Bhoochetana

Mission Project on Rainfed Agriculture:
Bridging Yield Gaps through Science-led Interventions for Sustainable Use of Natural Resources in Karnataka

Annual Report (2011-2012)

International Crops Research Institute for the Semi-Arid Tropics
Patancheru 502 324, Andhra Pradesh, India

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ICRISAT
Science with a human face
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Executive Summary

To address the issues of stagnant agricultural growth in the state during 2002-2008, Government of Karnataka (GoK) embarked on a mission mode project to approach the yield gaps through science-led interventions for sustainable use of natural resources in Karnataka since 2009. The mission mode project referred as "Bhoochetanna" is technically supported by the ICRISAT and has adopted a consortium approach for implementation across 30 districts by the Department of Agriculture. The goal of Bhoochetana is to make a difference in the lives of farmers in all 30 districts of Karnataka through increasing average productivity of selected crops by 20% in four years. The specific objectives are as follows:

1. To identify and scale-up best-bet options (soil, crop and water management) including improved cultivars to enhance productivity by 20% of the selected crops in selected 24 (later extended to 30) districts;
2. To train DoA staff in stratified soil sampling at villages, analysis of macro- and micronutrients, preparation of GIS-based soil maps; and to guide DoA, to establish high quality soil analytical laboratory at Bengaluru and to undertake stratified soil sampling, their analyses and sharing results in nine districts; and
3. To build capacity of the stake holders (farmers and consortium partners) in the sustainable management of natural resources and enhancing productivity in dryland areas.

The ICRISAT-led consortium comprised of knowledge-generating institutions like State Agricultural Universities of Bengaluru, Raichur and Dharwad with knowledge-transforming departments like Department of Agriculture, Watershed Development Department along with Department of Economic and Statistics. The Bhoochetana has adopted farmer participatory holistic approach in partnership with community based organizations (CBOs) for increasing the crop yields with improved management practices.

During the third year implementation, Bhoochetana mission project has consolidated the benefits observed during the first two years and expanded the coverage with improved management practices to three million ha during the rainy and post-rainy season of 2011-12. The review and planning meeting held at ICRISAT had decided to cover three million ha area during the season and also recommended inclusion of irrigated crops like sugarcane, paddy under Bhoochetana program.

Based on the results of soil analysis undertaken by the Department of Agriculture in 15 districts, ICRISAT-led consortium developed soil-test based recommendations which were adopted during the 2011-12 season. Continued capacity development efforts resulted in strengthening the consortium team as well as building the capacity of new farm facilitators as well as Department of Agriculture officials from the newly added 15 districts. In all, 92,150 participants were trained through 4,268 district, taluk and village level trainings.

The wide-spread deficiency of multiple nutrients like zinc, boron and sulphur across the 15 districts were observed with a exception of marginal deficiencies of sulphur in Bengaluru urban, Belgaon, Mysore and Ramnagara districts. During the 3rd year of Bhoochetana implementation, inspite of unfavorable rainfall situation during the season in number of districts substantially increased crop yields ranging from 24% to 45% in finger millet were observed. As a result, finger millet production in 10 districts on 94,083 ha out of 3.29 lakh ha increased crop yields by 26,900 tons due to improved practices under Bhoochetana. Similarly in case of maize, increased crop yields ranged from 24% in Bengaluru rural to 44% in Koppal district with improved management over the farmer management. In 10 districts, with average maize productivity of four tons per ha under farmer management practices with improved management productivity was increased to 5.5 ton per ha with a corresponding increase of 1.5 ton per ha. Similarly, paddy yields with improved management increased by 21 to 32% over the farmers management yields and in case of pearl millet, improved management recorded 21 to 63% increased crop yields over the farmers' management in various districts. Similar results were observing for sorghum, cowpea, greengram, field beans, pigeonpea, soybean, sunflower and groundnut. With the increased coverage area under improved management practices of Bhoochetana, yields of 14 crops in 29 districts were increased and as a result, 2.2 lakh tons of additional pulses production was observed along with 4.62 lakh tons of cereals and 0.53 lakh ton of oil seed crops. This novel approach of Bhoochetana has provided a proof of concept and demonstrated productivity enhancement/bridging the yield caps through science-based approach in the state.

The Bhoochetana mission project has become an exemplar scale-up program in the country and the success was recognized by the Central Government through Krishi Karman Award for Karnataka for maximum productivity of coarse cereals as well as Agricultural Leadership Award from Agriculture Today.

During the third year, ICRISAT-led consortium piloted a noval ICT-based support systems for the Bhoochetana farmers in partnership with KVK, Dharwad and KVK, Raichur. Through field days and field visits results and learnings by the farmers were shared with other farmers in the districts and in all, 596 field days wre conducted which were attended by 40,500 farmers during the 2011-12 season.

In conclusion, Bhoochetana mission project has consolidated the impact observed during the first two years and scale-up by covering three million ha area during the third year. In spite of unfavorable rainfall situation, it is estimated that Bhoochetana contributed additional 2.2 lakh tons of pulses, 4.62 lakh tons of cereals and 0.53 lakh tons of oil seeds in the state. The economic returns from the increased productivity from the rainfed crops was 646.7 crores equivalent to US$ 129 million. In addition to the increased productivity and incomes for the farmers, the important impact of Bhoochetana is development of new farmer-friendly institutional arrangements to reach millions of small farmer, re-vitalized DoA, and convergence of various schemes and developmental activities in the state. There is an urgent need to capitalize on the gains during this phase and scale-up an initiative into a Bhoochetana mission program through a second phase for sustainable intensification of agriculture as well as building the resilience of the systems against the impacts of the climate change.

Background

Globally rainfed areas are hot-spots of poverty, malnutrition and degradation of natural resources. In India, out of 142 million ha of arable lands, 60% (85.2 million ha) is rainfed. Karnataka has the second largest area under rainfed agriculture after Rajasthan in the country. Crop yields in dry land areas are quite low (1-1.5 t ha^{-1}) which are lower by two to five folds of the yield from researchers managed plots. The findings from the comprehensive assessment of water for food and water for life revealed that the millennium development goal of reducing number of poor people by half can be met only through efficient use of the scarce water resources for agriculture. Food production can be increased substantially in rainfed areas through enhanced water use efficiency measures by adopting watershed management approach. Current rainwater use efficiency in dry land agriculture varies between 35-45% and vast potential of rainfed agriculture could be unlocked by using available scientific technologies including improved cultivars. The vast opportunities existing in dryland areas can be harnessed for improving rural livelihoods.

Goal of the Mission-Mode Project

The goal of Bhoochetana is to make a difference in the lives of farmers in all 30 districts of Karnataka (Figure 1) through increasing average productivity of selected crops by 20% in four years.

Figure 1. All 30 Districts included for productivity enhancement under Bhoochetana programme

Objectives

The overall goal of this mission project is to increase average productivity of selected crops in the 30 districts by 20% in four years. The specific objectives are as follows:

4. To identify and scale-up best-bet options (soil, crop and water management) including improved cultivars to enhance productivity by 20% of the selected crops in selected 24 (later extended to 30) districts;
5. To train DoA staff in stratified soil sampling at villages, analysis of macro- and micronutrients, preparation of GIS-based soil maps; and to guide DoA, to establish high quality soil analytical laboratory at Bengaluru and to undertake stratified soil sampling, their analyses and sharing results in nine districts; and
6. To build capacity of the stake holders (farmers and consortium partners) in the sustainable management of natural resources and enhancing productivity in dryland areas.

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.
- Three Universities of Agricultural Sciences (Bengaluru, Raichur, Dharwad) in the state of Karnataka with their Vice-Chancellors as SCC members supporting technical help from university scientists.
- 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 stake holders along with participating farmers.

The mission project Bhoochetana's annual Review and Planning meetings were conducted to build the team. Following this Review and planning meeting annually state level, district level and taluk level meetings were conducted to build the team at all levels, internalize the project strategy, plan the activities for the next season and share the experiences amongst the team members.

Project Planning and Monitoring Mechanism

The nodal officers took the responsibility to bring together all consortium partners for their inputs, constituted coordination committees at different levels and related activities for successful implementation of the Mission project. The project has been implemented in a Mission mode and coordination at different levels starting with cluster of villages in each Taluk, linking-up with Taluk level coordination committees (TCCs) and TCCs linking-up with district level coordination committees (DCCs) and state level co-ordination committee (SCC). Roles and responsibilities of each consortium partner have been defined clearly as given in the project document for implementation. The details of planning and monitoring the implementation process at different levels for Bhoochetana are presented in Figure 2 below. The proposed plans of action, responsibilities of different partners were clearly outlined in the project document as a guide book to follow timelines.

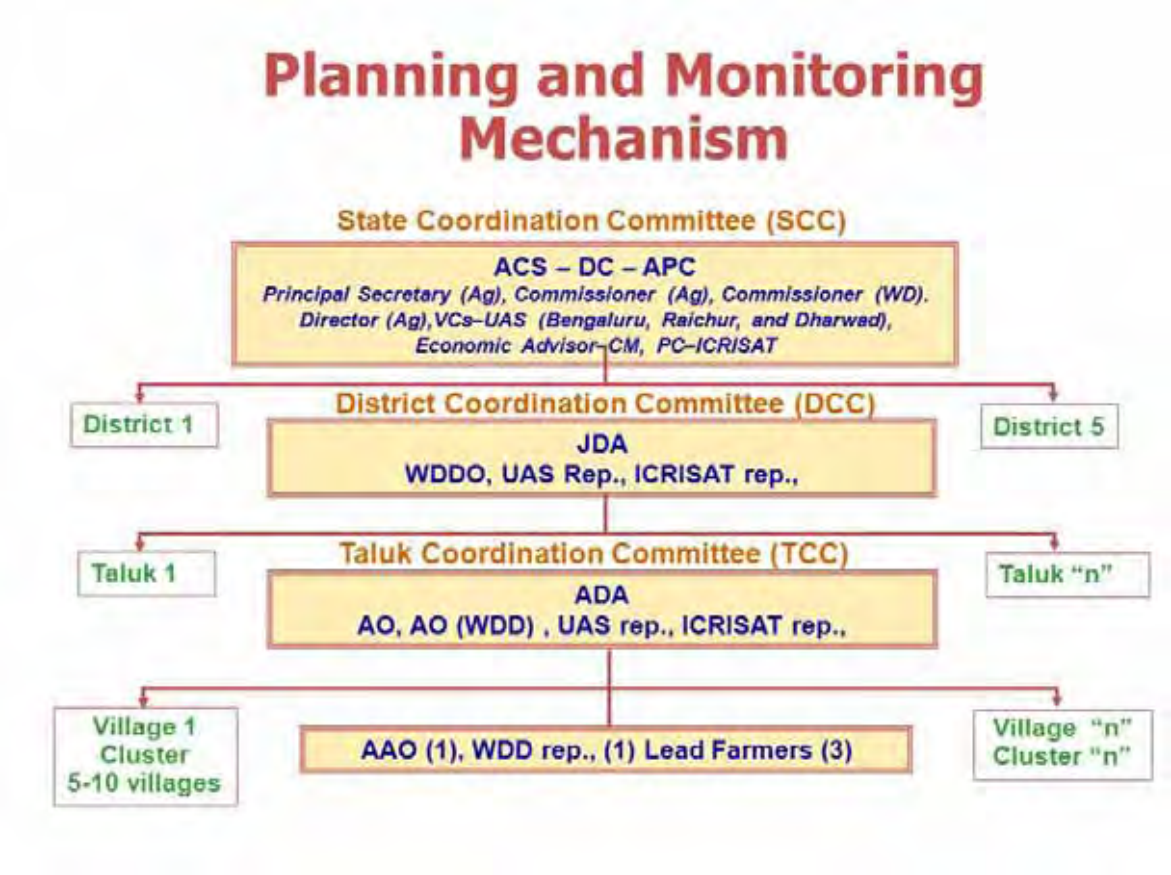

Figure 2. Planning and monitoring mechanism for implementing Bhoochetana mission mode project by DoA, Karnataka, facilitated by ICRISAT.

The project was initially approved for 20 districts covering 4 million ha; later the cabinet committee expanded the reach additionally to four more districts making it for 24 districts, and later on extended to remaining six districts. Overall Bhoochetana encompasses all 30 district of Karnataka by the third year of project implementation. During the fourth year irrigated crops viz; paddy and sugarcane are also included.

Project Strategy

Farmers' Participatory approach for enhancing crop productivity

- The most important strategy for this initiative is to adopt the Mission mode through convergence of different schemes of the Department of Agriculture, line departments of Government of Karnataka along with academic institutions like University of Agricultural Sciences, Bengaluru, Dharwad and Raichur with the international institution working in the area of dryland agriculture worldwide.
- Government of Karnataka has constituted State level Coordination Committee (SCC) for Bhoochetana programme headed by the Additional Chief Secretary & Development Commissioner to review the performance of the programme at regular intervals.

The salient points for the Mission mode are as follows:

- The Mission will adopt the principle of 4 Cs i.e., Consortium, Convergence, Capacity-building and Collective action. The consortium will be of development agencies such as line departments of state government and Field Facilitators' (FFS) along with academic and research institutions who are generators of the new technologies for improving the livelihoods of the rural poor in dryland area.
- 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 and inclusive development in the country.
- The approach of the Mission will be to ensure all backward linkages to meet the 4 Es through 4 Cs by 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 other best practices necessary financial incentive to undertake best-bet options for increasing agricultural productivity.
- To undertake improved best-bet management practices on large scale and share knowledge through their peer group. The lead farmers in the districts where already

work has been done in the last four years under Sujala-ICRISAT initiative with the trained NGOs is an added strength for undertaking such a Mission in a short time.

- The scientific approach of mapping soil nutrient deficiencies in the remaining 15 districts enabled scaling up the soil analysis based integrated nutrient management practices for sustainable growth in dryland areas of Karnataka. The DoA is being empowered to adopt soil-test based approach for developing site specific fertilizer recommendations. This approach not only increases the productivity of the land but also reduced 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 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 is guiding for establishment of village seed banks for the self-pollinated crops such as groundnut and chickpea as well as cross pollinated crops such as sorghum, pigeonpea etc., by training the farmers and establishing seed villages and village seed banks to ensure timely supply of seeds at reasonable prices for the farmers.
- Time lines are defined clearly for covering productivity enhancements in 30 districts, soil sampling and nutrient analysis mapping and capacity building of stakeholders during the project period as shown in Table 1 (timelines).

Table 1. Timeline for execution of activities in Bhoochetana districts.

Activity	Year	% activity coverage in districts		
		1-6	7-15	16-30
Productivity enhancement	2009	25		
	2010	50	33	
	2011	75	66	50
	2012	100	100	100
Nutrient status mapping	2009	100		
	2010		100	
	2011			100
	2012			
Capacity-building	2009	100		
	2010		100	
	2011			100

Through various activities such as village seed banks and vermicomposting, women were the important stakeholders in the development and are involved in this Mission to ensure sustainability.

- In addition to the strength of convergence through consortium, the Mission has planning and monitoring mechanism at cluster, taluk, district and state levels. The SC includes the decision makers from the different consortium partners including line departments to take timely necessary action through suitable government orders to all the concerned Mission staff.
- The Mission has simple principle of accountability and delegation of authority at different levels without diluting the individual accountability to meet the Mission goal collectively.

The Mission adopts in addition to the above, the rewarding mechanisms for the best performers i.e., the farmers at cluster, taluq, district and state level with appropriate personal recognitions. Similarly, the Mission staff those exhibit outstanding performance are also recognized by the state government.

Appropriate Rainfed Agricultural Technologies

Farmers evaluated some of the improved watershed technologies during 2005-2008 crop seasons in ICRISAT facilitated science-led Sujala-ICRISAT project covered an area of 3500 hectares in 46 micro-watersheds of six districts of Karnataka. Some of the technological options were found to be appropriate in enhancing productivity and income to farmers and rural poor. Technologies listed below are popularized and recommended during the crop season 2009 in Bhoochetana project districts.

In-situ Soil and Water Conservation Techniques

1. **Conservation furrow system**

   Contour furrows are simple and efficient method to conserve moisture. These are laid with the help of a country ploughs on a gradient of 0.2 to 0.4% at the time of sowing

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.

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. BBF system is laid out on a slope range of 0.4 – 0.8% with an optimum of 0.6% slope. BBF system (Figure 3) facilitates draining of excess rainwater as runoff and furrows act as traffic zone for plough bullocks. On Alfisols, raised beds suit well for groundnut cultivation as beds facilitate good aeration, store more moisture for the roots resulting in good crop growth. Deep tillage, shallow cultivation and organic residues application are some of the promising *in-situ* moisture conservation practices.

4. Tropicultor

ICRISAT designed multipurpose wheeled tool carrier is known as tropicultor, were supplied to farmers during Sujala-ICRISAT watersheds. These were familiar among farmers in Chitradurga, Kolar and all other districts. Tropicultor usage saves not only work hours in land preparation but also proper inversion of soil as desired (Figure 3a). Its use during sowing is effective due to metered mechanism for uniform application of fertilizer as well as sowing of seed at uniform depth and also equidistant seeding.

Figure 3a. Applying fertilizer and seed at a time with animal drawn Tropicultor

Figure 3b. Applying fertilizer and seed at a time withTractor mounted Tropicultor in Kottur watershed, Dharwad

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 sowings of large holding in short period, as it has hitching arrangement to hook it to a tractor for speedier operations (Figure 3b).

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, betters crop and environmental quality. Hence we used soil analyses results, seasonal rainfall, as basis to recommend fertilizer doses. Availability of organic manures, crop residues, biofertilizers, was also considered to provide taluk-wise recommendations for different crops in all districts.

2. Biofertilizers

Biofertilizers are very important, low-cost, eco-friendly organic agro-input, supplementary to the 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 harmless and eco-friendly low cost agro-input, supplementary to chemical fertilizers. Improve soil structure (porosity) and water-holding capacity. Increase soil fertility, fertilizer use efficiency (FUE) and ultimately helps increasing yield by 15-20%.

Due to 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 the 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 increases 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, PSB and *Trichoderma viride* were applied to soil in Bhoochetana project as seed treatment with *Rhizobium* and fungicides were suggested 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. Procedure to treat seed is to mix *Tricoderma viride* (Figure 4) with cooled rice gruel or Jaggery solution and thoroughly mix

this solution with seeds required for an acre to have an uniform coating over the seeds. Dry these seeds for 30 minutes in shade and sow the treated seeds within 24 hours.

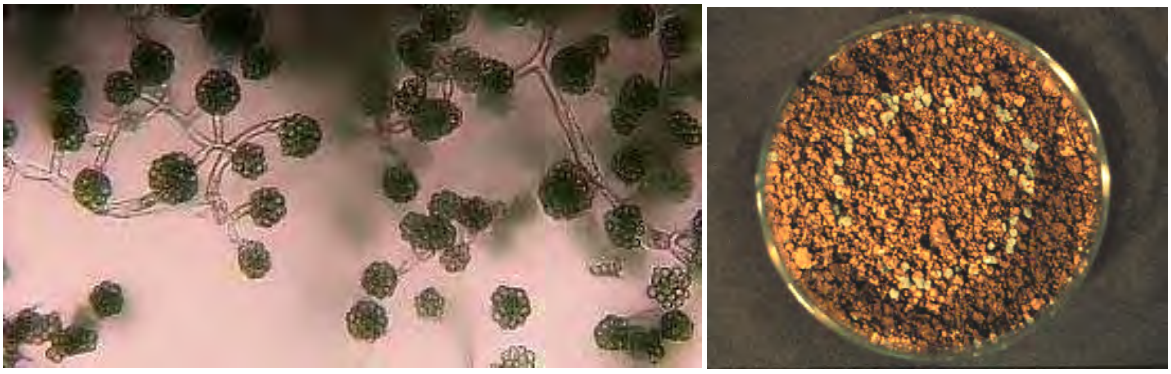

Figure 4. Trichoderma viride conidial spores in soil (left), commercial dried culture of conidial spores (right)

Integrated Pest Management

Farmers across all districts were trained on adopting cultural (Figure 5.) and biological methods of pest control, insect monitoring using pheromones traps, chemical control of insects on crossing threshold levels and growing tolerant cultivars.

Figure 5. Shaking pigeonpea plants to drop Helicoverpa larvae from the plants

Figure 6. Soaked chickpea seed infected with NP virus as feed to Heliothis larvae.

Training modules on controlling the damage caused by major insect pests like *Helicoverpa sps* on pigeonpea and an epidemic causing red hairy caterpillar on groundnut; several approaches including spraying of Nuclear Polyhedrosis Virus (NPV) early stage larvae and its preparation in house (Figure 6,7,8) were also included for the benefit of farmers' groups. Cost-effective eco-friendly biological control methods like shaking pigeonpea plants at flowering and pod formation was suggested, if *Heliothis* sps. infestation is severe in these

stages. Field advisories were organized during crop season with the assistance of UAS, Bengaluru and Dharwad staff coordinating with DoA officials in the districts.

Income-generating Rural Livelihoods

1. **Custom hiring centers for agricultural machinery**

   Tropicultors as either animal drawn or tractor drawn and animal drawn Penugonda ferti-cum seed drill (Figure 9) were placed in the control of each ADA to provide it for **the** needy farmers on hiring. This approach helped farmers who can not afford to buy them in the season, but use them based on their operational efficiency and to reduce dependence on labor for timely operations like sowing cum fertilizer application.

Figure 7. Dead Helicoverpa larvae by consuming NP Virus infected seed.

Figure 8. Larval crush centrifused to isolate virus, which is sedimented at the bottonm.

Figure 9. Tropicultor and Penugonda kurgi available for farmers in custom-hiring centers.

4. *Glyricidia* **planting on field bunds**

   - Farmers were encouraged to plant 3-4 months aged plants from nursery or cutting of tender branches of *Glyricidia* at 50 cm apart on field bunds.

- *Glyricidia* plant produce green leaf and succulent green branches abundantly (Figure 10) which are rich in Nitrogen.
- Green leaf and loppings can be harvested leaving 1 m height plants of one year old and apply to topsoil for enriching organic carbon and nutrients in the soil.
- *Glyricidia* on bunds can be harvested thrice in a year and applied before sowing of rainy season crop, *rabi* season crop and summer season crop.

Figure 10. Glyricidia planting on field bunds as green manure and reduce soil erosion

5. Vermicomposting

With an objective of converting farm residues and organic wastes in villages with the help of earthworms into valuable manure known as vermicompost was introduced to farmers and rural women as a technology through 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 earth worms (*Eisenia sp.*, *Eudrilus sp.*), use of weeds and crop residues and sericulture residues, animal and poultry manures and rock phosphate as materials.

During trainings, farmers and field facilitators were briefed about the benefits of vermicomposting as enriching soil organic carbon and thereby productivity, good storage quality of produce without toxic residues, fetches higher price for organic produce in the markets. Scientific methods of vermicompost preparation were provided to rural women SHG members (Figure 11), field facilitators during training programs in Bhoochetana project as a rural livelihood option.

Figure 11. Adoption of Vermicompost preparation methods by rural women in Bhoochetana project.

Farmers' Preferred Varieties

High-yielding short-duration varieties of major rainfed crops were evaluated by large number of farmers in six districts through Sujala-ICRISAT project during crop seasons from 2005 to 2008. Farmers preferred some of these crop varieties suitable based on economic yield, acceptable quality of grain or pod and fodder in their region.

1. **Ragi (finger millet)**

   Ragi is a staple food crop and is widely grown in Kolar, Chickballapur, Tumkur and Chitradurga districts. Based on some preferred traits, improved varieties of ragi released for Karnataka GPU 28, HR 911, L 5 and MR 1 were evaluated by farmers during 2005-2008 crop seasons under Sujala-ICRISAT initiative. In these evaluations farmers preferred L 5 and MR 1 varieties based on yields and hence recommended to farmers in Bhoochetana project.

2. **Groundnut**

   Short-duration cultivars of groundnut ICGV 91114, Kadiri 1375, Kadiri 6 and GPBD 4 were evaluated by large number of farmers in their fields for three seasons in these six districts under Sujala-ICRISAT initiative during 2005-2008 crops seasons. Farmers expressed interest to adopt ICGV 91114 in Kolar, Chickballapur, Tumkur and Chitradurga while farmers in Haveri and Dharwad expressed interest to adopt GPBD 4 for their cropping.

3. **Soybean**

   Soybean cultivars JS 335 and JS 9305 were evaluated by large number of farmers in Dharwad and Haveri during 2005-2008 crop seasons under Sujala-ICRISAT initiative. JS 9305 showed good growth and was found to give higher yields despite drought. The variety has been introduced in Haveri and Dharwad as preferred by farmers in these districts.

4. **Maize** *and* **Sunflower**

   Commercially released high-yielding private hybrids and varieties accepted by farmers.

Project Activities

Review and Planning Meeting 2010-11

A review and planning meeting was held during 27-29 November 2010 at ICRISAT to review the achievements during 2010 and plan for activities during rainy season 2011 for Bhoochetana project in the presence of Honorable Minster for Agriculture, Karnataka, Mr. Umesh Katti and Dr William D. Dar, the Director General of ICRISAT. The participants for the meeting were state level coordination committee members (Economic Advisor to Hon. Chief Minister of Karnataka, Commissioner of Agriculture, and Director of Agriculture), the District Level officials of Department of Agriculture (JDA and DDAs) and some taluk officials (Bhoochetana Cell, and ADAs). An important decision of extending the benefits of Bhoochetana project activities during 2011 season to irrigated crops like sugarcane and paddy in the remaining 5 districts of Karnataka (Uttara Kannada, Kodugu, Dakshina Kannada, Shimoga, Chikmangaluru, Udipi) was approved. It was decided that diagnostic soil sampling would be taken up by the staffs of DoA with farmers' participation. Soil samples analysis for nutrient status of farmers' fields would be taken by the department-owned soil testing laboratories locally in the remaining 15 districts of Karnataka. It was also deliberated to scale up Bhoochetana activities in 30 lakh hectares considering the timelines initial decided for scaling up activities. It was felt that regular state level coordination meetings proved benefitial for the project functioning and need to continue all these efforts to make the program a torch bearer for the Government of India.

During the Review meeting the GoK Team led by Hon. Agricultural Minister Shri Umesh V Katti met Dr. W.D.Dar and appreciated the help for Bhoochetana. The team requested the

D.G., ICRISAT to scale-up and widen the scope of Bhoochetana by bringing other CG centers work in Karnataka. ICRISAT D.G. accepted the request and do his best to bring the CG partners to help the farmers in Karnataka (Figure 12).

Figure 12. Hon. Minister of Agriculture, Mr Umesh Katti, meeting with DG, ICRISAT

Bhoochetana aims at improving the lives of 3.6 million smallholder farm families in four years covering 71 million hectares in 25 rainfed districts of Karnataka (in southern India). Sixty-three participants from GoK, led by the Hon. Minister of Agriculture Mr Umesh Katti, and including Dr KV Raju, Economic Advisor to the Chief Minister of Karnataka; Dr Baburao Mudbi, Commissioner, Department of Agriculture; Dr KV Sarvesh, Director of Agriculture, GoK participated in the meeting.

In his address, Director General William Dar congratulated the GoK for taking a big step forward through a science-led holistic approach for improving the productivity and livelihoods of smallholder farmers in rainfed areas of Karnataka. He also stressed the need to bring in the change of institutional governance, increased investments in rainfed areas, and the need to address the issues of forward and backward linkages with the help of public

private partnerships. Dr Dar appreciated the political will of the government as well as the support from the Department of Agriculture, which has shown remarkable results during the last two years.

He also spoke about ICRISAT's new strategy of inclusive market-oriented development (IMOD), which has evolved through our efforts of increasing productivity and improving livelihoods. This is attainable only with the help of the market as smallholder farmers can get the benefit of increased productivity only if they are linked with the markets, he added.
Dr Raju highlighted the importance of human interventions, a critical factor for the success of Bhoochetana, and called for change in the mindset and innovations to reach millions of small farm facilitators.

Giving an overview of the program, SP Wani highlighted novelties of the Bhoochetana program, such as the adoption of a science-led holistic approach through convergence, consortium and capacity building for increasing productivity in rainfed areas. He said that current farmers' yields in Karnataka, as evident from the yield gap analysis by ICRISAT, are lower by two to three folds than the achievable yields. Results during the first two years on vast areas in 15 districts have demonstrated the possibilities of doubling the agricultural productivity using increased water use efficiency with improved cultivars, soil and water management practices and soil test-based nutrient recommendations.

Dr Wani also identified the learnings from the last two years and suggested the way forward, mainly in the area of institutional governance, and ways to overcome the bottlenecks to ensure timely supply of inputs and capacity building for millions of smallholder farmers. He suggested alternative service providers through public private partnerships to bridge the gap in capacity building and the input supply chain. In a separate meeting between the Minister of Agriculture Mr Umesh Katti and Director General William Dar, the Government of Karnataka requested ICRISAT's help for convergence of activities of the watershed department, animal husbandry and horticulture departments with agriculture for improving the livelihoods of farmers (Figure 13).

Figure 13. Review and planning meeting of Bhoochetana Project at ICRISAT, Patancheru during 27-29 November 2010.

Capacity-Building of Stakeholders on Sustainable Natural Resource Management Team Building workshop in Bengaluru

A team building workshop was organized for the team members of Bhoochetana project on 5th March 2011 at Bengaluru (Figure 14) with an objective of establishing good coordination among team members from the newly scaled up districts and discuss the technologies implementation strategies in the team spirit. The participants in team building workshop include JDAs, ADAs, Nodal officers of different districts from DoA, scientists from Universities of Agricultural sciences in Bengaluru, Dharwad and Raichur, scientists and scientific officers from ICRISAT.

District level trainings were organized in the months of April and May in all the districts following the team building workshop at Bengaluru and completed before the season started in all the thirty districts with the participation of JDAs, ADAs, scientists from Universities and KVKs, scientists and scientific officers from ICRISAT (Figure 15b). District level trainings were attended by Agricultural officers, Assistant Agricultural Officers, Agricultural Assistants, Field Facilitators and Lead farmers. The topics included in training were participatory soil sampling, soil nutrient status in their respective taluks of each

district, nutrients recommendations based on soil nutrient deficiencies for major crops, suitable high-yielding varieties and integrated disease and pest management for different crops, livelihood options for rural landless poor and on best-bet management options for enhancing the productivity of agricultural crops. Seventy seven trainings were organized at district level in all 30 districts and more than 4700 field staffs were trained through these trainings (**Table 2**). In twelve districts, more than two trainings were arranged to encompass all the staff with required training.

Figure 14. Dr K.V. Raju, Economic advisor to government of Karnataka addressing Bhoochetana team at team building workshop in Bengaluru

Figure 15a. Dr. Wani addressing Bhoochetana team members in state level training program in Bengaluru.

Figure 15b. Mr. Sudi providing district level training to Bhoochetana team members.

Training of Trainers (ToTs) were conducted in Bengaluru, Dharwad and Raichur by the respective Universities of Agriculture scientists leading the training programs with participation of scientists and scientific officers participating in training programme to provided information on Bhoochetana technologies and operational strategies for the programme implementation.

Figure 16a. District level training workshop in Chitradurga

Figure 16b. Training of trainers (ToTS) at Dharwad

Taluk level trainings were arranged for Agricultural Assistants, newly appointed field facilitators and lead farmers in each taluk during May and June in all the districts (Figure 16). These trainings were arranged with an objective of hands-on training and demonstration of technologies like seed treatment, soil sampling, use of Tropicultor, crop harvest sampling and village level recording keeping with field facilitators. In all the 30 districts, there were 318 taluk level trainings were conducted and trained a total of 23446 men and women on Bhoochetana technologies (**Table 2**). In as many as 11 districts, more than 10 taluk level trainings were organized for each district (Figure 17).

Figure 17a. Taluk-level field facilitators training at Sidlagatta in Chikballapur district.

Figure 17b. Taluk-level field facilitators training in Bijapur

Cluster/Village level training were organized by AOs of DoA and Research technicians of ICRISAT some times assisted by resource persons either scientists or scientific officers from ICRISAT (Figure 18a). These were even informal gathering of a group of farmers in a village to discuss the issues of input distribution or specific soil/crop related issues in their villages (Figure 18b).

Figure 18a. Farmers group discussion with ICRISAT staff on input supplies in a village of Belgaum district

Figure 18b.Village level farmers training in Yadgir district.

These cluster/villagemeetings were conducted in large numbers (3873) covering more than 63000 farm men and women (Table 2) before the start of the season and during crop season in 30 districts which were generally very effective in communicating technologies.

Table 2. Trainings conducted in all districts under Bhoochetana program during 2011-12

District	Taluks	District-level		Taluk/village-level			
		No. of Trainings		No. of trainings			
		District level	Participants	Taluk level	Participants	Village level	Participants
Bagalkote	Badami, Bagalkot, Bilagi, Hungund, Jamakhandi, Mudhol	2	316	10	1368	115	5810
Bellary	Bellary, Kudligi, Sandur, Hospet, Siryguppa, H.B.halli, Hadagali	1	67	11	210	260	10400
Bengaluru Rural	Devanahalli, Nelamangala Doddaballapura, Hoskore,.	2	77	26	1285	77	2360
Bengaluru Urban	Anekal, Bengaluru (S), Bengaluru(N), Bengaluru(E)	1	50	4	180	25	625
Belgaum	Athani, Bailhongal, Raibag, Chikodi, Belgaum, Gokak, Hukkeri, Ramdurg, Khanapur, Soundatti	1	-	10	-	162	-
Bidar	Bidar, Bhalki, Aurad, Humnabad, Basavakalyan.	1	120	10	647	335	18,550
Bijapur	B. Bagewadi, Bijapur, Indi, Muddebihal, Sindagi	1	395	2	302	122	6800
Chamarajanagara	Chamarajanagara, Kollegal, Gundalpet, Yelandur	2	224	8	336	92	1092

Chikkaballapur	Chickballapur, Bagepalli, Shidlagatta, Chintamani, Gouribidanur, Gudibandae	2	580	8	1350	218	3280
Chikkamangaluru	Chikkamangaluru, Kadur, Tarekere	1	160	8	480	128	1180
Chitradurga	Challakere, Chitradurga, Hiriyuru, Holalkere, Hosadurga, Molakalmuru	2	186	9	843	30	1121
Davangere	Davanagere, Harapanahalli Harihar, Honnali, Jagaluru Channagiri	01	467	27	7371	195	60303
Dharwad	Dharwad, Hubli, Kalghatgi, Kundgol, Navalgund	2	0	38	0	240	
Dakshina Kannada	Mangalore, Bantwal, Belthangady, Puttur, Sulia	01	70	08	400	12	360
Gadag	Gadag, Ron, Mundargi, Shirahatti, Naragunda	5	250	11	750	22	880
Gulburga	Aland, chincholi, Gulburga, Sedam,	1	13	7	294	32	1444
Hassan	Alur, Arklgud, Arsikere, Belur, Chanrayapatna, Hassan, Holenarsipura	1	0	7	0	236	0
Haveri	Haveri, Hangal, Savanur, Hirekerur, Ranebennur, Byadagi, Shiggaon.	1	155	07	679	285	22230
Kolar	Kolar, Mulbagal, Malur, Srinivaspura, Bangarpet,	1	16	5	110	250	1850
Kodugu	Somwarpet, Madikeri, Virajpet	0	0	0	0	0	0
Koppal	Gangaavathi, Koppala. Kustagi, Yalburga	1	65	6	325	28	2128
Mandya	Mandya, Malavalli, Maddur, Pandavapura, Srirangapatna, K R Pet, Nagamangala	1	78	1	68	47	2820
Mysore	H D Kote, Piriyapattana Hunasuru, Mysore, K R Nagara, T Narasipura, Nanjanagudu	34	215	7	16	13	215
Raichur	Manvi, Lingasugur, Raichur, Sindhanur, Devadurga	2	220	5	240	10	300
Ramnagara	Ramanagera, Magidi, Chanapatatna, Kankapura	2	262	22	820	85	2550
Shimago	Bhadravathi, Hosanagar, Sagara, Shikarpur, Shimago, Soroba	0	0	0	0	202	7070
Tumkur	Tumkur, Tiptur, Turuvekere, Cnhalli, Gubbi, Kunigal, Sira, Koratagere, Madugiri, pavgada	3	1000	20	7000	410	9000
Udipi	Udupi, Kundapura, Karkala	1	120	3	135	50	2750
Uttara Kannada	Karwar, Ankola, Bhaktal, Kumta, Honnavar, Sirsi	1	50	35	1100	96	2000
Yadgiri	Shahapur, Shorapur, and Yadgiri	3	145	3	180	96	8315
Total		**77**	**4791**	**318**	**23446**	**3873**	**63912**

Review and Planning Meeting 2011-12

A Review and Planning Meeting of the Bhoochetana project was held at ICRISAT-Patancheru on 6-8 January to review the progress of its 3rd year and to plan activities for the 4th year (Figure 19). Conceived by ICRISAT for the Government of Karnataka, the project aims to bridge the gap between crop yields obtained in farmers' fields and achievable yields, by adopting a science-led consortium approach.

