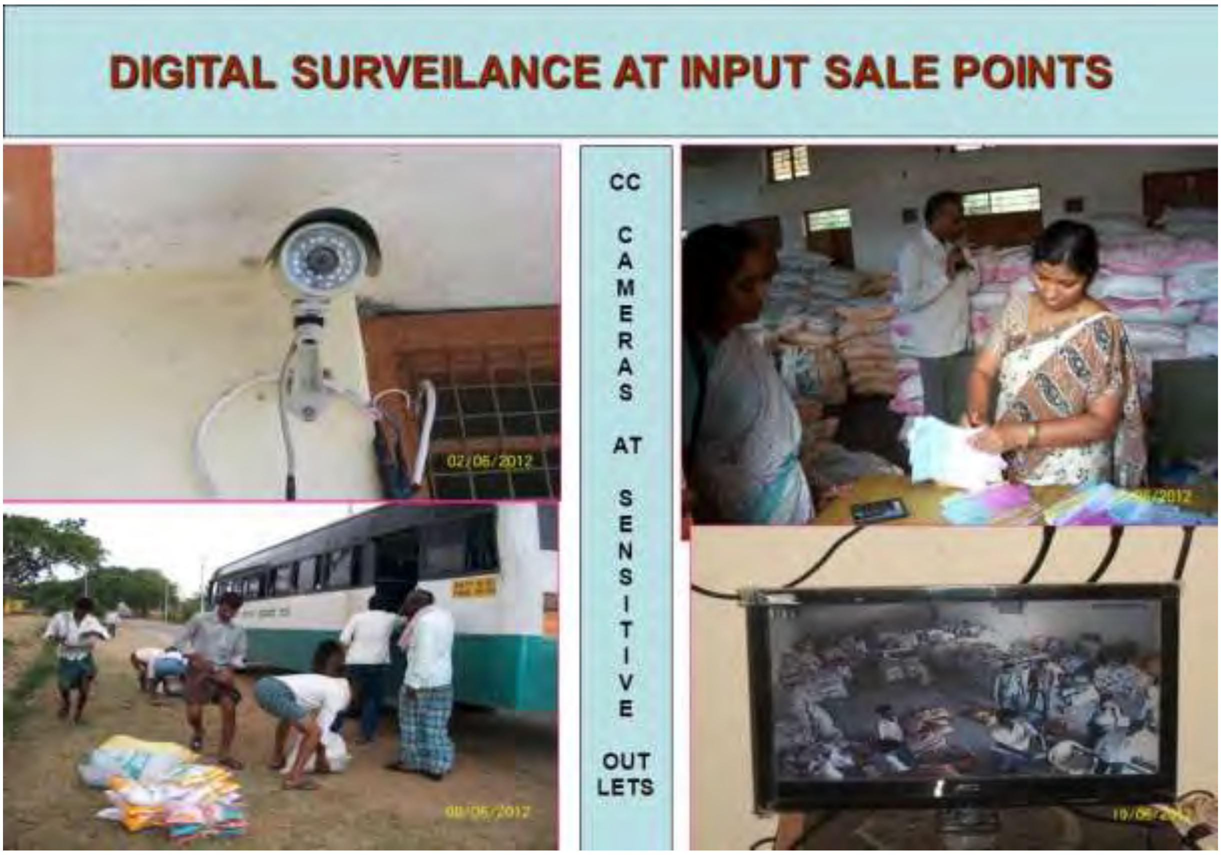

Ragi Field Day at Devarahalli,Channagiri Tq.
KSDA
10/29/2011
10/29/2011

BHOOCHETANA FIELD DAYS AT HONNALI AGAIN: FACILITATORS FACILITATED

BHOOCHETANA – PLANNED APPROACH FOR KHARIF 2012

SEED TREATMENT CAMPAIGN

PRE-SEASON TRAINING FOR INPUT DEALERS


DIGITAL SURVEILANCE AT INPUT SALE POINTS
CC CAMERAS AT SENSITIVE OUT LETS
02/06/2012
08/06/2012


SEED DISTRIBUTION – A PLANNED EFFORT
Subsidy Seed Sales
Bt Cotton Seed Sales
SRI DEVI ENTERPR
KSDA

BHOOCHETANA – IMPROVED WALL PAINTINGS

WHEN RAINS SEEMED UNCERTAIN...
AWARENESS CAMPAIGNS HELPED TO SAVE CROPS FROM UREA MENACE.

KRISHI UTSAV 2012

BHOOCHETANA EFFORTS HIGHLIGHTED AT THEIR BEST

BHOOCHETANA FACILITATORS WERE TRAINED TO STRENGTHEN FFS MISSION MODE

AWARENESS CAMPAIGN IN BHADRA COMMAND AREA AS DAM WENT DRY DURING EARLY KHARIF

Pr. Secy. To Go AP, Dr. V. Nagi Reddy's Visit on 22/10/12 to 25/10/12

BHOOCHETANA – DETERMINED APPROACH FOR KHARIF 2013

Soil Test Campaign 2013-14

Sustainable Income from Inter-cropping

Minor Millets Responded to Bhoochetana Efforts Like Major Crops

SAVE MAIZE CAMPAIGN - SAVED NOT JUST THE CROP, IT SAVED FARMER BRETHREN

Sprays with Water Soluble Fertilisers and Micro Nutrients Did All the WONDERS !!

FARMERS FIELD SCHOOLS - REVIVED

Farmers field Schools Helped Farmers to understand ICM in a BETTER WAY…
A View of FFS, Honnali Taluka.

BHOOCHETANA – A Mission – All Traditional Extension Activities Revived

Night Meetings Helped to Train the Farmers to Adopt New ICM Strategies.


BHOOCHETANA – NEW APPROACH
Harapanahalli Taluka
08/08/2013
Crop Sprayed with WS NPK and Micro Nutrients Excelled Well.


Mechanized Rice Transpalanting
During 2013 Kharif
GREEN MANURING UNDER BC

A Birds Eye View of Save Maize Campaign in All the Six Talukas.
Just not Crop – Farmers SAVED.

- Excess Moisture crisis DIAGNOSED.
- Critical inputs Delivered at Farmers DOOR STEPS.
- Mandatory Spray Taken up.
- Yield Increased by 50 % , but TRIPLED over the affected ones.

WE FEEL PROUD TO HOST STATE LEVEL BHOOCHETANA FIELD DAY.

- Hon'ble Minister for Agriculture had words with Happy Happy Farmers.
- Maize, Jowar, Groundnut, Sugarcane at their BEST.
- Line Departments had their share with BEST EXHIBITION
- Farmers and Extension Officers from many Districts made their PRESENCE FELT.

ICRISAT TRAINEES VISIT TO VIEW BC

ON 24&25 DEC-2013

THIRD PARTY EVALUATION

FIELD TRIAL-ARALAHALLI FARM HONNALI TQ.

REDGRAM ICPH-2671+CASTOR DCH-177)

BHOOCHETANA Paper Cuttings

ಶೇಂಗಾ ಬೀಜೋಪಚಾರ ಬಳಕೆ ಪ್ರಾತ್ಯಕ್ಷಿಕೆ

ಅತಿ ರಸಗೊಬ್ಬರ ಬಳಕೆಯಿಂದ ಕೀಟ ಬಾಧೆ

ಕೊಂಡಜ್ಜಿಯಲ್ಲಿ ಭೂಚೇತನ ಕ್ಷೇತ್ರೋತ್ಸವ

OUR BHOOCHETANA DETAILS
2010-11,2011-12 ,2012-13 & 2013-14

Year	Season	Area			Villages covered	No. of farmer facilit-ators	No. of Bene-ficiaries
		Tar	Ach	%			
KHARIF							
2010-11	Kharif	74027	73559	99	157	162	68341
2011-12	Kharif	135600	130574	96	376	273	100505
2012-13	Kharif	266500	259087	97	598	363	210150
2013-14	Kharif	285000	293303	100	658	298	260870
RABI							
2010-11	Rabi	2000	2000	100	27	9	1000
2011-12	Rabi	12000	10400	86	41	13	2646
2012-13*	Rabi	11000	NIL	NIL	NIL	NIL	NIL
2013-14	Rabi	10500	14949	43	115	42	9835

* No promising rains received , Hence not implemented.

OUR BHOOCHETANA EFFORTS
2010-11, 2011-12,2012-13 & 2013-14

Year	Season	Gypsum (Tonnes)		Borax (Tonnes)		Zinc Sulphate (Tonnes)	
		Total	Kg/ha.	Total	Kg/ha.	Total	Kg/Hec.
KHARIF							
2010-11	Kharif	1650	22.43	9.00	0.1	305.00	4.15
2011-12	Kharif	8371	64.11	393.28	3.00	1029.52	7.88
2012-13	Kharif	7600	29.33	230.00	0.88	490.00	2.67
2013-14	Kharif	9754	34.50	402.00	1.37	1086.00	3.702
RABI							
2010-11	Rabi	105	52.50	10	5	30	15
2011-12	Rabi	559	63.75	34	3.3	56	5.38
2012-13*	Rabi	Nil	Nil	Nil	Nil	Nil	Nil
2013-14	Rabi	650	43.48	70	4.68	244.25	16.34

* No promising rains received , Hence not implemented.

BHOOCHETANA EFFORTS
2010-11, 2011-12
2012-13 & 2013-14

Year	Season	Field days conducted (Nos)	CC Experiments conducted
Kharif			
2010-11	Kharif	46	43
2011-12	Kharif	85	31
2012-13	Kharif	169	200
2013-14	Kharif	135	453
Rabi			
2010-11	Rabi	46	43
2011-12	Rabi	85	31
2012-13	Rabi	22	-
2013-14	Rabi	Under Progress	

BHOOCHETANA RESULTS

2010-11 & 2011-12
(Yield data in Kg/ha)

Crops	2010-11		2011-12		% increase	
	Bhoo chetana Crops	Common Crops	Bhoo chetana Crops	Common Crops	2010-11	2011-12
Maize	8061.24	6262.53	11222	9186	22	22
G.Nut	11377.78	7988.89	5928	5056	42	17
Jowar	5773.7	4195.18	7490	5938	38	26
Ragi	2860.89	2588.44	3760	3160	11	19
Cotton	NA	NA	3400	2600	NA	31
Bengalgram (Rabi)	1070.44	829.7	1472.80	1219.29	29	20.80
Rabi-Jowar	2971.95	1749.98	2429.22	2057.10	70	18.09

BHOOCHETANA RESULTS
2012-13 & 2013-14
(Yield data in Kg/ha)

Crops	2012-13		2013-14		% increase	
	Bhoo chetana Crops	Common Crops	Bhoo chetana Crops	Common Crops	2012-13	2013-14
Maize	5450	4054	5633	4499	26	20.14
G.Nut	1513	1170	1812	1433	27	20.90
Jowar	3101	2480	2958	2480	20	14.82
Ragi	2604	1876	2081	1656	28	20.44
Sunflower	1382	1077	1134	888	22	21.67
Cotton	NA	NA	In progress	In progress	NA	22.99
Rice	7695	6732	5983	5417	13	9.47

BHOOCHETANA EFFORTS

2010-11, 2011-12 , 2012-13 & 2013-14

Training details	2010-11	2011-12	2012-13	2013-14
District Level	4	7 (6 days Instl.Trg.)	1	2
Taluk level	6	27	12	12
Hobli level	26	40	18	60
Cluster level	130	345	980	995

BHOOCHETANA - A MISSION TO BE ACCOMPLISHED

2010-11 – We started on Modest scale.
2011-12- Our preparations Started with Season.
2012-13 We had Prepared our Level Best.

But, During 2012-13, Nature did not support us, both in Rainfed and Irrigated Belts.
2013-14 WE HAVE DONE OUR BEST, ALL BC INPUT STOCKS ARE OVER, CROPS ALMOST LOST IN RAINS WERE SAVED !

WE REMAIN COMMITTED TO IMPROVE UPON . . . .
WE WISH NATURE BLESSES US WITH . . . . . Optimum Field conditions

PRAKRUTHIMEVA JAYATE

THANK YOU

ANNUAL REVIEW AND PLANNING WORKSHOP FOR BHUCHETANA

JOINT DIRECTOR OF AGRICULTURE BELGAUM

3 Distinct Agro-Climatic Zones

Latitude - 15-23`- 16-28`N

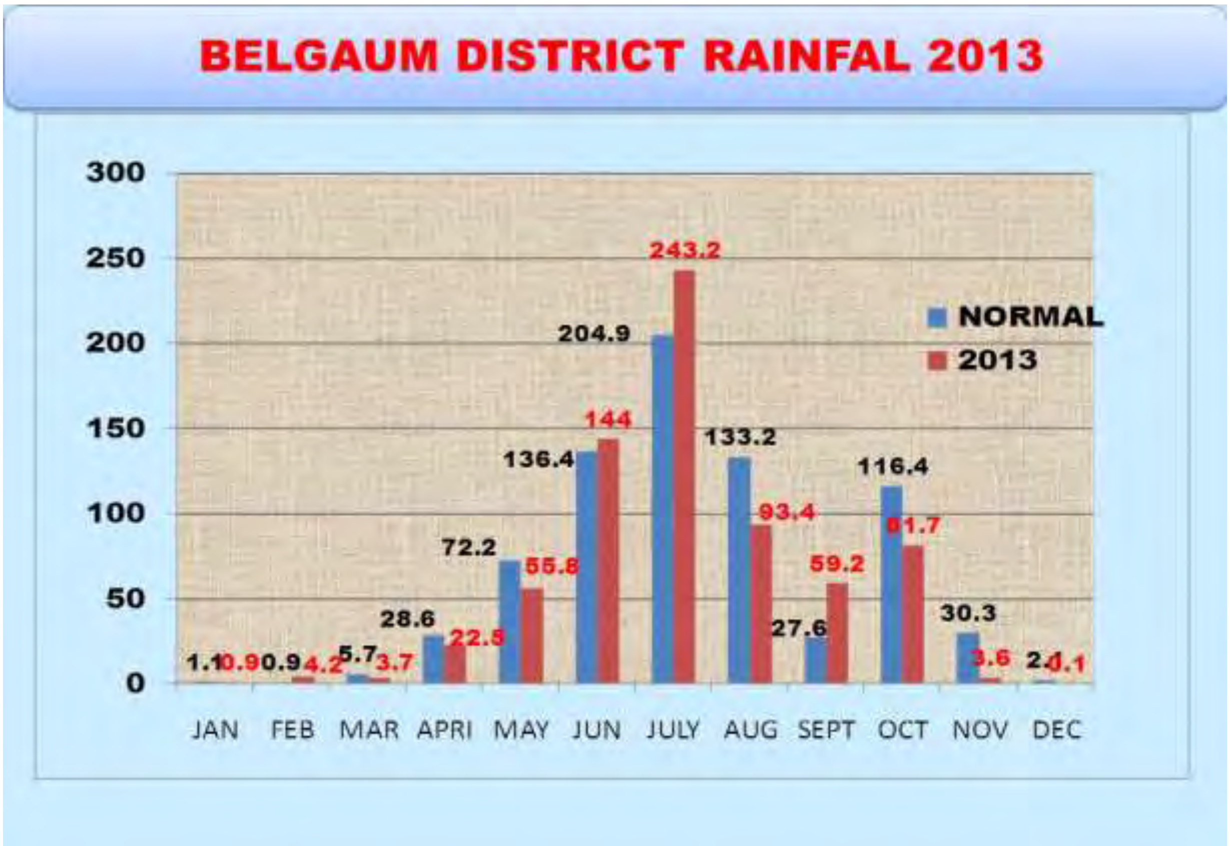
Longitude-74-05 `- 75-28`E

Agriculture Zones-03

1.Hilly Zone-KHANAPUR

2.Northern Trans Zone BLH-BGM-CKD-HKR

3.Northern Dry Zone-ATH-GKK-RBG-RMD-SND


BELGAUM DISTRICT RAINFAL 2013
300
250
200
150
100
50
0
NORMAL
2013
1.1
0.9
0.9
4.2
5.7
3.7
28.6
22.5
72.2
55.8
136.4
144
204.9
243.2
133.2
93.4
27.6
59.2
116.4
81.7
30.3
3.6
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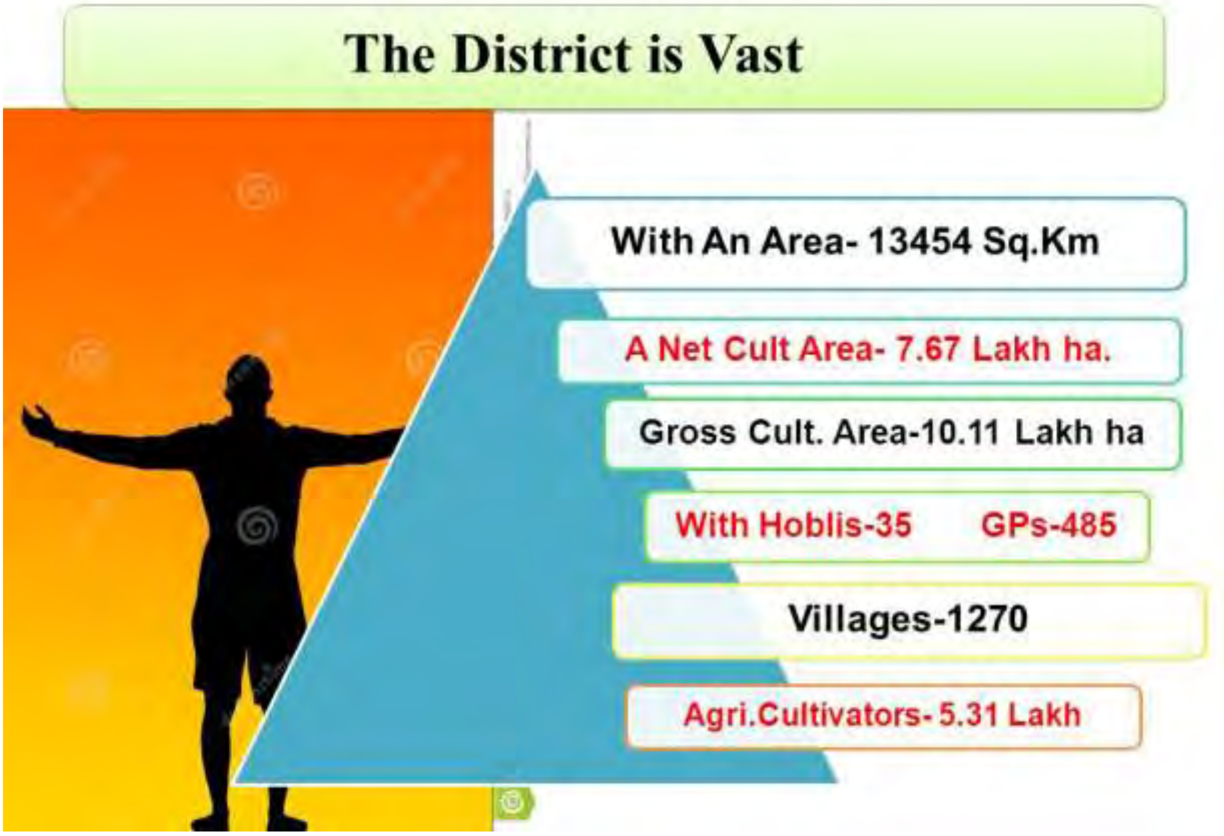
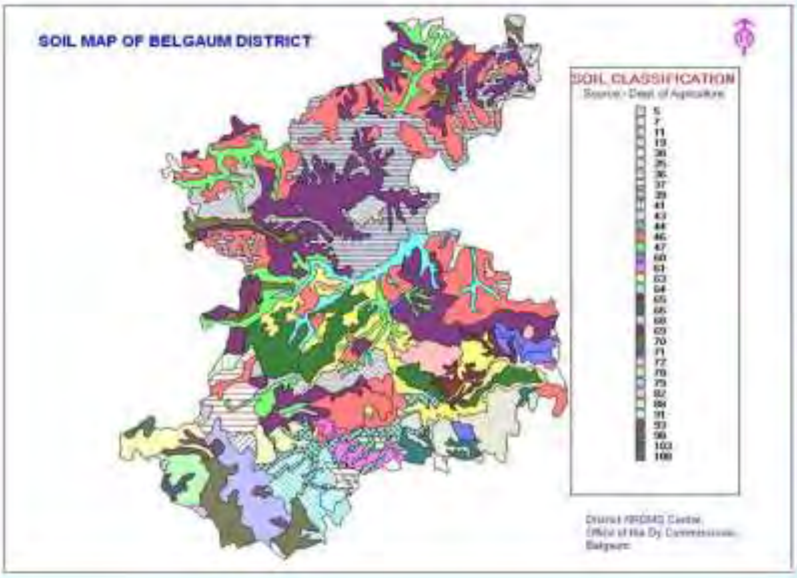
SEPT
OCT
NOV
DEC