Among those who attended the meeting were staff of the Department of Agriculture (DoA) from 30 districts of Karnataka; senior policy officials from DoA, Bengaluru; representatives from State Agricultural University (SAU); Managing Director and Deputy Director of Karnataka State Seeds Corporation (KSSC); Vice Chancellor of the University of Agricultural Sciences (UAS), Raichur; Dr VS Prakash, Director, Karnataka State Natural Disaster Monitoring Centre (KSNDMC); and Dr SA Patil, Chairman, Karnataka Krishi Mission.

The meeting began with Dr Suhas Wani welcoming the 245 participants, followed by Dr Baburao Mudbi, Commissioner of Agriculture, DoA, stating the objectives and the learnings from the project during the last three years. Presenting the way forward based on past experiences, Dr Sarvesh, Director of Agriculture, said the project would cover an additional 5 million ha in 30 districts during the 2012 rainy season.

Delivering the inaugural address on behalf of Director General William Dar, Dr Peter Craufurd, Program Director, Dryland Resilient Systems, appreciated the project's participatory research approach in achieving impacts. Lauding the Government of Karnataka for scaling-up the technology, he said it had become a model state in India. Presenting the project's progress and status, Dr Wani spoke of the huge challenge of covering 5 million ha in the 2012 rainy season. The subsequent technical session saw detailed discussions on the strategy to meet this target, such as district- and taluk-wise inputs (seeds, fertilizers including micronutrients, biofertlizer, etc.) and financial and human resources required.

The group also developed recommendations in handling the 10,000 farm facilitators as well as in training them to reach 3.6 million small farm holders in the state. This was followed by a team-building exercise. Devising a strategy to multiply seeds of improved cultivars to meet project needs, officials and staff from DoA, KSSC and ICRISAT agreed that all the seed

villages will have Bhoochetana inputs and that new seed villages managed by KSSC would be situated in Bhoochetana blocks.

The workshop came up with recommendations such as: inclusion of irrigated area in addition to the rainfed area to cover 5 million ha; enhancing micronutrient use (currently around 20% of the recommended rates); training of farmers and farm facilitators, and strengthening crop-based farmer field schools; undertaking soil sampling in selected areas to study residual benefits of micronutrient application during the last two or three years; and covering 7.4 million ha during the second phase with technical support from ICRISAT. Feedback from participants and DoA revealed their satisfaction with the progress made, new means of communication being adopted, and institutional mechanisms being strengthened for effective extension of the technologies in the state.

The occasion also saw the release by Dr SA Patil of a manual on pest management and good practices in Belgaum district prepared by DoA, and the release of the Soil Fertility Atlas of Karnataka by Dr BV Patil, who described it as a historical step for the state of Karnataka

Figure 19. Dr Suhas P Wani addressing Bhoochetana team in Review and Plang Meeting 2011-12at ICRISAT, Patancheru

Facilitation of Project Activities in the Mission Mode

- To provide good beginning for the third year activities by including the senior staff working in the new added 15 districts to the project, team building exercise at Bengaluru was organized by ICRISAT and DoA to facilitate all stake holders from 30 districts to come together for 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 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 timely 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 any assistance required for farmers' problems.
- ICRISAT developed format for weekly progress reporting and ICRISAT staff facilitated regular feedback weekly from districts to ICRISAT and SCC through comprehensive checklist format.
- Intense monitoring of field trials by DoA and ICRISAT SCC members through direct contact of ICRISAT staff, farmers and field facilitators, DoA officials in districts using pocket telephone directory published by DoA in Bengaluru.
- Besides participation of project coordinator from ICRISAT and visiting scientist in regular SCC review meetings, their field visits in Kolar district as well as meeting with UAS scientists in Bengaluru and Dharwad had helped to invigorate ICRISAT staff morale and commitment for project activities.

Awareness and Field Publicity Campaigns on Bhoochetana for Farmers

The DoA staff ensured wall writings (Figure 20) and exhibition of posters in all villages within short period before the on-set of monsoon, indicating the main objective of the program and areas to be covered by the program. Additionally thousands of brochures and handouts were published and distributed in each district on improved management practices, information on nutrients status, nutrients recommended taluk-wise and widely distributed in all selected districts.

Print Media news coverage was extensive to introduce Bhoochetana program to farmers and also on activities during the season in all districts, besides field facilitators and lead farmers contacts with individual farmers in selected village.

Figure 20a. Wall writings in Kannada, on Bhoochetana goal and extent of its spread in the district.

Figure 20b. Wall writing in Kannada on technologies appropriate to implement in farmers' fields for enhancing productivity

Soil Nutrient Diagnostic Studies and Nutrient Input Recommendations

Stratified Soil Sampling in the 30 Districts

In each district, 20% of the villages were selected randomly for sampling and in each village 20 representatives fields were sampled based on stratified sampling technique considering topo-sequence of the fields in a watershed village. All these samples were processed by grinding, sieving and analyzed these samples in the ICRISAT's laboratory for their nutritional status. During 2008, soil samples from around 11609 farmers' fields in several taluk of each district were collected from six districts (Table 3). These samples were analyzed for diagnosing macro and micronutrients status. Based on the established critical limits for each nutrient, fields were categorized as deficient or sufficient**.**

During the year 2009-10, with the active participation of farmers and DoA staff coordination, ICRISAT staff collected 35460 samples in 1773 villages of nine district from June to December as given in Table 3. Samples from fifteen districts totaled around 45070 were analyzed at Central Analytical Services Laboratory in ICRISAT, Patancheru.

Soil Health Cards were provided to individual farmers in local language (Kannada) with details of individual nutrient status and critical limits along with comment on nutrients status of the field. Second side of the card contains recommended dose of nutrients for each

crop as well as quantity of nutrients available in commercial fertilizers for the understanding of farmers.

Table 3. Detailed Nutrient status of soil samples collected and analyzed by ICRISAT from 45070 farmers' fields in 15 districts of Karnataka during 2008 and 2009 crop seasons.

S. No	District	Year of Sampling	No. of fields	% of fields deficient in a nutrient					
				OC %	Avail P ppm	Avail K ppm	Avail S ppm	Avail Zn ppm	Avail B ppm
1.	Chikaballapur	2008	2257	78	37	34	80	52	80
2.	Chitradurga	2008	1489	76	54	15	86	80	64
3.	Dharwad	2008	1129	31	53	1	79	44	39
4.	Haveri	2008	1532	55	42	5	85	60	46
5.	Kolar	2008	2161	81	31	34	85	32	87
6.	Tumkur	2008	3041	77	65	34	92	50	91
			11609						
7.	Bengaluru (R)	2009	4448	73	21	23	90	29	79
8.	Bidar	2009	2375	40	48	1	83	62	66
9.	Bijapur	2009	2791	70	81	3	77	89	43
10.	Chamara janagar	2009	1640	76	37	4	87	67	62
11.	Davanagere	2009	2968	59	30	12	76	74	64
12.	Gulbarga	2009	3640	60	64	1	83	86	71
13.	Hassan	2009	10274	48	23	18	82	50	91
14.	Raichur	2009	3343	71	48	4	64	79	39
15.	Yadgir	2009	1982	74	48	5	72	90	58
			33461						

During 2010-11, staff of DoA with participation of farmers in the villages collected soil samples from farmers' fields in 15 districts which were introduced for scaling up of Bhoochetana activities based on the decision taken at the review and planning meeting. A total of 47794 samples were collected from the farmers' fields and these samples were analyzed in various soil testing laboratories of Department of Agriculture, Government of Karnataka. These results were distributed to individual farmers in each taluk through staff of DoA and field facilitators appointed for Bhoochetana programme in villages.

At the beginning of the third year, Bhoochetana project achieved the activity target for nutrient status mapping for the entire Karnataka including five districts added to the project from the initial target of 25 districts.

Table 4. Detailed Nutrient status of soil samples collected and analyzed by DoA, Karnataka from 47794 farmers' fields in 15 districts of Karnataka during 2010-11 crop season.

S No.	District	Year of sampling	No. of fields	% of fields deficient in a nutrient					
				OC	Av P	Av K	Av S	Av Zn	Av B
1.	Bagalkot	2010-11	2440	36	97	28	59	55	69
2.	Bengaluru (U)	2010-11	2680	58	10	14	6	37	60
3.	Belgaum	2010-11	4560	29	95	52	2	68	74
4.	Bellary	2010-11	2100	32	90	33	67	19	36
5.	Chikmagalur	2010-11	4140	48	15	44	34	77	43
6.	Dkn. Kannada	2010-11	1418	2	29	71	21	65	44
7.	Gadag	2010-11	1270	75	65	2	85	92	34
8.	Kodugu	2010-11	1160	0	59	68	74	24	28
9.	Koppal	2010-11	2499	65	7	2	22	59	87
10.	Mandya	2010-11	5479	43	14	6	27	71	65
11.	Mysore	2010-11	4860	69	25	3	13	26	60
12.	Ramanagara	2010-11	3068	70	5	15	13	48	88
13.	Shimoga	2010-11	6140	23	41	46	34	36	36
14.	Udupi	2010-11	1000	4	85	34	54	51	69
15.	Utr.Kannada	2010-11	4980	46	41	45	28	53	48
Total (15 districts) / mean			47794						
Grand total (30 districts)			92864	52	41	23	52	55	62

Soil Nutrient Status Mapping and Fertility Status Manual

Using GIS based extrapolation techniques, district-wise nutrient status maps of soil pH , EC, Organic Carbon, Phosphorus, Potassium, Sulfur, Zinc and Boron for all 30 districts of Karnataka state were prepared as geo-referencing data for all sampled fields were available.

We presented complete map of Karnataka state showing OC, P, K, S, Zn, and boron nutrient status of soil in 30 districts (Figures 23 to 30) which were done at the beginning of crop season 2011-12, and provided to DoA, Karnataka. Karnataka state achieved the distinction of mapping the soil nutrient status including micronutrients for the entire state, and became the first state in the country. Fertility status Atlas for Karnataka state was prepared (Figures 21 and 22) and distributed to DoA offices in the state, Government of Karnataka, all the university libraries in the country and also placed on the internet which can be accessed at the following link

http://www.intranet.icrisat.org/gtaes/Projects/Bhoo%20Chetana/pdfs/596_2011.pdf

Figure 21. Release of Soil Atlas book by Hon. Chief Minister of Karnataka at Bengaluru

Figure 22. Release of Soil Atlas book in Review and Planing Meeting at ICRISAT, Patancheru

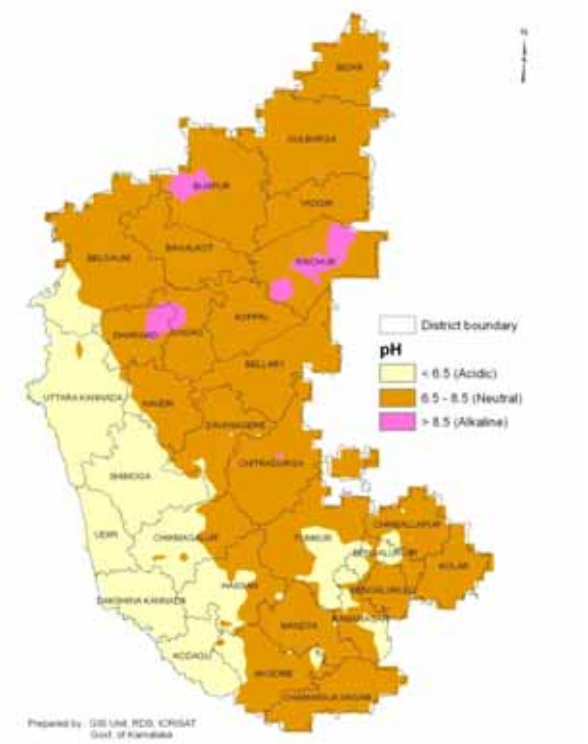

Figure 23. Soil $_{P}H$ map of various soils in 30 districts of Karnataka, resulting from extrapolation of 92864 farmers' field samples analyses data during 2008-2011

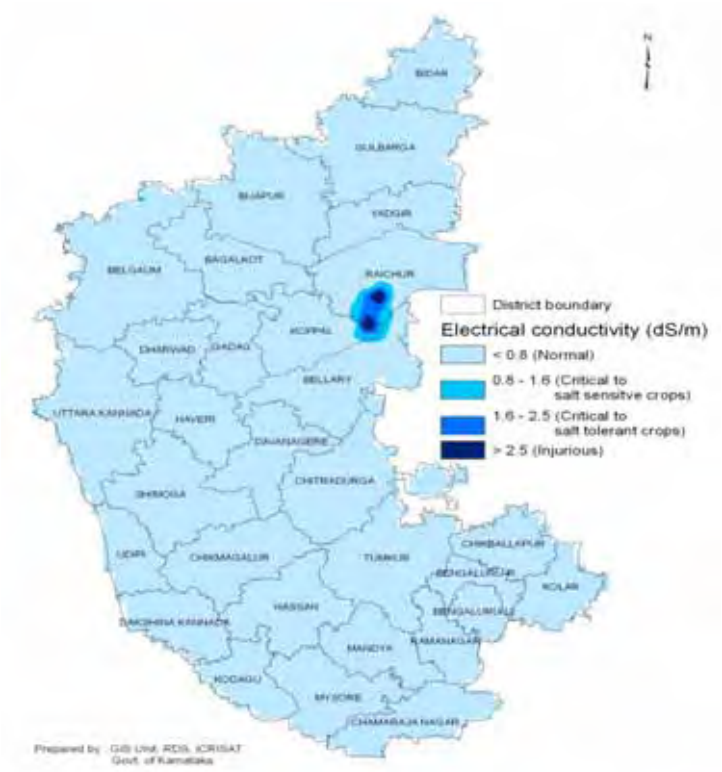

Figure 24. Soil Electrical Conductivity (EC) map of various soils in 30 districts of Karnataka, resulting from extrapolation of 92864 field samples analyses data during 2008-2011

Figure 25. Soil Organic Carbon (OC) map of various soils in 30 districts of Karnataka, resulting from extrapolation of 92864 field samples analyses data during 2008-2011

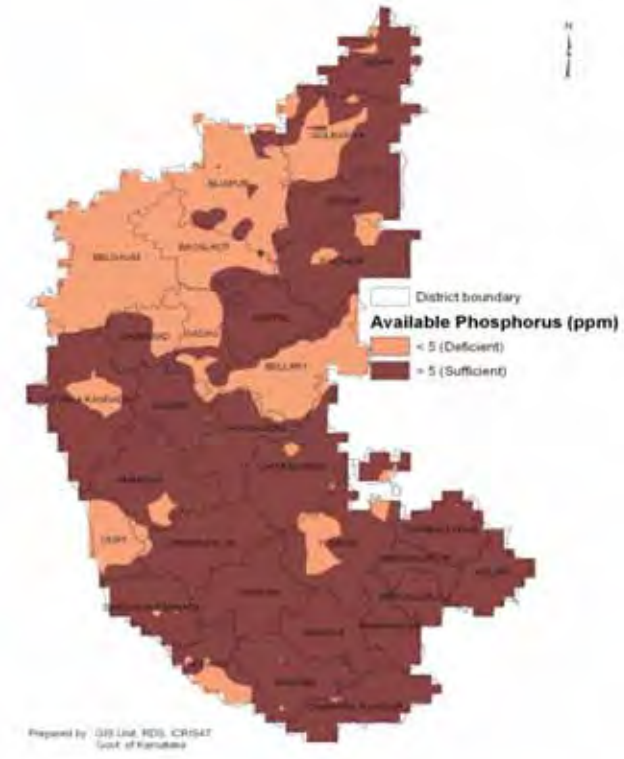

Figure 26. Soil available Phosphorus (P) map of various soils in 30 districts of Karnataka, resulting from extrapolation of 92864 field samples analyses data during 2008-2011

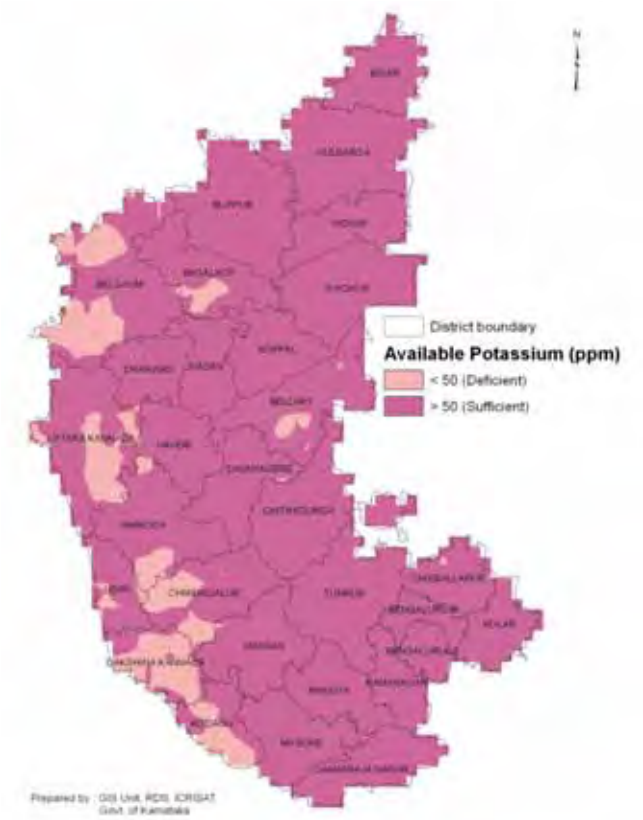

Figure 27. Soil available Potassium status map of 30 districts in Karnataka. resulting from extrapolation of 92864 field samples analyses data during 2008-2011

Figure 28. Soil available Sulphur status map of 30 districts in Karnataka resulting from extrapolation of 92864 field samples analyses data during 2008-2011

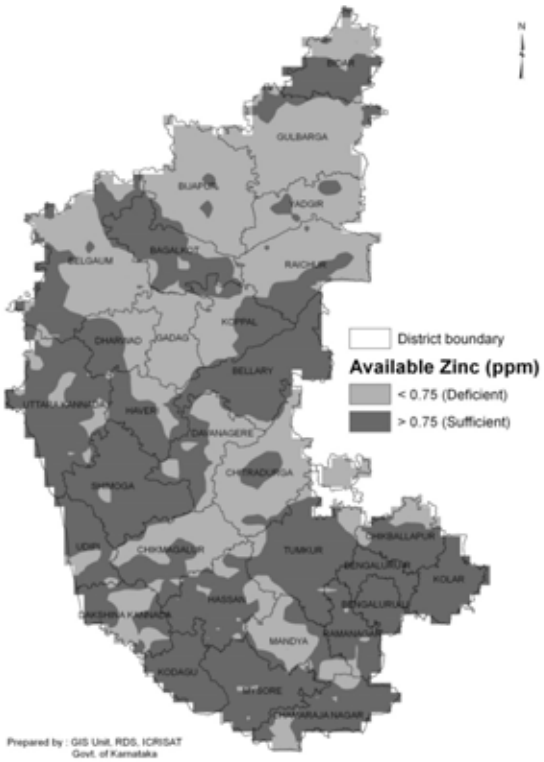

Figure 29 . Soil available Zinc status map of 30 districts in Karnataka. resulting from extrapolation of 92864 field samples analyses data during 2008-2011

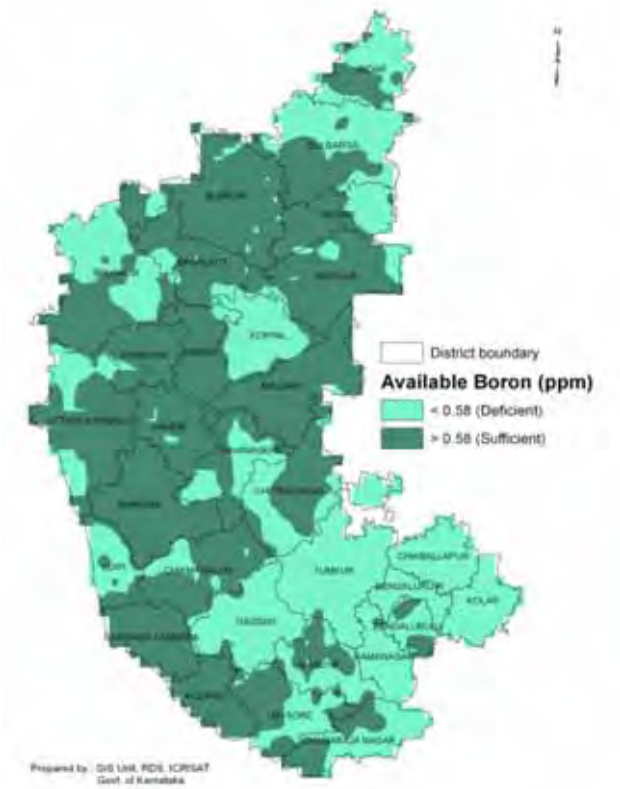

Figure 30. Soil available Boron status map of 30 districts in Karnataka resulting from extrapolation of 92864 field samples analyses data during 2008-2011.

Taluk Wise Nutrient Recommendations, Fertilizer Dosage for Kharif Crops

Soil analysis based nutrient recommendations were provided by ICRISAT at taluk level for selected major crops in all thirty districts. The reference nutrient recommendations for each crop were extracted from UAS, Bengalure; or UAS, Dharwad; or UAS, Raichur recommendations for their respective operational regions (Table 5).

Table 5.Reference nutrient recommendations for selected major crops during kharif and rabi seasons in the operational districts under the University of Agricultural sciences, Bengaluru.

S No	Crop:	Nutrients recommendation (kg ha^{-1})						Zones
Kharif season		**N**	**P_2O_5**	**K_2O**	**S**	**Zn**	**B**	
1	Hy. maize (Rainfed)	100	50	25	30	5	0.5	6,7,8,9
2	Hy. sorghum (Rainfed)	65	40	40	30	5	0.5	6,7,8
3	Hy. Pearl millet (Rainfed)	50	25	0	30	5	0.5	6
4	Ragi (Rainfed)	50	40	25	30	5	0.5	6,7,8,9
5	Paddy (Kharif)	100	50	50	30	5	0.5	
	Paddy (Summer)	125	62	62	30	5	0.5	
	Paddy (Kharif)	75	75	90	30	5	0.5	
	Paddy (Coastal)	60	30	45	30	5	0.5	
6	Pigeonpea	25	50	25	30	5	0.5	6,7,8
7	Greengram (Rainfed)	13	25	25	30	5	0.5	All zones
8	Blackgram and Cowpea	40	50	0	30	5	0.5	All zones
9	Lab Lab	25	50	25	30	5	0.5	6,7,8
10	Soybean (Irrigated)	30	80	38	30	5	0.5	6,7,8
	Soybean (Rainfed)	25	60	25	30	5	0.5	6,7,8
11	Horsegram	25	38	25	30	5	0.5	6,7,8
12	Groundnut (Rainfed)	25	50	25	30	5	0.5	6,7,8
13	Sunflower (Rainfed)	37.5	50	37.5	30	5	0.5	6,7,8
14	Cotton	150	75	75	30	5	0.5	6,7,8
15	Chilly (Irrigated)	150	75	75	30	5	0.5	All Zones
	Chilly (Rainfed)	100	50	50	30	5	0.5	6,7,8
Rabi Season								
1	Paddy (Rabi)	125	62	62	30	5	0.5	
2	Hy. maize (Irrigated)	150	75	40	30	5	0.5	6,7,8,9
3	Hy. sorghum (Irrigated)	100	75	40	30	5	0.5	6,7,8
4	Rabi Sorghum (Rainfed)	50	25	0	30	5	0.5	6
5	Hy. Pearl millet (Irrigated)	100	65	25	30	5	0.5	6
6	Ragi (Irrigated)	100	50	50	30	5	0.5	6,7,8,9
7	Greengram (Irrigated)	25	50	50	30	5	0.5	All zones
8	Groundnut (Irrigated)	25	75	37.5	30	5	0.5	All zones
9	Sunflower (Irrigated)	62.5	75	62.5	30	5	0.5	6,7,8
10	Chickpea (Irrigated)	25	50	50	30	5	0.5	6,7,8
11	Chickpea (Rainfed)	13	25	25	30	5	0.5	6,7,8

Based on farmers' affordability, locally adjustments were made as agreed by UAS scientists and DoA subject matter specialists and ICRISAT Scientists.

Table 6. Reference nutrient recommendations for selected crops during kharif and rabi seasons in the operational districts under the University of Agricultural sciences, Dharwad.

S No	Crop:	Nutrients recommendation (kg ha^{-1})						Zones
	Kharif Season	N	P_2O_5	K_2O	S	Zn	B	
1	Maize (Rainfed)	100	50	25	30	5	0.5	All zones
2	Sorghum (Rainfed)	60	40	40	30	5	0.5	All zones
3	Pearl Millet (Rainfed)	50	25	0	30	5	0.5	1,2,3
4	Ragi (Rainfed)	50	40	25	30	5	0.5	8
5	Paddy	100	50	50	30	5	0.5	1,2,8
	Paddy	150	75	75	30	5	0.5	3
	Paddy	75	75	90	30	5	0.5	9,10
6	Pigeonpea	25	50	12.5	30	5	0.5	1,2,3,8
7	Greengram	25	50	0	30	5	0.5	1,2,3,8
8	Blackgram	25	50	0	30	5	0.5	1,2,3,8
9	Cowpea (Alasandi)	25	50	25	30	5	0.5	1,2,3,8
10	Soybean (Rainfed)	25	60	25	30	5	0.5	1,2,3,8
11	Horsegram	10	30	0	30	5	0.5	1,2,3,8
12	Groundnut (Rainfed)	25	50	25	75	5	0.5	1,2,3,8
13	Sunflower (Rainfed)	35	50	35	30	5	0.5	1,2,3,8
14	Cotton (Irrrigated)	150	75	75	30	5	0.5	2,3,8
Rabi season								
1	Chickpea (Rainfed)	10	25	0	30	5	0.5	1,2,3,8
2	RabiSorghum (Rainfed)	50	25	0	30	5	0.5	All zones
3	Sunflower (Irrigated)	60	75	60	30	5	0.5	1,2,3,8
4	Ragi (Irrigated)	100	50	50	30	5	0.5	8
5	Maize (Irrigated)	150	75	37.5	30	5	0.5	1,2,3,8
6	Sorghum (Irrigated)	100	75	40	30	5	0.5	1,2,3,8
7	Pearl Millet (Irrigated)	100	62	25	30	5	0.5	1,2,3
8	Groundnut (Irrigated)	25	75	25	75	5	0.5	1,2,3,8

These recommendations were disseminated through JDA-DoA in all thirty districts by all possible communication methods like wall writings, Pocket diaries, soil health cards, brochures, daily news publications in local language. The JDAs of thirty districts were provided with taluk wise crop specific nutrient recommendations for all major crops grown in the districts and fertilizer dosage at the beginning of the crop season. As example some variable crop specific fertilizer dosage based on soils analysis for each taluk are provided in the report (Table 7).

Table 7. District/Taluk-wise fertilizer dosage adjusted for soil test nutrients status based on recommended nutrient requirement for rainfed crops in various districts for Kharif 2011.

Crop	District / Taluk	Fertilizers recommended (kg ha^{-1})					
		Urea	DAP	MoP	Gypsum	$ZnSO_4$	Agribor
Ragi	Chikkaballapur / C'ballapur	196	54	42	200	13	2.5
	Kolar / Kolar	294	82	32	200	13	2.5
	Tumkur / Korategere	175	109	83	200	13	2.5
Maize	Haveri / Byadagi	294	82	32	200	25	1.25
	Haveri / Shiggavi	131	82	32	200	13	2.5
	Chitradurga / Chitradurga	262	163	32	200	25	2.5
Groundnut	Kolar / Chintamani	33	54	17	200	25	2.5
	Tumkur / Pavgada	12	109	17	200	25	2.5
	Dharwad / Kundagola	12	109	17	200	25	1.25
Soybean	Dharwad / Dharwad	12	40	21	200	13	1.25
	Dharwad / Kalaghatagi	0	80	21	200	13	2.5
	Dharwad / Navalagund	23	80	21	200	25	1.25
Sorghum	Haveri / Hirekerur	116	38	0	200	13	1.25
	Dharwad / Kundagola	101	76	0	200	25	1.25
	Raichur / Raichur	116	38	0	200	25	2.5
Pearl millet	Bijapur / Bijapur	167	130	21	200	25	1.25
	Raichur / Manvi	192	65	21	200	25	1.25
Chickpea	Haveri / Ranebennur	44	109	0	200	25	1.25
Blackgram	Bijapur / Bijapur	12	109	0	200	25	1.25
Greengram	Bidar / Bidar	6	54	0	200	13	2.5
Pigeonpea (MD)	Gulburga / Chincholi	12	109	0	200	25	2.5
Pigeonpea (SD)	Manvi	66	54	0	200	25	1.25

If borax is applied in stead of Agribor, quantity needs to be doubled

Monitoring and Evaluation by State Coordination Committee (SCC)

State level coordination committee is a high power committee constituted with state level senior administrators of government of Karnataka, directors of department of agriculture and watershed development department, vice-chancellors of the three universities of agriculture in Bengaluru, Raichur and Dharwad, Economic advisor to Chief Minister, Karnataka and project coordinator from ICRISAT.

The committee meets frequently during the beginning of the season to take stock of inputs procurement and distribution arrangements, monsoon progression and crop sown statistics.

To fetch complete information from cluster villages, taluks to district, a checklist of activity progress weekly-report was prepared and improved by ICRISAT to ensure follow-up weekly reporting synchronized from JDA office and ICRISAT staff.

State level committee reviews the progress of project activities and interacts with district level officials instantaneously through video-conferencing and take stock of solutions to address problems arising in the field and issue directives for each district Mr. S A Ravindranath, Minister of Agriculture attended a district level committee meeting and found out the progress of implementation and success achieved in enhancing the crop yields of ragi and groundnut during kharif season.

State level committee reviews the progress of project activities during 2011-12 and interacts with district level officials instantaneously through video-conferencing and take stock of solutions to address problems arising in the field and issue directives for each district (Figure 31).

Figure 31. State level coordination committee (SCC) reviews the progress in the districts through video conferencing from Bengaluru

Rainfed Crop Planning during 2011-12

Target Area Sown to Major Crops in Rainy Season

During crop season 2011-12, scaling-up of productivity enhancement activities were undertaken in the group of six districts by increasing cropping area coverage from 50% in the second year to 75% in the third year, increase in area coverage in second group of nine districts from 33% to 66% and expanding activities to cover 50% area in the newly added 15 districts was taken-up. Farmers in all these selected districts were motivated to cover large area under Bhoochetana activities for possible benefits to participating farmers in the technology uptake of the project. Accordingly, Bhoochetana activities were targeted to cover an area of 29.4 lakh hectares with improved management to enhance rainfed crop productivity in 30 districts during rainy season 2011-12. The project implemented crop productivity enhancement technologies on 26.6 lakh hectares, which was 90% of the target

area with five major food grain cereals (paddy, finger millet, maize, sorghum and pearl millet), five major grain legumes (pigeonpea, green gram, black gram, field beans and cowpea) and four major oilseed crops (soybean, sunflower, cotton and groundnut) of Karnataka. Monsoon rains were scanty all through the season; however, the onset of monsoon and rainfall in June and July was normal in many districts which helped farmers to achieve an overall 90% sowing of the target area (**Table 8**) under major crops in all the 30 districts of Karnataka. Paddy, maize and soybean crops are most preferred by the farmers as seen from 100% target area sown in most of the districts. Groundnut, green gram, finger millet and sorghum crops were chosen, based on the seasonal conditions as evidenced by low and variable sowing percentage achieved with these crops in different districts during Kharif season.

Table 8. District-wise target cropping area (hectares) sown to major crops during Kharif crop season 2011-12.

S.No.	District	Major rainfed crop	Target area	Area sown	% Achieved
1	Bagalkot	Pearl millet	15000	15000	100
	Bagalkot	Green gram	8500	8500	100
	Bagalkot	Maize	27800	27800	100
	Bagalkot	Sunflower	6200	6200	100
	Bagalkot	Soy bean	1500	1500	100
	Bagalkot	Pigeonpea	5800	3700	64
2	BengaluruRural	Finger millet	30000	30000	100
	BengaluruRural	Maize	5600	5600	100
3	Bengaluru Urban	Finger millet	11200	11200	100
4	Belgaum	Maize	20000	29520	148
	Belgaum	Soy bean	35000	64519	184
	Belgaum	Groundnut	15000	26822	179
	Belgaum	Cotton	17500	28302	162
5	Bellary	sorghum	6000	5345	89
	Bellary	Maize	32000	33,332	104
	Bellary	pigeonpea	4300	4098	95
	Bellary	Groundnut	27800	28066	101
	Bellary	Sunflower	2000	1700	85
6	Bidar	Pigeonpea	41038	40217	98
	Bidar	Black gram	28481	20848	73
	Bidar	Green gram	24812	16624	70
	Bidar	Soy bean	22050	35059	159
	Bidar	Sorghum	37314	27985	75
7	Bijapur	Maize	34800	24080	65
	Bijapur	Pearl millet	17800	17742	100
	Bijapur	Pigeonpea	88500	44788	51
	Bijapur	Green gram	5500	2928	53
	Bijapur	Sunflower	12600	8371	66
	Bijapur	Groundnut	17800	7195	40

8	Chamarajanagara	Sorghum	10252	8283	81
	Chamarajanagara	Maize	23464	23910	102
	Chamarajanagara	Finger millet	9520	10246	108
	Chamarajanagara	Sunflower	7680	5696	74
	Chamarajanagara	Groundnut	5095	6966	137
9	Chikkaballapur	Finger millet	39500	37170	94
	Chikkaballapur	Pigeonpea	8900	6932	78
	Chikkaballapur	Groundnut	42000	29351	70
	Chikkaballapur	Maize	27900	36992	133
	Chikkaballapur	Field bean	5300	4780	90
10	Chikkamagaluru	Paddy	20600	20600	100
	Chikkamagaluru	Finger millet	27000	27000	100
	Chikkamagaluru	Sorghum	1400	968	69
	Chikkamagaluru	Maize	7500	7500	100
	Chikkamagaluru	Sunflower	5200	5200	100
	Chikkamagaluru	Groundnut	2400	2400	100
	Chikkamagaluru	Green gram	1900	1900	100
11	Chitradurga	Groundnut	96000	67951	71
	Chitradurga	Maize	64500	63860	99
	Chitradurga	Finger millet	25000	24760	99
12	Dakshina Kannada	Paddy	5200	5200	100
13	Davanagere	Sorghum	135600	130574	96
	Davanagere	Finger millet	5000	4105	90
	Davanagere	Maize	104000	103005	99
	Davanagere	Groundnut	5000	3628	73
	Davanagere	Cotton	10000	9204	92
	Davanagere	Pigeonpea	4000	3755	94
14	Dharwad	Soy bean	10000	10000	100
	Dharwad	Groundnut	20000	19000	95
	Dharwad	Green gram	10000	70750	78
	Dharwad	Maize	20000	19750	99
15	Gadag	Maize	54000	58095	107
	Gadag	Pigeonpea	3400	3204	94
	Gadag	Green gram	73000	55211	76
	Gadag	Groundnut	59000	40956	69
	Gadag	Sunflower	15500	7675	50
	Gadag	Cotton	25000	26834	107
16	Gulbarga	Green gram	35000	9396	27
	Gulbarga	Black gram	39000	18834	48
	Gulbarga	Sunflower	27200	8057	30
	Gulbarga	Pearl millet	19700	13228	67
	Gulbarga	Pigeonpea	215000	151731	71
17	Hassan	Maize,	34800	34800	100
	Hassan	Finger millet	44700	16830	38
	Hassan	Cowpea	7000	5602	80
	Hassan	Green gram	5600	5600	100
	Hassan	Sunflower	2300	1155	50
18	Haveri	Maize	128500	128500	100
	Haveri	Groundnut	15000	15000	100

	Haveri	Soy bean	7000	7000	100
	Haveri	Cotton	72000	72000	100
19	Kodagu	Maize	2000	2000	100
	Kodagu	Paddy	17000	17000	100
20	Kolar	Groundnut	11500	9735	85
	Kolar	Finger millet	44000	24550	56
	Kolar	Pigeonpea	2200	2384	108
	Kolar	Field beans	4500	1417	32
21	Koppal	Sorghum	4000	1608	40
	Koppal	Maize	12500	16968	136
	Koppal	Pearl millet	31000	32900	106
	Koppal	Sunflower	9000	4870	54
	Koppal	Groundnut	9000	4430	49
	Koppal	Green gram	5500	3481	63
22	Mandya	Cowpea	2500	2234	89
	Mandya	Finger millet	19200	12285	64
	Mandya	Maize	1500	1482	99
23	Mysore	Finger millet	19500	13850	71
	Mysore	sorghum	3700	3700	100
	Mysore	Maize	10500	10454	100
	Mysore	Cowpea	5423	5423	100
	Mysore	Black gram	1177	1177	100
	Mysore	Groundnut	2000	2000	100
	Mysore	Cotton	16000	16000	100
24	Raichur	Pearl millet,	25000	18,020	72
	Raichur	Pigeonpea	25000	20182	81
	Raichur	Groundnut	5500	2990	54
	Raichur	Sunflower	7000	8575	123
	Raichur	Cotton	9500	9260	97
25	Ramanagara	Finger millet / Pigeonpea	49900	47506	95
26	Shimago	Maize	16800	16800	100
	Shimago	Paddy	35600	35600	100
27	Tumkur	Green gram	5000	4956	99
	Tumkur	Maize	10000	9965	100
	Tumkur	Finger millet	155000	146630	95
	Tumkur	Groundnut	115000	87050	76
28	Udipi	Paddy	10000	10000	100
29	Uttara Kannada	paddy	22000	21600	98
	Uttara Kannada	Maize	2000	2000	100
30	Yadgir	Green gram	32000	24357	76
	Yadgir	Sunflower	11100	11074	100
	Yadgir	Pearl millet	22000	**21403**	**97**
	Yadgir	Pigeonpea	40000	47366	118
Total	**30 Districts**	**14 crops**	**3076606**	**2,763,467**	**90.5**

Input Distribution during Rainy 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 the balanced and recommended usage of nutrients was not achieved. In the 15 districts which were newly introduced to Bhoochetana activities during 2011, micronutrient consumption was low in Bijapur, Bellary, Gulbarga, Udipi and Yadgiri owing to less familiarity of technologies and their advantage to farmers. In the older districts like Tumkur, Haveri, Davanagere where Bhoochetana was operationalized in the previous year, farmers purchased inputs knowing the advantage of inputs. In newly introduced districts like Bagalkot and Belgaum, better efforts of DoA and ICRISAT staff to create awareness among farmers about the advantage of correcting nutrient deficiencies might have helped to increase the use of micronutrients by farmers to enhance their crop productivity and incomes (**Table 9**).