The District is Vast
With An Area- 13454 Sq.Km
A Net Cult Area- 7.67 Lakh ha.
Gross Cult. Area-10.11 Lakh ha
With Hoblis-35 GPs-485
Villages-1270
Agri.Cultivators- 5.31 Lakh

It is Blessed with Varied Soil Types

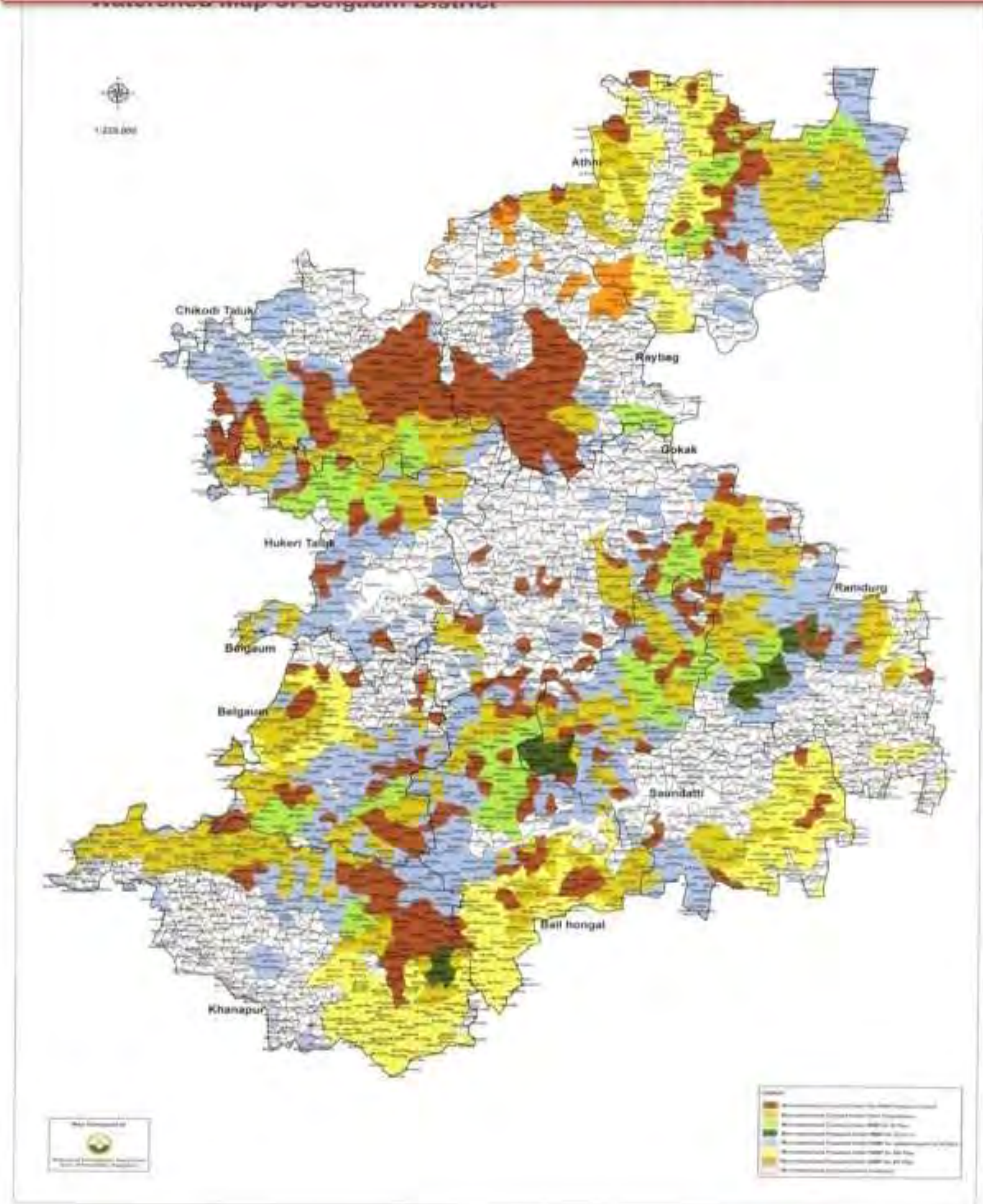


As Many As 34 Types of Soils Are Found in District.

Clays And Loams Dominate.

Irrigation Potentiality is more than 50%

WATERSHED MAP OF BELGAUM DISTRICT



KHARIF -2013

BELGAUM DIST BHUCHETANA TAGRGET AREA

	RAINFED	IRR S. CANE	IRR PADDY
TARTGET	326000	78000	5000
ACHIVEMENT	302314	58439	5000

CROP-WISE TARGET AREA AND AREA SOWN

Sl.No	Crops	DISTRICT TOTAL		BHUCHETANA AREA		
		Target Area (in ha.)	Area Covered (in ha)	Target Area (in ha.)	Area Sown (in ha.)	% Area Sown
1	Rice	65000	65733	64000	62579	97.8
2	Jowar	30000	23185	23000	21934	95.4
3	Maize	125000	115587	40000	52655	131.6
4	Bajra	11000	10738	15000	8680	57.9
5	Tur	5000	3718	5000	254	5.1
6	Black gram	3300	5670	3000	3000	100.0
7	Green gram	23450	14948	24000	15077	62.8
8	Cowpea and others	4000	2476	2000	1383	69.2
9	Groundnut	29000	33465	35000	32827	93.8
10	Sunflower	8340	2899	5000	1744	34.9
11	Soybean	96000	78410	80000	79037	98.8
12	Cotton	30050	25925	30000	23144	77.1
	Total	**430140**	**382754**	**326000**	**302314**	**92.7**

2013-14 BHUCHETANA ACTIVITIES

1038 VILLAGES were planned to cover

Out of which 930 VILLAGES BENCHMARK SURVEY COMPLETED

281619 -FARMERS REGISTRATION

206 CLUSTER GODOWNS FOR INPUTS

A TOTAL OF 441 WRITINGS ON WALL HAVE BEEN TAKEN UP ON BC -ACTIVITIES

TALUKA WISE NUMBER OF FACILITATORS UNDER BHUCHETANA

Sl. No.	Taluka	TARGET AREA	FARMER FACILITATOR
1	Athani	20925	56
2	Bailhongal	62875	49
3	Belgaum	40950	37
4	Chikodi	47125	57
5	Gokak	10425	52
6	Hukkeri	45325	72
7	Khanapur	30975	48
8	Raibag	5850	33
9	Ramdurg	21050	40
10	Soundatti	40500	70
	Total	**326000**	**514**

FACILITATOR TRAINING IN DATC

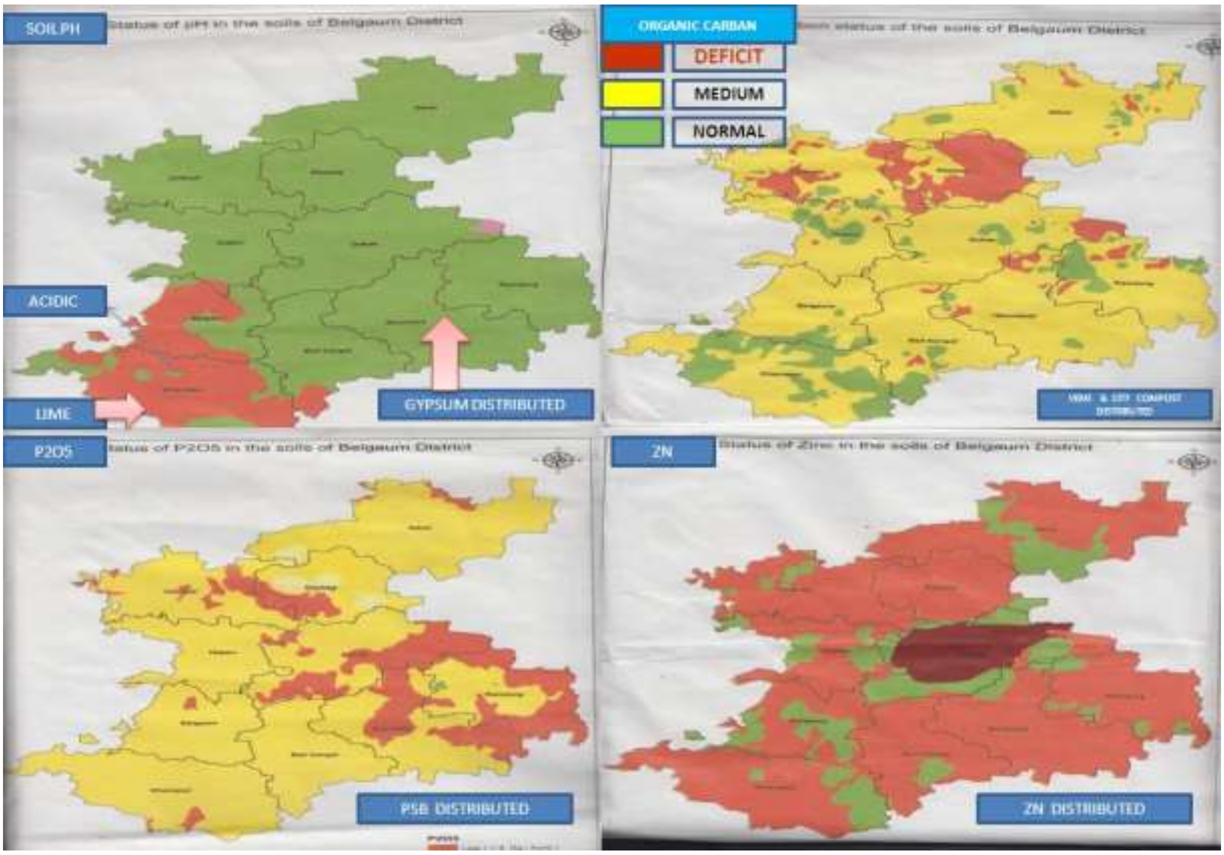
SOIL SAMPLING –TARGET -10150 ACH-11013

SOIL SAMPLING DEMONSTRATION CONDUCTED

TALUKA WISE DEFICIENCY OF MICRONUTRIENTS

Taluka	% Deficit							
	PH	OC	AV P	AV K	AV ZN	AV Bo	AV Fe	Av s
ATHANI	7.7	27	66	8	55	73	77	0
BAILHONGAL	7.0	27	69	12	78	66	31	3
BELGAUM	6.2	14	70	20	34	68	14	2
CHIKKODI	7.6	39	78	3	81	85	39	1
GOKAK	7.6	25	86	0	72	74	57	1
HUKKERI	7.5	27	73	0	52	78	10	3
KHANAPUR	5.9	9	61	8	44	54	0	2
RAIBAG	8.1	60	80	13	93	86	68	2
RAMADURG	7.4	26	85	5	74	78	66	2
SAVADATTI	7.8	32	81	0	97	81	52	0
BELGAUM DIST	7.3	29	**75**	6	**70**	**75**	**42**	2

ANALYSED 114 SAMPLES RANDOMLY SELECTED FROM EACH TALUKA



SEED TREATMENT CAMPAIGN-10

IN ALL TALUKAS

DISTRIBUTION OF INPUT

PREPOSITION	INDENTED &OTHER SCHEMS	DISTRIBUTION
GYP-5120	GYP-5689	GYP-8616
ZN-922	ZN-769	ZN-1691
BO-166	BO-150	BO-315

PACKAGE OF BHUCHETANA INPUTS ALONG WITH SEEDS

FARMERS KNOWING THE IMPORTANCE OF GYPSUM

8616 ton of Gypsum is distributed to farmers

THE DISTRICT RECORDS THE HIGHEST EVER CONSUMPTION OF GYPSUM

- Per hectare Usage 28.50 kg/ha

GYPSUM ACTS AS SOIL CONDITIONER

MICRONUTRIENT USAGE SHOWS PROGRESS

THE FARMERS RECOGNIZE THE EFFECT OF ZINC IN AGRICULTURE

- 1613 Tons of Zinc Sulphate Distributed.
- Per hectare Usage
- 5.33 kg/ha

MICRONUTRIENT USAGE SHOWS PROGRESS

THE FARMERS RECOGNIZE THE EFFECT OF BO IN AGRICULTURE

- **311 Tons of Bo is Distributed.**
- **Per hectare Usage**
- **1.02 kg/ha**

ORGANIC FERTILISERS DISTRIBUTION

292 tonn of Vermi compost Distributed

431 tonn of city compost Distributed

	TARGET	ACHIVEMENT
DIST LEVEL TRAINING	1	1
TALUKA LEVEL TRAINING	10	10
HOBLI LEVEL TRAINING	70	43
CLUSTER LEVEL TRAINING	652	469

DISTRICT LEVEL TRAINING AT DATC ARABHAVI ON 6/4/2013

MEETING OF DIST LEVEL OFFICERS FOR BC IMPLIMENTATION


HOBLI LEVEL
TRAININGS

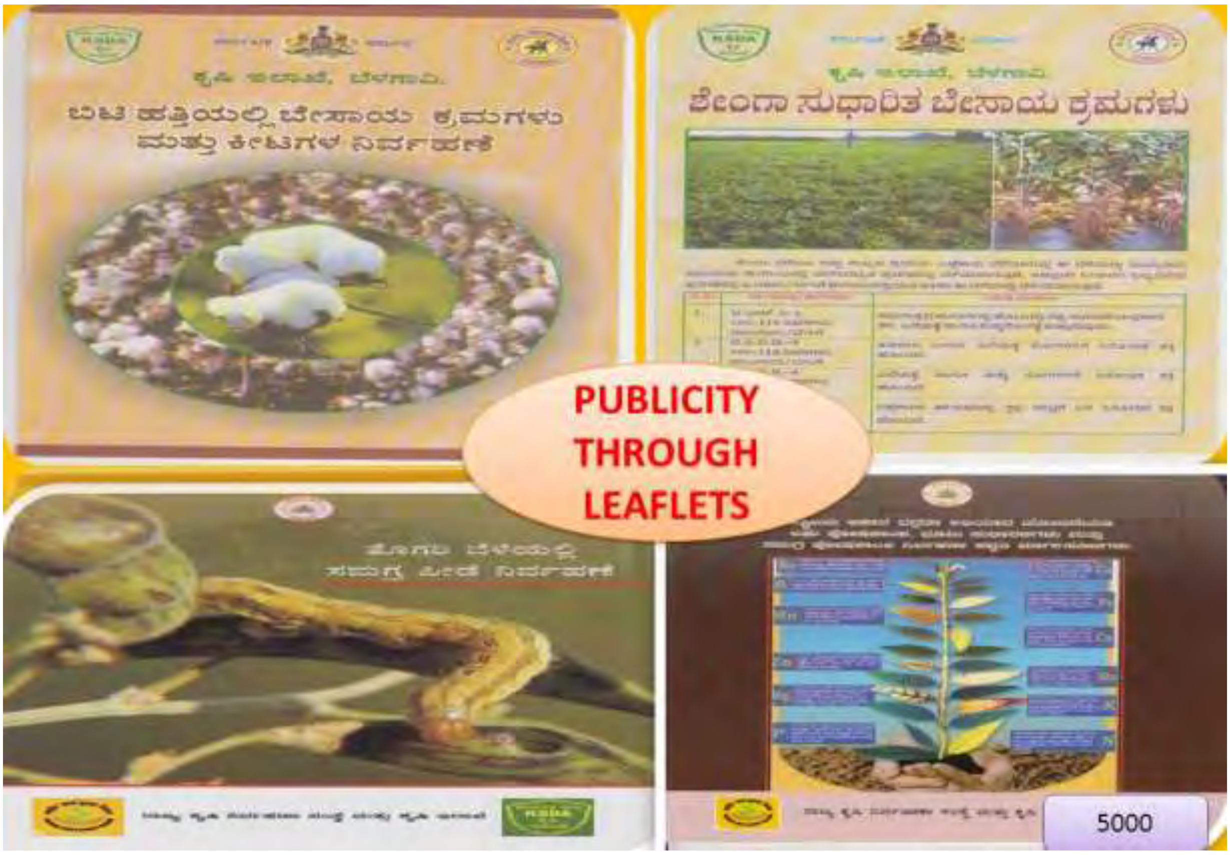

VILLAGE
LEVEL
TRAININGS

SATELITTE TRAINING

PUBLICITY THROUGH RALLY

PUBLICITY THROUGH WALL WRITING

A TOTAL OF 441 WRITINGS ON WALL HAVE BEEN TAKEN UP ON BC -ACTIVITIES




ಗೋದಿ
ಉತ್ಪಾದನಾ ತಾಂತ್ರಿಕತೆಗಳು
ಕಡಲೆ ಬೆಳೆಯ ಸುಧಾರಿತ
ಬೇಸಾಯ ಕ್ರಮಗಳು
ಸಜ್ಜೆ
ಆಧುನಿಕ ಬೇಸಾಯ ಕ್ರಮಗಳು
ಗೋವಿನ ಜೋಳದ
ಸುಧಾರಿತ ಬೇಸಾಯ ಕ್ರಮಗಳು
5000


ಸೋಯಾ ಅವರೆ
ಕೃಷಿ ಇಲಾಖೆ
ಭತ್ತದ ಬೇಸಾಯದಲ್ಲಿ ಸುಧಾರಿತ ಕ್ರಮಗಳು
5000

BELGAUM DISTRICT PRESS CUTTING


ರೈತ ಚೆನ್ನಾಗಿ ಬಾಳಬೇಕೆಂಬ ಸಂಕಲ್ಪ ಅಗತ್ಯ

ರಾಸಾಯನಿಕ ಗೊಬ್ಬರದಿಂದ ಭೂಮಿ ಫಲವತ್ತತೆ ನಾಶ

ಇಟಗಿ: ರೈತರಿಗೆ ತರಬೇತಿ ಕಾರ್ಯಕ್ರಮ

ತರಬೇತಿ ಕಾರ್ಯಕ್ರಮದಲ್ಲಿ ಮಾತನಾಡುತ್ತಿರುವ ಸಹಾಯಕ ಕೃಷಿ ಅಧಿಕಾರಿ ಎ.ಬಿ.ಇಟ್ನಾಳ.

BELGAUM DISTRICT PRESS CUTTING


ರೈತ ಚೆನ್ನಾಗಿ ಬಾಳಬೇಕೆಂಬ ಸಂಕಲ್ಪ ಅಗತ್ಯ

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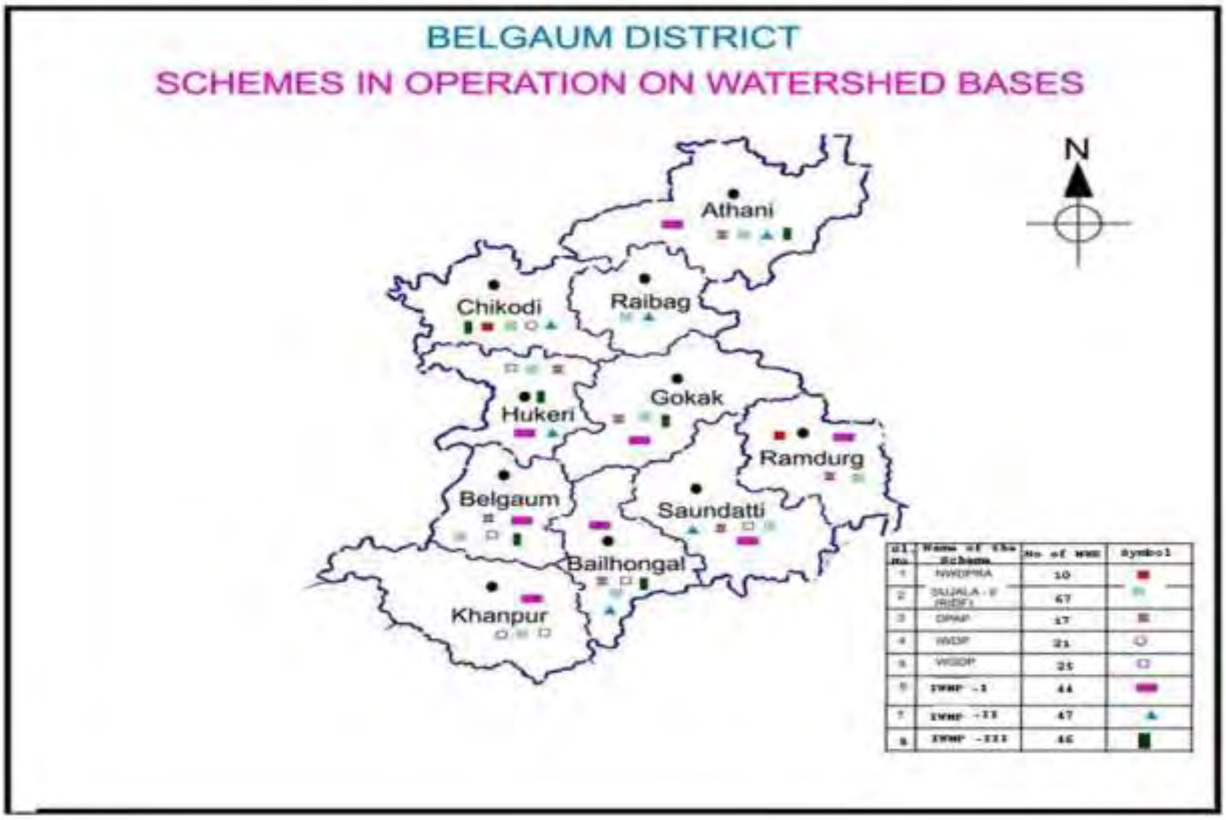
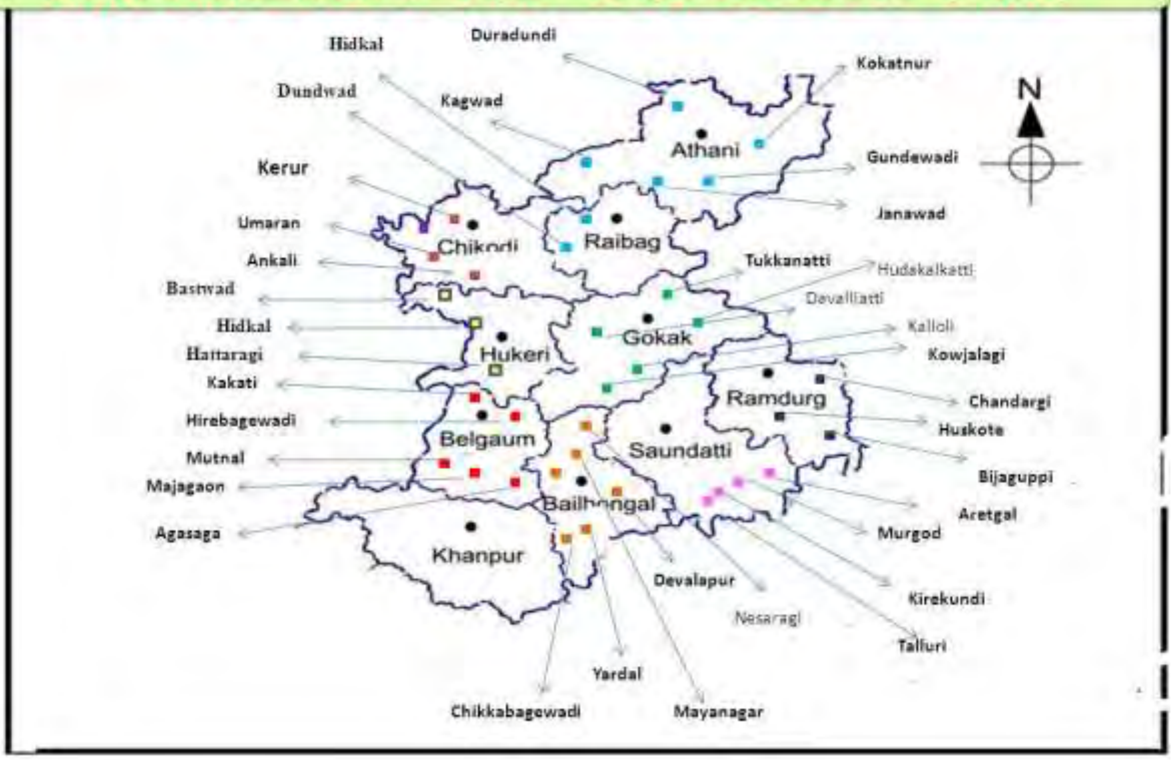


FARMER FIELD SCHOOLS-513



FARMER FIELD SCHOOLS

CROP	NO OF FFS
PADDY	115
HYD JOWAR	37
MAIZE	74
G.NUT	65
SOYABEAN	92
COTTON	47
IRR PADDY	10
IRR S.CANE	78


WHEAT
COTTON
FIELD DAY
SOYBEAN
MAIZE


PADDY
PADDY FIELD DAY


NEW TECHNOLOGY ADOPTED
MRC-9618
15 DAYS IN TRAY
4390 PLANTS /AC
PLOT YIELD 16 Q/AC
CHECK PLOT 12Q/AC
10 KG ZN 5 KG BO APPLICATION


COTTON TRANSPLANTING IN HUKKERI TQ


UMESH SHRIPAD INAMDAR, NERLI
TRANSPLANTED COTTON CROP WITH GROUNDNUT INTERCROP


Soybean new variety JSS-9305
AREA-2000 HA
Bhima Appaji Patil Nerli hukkeri tq
Soybean JS -9305
BC PLOT YIELD 11.5 Q/AC CHECK PLOT 10 Q/AC

We Have Taken Up

In Association with KSSC Making Buy-Back Arrangement, JS-9305 (A Potent Soybean Variety) Seed Production on 200 Hectares

SINGLE EYE BUD PLANTING IN SUGAR CANE

LAXMAN RAMDURG

CO-86032

5000 Plants/ac 1.5 ton

COST OF CULTIVATION

More tillers

Yield 80 tonn/ac

We Are Putting Our Efforts

To Popularize Area Under Paired Row Planting in Sugarcane,

in View scarcity of the Labour and Ease of Weed Management.

We Are Putting Our Efforts

Towards Enhancing the Area under Drip Irrigation, by Inviting & Encouraging the Sugar Factories to Take on the Burden of Bearing the Farmers' Portion. After Covering 63,000 ha. Till Now, We Plan Another 18,000 ha. In the Current Fiscal.

POPULARISATION OF HYBRID PADDY

To Enhance Area Under Hybrid Paddy Cultivation By Distribution of NEW Hybrid Paddy Seeds. Now the Area is in Excess of 5000 ha.

- JKRH-401
- GK-5003
- GK 401
- RARH-111
- PHB-71
- YNR-2355
- ARISE-6444

USE OF *Nomuraea rileyi* (BIO FUNGICIDE)IN SOYABEAN TO CONTROL THE PEST

We Are Putting Our Efforts

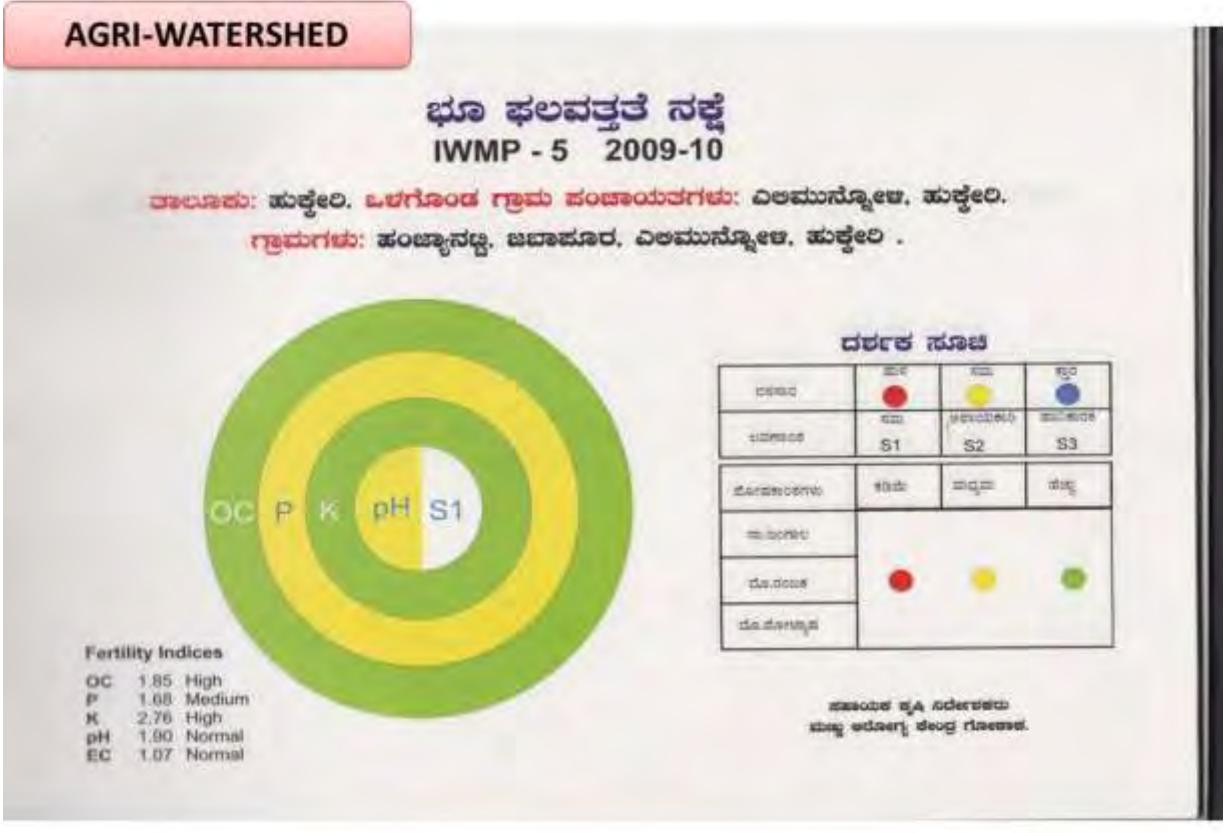
To Demonstrate to the Farmers , the Growing Importance of Bio-Control : *Nomuraea rileyi*-An Entomo-pathogen that spreads on *Heliothis* Larva and Kills it.

On A Pilot Scale

Bio-Control Lab, Bailhongal Has Produced And Distributed 300 kg of *N. rileyi* for Demonstrations in Soybean.

INTERCROPPING SUGARCANE +G.NUT+ONION (HORT +AGRI)

AGRI-WATERSHED



BHUCHETANA PLOT ALONG WITH IWMP JALANAYANA SCHEME VIJAY. SANKESHWARI -YALIMUNNOLI TQ HUKKERI

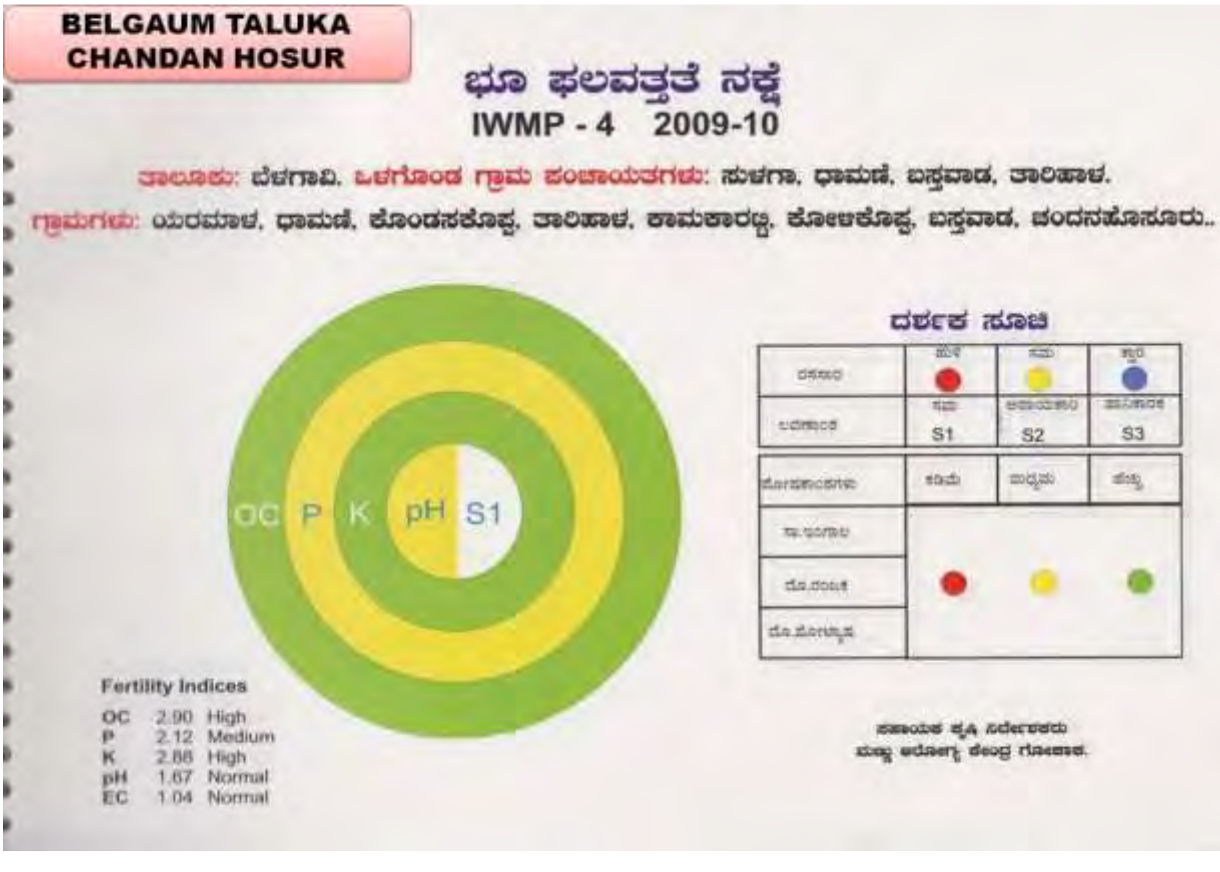
PRAKASH GUDASHI HUKKERI TQ

FARM POND +BHUCHETANA COTTON PLOT

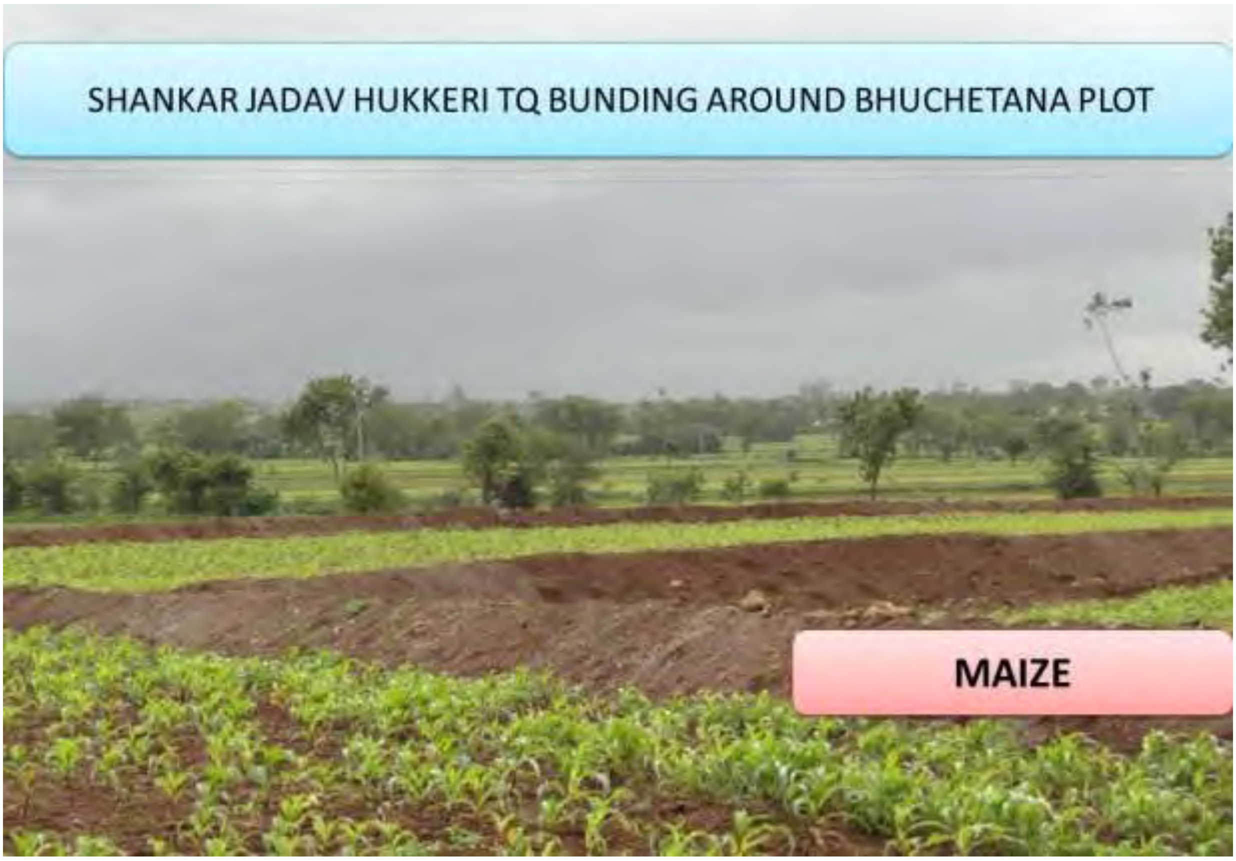
GYPSUM 100 KG+ZN 5 KG/AC

YIELD 8 Q/AC

CONVERGENCE OF AGRI+HORT+WATERSHED MALLAPPA B. MALAGI SOPPADL SAVADATTI TQ




VENTED DAM KADOLI + GROUND NUT AND SORGHUM BC PLOTS
FARM POND PROTECTIVE IRRI SORGHUM IN C.HOSUR
BUNDING+COTTON BC COTTON C.HOSUR


SHANKAR JADAV HUKKERI TQ BUNDING AROUND BHUCHETANA PLOT
MAIZE

BHUCHETANA DEMONSTRATION MAIZE PLOT
RAVI JANAMATTI YADAGU TQ:HUKKERI

BHUCHETANA DEMONSTRATION SOYABEAN PLOT
AJIT YELIMUNNOLI

PADDY DEMONSTRATION PLOTS

SOYABEAN DEMONSTRATION PLOTS


SUGARCANE DEMONSTRATION PLOTS –ATHANI TQ
YIELD 80 TONN/AC


MAIZE DEMONSTRATION PLOTS

Success Story

S O Y B E A n

Name & Address of the Farmer : Sri Nagappa Balappa Bagawad
Kankanawadi village:-Raibagh Taluk
Crop: Soybean. Variety: JSS-335
Inputs applied : Gypsum 200kg/ha, Znso4 15/kg/ha, Borax 5kg/ha.
City compost 250 kg /ha and with recommended NPK
Yield Bhoochetana plot: 24 qtl/ha.
Non Bhoochetana : 20. qtl/ha (normal practices)
% of increase in yield: 20

Success Story

SOYBEAN

Name & Address of the Farmer : Sri Ravi Raju Kulakarani.
Hirebagawadi village, Belgaum Taluk
Crop: Soybean. Variety: JS-335
Inputs applied : Gypsum 200kg/ha, Znso4 15/kg/ha, Borax 4kg/ha.
PSB 2kg/ha, Neem oil 2.5 ltr/ha and with recommended NPK
Yield Bhoochetana plot: 26 qtl/ha.
Non Bhoochetana : 21 qtl/ha (normal practices)
% of increase in yield 23 %

Success Story

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Name & Address of the Farmer : Sri Kallappa Nayakar
Jamoboti village, Khanapur Taluk
Crop: GROUND NUT. Variety: ICGV-91114
Inputs applied : Gypsum 200kg/ha, Znso4 15/kg/ha, Borax 5kg/ha.
Psb- 500 gm /ha and with recommended NPK
Yield Bhoochetana plot: 19.100 qtl/ha.
Non Bhoochetana :15.00 qtl/ha (normal practices)
% of increase in yield: 4%

Success Story

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Name & Address of the Farmer : Sri Sattappa Adavappa Banni
Solapur village, Hukkari Taluk
Crop: Sorghum . Variety: Haritha
Inputs applied : Gypsum 200kg/ha, Znso4 15/kg/ha, Borax 5kg/ha.
City compost 250 kg /ha and with recommended NPK
Yield Bhoochetana plot: 28 qtl/ha.
Non Bhoochetana : 22.50 qtl/ha (normal practices)
% of increase in yield: 24 %

Success Story

MAIZE

Name & Address of the Farmer : Sri Shanker Lakappa Patil
Basapur village, Hukkari Taluk
Crop: Maize. Variety: CP-818
Inputs applied : Gypsum 200kg/ha, Znso4 15/kg/ha, Borax 5kg/ha.
City compost 250 kg /ha Psb-1kg/ha and with recommended NPK
Yield Bhoochetana plot: 35 .qtl/ha.
Non Bhoochetana : 30 qtl/ha (normal practices)
% of increase in yield: 16 %

WITH ALL EFFORTS WE COULD ABLE ACHIVE.....