Table 9. District-wise micronutrients (requirements based on soil analysis) actual distribution to farmers during Kharif seasons 2011-12.

S No.	District	Crops	Target quantity (tons)			Quantity distributed (tons) & % target		
			Gypsum	$ZnSO_4$	Borax	Gypsum	$ZnSO_4$	Borax
1.	Bagalkot	Pearl millet, Green gram, Maize, Sunflower, Soy bean, Pigeonpea	6480	324	162	5016.4 (91)	301.96 (89)	122.63 (81)
2.	Belgaum	Soy bean cotton, maize, groundnut	8750	438	175	7300 (42)	544 (62)	96 (27)
3.	Bellary	Sorghum, Maize, Groundnut, Pigeonpea, Sunflower	14420	1081	180	1884 (13)	182 (17)	73 (41)
4.	Bengaluru—R	Finger millet, Maize	3560	178	71	1273 (36)	163 (92)	68 (96)
5.	Bengaluru—U	Finger millet	1120	168	28	715.34 (63)	81.29 (48)	23.6 (83)
6.	Bidar	Pigeonpea, Black gram, Green gram, Soy bean, Sorghum	22,530	947	516	3112 (13.8)	342 (36.1)	167 (32.4)
7.	Bijapur	Maize, Pearl millet , Pigeonpea, Green gram Sunflower, Groundnut	21021	2628	340	2375.5 (11.3)	321.2 (12.2)	52.4 (15.4)
8.	Chamarajanagara	Sorghum, Finger millet, maize, sunflower, groundnut	5135	280	112	4352 (44)	269 (96)	101.5 (91)
9.	Chikkaballapur	Finger millet, Maize, Groundnut Field Bean (Avare), Pigeonpea	13870	2217	329	4197.85 (30)	376 (17)	149.63 (45)
10.	Chikamagalur	Paddy, Finger millet, Sunflower, Groundnut, Green gram, Maize	6600	330	132	4510 (68.3)	215 (65.15)	98 (74.24)
11.	Chitradurga	Groundnut , Finger millet, Maize,	6408	763	175.4	4150 (22.4)	499.0 (53.8)	115.0 (49.6)
12.	Dakshina Kannada	Paddy	563.25	57.793	9.1	483.25 (85.7)	56.89 (98.4)	9.0 (99)

13.	Davanagere	Finger millet, maize, sorghum, Pigeonpea, Groundnut, Cotton	13560	678	271	8371 (61.98)	1029.52 (159.97)	393.28 (155.73)
14.	Dharwad	Soy bean, Groundnut, Green gram, Maize	6000	87.5	300	1586 (26.4)	41.1 (46.9)	470.13 (156.7)
15.	Gadag	Maize, Groundnut, Green gram, Sunflower, Cotton, Pigeonpea	10735	536	214	4938 (45.9)	418 (77.98)	96 (44.85)
16.	Gulbarga	Pigeonpea, green gram, black gram, sunflower, pearl millet	33590	1680	672	3627 (10.8)	280.5 (16.7)	42.33 (6.3)
17.	Hassan	Maize, Finger Millet, Cowpea, Green gram, Sunflower	10120	959.6	233.5	1621 (16.9)	200.2 (20.9)	103.35 (44.3)
18.	Haveri	Maize, Groundnut, Soybean, Cotton	22,300	1160	446	5280 (23.68)	526 (45.34)	225.60 (50.58)
19.	Kodagu	Maize, Paddy	2567	75.36	38	1540.2 (60)	39.9 (53)	6.25 (16.45)
20.	Kolar	Groundnut, Finger Millet, Pigeonpea, Field beans	6220	777	155	1387 (22.3)	76.92 (9.9)	20.925 (13.5)
21.	Koppal	Sorghum, Pearl millet, Groundnut Sunflower, Green gram, Maize,	7100	355	178	2285 (32)	275 (71)	48 (27)
22.	Mandya	Cowpea, Finger millet, Maize	2320	550	116	804 (34)	109 (20)	26.70 (23)
23.	Mysore	Finger millet, maize, groundnut, sorghum, cowpea, black gram, cotton	2915	490	333	1754 (60.17)	207 (42.2)	30.6 (9.1)
24	Raichur	Pearl millet, pigeonpea, cotton groundnut, sunflower	7200	360	72	1718 (23.2)	360 (100)	42 (58.3)
25	Ramanagara	Finger millet, Pigeonpea	4990	1062	250	1515 (30.4)	121.7 (11.5)	42.27 (17)
26	Shimago	Paddy, Maize	13980	699	349.5	3494.9 (25)	209.7 (30)	104.8 (29.98)
27	Tumkur	Green gram, Finger millet, Groundnut, Maize	28500	1425	570	8160 (28.6)	615 (43.1)	295 (51.7)
28.	Udupi	Paddy	2000	150	50	399.9 (19.99)	29.3 (19.5)	4.4 (8.8)
29.	Uttara Kannada	Paddy, Maize	2400	120	48	1070 (45)	33.7 (28)	7.7 (16)
30.	Yadgir	Green gram, sunflower, pearl millet, pigeonpea	21020	2226	525	3195 (15.2)	300.5 (13.5)	71.92 (13.7)

Target Area Sown to Major Crops in Post-rainy Season

Rabi cropping was planned in 13 districts where farmers traditionally grow rainfed crops during the season with stored soil moisture especially on black soils. Chickpea, safflower and sorghum were grown in these conditions. However, groundnut, sunflower and sugarcane were also sown mostly with irrigated dry conditions. Chickpea and sorghum were sown by farmers in large areas during the rabi season (**Table 10**). But farmers' preference to sow chickpea and groundnut in almost all target area achieving nearly 100% in majority of the districts shows market interest for these produce although their seed costs are higher. A total of **695951** ha were sown to seven rainfed crops against the target area of **856521** ha with these crops during the rabi season.

Table 10. District-wise target cropping area (hectares) sown to major crops during Rabi 2011-12.

District	Major rainfed crop	Target area	Area sown	% Achieved
Bagalkot	Rabi sorghum	45600	41000	90
Bagalkot	Chickpea	32300	32900	102
Bagalkot	Sunflower	5280	4940	94
Bagalkot	Groundnut	1250	1300	104
Bagalkot	Sugarcane	9150	8300	91
Belgaum	Chickpea	76000	68400	90
Belgaum	Rabi sorghum			
Bellary	Rabi sorghum	5000	3853	77
Bellary	Chickpea	23700	25829	108
Bellary	Sunflower	6500	2913	45
Bidar	Chickpea	33635	28926	86
Bidar	Safflower	4963	4268	86
Bidar	Rabi sorghum	9934	8543	86
Bijapur	Rabi sorghum	30000	29159	97
Bijapur	Chickpea	50000	34645	69
Davanagere	Rabi sorghum	3000	2480	83
Davanagere	Chickpea	3000	1920	64
Davanagere	others	6000	6000	100
Dharwad	Rabi sorghum	19000	18500	97
Dharwad	Chickpea	19000	18500	97
Gadag	Rabi sorghum	61000	44788	73
Gadag	Wheat	33000	21688	66
Gadag	Chickpea	83000	66160	80
Gadag	Sunflower	38000	22324	59
Gadag	Rabi Cotton	50000	34869	70
Gulbarga	Chickpea	13923	12610	91
Gulbarga	Rabi sorghum	41786	37029	89
Haveri	Rabi sorghum	29000	18310	63
Haveri	Sunflower	4050	920	23
Haveri	Chickpea	2650	628	24
Haveri	Safflower	1800	210	12
Koppal	Rabi sorghum	14000	5385	39
Koppal	Chickpea	12000	9975	83
Koppal	Rabi sorghum	45600	41000	90
Koppal	Chickpea	32300	32900	102
Koppal	Sunflower	5280	4940	94
Koppal	Groundnut	1250	1300	104
Koppal	Sugarcane	9150	8300	91
Raichur	Rabi sorghum	30000	26610	89
Raichur	Chickpea	37000	33035	87
Yadgir	Chickpea	6000	3034	51
Yadgir	Rabi sorghum	16000	16000	100
13 Districts	**7 crops**	**856521**	**695951**	**81**

Input Distribution during Post-rainy Season

In 13 districts, usage of micronutrients to the recommended target quantities was higher with farmers of Davangere, but total quantities distributed to farmers were higher in Gadag, Bagalkot, Bellary, Bidar, Yadgir and Gulbarga districts respectively (Table 11). Even during rabi seasons, farmers were convinced to use deficient micronutrients to improve productivity and water use efficiency of these rainfed crops successfully.

Table 11. District-wise micronutrients (requirements based on soil analysis) distribution to farmers during Rabi seasons 2011-12.

S. No	District	Crops	Target quantity (tons)			Quantity distributed (tons) (% target)		
			Gypsum	$ZnSO_4$	Borax	Gypsum	$ZnSO_4$	Borax
1.	Bagalkot	Sunflower, finger millet, chickpea, groundnut, sugarcane	4679	585	82.85	2028 (43)	156 (27)	52.42 (63)
2.	Belgaum	Chickpea, Sorghum						
3.	Bellary	Chickpea, Finger millet, Safflower	7040	528	88	1546 (22)	133 (25)	58 (66)
4.	Bidar	Finger millet, Chickpea, Safflower	8714	571	204	1450 (16.6)	160 (28.2)	119 (58.3)
5.	Bijapur	Rabi Sorghum, chickpea	12761	1595	192	245 (1.91)	6 (0.37)	9 (4.68)
6.	Davangere	Finger millet, Chickpea	600	30	12	618.6 (103.1)	56 (186.6)	34 (283.3)
7.	Dharwad	Rabi Sorghum, chickpea	1900	25.63	116.25	386 (20.3)	14.5 (56.5)	131.5 (113)
8.	Gadag	Rabi Sorghum, chickpea, Sunflower	6320	316	126	2306 (36.48)	57 (18)	19 (15)
9.	Gulbarga	Rabi sorghum, Chickpea	11142	1116	140	1337 (12)	340.4 (30.5)	29.96 (21.4)
10.	Haveri	Rabi sorghum, Chickpea, Sunflower, Safflower	3750	188	47	310 (8.26)	55 (29.25)	15 (31.91)
11.	Koppal	Rabi Sorghum, Chickpea.	260	130	52	320 (12)	64 (49)	19 (37)
12.	Raichur	Rabi sorghum, chickpea	3300	170	85	384 (12)	45 (26)	4.2 (5)
13.	Yadgir	Rabi sorghum, Chickpea	4400	550	110	1764.4 (40.1)	282.15 (51.3)	37.95 (34.5)

Inputs consortium trends during three years gradual and steady increase in consumption of recommended borax, Z_nSO_4 and gypsum in the state for rainfed crops before 2009. The data in Table shows that large scope exists to enhance balanced nutrient consumption for sustainable intensification (Table 12).

Table 12. 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

Seasonal Rainfall and Cropping Situation in the Districts

1. Bagalkot

Kharif season

In Bagalkot, rainfall variability in taluks of Bagalkot and Mudhol during the season was considered to analyze its effect on crop productivity during the kharif crop season (Table 13). June rainfall was slightly more than normal in Bagalkot and less than normal in Mudhol taluks, however, facilitating sowing of all selected major crops in the district during 3rd and 4th weeks of June by most farmers, and the late sowing season continued in July due to follow-up rains (Table 14). In this district pearl millet, green gram, maize, sunflower and soybean crops were sown 100% of their target areas under Bhoochetana project (Table 13), and pigeonpea was less preferred as it was sown in 3700 ha (64%) of the 5800 ha target area in the district.

Table 13. Seasonal normal rainfall and actual rainfall observed in taluks of Bidar district during crop season 2011-12.

Taluk	Month	May	Jun	Jul	Aug	Sep	Oct	Nov
Bagalkot	Normal rainfall (mm)	56	74	81	67	152	104	33
	Rainfall 2011 (mm)	**96.75**	**86.5**	**60.3**	**106.8**	**71.6**	**81.2**	**0**
Mudhol	Normal rainfall (mm)	63.0	71.0	67.0	59.0	132.0	95.0	31.0
	Rainfall 2011 (mm)	**72.3**	**67.9**	**118.4**	**46.4**	**54.3**	**75.9**	**0.0**

Rainfall in the month of July helps in establishment of crops was more than normal (+76%) in Mudhol taluk but was deficit (-11%) in Bagalkot in July. During the crop growth period from June to November, there was a deficit rainfall of 20%, especially in the month of

September affected the crop maturity and productivity of selected crops in improved as well as farmers' management practices.

Rabi season

Bagalkot receives assured rainfall only in the SW monsoon and rabi crops are grown on stored soil moisture. These crops performance depends mostly on September and October rainfall which was >50% deficit to the normal rainfall during September and less than normal in October also. Rabi sorghum, sunflower and black gram crops were sown between 3rd week of September to 3rd week of October with rainfall during these months (Table 14). These rabi crops were affected by poor establishment and lower crop yields.

Table 14. Window of sowing opportunities for Kharif crops during 2011-12 in Bagalkot district of Karnataka under Bhoochetana project.

S.No.	District	Major rainfed crop	Sowing window of opportunity
1.	Bagalkot	Pearl millet	3rd week of June to 4th week of July
2.		Green gram	Last week of May to 3rd week of June
3.		Maize	4th week of June to 1st week of August
4.		Sunflower	3rd week of June to 2nd week of August
5.		Soybean	4th week of May to 2nd week of June
6.		Tur (red gram)	3rd week of June to 1st week of August

Groundnut and Sugarcane

Which are grown mostly irrigated were sown late up to the end of January. In Bagalkot district, sowing of Rabi season crops was done on 95% of the target area, and rabi sorghum was sown on 90% of the target area during the rabi season.

Table 15. Window of sowing opportunities for Rabi crops during 2011-12 in Bagalkot district of Karnataka under Bhoochetana project.

S.No	District	Major rainfed crop	Sowing window of opportunity
1.	Bagalkot	Rabi Sorghum	3rd week of September to last week of October
2.		Black gram	Last week of September to 1st week of Nov
3.		Sunflower	2rd week of September to 3rd week of October
4.		Groundnut	Last week of November to 4th week of January
5.		Sugarcane	2rd week of October to 3rd week of February

2. Belgaum

In Belgaum district, seasonal rainfall variability was analyzed in relation to cropping season in Belgaum taluk and Ramdurga taluk for the year 2011-12. In Belgaum taluk the onset of rainy season was quite early but rainfall occurred was less than normal in the months of May, June and July. The rainfall was more than normal in August, September and October months resulting in higher crop productivity (**Table 16**) of long-duration crops. Cotton, soybean, maize and rainfed paddy were sown quite early in the second fortnight of May (**Table 17**).

Table 16. Seasonal normal rainfall and actual rainfall observed in taluks of Belgaum district during crop season 2011-12.

Taluk	Month	May	Jun	Jul	Aug	Sep	Oct	Nov
Belgaum	Normal rainfall (mm)	103.0	225.0	473.0	265.0	119	122.0	42.0
	Rainfall 2011 (mm)	**51.5**	**188.7**	**303.1**	**285.1**	**179.6**	**192.6**	**11.3**
Ramdurga	Normal rainfall (mm)	63.0	68.0	68.0	58.0	117	98.0	27.0
	Rainfall 2011 (mm)	**91.7**	**83.1**	**140.1**	**113.7**	**90.3**	**95.0**	**0.0**

Groundnut and green gram were late sown in the months of June and July. In the other side of the district, Ramdurga taluk received higher than normal rainfall during May, June, July and August contrastingly but receded in the later months from September to November resulting in lesser than normal rainy season and crop productivity. In Belgaum more than 150% of the target area earmarked for maize, soybean, groundnut and cotton were sown during the season as these are commercial crops of market importance.

Table 17. Window of sowing opportunities for Kharif crops during 2011-12 in Belgaum district of Karnataka under Bhoochetana project.

S. No.	District	Major rainfed crop	Sowing window of opportunity
1.		Cotton	15TH of May to July30
2.		Soybean	May 15TH to July 15TH
3.		Groundnut	June to July end
4.	Belgaum	Maize	May to July end
5.		Rainfed paddy	20TH May to June end
6.		Green gram	June to 15TH July
7.		Sorghum	May to June

Table 18. Window of sowing opportunities during Rabi 201-12 for crops in Belgaum district of Karnataka under Bhoochetana project.

S No.	District	Major rainfed crop	Sowing window of opportunity
1.	Belgaum	sorghum	1st week, October to 15th November
2.		Chickpea	1st week, October to 30th November

Rabi season

In Belgaum, selected rabi crops are sorghum, chickpea and sunflower which were sown during the first week of October and almost completed by 15th November in most parts of the district (Table 18). Late sowings were done in the second fortnight of November. Over all a total of 68400 ha were sown to chickpea (90%) out of the target area of 76000 ha. Rabi sorghum and chickpea were sown mostly during first fortnight of October and sorghum in some cases was late sown in November also.

3. Bellary

In Bellary, major crops in kharif season were sorghum, maize, intercrop or sole crop pigeonpea, groundnut and sunflower. Seasonal rainfall variability and distribution was presented for Bellary and Sandur taluks to give an understanding of distributions and deviations from the normal rainfall (Table 19). Rainfall in June and July months was well above normal providing opportunity for farmers to take up sowing in time and to achieve good germination and plant stand.

Table 19. Seasonal normal rainfall and actual rainfall observed in taluks of Bellary district during crop season 2011-12.

Taluk	Month	May	Jun	Jul	Aug	Sep	Oct	Nov
Bellary	Normal rainfall (mm)	51.9	48.4	48.9	62.8	131.4	107.7	32.1
	Rainfall 2011 (mm)	**18.1**	**84.4**	**74.9**	**39.4**	**46.7**	**154.1**	**33.5**
Sandur	Normal rainfall (mm)	85.6	90.4	124.7	124.7	143.4	138.7	35.9
	Rainfall 2011 (mm)	**106.0**	**85.5**	**241.7**	**163.0**	**20.4**	**110.2**	**15.2**

The normal sowing window existed in June and July for sorghum, pigeonpea, groundnut and sunflower in red soil areas and delayed sowing of maize, groundnut and sunflower in July in Black soil areas (Table 20).

Overall, the area sown to crops exceeds 100% of the target area coverage with narrow deviations for individual crop targets.

Table 20. Window of sowing opportunities for Kharif crops during 2011-12 in Bellary district of Karnataka under Bhoochetana project

S. No.	District	Major rainfed crop	Sowing window of opportunity
1.	Bellary	Sorghum	4th week of May to 1st week of July
2.		Maize	1st week of July to 1st week of August
3.		Pigeonpea	4th week of May to end June, extended to 4th week of July
4.		Groundnut	1st week of May to end June (6 taluks), 1st week of July (1 taluk), 1st week of July to 4th week of July.
5.		Sunflower	1st week of June to 4th week of July

Rabi season

Rabi sorghum, chickpea and safflower were the major post rainy season crops on black soils of Bellary district. Although, rainfall was deficit during August and September causing low stored soil moisture, well above normal rainfall in the month of October was quite helpful for farmers to complete chickpea (108%), sorghum (77%) and sunflower (45%) sowings with in the normal sowing window for these crops in the district (Table 21). Hence, it was possible to achieve an overall target area coverage of 93% in the rabi season for Bellary district.

Table 21. Window of sowing opportunities for Rabi crops during 2011-12 in Bellary district of Karnataka under Bhoochetana project.

S No	District	Major rainfed crop	Sowing window of opportunity
1.	Bellary	Rabi sorghum	2nd week, September to 2nd week, October
2.		Chickpea	2nd week, September to 2nd week, October
3.		Safflower	2nd week, September to 2nd week, October

4. Bengaluru (Rural)

Major crops selected for productivity enhancement under Bhoochetana project were finger millet and maize in this district. Maize has been a prominent crop in Doddaballapur taluk, and finger millet (ragi) is a major crop in Hoskote, Devanhalli and Nelamangala. Hence, we presented seasonal rainfall for Doddaballapur and Hoskote taluks which are dissimilar in their normal rainfall pattern and relevant for major crop yield estimations and assessment by comparing improved management against farmers' management.

Table 22. Seasonal normal rainfall and actual rainfall observed in Bengaluru (Rural) district during crop season 2011-12.

Taluk	Month	May	Jun	Jul	Aug	Sep	Oct	Nov
Doddaballapur	Normal rainfall (mm)	8	75	100	126	159	166	65
	Rainfall 2011 (mm)	**123.6**	**49.5**	**80.5**	**192.8**	**25**	**157.3**	**24.3**
Hoskote	Normal rainfall (mm)	94	67	78	97	136	146	59
	Rainfall 2011 (mm)	**72.2**	**61.8**	**167.6**	**202**	**71.8**	**77.8**	**16.2**

Table 23. Window of sowing opportunities for Kharif crops during 2011-12 in Bengaluru Rural district of Karnataka under Bhoochetana project.

S. No	District	Major rainfed crop	Sowing window of opportunity
1.	BengaluruRural	Finger millet	2nd week July to 4th week August
2.		Maize	2nd week June to 4th week July

Seasonal rainfall observed during May to November in Doddaballapur taluk was higher than normal in May (+116 mm) and deficit rainfall in the months of June (-26 mm), July (-20 mm) and was poorly distributed (Table 22). Although, monthly rainfall was much higher than normal in May (+1537%) and August (+53%), less than normal rainfall in June (-34%), July (-19.5%) and September (-84%) coincides with critical stages of crop growth based on sowing period (Table 23) and duration of crop. However, in August and November considerable amount of rainfall occurred and crop productivity might not have affected so much.

In Hoskote taluk, monthly rainfall was lower in May (-23%) and June (-8%), but was much higher in July (+115%), August (+108%) facilitated sowing of finger millet with good crop stand. Rainfall was deficit again in September (-47%), October (-47%), November (-72%)) compared to normal rainfall in these months. Less than normal rainfall caused much concern to finger millet farmers as it was affected by low rainfall during crop growing period especially for crop that was late sown in August.

5. Bengaluru (Urban)

Finger millet is the main crop during kharif in the urban surroundings of Bengaluru (U) district which comprise taluks of Anekal, Bengaluru East, Bengaluru North and Bengaluru South.

Table 24. Seasonal normal rainfall and actual rainfall observed in taluks of Bengaluru (Urban) district during crop season 2011-12.

Taluk	Month	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
Anekal	Normal rainfall (mm)	42.2	118.6	60.7	91.3	116.7	140.8	156	65.4
	Rainfall 2011 (mm)	**140**	**132.5**	**65.8**	**63.6**	**224**	**66.4**	**249**	**92.4**
Bengaluru North	Normal rainfall (mm)	46.6	112.5	75.1	111.5	139	165	164.3	62.3
	Rainfall 2011 (mm)	**277.6**	**150.5**	**57.7**	**92.7**	**278.2**	**111.1**	**162**	**49.9**

Although, Anekal and Bengaluru North received higher than normal rainfall in April and May, traditionally farmers resort to finger millet sowing during July, a deficit rainfall month this year and August which received higher (+91 to +100%) rainfall than normal in these two taluks (Table 24), presented a sowing opportunity in both these months (**Table 25**). Rainfall in the crop growing season was satisfactory and farmers expected good crop harvest of finger millet in this district.

Table 25. Window of sowing opportunities for Kharif crops during 2011-12 in Bengaluru Urban district of Karnataka under Bhoochetana project.

S. No.	District	Major rainfed crop	Sowing window of opportunity
1.	Bengaluru Urban	Finger millet	1st July to 30thAugust

6. Bidar

Kharif season

In Bidar district, black gram, green gram, pigeonpea, soybean and sorghum are the major crops selected for productivity enhancement under Bhoochetana project.

Table 26. Seasonal normal rainfall and actual rainfall observed in taluks of Bidar district during crop season 2011-12.

Taluk	Month	May	Jun	Jul	Aug	Sep	Oct	Nov
Aurad	Normal rainfall (mm)	26	142	218	201	165	75	20
	Rainfall 2011 (mm)	**25.7**	**65.5**	**424.2**	**262.7**	**90.7**	**8.7**	**0**
Bidar	Normal rainfall (mm)	34	150	224	203	218	86	28
	Rainfall 2011 (mm)	**24.50**	**57.2**	**304.8**	**222.6**	**67.6**	**12.2**	**0**

Table 27. Window of sowing opportunities for Kharif crops during 2011-12 in Bidar district of Karnataka under Bhoochetana project.

S. No.	District	Major rainfed crop	Sowing window of opportunity
1.		Pigeonpea	4th week of June to 3rd week of July.
2.		Green gram	4th week of June to 3rd week of July.
3.	Bidar	Black gram	4th week of June to 3rd week of July.
4.		Soya bean	1st week of July to3rd week of July.
5.		Sorghum	1st week of July to3rd week of July.

Aurad and Bidar taluks rainfall amount and distribution analyses are presented in Table 26. In June, rainfall was less than normal in both the taluks, hence, sowing of legumes were delayed until end June. Soybean and sorghum sowings progressed until 3rd week of July (Table 27). Farmers preference to soybean increased as the area sown to this crop increased up to 160% of the target area for the crop as green gram (70%) and sorghum (75%) were less preferred in the season. Lower than normal rainfall in September (-45%, -68%) and October (-88%, -86%) in Aurad and Bidar respectively might have affected pod filling and maturity of soybean and pigeonpea. Green gram and black gram which are short season legumes, productivity would be higher due to good rainfall in July and August in all the taluks of Bidar.

Rabi season

Chickpea, safflower and rabi sorghum were the post-rainy season crops sown in the district. These crops were sown in 86% of the target area for each crop and to the total target area. This are crops were typically sown in a short period of sowing opportunity between the last week of September to 2nd week of October as the moisture recedes quickly in the absence of rainfall (Table 28). With less than normal rainfall in the months of September and October, and no follow up rains after the crops were sown, it is more likely that these post rainy season crop yields are low in this season.

Table 28. Window of sowing opportunities for Rabi crops during 2011-12 in Bidar district of Karnataka under Bhoochetana project.

S No	District	Major rainfed crop	Sowing window of opportunity
1.		Rabi Sorghum	4th week, September to 4th week, October
2.	Bidar	Chickpea	4th week, September to 2nd week, October
3.		Safflower	4th week, September to 2nd week, October

7. Bijapur

In Bijapur, maize, pearl millet, pigeonpea, green gram, sunflower and groundnut were the major crops selected for productivity enhancement activities under Bhoochetana project. Sindagi and Bijapur taluks in Bijapur district was considered as representative taluks to summarize rainfall variability scenario in the district. In both the taluks the rainfall was lower than normal in June, July, September, October and November (**Table 29**).

Table 29. Seasonal normal rainfall and actual rainfall observed in taluks of Bijapur district during crop season 2011-12.

Taluk	Month	May	Jun	Jul	Aug	Sep	Oct	Nov
Sindagi	Normal rainfall (mm)	37	95	95	91	168	92	21
	Rainfall 2011 (mm)	**19.3**	**31.2**	**84.1**	**118.5**	**26.7**	**11.2**	**0**
Bijapur	Normal rainfall (mm)	48	91	84	83	166	109	25
	Rainfall 2011 (mm)	**55.4**	**27.3**	**51.0**	**66.1**	**29.4**	**26.4**	**0**

During August, rainfall was higher than normal in Sindagi (+30%) and it was lower than normal in Bijapur (-20%). Since, the rainfall is lower than normal from the beginning of the season, target area sown was less than 66% for all crops except pearl millet which was sown in 100% of the target area (Table 30) by end June.

Table 30. Window of sowing opportunities for Kharif crops during 2011-12 in Bijapur district of Karnataka under Bhoochetana project.

S.No.	District	Major rainfed crop	Sowing window of opportunity
1.	Bijapur	Maize	1st week July to 14th week September
2.		Pearl millet	4th week May to 4th week June
3.		Pigeonpea	1st week July to 2nd week August
4.		Green gram	3rd week May to 2nd week June
5.		Sunflower	4th week August to 4th week September
6.		Groundnut	1st week June to 2nd week August

Rabi Season

During rabi season, sorghum and chickpea crops were sown between 3rd and 4th weeks of September until end of October on black soils (Table 31). These crops completed their duration without considerable rainfall after germination. Hence, the crop yields are expected to be lower in the post rainy season.

Table 31. Window of sowing opportunities for Rabi crops during 2011-12 in Bijapur district of Karnataka under Bhoochetana project.

S.No.	District	Major rainfed crop	Sowing window of opportunity
1	Bijapur	Rabi Sorghum	4th week September to 4th week Oct
2		Chickpea	3rd week September to 4th week Oct

8. Chamarajanagar

Maize, sorghum, finger millet, sunflower and groundnut were the major crops selected for productivity enhancement under Bhoochetana project in Chamarajanagar district.

Table 32. Seasonal normal rainfall and actual rainfall observed in taluks of Chamarajanagara district during crop season 2011-12.

Taluk	Month	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
Kollegal	Normal rainfall (mm)	55	127	48	64	67	125	142	72
	Rainfall 2011 (mm)	**112**	**90**	**12**	**40**	**71**	**5**	**118**	**132**
Chamarajanagar	Normal rainfall (mm)	45	144	35	37	45	73	175	57
	Rainfall 2011 (mm)	**132**	**127**	**42**	**25**	**59**	**23**	**112**	**128**

It is one of the South interior Karnataka districts which receive high rainfall starting from April (Table 32) and sowing of most crops was initiated in April and completed by end of May (Table 33) even before the onset of South West monsoon on peninsular India. Groundnut, finger millet and maize crops were sown more than 100% of the target area indicating farmers' preference for these crops. But sorghum and sunflower was sown on 81% and 74% respectively against the target cropping area.

Table 33. Window of sowing opportunities for Kharif crops during 2011-12 in Chamarajanagara district of Karnataka under Bhoochetana project.

S.No.	District	Major rainfed crop	Sowing window of opportunity
1.	Chamarajanagara	Sorghum	April 1st week to may 2nd week
2.		Maize	1st week of May to end of May (Ch'rajangr., Gundalpet), 1st week of June to July (Kollegal and Yelandur)
3.		Finger millet	2nd week of June
4.		Sunflower	2nd week of April to 2nd week of May
5.		Groundnut	3rd week of April to 2nd week May, extended to June

During kharif cropping season, rainfall in July and September months was particularly deficit in all taluks. Annual rainfall during 2011 was more than normal in Chamarajanagara, and Gudalpet taluks, but in Kollegal and Yelandur taluks the annual rainfall was deficit this year. Deficit rainfall in July coincided with grain filling stages of sorghum, maize and sunflower, pod formation and filling stage of groundnut as these crops were mostly sown in the month of May, and affected crops performance.

9. Chikkaballapur

Finger millet in Chikkaballapur and Sidlagatta taluks, groundnut in Bagepally and Gudibanda taluks were the major crops in Chikkaballapur district besides pigeonpea and field beans which were grown as intercrops in either finger millet or groundnut. Bagepally and Chikkaballapur taluks in Chikkaballapur district were considered as representative taluks for rainfall analysis to assess crop prospects in the entire district. Bagepally taluk represents groundnut growing areas in the district while Chikkaballapur taluk represents ragi growing areas in the district for estimating crop productivity trends of these crops in response to rainfall and water stress conditions.

Table 34. Seasonal normal rainfall and actual rainfall observed in taluks of Chikkaballapur district during crop season 2011-12.

Taluk	Month	May	Jun	Jul	Aug	Sep	Oct	Nov
Chikkaballapur	Normal rainfall (mm)	3.6	7.0	30.2	65.3	57.1	85.1	92.9
	Rainfall 2011 (mm)	**0.20**	**0.0**	**40.8**	**46.2**	**37.7**	**69.6**	**189.1**
Bagepally	Normal rainfall (mm)	6.4	10.2	32.7	73.2	77.5	101.6	123.0
	Rainfall 2011 (mm)	**0.00**	**0.0**	**36.3**	**83.6**	**27.6**	**64.6**	**148.6**

In Chikkaballapur and Bagepally, there was no rainfall during June (Table 34). In both taluks, rainfall in July helped farmers to initiate early sowing of finger millet, groundnut and

Hybrid Maize, while maize and finger millet sowings continued until end of August in some parts of the district (Table 35). Pigeonpea as sole crop was sown quite early in 4th week of May in Chakvel mandal and in parts of Gowribidnur taluk. In Chikkaballapur taluk, deficit rainfall in the months of August (-29%), September (-34%) and October (-18%) created stress during crop growing period and grain filling stages of finger millet during the season. More than normal rainfall occurred in November must have been useful for late sown finger millet crop during grain filling stage.

Table 35. Window of sowing opportunities for Kharif crops during 2011-12 in Chikkaballapur district of Karnataka under Bhoochetana project

S. No.	District	Major rainfed crop	Sowing window of opportunity
1.		Finger millet	1st week July to 4th week August
2.		Pigeonpea (Tur)	4th week May to 4th week July
3.	Chikkaballapur	Groundnut	1st week July to 4th week July
4.		Hybrid Maize	4th week June to 4th week August
5.		Field bean (Avare)	1st week July to 4th week August

In Bagepally, above normal rainfall during July (+11%) and August (+ 14%) was favorable for good crop growth and flowering in groundnut, but deficit rainfall in September (-64%) and October (-36%) coincides with flowering and pod formation respectively had affected groundnut pod yields. Groundnut sown early in July affected by moisture stress at pod filling, however, farmers benefitted from easy harvest of groundnut crop with rains in November.

10. Chikmagaluru

Table 36. Seasonal normal rainfall and actual rainfall observed in taluks of Chikmanguluru district during crop season 2011-12.

Taluk	Month	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
Chikmagaluru	Normal rainfall (mm)	62.0	115.0	91.0	174.0	102.0	88.0	143.0	52.0
	Rainfall 2011 (mm)	**87.2**	**162.5**	**186.2**	**146.4**	**164.4**	**149.3**	**319.4**	**124**
Kadur	Normal rainfall (mm)	34.0	84.0	54.0	72.0	43.0	97.0	126.0	54.0
	Rainfall 2011 (mm)	**94.7**	**69.4**	**92.4**	**41.7**	**87.7**	**30.1**	**301**	**10.6**
Mudigere	Normal rainfall (mm)	74.0	126.0	436.0	769.0	421.0	215.0	187.0	56.0
	Rainfall 2011 (mm)	**278.4**	**280**	**1078**	**603**	**589**	**469**	**434.8**	**151**

Table 37. Window of sowing opportunities for Kharif crops during 2011-12 in Chikkamanguluru district of Karnataka under Bhoochetana project.

S. No.	District	Major rainfed crop	Sowing window of opportunity
1.		Paddy	1st week, August to 3rd week, September
2.		Finger millet	2nd week, July to 2nd week, August
3.		Sorghum	2nd week, May to 3rd week, June
4.	Chikmagalur	Maize	2nd week, June to end July
5.		Groundnut	1st week, June to 3rd week, July
6.		Green gram	2nd week, May to 3rd week June
7.		Sunflower	1st week, June to 2nd week July

Paddy, Finger millet, sorghum, maize, sunflower, groundnut and green gram are the selected crops for productivity enhancement under Bhoochetana project. In Chikamagaluru, seasonal rainfall amounts and distribution indicates wide variability and considered to have three regimes of rainfall variability. Kadur taluk is relatively low rainfall area in the district with annual rainfall >700 mm, Chikmagaluru and Tarikere taluks are similar with medium rainfall above 1200 to 1500 mm and N. R. Pura taluk annual rainfall nearly 2000 mm. High rainfall taluks are Koppa, Mudigere and Sringeri with rainfall in the range of 3500 mm to 6000mm per annum. In this district, premonsoon rainfall in the months of April and May is quite substantial (Table 36). Sorghum and green gram were sown quite early from second

fortnight of May to second fortnight of June. Paddy was sown in the months of August and September. Maize, Sunflower, and groundnut were sown in June and July (**Table 37**). Sorghum crop was sown on 69% of the target area. All other major crops were sown in 100% of the target area in the season.