SL.NO	CROP	CCE. NO	YIELD KG PER HA CHECK	BC PLOT	% INCREASE
1	SOYBEAN	25	1326	1430	7.84
2	GROUNDNUT	25	1220	1350	10.66
3	SORGHAM	25	2230	2360	5.83
4	MAIZE	25	2250	2400	6.67
5	COTTON	10	1470	1622	10.34
6	PADDY	10	3000	3290	9.67
7	SUGARCANE	12	50.50	60	15.83

RABI BHUCHETANA TAGRGET AREA

Sl.No	Crops	DISTRICT TOTAL		BHUCHETANA TOTAL		
		Total Target Area (in ha.)	Total Area Covered (in ha)	Target Area (in ha.)	Bhuchetana Area Sown (in ha.)	% Area Sown
1	R-Jowar	127000	112803	135000	104774	77.6
2	Wheat	50000	42777	15000	9517	63.4
3	Bengalgram	85000	74186	50000	50738	101.5
Total		262000	229766	200000	165029	82.5

TALUKA WISE NUMBER OF FACILITATORS UNDER RABI BHUCHETANA

Sl. No.	Taluka	TARGET AREA	FARMER FACILITATOR
1	Athani	53000	46
2	Bailhongal	24500	47
3	Belgaum	7500	21
4	Chikodi	5000	10
5	Gokak	13000	31
6	Hukkeri	7500	16
7	Khanapur	0	0
8	Raibag	5000	10
9	Ramdurg	33000	40
10	Soundatti	51500	56
	Total	200000	277

FARMERS KNOWING THE IMPORTANCE OF GYPSUM

THE DISTRICT RECORDS THE HIGHEST EVER CONSUMPTION OF GYPSUM

- 2946 Tons of Gypsum Delivered to the Doorsteps of Cultivators.
- Per hectare Usage 17.85 kg/ha

GYPSUM ACTS AS SOIL CONDITIONER

MICRONUTRIENT USAGE SHOWS PROGRESS

THE FARMERS RECOGNIZE THE EFFECT OF ZINC IN AGRICULTURE

- 987 Tonn of Zn Distributed.
- Per hectare Usage
- 5.9 kg/ha

MICRONUTRIENT USAGE SHOWS PROGRESS

THE FARMERS RECOGNIZE THE EFFECT OF BO IN AGRICULTURE

- **152 Tonn of Bo is Distributed.**
- **Per hectare Usage**
- **0.92 kg/ha**


GOKAK TQ ,BELGAUM DIST HOBALI LEVEL TRAINING
ಹೋಬಳಿ ಮಟ್ಟದ ರೈತರ ತರಬೇತಿ
ಬೀಜೋಪಚಾರದ ಪ್ರಾತ್ಯಕ್ಷಿಕೆ
ರೈತ ಸಂಪರ್ಕ ಕೇಂದ್ರ ಗೋಕಾಕ.


HOBLI LEVEL TRAINING

2% UREA SPRAY AT THE TIME OF FLOWERING

BENGALGRAM +JOWAR

SUGAR CANE +BENGALGRAM+G.NUT IN RAIBAG TQ

BENGALGRAM +NIGER AS TRAP CROP

BENGALGRAM FIELD DAY

BHUCHETANA PLOT ---RABI JOWAR

JOWAR FIELD DAY


WHEAT
BC DEMONSTRATION PLOT
WHEAT FIELD DAY
ಭೂಚೇತನ ಗೋದಿ ಬೆಳೆಯಲ್ಲಿ ಕ್ಷೇತ್ರೋತ್ಸವ


RABI BHUCHETANA CONVERGENCE +WATERSHED
BUNDS
Watershed bunds –Bhuchetana Plots

Watershed bunds –Bhuchetana BENGALGRAM PLOT

BHUCHETANA EXPENDITURE-GENERAL 2401-00-109-0-27 & 21(059)

GRANT RELEASE - 268.40 LAKH

EXPENDITURE - 267.46 LAKH

ST	32.10 **LAKH**	10.30 LAKH

RKVY BHUCHETANA-SDP - EXPENDITURE- 2401-00-800-1-57(059)

GRANT RELEASE - 186.00LAKH

EXPENDITURE - 133.40 LAKH LAKH

RKVY BHUCHETANA-SDP - EXPENDITURE- 2401-00-800-1-57(133)

GRANT RELEASE - 30.12 LAKH

EXPENDITURE - 24.42 LAKH

SC	**42.11 LAKH**	1.61 LAKH

2014-15 ACTION PLAN

- TARGET AREA -326000 HA
- NO. OF FACILITATORS -500
- NO. OF WALL WRITING -500
- NO. OF GODOWNS -250
- FARMER FIELD SCHOOL -500

INPUT REQUIREMENT

GYPSUM - 32600 TONNS

ZINC SULPHATE - 1630 TONNS

BORAN - 815 TONNS

TRAININGS AND FIELD DAYS

DISTRICT LEVEL - 1

TALUKA LEVEL - 10

HOBLI LEVEL -35

CLUSTER LEVEL -500

TALUKA LEVEL FIELD DAY - 10

HOBLI LEVEL FIELD DAY -5

WE ACHIEVED THE PROGRESS BECAUSE.........

PRE SEASON PLAN FOR SELECTON OF FACILITATORS

TRAINED THEM ---

GIVEN TARGET TO EACH FACILITATOR –AREA ,CROP TRAININGS

MADE TIMELY ARRENGEMENTS FOR INPUTS

PACKAGE ALONG WITH SEED

MADE TEAM TO TRAIN AND MONITOR FARMER FIEL D SCHOOLS

MADE TEAM TO LOOK DEMONSTRATIONS AND CES

ALL SECTIONS WERE REVIEWED PERIODICALY

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GYPSUM CONTAINS –Ca AND S

ca

- Utilized for Continuous cell division and formation
- Involved in nitrogen metabolism
- Reduces plant respiration
- Aids translocation of photosynthesis from leaves to fruiting organs
- Increases fruit set
- Essential for nut development in peanuts

s

Integral part of amino acids
- Helps develop enzymes and vitamins
- Promotes nodule formation on legumes
- Aids in seed production
- Necessary in chlorophyll formation (though it isn't one of the constituents)

ZN

- Aids plant growth hormones and enzyme system
- Necessary for chlorophyll production
- Necessary for carbohydrate formation
- Necessary for starch formation
- Aids in seed formation

BO

.Essential of germination of pollon grains and growth of pollen tubes
· Essential for seed and cell wall formation
· Promotes maturity
· Necessary for sugar translocation
· Affects nitrogen and carbohydrate

GOAL AND OBJECTIVES

1. To identify and scale up best options(soil, crop and water management) including improved cultivar to enhance productivity

2. Use of micro nutrients based on soil sample analysis to enhance productivity

3. Capacity building of farmers to implement improved practices for sustainable use natural resource to enhance productivity (Trainings)

Success Story

Name & Address of the Farmer : Sri Nagappa Balappa Bagawad
Kankanawadi village:-Raibagh Taluk
Crop: Soybean. Variety: JSS-335
Inputs applied : Gypsum 200kg/ha, Znso4 15/kg/ha, Borax 5kg/ha.
City compost 250 kg /ha and with recommended NPK
Yield Bhoochetana plot: 24 qtl/ha.
Non Bhoochetana : 20. qtl/ha (normal practices)
% of increase in yield: 30.00

111

Success Story



SOYBEAN

Name & Address of the Farmer : Sri Ravi Raju Kulakarani.
Hirebagawadi village, Belgaum Taluk
Crop: Soybean. Variety: JS-335
Inputs applied : Gypsum 200kg/ha, Znso4 15/kg/ha, Borax 4kg/ha.
PSB 2kg/ha, Neem oil 2.5 ltr/ha and with recommended NPK
Yield Bhoochetana plot: 30.75qtl/ha.
Non Bhoochetana : 16.25qtl/ha (normal practices)
% of increase in yield: 52.00.

Success Story



GROUNDNUT

Name & Address of the Farmer : Sri Vital Appanna Karigar
Yadagud village, Hukkari Talk
Crop: Groundnut Variety: TMV-2
Inputs applied : Gypsum 200kg/ha, Znso4 15kg/ha, Trichoderma 5kg/ha,
PSB 500gm/ha. with recommended NPK
Yield Bhoochetana plot: 18.00qtl./ha.
Non Bhoochetana : 14.00 qtl/ha (normal practices)
% of increase in yield: 28.57

Success Story

G ro u n d n ut

Name & Address of the Farmer : Sri Kallappa Nayakar
Jamoboti village, Khanapur Taluk
Crop: Green gram. Variety: icgv-91114
Inputs applied : Gypsum 200kg/ha, Znso4 15/kg/ha, Borax 5kg/ha.
Psb- 500 gm /ha and with recommended NPK
Yield Bhoochetana plot: 19.100 qtl/ha.
Non Bhoochetana :15.00 qtl/ha (normal practices)
% of increase in yield: 4%

Success Story

S
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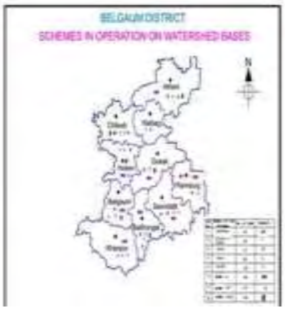
Name & Address of the Farmer : Sri Sattappa Adavappa Banni
Solapur village, Hukkari Taluk
Crop: Sorghum . Variety: Haritha
Inputs applied : Gypsum 200kg/ha, Znso4 15/kg/ha, Borax 5kg/ha.
City compost 250 kg /ha and with recommended NPK
Yield Bhoochetana plot: 46qtl/ha.
Non Bhoochetana : 44 qtl/ha (normal practices)
% of increase in yield: 20%

Success Story

MAIZE

Name & Address of the Farmer : Sri Shanker Lakappa Patil
Basapur village, Hukkari Taluk
Crop: Maize. Variety: CP-818
Inputs applied : Gypsum 200kg/ha, Znso4 15/kg/ha, Borax 5kg/ha.
City compost 250 kg /ha Psb-1kg/ha and with recommended NPK
Yield Bhoochetana plot: 44.qtl/ha.
Non Bhoochetana : 47 qtl/ha (normal practices)
% of increase in yield: 30.00


BELGAUM DISTRICT
SCHEMES IN OPERATION ON WATERSHED BASES
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ICRISAT
Science with a human face

International Crops Research Institute
for the Semi-Arid Tropics

CGIAR

GoK-ICRISAT Initiatives
Annual Review and Planning Workshop for Bhoochetana and Bhoochetana Plus

Increasing Adoption, Area Coverage and Impacts

5-8 February 2014

IWMI ILRI IRRI CIMMYT ICARDA IFPRI ICRAF AVRDC The World Vegetable Center

ICRISAT
Science with a human face

Theme & Concept Workshop

Theme

Increasing Adoption, Area Coverage and Impacts

Concept

Science-led Development thru PR4D for Enhancing Impacts

ICRISAT
Science with a human face

Increasing Adoption, Area Coverage and Impacts

- We are targeting 20% increased production over the yields of Bhoochetana I Phase
- It's the challenge we ourselves have set
- Policymakers and farmers are eager and ready to implement
- Can we (BC Consortium) facilitate this transformation? **YES WE CAN!**

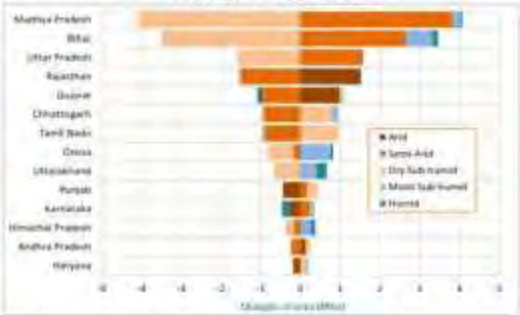
ICRISAT
Science with a human face

Science-led P4D to Meet the Target

- Climate change is a reality

Trend in max Temperature at Gulbarga, Karnataka

Changes in Status of Agroecological Regions between 1971-90 and 1991-2004



In Karnataka 0.23 m ha area is added to SAT

- Innovations to make agriculture resilient and sustainable are must for development

Objectives

1. To review the progress of GoK-ICRISAT initiatives viz; Bhoochetana and Bhoochetana Plus; and assess the strengths and weaknesses during the implementation of both the programs.
2. To plan and develop a strategy for strengthening Bhoochetana and Bhoochetana plus for "**Increasing Adoption and Area Coverage**" for capitalising and enhancing the benefits of Bhoochetana Mission Program (BCMP) for developing climate resilient agriculture to improve livelihoods of the farmers in the state by operationalising inclusive market oriented development (IMOD) strategy.
3. To prepare detailed operational plans for science-led GoK-CGIAR development initiatives to establish evidence-based scaling-up model for integrated rural development through holistic participatory research for development (PR4D) framework.

Thank you!

CGIAR

ICRISAT Science with a human face

International Crops Research Institute for the Semi-Arid Tropics

UNIVERSITY OF HORTICULTURAL SCIENCES, BAGALKOT

CONVERGENCE OF MICRO-IRRIGATION AND GROUND WATER USE

Dr J. Venkatesha
Director of Research
UHS, Bagalkot, Karnataka

Water is a critical input for crop production

- Population growth is increasing day by day (120 crore)
- By 2040- India number one in the world.
- Tremendous pressure on food demand
- 265 million tons of Horticulture products and 250 million tons of food grains
- Every unit of available land resource and critical inputs needs to be exploited.
- To increase production and productivity of crops, water is an important input, it has to be conserve effectively and use efficiently.

Available Water To Agriculture Is Limited

- Water : 1.4 million cubic kilometers
- 97% of above water is not suitable for irrigation/drinking water
- 3% only sweet water, out of 3%, 77% of water is in the form of Ice in Arcatic and Himalayan hills.
- 23% of water is only available for use (Drinking, Industry & Agriculture)

Benefits of Groundwater Use for Agricultural Irrigation

Groundwater is a 'very popular commodity' with Farmers since it:

- is usually found close to the point-of-use (often only a well's depth away)
- can be developed quickly at low capital cost by individual private investment
- is available directly on-demand for crop needs

Dependence on groundwater

- 60 per of the net irrigated area meeting its requirements from groundwater sources mainly in form of tube-wells (40 per cent).
- 19 million wells in the country, of which 16 million are in use that draws 231 BCM of water.
- This has been at the expense of decline in irrigation by canals and tanks.
- What is significant is that since 1996-97, the net irrigated area through canals has actually undergone an absolute decline, rather than achieving an accelerated growth despite the fact that funding has increased 1,520 times from 500 crores to 7,598 crores

Source : FICCI, 2011

Dependence on groundwater

- The impact of the over-withdrawal has been felt on the overall availability of groundwater with the number of over exploited blocks in the country having risen from 231 in 1994 to 939 in 2012.

- Measures to augment irrigation would have to include mechanisms for recharge (in case of groundwater based systems) and greater emphasis on surface water based methods for irrigation.