11. Chitradurga

Groundnut, maize and finger millet are prominent crops selected for productivity enhancement during kharif 2011under Bhoochetana activities in Chitradurga district. Predominantly finger millet was grown in Hosdurga taluk and groundnut was grown in Challekere taluk and maize was grown mostly in Chitradurga taluk. We provided monthly rainfall data of Hosdurga taluk and Chellakere taluk to understand variability in major crops productivity of in the district. Early sowings of maize and groundnut were done with rainfall in June in all taluks of the district and sowings continued in July and August (Table 38) as the rainfall in these months were scanty and sporadic (Table 39). Finger millet and maize were sown on 99% of the target area, and groundnut was sown on 71% of the target area owing to very low rainfall during June- July. Deficit rainfall was recorded in July (-32.5%), August (-34.5) and much lesser than normal rainfall during September (-73%) month in Hosdurga. Deficit rainfall was also recorded in July (-37.8%), August (0) and much lesser than normal rainfall during September (78.3%) month in Challekere. Rainfall was low also in Hiriyur taluk in July and September, and deficit rainfall during September in Molkalmur taluk. Deficit rainfall in Challekere, Hosdurga and Hiriyur during July has potential to effect on crop establishment and growth of groundnut and maize sown during June.

Table 38. Window of sowing opportunities for Kharif crops during 2011-12 in Chitradurga district of Karnataka under Bhoochetana project.

S. No.	District	Major rainfed crop	Sowing window of opportunity
1	Chitradurga	Groundnut	2nd week June to 1st week August
2		Maize	1st week of June to last week of July
3		Finger millet	1st week of August to 2nd week, September

Table 39. Seasonal normal rainfall and actual rainfall observed in taluks of Chitradurga district during crop season 2011-12.

Taluk	Month	May	Jun	Jul	Aug	Sep	Oct	Nov
Hosdurga	*Normal rainfall (mm)*	*67*	*31*	*48*	*40*	*73*	*128*	*33*
	Rainfall 2011 (mm)	**57.4**	**36.3**	**32.4**	**26.2**	**19.7**	**176**	**19.1**
Challekere	*Normal rainfall (mm)*	*63*	*29*	*33*	*41*	*84*	*107*	*16*
	Rainfall 2011 (mm)	**49.6**	**13.7**	**20.5**	**41.1**	**18.2**	**83.3**	**6.3**

Deficit rainfall in Challekere, Hiriyur, Hosdurga and Molkalmur especially during September might have affected during grain filling phase of maize and pod filling phase of groundnut hence yield reductions were observed even with improved management of these crops.

12. Dakshina Kannada

We considered seasonal rainfall in Mangalore (normal 3609 mm) and Belthangady (normal 4509 mm) taluks as representative of lower and higher rainfall taluks in the districts for crop productivity analysis. Rainfall in Mangalore was less than normal in June and July where as it was more than normal during these months in Belthangady (Table 40). Lesser rainfall in two months had resulted in staggered transplanting extended up to September in taluks with similar rainfall situation.

In Dakshina Kannada, major crop selected for the productivity enhancement was paddy with a target of 5200 ha and 100% of the target for sowing / staggered transplanting was achieved between June and September under Bhoochetana (Table 41).

Table 40. Seasonal normal rainfall and actual rainfall observed in taluks of Dakshina Kannada district during crop season 2011-12.

Taluk	Month	May	Jun	Jul	Aug	Sep	Oct	Nov
Mangalore	*Normal rainfall (mm)*	*222*	*980*	*1101*	*680*	*303*	*181*	*73*
	Rainfall 2011 (mm)	**45**	**754.5**	**906.4**	**869.8**	**604**	**167.1**	**69.2**
Belthangady	*Normal rainfall (mm)*	163	977	1499	1037	396	256	95
	Rainfall 2011 (mm)	**75.8**	**1285**	**1149**	**966**	**557**	**344**	**186**

Table 41. Window of sowing opportunities for Kharif crops during 2011-12 in Dakshina Kannada district of Karnataka under Bhoochetana project

S. No.	District	Major rainfed crop	Sowing window of opportunity
1	Dakshina Kannada	Paddy	1st June to 30th September

13. Davanagere

In Davan**a**gere, major crops selected for productivity enhancement under Bhoochetana program were sorghum, finger millet, maize, groundnut, cotton and pigeonpea. Sowing targets were achieved for all crops between 90% for finger millet and 99% for maize with an exception of groundnut sown in 73% much less than the target area. We present rainfall distribution and variability analysis for Harapanhalli and Davangere taluks representing the district. During July and October rainfall was lower than normal in Harappanhalli, and rainfall in Davangere was more than normal all through the season from June to November

months (Table 42). Surprisingly larger periods of dry spell did not present during the crop season 2011 across all taluks in this district. Hence farmers expect bigger response of crops for the improved practice.

Table 42. Seasonal normal rainfall and actual rainfall observed in taluks of Davangere district during crop season 2011-12.

Taluk	Month	May	Jun	Jul	Aug	Sep	Oct	Nov
Harappan-	*Normal rainfall (mm)*	*97.8*	*82.6*	*101.4*	*93.8*	*144.8*	*127.0*	*42.5*
halli	Rainfall 2011 (mm)	**6.6**	**121**	**68.6**	**244.6**	**149.8**	**73.6**	**290.8**
Davangere	*Normal rainfall (mm)*	*88.1*	*75.0*	*88.2*	*74.2*	*122.1*	*117.3*	*38.3*
	Rainfall 2011 (mm)	**1.6**	**82.2**	**118.8**	**233.7**	**331.6**	**127.4**	**181.4**

Table 43. Window of sowing opportunities for Kharif crops during 2011-12 in Davangere district of Karnataka under Bhoochetana project

S. No.	District	Major rainfed crop	Sowing window of opportunity
1	Davanagere	Sorghum	2nd week of June to 1st week of July
2		Finger millet	1st week of July to 2nd week of August
3		Maize	2nd week of June to 1st week of July
4		Pigeonpea	2nd week of June to 1st week of July
5		Groundnut	1st week of July to 3rd week of July
6		Cotton	3rd week of May to 4th week of June

Sorghum, maize and pigeonpea as intercrop were sown starting from 2nd week of June to 1st week of July. Cotton sowing started quite early in 3rd week of May and were completed by end of June (Table 43). Groundnut and finger millet were sown relatively late as the cropping season commenced, but these crops were generally sown during July and August based on traditional wisdom.

Rabi Season

In Davan**a**gere district, rabi sorghum and chickpea were the major crops selected for productivity enhancement along with other minor crops of importance under Bhoochetana program. In the month of September, sorghum was sown on 83% and chickpea was sown on 64% of the target area for these crops during rabi season (Table 44).

Table 44. Window of sowing opportunities for Rabi crops during 2011-12 in Davangere district of Karnataka under Bhoochetana project.

District	Major rainfed crop	Sowing window of opportunity
Davanagere	Rabi Sorghum	2nd week to 4th week of September
	Chickpea	2nd week of September to 1st week of October

14. Dharwad

Groundnut, maize, Soybean and green gram were chosen for productivity enhancement during rainy season under this project. Kundagol and Dharwad taluks in this district represent rainfall variability pattern for rainfall during the season in Dharwad district (Table 45).

Table 45. Seasonal normal rainfall and actual rainfall observed in taluks of Dharwad district during crop season 2011-12.

Taluk	Month	May	Jun	Jul	Aug	Sep	Oct	Nov
Kundagol	*Normal rainfall (mm)*	108.5	89.1	135.7	75.6	118.1	603.3	114.6
	Rainfall 2011 (mm)	**67.9**	**103.7**	**72.5**	**73.1**	**22.7**	**397.4**	**179.1**
Dharwad	*Normal rainfall (mm)*	81.9	102.5	183.8	118.6	107.5	652.7	129.9
	Rainfall 2011 (mm)	**46.1**	**184.3**	**118**	**131.5**	**76.9**	**683.1**	**235.2**

Table 46. Window of sowing opportunities for Kharif crops during 2011-12 in Dharwad district of Karnataka under Bhoochetana project.

S.No.	District	Major rainfed crop	Sowing window of opportunity
1.	Dharwad	Maize	June to August
2.		Green gram	2rd week of May to June end
3.		Soybean	2rd week of May to June end
4.		Groundnut	1st week June to 2nd Week July

Table 47. Window of sowing opportunities for Rabi crops during 2011-12 in Dharwad district of Karnataka under Bhoochetana project.

S.No.	District	Major rainfed crop	Sowing window of opportunity
1.	Dharwad	Rabi sorghum	1st week of October to end October
2.		Chickpea	October and November

June rainfall was higher than normal in all taluks, with mean higher rainfall (+62%) for Dharwad district, facilitated sowing of all crops in June (Table 46). July rainfall in all taluks was deficit (-35%) overall, and was particularly low in Navalgund taluk. Rainfall in the month of September was particularly deficit in Kundgol and Navalgund taluks, potentially affecting maize and groundnut in critical stages as were sown in July. Good rainfall in August this season was useful for higher productivity of short season legumes sown in June and July.

Table 48. Seasonal normal rainfall and actual rainfall observed in taluks of Gadag district during crop season 2011-12.

Taluk	Month	May	Jun	Jul	Aug	Sep	Oct	Nov
Nargund	*Normal rainfall (mm)*	*71*	*75*	*75*	*54*	*129*	*129*	*28*
a	Rainfall 2011 (mm)	**18.6**	**88.4**	**46.1**	**109.6**	**25.6**	**82.4**	**0.0**
Gadag	*Normal rainfall (mm)*	*83*	*79*	*74*	*88*	*136*	*136*	*33*
	Rainfall 2011 (mm)	**63.0**	**92.1**	**59.0**	**161.3**	**30.5**	**60.4**	**0.0**

Rabi Season

Sorghum and chickpea are two important rabi crops selected for productivity enhancement under Bhoochetana project on Black soils of Dharwad. Although there was deficit rainfall situation existed in September and more than normal rainfall (+43%) in October facilitated sowing of these two crops up to 97% of the target area during October and November (Table 47). Low soil profile moisture and less follow-up rains in November and December months would affect rabi crop performance in the district.

15. Gadag

Green gram, groundnut, maize, cotton, pigeonpea and sunflower were the major crops selected for productivity enhancement under Bhoochetana project in this district. Rainfall in Nargunda and Gadag taluks was considered (Table 48) to recognize cropping conditions in Gadag district and to provide general picture of different crops performance during the season 2011-12.

Normal rainfall in the month of June helped to farmers to initiate sowings of all crops in June. Green gram sowing was initiated in late May and continued until 2nd week of June. Staggered sowing of maize, sorghum and groundnut intercropped with pigeonpea were progressed until end of July depending on the land preparation and soil moisture conditions (**Table 49**). Sunflower sowings continued until first week of August.

Table 49. Window of sowing opportunities for Kharif crops during 2011-12 in Gadag district of Karnataka under Bhoochetana project.

S.No.	District	Major rainfed crop	Sowing window of opportunity
1	Gadag	Maize	1st week June to 4th week July
2		Groundnut	1st week June to 4th week July
3		Sunflower	2nd week July to 1st week August
4		Pigeonpea(Tur)	1st week June to 4th week July
5		Sorghum	1st week June to 1st week July
6		Green gram	4th week May to 2nd week June

Rabi Season

Sorghum, chickpea and sunflower were the major crops sown in this district for productivity enhancement under Bhoochetana. In addition, wheat and rabi cotton crops were sown on

large area in this district under this program. Chickpea and sorghum sowings were initiated in the first week of October and continued until end of the month (**Table 50**). Sunflower sowing was initiated in the month of November and completed by 2nd week of December. Deficit rainfall during September (-80%) in Nargunda and (-77%) in Gadag; deficit rainfall during October (-36%) in Nargunda and (-55%) in Gadag followed by no rainfall in November in both these taluks (Table 49) must have affected crop growth due to low soil moisture in the post rainy season.

Table 50. Window of sowing opportunities for Rabi crops during 2011-12 in Gadag district of Karnataka under Bhoochetana project.

S. No	District	Major rainfed crop	Sowing window of opportunity
1.	Gadag	Chickpea	1st week, October to 4th week, November
2.		Sorghum	1st week, October to 4th week, October
3.		Sunflower	1st week, November to 2nd week, December

16. Gulbarga

Black gram, green gram, sunflower, pearl millet and pigeonpea were the major crops chosen for productivity enhancement in Gulbarga district. We presented rainfall situation for Jevargi and Gulbarga taluks from May to November during 2011 to explain the rainfall situation in the district. Sowing of all major crops were initiated in early June but progressed until August due to low rainfall (Table 51). June rainfall was less than normal in all taluks (Table 52) except Aland resulted in very low percentage of sowings (30-71%) and also affected establishment of early sown legumes.

Table 51. Window of sowing opportunities for Kharif crops during 2011-12 in Gulbarga district of Karnataka under Bhoochetana project.

S. No	District	Major crops	Sowing window of opportunity
1.	Gulbarga	Green gram	1st week of June-4th week of June
2.		Black gram	1st week of June-4th week of June
3.		Sunflower	2nd week of June-2nd week of August
4.		Pearl millet	1st week of June-4th week of June
5.		Pigeonpea	2nd week of June-4th week of July

Table 52. Seasonal normal rainfall and actual rainfall observed in taluks of Gulbarga district during crop season 2011-12.

Taluk	Month	May	Jun	Jul	Aug	Sep	Oct	Nov
Javargi	*Normal rainfall (mm)*	40	125	141.5	162.5	203	108.4	31
	Rainfall 2011 (mm)	**33.9**	**44.5**	**69.6**	**127.2**	**23.9**	**76.9**	**0.4**
Gulbarga	*Normal rainfall (mm)*	45	116	142.9	147	226	82	22
	Rainfall 2011 (mm)	**29.7**	**60.1**	**194.4**	**180.3**	**60.7**	**144.9**	**0**

Table 53. Window of sowing opportunities for Rabi crops during 2011-12 in Gulbarga district of Karnataka under Bhoochetana project.

District		Major rainfed crop	Sowing window of opportunity
1.	Gulbarga	Sorghum	4th week of September-1st week of November
2.		Chickpea	4th week of September-1st week of November

Rainfall in all taluks was particularly less than normal in September except in Aland, followed by less than normal rainfall in October in Afzalpur, Chincholi and Chitapur. Sorghum and chickpea were major crops chosen for productivity enhancement during rabi season in Gulbarga.

These crops were sown from 4th week of September to first week of November (**Table 53)**. There was no rainfall in November and December months could potentially affect pigeonpea and Rabi season crops with moisture stress resultant of less rainfall for consecutive 3 months.

17. Haveri

Maize, groundnut, soybean and cotton were the major crops selected for productivity enhancement under Bhoochetana project. In Haveri, Savanur and Ranebannur taluks were selected to represent the rainfall situation for the entire district (Table 54). Savanur has major groundnut growing areas and Ranebennur represents maize growing areas of the district.

Table 54. Seasonal normal rainfall and actual rainfall observed in taluks of Haveri district during crop season 2011-12.

Taluk	Month	May	Jun	Jul	Aug	Sep	Oct	Nov
Savanur	*Normal rainfall (mm)*	*98*	*85*	*128*	*88*	*100*	*115*	*36*
	Rainfall 2011 (mm)	**69.3**	**110.5**	**104**	**79.8**	**52.7**	**120**	**0.0**
Ranebennur	*Normal rainfall (mm)*	*88*	*69*	*97*	*62*	*86*	*117*	*36*
	Rainfall 2011 (mm)	**92.9**	**102.2**	**83.7**	**74.7**	**62.0**	**85.3**	**5.0**

Seasonal rainfall in all taluks was less than normal during 2011. June rainfall was more than normal in all taluks except Shiggaon facilitating 100% of the target area sowing between 2nd week of June to 3rd week of July in the district (**Table 55**).

Rabi sorghum, chickpea, safflower and sunflower are the major crops chosen for productivity enhancement in post-rainy season in Haveri district. Sowing of these crops was completed between 4th week of September and 4th week of October (**Table 56**).

Table 55. Window of sowing opportunities for Kharif crops during 2011-12 in Haveri district of Karnataka under Bhoochetana project.

S.No.	District	Major rainfed crop	Sowing window of opportunity
1.	Haveri	Maize	1st week of June to 4th week of July.
2.		Groundnut	2nd week of June to 3rd week of July.
3.		Soya bean	2nd week of June to 3rd week of July.
4.		Cotton	1st week of June to 3rd week of July.

Table 56. Window of sowing opportunities for Rabi crops during 2011-12 in Haveri district of Karnataka under Bhoochetana project.

S. No.	District	Major rain fed crop	Sowing window of opportunity
1.	Haveri	Rabi Sorghum	4th week, September to 4th week, October
2.		Chickpea	1st week, October to 4th week, October
3.		Safflower	4th week, September to 3rd week, October
4.		Sunflower	4th week, September to 4th week, October

Although rainfall was well distributed with large number of rainy days from July to October, rainfall was less than normal during these months and no rainfall received during November and December. As a result rabi season crops were exposed to moisture stress and productivity of these rabi season crops may be affected in Haveri district.

18. Hassan

Maize, finger millet, cowpea, green gram and sunflower were major crops selected for productivity enhancement in Hassan. Arkalguda and Hassan taluks rainfall was considered to understand rainfall situation for crop growth during 2011. Rainfall was higher than normal for May (+21% in Arkalguda, +62% in Hassan) and June ((+108% in Arkalguda, +106% in Hassan) in both taluks (**Table 57**). Farmers could sow maize and green gram on 100% of the target area, cowpea on 80% of the target area, but finger millet and sunflower was less preferred covering 38% and 50% of the target area respectively with these crops. Sowing of cowpea, green gram and maize were initiated in late May and were completed in the first fortnight of June. Sunflower sowings were done in July.

Rainfall was less than normal in July, September and October in all taluks and during November rainfall was much higher than (+251% in Arkalguda, +51% in Hassan) normal rainfall in both taluks and similar trend in rainfall was noticed in all other taluks fo the district.

Table 57. Seasonal normal rainfall and actual rainfall observed in taluks of Hassan district during crop season 2011-12.

Taluk	Month	May	Jun	Jul	Aug	Sep	Oct	Nov
Arkalgud a	*Normal rainfall (mm)*	*109*	*92*	*192*	*115*	*87*	*136*	*45*
	Rainfall 2011 (mm)	**136.2**	**192**	**96.4**	**113.3**	**47.4**	**86.6**	**157.9**
Hassan	*Normal rainfall (mm)*	*94.8*	*74.7*	*154*	*84*	*105*	*160*	*52*
	Rainfall 2011 (mm)	**153.2**	**154**	**108**	**105.2**	**39.2**	**150.2**	**78.8**

19. Kodagu

Maize and paddy were the two major crops selected for productivity enhancement under Bhoochetana project in Kodagu districts. Paddy was transplanted / direct seeded in 100% of the target area. Since it is a high rainfall area, upland paddy transplantation / direct seeding was done between end of July and end of September in a staggered manner. With high rainfall received between July to November in Madikeri and other taluks with similar rainfall pattern (**Table 58**), paddy was not exposed to any kind of water / moisture limitation.

Table 58. Seasonal normal rainfall and actual rainfall observed in taluks of Kodugu district during crop season 2011-12.

Taluk	Month	May	Jun	Jul	Aug	Sep	Oct	Nov
Madikeri	*Normal rainfall (mm)*	*150*	*589*	*1150*	*696*	*295*	*206*	*79*
	Rainfall 2011 (mm)	**72**	**778**	**848**	**866**	**540**	**151**	**53**
Sowmarpet	*Normal rainfall (mm)*	*119*	*323*	*760*	*463*	*170*	*182*	*77*
	Rainfall 2011 (mm)	**114**	**359**	**352**	**404**	**209**	**251**	**151**

Maize was mostly confined to low rainfall taluks, and sowing was completed in the months of June and July (**Table 59**) achieving 100% target sowing in the district.

Table 59. Window of sowing opportunities for Kharif crops during 2011-12 in Kodugu district of Karnataka under Bhoochetana project.

S. No.	District	Major rainfed crop	Sowing window of opportunity
1.	Kodagu	Maize	1st week June to 4th week July
2.		Paddy	4th week July to 4th week Sept

20. Kolar

Groundnut and finger millet were the major crops selected for productivity enhancement with intercrops like pigeonpea and field beans which are preferred generally by local farmers. Rainfall from May to November was reported for the taluks of Mulbagula, a predominantly groundnut growing taluk and Kolar where finger millet (ragi) is an important food and fodder crop for farmers. Finger millet is a major crop crop grown in

surrounding Srinivaspura, Malur and Bangarpet taluks. Finger millet was sown in the month of August in all taluks (**Table 60**) achieving cropping target of 56% for the entire district. Groundnut was sown in June completed 85% of the target cropping area with pigeonpea as paired row intercrop. Field bean was also sown as intercrop mostly in finger millet system.

Table 60. Window of sowing opportunities for Kharif crops during 2011-12 in Kolar district of Karnataka under Bhoochetana project.

S. No	District	Major rainfed crop	Sowing window of opportunity
1.	Kolar	Groundnut	1st week of June-4th week of June
2.		Ragi	1st week of August-4th week of August
3.		Pigeonpea	2nd week of July-2nd week of August
4.		Field bean	1st week of August-4th week of August

Rainfall in Mulbagula and Kolar was less than normal during June (-20%, -44%) and also in September (-68%, -82%) and November (-20%,-14%).

Table 61. Seasonal normal rainfall and actual rainfall observed in taluks of Kolar district during crop season 2011-12.

Taluk	Month	May	Jun	Jul	Aug	Sep	Oct	Nov
Mulbagula	*Normal rainfall (mm)*	*75*	*54*	*76*	*99*	*137*	*146*	*70*
	Rainfall 2011 (mm)	**54.1**	**45.0**	**188.2**	**99**	**43.4**	**158.3**	**55.9**
Kolar	*Normal rainfall (mm)*	*84*	*52*	*76*	*95*	*151*	*139*	*64*
	Rainfall 2011 (mm)	**95.6**	**29.4**	**100.4**	**144.8**	**26.4**	**153.6**	**55.4**

More than normal rainfall during July (+147%, +32%), August (0, +52) and October (+8%, +10%) adding to more than normal seasonal total rainfall in this district provided better growth and tillering in finger millet and good growth, flowering and pod filling in groundnut (Table 61). Although there was deficit rainfall in September, crop growth was not affected by moisture stress. Pigeonpea also completed its growth period without stress as there was near normal rainfall in the month of November.

21. Koppal

Sorghum, maize, pearl millet, sunflower, groundnut and green gram were the major crops selected for productivity enhancement under Bhoochetana in Koppal district. June rainfall in all taluks were lower than normal (Table 62)and sowings initiated in June for maize, pearl millet could achieve more than 100% of the sowing target area.

Table 62. Seasonal normal rainfall and actual rainfall observed in taluks of Koppal district during crop season 2011-12.

Taluk	Month	May	Jun	Jul	Aug	Sep	Oct	Nov
Koppal	*Normal rainfall (mm)*	*55*	*74*	*81*	*89*	*148*	*95*	*19*
	Rainfall 2011 (mm)	**47.2**	**30.4**	**153.6**	**130.3**	**35.4**	**23.4**	**1.5**
Kustugi	*Normal rainfall (mm)*	*48.0*	*59.0*	*79.0*	*77.0*	*150*	*92.0*	*21.0*
	Rainfall 2011 (mm)	**59.0**	**42.0**	**58.1**	**90.7**	**45.5**	**57.8**	**0.0**

Table 63. Window of sowing opportunities for Kharif crops during 2011-12 in Koppal district of Karnataka under Bhoochetana project.

S. No.	District	Major rainfed crop	Sowing window of opportunity
1.	Koppal	Sorghum	4th week, May to 4th week, June
2.		Maize	1st week, June to 2nd week, July
3.		Pearl millet	1st week, June to 4th week, July
4.		Sunflower	2nd week, August – 4th week, September
5.		Groundnut	1st week, June – 4th week, June
6.		Green gram	1st week, June to 2nd week, July

Although sorghum sowing started as early as in May, farmers could complete 40% of the crop coverage target area (Table 63). Groundnut and green gram sowings initiated in the first week of June continued until 2nd week of July in some place however achieved around 50% sowing target area.

22. Mandya

Cowpea, finger millet and maize were major crops selected for productivity enhancement under Bhoochetana project for this district. Cowpea sowing was initiated with rainfall in April-May and completed 89% of the target area for the crop (Table 64)). June and July rainfall in Mandya and Pandavapura was less than normal (Table 65). Maize and finger millet sowing was initiated during first week of August with near normal rainfall in this month.

Table 64. Seasonal normal rainfall and actual rainfall observed in taluks of Mandya district during crop season 2011-12.

Taluk	Month	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mandya	*Normal rainfall (mm)*	*53.8*	*49.9*	*69.4*	*145*	*176.1*	*56*	*20.9*
	Rainfall 2011 (mm)	**18.8**	**42.6**	**67.5**	**34.2**	**211**	**111.5**	**0.9**
Pandava-	*Normal rainfall (mm)*	*47.9*	*55.7*	*53.4*	*118.7*	*165.8*	*52.4*	*16*
pura	Rainfall 2011 (mm)	**24**	**32.2**	**70.1**	**34.6**	**133.3**	**117.5**	**0.7**

Deficit rainfall during September in Mandya (-76%) and Pandavapura (71%) caused setback for crop establishment for maize and tillering in finger millet. Sufficient rainfall in the months of October and November helped farmers to harvest good crops of finger millet and

maize as there was no moisture deficit during heading and grain filling stages of these cereal crops.

Table 65. Window of sowing opportunities for Kharif crops during 2011-12 in Mandya district of Karnataka under Bhoochetana project

S. No.	District	Major rainfed crop	Sowing window of opportunity
1.	Mandya	Cowpea	10th April to 9th May
2.		Finger millet	1st August to 30th August
3.		Maize	8th August to 5th September

23. Mysore

A long list of seven crops was selected in Mysore district for productivity enhancement under Bhoochetana project. Finger millet, cotton, maize and cowpea are important in terms area coverage. Each one of black gram, groundnut and sorghum were grown on less than 4000 ha in the district. All these crops were sown in the month of June as rainfall during May and June was above normal in all the taluks of the districts (Table 66). Seasonal rainfall total from June to November was higher than normal in the district, but rainfall in the month of September was deficit. Higher rainfall during August and October could provide sufficiency of soil water for plant growth without any hindrance. Rainfall in the months of October and particularly November (+427%, +527%) was higher than long term average in the district (Table 67), but this rainfall probably was not useful for any of the target crops.

Table 66. Window of sowing opportunities for Kharif crops during 2011-12 in Mysore district of Karnataka under Bhoochetana project.

S. No.	District	Major rainfed crop	Sowing window of opportunity
1		Finger millet	
2.		Sorghum	
3.		Maize	
4.	Mysore	Cowpea	1st June to 1st July
5.		Cotton	
6.		Blackgram	
7.		Groundnut	

Table 67. Seasonal normal rainfall and actual rainfall observed in taluks of Mysore district during crop season 2011-12.

Taluk	Month	May	Jun	Jul	Aug	Sep	Oct	Nov
Mysore	*Normal rainfall (mm)*	147	67	73	68	121	157	55
	Rainfall 2011 (mm)	**153.9**	**90.6**	**97.5**	**174.7**	**97.0**	**136.8**	**290.3**
Nanjanagudu	*Normal rainfall (mm)*	130.0	44.0	67.0	65.0	94.0	131.0	47.0
	Rainfall 2011 (mm)	**153.9**	**124.6**	**50.3**	**161.2**	**71.3**	**168.9**	**295.5**

24. Ramanagara

Finger millet and pigenoepea are the two major crops selected for productivity enhancement under Bhoochetana project in Ramanagara district. Ramanagara and Kanakapura taluks were considered as represent taluks to portray rainfall variability situation for the district. Rainfall useful for cropping generally occurs from April to May much before the onset of SW monsoon. Rainfall during April and May was more than normal in both taluks (Table 68) facilitating pigeonpea sowing from second week of May (Table 69) continued until end of June as the rainfall become deficit in the month of June, August and September compared to normal rainfall for these months but crops were not exposed to moisture stress as higher than normal rainfall in July and October retained sufficient soil water in the profile.

Table 68. Seasonal normal rainfall and actual rainfall observed in taluks of Ramanagara district during crop season 2011-12.

Taluk	Month	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
Ramanagara	*Normal rainfall (mm)*	44	129	69	93	102.4	192	168	61
	Rainfall 2011 (mm)	**231.1**	**170.6**	**63.2**	**132.3**	**88.3**	**71.4**	**211.2**	**63.8**
Kanakapura	*Normal rainfall (mm)*	48	128	51	67	77	151	149	48
	Rainfall 2011 (mm)	**126**	**139.5**	**22.4**	**82**	**103**	**27**	**174**	**25**

Finger millet sowing was initiated in the 2nd week of July and continued until last of August. Sowing of both crops reached 95% of the target cropping area in the district.

Table 69. Window of sowing opportunities for Kharif crops during 2011-12 in Ramanagara district of Karnataka under Bhoochetana project

S. No.	District	Major rainfed crop	Sowing window of opportunity
1.	Ramanagara	Finger millet	2nd week July to last week August
2.		Pigeonpea	2nd week May to last week June

25. Raichur

Table 70. Window of sowing opportunities for Kharif crops during 2011-12 in Raichur district of Karnataka under Bhoochetana project.

S. No.	District	Major rainfed crop	Sowing window of opportunity
1.	Raichur	Pearl Millet	15th June to 20th July
2.		Pigeonpea	15th June to 30th July
3.		Groundnut	10th June to 15 July
4.		Cotton	15 June to 30th July
5.		Sunflower	15th June to 30th July

Groundnut, pearl millet, sunflower, pigeonpea and cotton were the major crops selected under Bhoochetana programme for productivity enhancement of rainfed crops in this district. Raichur and Lingsugur taluks were considered to present rainfall situation in Raichur district and its effects on crop productivity across taluks.

During the months of June and July, rainfall was much less than normal in all taluks except Lingsugur and Sindhanur. Sowing of kharif crops were initiated from 10th of June and continued until end of July (Table 70). Rainfall receded during later part of crop season from August to November and was much less than normal (Table 71) in all taluks, and crops sown during July and August were affected at maturity.

Table 71. Seasonal normal rainfall and actual rainfall observed in taluks of Raichur district during crop season 2011-12.

Taluk	Month	May	Jun	Jul	Aug	Sep	Oct	Nov
Raichur	*Normal rainfall (mm)*	*28.8*	*93.4*	*128.9*	*125.6*	*165.8*	*80.9*	*22.8*
	Rainfall 2011 (mm)	**12.5**	**70.5**	**93.9**	**53.5**	**20.2**	**28.1**	**1.5**
Lingsugur	*Normal rainfall (mm)*	*39.9*	*62.5*	*80.2*	*30.3*	*141.4*	*77.6*	*30.3*
	Rainfall 2011 (mm)	**56.5**	**66.0**	**82.6**	**101.0**	**44.9**	**35.3**	**2.0**

Rabi season

Rabi sorghum and chickpea were the major crops selected for productivity improvement during rabi season in this district. Considering rainfall conditions from August until November, there was less probability of stored soil water in the profile for rabi season crops like chickpea and sorghum in the district. However, rabi crop sowings were sown with scanty rainfall during September and October (Table 72). These crops were provided with available lifesaving irrigation.

Table 72. Window of sowing opportunities for Rabi crops during 2011-12 in Raichur district of Karnataka under Bhoochetana project

S No	District	Major rainfed crop	Sowing window of opportunity
1.	Raichur	Rabi Sorghum	3rd week, September to 1st week, October
2.		Chickpea	3rd week, September to 2nd week, October

26. Shimoga

Paddy and maize were the major crops selected in this district for productivity enhancement under Bhoochetana during the kharif season 2011. Both these crops were sown 100% of the 16800 ha target area for paddy and 35600 ha for maize.

Table 73. Seasonal normal rainfall and actual rainfall observed in taluks of Shimago district during crop season 2011-12

Taluk	Month	May	Jun	Jul	Aug	Sep	Oct	Nov
Shimago	*Normal rainfall (mm)*	*35.2*	*139.2*	*140.2*	*157.8*	*113.6*	*144.6*	*38.6*
	Rainfall 2011 (mm)	**101.5**	**98.9**	**255.6**	**154**	**84**	**146.7**	**46.9**
Shikari	*Normal rainfall (mm)*	*49.6*	*133.4*	*182.8*	*200.8*	*136.2*	*90.4*	*22.2*
pur	Rainfall 2011 (mm)	**68.4**	**281.7**	**646.1**	**155.2**	**120.1**	**140**	**44.4**

Seasonal total rainfall from May to November in all the taluks including Shimago and Shikariput taluks was more than normal this year (Table 73). Paddy transplanting was done in high rainfall taluks of Hosanagara, Tirthahalli, Sagar, Shimago and Bhadravathi during end of June and mid-July, while paddy was direct seeded using seed drill in relatively lesser rainfall taluks of Soraba and Shikaripura. Maize was sown in June-July in lesser rainfall taluks of Soraba, Shikaripura and Bhadravathi, and to some extent even in Shimago.

27. Tumkur

Finger millet (155000 ha) and groundnut (115000 ha) were the major crops selected for productivity enhancement under Bhoochetana project along with maize in 10000 ha and green gram in 5000 ha. Sowing of finger millet in 95% of the target area and groundnut in 76% of the area was achieved during the kharif season; however green gram and maize cropping targets were achieved. Chikkanayanahalli and Pavagada taluks were considered to present rainfall situation in the district during 2011, as ragi was the major crop in Chikkanayanahalli, Gubbi and Tumkur and adjoining taluks while groundnut was a prominent crop in Koratagere, Madgiri, Pavagada and Sira taluks of Tumkur district. Seasonal total rainfall in all the taluks of Tumkur except Koratagere and Tumkur was deficit, more significantly rainfall in September was very low affecting groundnut and finger millet productivity (Table 74).

Table 74. Seasonal normal rainfall and actual rainfall observed in taluks of Tumkur district during crop season 2011-12.

Taluk	Month	May	Jun	Jul	Aug	Sep	Oct	Nov
CN Halli	*Normal rainfall (mm)*	*64.8*	*42.8*	*47.2*	*40.4*	*112*	*118.8*	*38.2*
	Rainfall 2011 (mm)	**49.5**	**45.4**	**47.5**	**45.9**	**43.9**	**123.8**	**17.7**
Pavagada	*Normal rainfall (mm)*	*57.8*	*39.8*	*46*	*52.8*	*119.3*	*110.8*	*28*
	Rainfall 2011 (mm)	**47.2**	**27.4**	**33.7**	**85.1**	**3**	**64.5**	**4.9**

Rainfall in June and July was near normal, but only groundnut sowing was completed in June while finger millet and hybrid maize sowings were progressed in July (**Table 75**).

During September, October and November rainfall receded in Pavagada where groundnut areas were affected in its critical stages hence its productivity was also affected.

Table 75. Window of sowing opportunities for Kharif crops during 2011-12 in Tumkur district of Karnataka under Bhoochetana project.

S. No.	District	Major rainfed crop	Sowing window of opportunity
1.	Tumkur	Hybrid Maize	June / July
2.		Finger millet	July
3.		Groundnut	June
4.		Green gram	4th week February to 1st week March

28. Udupi

Paddy is the single crop selected for productivity enhancement under Bhoochetana project in Udupi district and the target area was 10000 ha, and paddy transplanted in 100% of the target area. Paddy crop was either direct seeded or transplanted in different taluks of the district based on the rainfall situation. Direct seeding started in the 3rd week of May and transplanting of paddy in high rainfall taluks continued and was completed by the end of July during the kharif season (Table 76).

Table 76. Window of sowing opportunities for Kharif crops during 2011-12 in Udipi district of Karnataka under Bhoochetana project.

S. No.	District	Major rainfed crop	Sowing window of opportunity
1.	Udupi	Paddy	3rd week of May to 1st week of July.

Normal annual rainfall in Udipi is very high around 4182 mm for the entire district and during the year 2011, district mean rainfall is higher than normal at 4697 mm, an increase of 12.3%. Seasonal rainfall in Karkala, Kundapur and Udipi taluks was higher than normal at 9%, 14% and 15% respectively (Table 77). During monsoon season from June to October rainfall was higher than normal in all taluks resulting good seasonal conditions for paddy crop.

Table 77. Seasonal normal rainfall and actual rainfall observed in taluks of Udipi district during crop season 2011-12.

Taluk	Month	May	Jun	Jul	Aug	Sep	Oct	Nov
Udipi	*Normal rainfall (mm)*	*172*	*1033*	*1259*	*718*	*363*	*185*	*65*
	Rainfall 2011 (mm)	**37**	**889.9**	**1538.4**	**865.6**	**575.2**	**500.7**	**168.3**
Karkala	*Normal rainfall (mm)*	*180*	*1092*	*1649*	*977*	*433*	*302*	*123*
	Rainfall 2011 (mm)	**50.4**	**1351.2**	**1313.4**	**1183.6**	**668**	**439.8**	**213.6**

Table 78. Window of sowing opportunities for Kharif crops during 2011-12 in Uttara Kannada district of Karnataka under Bhoochetana project.

S. No	District	Major rainfed crop	Sowing window of opportunity
1.	Uttara Kannada	Paddy	3rd week of June to 2nd week of August
2.		Maize	3rd week of June to 4th week of July

29. Uttara Kannada

Paddy and maize were the two major crops selected for productivity enhancement under Bhoochetana project. Paddy crop was targeted in an area of 22000 ha. Cropping target was achieved by cropping 98% of the area between June by direct seeding in lesser rainfall taluks of Haliyal, Mundgod and Banvasi area in Sirsi, and by staggered transplanting of paddy in high rainfall taluks like Bhatkal, Hannovar, Joida and Siddapur up to first fortnight of August (Table 78). Although rainfall in May was much less than normal in all taluks, rainfall in June was more than normal in all taluks helped paddy directed seeding and followed it up by higher rainfall in July for transplantation of paddy in high rainfall areas in the district (Table 79). Maize was targeted in an area of 2000 ha and achieved 100% of cropping target area with maize sown between 3rd week of June and 4th week of July.

Table 79. Seasonal normal rainfall and actual rainfall observed in taluks of Uttara Kannada district during crop season 2011-12.

Taluk	Month	May	Jun	Jul	Aug	Sep	Oct	Nov
Hannovar	*Normal rainfall (mm)*	149	1020	1141	751	367	161	
	Rainfall 2011 (mm)	**23**	**1039**	**1300**	**1172**	**613**	**52**	
Sirsi	*Normal rainfall (mm)*	87	511	972	538	187	126	
	Rainfall 2011 (mm)	**69**	**1126**	**754**	**578**	**540**	**139**	

30. Yadgir

Sole pigeonpea, Green gram, pearl millet and sunflower were major crops selected for productivity enhancement under Bhoochetana initiative. Rainfall of Shorapur and Yadgir taluks were presented for analysis to represent the entire district (Table 80) and its effects on different crops grown in taluks of Yadgir district. Rainfall in all months from June to November was lower than normal in Shorapur taluk. Yadgir taluk received higher than normal rainfall in May, June, July and August, however, recorded very low rainfall in September and lower than normal rainfall in October.

Table 80. Seasonal normal rainfall and actual rainfall observed in taluks of Yadgir district during crop season 2011-12.

Taluk	Month	May	Jun	Jul	Aug	Sep	Oct	Nov
Shorapur	*Normal rainfall (mm)*	*28*	*103*	*128*	*140*	*180*	*126*	*24*
	Rainfall 2011 (mm)	**28**	**24.7**	**97.8**	**79.9**	**31.9**	**64.3**	**0**
Yadgir	*Normal rainfall (mm)*	*34.6*	*120.1*	*174.1*	*175*	*193*	*103*	*20*
	Rainfall 2011 (mm)	**149.4**	**146.4**	**397.1**	**285.2**	**41.6**	**72**	**0**

Pigeonpea was sown on 47366 ha exceeding the coverage of the crop by 118% to the target area. Green gram was sown less on 76% of the target area probably based on low productivity of green gram in the previous year. Green gram, pearl millet and pigeonpea sowing commenced in the 3rd week of June and staggered sowing until end July (Table 81).

Lower than normal rainfall in September and October months in the district coincided with flowering of July-sown Sunflower and June sown pigeonpea affecting these crops yields considerably.

Table 81. Window of sowing opportunities for Kharif crops during 2011-12 in Yadgir district of Karnataka under Bhoochetana project

S. No.	District	Major rainfed crop	Sowing window of opportunity
1.	Yadgiri	Green gram	3rd week of June-2nd week of July
2.		Sunflower	1st week of July-3rd week of August
3.		Pearl millet	3rd week of June-4th week of July
4.		Pigeonpea	3rd week of June-4th week of July

Rabi Season

During rabi season, sorghum and chickpea were taken with the available stored soil moisture in black soils. Sorghum sowings commenced in the last week of September and continued until end of October (Table 82).

Since rabi sorghum sowings started in the month of September farmers could sow in 100% of the target area. Chickpea sowings commenced in the 1st week of October and continued up to 2nd week of November, but could not achieve more than 51% of the target area sowing under receding soil moisture and without follow-up rains in November.

Table 82. Window of sowing opportunities for Rabi crops during 2011-12 in Yadgir district of Karnataka under Bhoochetana project.

S. No.	District	Major rainfed crop	Sowing window of opportunity
1.	Yadgir	Sorghum	4th week of September-4th week of October
2.		Chickpea	1st week of October-2nd week of November

Crop Cutting Experiments for Crop yield Estimation: A Joint Evaluation

Joint team of official from DoA, DES, UAS Scientists along with ICRISAT Technicians adopted a uniform crop sampling procedure across all districts for cutting crop samples to estimate yields. The instructions followed were as follows.

- Identify all farmers who are registered / took the inputs from RSKs and applied in their designated fields and sown selected major crop. This was ascertained through RSK bills and FFs who facilitated the farmer in the village to register / get the inputs.
- At taluk level, ADA / AO ensured in preparing the total list of those identified farmers along with ICRISAT Research Technician and FFs / LFs in the villages.
- Pool up the list of farmers at district level to facilitate further monitoring and evaluations.
- At taluk level, ICRISAT staff / AO / ADA made at least two field visits in the cropping season to randomly select farmers' fields those coincide with the end of vegetative phase and flowering or maturity phase.
- In these phases, field photos showing crop growth differences in individual farmer's fields were obtained as a record for verification.
- At the time of crop harvest, JDA office prepared farmers' list for crop sampling randomly selecting farmers' fields which also had farmers' management treatment in the same farmer's field.
- Crop sampling was done only in the randomly selected farmers' fields in each village.

Figure 32a. Finger millet crop sampling in Chikballapur district

Figure 32b. Green gram crop sampling in Bidar district.

Procedure for Field Selection for Sampling

- 10 farmers' fields in each taluk were considered for crop sampling, and collected samples in both farmers' management and improved management as advised in Bhoochetana guidelines. If both treatments are not present in one farmer's field, farmers'management samples were collected from neighbouring farmer's field.
- A minimum of three randomly selected samples in each treatment from a farmer's field with a minimum sample size of 9 m^2 or even more crop area based on crop row orientation. The aggregated sample should be a minimum of 27 m^2 or more crop area for each treatment in a field.
- Enough precautions were taken to select unbiased representative crop samples from farmers' field.
- Total fresh weight of each sample (9 m^2 or more) was measured for three samples, and a sub-sample of 10-15 whole plants weighing up to 2 to 3 kg fresh weight was collected, weighed for recording fresh weight of sub-sample.
- In this process, we collected one sub-sample each from farmers' management and improved BC management of a farmers' field for moisture estimation and yield components estimation.
- The whole plant sub-samples were processed to separate pods and haulms or ear-heads and stalk.
- Thus collected two plant parts were properly labeled and bagged in Kora cloth bags (pod or ear head) and muslin cloth bags (stalk) by ICRISAT Technicians and air /sun-dryed for two to three days, and were sent to ICRISAT Patancheru Campus for further processing and yield estimations.
- At ICRISAT, these plant samples were dried at constant temperature of 65-70º C for 48 hrs in stabilized dryers and dry weights were recorded.
- Grain/pod attributes were measured to understand quality and marketability of the produce.
- Although mean crop yields are provided for the purpose of summaries, individual farmers-wise crop yields are also provided to the DoA officials for field verification.

Some subsamples of whole plant randomly collected were retained for processing by DoA staff which might serve as a counter check for yield estimations provided by ICRISAT.

Results of Participatory Crop Yield Estimation

Rainy Season Crop Yields

Bagalkot

Green gram

Green gram is an important short season legume sown on 8500 ha in Badami and Hungund taluks of Bagalkot during kharif 2011. In Badami taluk green gram grain yield was less in farmers' management (FM) as well as improved management (IM) due to low rainfall in July which was crucial for May-June sown green gram at its pod filling stage. Grain yield with improved management was 280 kg ha^{-1}, an increase of 48% compared to 190 kg ha^{-1} under farmers' management (Table 83). Fodder yield was also higher with IM by 240 kg ha^{-1} compared to FM by 42%. Green gram haulms are used as cattle fodder in the region. In Humgund taluk green gram grain yield was better in both treatments, and enhanced grain yield of 340 kg ha^{-1} was observed with improved management compared to 300 kg ha^{-1} in farmers' management which was an increase of 40%. A mean increase of 44% in grain yield was estimated for the entire district. In Bagalkot, application of micronutrients was higher based on fertilizer distribution statistics (81% area coverage) under Bhoochetana project and hence green gram grain yield increase of 44% lead to an estimated increase in production of 757 tons green gram in the district even in dry season with Bhoochetana interventions.

Table 83. Green gram yield (kg ha^{-1}) with improved management compared to farmers' management in different taluks of Bagalkot district during Kharif 2011.

		Farmers' Management			Improved Management			% increase over FM		
Crop	**Taluk**	**TDM**	**Fodder**	**Grain**	**TDM**	**Fodder**	**Grain**	**TDM**	**Fodder**	**Grain**
Green gram	Badami	870	570	190	1270	810	280	46	42	48
	Hungund	1300	860	300	1810	1200	420	39	40	40
Mean		**1030**	**680**	**230**	**1470**	**960**	**340**	**43**	**41**	**44**

Maize

Maize is the most important food and fodder crop in Bagalkot with largest target area of 27800 ha sown, clearly indicates farmers' interest in this crop. Maize grain yield was estimated from Bagalkot and Jamakandi taluks. Maize grain yield in both the managements was higher in the range of 4 to 7 tons ha^{-1} during kharif season, and grain yield was higher in Bagalkot than in Jamakandi. Mean grain yield of 4530 kg ha^{-1} was observed with farmers' management compared to higher mean grain yield of 6050 kg ha^{-1} with improved

management, and that is an increase of 33% (Table 84) with IM over FM. Due to IM, farmers in this district was expected to harvest an additional maize production of 33550 tons during this season benefited by Bhoochetana interventions. Similarly fodder yield was 3610 kg ha^{-1} with farmers' management compared to mean fodder yield higher at 4540 kg ha^{-1}, an increase of 26% fodder availability with improved management.

Table 84. Maize yield (kg ha^{-1}) with improved management compared to farmers' management in different taluks of Bagalkot district during Kharif 2011.

		Farmers' Management			Improved Management			% increase over FM		
Crop	Taluk	TDM	Fodder	Grain	TDM	Fodder	Grain	TDM	Fodder	Grain
Maize	Bagalkot	9520	2920	5270	12500	4220	6840	31	45	30
	Jamakandi	9430	3780	4380	11890	4620	5850	26	22	33
Mean		**9450**	**3610**	**4560**	**12010**	**4540**	**6050**	**27**	**26**	**33**

Pearl millet

Pearl millet was grown on 15000 ha particularly in Badami and Hungund taluks of Bagalkot district. It is a short duration cereal grown for its grain fit for human consumption and fodder as cattle feed. Pearl millet grain yield was higher this season with farmers' management as well as improved management. An increase of nearly 1360 kg ha^{-1} of grain yield was observed in IM treatment compared to FM in the district (Table 85). Pearl millet mean grain yield was 3230 kg ha^{-1} in FM compared to mean grain yield in IM was 4590 kg ha^{-1} that is an increase of 42% in grain yield. With Bhoochetana interventions, it is estimated that farmers in this district had harvested an additional production of 16400 tons of pearl millet during the crop season. An increase in fodder yield of almost 2340 kg ha^{-1} was also observed with IM compared to FM in the district during crop season 2011.

Table 85. Pearl millet yield (kg ha^{-1}) with improved management compared to farmers' management in different taluks of Bagalkot district during Kharif 2011.

Crop	**Taluk**	**Farmers' Management**			**Improved Management**			**% increase over FM**		
		TDM	**Fodder**	**Grain**	**TDM**	**Fodder**	**Grain**	**TDM**	**Fodder**	**Grain**
Pearl Millet	Badami	11740	6730	3400	16060	9150	4790	37	36	41
	Hungund	9600	5520	2950	13670	7740	4240	42	40	44
Mean		**10940**	**6280**	**3230**	**15170**	**8620**	**4590**	**39**	**37**	**42**

Soybean

Soybean is primarily an oilseed crop rich in seed protein crop grown on 1500 ha in the district under Bhoochetana. Soybean crop yield during this season was low in both the treatments owing to seasonal conditions. Soybean mean grain yield with farmers'

management across three taluks was 950 kg ha^{-1}. Soybean mean grain yield with improved management was 1460 kg ha^{-1}, a gain of 610 kg ha^{-1} compared to farmers' management (Table 86). It is 55% yield increase even in drier seasons over farmers' management. With Bhoochetana interventions, it is estimated that farmers in this district had harvested an additional production of 620 tons of Soybean during the season. Corresponding increase in mean biomass (1250 kg ha^{-1}) and mean plant biomas (500 kg ha^{-1}) yield of soybean was estimated in response to improved management over farmers' management.

Table 86. Soybean yield (kg ha^{-1}) with improved management compared to farmers' management in different taluks of Bagalkot district during Kharif 2011.

Crop	Taluk	Farmers' Management			Improved Management			% increase over FM		
		TDM	Fodder	Grain	TDM	Fodder	Grain	TDM	Fodder	Grain
Soybean	Badami	1990	650	940	3080	950	1520	55	46	61
	Jamakandi	2920	1590	900	4260	2240	1370	46	41	51
	Mudol	2490	720	1250	3670	970	1920	47	35	54
Mean		**2570**	**1200**	**950**	**3820**	**1700**	**1460**	**48**	**42**	**55**

Sunflower

Sunflower is an oilseed crop grown on 6200 ha in the district and the crop was grown in kharif purely as rainfed. Sunflower mean seed yield recorded in farmers' management was 2180 kg ha^{-1} compared to 31% increase in mean seed yield at 2860 kg ha^{-1} with improved management (Table 87). Improved management comprises of application of deficient micronutrients and sulfur along with balanced application of major nutrients as per recommendation. All the farmers adopted improved varieties of sunflower in both the treatments.

In Bagalkot district, legumes cereals and oilseeds performed well during the season with a mean yield increase above 30%for all crops and up to 55% for soybean. It is estimated that farmers in this district are benefitted by larger crop area applied (81% of target area) with nutrients under Bhoochetana scheme to harvest an additional 3365 tons sunflower crop.

Table 87. Sunflower yield (kg ha^{-1}) with improved management compared to farmers' management in different taluks of Bagalkot district during Kharif 2011.

Crop	Taluk	Farmers' Management			Improved Management			% increase over FM		
		TDM	Fodder	Grain	TDM	Fodder	Grain	TDM	Fodder	Grain
Sun	Hungund	14800	12050	1770	18340	14860	2270	24	23	28
flower	Jamakandi	12620	7740	2810	16560	10100	3750	31	31	34
Mean		**13920**	**10320**	**2180**	**17630**	**12960**	**2860**	**27**	**26**	**31**

Belgaum

Soybean

Soybean was grown on the largest area of 64500 ha under Bhoochetana for any one crop in Belgaum district; hence its productivity is important. Soybean seed yield in FM and IM treatments was more than district long-term average. Sunflower seed yield estimated in Hukkeri and Chikkodi taluks under farmers' management was nearly 1850 kg ha^{-1}, and seed yield under improved management was around 2330 kg ha-1 (Table 88). Seed yield increase due to improved management in Hukkeri and Chikkodi taluks were 25% and 27% respectively.

Micronutrient fertilizers used by farmers based on distribution statistics in the district was 42% of Gypsum, 62% of ZnSO4 and 27% Borax of the total requirement. With mean increase of 26% in soybean grain yield, it is estimated that an additional production 2340 tons of soybean occurred in the district.

Table 88. Soybean yield (kg ha^{-1}) with improved management compared to farmers' management in different taluks of Belgaum district during Kharif 2011.

Crop	Taluk	Farmers' Management			Improved Management			% increase over FM		
		Grain	Fodder	TDM	Grain	Fodder	TDM	Grain	Fodder	TDM
Soybean	Hukkeri	1860	4440	6310	2330	5790	8120	25	30	29
	Chikkodi	1850	3060	4910	2350	4160	6500	27	36	32
Mean		**1855**	**3750**	**5610**	**2340**	**4980**	**7310**	**26**	**33**	**31**

Maize

Maize crop was grown on 29500 ha, the second largest area for this crop in Belgaum district under Bhoochetana programme. Maize grain yield in Belgaum in FM and IM was higher due to better seasonal conditions. Mean grain yield of maize estimated for Hukkeri and Chikkodi taluks in farmers' management was 4770 kg ha^{-1}, and an increase in grain yield up to 6150 kg ha^{-1} with improved management (**Table 89**). An increase in fodder yield up to 1740 kg ha^{-1} was also estimate with improved management, and farmers gained out of additional fodder availability.

Table 89. Maize yield (kg ha^{-1}) with improved management compared to farmers' management in different taluks of Belgaum district during Kharif 2011.

Crop	Taluk	Farmers' Management			Improved Management			% increase over FM		
		Grain	Fodder	TDM	Grain	Fodder	TDM	Grain	Fodder	TDM
Maize	Hukkeri	4710	6350	11060	6110	8120	14230	30	28	29
	Chikkodi	4830	6030	10860	6200	7750	13950	28	28	28
Mean		**4770**	**6190**	**10960**	**6150**	**7930**	**14090**	**29**	**28**	**29**

Mean grain yield increase of 29% and mean fodder yield increase of 28% was observed compared to farmers' managed maize in the district under Bhoochetana interventions (**Table 89**). With mean increase of 29% in maize grain yield and 28% in maize fodder yield, it is estimated that an additional production of 7508 tons of maize grain and 9396 tons of fodder was available in the district.

Groundnut

Groundnut was grown on 15000 ha during kharif as rainfed under Bhoochetana programme. Pod yield of groundnut was estimated around 2200 kg ha^{-1} in Hukkeri taluk and 2120 kg ha^{-1}in Chikkodi taluk. In these taluks pod yield with improved management was estimated around 2900 kg ha^{-1} and 2700 kg ha^{-1} respectively (Table 90). A mean increase of 30% in pod yield was observed due to improved management under Bhoochetana program in the district. Groundnut haulms are fodder for animals in the district. Groundnut fodder yield mean increase of 720 kg ha^{-1} (25%) was also estimated with improved management under Bhoochetana in the district. It is estimated that an increase in groundnut production up to the tune of….tons in the district by use of improved managements along with micronutrients in 27%of the target area under Bhoochetana in the district.

Table 90. Groundnut yield (kg ha^{-1}) with improved management compared to farmers' management in different taluks of Belgaum district during Kharif 2011.

Crop	Taluk	Farmers' Management			Improved Management			% increase over FM		
		Pod	Fodder	TDM	Pod	Fodder	TDM	Pod	Fodder	TDM
Groundnut	Hukkeri	2200	2730	4930	2910	3470	6390	33	27	30
	Chikkodi	2120	3020	5150	2690	3740	6430	27	24	25
Mean		**2160**	**2880**	**5040**	**2800**	**3610**	**6410**	**30**	**25**	**27**

Bellary district

Groundnut

Groundnut was grown on 28066 ha in the district which was more than (101%) the initial target area 27800 ha set for this crop under Bhoochetana in the district. Groundnut pod yield during the season was much lower due to low rainfall and unfavorable seasonal conditions during August in Bellary and Hadagali taluks followed by deficit rainfall during September and October in all these taluks affected groundnut crop during flowering and its pod filling stages in groundnut growing taluks of HB halli, Hadagali and Hospet in of Bellary district. Pod mean yield was low at 430 kg ha^{-1} under farmers' management and it was also less at 610 kg ha^{-1} under improved management in these three taluks. However, groundnut pod

yield was better in both treatments due to good response of groundnut for more than normal rainfall during October in Sandur taluk (Table 91).

Table 91. Groundnut yield (kg ha^{-1}) with improved management compared to farmers' management in different taluks of Bellary district during Kharif 2011.

Crop	Taluk	Farmers' Management			Improved Management			% increase over FM		
		TDM	Fodder	Pod	TDM	Fodder	Pod	TDM	Fodder	Pod
Ground-nut	H.B. halli	850	530	320	1120	680	440	32	28	38
	Hadagali	2210	1570	650	3120	2200	920	41	40	42
	Hospet	1040	720	320	1400	940	460	35	31	44
	Kudligi	2040	1180	870	2670	1490	1180	31	27	36
	Sandur	3130	1910	1220	4150	2230	1930	33	17	58
Mean		**1910**	**1180**	**730**	**2540**	**1500**	**1040**	**33**	**27**	**43**

Mean pod yield under farmers' management was at 730 kg ha-1 and with improved management it was estimated at 1040 kg ha-1, that tantamount to an increase of 43% in pod yield for the district. It is estimated that 1120 tons of additional pod production was done in Bellary even under adverse seasonal conditions in all taluks except Sandur due to improved management under Bhoochetana project.

Maize

Maize was sown in an area of 33332 ha, more than (104%) target for the crop in the district due to higher preference by farmers. Over all, maize productivity with farmers' management and improved management was low due to the seasonal conditions especially deficit rainfall during September and October in most of the taluks. Deficit rainfall synchronized with maize silking and grain filling resulted in low grain yield. Mean grain yield of maize was 1440 kg ha-1 with farmers' management and it was higher at 1990 kg ha^{-1} which is a mean increase of 38% in grain yield over farmers' management even under unfavorable seasonal conditions (Table 92). There was an increase of 720 kg ha^{-1} in fodder yield at 1950 kg ha^{-1} in FM to 2670 kg ha^{-1} in IM. As a result of maize yield increase due to Bhoochetana interventions, it is estimated that an additional maize production to the tune of 2288 tons in Bellary district in addition to increase fodder availability.

Table 92. Maize yield (kg ha^{-1}) with improved management compared to farmers' management in different taluks of Bellary district during Kharif 2011.

Crop	Taluk	Farmers' Management			Improved Management			% increase over FM		
		TDM	Fodder	Grain	TDM	Fodder	Grain	TDM	Fodder	Grain
Maize	H.b.halli	4200	3340	720	5480	4180	1060	30	25	47
	Hadagali	3640	1280	1970	5210	1790	2760	43	39	40
	Hospet	4100	2040	1470	5360	2590	2030	31	27	38
	Kudligi	4230	2170	1730	6140	3240	2310	45	49	33
	Sandur	1960	1380	490	2710	1870	730	38	36	49
Mean		**3710**	**1950**	**1440**	**5180**	**2670**	**1990**	**39**	**37**	**38**

Pigeonpea

A small area of 4098 ha was sown to pigeonpea in Bellary and it was 95% of the target area (4300 ha) in the district during 2011. Pigeonpea grain yield was low due to seasonal conditions in farmers' management as well as with improved management. Mean grain yield was low at 620 kg ha^{-1} in farmers' management and was 920 kg ha^{-1} in improved management. There was an increase in grain yield at 300 kg ha^{-1} (49%) with improved management under unfavourable seasonal conditions (Table 93). Due to increase in grain yield with use of recommended nutrients including micronutrients, 168 tons of pigeonpea was produced additionally in the district.

Table 93. Pigeonpea yield (kg ha^{-1}) with improved management compared to farmers' management in different taluks of Bellary district during Kharif 2011.

Crop	Taluk	Farmers' Management			Improved Management			% increase over FM		
		TDM	Fodder	Grain	TDM	Fodder	Grain	TDM	Fodder	Grain
Pigeon pea	H B halli	2390	1350	600	3330	1870	870	39	39	45
	Hadagali	5400	3830	980	7650	5350	1480	42	40	51
	Kudligi	2060	1590	260	3050	2360	380	48	49	44
Mean		**3540**	**2510**	**620**	**5060**	**3570**	**920**	**43**	**42**	**49**

Sorghum

Sorghum was sown in an area of 5345 ha that was 89% of the target area of 6000 ha in the district. Sorghum grain yield was affected by low rainfall during September and October in HB halli, Hadagali and Kudligi taluks, and in Sandur taluk grain yield was much higher in both treatments due rainfall more than normal in September and October. In deficit rainfall situation and more than normal rainfall situation, there was clear difference in mean grain yield between farmers' management and improved management in every taluk. Over all, mean grain yield at 1960 kg ha^{-1} was estimated under farmers' management while mean grain yield of 2790 kg ha^{-1} was observed under improved management that is 42% increase in grain yield for the district (Table 94). Similarly increase fodder yield at 4000 kg ha^{-1} was observed with improved management compared to fodder yield at 2870 kg ha^{-1} from farmers' management.

Table 94. Sorghum yield (kg ha^{-1}) with improved management compared to farmers' management in different taluks of Bellary district during Kharif 2011.

Crop	Taluk	Farmers' Management			Improved Management			% increase over FM		
		TDM	Fodder	Grain	TDM	Fodder	Grain	TDM	Fodder	Grain
Sorghum	H.B.halli	4760	2460	1810	6980	3500	2670	47	43	48
	Hadagali	4710	2100	1980	6830	2970	2920	45	42	47
	Kudligi	4900	2390	1740	6880	3390	2540	40	42	46
	Sandur	9770	6220	2660	12610	8280	3280	29	33	23
Mean		**5500**	**2870**	**1960**	**7710**	**4000**	**2790**	**40**	**39**	**42**

There was an additional yield of fodder increase at 1130 kg ha^{-1} (39%) due to use of balanced nutrient management in the district. Improved fodder productivity due to Bhoochetana program enhanced fodder availability in the district. With increase in sorghum productivity, it is estimated than 647 tons of sorghum grain was additionally produced in the district during the kharif 2011.

Sunflower

Sunflower is an important oil seed crop sown on smaller area of 1700 ha out of the target area of 2000 ha (85%) in Siriguppa taluk of the district. Sunflower seed yield was estimated at 1880 kg ha^{-1} in farmers' management, and there was an increase of 41% in seed yield at 2650 kg ha^{-1} under improved management compared to farmers' management (**Table 95**).

Table 95. Sunflower yield (kg ha^{-1}) with improved management compared to farmers' management in different taluks of Bellary district during Kharif 2011.

Crop	Taluk	Farmers' Management			Improved Management			% increase over FM		
		TDM	Fodder	Grain	TDM	Fodder	Grain	TDM	Fodder	Grain
Sunflower	Siruguppa	5620	2710	1880	7800	3780	2650	39	39	41
Mean		**5620**	**2710**	**1880**	**7800**	**3780**	**2650**	**39**	**39**	**41**

Due to improved seed yield of sunflower with the application of balanced nutrients including of micronutrients, additionally 200 tons of sunflower was produced in the district.

Bengaluru Urban

Finger millet

In Bengaluru Urban, finger millet was the major crop selected for productivity enhancement, was sown to 100% of the target area of 11200 ha under Bhoochetana program. Finger millet is traditionally considered as low input crop and farmers conceive that this crop requires lesser inputs. However, in Bengaluru Urban balanced application of macro and micronutrient fertilizers like Gypsum at 63%, ZnSO4 at 48% and Borax at 83% to the target area was achieved. With favourable rainfall in all the taluks of the district, grain yield was more than long term district average in both the treatments. Finger millet yield estimation was made in Anekal, Bengaluru East, Bengaluru North and Bengaluru South taluks of the district. Finger millet mean grain yield estimated was 2180 kg ha^{-1} with farmers' management, and 2930 kg ha^{-1} with improved management, an increase in mean grain yield was 34% across all taluks (Table 96).

Table 96. Finger millet yield (kg ha^{-1}) with improved management compared to farmers' management in different taluks of Bengaluru Urban district during Kharif 2011.

Crop	Taluk	Farmers' Management			Improved Management			% increase over FM		
		TDM	Fodder	Grain	TDM	Fodder	Grain	TDM	Fodder	Grain
Finger millet	Anekal	11480	7730	2520	16140	10850	3340	41	40	32
	B'East	11370	7290	2730	17330	12070	3660	52	66	34
	B'North	10560	7340	2100	14230	9730	2860	35	32	36
	B'South	10670	7430	1810	13000	9020	2400	22	21	33
Mean		**10870**	**7450**	**2180**	**14640**	**10010**	**2930**	**35**	**34**	**34**

Similarly finger millet fodder was also estimated at 7450 kg ha-1 under farmers' management while fodder yield under improved management was estimated at 10010 kg ha-1. With increase (34%) in mean grain yield, additionally 4032 tons of finger millet grain was produced in the district besides increased fodder availability.

Bengaluru Rural

Finger millet

Finger millet was the major crop sown to 30000 ha in the district and achieved 100% of the target area for this crop under Bhoochetana project. Finger millet grain yield was estimated to be moderately better and more than long-term district average productivity of the crop during 2011 season at mean grain yield of 1930 kg ha^{-1} in the farmers' management as well as mean grain yield of 2610 kg ha^{-1} in the improved management due to moderate seasonal conditions (Table 97).

Table 97. Finger millet yield (kg ha^{-1}) with improved management compared to farmers' management in different taluks of Bengaluru Rural district during Kharif 2011.

Crop	Taluk	Farmers' Management			Improved Management			% increase over FM		
		TDM	Fodder	Grain	TDM	Fodder	Grain	TDM	Fodder	Grain
Finger millet	Devanahalli	10010	6460	2310	12970	7970	3090	30	23	34
	Doddaballapura	6030	3350	1820	7830	4360	2490	30	30	37
	Hoskote	9660	6510	1790	12730	8570	2410	32	32	34
	Nelamangala	6690	3630	1780	8830	4740	2460	32	31	38
Mean		**8100**	**4990**	**1930**	**10590**	**6410**	**2610**	**31**	**29**	**35**

With an improvement of grain yield of 680 kg ha^{-1} in improved management, tantamount to 35% increase in grain yield over farmers' management, there was additional 7344 tons of finger millet grain was produced in the district. Fodder yield increase by 29% at 6410 kg ha^{-1} under improved management compared to fodder yield at 4990 kg ha^{-1} under farmers' management. Fodder yield increase of nearly 1480 kg ha^{-1} increased fodder availability in the district.

Maize

Maize was targeted on 5600 ha under Bhoochetana programme in the district and achieved 100% sowing of the target area for this crop. Maize crop was moderately affected by low rainfall and moisture stress in September. However, there was a clear difference in maize mean grain yield by 1000 to 1500 kg ha-1, which is 24% increase with improved management (5780 kg ha-1) compared to farmers' management (4650 kg ha-1) in Doddaballapura and Nelamangala taluks of the district (Table 98).

Table 98. Maize yield (kg ha^{-1}) with improved management compared to farmers' management in different taluks of Bengaluru Rural district during Kharif 2011.

Crop	Taluk	Farmers' Management			Improved Management			% increase over FM		
		TDM	Fodder	Grain	TDM	Fodder	Grain	TDM	Fodder	Grain
Maize	Doddaballapura	8860	3870	4200	12250	5400	5510	38	40	31
	Nelamangala	11900	5950	5090	15440	8440	6060	30	42	19
Mean		**10380**	**4910**	**4650**	**13850**	**6920**	**5780**	**33**	**41**	**24**

Similar increase in fodder yield was estimated at 6920 kg ha^{-1} under improved management compared to 4910 kg ha^{-1} under farmers' management, and it was 41% increase in fodder yield. Maize grain yield increased with improved management even under moderate moisture stress situation when farmers applied recommended dose of nutrients under Bhoochetana programme. Due to implementation of improved technologies in the district it was estimated that an increase of 2278 tons of additional maize grain yield was produced by farmers, and an additional fodder yield around 1000 kg ha^{-1} was also produced which amounts an additional 5600 tons of fodder production in the district.

Bidar

Black gram

Black gram cultivation is traditionally preferred by farmers during kharif in the district and it was sown on 20848 ha against target area of 28480 ha achieved 73% of the target. In Bidar district, 13.8% of Gypsum, 36.1% of ZnSO4 and 32.4% of Borax to the target requirement as per recommendation was distributed to farmers and was applied to selected crops under Bhoochetana project.

Black gram mean grain yield was estimated at 820 kg ha^{-1} with farmers' management and it was an increase of 33% at 1090 kg ha^{-1} grain yield with improved management under Bhoochetana programme, due to balanced application of micro and macro nutrients at the recommended dosage (Table 99). With increase of black gram grain yield by 33%, it was

estimated that 1061 tons of black was additionally produced in the district under Bhoochetana project, providing additional income to farmers as grain fetches higher market price per quintal of grain.

Table 99. Black gram yield (kg ha^{-1}) with improved management compared to farmers' management in different taluks of Bidar district during Kharif 2011.

Crop	Taluk	Farmers' Management			Improved Management			% increase over FM		
		TDM	Fodder	Grain	TDM	Fodder	Grain	TDM	Fodder	Grain
Black gram	Aurad	2590	1240	910	3450	1640	1230	33	32	35
	Bhalki	2570	1370	770	3620	2010	980	41	47	27
	Bidar	2330	1160	800	3220	1630	1080	38	40	36
Mean		**2480**	**1250**	**820**	**3410**	**1750**	**1090**	**37**	**40**	**33**

Green gram

Green gram is another short season pulse crop grown on 16624 ha during the season, a short fall of 30% in target sowing area against targeted cropping area of 24812 ha, due to lesser interest in farmers due to poor yield of this crop in the previous year. Green gram grain yield was estimated to better under both treatments during this season owing to good seasonal conditions for this crop in Bhalki and Bidar, however heavy rainfall during August had affected crop in Aurad.

Mean grain yield of green gram was 810 kg ha^{-1} with farmers' management and 1120 kg ha^{-1} with improved management, that is 39% increase in yield over farmers' management. Green gram haulms are used as fodder for cattle in the district, hence fodder increase up to 23% at 1140 kg ha^{-1} in improved management compared to 920 kg ha^{-1} in farmers' management (Table 100). Based on 39% increase in grain yield of green gram with IM, it is estimated that 1061 tons of additional grain was produced in the district under Bhoochetana initiative. Similarly green gram fodder is also additionally available in the district due to Bhoochetana programme.

Table 100. Green gram yield (kg ha^{-1}) with improved management compared to farmers' management in different taluks of Bidar district during Kharif 2011.

Crop	Taluk	Farmers' Management			Improved Management			% increase Over FM		
		TDM	Fodder	Grain	TDM	Fodder	Grain	TDM	Fodder	Grain
Green gram	Aurad	1800	900	590	2440	1160	870	35	29	47
	Bhalki	2040	870	860	2590	1060	1130	27	21	32
	Bidar	2220	980	930	3400	1180	1310	53	21	41
Mean		**2040**	**920**	**810**	**2870**	**1140**	**1120**	**40**	**23**	**39**

Pigeonpea

Pigeonpea is one of the major crops in Bidar grown as a sole crop and also as intercrop by farmers with high input management. Pigeonpea was grown on 40217 ha almost 98% of the target area for the crop in this district. Although pigeonpea grain yield was low with both treatments due to deficit rainfall in September, October and November caused terminal stress for this crop. Grain yield under improved management was higher by 30% at 1030 kg ha^{-1} compared to 790 kg ha^{-1} under farmers' management (Table 101). It was estimated that around 1359 tons of pigeonpea grain was additionally produced with improved management under Bhoochetana project in Bidar.

Table 101. Pigeonpea yield (kg ha^{-1}) with improved management compared to farmers' management in different taluks of Bidar district during Kharif 2011.

Crop	Taluk	Farmers' Management			Improved Management			% increase over FM		
		TDM	Fodder	Grain	TDM	Fodder	Grain	TDM	Fodder	Grain
Pigeon pea	Aurad	2870	1780	700	3840	2330	910	34	31	30
	Bhalki	4480	3050	940	5870	4010	1190	31	32	27
	Bidar	3160	2060	690	4160	2600	940	31	26	35
Mean		**3600**	**2370**	**790**	**4750**	**3080**	**1030**	**32**	**30**	**30**

Sorghum

Sorghum was sown on 27985 ha covering 75% of the target area for this crop under Bhoochetana project in Bidar district. Sorghum yield was estimated in Bhalki and Bidar taluks of the district. Sorghum grain and fodder yield during the season was above long-term average yields for sorghum in this district. An increase in mean grain yield of 35%was observed. Mean grain yield was 2800 kg ha^{-1} with improved management and grain yield was low at 2080 with farmers' management (Table 102). With grain yield improvement around 35%, additional 3708 tons of sorghum grain was additionally produced in the district. Sorghum fodder is also an important component of yield as it is feed to the cattle in India. An increase in fodder yield up to 540 kg ha^{-1} with improved management compared to farmers' management provided additional fodder availability in the district.

Table 102. Sorghum yield (kg ha^{-1}) with improved management compared to farmers' management in different taluks of Bidar district during Kharif 2011.

Crop	Taluk	Farmers' Management			Improved Management			% increase over FM		
		TDM	Fodder	Grain	TDM	Fodder	Grain	TDM	Fodder	Grain
Sorghum	Bhalki	5580	2730	2300	7780	3840	3150	39	41	37
	Bidar	3820	1330	1930	4700	1480	2570	23	12	33
Mean		**4520**	**1890**	**2080**	**5930**	**2430**	**2800**	**31**	**29**	**35**

Soybean

Soybean was grown on 35059 ha, much higher (159%) than the target area 22050 ha in the district which indicates renewed interest of farmers for this commercial oilseed crop. Soybean crop yield in both treatments were more than the long-term average for the district. Mean seed yield of Soybean was 1860 kg ha^{-1} with farmers' management while increased mean seed yield (36%) at 2530 kg ha^{-1} was estimated under improved management with balanced application of macro and micronutrients (Table 103) as successful interventions in Bhoochetana project. It is estimated that additionally 2039 tons of Soybean grain was produced with increased productivity at 36% due to Bhoochetana interventions.