Sources of irrigation

- Rivers (Canals & lift irrigation)
- Tanks
- Wells (Open and tube wells)
- Lakes
- Others (Farm ponds)

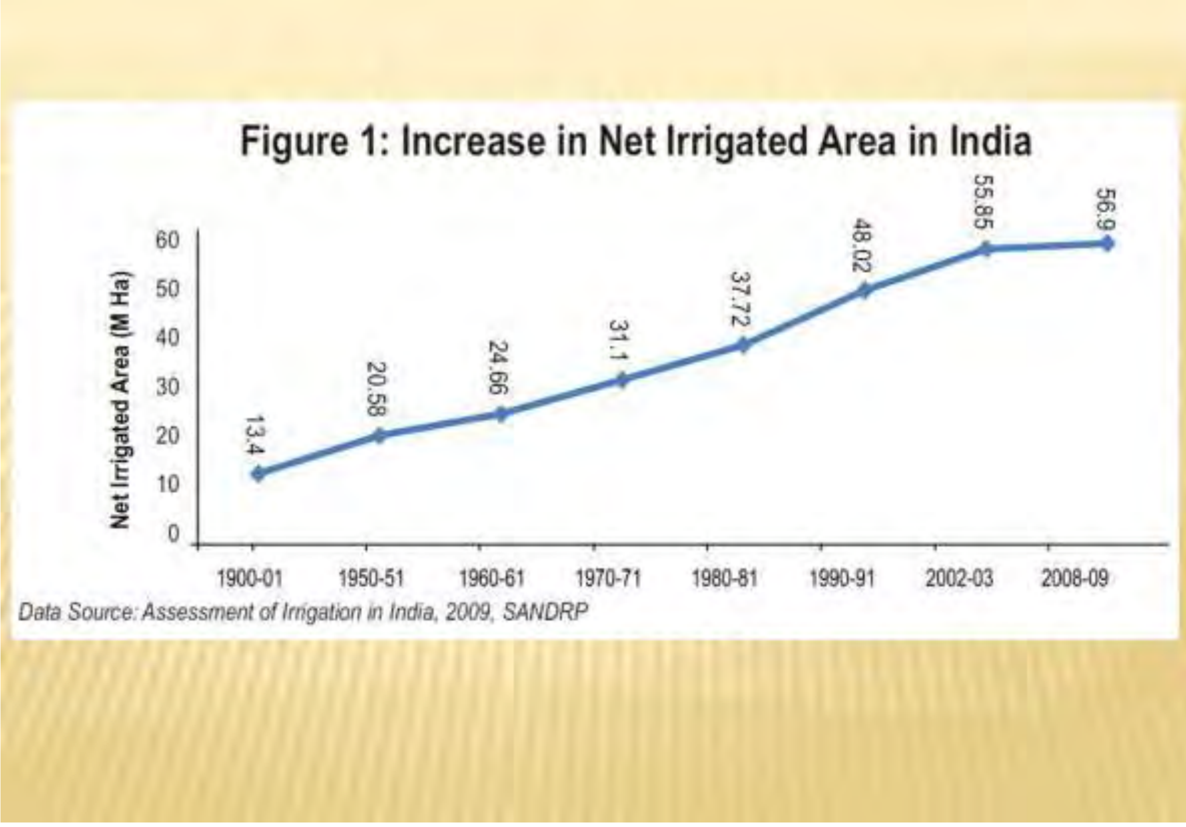


Figure 1: Increase in Net Irrigated Area in India
Net Irrigated Area (M Ha)
60
50
40
30
20
10
0
13.4
20.58
24.66
31.1
37.72
48.02
55.85
56.9
1900-01
1950-51
1960-61
1970-71
1980-81
1990-91
2002-03
2008-09
Data Source: Assessment of Irrigation in India, 2009, SANDRP

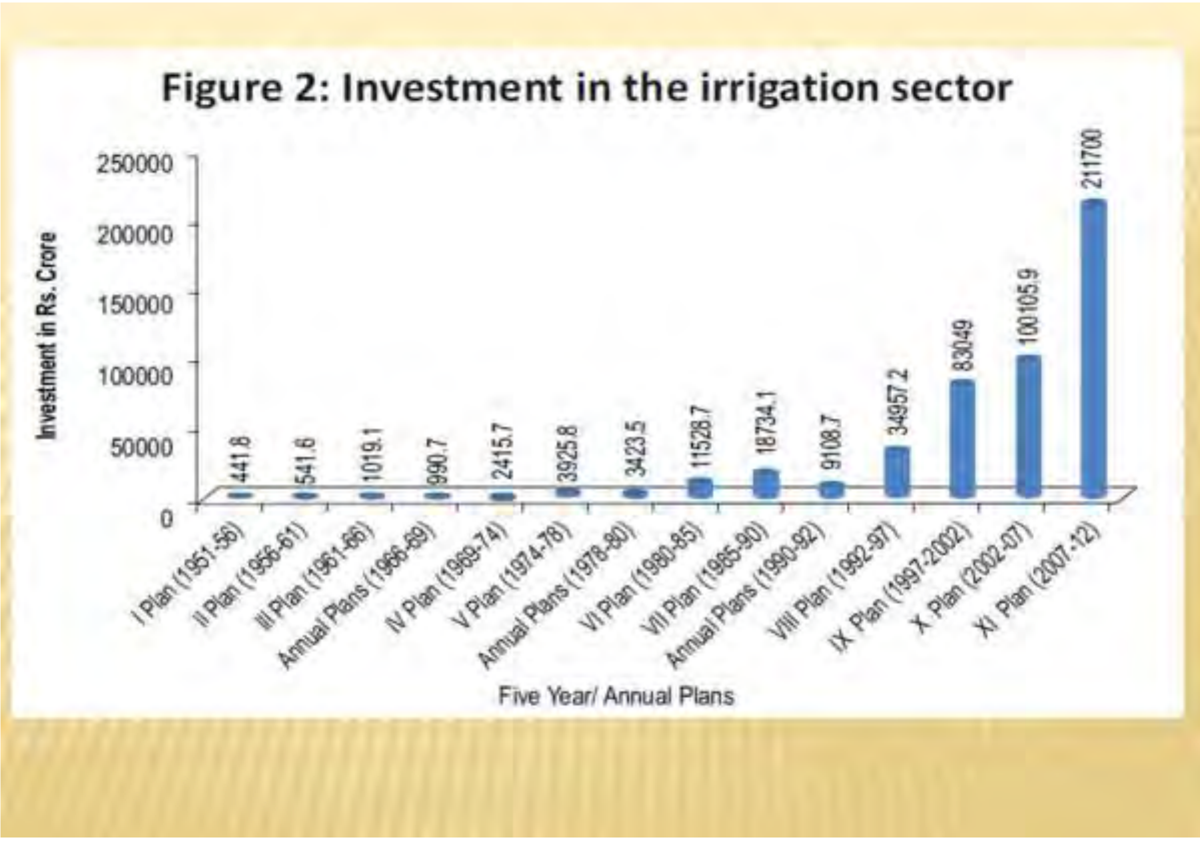


Figure 2: Investment in the irrigation sector
Investment in Rs. Crore
250000
200000
150000
100000
50000
0
441.8
541.6
1019.1
990.7
2415.7
3925.8
3423.5
11528.7
18734.1
9108.7
34957.2
83049
100105.9
211700
I Plan (1951-56)
II Plan (1956-61)
III Plan (1961-66)
Annual Plans (1966-69)
IV Plan (1969-74)
V Plan (1974-78)
Annual Plans (1978-80)
VI Plan (1980-85)
VII Plan (1985-90)
Annual Plans (1990-92)
VIII Plan (1992-97)
IX Plan (1997-2002)
X Plan (2002-07)
XI Plan (2007-12)
Five Year/ Annual Plans

The water resources of India are

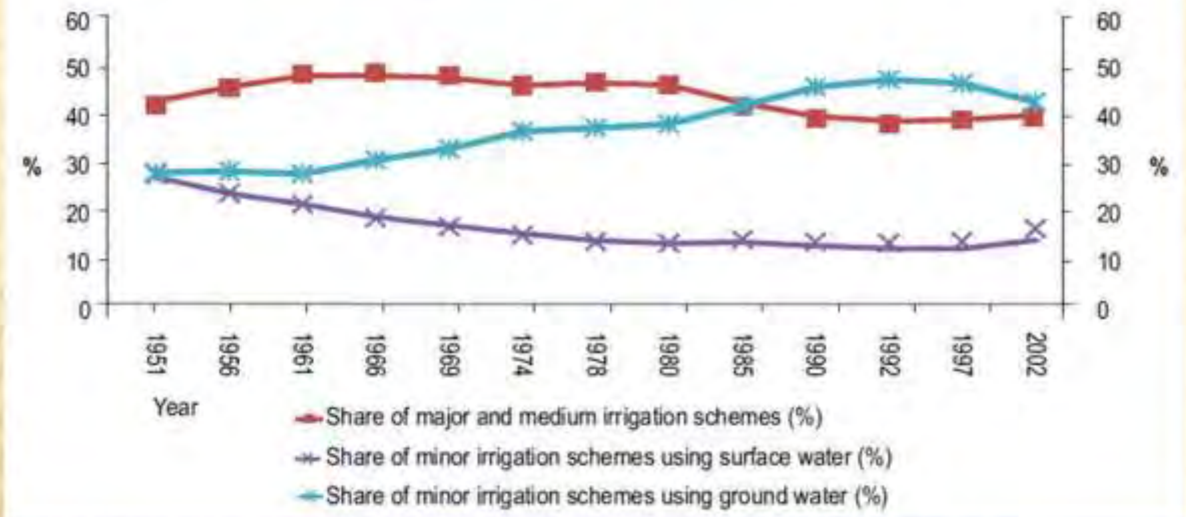
1. 4000 Cu. Km from annual precipitation including snowfall,
2. 1869 Cu. Km from annual potential flow in rivers,
3. 690 Cu. Km from estimated utilizable surface water resources
4. **432 Cu. Km from estimated utilizable ground water resources.**

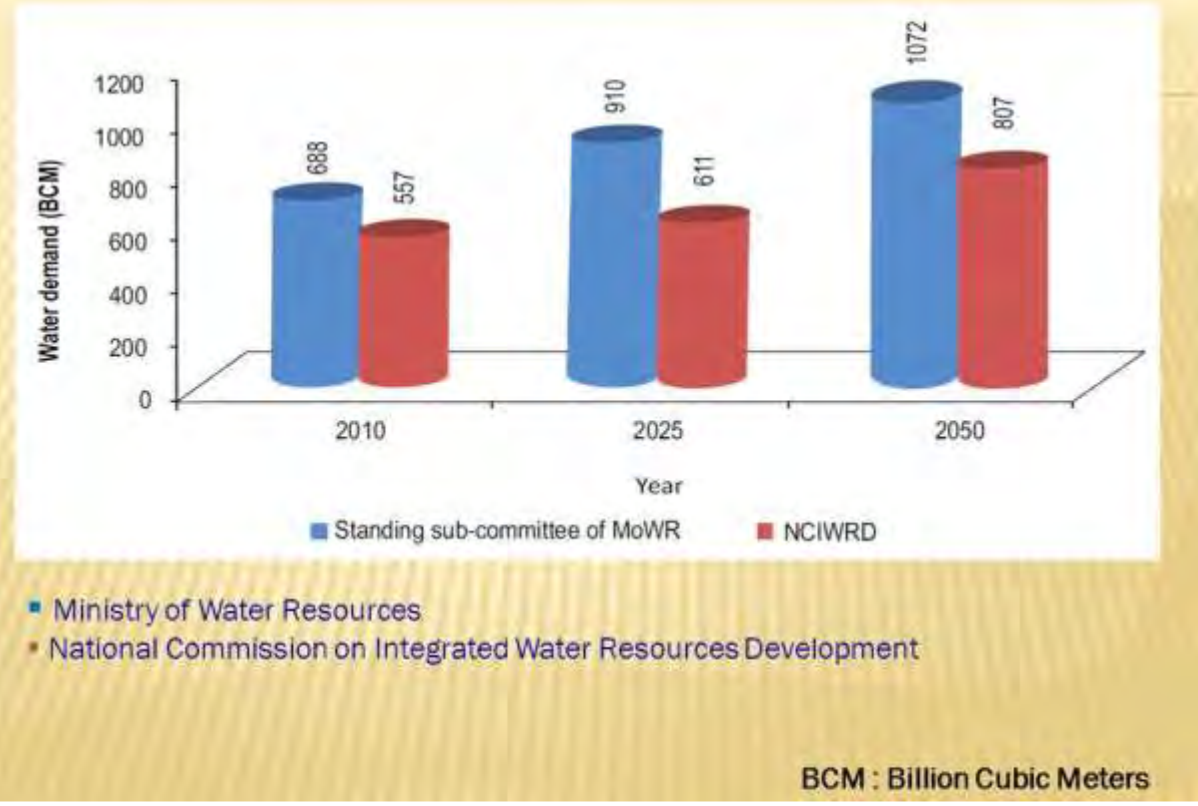
The estimated water requirement of India during the year 2025

1. 77.0 M .ha m for irrigation (M. ha M – Million Hectare Meter)
2. 5.2 M .ha m for drinking
3. 12.0 M .ha m for industry
4. 7.1 M .ha m for energy
5. 3.7 M .ha m for others
6. Total requirement of about 105 M .ha m.

The utilizable water resources are just enough but these are to be used effectively and efficiently

Figure 3 (a) - Changing share of surface/ groundwater sources in irrigation potential created





Average annual yield of the rivers of the Karnataka

Sl. No.	River System	Estimated average yield in		
		Million Cubic Meter	TMC,ft	Percentage
1	Krishna	27,451	969.44	27.90
2	Cauvery	12,034	425.00	12.23
3	Godavari	1,415	49.97	1.44
4	West Flowing river	56,600	1998.83	57.51
5	North Pennar South Pennar Palar	906	32.00	0.92
	TOTAL	**98406**	**3475.24**	**100**

Irrigation methods

Based on the source of water excluding precipitation,

irrigation systems can be grouped into two

(1) **Surface irrigation system**:

(a) Reservoir tank/ system
(b) Canal system
(c) Diversion systems

(2) **Ground water irrigation systems**:

(a) Open well/ dug well
(b) Bore/ tube well.

3) Check basin:

(i) Rectangular – Closed spaced crop
(ii) Contour – Slope is more
(iii) Ring – orchard crops

4) Ridges and furrow method

5) **Sub-surface**: Water reaches the root surface by upward vertical movement from source in the deeper layer of the soil. Useful where capillary movement is substantial (clayey soils)

6) **Aerial method** (Sprinkler): Commonly practiced, water is pumped in pipes and allowed to sprinkle or spray (simulate rainfall).

There are three types.

i) Rotating head sprinklers – low or medium discharge, high discharge

ii) Perforated pipes – To cover shorter distances and to deliver large quantity of water – eg. vegetable

iii) Pop up sprinkler – low delivery application to lawns

iv) Rain gun – sugarcane, banana (high water required and tall)

Irrigation efficiency in different methods

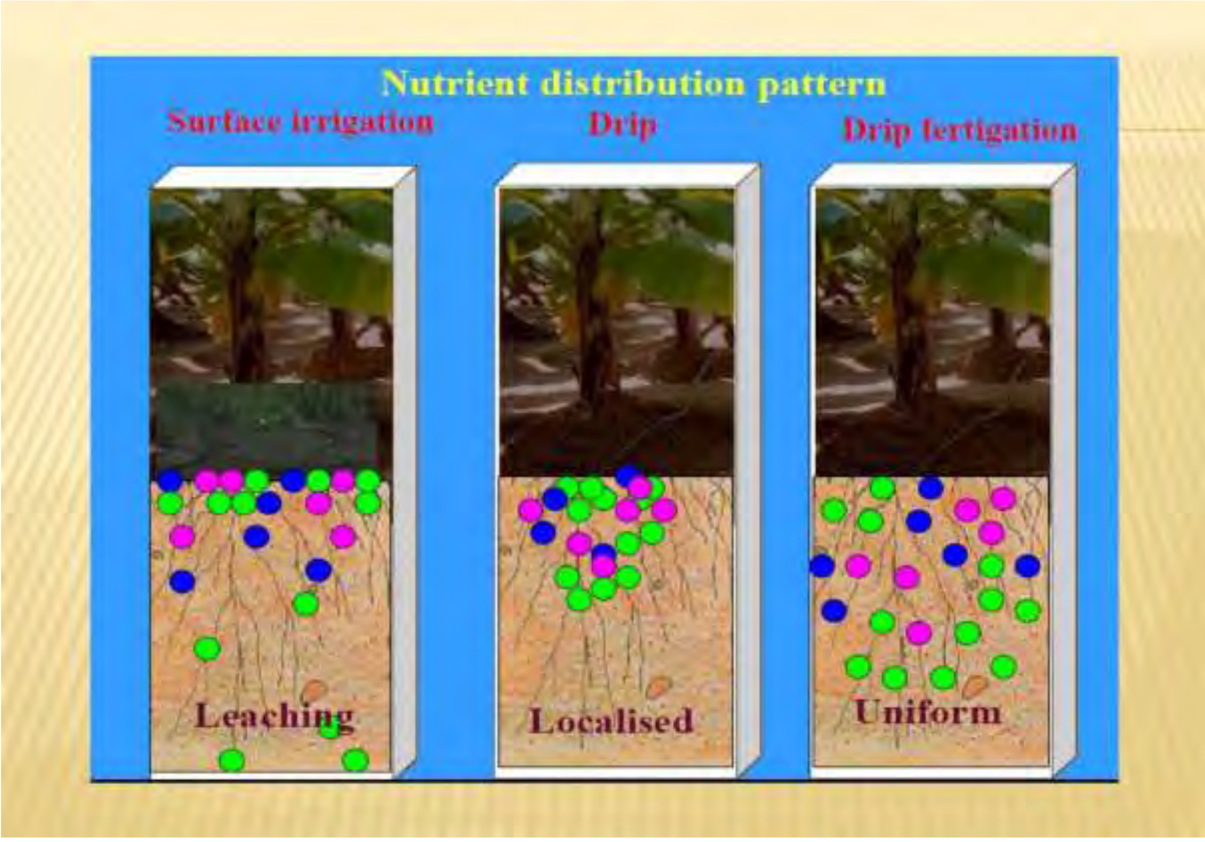
Method of irrigation	Irrigation efficiency (per cent)
1) Flooding	20 to 25
2) Border strip	50 to 60
3) Check basin	60 to 65
4) Furrow	60 to 70
5) Sprinkler	65 to 75
6) Drip	90 to 95

Comparison of Water requirement of horticultural crops in drip irrigation to surface irrigation

Crop	Drip irrigation (litres/tree/day)	Surface irrigation (litres/tree/day)
Coconut	75-100	200-300
Grapes	25-45	90-100
Mango	30-50	90-150
Guava	20-30	70-100
Sapota	20-30	70-100
Pomegranate	20-40	60-130
Banana	12-16	30-40
Citrus	10-20	25-65
Papaya	5-8	18-26
Vegetables	1-2	4-8

Strategies for enhancing Water Use Efficiency through micro-irrigation

- Drip irrigation
- Drip fertigation
- Sprinkler method
- Protected cultivation (foggers, mist)
- Drip + Mulching (Organic/poly mulch)
- Anti-transpirants (Kaoline)
- Irrigation at the critical stages of crop growth period



Fertilizer Use Efficiency

Nutrient	Fertilizer Use Efficiency (%)		
	Soil appln.	Drip	Drip Fertign.*
Nitrogen	30-50	65	95
Phosphorous	20	30	45
Potassium	50	60	80

* 95% applied fertilizer taken by plants

DRIP IRRIGATION SYSTEM

Drip irrigation refers to application of water in small quantity at the rate of mostly less than 12 lph as drops to the zone of the plants through a network of plastic pipes fitted with emitters.

Drip irrigation in its present form has become compatible with plastics that are durable and easily moulded into a variety and complexity of shapes required for pipe and emitters.

Merits and demerits of micro-irrigation

MERITS OF DRIP IRRIGATION

1. Increased water use efficiency (25-50 %)
2. Better crop yield (20-25 %)
3. Uniform and better quality of the produce
4. Efficient and economic use of fertiliser through fertigation
5. Less weed growth
6. Minimum damage to the soil structure
7. Avoidance of leaf burn due to saline soil
8. Usage in undulating areas and slow permeable soil
9. Low energy requirement (i.e.) labour saving
10. High uniformity suitable for automization

DEMERITS

1. Clogging of drippers
2. Chemical precipitation
3. Salt accumulation at wetting front

Merits of Sprinkler systems

- Sprinkler irrigation does not require surface shaping of leveling.
- Can be applied to areas of variable topography.
- Suitable for most crops, not all, and are adaptable to most irrigable soils.
- Flexibility is possible because sprinkler heads are available in a wide range of discharge capacities.
- Chemical and fertilizer applications are easily used with sprinkler systems.

Demerits of Sprinkler systems

- Water application efficiency under sprinkler irrigation is strongly affected by wind
- Some crops are especially sensitive to fungal diseases, leaf scorch, or fruit damage, and tall crops may obstruct hand-move or side-roll portable systems.
- Falling drops on bare soil, causing slaking and surface sealing (Crusting)
- High maintenance requirements,
- High operating pressures

Micro Irrigation

- The coverage of irrigation in India is about 40 per cent of the gross cropped area.

- One of the main reasons for this low coverage is the predominant use of flood irrigation where water use efficiency is very low.

- Available estimates indicate that water use efficiency under flood irrigation is only about 35 to 40 percent because of high distribution losses

Micro Irrigation

- Micro irrigation (MI) which is the most efficient method of irrigation was introduced in India in 1987.

- Micro irrigation can be in form of drip/sprinkler irrigation method and is the most successful demand management strategy to reduce water consumption in agriculture.