Table 103. Soybean yield (kg ha^{-1}) with improved management compared to farmers' management in different taluks of Bidar district during Kharif 2011.

Crop	Taluk	Farmers' Management			Improved Management			% increase over FM		
		TDM	Fodder	Grain	TDM	Fodder	Grain	TDM	Fodder	Grain
Soybean	Aurad	3410	630	1940	4380	800	2530	29	27	31
	Bhalki	3100	740	1530	4440	1120	2220	43	51	45
	Bidar	3740	860	2040	4900	1050	2760	31	21	35
Mean		**3450**	**760**	**1860**	**4610**	**1000**	**2530**	**33**	**32**	**36**

Bijapur

Green gram

Green gram was grown on 2928 ha, much less than 5500 ha target area achieving 53% of the cropping target for the season in the district. Farmers were disinterested in green gram due to previous year experience. However, this season also farmers were disappointed with crop yield as affected by deficit rainfall in Basavan Bagewadi, Bijapur and Muddebihal. Even with low rainfall and at low yield levels, green gram grain yield was 30% increased at 300 kg ha^{-1} with improved management compared to 240 kg ha^{-1} with farmers' management (Table 104). With improved grain yield, it was estimated that 37 tons of additional grain was produced in the district because of improved management under Bhoochetana programme.

Table 104. Green gram yield (kg ha^{-1}) with improved management compared to farmers' management in different taluks of Bijapur district during Kharif 2011.

Crop	Taluk	Farmers' Management			Improved Management			% increase over FM		
		TDM	Fodder	Grain	TDM	Fodder	Grain	TDM	Fodder	Grain
Green gram	Bas. Bagewadi	1060	630	260	1320	760	330	25	21	28
	Bijapur	940	420	310	1270	640	390	34	52	26
	Muddebihal	450	230	150	600	320	190	34	41	24
Mean		**820**	**430**	**240**	**1060**	**570**	**300**	**30**	**35**	**26**

Groundnut

Groundnut was grown on 7195 ha, that is 40% of the target area for groundnut under Bhoochetana program in the district. Due to low rainfall in June and July groundnut sown area shrunk in Bijapur taluk and sowing was done in Indi and some areas in Bijapur taluk mostly during July and August. Groundnut pod yield was very low with both treatments, however smaller gains existed with balanced application of micro and macro nutrients at recommended dosage. There was 25% mean pod yield increase at 400 kg ha^{-1} in improved management compared to mean pod yield of 320 kg ha^{-1} in farmers' management (Table 105). Groundnut haulms used as fodder for animals in the district, as such there was 38% increase of fodder yield at 700 kg ha^{-1} in improved management compared to 510 kg ha^{-1} in farmers' management. It is evidenced that under low productive environment also, improved management practices help farmers to enhance crop yield and water use efficiency through use of balance application of micro and macro nutrient at recommended dosage to groundnut.

Table 105. Groundnut yield (kg ha^{-1}) with improved management compared to farmers' management in different taluks of Bijapur district during Kharif 2011.

Crop	Taluk	Farmers' Management			Improved Management			% increase over FM		
		TDM	Fodder	Pod	TDM	Fodder	Pod	TDM	Fodder	Pod
Ground	Bijapur	430	310	120	570	400	170	34	29	46
nut	Indi	1070	620	440	1410	870	540	32	40	22
Mean		**830**	**510**	**320**	**1100**	**700**	**400**	**33**	**38**	**25**

An estimated 161 tons of groundnut pod was produced additionally based on 25% increase in pod yield with improved management, besides increased mean fodder yield by 38% with improved management since groundnut haulms are used as cattle feed in this district.

Maize

Maize was grown on 24080 ha i.e. 65% of the target area of 34800 ha which should have been sown to maize as planned initially. Maize grain yield was moderately affected by low rainfall particularly in September when maize was at its silking phase. Maize yield was estimated from Bijapur crop samples and mean grain yield of maize was 4170 kg ha^{-1} in farmers' management and it was estimated at 5440 kg ha^{-1} from improved management (Table 106). Since observed grain yield increase of 31% with improved management had resulted in increased grain yield of 5440 tons additional pod production from enhanced maize grain yield in the district.

Maize fodder yield also increased by 33% as 3680 kg ha^{-1} of fodder yield was harvested under improved management compared to lower fodder harvest of 2770 kg ha^{-1} which was 910 kg ha-1 lesser under farmers' management.

Table 106. Maize yield (kg ha^{-1}) with improved management compared to farmers' management in different taluks of Bijapur district during Kharif 2011.

Crop	Taluk	Farmers' Management			Improved Management			% increase over FM		
		TDM	Fodder	Grain	TDM	Fodder	Grain	TDM	Fodder	Grain
Maize	Bijapur	8280	2770	4170	10890	3680	5440	31	33	31
Mean		**8280**	**2770**	**4170**	**10890**	**3680**	**5440**	**31**	**33**	**31**

Pearl millet

Pearl millet was grown on 177742 ha almost achieved sowing target of 100% area for productivity enhancements under Bhoochetana program during kharif. Pearl millet mean grain yield at 2050 kg ha^{-1} under improved management, farmers increased pearl millet productivity by 32% compared to mean grain yield of 1560 kg ha^{-1} under farmers' management. Similarly mean fodder yield also increased by 34% with improved management at 1920 kg ha^{-1} compared to 1430 kg ha^{-1} with farmers' management (Table 107).

Table 107. Pearl millet yield (kg ha^{-1}) with improved management compared to farmers' management in different taluks of Bijapur district during Kharif 2011.

Crop	Taluk	Farmers' Management			Improved Management			% increase over FM		
		TDM	Fodder	Grain	TDM	Fodder	Grain	TDM	Fodder	Grain
Pearl Millet	B.bagewadi	2960	1180	1260	3880	1620	1700	31	37	34
	Bijapur	4690	1910	2090	5840	2510	2680	25	31	28
	Muddebihal	3460	1300	1420	4350	1740	1900	26	34	34
Mean		**3630**	**1430**	**1560**	**4610**	**1920**	**2050**	**27**	**34**	**32**

Higher productivity of pearl millet due to improved management, it was estimated that 986 tons of pearl millet grain was additionally produced in the district because of Bhoochetana initiative besides additional fodder production in the district by enriching deficient soils with required nutrient quantities.

Pigeonpea

Pigeonpea sown area was much lesser at 44788 ha (51%) against planned target area of 88500 ha during kharif this year, as the sowing opportunity was delayed until July-August due to

low rainfall in June and July in three out of five taluks in the district, and farmers shifted their choice of crops.

Table 108. Pigeonpea yield (kg ha^{-1}) with improved management compared to farmers' management in different taluks of Bijapur district during Kharif 2011.

Crop	Taluk	Farmers' Management			Improved Management			% increase over FM		
		TDM	Fodder	Grain	TDM	Fodder	Grain	TDM	Fodder	Grain
Pigeon pea	B. Bagewadi	1230	690	380	1650	920	530	34	33	39
	Bijapur	2050	860	780	2650	1190	1010	29	39	29
	Indi	3680	2000	1120	4910	2640	1510	33	32	34
	Sindagi	2300	1110	860	3000	1440	1110	30	30	29
Mean		**2180**	**1090**	**740**	**2870**	**1450**	**980**	**32**	**33**	**32**

Pigeonpea crop growth during the season was poor resulted in lower grain and biomass yield under farmers' and improved management in three out of five taluks. There was significant difference in grain yield from Bijapur and Sindagi to yield in Indi. However, mean grain yield of pigeonpea was low at 740 kg ha^{-1} under farmers' management compared to 32% higher mean grain yield at 980 kg ha^{-1} under improved management (Table 108). Even with unfavourable seasonal conditions, increase grain yield of pigeonpea by 32% contributed to an estimated 2400 tons of additional pigeonpea grain produced in the district.

Sunflower

Sunflower was grown on 8371 ha which was 66% of the 12600 ha planned target area for this crop under Bhoochetana in the district. Actual cropped area for all crops except pearl millet was much less than the planned cropping area in the district owing to deficit rainfall in June, July and August in 3 out of 5 taluks in the district. Sunflower biomass and seed yield in both FM and IM are moderately low.

Seed yield under improved management was estimated to be 31% higher at 1660 kg ha^{-1} under improved management compared to lower seed yield at 1260 kg ha^{-1} under farmers' management (Table 109). Biomass yield was also higher around 26% under improved management compared to farmers' management in this district. Because of increase seed yield of sunflower by 31%, it was estimated that an additional 570 tons of sunflower was produced in the district.

Table 109. Sunflower yield (kg ha^{-1}) with improved management compared to farmers' management in different taluks of Bijapur district during Kharif 2011.

Crop	Taluk	Farmers' Management			Improved Management			% increase over FM		
		TDM	Fodder	Grain	TDM	Fodder	Grain	TDM	Fodder	Grain
Sunflower	Bijapur	3770	1720	1260	4760	2150	1660	26	25	31
Mean		**3770**	**1720**	**1260**	**4760**	**2150**	**1660**	**26**	**25**	**31**

Chickballapur

Groundnut

Groundnut was sown on 29351 ha (70%) out of the target area of 42000 ha planned for productivity enhancement of this crop under Bhoochetana project. This crop was grown in all six taluks of Chikballapur. In this district, 30% of gypsum, 17% of $ZnSO_4$ and 45% of Borax was distributed to and applied by farmers under Bhoochetana project. Groundnut pod yield was moderate overall in the district during the season, owing to deficit rainfall in September to October. Groundnut growth was however moderately affected at flowering and severely affected at pod filling hence reduction in pod yield, although higher fodder yield was observed in proportion to pod yield with more than normal rainfall in the vegetative phase of the crop during July and August in all taluks of the district.

Table 110. Groundnut yield (kg ha^{-1}) with improved management compared to farmers' management in different taluks of Chickballapur district during Kharif 2011.

Crop	Taluk	Farmers' Management			Improved Management			% increase over FM		
		TDM	Fodder	Pod	TDM	Fodder	Pod	TDM	Fodder	Pod
Ground nut	Bagepalli	2530	1620	920	4670	3190	1480	84	98	62
	Chikkaballapur	2970	1980	990	4910	3210	1700	65	62	72
	Chinthamani	2990	2030	970	3910	2380	1540	31	17	59
	Gowribidanur	2730	1730	1010	4330	2760	1580	59	60	57
	Gudibande	2300	1250	1070	3190	1690	1500	39	36	41
	Siddlagatta	1630	1080	550	2300	1480	820	41	37	49
Mean		**2570**	**1630**	**940**	**3940**	**2470**	**1470**	**53**	**52**	**56**

There was an increase of 56% in pod yield with improved management at 1470 kg ha^{-1} compared to pod yield at 940 kg ha^{-1} in farmers' management (Table 110). Fodder yield increase was 52% at 2470 kg ha^{-1} with improved management compared to 1630 kg ha^{-1} with farmers' management. It was estimated that because of improved management 3784 tons of additional pod yield was produced in the district. Productivity enhancement of pod and

fodder yield was possible because of better translocation of nutrients with enhanced water use under balanced nutrient application compared to restricted growth resulted from deficit translocation of nutrients and water by groundnut under farmers' management.

Maize

Maize crop is getting farmers' preference especially in Sidlagatta, Gowribidnur and Chikballapur taluks. Maize crop was grown 36992 ha which is more than target area of 27900 ha in all taluks of the district. Maize crop growth was better in Sidlagatta Chikballapur and Gowribidunur taluks compared to other taluk in the district due to better rainfall in August and September months. Maize fodder yield was not available from this district as these samples were not available for processing in time.

Table 111. Maize yield (kg ha^{-1}) with improved management compared to farmers' management in different taluks of Chickballapur district during Kharif 2011.

Crop	Taluk	Farmers' Management			Improved Management			% increase over FM		
		TDM	Fodder	Grain	TDM	Fodder	Grain	TDM	Fodder	Grain
Maize	Bagepalli	2410	-	2010	2870	-	2410	19	-	20
	Chikkaballapur	3540	-	2960	4460	-	3830	26	-	29
	Gowribidanur	3060	-	2580	4050	-	3440	32	-	33
	Gudibande	1880	-	1560	2680	-	2250	43	-	44
	Siddlagatta	4330	-	3710	5290	-	4530	22	-	22
Mean		**3110**	**-**	**2620**	**3990**	**-**	**3390**	**28**		**29**

Maize grain yield increased by 29% at 3390 kg ha^{-1} with improved management compared to 2690 kg ha^{-1} with farmers' management (Table 111). Maize grain yield of 3652 tons was additionally produced in the district due to Bhoochetana interventions by farmers.

Chikkamagaluru

Maize

Maize was one of the major crops selected under Bhoochetana for productivity enhancement, targeted in an area of 7500 ha and 100% cropping with maize was achieved in the district. Maize productivity was assessed in Chikkamagaluru, Kadur and Tarikere taluks of the district. Overall maize productivity in the district was higher even with farmers' management due to better seasonal rainfall conditions.Maize grain yield increased by 41% at 6760 kg ha^{-1} with improved management compared to maize grain yield at 4810 kg ha-1

with farmers' management (Table 112). Similarly 56% increase in fodder yield was recorded at 8000 kg ha^{-1} with improved management compared to fodder yield at 5120 kg ha^{-1} with farmers' management. It is estimated that an additional 9521 tons of maize grain and proportionate fodder was produced in the district because of improved management under Bhoochetana project.

Table 112. Maize yield (kg ha^{-1}) with improved management compared to farmers' management in different taluks of Chikkamangaluru district during Kharif 2011.

Crop	Taluk	Farmers' Management			Improved Management			% increase over FM		
		TDM	Fodder	Grain	TDM	Fodder	Grain	TDM	Fodder	Grain
Maize	Chikkamagaluru	**10070**	**4590**	**4730**	**14960**	**7720**	**6410**	**49**	**68**	**35**
	Kadur	10600	5340	4550	15550	7980	6440	47	49	42
	Tarikere	10970	5410	5150		8300	7420		53	44
	Mean	**10440**	**5120**	**4810**	**15260**	**8000**	**6760**	**46**	**56**	**41**

Chitradurga

Groundnut

Groundnut was grown on 67951 ha out of the target area of 96000 ha for this crop in the district. In general groundnut pod yield was poor this year owing to -24.1% deficit mean rainfall in all taluks of the district. In groundnut growing taluks of Chellekeri and Molakalmur, the rainfall was deficit by -33.6%, and -27% respectively in during the season from June to November. It affected groundnut crop very severely resulting in very low yield. However, with improved management slight increase of 190 kg ha^{-1} in groundnut mean pod yield at 690 kg ha^{-1} (37%) compared to 500 kg ha^{-1} with farmers' management (Table 113).

Table 113. Groundnut yield (kg ha^{-1}) with improved management compared to farmers' management in different taluks of Chitradurga district during Kharif 2011.

Crop	Taluk	Farmers' Management			Improved Management			% increase over FM		
		TDM	Fodder	Pod	TDM	Fodder	Pod	TDM	Fodder	Pod
Groundnut	Challakere	930	550	390	1290	720	560	38	32	45
	Molakalmur	1310	750	560	1750	1000	750	34	34	33
	Mean	**1180**	**680**	**500**	**1590**	**900**	**690**	**35**	**33**	**37**

Groundnut haulms used as fodder increased by 33% at 900kg ha^{-1} compared to 680 kg ha^{-1} is an additional advantage. It is estimated that an additional pod yield of 4086 tons was produced in the district with Bhoochetana intervention even during a low productive year.

Maize

Maize was grown on 63860 ha with improved management as against the target area of 64500 ha under Bhoochetana. Maize grain and fodder yield was generally low in both treatments due to deficit rainfall during growing season in the district. However, maize grain yield increased to 31% at 3920 kg ha^{-1} with improved management compared to 2990 kg ha^{-1} with farmers' management (Table 114). An increase of 500 kg ha^{-1} fodder yield at 1720 kg ha^{-1} was 41% increase under improved management compared to fodder yield of 1220 kg ha^{-1} with farmers' management.

Table 114. Maize yield (kg ha^{-1}) with improved management compared to farmers' management in different taluks of Chitradurga district during Kharif 2011.

Crop	Taluk	Farmers' Management			Improved Management			% increase over FM		
		TDM	Fodder	Grain	TDM	Fodder	Grain	TDM	Fodder	Grain
Maize	Chitra durga	6040	1450	3550	7750	2030	4430	28	40	25
	Holalkere	4560	990	2430	6260	1420	3410	37	43	40
Mean		5300	1220	2990	7000	1720	3920	32	41	31

It is estimated that 13437 tons of maize grain and proportionate fodder production was additionally produced by farmers with improved management under Bhoochetana initiative in the district.

Finger millet

Table 115. Finger millet yield (kg ha^{-1}) with improved management compared to farmers' management in Hosadurga taluk of Chitradurga district during Kharif 2011.

Crop	Taluk	Farmers' Management			Improved Management			% increase over FM		
		TDM	Fodder	Grain	TDM	Fodder	Grain	TDM	Fodder	Grain
Finger millet	Hosadurga	1720	1030	510	2430	1390	740	41	36	43
Mean		**1720**	**1030**	**510**	**2430**	**1390**	**740**	**41**	**36**	**43**

Finger millet (ragi) is one of the major crops in the district with a target area of 25000 ha and nearly 24760 ha were cropped with finger millet in the district. Hosdurga taluk is traditionally a finger millet grown area, and seasonal rainfall was deficit by -12% during the year, hence finger millet crop yield was less than a ton per ha, affected by abiotic stress in both treatments. Finger millet grain yield increased by 43% with improved management at

740 kg ha^{-1} compared to grain yield of 510 kg ha^{-1} with farmers' management (Table 115). Fodder yield increased by 36% with improved management at 1390 kg ha^{-1} compared to fodder yield at 1030 kg ha^{-1}. It was estimated that 1288 tons of finger millet grain was additionally produced with improved management under Bhoochetana project during the season in Chitradurga.

Dakshina Kannada

Paddy

Paddy was planned to grow on 5200 ha during the kharif season in Dakshina Kannada, and the entire target area was sown / transplanted to paddy in Bantwal, Belthangady, Mangalore, Puttur and Sulya taluks of the district. Puttur taluk recorded the highest paddy grain and fodder yield while Bantwal recorded highest biomass production and fodder yield, but had proportionately lesser grain yield, probably due to low translocation of resources to head in both these treatment owing to seasonal conditions. Overall, paddy grain yield increase of 32%was observed with improved management at a mean grain yield of 5710 kg ha^{-1} compared to mean grain yield of 4320 kg ha^{-1} of paddy under farmers' management (Table 116). Fodder yield increase was 31%, also proportionate at 7440 kg ha^{-1} with improved management compared to 5690 kg ha^{-1} of fodder with farmers' management. It was estimated that an increase of 6194 tons was additionally produced by paddy farmers because of improved management under Bhoochetana programme.

Table 116. Paddy yield (kg ha^{-1}) with improved management compared to farmers' management in different taluks of Dakshina Kannada district during Kharif 2011.

Crop	Taluk	Farmers' Management			Improved Management			% increase over FM		
		TDM	Fodder	Grain	TDM	Fodder	Grain	TDM	Fodder	Grain
Paddy	Bantwal	13730	10780	2950	18400	14420	3980	34	34	35
	Belthangady	7730	3610	4130	10250	4910	5340	33	36	29
	Mangalore	8450	3650	4790	10760	4530	6230	27	24	30
	Puttur	12650	6350	6310	17200	8730	8470	36	38	34
	Sulya	7520	4080	3440	9170	4630	4540	22	13	32
Mean		**10010**	**5690**	**4320**	**13150**	**7440**	**5710**	**31**	**31**	**32**

Davangere

Groundnut

Groundnut was grown in a small area of 3628 ha as against planned target coverage of 5000ha with productivity enhancement under Bhoochetana programme. Groundnut yield

estimation was taken up in Davangere and Honnali taluks of Davangere district. Groundnut pod yield was better in both treatments due to favourable seasonal conditions. Groundnut pod yield increase of 26% was higher at 3520 kg ha^{-1} compared to pod yield of 2800 kg ha^{-1} (Table 117).

Table 117. Groundnut yield (kg ha^{-1}) with improved management compared to farmers' management in different taluks of Davangere district during Kharif 2011.

Crop	Taluk	Farmers' Management			Improved Management			% increase over FM		
		TDM	Fodder	Pod	TDM	Fodder	Pod	TDM	Fodder	Pod
Ground nut	Davanagere	5170	2390	2780	6280	2880	3400	21	20	22
	Honnali	6330	3520	2810	8660	5060	3610	37	44	28
Mean		**5870**	**3070**	**2800**	**7710**	**4180**	**3520**	**31**	**36**	**26**

Groundnut haulms used as fodder for cattle in the region, and fodder yield of groundnut increased by 36% with improved management at 4180 kg ha^{-1} compared to 3070 kg ha^{-1} of fodder yield with farmers' management. Although groundnut pod yield vary considerably between treatments but more or less same between both taluks. It was estimated that an additional 2232 tons of groundnut pod was produced by farmers adopting improved management under Bhoochetana initiative.

Maize

Maize is a major crop in Davangere, second largest area planned to grown on 104000 ha during kharif in the state after Haveri, and achieved 99% of the target area under this crop. It was grown in Channagiri, Davangere, Harappanhalli, Honnali and Jagaluru taluks in the district. Maize grain and fodder yield estimated in both treatments were higher indicating better productivity of the crop during the season. Grain yield increase of 29% was estimated with grain yield of 6960 kg ha^{-1} recorded with improved management compared to grain yield of 5410 kg ha^{-1} recorded with farmers' management (Table 118). Higher fodder yield was recorded in both treatments and the fodder yield increase observed was 24% at 12870 kg ha^{-1} compared to 10370 kg ha-1 fodder yield with farmers' management. It was estimated that an additional 99944 tons of maize grain was produced with improved management under Bhoochetana in Davangere district.

Table 118. Maize yield (kg ha^{-1}) with improved management compared to farmers' management in different taluks of Davangere district during Kharif 2011.

Crop	Taluk	Farmers' Management			Improved Management			% increase over FM		
		TDM	Fodder	Grain	TDM	Fodder	Grain	TDM	Fodder	Grain
Maize	Channagiri	12640	3900	6530	15200	4810	7880	20	23	21
	Davanagere	12870	3700	7260	15230	4320	9500	18	17	31
	Harapanahalli	8160	2680	3970	10650	3380	5510	31	26	39
	Honnali	10190	2510	5940	13340	3580	7420	31	43	25
	Jagaluru	8030	3310	3380	9940	3820	4510	24	15	33
Mean		**10370**	**3220**	**5410**	**12870**	**3980**	**6960**	**24**	**24**	**29**

Pigeonpea

Pigeonpea was targeted to grown on 4000 ha mostly as intercrop but sown on 3755 ha achieving 94% of the target in the district. Crop performance was poor in both treatments owing to robust growth of main crops like maize or sorghum in the rainy season. Pigeonpea grain yield increase was recorded as 20% even at very low grain yield of 560 kg ha^{-1} compared to 460 kg ha-1 grain yield under farmers' management (Table 119). Fodder yield also increased 22% in improved management at 1500 kg ha^{-1} compared to 1230 kg ha^{-1} of fodder yield under farmers' management. Pigeonpea stalk has a limit utility for thatching purpose and small portion of fodder as leaf and flower may be used as fodder for animals. It was estimated that an additional 223 tons was produced with improved management under Bhoochetana initiative in the district.

Table 119. Pigeonpea yield (kg ha^{-1}) with improved management compared to farmers' management in different taluks of Davangere district during Kharif 2011.

Crop	Taluk	Farmers' Management			Improved Management			% increase over FM		
		TDM	Fodder	Grain	TDM	Fodder	Grain	TDM	Fodder	Grain
Pigeon pea	Channagiri	1470	1020	240	1840	1210	320	25	19	33
	Davanagere	2240	1420	620	2800	1820	750	25	28	21
	Harihar	1550	1020	340	1830	1210	380	18	19	12
	Honnali	2090	1280	510	2450	1470	600	17	15	18
Mean		**1920**	**1230**	**460**	**2340**	**1500**	**560**	**22**	**22**	**20**

Finger millet

Finger millet was grown on 4105 ha (90%) of the target area of 5000 ha in the district. Productivity of finger millet in both treatments was moderate during the season. Finger millet grain yield increased by 24% with improved management recorded at 1740 kg ha^{-1} compared to grain yield of 1400 kg ha^{-1} with farmers' management (Table 120). Fodder yield increase was higher at 33% at 4760 kg ha^{-1} with improved management compared to 3580 kg

ha^{-1} with farmers' management. It was estimated that finger millet grain yield of 1054 tons was additionally produced by farmers with improved management under Bhoochetana initiative.

Table 120. Finger millet yield (kg ha^{-1}) with improved management compared to farmers' management in different taluks of Davangere district during Kharif 2011.

Crop	Taluk	Farmers' Management			Improved Management			% increase over FM		
		TDM	Fodder	Grain	TDM	Fodder	Grain	TDM	Fodder	Grain
Finger millet	Channagiri	5760	2560	2210	6710	3050	2610	17	19	18
	Harapanahalli	5560	4260	860	7720	5900	1170	39	39	35
Mean		**5640**	**3580**	**1400**	**7320**	**4760**	**1740**	**30**	**33**	**24**

Sorghum

Sorghum was targeted to grown on 7600 ha and achieved sowing in 6877 ha, i.e. 90% of the target area. Crop yield was estimated in Channagiri, Davangere, Harappanhalli, Harihar and Honnali taluks of the district. Sorghum grain yield increase of 42% was observed at 3780 kg ha^{-1} with improved management compared to grain yield of 2670 kg ha^{-1} with farmers' management (Table 121). Fodder yield increase was slightly low at 31% as fodder yield was 4860 kg ha^{-1} with improved management compared to fodder yield of 3710 kg ha-1 with farmers' management.

Table 121. Sorghum yield (kg ha^{-1}) with improved management compared to farmers' management in different taluks of Davangere district during Kharif 2011.

Crop	Taluk	Farmers' Management			Improved Management			% increase over FM		
		TDM	Fodder	Grain	TDM	Fodder	Grain	TDM	Fodder	Grain
Sorghum	Channagiri	8290	4100	3100	12470	6040	4940	50	47	60
	Davanagere	6240	3070	2620	7940	3380	3480	27	10	33
	Harapanahalli	5820	3380	2100	7390	4260	2880	27	26	37
	Harihar	7200	3020	3350	10330	4630	4660	44	53	39
	Honnali	8050	5020	2200	9730	5990	2950	21	19	34
	Mean	**7120**	**3710**	**2670**	**9570**	**4860**	**3780**	**34**	**31**	**42**

Dharwad

Green gram

Green gram was grown on 7075 ha as against 10000 ha of target area planned for this crop in Dharwad. Green gram yield was estimated in Dharwad, Kundagol and Navalgunda taluks of the Dharwad. Deficit rainfall in Kundagol (-26%) and Navalgunda (-23%) affected green gram yield and 10% above normal rainfall especially in early part of the season enhanced green gram yield in Dharwad taluk in both treatments. Mean grain yield of 1370 kg ha^{-1} was

estimated with improved management whereas 960 kg ha-1 of grain yield was estimated with farmers' management (Table 122). Haulms samples were unavailable from the district and hence could not estimate fodder yield in the district.

Table 122. Green gram yield (kg ha^{-1}) with improved management compared to farmers' management in different taluks of Dharwad district during Kharif 2011.

Crop	Taluk	Farmers' Management			Improved Management			% increase over FM		
		TDM	Fodder	Grain	TDM	Fodder	Grain	TDM	Fodder	Grain
Green gram	Dharwad	-	-	1470	-	-	2000	-	v	37
	Kundagol	-	-	620	-	-	910	-		47
	Navalgunda	-	-	630	-	-	980	-		57
Mean		**-**	**-**	**960**	**-**	**-**	**1370**	**-**	**-**	**43**

Grain yield increase recorded was 43% and it was estimated that an additional 1135 tons of green grain was produced by farmers because of improved management under Bhoochetana initiative in the district during the Kharif season.

Groundnut

Groundnut was grown on 19000 ha against a target area of 20000 ha planned for productivity enhancement under Bhoochetana initiative during kharif season in Dharwad district. Groundnut pod yield increased by 39% as recorded around 5560 kg ha^{-1} with improved management compared to 4010 kg ha^{-1} with farmers' management (Table 123). Haulms samples were not available for estimation of fodder. Rainfall variation across taluks during the season was responsible for wide variation in pod yields in the district. It was estimated that an additional 2323 tons of groundnut pod was produced in the kharif season due to improved management under Bhoochetana initiative in the district.

Table 123. Groundnut yield (kg ha^{-1}) with improved management compared to farmers' management in different taluks of Dharwad district during Kharif 2011.

Crop	Taluk	Farmers' Management			Improved Management			% increase over FM		
		TDM	Fodder	Pod	TDM	Fodder	Pod	TDM	Fodder	Pod
Ground nut	Dharwad	-	-	6070	18640	10170	8470	207	-	40
	Hubali	-	-	2930	9700	5700	4000	231	-	37
	Navalgunda	-	-	2060	7610	4740	2870	269	-	39
Mean		**-**	**-**	**4010**	**12860**	**7300**	**5560**	**221**	**-**	**39**

Soybean

Soybean is a commercial edible oil seed crop grown in Dharwad targeted in an area of 10000 ha for productivity enhancement under Bhoochetana initiative and 100% of the target area

was sown to soybean during kharif in Dharwad. Soybean mean seed yield increased by 34% as the seed yield of 1140 kg ha^{-1} was recorded with improved management compared to seed yield of 850 kg ha^{-1} with farmers' management (Table 124). Based on enhanced productivity of soybean with improved management it was estimated that an additional seed yield of 739 tons soybean was produced by the farmers under Bhoochetana initiative in the district.

Table 124. Soybean yield (kg ha^{-1}) with improved management compared to farmers' management in different taluks of Dharwad district during Kharif 2011.

Crop	Taluk	Farmers' Management			Improved Management			% increase over FM		
		TDM	Fodder	Grain	TDM	Fodder	Grain	TDM	Fodder	Grain
Soy bean	Dharwad	-	-	1050	-	-	1390	-	-	32
	Hubali	-	-	710	-	-	970	-	-	37
Mean		-	-	850	-	-	1140	-	-	34

Gadag

Green gram

Green gram was grown on 55211 ha as against the planned target area of 73000 ha in Gadag district during kharif season. Green gram yield in both treatments were more than district average yield for this crop owing to good seasonal conditions.

Table 125. Green gram yield (kg ha^{-1}) with improved management compared to farmers' management in different taluks of Gadag district during Kharif 2011.

Crop	Taluk	Farmers' Management			Improved Management			% increase over FM		
		TDM	Fodder	Grain	TDM	Fodder	Grain	TDM	Fodder	Grain
Green gram	Gadag	-	-	780	-	-	1100	-	-	41
	Mundaragi	-	-	760	-	-	1080	-	-	42
	Ron	-	-	740	-	-	1060	-	-	43
Mean		**-**		**-**		**-**	**1080**	**-**	**-**	**42**

Mean grain yield increase of 42% was observed across three taluks as mean grain yield recorded was 1080 kg ha^{-1}with improved management compared to estimated grain yield of 760 kg ha^{-1} with farmers' management (Table 125). Haulms samples were unavailable for yield estimation and could not be done. It was estimated that an additional 10477 tons of green gram was produced by farmers under Bhoochetana initiative in the district.

Groundnut

Groundnut was grown on 40956 ha against the planned target area of 59000 ha in Gadag. Groundnut pod yield was around the long-term average yield of this district for the crop in this season. Groundnut yield was estimated in Gadag, Mundaragi, Ron and Shirahatti taluks

of the district. Groundnut mean pod yield increase was 49% as the mean pod yield recorded was 1870 kg ha^{-1} with improved management compared mean pod yield of 1260 kg ha^{-1} with farmers' management (Table 126). Haulms as fodder, yield increase by 45% as estimated at 2100 kg ha^{-1} with improved management compared to fodder yield of 1450 kg ha^{-1} with farmers' management. Based on pod yield increase with improved management, it was estimated that an additional 16142 tons of groundnut pod was produced by farmers in the district under Bhoochetana initiative during the kharif season

Table 126. Groundnut yield (kg ha^{-1}) with improved management compared to farmers' management in different taluks of Gadag district during Kharif 2011.

Crop	Taluk	Farmers' Management			Improved Management			% increase over FM		
		TDM	Fodder	Pod	TDM	Fodder	Pod	TDM	Fodder	Pod
Ground nut	Gadag	3100	1610	1490	4810	2520	2290	55	57	54
	Mundaragi	2410	1290	1110	3640	2000	1640	51	55	48
	Ron	2820	1410	1410	3800	1860	1940	35	32	38
	Shirahatti	2510	1490	1020	3640	2030	1610	45	36	58
Mean		2710	1450	1260	3970	2100	1870	47	45	49

Maize

Maize was grown on 58095 ha, more than the target area of 54000 ha as this crop found farmers' preference in Gadag district. It was grown in Gadag, Mundaragi, Naragund, Ron and Shirahatti taluks in the district. Maize grain yield was better in both treatments owing to good seasonal conditions. Maize mean grain yield increase was 40% across all taluks with a high of 56% in Naragund taluk. Mean grain yield of 6300 kg ha^{-1} was recorded with improved management compared to 4510 kg ha^{-1} with farmers' management (Table 127). Fodder yield samples were not available from farmers' management for comparison however maize mean fodder yield was around 5500 kg ha^{-1} with improved management. Based on 40% grain yield increase with IM, it was estimated that an additional 43594 tons of maize grain was produced by farmers in the district during kharif season.

Table 127. Maize yield (kg ha^{-1}) with improved management compared to farmers' management in different taluks of Gadag district during Kharif 2011.

Crop	Taluk	Farmers' Management			Improved Management			% increase over FM		
		TDM	Fodder	Grain	TDM	Fodder	Grain	TDM	Fodder	Grain
Maize	Gadag	-	-	4610	14860	6260	6730	-	-	46
	Mundaragi	-	-	4540	12360	4430	5830	-	-	28
	Naragund	-	-	4180	14660	6080	6500	-	-	56
	Ron	-	-	5100	15340	5510	7170	-	-	41
	Shirahatti	-	-	4100	12350	5240	5290	-	-	29
Mean		**-**	**-**	**4510**	**13910**	**5500**	**6300**	**-**	**-**	**40**

Gulburga

Black gram

Black gram was grown on 18834 ha during kharif in Gulbarga district achieving only 48% of the target area of 39000 ha under productivity enhancement initiative of Bhoochetana programme. The short fall in sowing to this crop must have happened because of very low rainfall in all taluks of the district during June when most farmers prefer to sow black gram. Black gram crop yield was assessed in Aland, Chincholi, Gulburga and Sadam taluks of the district.

Table 128. Black gram yield (kg ha^{-1}) with improved management compared to farmers' management in different taluks of Gulburga district during Kharif 2011.

Crop	Taluk	Farmers' Management			Improved Management			% increase over FM		
		TDM	Fodder	Grain	TDM	Fodder	Grain	TDM	Fodder	Grain
Black gram	Aland	820	400	240	1370	610	410	67	53	71
	Chincholi	640	290	210	790	400	250	23	38	19
	Gulbarga	1110	500	380	1620	730	480	46	46	26
	Sedam	1570	730	540	2170	980	740	38	35	38
Mean		**1210**	**560**	**410**	**1720**	**780**	**560**	**41**	**39**	**38**

Black gram grain yield was low in both treatments owing to moisture stress situation during crop growth period. However, balanced application of micro and macronutrients for improved management of the crop enhanced grain yield by 38% at 560 kg ha^{-1} compared to grain yield of 410 kg ha^{-1}with farmers' management (Table 128). A corresponding increase in fodder yield at 39% with improved management was also recorded. Thereby enhancing rainfall use efficiency of low rainfall during crop season was possible. It was estimated that an increase of 369 tons was additionally produced in the district due to Bhoochetana interventions.

Green gram

Green gram was sown on 9396 ha during kharif season in Gulbarga district, achieved 27% of 35000 ha sowing target area for productivity enhancements under Bhoochetana initiative. The short fall in sowing area was due to low rainfall in June as was the case for Black gram. Grain yield in both treatments were low because of unfavourable seasonal conditions. However, there was an increase of 42% in grain yield at 690 kg ha^{-1} with improved management compared to mean grain yield of 480 kg ha^{-1} across all taluks was recorded with farmers' management (Table 129). Green gram fodder yield was also significantly increased at 35% with improved management. It was estimated that an additional 463 tons

of grain yield was produced by farmers under Bhoochetana initiative during the kharif in the district.

Table 129. Green gram yield (kg ha^{-1}) with improved management compared to farmers' management in different taluks of Gulburga district during Kharif 2011.

Crop	Taluk	Farmers' Management			Improved Management			% increase over FM		
		TDM	Fodder	Grain	TDM	Fodder	Grain	TDM	Fodder	Grain
Green gram	Aland	3190	1990	790	4010	2550	1060	26	28	34
	Gulbarga	1480	1030	300	2030	1410	420	37	37	41
	Sedam	2760	2010	520	3860	2770	770	40	38	48
Mean		**2330**	**1610**	**480**	**3160**	**2180**	**690**	**35**	**35**	**42**

Pearl millet

Pearl millet was grown on 13228 ha achieved 67% of planned area of 19700 ha for this crop in Gulbarga district. Pearl millet assessment was done in farmers' fields of Aland and Gulbarga taluks. Grain yield of pearl millet in both treatments was moderately high and more than district long-term average even in farmers' management. Pearl millet grain yield increased by 44% with improved management at 2410 kg ha^{-1} compared to grain yield of 1670 kg ha^{-1} in the farmers' management (Table 130). Since pearl millet fodder is also used as cattle feed, an increase of 34% in fodder yield at 2280 kg ha^{-1} with improved management compared to fodder yield of 1700 kg ha^{-1} under farmers' management is an added advantage to farmers who adopted Bhoochetana improved management technologies.

Table 130. Pearl millet yield (kg ha^{-1}) with improved management compared to farmers' management in different taluks of Gulburga district during Kharif 2011.

Crop	Taluk	Farmers' Management			Improved Management			% increase over FM		
		TDM	Fodder	Grain	TDM	Fodder	Grain	TDM	Fodder	Grain
Pearl Millet	Aland	3830	1510	1670	5100	1990	2250	33	32	35
	Gulbarga	4280	1800	1670	6150	2430	2490	44	35	49
Mean		4130	1700	1670	5800	2280	2410	40	34	44

It is estimated that an additional 918 tons of grain was produced by farmers who adopted Bhoochetana improved management in the district.

Sunflower

Sunflower crop was sown to 8057 ha achieved only 30% of the cropped area with the crop as against target area of 27200 ha owing to less than a ton seed yield and low economic gains received previous year by the farmers. Sunflower seed yield this season was a shade better than previous year in both treatments. Sunflower seed yield increased by 48% at 1390 kg ha^{-1}

with improved management compared to mean seed yield of 940 kg ha^{-1}with farmers' management (Table 131). It is estimated that 771 tons of sunflower seed was additionally produced in Gulbarga due to adoption of improved management under Bhoochetana initiative.

Table 131. Sunflower yield (kg ha^{-1}) with improved management compared to farmers' management in different taluks of Gulburga district during Kharif 2011.

Crop	Taluk	Farmers' Management			Improved Management			% increase over FM		
		TDM	Fodder	Grain	TDM	Fodder	Grain	TDM	Fodder	Grain
Sun	Aland	3890	2000	1130	5180	2490	1570	33	25	39
flower	Gulbarga	2390	1110	740	3870	1700	1200	62	53	62
Mean		**3140**	**1560**	**940**	**4530**	**2100**	**1390**	**44**	**35**	**48**

Hassan

Maize

Maize as many farmers' preferred choice was grown on 34800 ha covering 100% of the target area planned for maize under Bhoochetana initiative during kharif season. Maize yield was estimated from crop samples in Alur, Arkalagud, Arasikere, Hassan and Holenarasipura taluks of Hassan district. Mean grain yield increase was higher by 29% with improved management at 5190 kg ha^{-1} compared to grain yield of maize at 4340 kg ha^{-1} with farmers' management during the kharif season (Table 132). Fodder yield also increased by 22% at 4710 kg ha^{-1} with improved management compared to fodder yield of 3860 kg ha^{-1} with farmers' management.

As a result of enhance grain yield, it is estimated that 7469 tons of maize grain was produced additionally in the district with adoption of improved management under Bhoochetana project.

Table 132. Maize yield (kg ha^{-1}) with improved management compared to farmers' management in different taluks of Hassan district during Kharif 2011.

Crop	Taluk	Farmers' Management			Improved Management			% increase over FM		
		TDM	Fodder	Grain	TDM	Fodder	Grain	TDM	Fodder	Grain
Maize	Alur	11430	4770	5500	14500	5890	6660	27	23	33
	Arakalagud	8020	4900	2590	10130	5800	3120	26	18	38
	Arasikere	8450	3110	4630	11110	4090	5350	31	32	25
	Belur	8810	3370	4610	11230	4300	5440	27	28	27
	Hassan	7300	2610	3800	8650	2910	4690	18	11	28
	Holenarasipura	8380	3700	3900	9730	4150	4680	16	12	24
Mean		**9040**	**3860**	**4340**	**11370**	**4710**	**5190**	**26**	**22**	**29**

Finger millet

Finger millet was grown on 16830 ha (38%) out of the targeted area 44700 ha in Hassan district during kharif season. Finger millet yield was estimated in C.R. Patna, Alur, Arakalagud, Arasikere, Belur, Hassan and Holenarasipura taluks of the district. Variation in grain yield is much higher among taluks due to variability in amounts and distribution of rainfall in taluks. However finger millet responded by 30% increase (ranged from 20% to 36%) in mean grain yield at 1910 kg ha^{-1} to improved management that was consistently better compared to mean grain yield of 1470 kg ha^{-1} across all taluks (Table 133). Finger millet fodder yield in response to improved management was similar with an increase in mean fodder yield by 29%, and the mean difference in fodder yield was 1470 kg ha^{-1} between IM and FM treatments. It is estimated that 3324 tons of finger millet grain was additionally produced in the district due to adoption of improved management technologies under Bhoochetana initiative.

Table 133. Finger millet yield (kg ha^{-1}) with improved management compared to farmers' management in different taluks of Hassan district during Kharif 2011.

Crop	Taluk	Farmers' Management			Improved Management			% increase over FM		
		TDM	Fodder	Grain	TDM	Fodder	Grain	TDM	Fodder	Grain
Finger millet	C.R Patna	6950	4930	1430	9220	6420	1920	33	30	34
	Alur	5830	4520	910	7630	5910	1130	31	31	24
	Arakalagud	6930	4530	1540	9460	5990	2100	37	32	36
	Arasikere	6590	5080	950	8520	6500	1290	29	28	36
	Belur	10650	7370	2440	13480	9470	2940	27	28	20
	Hassan	5110	3660	1070	6680	4770	1310	31	30	22
	Holenarasipura	9800	5700	2620	12700	7010	3570	30	23	36
Mean		**7270**	**5120**	**1470**	**9480**	**6590**	**1910**	**30**	**29**	**30**

Haveri

Groundnut

Groundnut was sown on 15000 ha covering the target area 100% by the crop under Bhoochetana productivity enhancement initiative in Haveri district. Groundnut yield was estimated in Haveri, Savanur and Shiggaon taluks of the district. Groundnut pod yield was higher than long-term average in all taluks of the district as the seasonal conditions were favaourable to groundnut crop. Mean pod yield of 3660 kg ha^{-1} was an increase of 42% with improved management compared to mean pod yield of 2570 kg ha^{-1} during kharif season in the district (Table 134). Groundnut haulms are also used as fodder to cattle, and the fodder yield was 20% higher at 3190 kg ha^{-1} with improved management compared to 2650 kg ha^{-1}

fodder yield with farmers' management. It was also estimated that 38550 tons of groundnut pod was additionally produced in the district by increased groundnut pod yield with improved management.

Table 134. Groundnut yield (kg ha^{-1}) with improved management compared to farmers' management in different taluks of Haveri district during Kharif 2011.

Crop	Taluk	Farmers' Management			Improved Management			% increase Over FM		
		TDM	Fodder	Pod	TDM	Fodder	Pod	TDM	Fodder	Pod
Ground	Haveri	4600	2590	2020	6120	3090	3030	33	19	50
nut	Savanur	5790	2670	3130	7390	3100	4300	28	16	37
	Shiggaon	4970	2680	2300	6660	3330	3340	34	24	45
Mean		5220	2650	2570	6840	3190	3660	31	20	42

Maize

Maize is an important cereal commercial crop grown on 128500 ha, 100% targeted area was sown to maize this season in Haveri indicates shift in farmers' preferred cropping decision. Maize was grown in Byadagi, Haveri, Hirekerur, Ranebennur, Savanur and Shiggaon taluks of the districts. Maize grain yield was recorded higher in both IM and FM treatments in farmers' fields. In Ranibennur, Hirekerur and Savanur taluks maize grain yield was lesser compared to other taluks of the district in both IM and FM treatment. Maize mean grain yield increased by almost 2000 kg ha^{-1} (34%) with improved management at 8075 kg ha^{-1} compared to maize grain yield of 6070 kg ha^{-1} with farmers' management (Table 135). Fodder yield also increased similarly by 23% with improved management at 5890 kg ha^{-1} compared to maize fodder yield of 4940 kg ha^{-1}. It is estimated that an increase in maize mean grain yield by 34% assisted farmers to produce additional 60858 tons of maize grain in the district.

Table 135. Maize yield (kg ha^{-1}) with improved management compared to farmers' management in different taluks of Haveri district during Kharif 2011.

Crop	Taluk	Farmers' Management			Improved Management			% increase Over FM		
		TDM	Fodder	Grain	TDM	Fodder	Grain	TDM	Fodder	Grain
Maize	Byadagi	13010	5380	6480	16520	6770	8117	24	21	24
	Haveri	13080	5020	6970	17230	5960	9575	32	39	28
	Hirekerur	11900	5050	5790	14700	5910	7440	32	19	37
	Ranebennur	10270	4200	5220	14430	5220	7433	24	17	29
	Savanur	11520	4590	5910	14480	5370	7900	41	24	42
	Shiggoan	12860	5490	6410	16050	6010	8605	26	17	34
Mean		12030	4940	6070	15500	5890	8075	25	23	34

Soy bean

Soy bean was grown on 7000 ha, achieved 100% of the target soy bean cropped area in Haveri for productivity enhancement initiative under Bhoochetana programme. Soy bean yield assessment was done in Haveri, Savanur and Shiggaon taluks of the district. Soy bean crop yield was better than its long-term average productivity in the district with farmers' management. Less variability was observed in grain yield among different taluks of the district. Soy bean mean seed yield increased by 41% with improved management at 1910 kg ha^{-1} compared to mean grain yield at 1370 kg ha^{-1} with farmers' management (Table 136). Because of increased grain yield at 41%, it is estimated that 895 tons of additional soy bean grain was produced under Bhoochetana programme during the kharif season in the district.

Table 136. Soybean yield (kg ha^{-1}) with improved management compared to farmers' management in different taluks of Haveri district during Kharif 2011.

Crop	Taluk	Farmers' Management			Improved Management			% increase over FM		
		TDM	Fodder	Grain	TDM	Fodder	Grain	TDM	Fodder	Grain
Soybean	Haveri	2990	940	1350	3680	1050	1840	29	19	33
	Savanur	3250	1020	1420	4170	1190	1980	23	12	36
	Shiggaon	3350	1290	1320	4170	1470	1865	29	17	39
Mean		3230	1110	1370	4070	1270	1910	25	14	41

Kodugu

Maize

Maize is an important dryland crop grown on 100% target area of 2000 ha for the crop in Kodugu district. Yield assessment was done in farmers' field of Somwarpet taluk of the district. Mean grain yield increase in maize was 31% with improved management at 9670 kg ha^{-1} compared to mean grain yield of maize at 7380 kg ha^{-1} with farmers' management during kharif season (Table 137). Maize fodder yield increase was low (20%) at 7940 kg ha^{-1} with improved management compared to maize fodder yield at 6620 kg ha^{-1} with farmers' management.

Table 137. Maize yield (kg ha^{-1}) with improved management compared to farmers' management in different taluks of Kodugu district during Kharif 2011.

Crop	Taluk	Farmers' Management			Improved Management			% increase over FM		
		TDM	Fodder	Grain	TDM	Fodder	Grain	TDM	Fodder	Grain
Maize	Somwarpet	15450	6620	7380	19460	7940	9670	26	20	31
Mean		15450	6620	7380	19460	7940	9670	26	20	31

It is estimated based on grain yield increase at 31% that an additional 753 tons of maize grain was produced in the district due to improved management of maize under Bhoochetana initiative.

Paddy

Paddy was planned to grow on 17000 ha during the kharif season in Kodugu, and 100% of the target area was sown/transplanted to paddy in Madikeri, Somwarpet and Virajpet taluks of the district. Somwarpet taluk recorded the highest paddy grain and fodder yield while Madikere recorded lower biomass and fodder yield owing to seasonal conditions. Overall, paddy grain yield increase of 21%was observed with improved management at a mean grain yield of 7460 kg ha^{-1} compared to mean grain yield of 6140 kg ha^{-1} of paddy under farmers' management (Table 138). Fodder yield increase was 29%, also proportionate at 7010 kg ha^{-1} with improved management compared to 5430 kg ha^{-1} of fodder with farmers' management. It was estimated that an increase of 3691 tons was additionally produced by paddy farmers because of improved management under Bhoochetana programme.

Table 138. Paddy yield (kg ha^{-1}) with improved management compared to farmers' management in different taluks of Kodugu district during Kharif 2011.

Crop	Taluk	Farmers' Management			Improved Management			% increase over FM		
		TDM	Fodder	Grain	TDM	Fodder	Grain	TDM	Fodder	Grain
Paddy	Madikeri	9740	4010	6560	11590	4810	7780	19	20	19
	Somwarpet	12920	6740	6630	16860	8910	7950	30	32	20
	Virajpet	9910	5010	4900	11680	6340	6130	18	27	25
Mean		11110	5430	6140	13850	7010	7460	25	29	21

Kolar

Finger millet

Finger millet was the major crop sown to 24550 ha in the district and achieved only 56% of the target area for this crop under Bhoochetana project. Finger millet grain yield was estimated to be moderately better during 2011 season than the long-term district average productivity of the crop at mean grain yield of 1470 kg ha^{-1} in the farmers' management as well as mean grain yield of 1880 kg ha^{-1} in the improved management due to moderate seasonal conditions. In Srinivaspur taluk, crop yield was very low compared to all other taluks in the district due to deficit seasonal rainfall, however improved management helped

farmers with 33% increase in grain yield of finger millet. An improvement of 410 kg ha^{-1} grain yield with improved management that tantamount to 28% increase in grain yield over farmers' management (Table 139), there was an estimated additional 2435 tons of finger millet grain was produced in Kolar district.

Table 139. Finger millet yield (kg ha^{-1}) with improved management compared to farmers' management in different taluks of Kolar district during Kharif 2011.

Crop	Taluk	Farmers' Management			Improved Management			% increase over FM		
		TDM	Fodder	Grain	TDM	Fodder	Grain	TDM	Fodder	Grain
Finger millet	Bangarpet	6897	4333	1867	8817	5600	2333	28	30	25
	Kolar	6430	3883	1633	8303	4940	2117	29	26	30
	Malur	5067	3193	1290	6677	4200	1673	32	33	28
	Mulabagal	7680	4713	1760	9050	5637	2190	18	20	25
	Srinivaspur	2493	1230	823	3083	1533	1093	26	25	33
Mean		5710	3470	1470	7190	4380	1880	26	26	28

Fodder yield increase by 26% at 4380 kg ha^{-1} with improved management compared to fodder yield at 3470 kg ha^{-1} under farmers' management. Fodder yield increase of 910 kg ha^{-1} enhanced finger millet fodder availability to farmers due to Bhoochetana initiative in Kolar.

Field beans

Field beans, a traditional preferred legume for culinary purpose grown as intercrop within finger millet or maize in the district. Field beans grown on 1417 ha (32%) although planned to grow on 4500 ha in the district. Crop yield was assessed in Srinivaspura and Mulbagal taluks of the district. Field beans mean grain yield increased by 30% with improved management at 1940 kg ha^{-1} compared to mean grain yield of 1490 kg ha^{-1} with farmers' management (Table 140). Because of enhance grain yield with improved management, it is estimated that 2111 tons of field beans grain was additional produced in the district under Bhoochetana initiative.

Table 140. Field beans yield (kg ha^{-1}) with improved management compared to farmers' management in different taluks of Kolar district during Kharif 2011.

Crop	Taluk	Farmers' Management			Improved Management			% increase over FM		
		TDM	Fodder	Grain	TDM	Fodder	Grain	TDM	Fodder	Grain
Field beans	Srinivasapur	3840	1695	1585	4965	2235	2090	30	30	32
	Mulbagal	7140	5210	1395	9510	7025	1785	33	35	28
Mean		5490	3450	1490	7240	4630	1940	32	34	30

Pigeonpea

Pigeonpea was grown on 2384 ha exceeding target cropping area of 2200 ha during kharif season 2011 as intercrop in groundnut and finger millet in the district. Pigeonpea yield was assessed from Bangarpet, Kolar, Malur, Mulbagal and Srinivaspura taluks of Kolar district. Pigeonpea grain yield with farmers' management was higher than long-term average yield of this crop in the district. Pigeonpea grain yield mostly as intercrop was 1940 kg ha^{-1} with improved management which was 30% higher than 1490 kg ha^{-1} with farmers' management (Table 141). Green leaf and flower of pigeonpea used as cattle feed mixed with cereal fodder and stalk used for thatching purpose. Pigeonpea stalk yield was 34% higher with improved management at 4630 kg ha^{-1} compared stalk yield of 3450 kg ha^{-1} with farmers' management. With 30% increase in grain yield of pigeonpea resulting from improved management, it was estimated that 3242 tons of pigeonpea grain was additionally produced in the district because of Bhoochetana interventions.

Table 141. Pigeonpea yield (kg ha^{-1}) with improved management compared to farmers' management in different taluks of Kolar district during Kharif 2011.

Crop	Taluk	Farmers' Management			Improved Management			% increase over FM		
		TDM	Fodder	Grain	TDM	Fodder	Grain	TDM	Fodder	Grain
Pigeon pea	Bangarpet	5960	3815	1355	8125	5275	1780	36	38	31
	Kolar	5740	3510	1470	7810	4685	1995	36	33	36
	Malur	7815	5380	1675	10605	7235	2345	36	35	40
	Mulbagal	6420	4225	1280	8925	5985	1730	39	41	35
	Srinivasapura	4715	3025	1020	6195	3920	1400	30	29	35
Mean		**5490**	**3450**	**1490**	**7240**	**4630**	**1940**	**32**	**34**	**30**

Koppal

Groundnut

Groundnut was sown on 4430 ha covering 49% of the target area 9000 ha for the crop under Bhoochetana productivity enhancement initiative in Koppal district. Groundnut yield was estimated in Koppal and Yalburga taluks of the district. Groundnut pod yield was higher than long-term average in both taluks of the district as the seasonal conditions were favourable to groundnut crop. Mean pod yield of 2670 kg ha^{-1}, was an increase of 53% with improved management compared to mean pod yield of 1750 kg ha^{-1} with farmers' management during kharif season in the district (Table 142). Groundnut haulms are also used as fodder to cattle, and the fodder yield was 39% higher at 3890 kg ha^{-1} with improved management compared to 2810 kg ha^{-1} fodder yield with farmers' management. It was also estimated that 2236 tons of groundnut pod was additionally produced in the district by increased groundnut pod yield with improved management.

Table 142. Groundnut yield (kg ha^{-1}) with improved management compared to farmers' management in different taluks of Koppal district during Kharif 2011.

Crop	Taluk	Farmers' Management			Improved Management			% increase over FM		
		TDM	Fodder	Pod	TDM	Fodder	Pod	TDM	Fodder	Pod
Ground nut	Koppal	5180	3060	2130	6390	3540	2860	23	16	34
	Yalburga	4140	2640	1500	6670	4130	2550	61	56	70
Mean		4550	2810	1750	6560	3890	2670	44	39	53

Maize

Maize was grown on 16968 ha i.e. 136% of the target area of 12500 ha which was an indication of farmers' preference shifting towards maize crop. Maize grain yield was moderately affected by low rainfall in Yalburga taluk particularly in September when maize was at its silking phase. Maize yield was estimated from Gangavathi and Yalburga taluk crop samples and mean grain yield of maize was 2810 kg ha^{-1} in farmers' management and it was estimated at 4040 kg ha^{-1} from improved management (Table 143). Since observed grain yield increase was 44% with improved management that resulted in an estimated increase in grain yield of 4151 tons additionally produced in Koppal district. Maize fodder yield also increased by 37% with improved management at 6340 kg ha^{-1} compared to fodder yield of 4620 kg ha^{-1} with farmers' management.

Table 143. Maize yield (kg ha^{-1}) with improved management compared to farmers' management in different taluks of Koppal district during Kharif 2011.

Crop	Taluk	Farmers' Management			Improved Management			% increase over FM		
		TDM	Fodder	Grain	TDM	Fodder	Grain	TDM	Fodder	Grain
Maize	Gangavathi	9170	5460	3120	13040	7720	4460	42	42	43
	Yalburga	6250	3370	2350	8500	4260	3420	36	27	46
Mean		8000	4620	2810	11220	6340	4040	40	37	44

Pearl millet

Pearl millet was grown on 32900 ha achieved 106% of sowing target of 31000 ha area for productivity enhancements under Bhoochetana program during kharif. Pearl millet mean grain yield at 1240 kg ha^{-1} under improved management, farmers increased pearl millet productivity by 63% compared to mean grain yield of 760 kg ha^{-1} under farmers' management. Similarly mean fodder yield also increased by 63% with improved management at 1770 kg ha^{-1} compared to 1090 kg ha^{-1} with farmers' management (Table 144). As a result of increased grain yield with improved management, it was estimated that 4018 tons of additional grain was produced in Koppal under Bhoochetana initiative.

Table144. Pearl millet yield (kg ha^{-1}) with improved management compared to farmers' management in different taluks of Koppal district during Kharif 2011.

Crop	Taluk	Farmers' Management			Improved Management			% increase over FM		
		TDM	Fodder	Grain	TDM	Fodder	Grain	TDM	Fodder	Grain
Pearl	Koppal	1620	830	640	2950	1310	1040	82	59	63
Millet	Kustagi	2360	1260	850	3970	2080	1380	68	65	63
Mean		2070	1090	760	3560	1770	1240	72	63	63

Sorghum

Sorghum was targeted to grow on 4000 ha and achieved sowing in 1608 ha, i.e. 40% of the target area. Crop yield was estimated in Koppal and Kustigi taluks of the district. Sorghum mean grain yield increase was 47% higher at 1570 kg ha^{-1} with improved management compared to grain yield of 1070 kg ha^{-1} with farmers' management (Table 145). Fodder yield increase was slightly low at 34% as fodder yield was 3150 kg ha^{-1} with improved management compared to fodder yield of 2340 kg ha^{-1} with farmers' management. Based on 47% increase in grain yield with improved management, it was estimated that 540 tons of sorghum grain was additionally produced in the district under Bhoochetana initiative.

Table 145. Sorghum yield (kg ha^{-1}) with improved management compared to farmers' management in different taluks of Koppal district during Kharif 2011.

Crop	Taluk	Farmers' Management			Improved Management			% increase over FM		
		TDM	Fodder	Grain	TDM	Fodder	Grain	TDM	Fodder	Grain
Sorg	Koppal	3520	2170	1120	5860	3090	1630	66	42	46
hum	Kustagi	4210	2460	1040	5450	3190	1530	29	30	47
Mean		3940	2340	1070	5610	3150	1570	43	34	47

Mandya

Cowpea

Cowpea was grown on 2234 ha, achieved 89% of the cropping target area of 2500 ha selected for productivity enhancement of cowpea under Bhoochetana initiative in Mandya district. Cowpea yield was estimated from KR pet, Mandya, Nagamangala and Pandavapura taluks of Mandya district. Cowpea yield was low in both treatments due to deficit rainfall in June and July resulted in poor crop growth for short season legume in all taluks. However, cowpea grain yield increase was 45% with improved management at mean grain yield of 390 kg ha^{-1} compared to very low mean grain yield of 270 kg ha^{-1} with farmers' management (Table 146). Cowpea fodder yield increased by 53% with improved management at 1440 kg ha^{-1} compared to 940 kg ha^{-1} with farmers' management. Low biomass production in both

the treatments was an indication of poor crop growth with unfavourable seasonal condition. It is estimated that as low as 75 tons of additional grain yield was produced because of improved management of the crop under Bhoochetana initiative in the district.

Table 146. Cowpea yield (kg ha^{-1}) with improved management compared to farmers' management in different taluks of Mandya district during Kharif 2011.

Crop	Taluk	Farmers' Management			Improved Management			% increase over FM		
		TDM	Fodder	Grain	TDM	Fodder	Grain	TDM	Fodder	Grain
Cow pea	K R Pet	1200	810	280	1790	1220	390	48	52	43
	Mandya	1330	950	230	2040	1470	350	53	55	51
	Nagamangala	860	860		1640	1640		90	90	
	Pandavapura	1660	1170	300	2160	1530	420	30	32	43
Mean		1280	940	270	1910	1440	390	49	53	45

Maize

Maize was grown on 1482 ha, 99% of the target area of 1500 ha. Maize grain yield was severely affected by low rainfall in Malavalli taluk particularly in September when maize was at its silking phase. Maize yield was estimated from Malavalli taluk crop samples and mean grain yield of maize was 930 kg ha^{-1} in farmers' management and it was estimated at 1200 kg ha^{-1} from improved management (Table 147). Since observed grain yield increase was 29% with improved management that resulted in an estimated increase in grain yield of 90 tons additionally produced in Mandya district. Maize fodder yield also increased by 26% with improved management at 2220 kg ha^{-1} compared to fodder yield of 1760 kg ha^{-1} with farmers' management.

Table 147. Maize yield (kg ha^{-1}) with improved management compared to farmers' management in Malavalli taluk of Mysore district during Kharif 2011.

Crop	Taluk	Farmers' Management			Improved Management			% increase over FM		
		TDM	Fodder	Grain	TDM	Fodder	Grain	TDM	Fodder	Grain
Maize	Malavalli	2850	1760	930	3710	2220	1200	30	26	29
Mean		2850	1760	930	3710	2220	1200	30	26	29

Finger millet

Finger millet was grown on 12285 ha, achieved 64% of the targeted area 19200 ha in Mandya district during kharif season. Finger millet yield was estimated in KR Pet, Maddur, Malavalli, Mandya, Nagamangala, Pandavapura and S R patna taluks of the district. Finger millet responded by 30% increase (ranged from 20% to 36%) in mean grain yield at 560 kg ha^{-1} with improved management that was consistently better compared to mean grain yield

of 430 kg ha^{-1} with farmers' management across all taluks (Table 148). Finger millet fodder yield in response to improved management was similar with an increase in mean fodder yield by 36%, and the mean difference in fodder yield was 460 kg ha^{-1} between IM and FM treatments. It is estimated that 574 tons of finger millet grain was additionally produced in the district due to adoption of improved management technologies under Bhoochetana initiative.

Table 148. Finger millet yield (kg ha^{-1}) with improved management compared to farmers' management in different taluks of Mandya district during Kharif 2011.

Crop	Taluk	Farmers' Management			Improved Management			% increase over FM		
		TDM	Fodder	Grain	TDM	Fodder	Grain	TDM	Fodder	Grain
Finger millet	K R Pet	1830	1200	470	2510	1680	640	37	40	36
	Maddur	1590	1110	460	2220	1600	570	39	44	24
	Malavalli	1920	1350	430	2510	1750	540	31	29	27
	Mandya	1780	1260	410	2330	1590	560	31	27	36
	Nagamangala	1960	1480	360	2700	2050	480	38	38	31
	Pandavapura	1770	1330	350	2420	1860	470	36	39	34
	SR Patna	1630	910	560	2110	1230	670	29	36	20
Mean		**1800**	**1250**	**430**	**2420**	**1710**	**560**	**35**	**36**	**30**

Mysore

Finger millet

Finger millet was grown on 13850 ha, achieved 71% of the targeted area of 19500 ha in Hassan district during kharif season. Finger millet yield was estimated in HD kote, KR Nagara, Mysore and Periyapatana taluks of Mysore district. Finger millet responded by 24% increase in mean grain yield at 2680 kg ha^{-1} to improved management that was consistently better compared to mean grain yield of 2170 kg ha^{-1} across all taluks (Table 149). Finger millet fodder yield in response to improved management was an increase in mean fodder yield by 29%, and the mean difference in fodder yield was 690 kg ha^{-1} between IM and FM treatments. It is estimated that 905 tons of finger millet grain was additionally produced in the district due to adoption of improved management under Bhoochetana initiative.

Table 149. Finger millet yield (kg ha^{-1}) with improved management compared to farmers' management in different taluks of Mysore district during Kharif 2011.

Crop	Taluk	Farmers' Management			Improved Management			% increase over FM		
		TDM	Fodder	Grain	TDM	Fodder	Grain	TDM	Fodder	Grain
Finger millet	H D Kote	5890	3270	2110	7280	3940	2680	24	21	27
	K R Nagara	5140	2460	1980	6010	3260	2520	17	33	27
	Mysore	5620	2720	2250	6840	3480	2700	22	28	20
	P Pattana	6160	3030	2420	7240	3560	2850	18	17	18
Mean		5760	3000	2170	7010	3690	2680	22	23	24

Raichur

Groundnut

Groundnut was sown on 2990 ha covering 54% of the target area 5500 ha for the crop under Bhoochetana productivity enhancement initiative in Raichur district. Groundnut yield was estimated from Sindhanur taluk of the district. Groundnut pod yield in both treatments was less during kharif as the seasonal rainfall was deficit particularly September and October months affecting groundnut crop. Mean pod yield of 1180 kg ha^{-1} was an increase by 30% with improved management compared to mean pod yield of 910 kg ha^{-1} with farmers' management during kharif season in the district (Table 150). Groundnut haulms are used as fodder to cattle, and the fodder yield was 20% higher at 1560 kg ha^{-1} with improved management compared to fodder yield of 1300 kg ha^{-1} with farmers' management. It was also estimated that 345 tons of groundnut pod was additionally produced in the district by increased groundnut pod yield with improved management.

Table 150. Groundnut yield (kg ha^{-1}) with improved management compared to farmers' management in Sindhanur taluk of Raichur district during Kharif 2011.

Crop	Taluk	Farmers' Management			Improved Management			% increase over FM		
		TDM	Fodder	Pod	TDM	Fodder	Pod	TDM	Fodder	Pod
Groundnut	Sindhanur	2210	1300	910	2740	1560	1180	24	20	30
Mean		2210	1300	910	2740	1560	1180	24	20	30

Pearl millet

Pearl millet was grown on 18020 ha achieved 72% of sowing target of 25000 ha area for productivity enhancements under Bhoochetana program during kharif. Pearl millet yield was assessed from Lingasugur taluk in the district. Pearl millet mean grain yield at 1520 kg ha^{-1} with improved management increased pearl millet grain yield by 21% compared to mean grain yield of 1260 kg ha^{-1} with farmers' management. Similarly mean fodder yield also increased by 23% with improved management at 2440 kg ha^{-1} compared to 1990 kg ha^{-1} with farmers' management (Table 151).

Table 151. Pearl millet yield (kg ha^{-1}) with improved management compared to farmers' management in Lingsugur taluk of Raichur district during Kharif 2011

Crop	Taluk	Farmers' Management			Improved Management			% increase over FM		
		TDM	Fodder	Grain	TDM	Fodder	Grain	TDM	Fodder	Grain
Pearl millet	Lingasugur	3700	1990	1260	4630	2440	1520	25	23	21
Mean		3700	1990	1260	4630	2440	1520	25	23	21

As a result of increased grain yield with improved management, it was estimated that 1508 tons of additional grain was produced in Raichur district under Bhoochetana initiative.

Sunflower

Sunflower crop was sown to 8575 ha achieved 123% of the target area 7000 ha cropped with sunflower owing to good seed yield and higher economic returns received in previous years for sunflower farmers. Sunflower yield was assessed in Raichur taluk of the district. Sunflower seed yield during kharif season was not up to farmers' expectations in both treatments. However, sunflower seed yield increased by 23% at 1030 kg ha^{-1} with improved management compared to mean seed yield of 840 kg ha^{-1} with farmers' management (Table 152). It is estimated that 770 tons of sunflower seed was additionally produced in Raichur due to adoption of improved management under Bhoochetana initiative.

Table 152. Sunflower yield (kg ha^{-1}) with improved management compared to farmers' management in Raichur taluk of Raichur district during Kharif 2011

Crop	Taluk	Farmers' Management			Improved Management			% increase over FM		
		TDM	Fodder	Grain	TDM	Fodder	Grain	TDM	Fodder	Grain
Sun flower	Raichur	3700	2180	840	4470	2630	1030	21	21	23
Mean		3700	2180	840	4470	2630	1030	21	21	23

Ramanagara

Pigeonpea

Pigeonpea was grown on 2700 ha achieving 100% of the target cropping area of 2700 ha during kharif season 2011 as intercrop in finger millet and as sole crop for vegetable pods in the district. Pigeonpea yield was assessed from Chanapatana, Magadi and Ramnagara taluks of Ramnagara district. Pigeonpea grain yield with farmers' management as well as improved management was lower for this crop in the district. Pigeonpea grain yield as intercrop was 1420 kg ha^{-1} with improved management which was 42% higher than 1010 kg ha^{-1} with farmers' management (Table 153). Green leaf and flower of pigeonpea used as cattle feed mixed with cereal fodder and stalk used for thatching purpose. Pigeonpea stalk yield was 30% higher with improved management at 10180 kg ha^{-1} compared to stalk yield of 7860 kg ha^{-1} with farmers' management. With 42% increase in grain yield of pigeonpea resulting from improved management, it was estimated that 125 tons of pigeonpea grain was additionally produced in the district because of Bhoochetana interventions.

Table 153. Pigeonpea yield (kg ha^{-1}) with improved management compared to farmers' management in different taluks of Ramanagara district during Kharif 2011

Crop	Taluk	Farmers' Management			Improved Management			% increase over FM		
		TDM	Fodder	Grain	TDM	Fodder	Grain	TDM	Fodder	Grain
Pigeon pea	Chanapatana	5720	3660	1100	7690	4880	1530	34	34	40
	Magadi	13170	11380	1200	17300	14780	1700	31	30	41
	Ramanagara	7160	5970	690	9380	7590	990	31	27	44
Mean		9510	7860	1010	12520	10180	1420	32	30	42

Finger millet

Finger millet was the major crop sown to 44806 ha in the district and achieved 95% of the target area 47200 ha for this crop under Bhoochetana project. Finger millet grain yield was estimated to be moderately better during 2011 season than the long-term district average productivity of the crop at mean grain yield of 2210 kg ha^{-1} in the farmers' management as well as mean grain yield of 3100 kg ha^{-1} in the improved management due to moderate seasonal conditions. In Magadi taluk, crop yield was higher compared to all other taluks in the district due to better seasonal rainfall. Improved management helped farmers with 40% increase in grain yield of finger millet. An improvement of 890 kg ha^{-1} grain yield with improved management that tantamount to 40% increase in grain yield over farmers' management (Table 154), there was an estimated additional 4621 tons of finger millet grain was produced in Ramnagara district. Mean fodder yield also increase by 39% in the district.

Table 154. Finger millet yield (kg ha^{-1}) with improved management compared to farmers' management in different taluks of Ramanagara district during Kharif 2011.

Crop	Taluk	Farmers' Management			Improved Management			% increase over FM		
		TDM	Fodder	Grain	TDM	Fodder	Grain	TDM	Fodder	Grain
Finger millet	Chanapatana	8190	4710	2130	11600	6690	3050	42	42	44
	Kanakapuara	7580	4320	2460	10120	5840	3170	33	35	29
	Magadi	9080	5690	2270	12830	8150	3340	41	43	47
	Ramangara	7120	4040	1990	9630	5450	2830	35	35	42
Mean		7990	4690	2210	11040	6530	3100	38	39	40

Shimago

Maize

Maize was grown on 16800 ha, achieved 100% of the target area which is an indication of farmers' preference to maize crop. Maize grain yield was higher compared to long-term

average maize yield for the district. Maize yield was estimated from Bhadravathi, Hosangar, Sagara, Shikaripur, Shimoga and Soraba taluks crop samples. Mean grain yield increase of 37% was estimated at 5970 kg ha^{-1} with improved management and maize grain yield was estimated at 4370 kg ha^{-1} with farmers' management (Table 155). Maize grain yield increase was 37% with improved management that resulted in an estimated increase in grain yield of 6720 tons additionally produced in Shimoga district. Maize fodder yield also increased by 35% with improved management at 3310 kg ha^{-1} compared to fodder yield of 2450 kg ha^{-1} with farmers' management.

Table155. Maize yield (kg ha^{-1}) with improved management compared to farmers' management in different taluks of Shimago district during Kharif 2011.