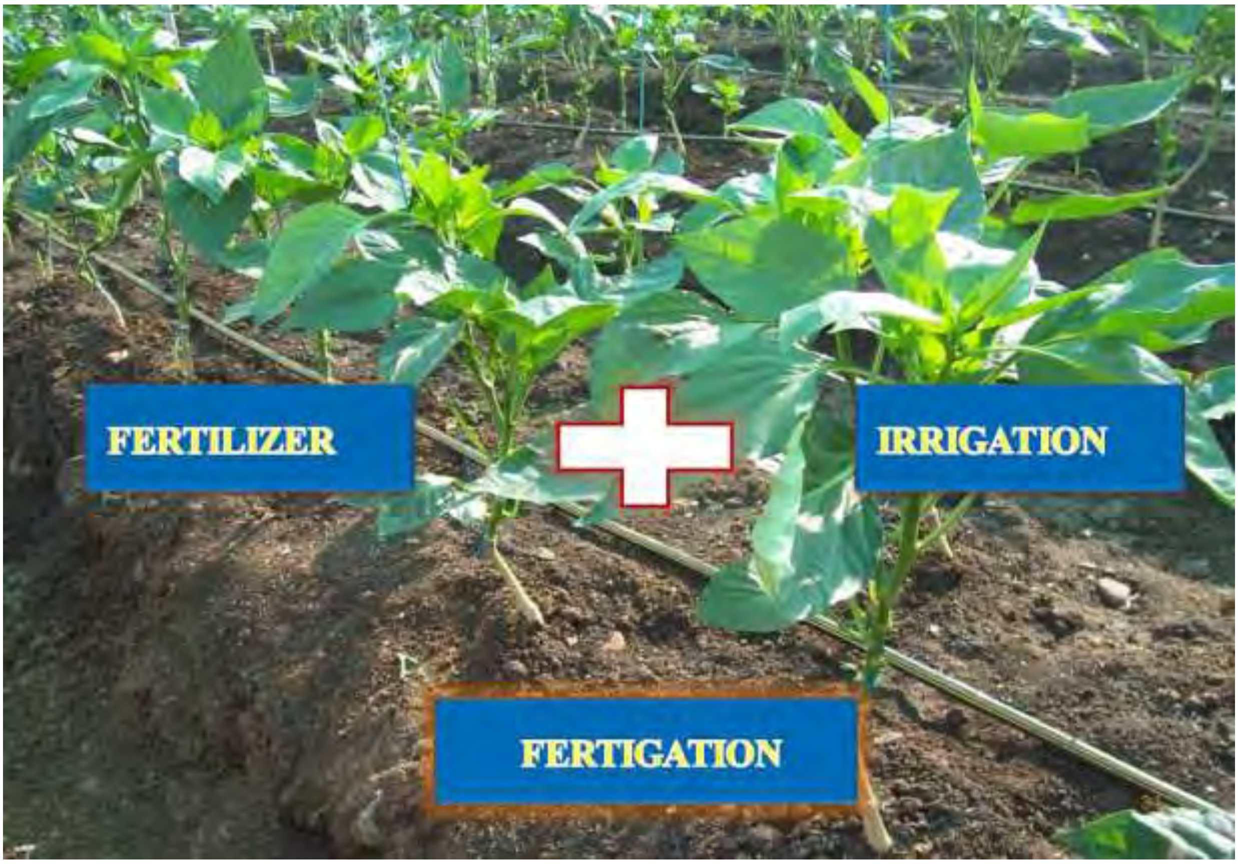
- Unlike flood irrigation, water in MI is supplied at a required quantity and interval required interval and quantity using pipe network, emitters and nozzles.

Table 4: Area under micro irrigation

State	Area under drip irrigation in '000 ha	Area under sprinkler irrigation in '000 ha	Total area under MI in '000 ha
Andhra Pradesh	363.07	200.95	564.02
Bihar	0.16	0.21	0.37
Chhattisgarh	3.65	59.27	62.92
Goa	0.76	0.33	1.09
Gujarat	169.69	136.28	305.97
Haryana	7.14	518.37	525.50
Himachal Pradesh	0.12	0.58	0.70
Jharkhand	0.13	0.37	0.50
Karnataka	177.33	228.62	405.95
Kerala	14.12	2.52	16.64
Madhya Pradesh	20.43	117.69	138.12
Maharashtra	482.34	214.67	697.02
Nagaland	0.00	3.96	3.96
Orissa	3.63	23.47	27.10
Punjab	11.73	10.51	22.24
Rajasthan	17.00	706.81	723.81
Tamil Nadu	131.34	27.19	158.52
Uttar Pradesh	10.68	10.59	21.26
West Bengal	0.15	150.03	150.18
Other States	15.00	30.00	45.00
Total	1428.46	2442.41	3870.86

Data Source: *Spread and Economics of Micro-irrigation in India: Evidence from Nine States*: K Palanisami, Kadir Mohan, K R Kakumanu, S Raman, *Economic and Political Weekly*, June 25, 2011 VOL XLVI NOS 26 & 27

2011



Cost benefits, Payback periods of Micro irrigation for various crops

Crops	Spacing of crops m	Cost of the system Rs.ha^{-1}	Pay back period	B:C ratio
Banana	0.91*1.5*1.8 paired row	45,000	1-2 Year	3.00
Grape	3.03*1.8	44,000	1 Year	3.28
Pomegranate	4.3*4.3	30,000	2 Year	5.16
Ber	4.5*4.5	30,000	1 Year	4.56
Tomato	0.45*0.45* 1.65 Paired row	30,000 canewall	1 Year	1.09
Papaya	1.81*1.81	40,000	2 Year	4.09
Cotton	0.9*1.5*1.8 Paired row	47,500	3 Years	1.83
Sugarcane	0.83*1.66 Paired row	47,500	1 –2 Year	3.45

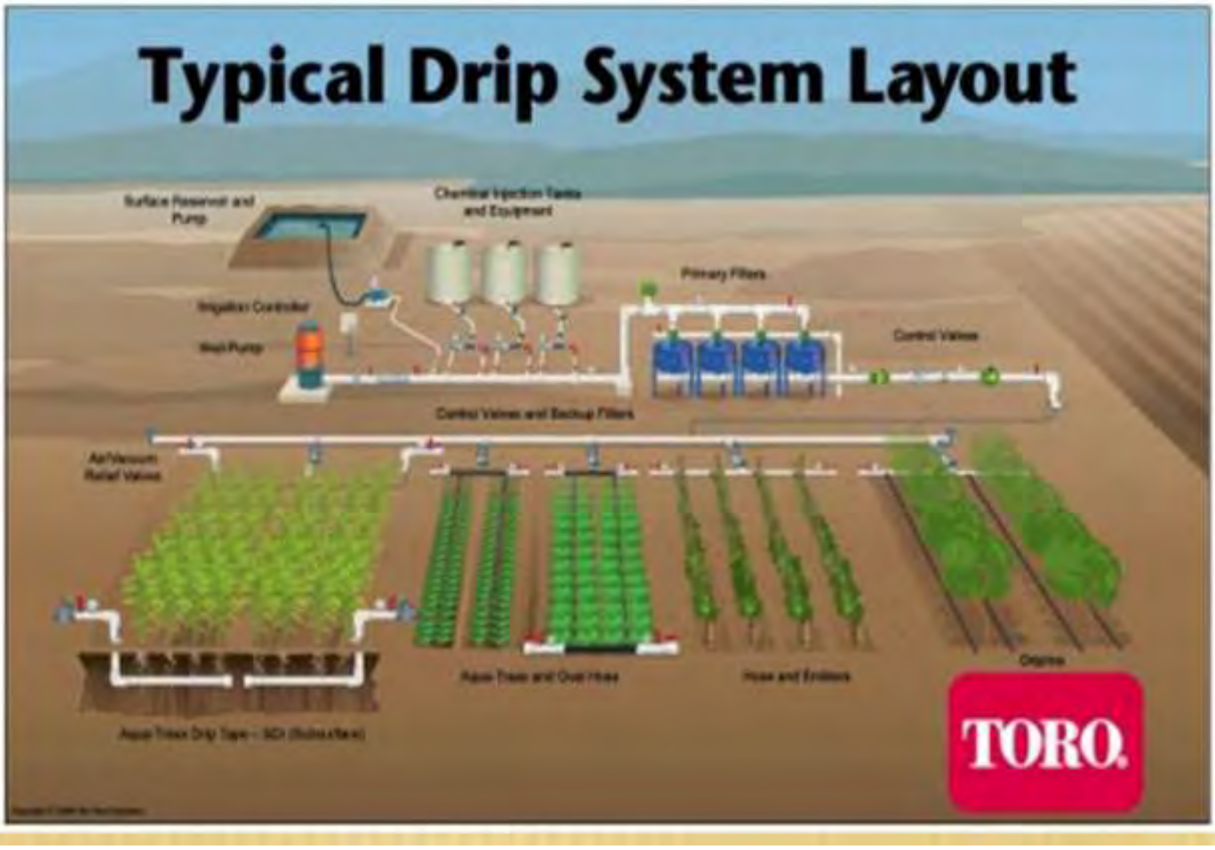
Water saving,yield and profit under drip and drip fertigation system

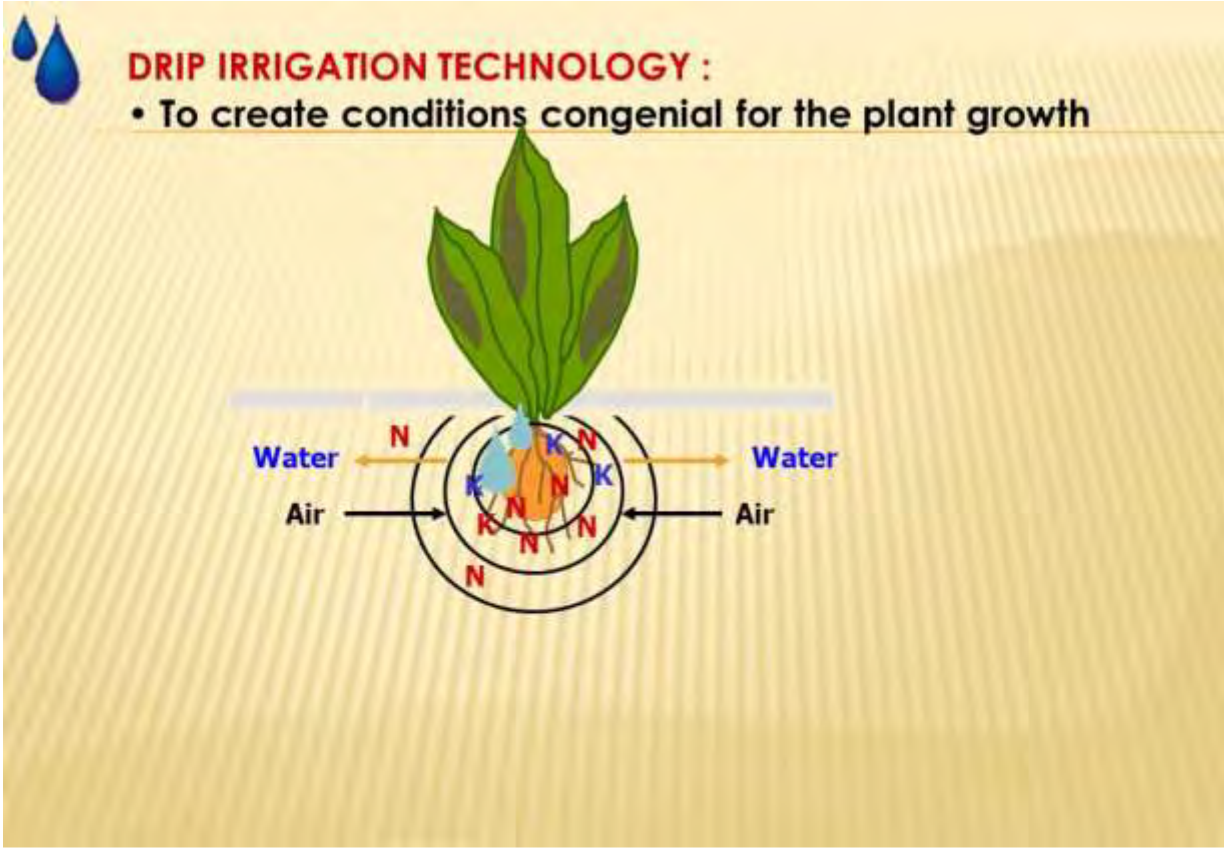
Crops	Water saving (%)	Yield (t/ha)			Profit (Rs/ha)		
		Conventional	Drip	Drip + Fertgn	Conventional	Drip	Drip + Fertgn
Banana	35	26	30	37	81000	98000	120000
Sugarcane	29	120	160	207	30000	47000	68000
Tomato	32	45	56	65	56000	77000	95000

Payback Period 1-2 years

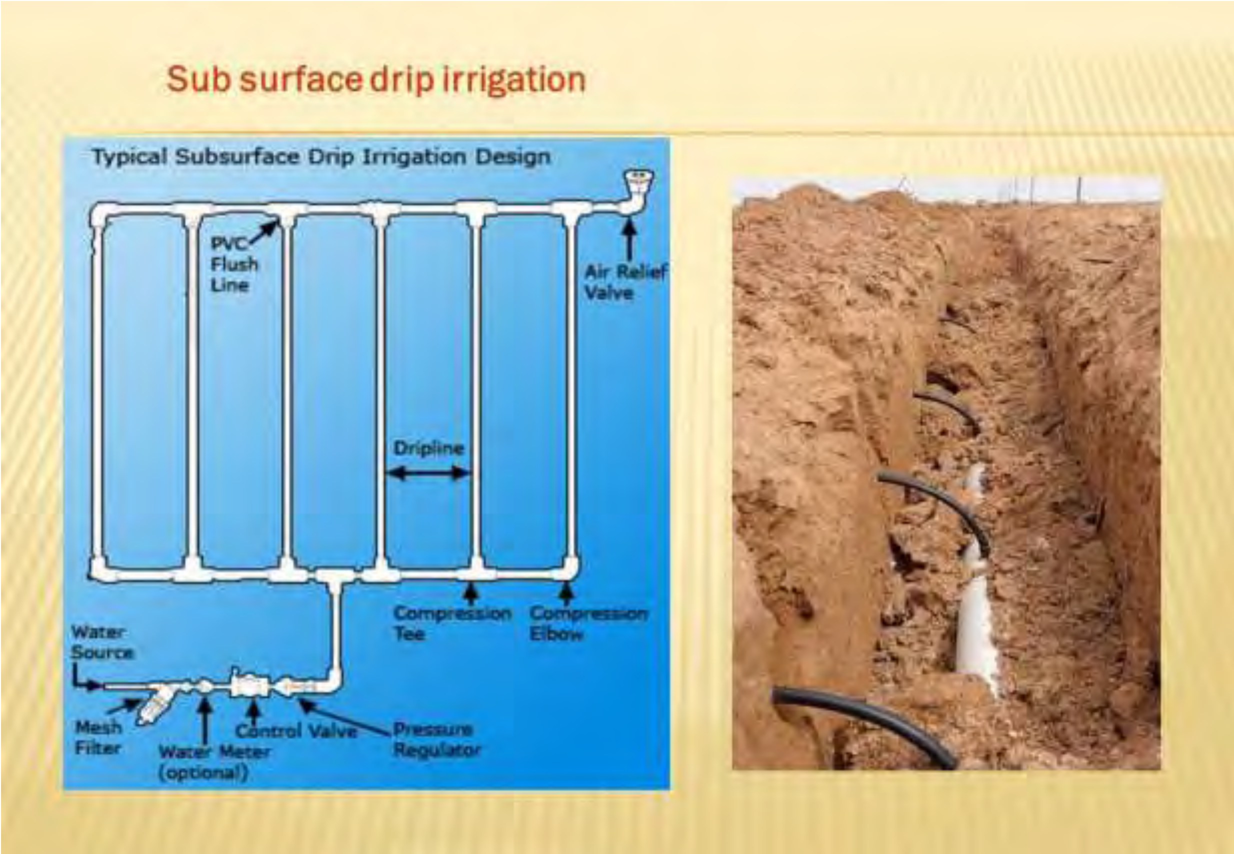
MIcro-irrigation for horticultural crops

Furrow irrigation




DRIP IRRIGATION TECHNOLOGY :
• To create conditions congenial for the plant growth
Water
Water
Air
Air
N
K
N
K
K
N
K
N
N
N
N
N


Main Menu
Root Zone
Dry Zone
Wet Zone
Wet Zone Soil Types
Drip Space Soil / Crop
Water / Air Capacity
DRIP IRRIGATION PRINCIPLES
Soil Types
•The shape of the wetted zone depends on the physical properties of the soil.
•In light soils the distribution of the water will be narrower and deeper.
•In heavy soil the distribution of the water will be relatively spherical in shape.
Heavy Soil
Medium Soil
Light Soil
Exit


Sub surface drip irrigation
Typical Subsurface Drip Irrigation Design
PVC Flush Line
Air Relief Valve
Dripline
Compression Tee
Compression Elbow
Water Source
Mesh Filter
Water Meter (optional)
Control Valve
Pressure Regulator


Fertigation + Mulching

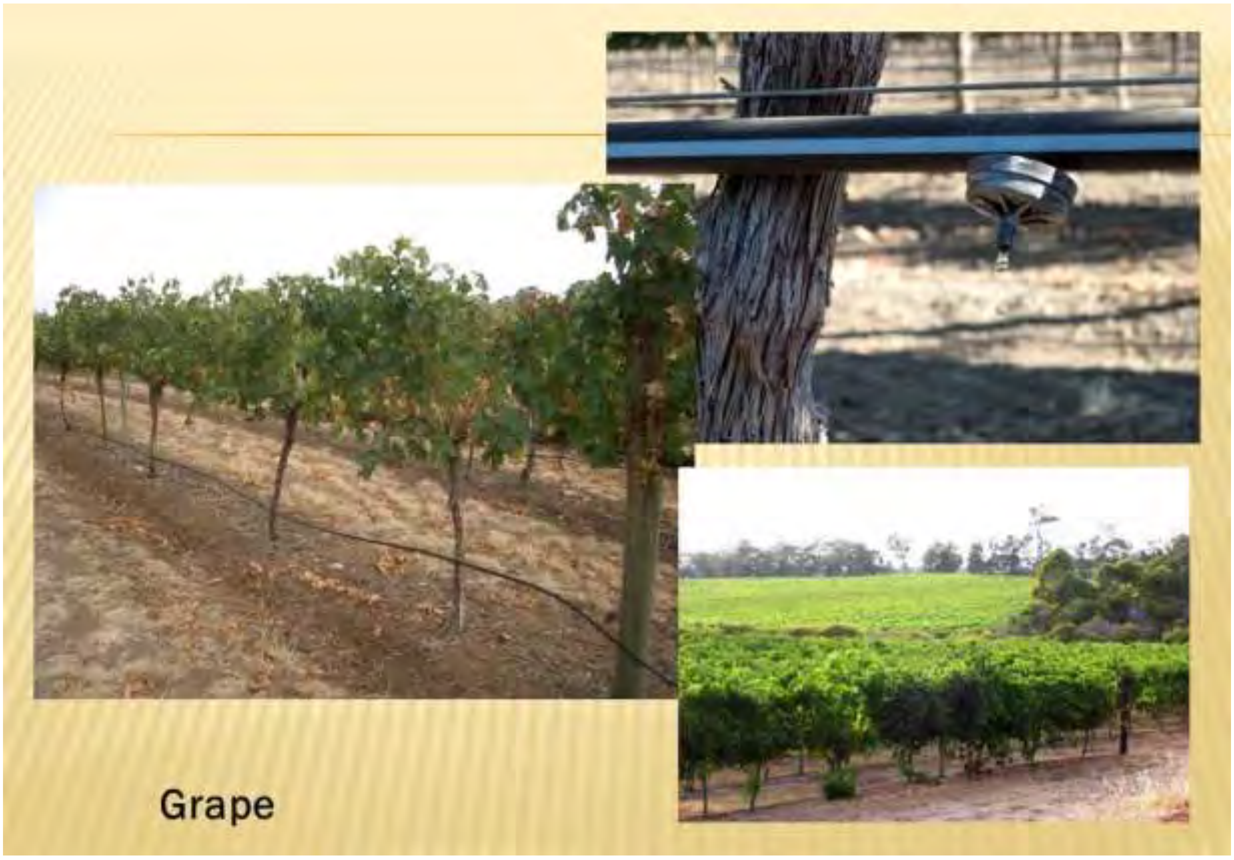

Potato


Fertigation + Mulching in Watermelon


Drip irrigation in banana


Drip + Mulching


Pomegranate


Grape

Inference

- In spite of better efforts for improving irrigation through surface irrigation methods is going to be slow due to erratic rainfall which affects storage capacity of the reservoirs. Under this situation, alternate strategies have to addressed for bringing more area under crop production through **micro-irrigation**
- It is imperative to bring more area under irrigation to enhance production, productivity and quality
- Ground water is depleting year by year due to over exploitation and erratic rainfall which necessitates to think alternate strategies by utilizing effective irrigation methods
- Over-exploitation of ground water to be minimised and effective and efficient utilisation of the same through modern irrigation methods

Upscaling of Learnings from ICRISAT-GOK Initiatives

Suhas P Wani and Team
6 February 2014

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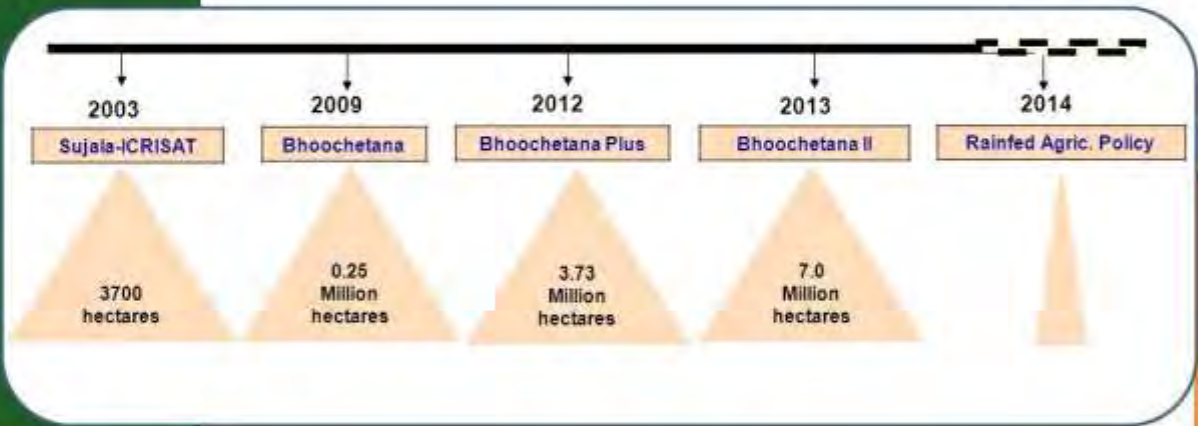
Journey thru ICRISAT-GOK Initiatives



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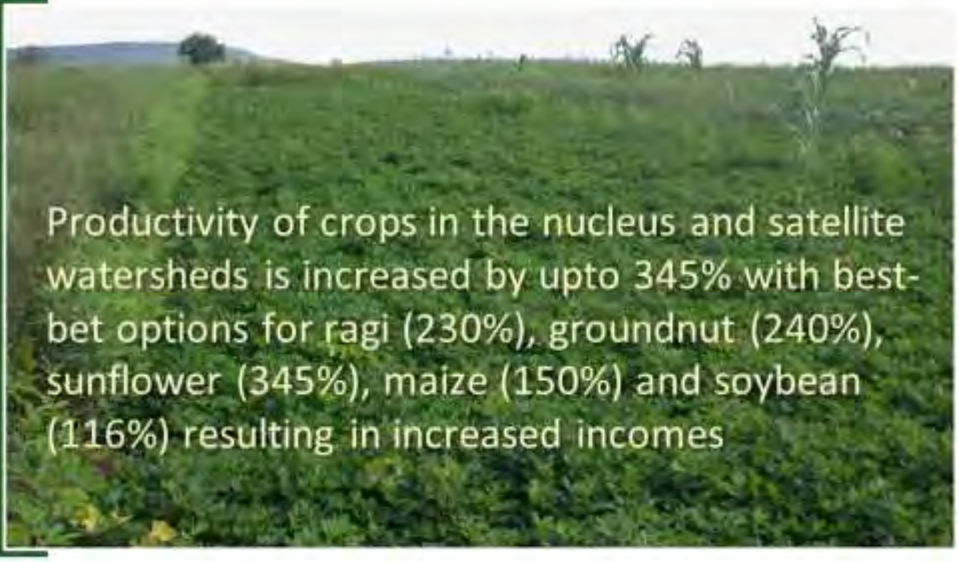
Sujala-ICRISAT Initiative
Main Message



Productivity of crops in the nucleus and satellite watersheds is increased by upto 345% with best-bet options for ragi (230%), groundnut (240%), sunflower (345%), maize (150%) and soybean (116%) resulting in increased incomes

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Bhoochetana-ICRISAT Initiative
Main Message

- Science-led approach promoted by Government of Karnataka adopted by farmers increased crop yields by 32 to 64 per cent over the normal farmer's practice
- Rain-fed Agriculture development could become growth engine for reducing poverty and achieving food security in Karnataka and India

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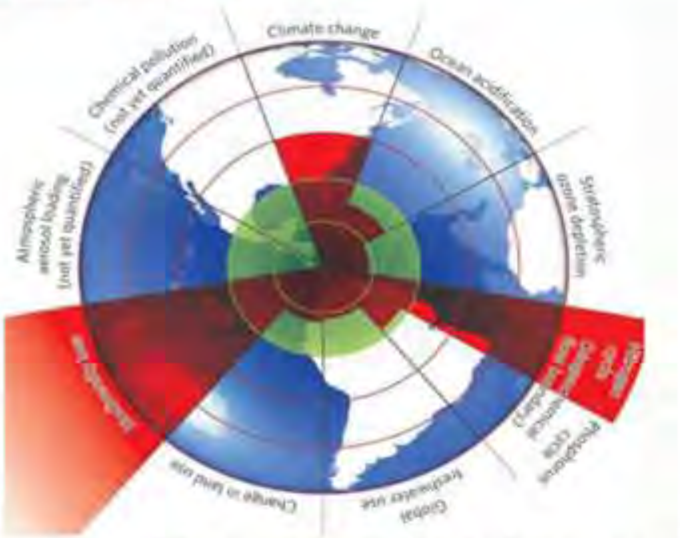
Planetary Boundaries: Safe Operating Space for Humanity



Biodiversity loss, **Nitrogen cycle** and **climate change** are various parameters has reached beyond its permissible threshold at planetary scale

Nature, 2009

Resilient Agriculture Investigators Network (RAIN)4Sustainable Development in Karnataka

Torch Bearers for Resilient Agriculture

- Establishment of Resilient Agriculture Investigator Network (RAIN)
- Developing a common understanding about resilient agriculture
- Developing a common approach, instruments, methodology, data set and terminology for resilient agriculture
- Establish the sites of Resilience Learning
- Sensitize all the stakeholders to use the resilience and vulnerability lense

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Bhoochetana: Increasing Adoption, Area Coverage and Impact: A Challenge to Meet

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Why We Need to Take a Challenge

- Increased vulnerability of rainfed agriculture due to climate change
- Food security is at risk
- Sustainable development is in question

Bhoochetana

Potential Sustainable Development Approach

- Science-led
- Participatory R4D
- 4 I C Es

Innovate	Collective	Efficiency
Inclusive	Cooperation	Equity
Integrated	Capacity building	Environment Protection
Intensification	Consortium	Economic gain

Achievements

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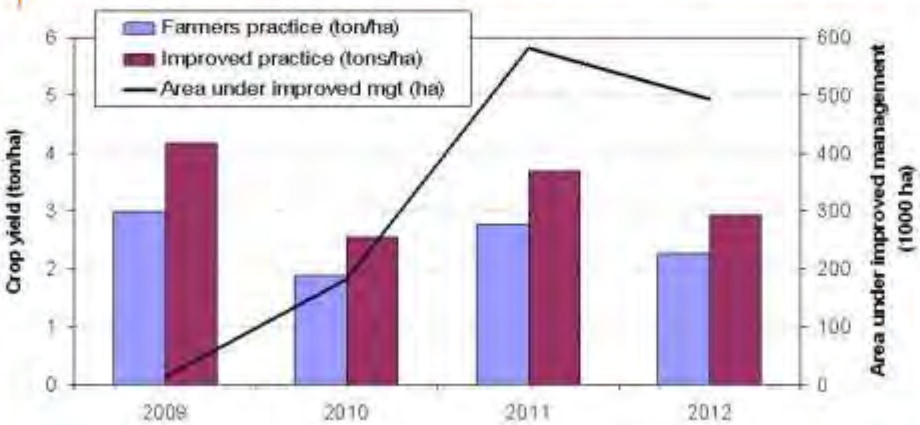
Improved Agricultural Practices Increased Crop Yields and Incomes in Karnataka: Bhoochetana



Year	2009	2010	2011	2012	Total
Net income (Rs in Crores)	11.49	204.81	599.45	451.80	1267.60
Net income (Million US$)	2.52	45.72	112.48	82.44	243.16

Example: Bhoochetana

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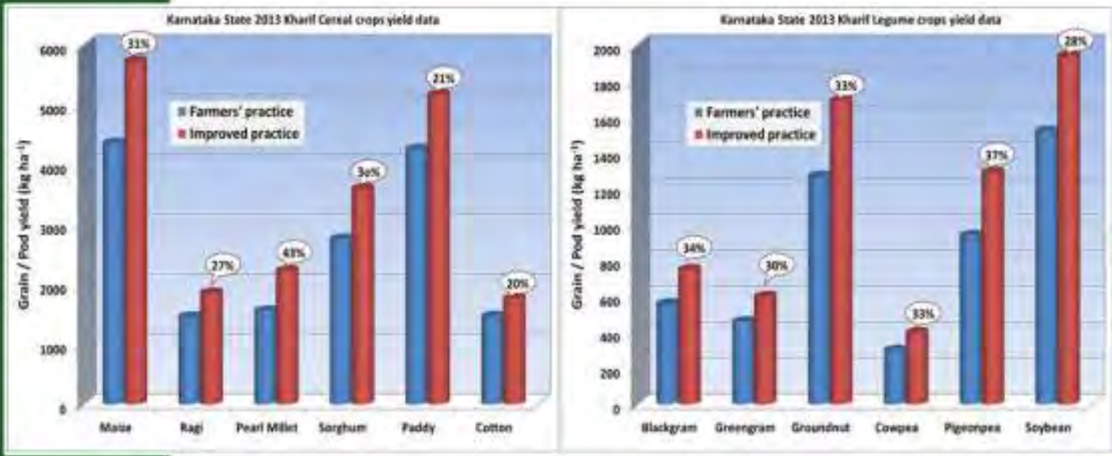
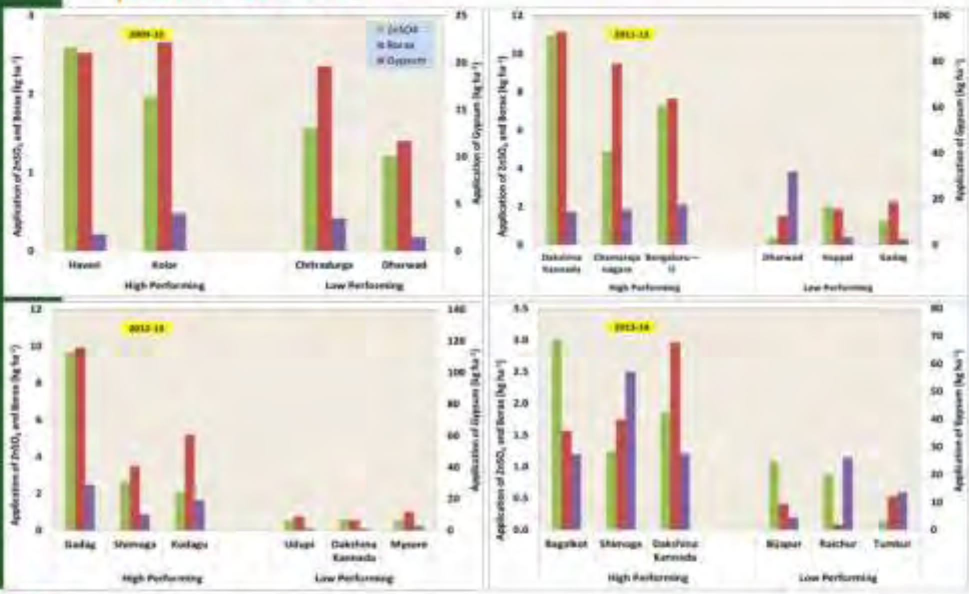
Increased Mean Crop Yields in the State during Rainy Season 2013



Distribution of Micronutrients in Total (tons) and Per Hectare (kg) under Bhoochetana Project

Year consumed	Season	Area covered (Lakhs ha)	Quantity Consumed (t)			Nutrient used (kg ha^{-1})		
			$ZnSO_4$	Gypsum	Borax	$ZnSO_4$	Gypsum	Borax
2009	*Kharif*	2.25	372	4309	53	1.65	19.15	0.23
	Rabi	0.59	-	-	-	-	-	-
2010	*Kharif*	12.72	2723	35376	389	2.27	29.50	0.32
	Rabi	3.70	362	5595	113	1.09	16.86	0.34
2011	*Kharif*	28.44	8775	96234	2781	3.46	37.90	1.10
	Rabi	6.60	1678	12475	432	2.94	21.87	0.76
2012	*Kharif*	35.70	6803	59935	3104	2.25	21.5	0.77

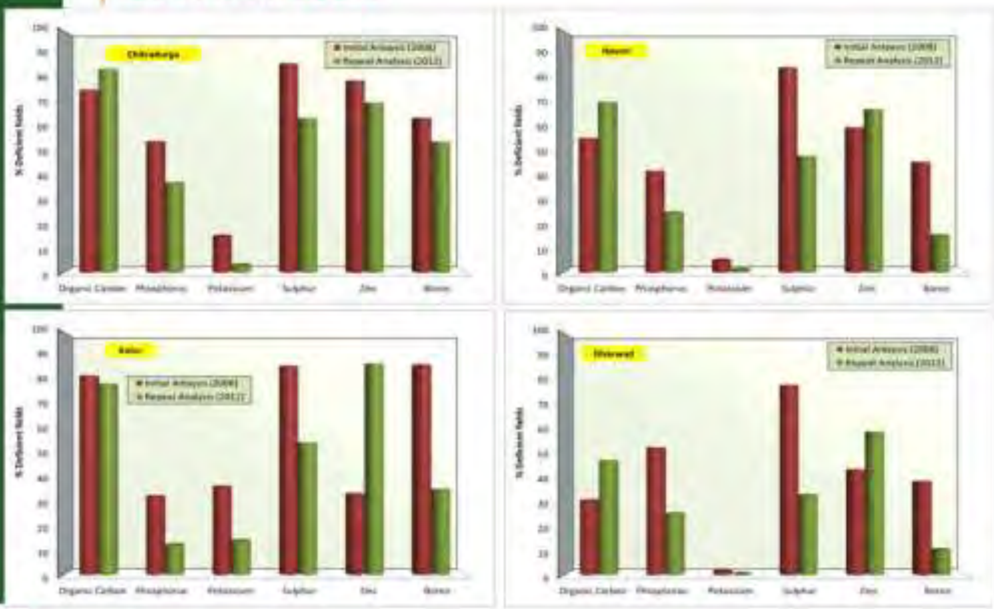
Nutrient Consumption-based High and Low Performing Districts under Bhoochetana during 2009 to 2013



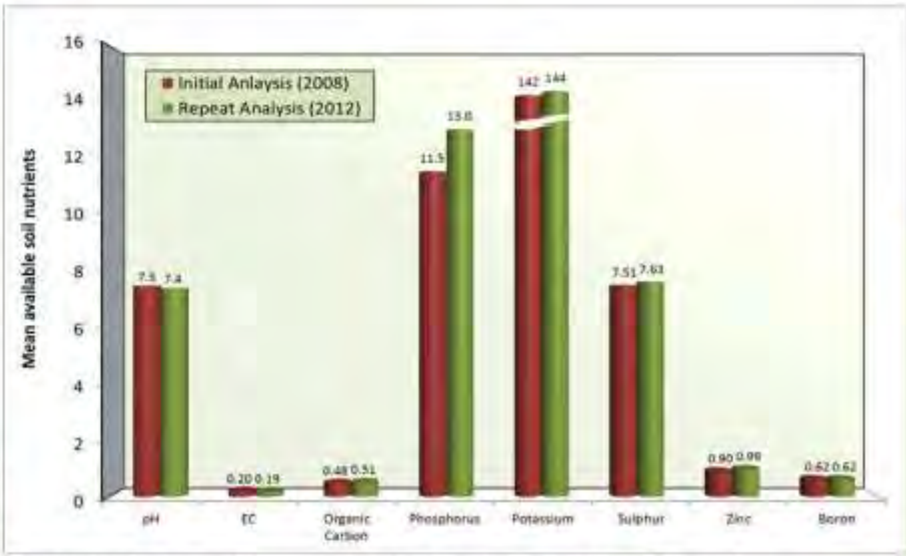
Number of Farmers Participated and Area Covered in Bhoochetana in Karnataka

*Figures in parentheses indicate No. of farmers (million) participated

Changes in the Soil Nutrient Deficiencies in Four District under Bhoochetana in Karnataka during 2008 and 2012



Soil Nutrient Status in Fields under Bhoochetana in Karnataka during 2008 and 2012



*Facts are based on analysis of four sample districts viz. Chitradurga, Haveri, Kolar and Dharwad
** Units for OC is % ; for P, K, S, Zn, B are mg kg^{-1} soil ; and for EC is dS m^{-1}

Revolutionising Rain-fed Agriculture thru Inclusivity and Resilience (ReRAInRe) in Karnataka

Specific Objectives

The specific objectives are:

- To revolutionise the rain-fed agriculture in the state through science-led inclusive development through integrated management of farms for increasing productivity and profits by 50 per cent in five years by enabling farmers to adopt holistic "Seed to Plate" approach;
- To enhance resilience of the rain-fed farmers as well as farming systems through suitable adaptation and mitigation interventions for the anticipated impacts of climate variability and change;
- To develop effective and sustainable integrated knowledge and inputs delivery systems for the farmers through public private partnerships;
- To undertake sustainable intensification and diversification of farming systems through mechanisation for sustainable development and harnessing the market potential for the small farmers for enhancing their incomes;
- To build the capacity of different stakeholders such as DoA officials, private entrepreneurs, development workers including non-government organisations (NGOs), farmers and policy makers in the state.

Five Pillars for Sustainable Development

- Integrated soil, water, nutrient and crop management options (holistic approach) as an entry point to harness low hanging fruits
- Farmers-centric sustainable delivery systems thru public-private partnerships (PPP) for empowerment of farmers

Five Pillars for Sustainable Development

(Contd..)

- Effective and sustainable seed delivery systems for Improved crops and cultivars for transforming subsistence agriculture into business model to diversify and intensify agriculture
- Social mobilisation for mechanisation thru collective action and minimum tillage
- Inclusive Market Oriented Development (IMOD) thru ensuring credit and institutional support to build resilience and enhance profits

Thank you!

CGIAR

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International Crops Research Institute
for the Semi-Arid Tropics

Government of Karnataka

WATERSHED DEVELOPMENT DEPARTMENT

IWMP CONVERGENCE WITH BHOOCHETANA

Objectives of Watershed Development

- Arresting Soil Erosion & Degradation
- Soil Moisture Conservation
- Enhancing Groundwater Recharge
- Improving Biomass Production
- Improving Productivity
- Enhancing Livelihood Options to Vulnerable Sections through IGA
- Enhancing investment in farm sector

Projects Sanctioned under IWMP

Year	No. of projects	No. of micro watersheds	Treatable Area (in lakh ha)	PIA	Cost per ha. (in rupees)	Total Cost (Rs. in lakhs)
2009-10	119	966	4.91	WDD	12000 / 15000	63268.32
2010-11	127	1189	5.47			70511.90
2011-12	116	1285	5.48			71407.01
2012-13	68	748	3.32			42529.23
2013-14	63	732	3.22			41929.25
Total	493	4920	22.4			289645.71

STEPS IN IMPLEMENTATION

Scheme is being implemented based on Common Guidelines issued by GOI

1) Entry Point Activities (EPA)
2) Selection of NGOs
3) Induction training to NGOs
4) Awareness building
5) Formation of Community based organization (CBOs)
6) Strengthening of CBOs
7) Training on Net planning, DPR and use of thematic GIS maps
8) Participatory preparation of Action plans and DPR
9) Plan approval
10) Implementation

EPA ACTIVITIES









AWARENESS PROGRAMME: WALL PAINTING




AWARENESS PROGRAMME: GRAMA SABHA

AWARENESS PROGRAMME: JATHA

BASE LINE SURVEY PROGRAMME

IMPLEMENTATION STRATEGY

- Implementation at GP level through EC committees
- One EC committee for each GP
- 2 to 3 GPs per Project (SWS)
- NGO role is mainly for social mobilization & Capacity building
- NGO staff
  - One NGO coordinator at District
  - project level - Team leader, IGA coordinator, DEO & one WA for every 1000 ha
- NGO services are for initial 30 months

CBO FORMATION

Community Based Organization were formed at the project level

- Self Help Groups
- User Groups
- Watershed Committee / Executive Committee

(formed under 61 A of Panchayat raj act)

- GP president will be the president
- Departmental staff – Secretary cum treasurer

Net Planning Process

- Transect walk along with EC members & farmers – decision on interventions required on each parcel of land in consultation with the beneficiary
- Presentation of entire action plan through PRA in Grama Sabha
- Approval of Grama Sabha with suggested changes
- Computerization and report generation
- Information available to citizen http://202.138.102.22/IWMP_NET_PLAN
- Approval of EC and submission to DWDOs
- Technical scrutiny
- Submission to DLC for final approval

1.Conservation measures for non-arable lands

- Boulder check
- Rubble Check
- Sunken pond
- Recharge pit
- Nala Revetment
- Diversion Channel
- Contour staggard trenches
- Gokatta
- Forestry activity

2.Conservation measures for arable lands

- Contour bunds
- Trench cum bund
- Graded bund
- Bench Terracing
- Water ways
- Farm Pond
- Shallow wells
- Agro-Forestry
- Dryland Horticulture
- Fodder Development

3. Drainage line Treatments

- o Dugout Pond
- o Recharge pit
- o Mini percolation Tank
- o Ravine Reclamation Structures
- o Vented dam
- o Check dam
- o Nalabund
- o Forestry Activity

Income Generation Activities – A sustainable livelihood

- Covers all vulnerable women, landless, SC/ST, S&MF
- Implemented through SHGs
- 8699 SHGs in Batch I & II with total membership of 134647
- Structured training model
- EAP, EDP and skill training through specialized agencies
- Demand and local resource based IGA activities
- Individual & group enterprises as business models
- Credit linkage with SHGs
- 8 to 9 % of the total project cost is allocated for livelihood activity

ACTIVITIES UNDER PRODUCTION SYSTEM

- 8% of the total project cost is earmarked for the enhancement of production activities (SLNA Decision)
- There is provision to enhance production through various activities of production system.
- To make use of the sustainable natural resources.
- Production system activities taken after completion of soil & moisture conservation activities.
- SLNA has accorded approval for implementation of important production activities like Agriculture, Horticulture, Animal Husbandry, Forestry, Fisheries, Apiculture

List of Production System Activities
Crop demonstration
Sprinkler Irrigation
Horticulture demonstration
Mushroom Cultivation
Model Cattle shed
Model Sheep shed
Trevis(1)
Silage pit
Azola Cultivation(2 pits)
Animal Health Camps
Drum irrigatation
Water bag kit
Model of Fisheries development
Nala bund/ V.Dam etc.,
Intensive form forestry activities
Block plantation

Monitoring Mechanisms

In house	• Vigilance wing at WDD • District Nodal Officers • Monthly meetings & Videoconferenses • GIS based monitoring, all the interventions will be marked on Google earth
Out source	• Independent M E L & D Agencies • Discrete / Concurrent monitoring • Process Monitoring • Impact Assessment • Monthly presentation on findings at H.O & Districts • A separate dedicated wing to monitor the compliance to observations
Community	• Monitoring by EC & UG • OK cards • Beneficiary cards

INSTITUTIONAL CONVERGENCE

Possible Departments : to Converge at various levels

- Agriculture
- Horticulture
- Animal Husbandry and Dairy
- Fisheries
- Forestry
- Rural Development

INSTITUTIONAL CONVERGENCE ....Contd

Possible Institutions

- State Agri /Horti / Vet Universities
- ICAR institutions
- Training institutions
- Co-operatives
- Farmer Organizations
- Non Government Organizations
- Credit & input support agencies

RKVY

1.Multi-Sectoral, flexibilities with the States, Projects based on priorities reflected in C- DAPs

2.SLNA may develop a System integration(agri, horti, AHD, Fish, Forestry etc. intervention)programme for selected WSs in districts/region and approach SLSC

3. Interventions could be with/without funds(financial or programmatic)

NFSM

- Crops Covered are rice, wheat and pulses
- Pulses – Mostly rainfed
- Promotion of Pulses in Wateshed through NFSM
- Coarse grains are proposed to be included in XII th Plan
- There would be enhanced scope to promote coarse cereals th. NFSM
- Linkage between WDTs & NFSM Distt. tech teams

NHM

- Holistic development of Horticulture sector, covers 372 districts,
- Eight categories of interventions like: planting material , area expansion, high-tech application , infrastructure support, development of horti clusters,HRD etc.
- WCDC/WDTs may obtain quality planting material from NHM credited outlets and seek technological back up as per horti development need of WS

NHM….Contd

- District Horticulture Mission should have representation of WCDC/WDTs
- WDTs and KVKs may interact for development and distribution of quality planting material
- Watershed/MNREGA may develop farm ponds/ Conservation structures and polythene lining and drip system may come from other programmes

ATMA

- Focus on Extension Reforms
- Cafeteria of activities- both for the State and District levels
- Extension Activities include training, demonstrations, exposure visits, farmer empowerment, FFSs, and field extension
- FIGs/CIGs need to be promoted in WSs
- WCDC need to be suitably represented in ATMA GB

ATMA- IWMP ....Contd(1)

- ATMA Field Programmes could be organized in WSs jointly through WDTs&BTTs
- WCDCs & WDTs to look into the SREPs and BAPs of ATMA for con.modalities
- FFs, VEWs and SMSs(of ATMAs&KVKs) need to be oriented on WDT Field progs
- IWMP train. strategy dovetailed to ATMA/ KVKs. SAMETI to develop trng modules
- Interface betw SLNA and IDWG of ATMA on quarterly basis for convergence modalities

KVKs

- Frontline Extension Programme of ICAR/SAUs
- Major activities include: Technology Assessment and Refinement (On Farm trials), Frontline Demonstrations, Training of Farmers and other extension activities like Farmer-Scientist Interactions, Kisan Mobile Advisory Services and providing technological backstopping to the the field programmes

KVK-IWMP Linkages

- MoU based linkages for training and technology testing
- Involvement of KVK SMSs for knowledge backstopping
- Drawing learnings from micro level farming situation reports of KVKs
- Development of Training modules as per specific requirements of a particular WS
- Important partner in dissemination of WS technologies

NATIONAL DAIRY PLAN

- Promote Dairy Farmer Producer Companies, Dairy Farmer Producer Organizations in Watersheds having potential
- WCDCs and Distt. Level Milk Unions to collaborate on use of Primary Milk Coops in WS areas for programme delivery

LIVESTOCK HEALTH & DISEASE CONTROL PROGRAMME

- Animal Health Camps in Watersheds in collaboration with the line Department functionaries
- WDTs to focus on Small ruminants and Backyard Poultry depending on the potential
- National Livestock Mission may have special windows for Watershed areas

NATIONAL FISHERIES DEVP BOARD PROGRAMME

- NFDB progs for inland (and marine)
- Water conservation in perennial surface water bodies through WS progs
- Fish Seeds / Finger lings from the line Department
- Community participation for water management and fish production&auction through PRIs
- Fisheries training through KVKs/ATMAs and outlets of SAUs and ICAR Institutes

MNREGA

- Water Conservation works th. MNREGA
- Bringing in System integration led by WDTs and
- Participated by the line departments
- Priorities should be given to the conservation works reflected in DPRs
- Larger earthworks not covered by IWMP should be covered by MNEREGA

NRLM

- Synergy between NRLM projects and Watershed projects
- Skill Development camps in Watershed areas
- Promotion of FFSs in Watershed areas
- Promotion of livelihoods and income generating activities in WS areas
- Organizing joint training strategies accordingly

NABARD Linkage

- Involvement of DDM at various levels
- Watershed – Farming Systems – input support and credit linkages
- Look into PLPs as one of the instrument of convergence and to capture the convergence priorities
- Help mobilize credit support for the entrepreneurs WS areas

WS-EF Linkages

- Forest area – Joint Ridge treatment planning
- Forest Deptt to treat upper ridges as per specification of the lower level requirements as per needs of the WDTs
- Community forestry and social forestry – planting material to come from Forestry Deptt
- Scope for Joint training strategies

BACKWARD REGION GRANT FUND(BRGF)

- Panchayats are positioned as institutions for planning and implementation
- To address the intra-district variations
- Most backward districts and sub-districts
- Scope for aligning BRGF and IWMP areas
- Involvement of Panchayats in local priority setting for WS management programmes

GREEN INDIA MISSION

- Focus on enhanced eco-system services through afforestation on degraded lands
- Possibility of massive plantation drives in WSs

BHOOCHETANA PLUS

- Bhoochetana activities are carried over in all the treated areas.
- Bhoochetana plus is in operation in four selected districts.

SHG formation and Training (S1,S2 S3)

User Group Formation and Training(U1,U2, U3)

Executive Committee formation and Training(E1,E2,E3)

NET PLAN


AiÉÆÃd£É:- DAiÀï.qÀ§Æè.JA.¦ 2012-13 UÁæªÀÄ: UÀÄqÀÄªÀÄPÉÃj ¨ÁèPï £ÀA: 4 vÁ: ¸ÀªÀzÀwÛ
N16⁰01′284″, E75⁰
02′136″,

Donwad IWMP B-II 2012-13
Bamblawad /Umarani F/B Block No-2 Rs.0.966 Lakhs HA:19.92 RMT:2848
GPS 16.23.33 N 74.37.23 E

Donwad IWMP Batch-II
Kargaon IWMP B-II Filed Bund Block-8 ,Rs.0.989 Ha-16.86, RMT-2920
,GPS 16.18.50 N 74.38.26 E


Karagaon/Yadgud IMWP B-II F/B,Block- 12 Rs.3.784 Lacks ,Ha-38.69
RMT- 8861 , GPS 16.19.31 N 74.37.16 E
Donwad IWMP Batch-II


N16⁰01′284″, E75⁰02′136″,


N16⁰01′270″, E75⁰02′070″,


Tq:Gokak
Year:2012-13
Village:Jamnal
Work:VD


N16⁰ 17′201″, E74⁰ 34′628″,


227/2 ,IWMP-I,
89/4,IWMP-II,
16 15'21" N 74 36'5"E


89/4,IWMP-II,
16 15′22″N 74 36′6″E


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Thank You!

Bhoochetana:

Enhancing awareness and publicity

Group II

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- Picco projector
- ICT Tablet, SMS advisory
- Information Kiosks
- Display posters at GP level / Milk collection centers containing details of FFs and BC adoptive farmers
- Aerial balloons
- Cycle rallies
- Experience sharing of adoptive farmers in local cable network/ radio/ Gram sabha
- Exhibitions and / Field Days
- Awareness among other stakeholders viz. input suppliers

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Improving convergence in the districts

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What are the bottlenecks? How can we overcome them?

- Mindset of the stakeholders – own goals, workloads and constraints
- All the partners are not represented. How to bring actors to the table? What are the hindrances?
- Staff shortage, many programs, interests and priorities are different. Too many meetings!
- Capacity building of the stakeholders from different departments: address constraints (human resource, technical capacities etc.) of different departments.
- Why, Where, What and How much? (of Convergence)
- For the common goals
- For What? For Planning, Implementation and Monitoring
- Where? Convergence means different at different levels

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Who leads the converged effort? An open questions!

Bottom-up approach → focused on the need

- RSK/Village Level – Preparation of Action Plans and Implementation
- District – planning, administration and monitoring and approval of Action Plans
- State – Policy and Streamlining of Resource

Examples of existing convergence models (IWMP, ATMA) need to be reviewed and learnings summarized

Things to do

Taking stock of the functioning of RSKs and an understanding of the factors that explain the variation in their functioning.

In every dept, every scheme cannot be converged. Commonly deliverable issues can be converged.

Lopsided planning – we are talking about convergence of all the departments, but we are talking for others when most of the relevant stakeholders are absent.

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Thank you!

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Documentation and Reporting

Group IV
Team : 30 members

Documentation

- ❖For planning and improvement of any activity that regularly takes place and damage to crop
- ❖For further execution and understanding of any Deputed In-charge
- ❖For accountability and transparency of activity

Problems Identified

- All the methods and procedures of major Interventions such as Varietal trails, vermicomposting, drip irrigation, etc. that improves crop yield and soil health to be documented properly in every season
- Major short falls occurred in last season and pre-cautions to be taken in future
- Major pest and diseases that damage every season and precautions to be taken
- All the suggestions and recommendations by visitors such as Scientists, Officers, etc.
- Procedure of soil sampling is not clear yet to some of the farmers
- P: Documentation of soil sample location should be documented for future sampling at same location and future soil analysis and comparison

Recommendation

Standard documentation format should be made for each activity

Documentation on procedure of soil sample should be available as a leaflet for each farmer at RSK centres

New Scientific tools such tables which has GPS, and photo attachment should be used

New methods such SMS, Photo clip, Video and Voice should be used

Reporting

At the beginning of crop season : Inputs and seed distributions should be reported
Crop growth- stage: fortnight
Pest and disease : fort-night
Yield : seasonal
Rainfall and weather: weekly


Thanks

Input Mobilization, Quality Monitoring and availability

Input Mobilization and availability

- Demand Assessment for next 5yrs inclusive of all line department and commodity board requirement
- Tender finalization to be made for 2 years period in order to ensure continuous supply of Inputs except seeds
- All inputs packages with barcode to be insisted to supplier

- Standardised package material to be used for all inputs
- Packages of all inputs made available in 0.5, 1.0 and 2.5acre requirement
- Inputs to be made available well in advance at RSK and Cluster godowns by April end
- Alternate products of Inputs also need to be available

- MIMS-Mobile Inputs Monitoring System for all Inputs
- Permission to purchase locally available organic manure specially from SHG's
- Liquid bio-fertilisers products need to be encouraged.
- Distribution by involving line departments(Watershed, Horticulture and Sericulture)
- Mini kits to be supplied in time(farmers Opinion)

Quality Monitoring

- All inputs quality check at divisional lab(Lab to be upgraded with technical qualified staff on out source basis)
- Quick test Kit to be made available specially for micronutrients

Group-4

Innovative Monitoring and Evaluation

RSK Level Monitoring

Strategy

- Weekly reviews of Line departments and FFs preferably on Shandy Day based on action plan
- GPS based monitoring (AOs/AAOs to be provided tablets
- Surprise visits
- Developing farmers' data base and issue of smart card

Indictors

- Number of Farmers visited
- Soil samples collected
- Godowns identified
- Meetings at cluster villages conducted
- Input sales at cluster villages
- Problems identified

Regular reporting thru CUG SMS system to higher level at all stages of program implementation

Taluka Level Monitoring

Strategy

- Monthly reviews of Line departments and FFs based on action plan
- ATMA BTMs should be made Bhoochetana nodal officer
- Surprise visits by ADA

Indictors

- Progress under each converged scheme

Regular reporting thru CUG SMS system to higher level at all stages of program implementation

District Level Monitoring

Strategy

- Monthly reviews of Line departments and ADAs based on action plan
- Bimonthly reviews of Line departments and ADAs and AOs based on action plan
- ATMA DPD should be made Bhoochetana nodal officer
- Surprise visits by JDA

Indictors

- Progress under each converged scheme

Regular reporting thru CUG SMS system to higher level at all stages of program implementation/ Social networking

Input supply system

Strategy

- Mobile input monitoring system similar to mFMS to monitor supply and distribution at every level

Crop cutting experiment

- GPS tracking using tablets from selection of experimental plot till harvest
- FFs should assist other department staff involved in CES using tablets

Impact analysis and evaluation

Explore use of remote sensing tools in monitoring and impact analysis

Thank You

Group 6

Enhancing involvement of women and youth in Bhoochetana

Satish B, AO, Udupi
Rajneet Uppal, ICRISAT Scientist
And Team

Present Scenarios

- Active participation of women in agriculture
- Migration of rural youth from agriculture

Avenues for enhancing role of women in BC

- Strengthening SHGs by trainings
- Input distribution
- Cooperative farming for seed production
- Vermicomposting
- Agri-allied activities – dairy, poultry, kitchen gardening
- Seed village concept
- Nursery raising
- Farm Facilitators

Avenues for enhancing role of youth in BC

- Soil sampling
- Farmer facilitators
- Lead farmers
- Input distribution by providing license in local area
- Crop Cutting experiments
- Publicity/ street plays/ Krishi Utsava
- Agri-business- biofertilizer, biopesticides
- Custom hiring centers
- Agri-related ventures to avoid rural youth migration
- Contract farming
- Dairy farming
- Exposure Visits

Requirements

- Infrastructure
- Financial help
- Awareness
- Trainings
- Mobility
- Small village markets

Thank You

Strengthening Sustainable Extension Through ICT-PPP Convergence
Group VIII
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IWMI
ILRI
IRRI
International Rice Research Institute
CIMMYT
ICARDA
IFPRI
ICRAF
AVRDC
The World Vegetable Center

Existing tools and their limitations
• Wall writing
• Rayat Sahay Vani
• Routers Marketing Limited
• Kioask
• KSNDMC
• Radio program
• TV program
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Innovative tools: Tablet based extension system

- SIM and internet connectivity required
- Data collection
  - Digitization of farmers' information, Crop status, Insect/pest incidence, Crop cutting experiments, Fertilizer applications, Soil sampling , Weekly progress report, Input procurement and distribution, Crop coverage
- Information dissemination
  - Updated agricultural information
  - Online soil test results delivery
- TNAU Crop doctor model
- FCMS-Farm crop management system for all the farmers
- SMS based queries
- Computerization and networking of RSKs
- Distribution of smart cards to farmers
- Social Networking (WhatsApp, Facebook): Commodity interest groups, like coffee, pomegranate, etc.

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Krishi vani

- Commodity based groups from data collected thru tablet based system
- Mass voice messages related to technologies and schemes
  - Weather report
  - PoP
- Provision for sending customized voice messages thru subject matter specialist
- Only Airtel numbers are provided

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Farmer to farmer video (Digital Green)

- Pico projectors to each RSK and Farm facilitator
- Location specific video development and screening
- Linking with ETV Annadata and other TV channels

PPP

- Krishi Gyan Sagar website linking with
    - Input suppliers
    - Retailers for sale of produce
    - Network providers (like Airtel Money)
    - Banks
- Convergence with E-Marketing, E-Maratha vahini, DMC, Kisan, RML (Routers Marketing Limited).


Thank you!
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Presentation on

Capacity building of Farmer Facilitators

Strategies for: Indicators, Monitoring mechanism and Accountability

Group I

IWMI ILRI IRRI International Rice Research Institute CIMMYT ICARDA IFPRI ICRAF AVRDC The World Vegetable Center

Indicators

- Quality of conducting FFS
- Mobilization of inputs
- Rapport with farmers
- Achievement of allotted activities
- Effectiveness of field days
- Timeliness in achieving targets

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Monitoring mechanism

- Pre evaluation and post evaluation after training
- Weekly/fortnightly review at RSK level and once in a month at taluk level
- Surprise visit by JDA/ADA
- Distribution of inputs and dissemination of knowledge
- No. of FFS effectively conducted
- Technology adoption rate by farmers
- Effectiveness in conducting CCE

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Accounatability

- Agreement before joining
- Commitments for achieving the targets
- Up-scaling of technologies amongst farmers
- Recognition of good work
- Feedback regarding progress

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