Crop	Taluk	Farmers' Management			Improved Management			% increase over FM		
		TDM	Fodder	Grain	TDM	Fodder	Grain	TDM	Fodder	Grain
Maize	Bhadravathi	7310	2130	4460	10460	2890	6250	43	36	40
	Hosanagar	3540	1340	1820	4690	1960	2370	32	47	30
	Sagara	6260	2660	3040	8550	3750	4140	37	41	36
	Shikaripur	9880	3210	5540	13360	4100	7680	35	27	39
	Shimoga	11160	2790	6920	14720	3630	9200	32	30	33
	Soraba	7200	2410	3890	9700	3330	5420	35	38	39
Mean		7690	2450	4370	10440	3310	5970	36	35	37

Paddy

Paddy was planned to grow on 35600 ha during the kharif season in Shimoga, and the 100% of the target area was sown/transplanted to paddy in Bhadravathi, Hosanagar, Sagara, Shikaripur, Shimoga, Soraba and Thirthahalli taluks of the district. Paddy yield was the highest in terms of grain and fodder in Soraba taluk while paddy in Hosanagar recorded the lowest fodder and grain yield in both FM and IM treatments owing to variable seasonal conditions. Overall, paddy grain yield increase was 28% with improved management at a mean grain yield of 6470 kg ha^{-1} compared to mean grain yield of 5050 kg ha^{-1} of paddy with farmers' management (Table 156). Fodder yield increase was 30% at 10610 kg ha^{-1} with improved management compared to 8170 kg ha^{-1} of fodder with farmers' management. It was estimated that an increase of 12638 tons was additionally produced by paddy farmers in the district because of improved management under Bhoochetana programme.

Tumkur

Finger millet

Finger millet was the major crop sown to 146630 ha in the district and achieved 95% of the 155000 ha target area for this crop under Bhoochetana project. Finger millet grain yield was

estimated near average during 2011 season at mean grain yield of 1470 kg ha^{-1} in the improved management as well as mean grain yield of 1880 kg ha^{-1} in the farmers' management due to moderate seasonal conditions. In Srinivaspur taluk, crop yield was very low compared to all other taluks in the district due to deficit seasonal rainfall, however improved management helped farmers with 33% increase in grain yield of finger millet. An improvement of 410 kg ha^{-1} grain yield with improved management that tantamount to 28% increase in grain yield over farmers' management (Table 157), there was an estimated additional 2435 tons of finger millet grain was produced in Kolar district.

Table 156. Paddy yield (kg ha^{-1}) with improved management compared to farmers' management in different taluks of Shimago district during Kharif 2011.

Crop	Taluk	Farmers' Management			Improved Management			% increase Over FM		
		TDM	Fodder	Grain	TDM	Fodder	Grain	TDM	Fodder	Grain
Paddy	Bhadravathi	11550	6720	4840	15910	9370	6530	38	40	35
	Hosanagar	10910	6390	4510	13540	8220	5320	24	29	18
	Sagara	14100	9060	5040	18110	11560	6550	28	28	30
	Shikaripura	13240	7310	5930	16820	9420	7400	27	29	25
	Shimoga	11260	7850	3410	15800	11030	4770	40	40	40
	Soraba	17320	10770	6550	21990	13450	8540	27	25	30
	Thirthahalli	14130	9070	5060	17400	11250	6150	23	24	22
Mean		**13220**	**8170**	**5050**	**17080**	**10610**	**6470**	**29**	**30**	**28**

Table 157. Finger millet (kg ha^{-1}) with improved management compared to farmers' management in different taluks of Tumkur district during Kharif 2011.

Crop	Taluk	Farmers' Management			Improved Management			% increase Over FM		
		TDM	Fodder	Grain	TDM	Fodder	Grain	TDM	Fodder	Grain
Finger millet	Kunigal	3360	2850	760	3760	2930	930	12	3	22
	Tumkur	-	-	700	-	-	860	-	-	23
Mean		3360	2850	730	3760	2930	895	12	3	23

Udipi

Paddy

Paddy was planned to grow on 10000 ha during the kharif season in Udipi, and 100% of the target area was sown / transplanted to paddy in Karkala, Kundapura and Udipi taluks of the district. Overall, paddy grain yield increase was 29% with improved management at a mean grain yield of 5210 kg ha^{-1} compared to mean grain yield of 4030 kg ha^{-1} of paddy with farmers' management (Table 158). Fodder yield increase was 43% at 5620 kg ha^{-1} with improved management compared to 3930 kg ha^{-1} of fodder with farmers' management. It

was estimated that an increase of 1038 tons was additionally produced by paddy farmers because of improved management under Bhoochetana programme.

Table 158. Paddy yield (kg ha^{-1}) with improved management compared to farmers' management in different taluks of Udipi district during Kharif 2011

Crop	Taluk	Farmers' Management			Improved Management			% increase Over FM		
		TDM	Fodder	Grain	TDM	Fodder	Grain	TDM	Fodder	Grain
Paddy	Karkala	6480	3100	3390	8760	4510	4250	35	46	25
	Kundapura	9370	5370	4000	13030	7630	5400	39	42	35
	Udupi	8010	3320	4690	10680	4720	5970	33	42	27
Mean		7960	3930	4030	10820	5620	5210	36	43	29

Uttara Kannada

Paddy

Paddy was planned to grow on 5200 ha during the kharif season in Dakshina Kannada, and the entire target area was sown/transplanted to paddy in Karwar, Mundgod, Hannovar, Siddapur, Joida, Haliyal and Ankola taluks of the district. Paddy mean grain yield increase of 11%was observed with improved management at a mean grain yield of 2928 kg ha^{-1} compared to mean grain yield of 2316 kg ha^{-1} of paddy under farmers' management (Table 159). Fodder yield increase was 31%, also proportionate at 7440 kg ha^{-1} with improved management compared to 5690 kg ha^{-1} of fodder with farmers' management. It was estimated that an increase of 6194 tons was additionally produced by paddy farmers because of improved management under Bhoochetana programme.

Table 159. Paddy yield (kg ha^{-1}) with improved management compared to farmers' management in different taluks of Uttara Kannada district during Kharif 2011

Crop	Taluk	Improved management			Farmers' management			% increase in yield		
		TDM	Grain	Fodder	TDM	Grain	Fodder	TDM	Grain	Fodder
Paddy	Karwar	7321	4251	2882	5301	3181	2073	38	34	39
	Hannovar	9212	4229	4983	9043	4085	4958	4	-	-
	Joida	7132	3298	3833	6957	3219	3738	2.5	2.5	19.1
	Haliyal	-	2928	-	-	2316	-	26.4	-	-
	Ankola	-	4445	-	-	4468	-	-0.5	-	-
Mean		7907	3838	3946	6022	3396	3898	15	11	10

Maize

Maize was grown on 2000 ha, achieved 100% of the target area with maize crop. Maize grain yield was low. Maize yield was estimated from Haliyal taluk crop samples and mean grain

yield of maize was 2580 kg ha^{-1} in farmers' management and it was estimated at 3250 kg ha^{-1} from improved management (Table 160). Grain yield increase was 26% with improved management that resulted in an estimated increase in grain yield of tons additionally produced in Uttara Kannada district. Maize fodder yield samples were not available for the district for assessment hence could not provide data on fodder yield of the crop.

Table 160. Maize yield (kg ha^{-1}) with improved management compared to farmers' management in Haliyal taluk of Uttara Kannada district during Kharif 2011

Crop	Taluk	Improved management			Farmers' management			% increase in yield		
		TDM	Grain	Fodder	TDM	Grain	Fodder	TDM	Grain	Fodder
Maize	Haliyal	-	3250	-	-	2580	-	-	26	-

Yadgiri

Green gram

Green gram was sown on 24357 ha during kharif season in Yadgiri district, achieved 76% of 32000 ha sowing target area for productivity enhancements under Bhoochetana initiative. The short fall in sowing area was due to low rainfall in June in Shahapur taluk of Yadgiri district. Grain yield in both treatments were low because of unfavourable seasonal conditions. However, there was an increase of 43% in grain yield at 810 kg ha^{-1} with improved management compared to mean grain yield of 570 kg ha^{-1} across all taluks was recorded with farmers' management (Table 161). Green gram fodder yield was also significantly increased at 35% with improved management. It was estimated that an additional 1052 tons of grain yield was produced by farmers under Bhoochetana initiative during the kharif in the district.

Table 161. Green gram yield (kg ha^{-1}) with improved management compared to farmers' management in different taluks of Yadgiri district during Kharif 2011

Crop	Taluk	Farmers' Management			Improved Management			% increase Over FM		
		TDM	Fodder	Grain	TDM	Fodder	Grain	TDM	Fodder	Grain
Green gram	Shahapur	2070	1050	650	2900	1550	890	40	48	37
	Yadgiri	1890	1160	480	2620	1430	730	39	24	52
Mean		1980	1100	570	2760	1490	810	39	35	43

Pearl millet

Pearl millet was grown on 21403 ha in Yadgiri district, achieved 97% of sowing target of 22000 ha area for productivity enhancements under Bhoochetana program during kharif.

Pearl millet mean grain yield at 2250 kg ha^{-1} under improved management, farmers increased pearl millet productivity by 33% compared to mean grain yield of 1680 kg ha^{-1} under farmers' management. Similarly mean fodder yield also increased by 35% with improved management at 2330 kg ha^{-1} compared to 1730 kg ha^{-1} with farmers' management (Table 162). As a result of increased grain yield with improved management, it was estimated that 1688 tons of additional grain was produced in Yadgiri under Bhoochetana initiative

Table 162. Pearl millet yield (kg ha^{-1}) with improved management compared to farmers' management in different taluks of Yadgiri district during Kharif 2011.

Crop	Taluk	Farmers' Management			Improved Management			% increase Over FM		
		TDM	Fodder	Grain	TDM	Fodder	Grain	TDM	Fodder	Grain
Pearl Millet	Shahapur	3500	1580	1450	4620	2070	1990	32	31	37
	Yadgiri	4580	1880	1920	5910	2590	2500	29	38	31
Mean		4040	1730	1680	5260	2330	2250	30	35	33

Pigeonpea

Pigeonpea was grown on 47366 ha exceeding target cropping area of 40000 ha during kharif season 2011 as intercrop in green gram and pearl millet in the district. Pigeonpea yield was assessed from Shorapur and Yadgiri taluks of Yadgiri district. Pigeonpea grain yield with farmers' management was lower than long-term average yield of this crop in the district. Pigeonpea grain yield mostly as intercrop was 850 kg ha^{-1} with improved management which was 29% higher than 660 kg ha^{-1} with farmers' management (**Table 163**). Green leaf and flower of pigeonpea are used as cattle feed with cereal mixed fodder and stalks are used for thatching purpose. Pigeonpea stalk yield was 24% higher with improved management at 1710 kg ha^{-1} compared stalk yield of 1380 kg ha^{-1} with farmers' management. With 29% increase in grain yield of pigeonpea resulting from improved management, it was estimated that 1041 tons of pigeonpea grain was additionally produced in the district because of Bhoochetana interventions.

Table 163. Pigeonpea yield (kg ha^{-1}) with improved management compared to farmers' management in differernt taluks of Yadgiri district during Kharif 2011.

Crop	Taluk	Farmers' Management			Improved Management			% increase Over FM		
		TDM	Fodder	Grain	TDM	Fodder	Grain	TDM	Fodder	Grain
Pigeonpea	Shorapur	2200	1210	680	2690	1430	870	22	18	29
	Yadagiri	2510	1550	640	3160	1990	820	26	29	29
Mean		2360	1380	660	2930	1710	850	24	24	29

Sunflower

Sunflower crop was sown to 11074 ha, achieved almost 100% of the target cropped area of 11100 ha. Sunflower seed yield was estimated from Shahapur and Shorapur taluks of Yadgiri district. Sunflower seed yield increased by 33% at 830 kg ha^{-1} with improved management compared to mean seed yield of 620 kg ha^{-1}with farmers' management (Table 164). It is estimated that 319 tons of sunflower seed was additionally produced in Yadgiri district due to adoption of improved management under Bhoochetana initiative.

Table 164. Sunflower yield (kg ha^{-1}) with improved management compared to farmers' management in different taluks of Yadgiri district during Kharif 2011.

Crop	Taluk	Farmers' Management			Improved Management			% increase Over FM		
		TDM	Fodder	Grain	TDM	Fodder	Grain	TDM	Fodder	Grain
Sun	Shahapur	1850	1000	530	2490	1440	720	35	44	36
flower	Shorapur	2370	1140	720	2690	1400	940	14	23	31
Mean		2110	1070	620	2590	1420	830	23	33	33

Crop-wise Summary

During the crop season 2011-12, rainfall distribution across different districts in Karnataka was variable and two conspicuous patterns were distinct. In the South western coastal districts of Karnataka where normal rainfall was high, rainfall during rainy season was more than normal. Rainfall in the South interior and southern districts of Karnataka was slightly more than normal or near normal in this season. In the North West and North Eastern Karnataka rainfall was less than normal especially in July and September, and affected overall crop productivity in these districts.

Finger millet

District mean yields of finger millet in farmers' management and improved management was reported from 8 districts as this has been one of the major food and fodder crops in these districts (Figure 33). With favorable seasonal conditions in Ramanagara, Mysore, Bengaluru Urban and Bengaluru Rural districts, finger millet yield was around 2 t ha^{-1} with farmers' management. In these districts, finger millet mean grain yield was estimated more than 2.5 to 3.0 t ha^{-1} with improved management that include application of micronutrients at recommended dosage. In favorable cropping conditions, yield increase due to improved management was in the range of 24% in Mysore to 40% in Ramanagara. With average seasonal conditions in Davangere and Kolar, finger millet mean grain yield was around 1.5 t ha^{-1} in the farmers' management and mean grain yield was nearly 2.0 t ha^{-1} in the improved

management. In these average conditions, an increase in grain yield was in the range of 24% in Davangere to 28% in Kolar with improved management compared to farmers' management (FM). Due to unfavorable cropping conditions in Chitradurga and Mandya, finger millet mean grain yield was less than 0.5 t ha^{-1} with farmers' management; 30% increased mean grain yield in Mandya and 45% increased mean grain yield in Chitradurga was observed with improved management in these districts. Finger millet crop yields in large areas as a consequence of scaling up of Bhoochetana project activities also testify that improved management that includes balanced nutrition enhances crop productivity under varied cropping conditions in rainfed agriculture. Fodder yield of finger millet (not in graph) also follow similar production trend by enhanced fodder yield with improved management in these districts.

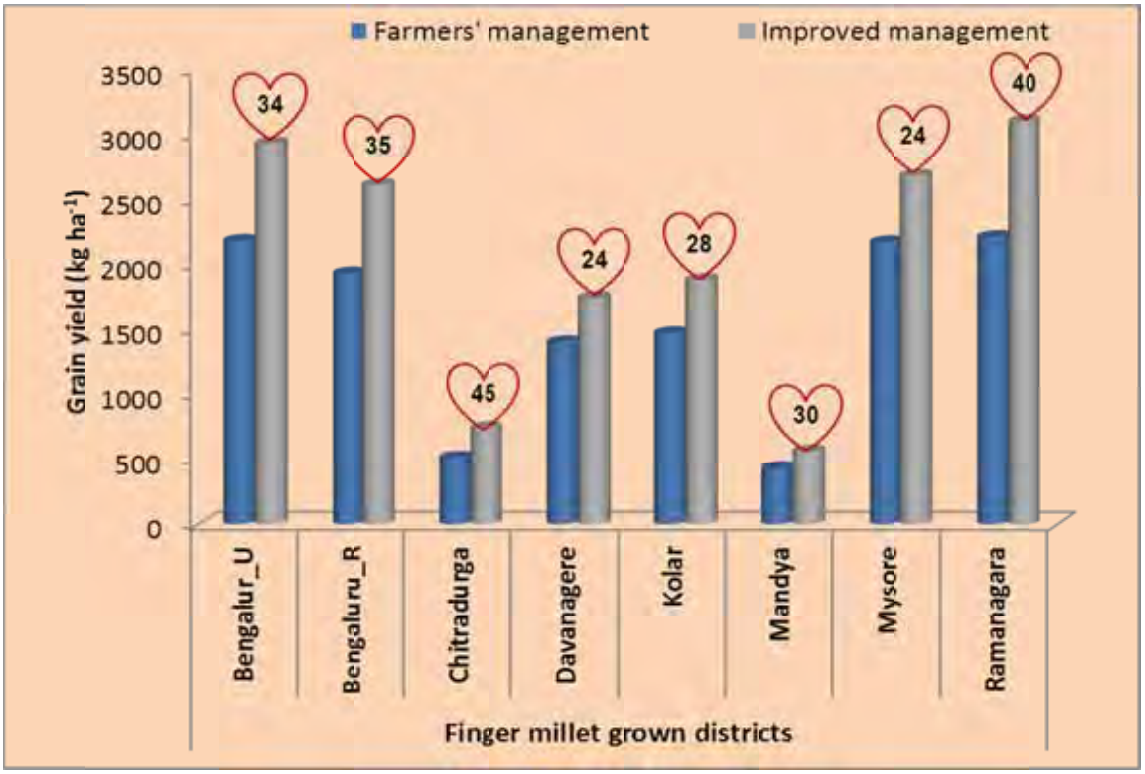

Figure 33 . Finger millet grain yield response to IM and FM in various districts of Karnataka during 2011-12 kharif season

Productivity enhancement due to technology adoption under Bhoochetana project improved finger millet production in 10 districts on 329016 ha. With application of balanced nutrients on 94083 ha, it was estimated that 26900 tons of finger millet grain was added to food grain granaries of Karnataka state and also enhance income to farmers due to additional grain and fodder produced from the same unit of land.

Maize

Maize is a major crop in 18 districts of Karnataka grown on more than 5.8 lakh ha during the kharif season. Nutrient deficiencies were corrected with application of micronutrients along with recommended major nutrients approximately in 1.95 lakh ha in these districts. Maize grain yield increase ranged from a minimum of 24% in Bengaluru Rural to a maximum of 44% in Koppal district with improved management compared to farmers' management within the same district (Figure 34). In nine out of 18 districts, maize grain yield was more than 4 t ha^{-1} with farmers' management indicates higher productivity of crop even with farmers' management. In 10 districts, maize grain yield with improved management was more than 5.5 t ha^{-1} with correspondingly increase of 1.5 t ha^{-1} compared to farmers' management in these districts. In Mandya, Bellary, Chikballapur, Chitradurga and Koppal maize yield in both FM and IM was low because of deficit rainfall conditions in August and especially September which corresponds with critical stages of crop growth. In Bagalkot, Chikmangaluru, Davangere, Dharwad, Gadag, Haveri, Kodugu and Shimoga districts, maize grain yield exceeded 6.0 t ha^{-1} with improved management. Due to balanced nutrient application including micronutrients, it is estimated that maize production increased by 3.03 lakh tons in Karnataka during kharif 2011 as a result of concerted efforts by Bhoochetana programme partner institutions.

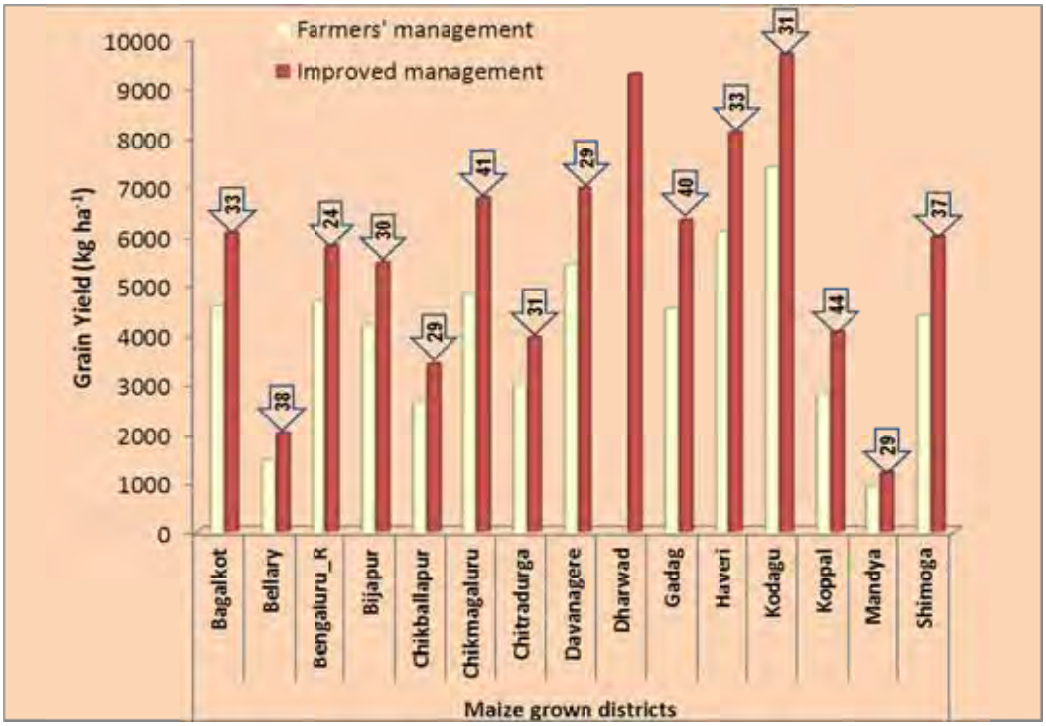

Figure 34. Maize grain yield response to IM and FM in various districts of Karnataka during 2011-12 kharif season.

Paddy

Paddy is one of the major food crops considered for productivity enhancement under Bhoochetana initiative in five high rainfall districts of the Southern Karnataka namely Dakshina Kannada, Uttara Kannada, Kodugu, Shimoga and Udipi. In these districts paddy was grown on 67800 ha of which 17033 ha only received balanced nutrients by correcting nutrient deficiencies in farmers' fields. Since paddy was grown as irrigated paddy with assured rainfall, a minimum 4 t ha^{-1} paddy grain yield was recorded with farmers' management in all these districts. Paddy grain yield corresponding increase with improved management was between a minimum of 21% in Kodugu to a maximum of 32% Dakshina Kannada. Paddy grain yield increase was between 1 to 1.5 t ha^{-1} in different districts with improved management compared to corresponding paddy grain yield with farmers' management. Paddy grain yield increase with improved management in five districts, it is estimated that an additional 23562 tons of paddy grain was produced in Karnataka during kharif 2011 as a result of Bhoochetana initiative in the state.

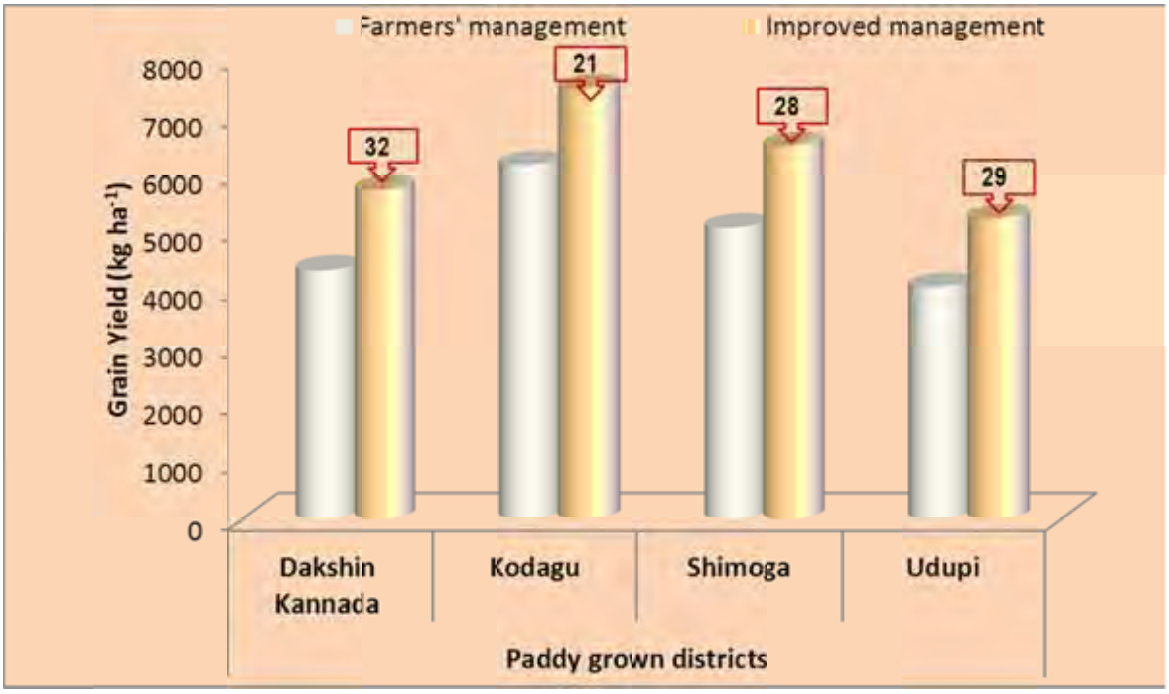

Figure 35 . Paddy grain yield response to IM and FM in various districts of Karnatka during 2011-12 kharif season

Pearl millet

Pearl millet is a major food crop in six of the North Eastern districts of Karnataka namely Bagalkot, Bijapur, Gulbarga, Koppal, Raichur and Yadgiri. Pearl millet was grown on 1.18

lakh ha during the kharif season however, received balanced nutrients only on 32587 ha in these districts. In Bagalkot, pearl millet produced higher grain yield in IM and FM due to favorable seasonal conditions, and the yield increase was 42% at 4.6 t ha^{-1} (Figure 36). In all other districts, pearl millet grain yield was between 1 to 1.5 t ha^{-1} in the farmers' management and grain yield was 1.5 to 2.5 t ha^{-1} with improved management. Grain yield increase ranged from a minimum of 21% in Raichur to a maximum of 63% in Koppal. Grain yield increase of Pearl millet with improved management resulted in additional grain production of 25520 tons during kharif season in six district of Karnataka.

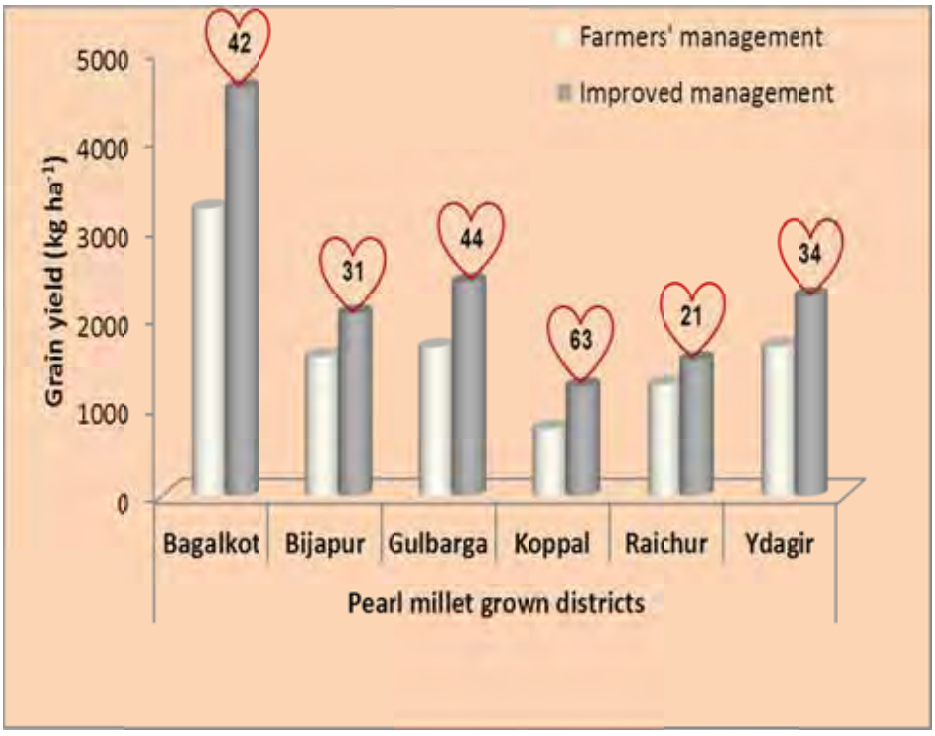

Figure 36 . Pearl millet grain yield response to IM and FM in various districts of Karnataka during 2011-12 kharif season

Sorghum

Sorghum was a major crop during Kharif in four districts namely Bellary, Bidar, Koppal and Davangere of Karnataka. Sorghum was grown on 165512 ha out of which 91081 ha received balanced nutrients under Bhoochetana in four districts. Sorghum grain yield increase with improved management ranged between a minimum of 35% in Bidar to 42% in Bellary, Davangere and 47% in Koppal (Figure 37). Among sorghum grown districts, Davangere recorded highest grain yield while Koppal recorded the lowest grain yield in both IM and FM. In different districts, sorghum grain yield increased by 1 to 1.5 t ha^{-1} in response to improved management. With enhanced productivity of sorghum in these districts, it was estimated that an additional 98215 tons of sorghum grain was produced during kharif season in Karnataka.

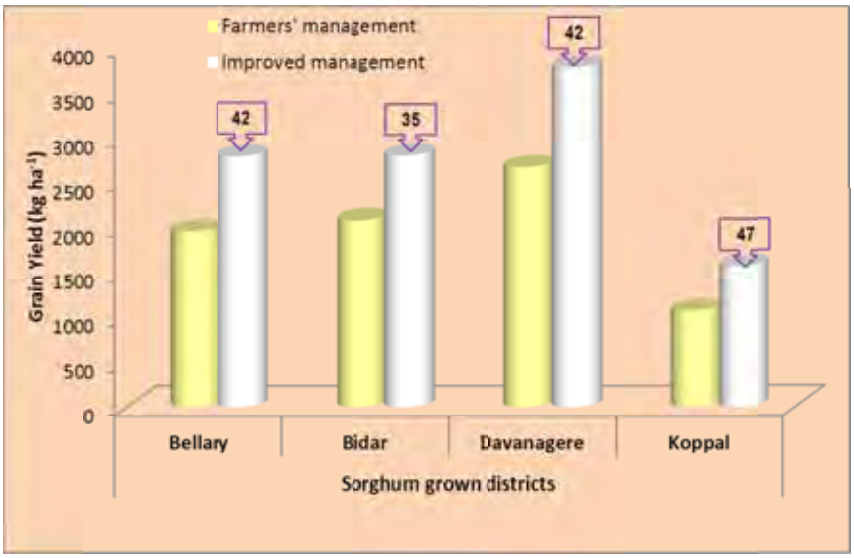

Figure 37. Sorghum grain yield response to IM and FM in various districts of Karnataka during 2011-12 kharif season

Pulses Production

Black gram

In pulses, black gram is an important grain legume grown on20848 ha in Bidar and 18834 ha in Gulbarga district. Balanced nutrition of NPK and micronutrients were applied to black gram crop on 3930 ha in Bidar and on 2457 ha in Gulburga. Black gram grain yield increased by 33% at 1090 kg ha^{-1} with improved management compared to 820 kg ha^{-1} with farmers' management in Bidar and grain yield increased 37% at 560 kg ha^{-1} with improved management compared to 410 kg ha^{-1} with farmers' management in Gulbarga based on large number of crop samples analysis during kharif season (Figure 38). Based on increase yield of black gram with improved management it was estimated that black gram grain yield of 1061 tons in Bidar and 369 tons in Gulbarga were additionally produced under Bhoochetana initiative.

Cowpea

Cowpea was grown on 2234 ha in Mandya district; however 575 ha were applied with balanced nutrition of NPK along with micronutrients. Grain yield in both treatments was poor owing to stressful seasonal conditions during crop growth. However, cowpea grain yield increased by 44% with improved management at 400 kg ha^{-1} compared to grain yield of 270 kg ha^{-1} with farmers' management (Figure 38). Based on increased yield of cowpea with improved management it was estimated that 75 tons of cowpea grain was additionally produced in Mandya because of improved management interventions in Bhoochetana.

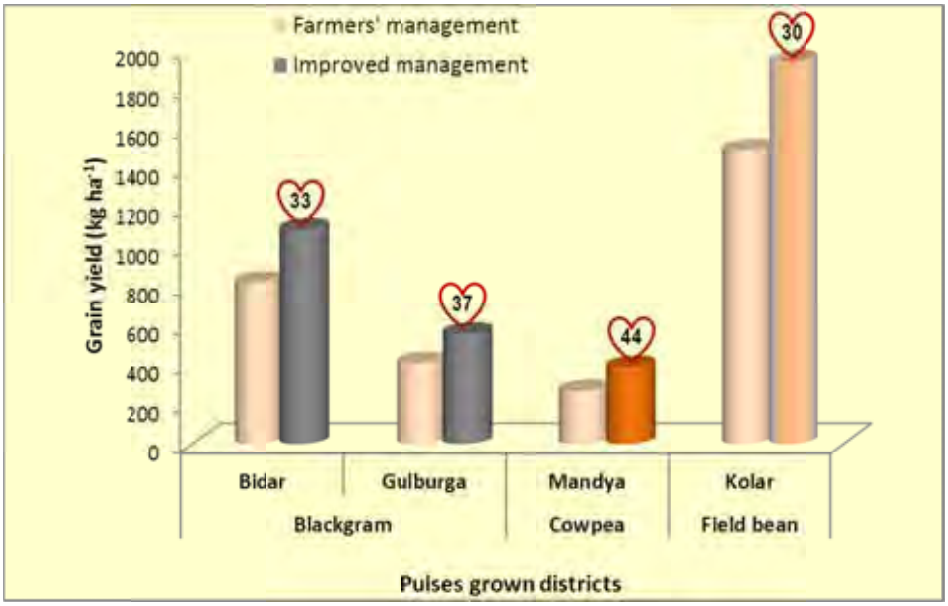

Figure 38. Grain yield response of pulses to IM and FM in various districts of Karnataka during 2011-12 kharif season

In Kolar, field beans was grown as an intercrop in finger millet or maize crop on 1417 ha out of which 608 ha were applied with balanced nutrients including micronutrients in improved management treatment under Bhoochetana project.

Field beans

Grain yield of field beans was higher in both FM and IM treatments and there was an increase in grain yield by 30% at 1940 kg ha^{-1} compared to 1490 kg ha^{-1} with farmers' management (**Figure 38**). Based on increase yield of field beans, it was estimated that 273 tons of additional grain yield was produced in Kolar district because of Bhoochetana interventions during kharif season.

Green gram

Green gram was grown in 7districts namely Bagalkot, Bidar, Bijapur, Yadgiri, Dharwad, Gadag and Gulbarga districts on total area of 124091 ha during kharif 2011, however it is estimated 52900 ha was applied with balanced nurtrition of NPK including micronutrients.

Green gram grain yield increased in a range with minimum 25% in Bijapur to 48% in Bagalkot in response to IM compared to FM in the same district (Figure 39). In Bijapur and Bagalkot grain yield of green gram with both managements were lower than 500 kg ha^{-1} due to moisture stress at critical stage of flowering and pod filling. In Bidar, Dharwad and Gadag grain yield of green gram was higher in both IM and FM treatments. Grain yield increase with IM was 38% in Bidar, 43% in Dharwad and 42% in Gadag compared to FM in

the same district. In Bidar, Dharwad, Gadag, Gulbarga and Yadgiri grain yield of green gram was almost higher at 1 to 1.5 t ha^{-1} compared to grain yield with farmers' management.

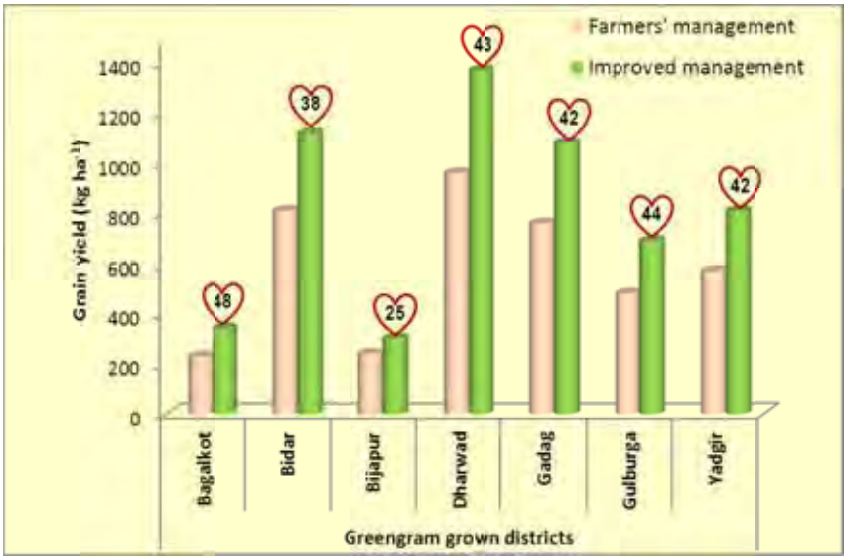

Figure 39. Green gram grain yield response to IM and FM in various districts of Karnataka during 2011-12 kharif season

Based on increased grain yield of green gram in 7 districts with improved management, it was estimated that 14983 tons of grain was additional produced in Karnataka because of improved management under Bhoochetana initiative.

Pigeonpea

Pigeonpea yield was reported from 7 districts of Karnataka namely Bellary, Bidar, Bijapur, Davangere Kolar, Ramnagara and Yadgiri. In these districts, pigeonpea was mainly grown as intercrop within Finger millet, maize or green gram and also as sole crop in the North East districts of Bidar, Bijapur and Yadgiri. Pigeonpea was grown on 145310 ha under Bhoochetana initiative during kharif 2011, but balanced nutrient application with improved management was done on 24777 ha. Pigeonpea yield in Davangere was lowest in FM and IM treatments proximal to 0.5 t ha^{-1} and yield increase was low at 22% compared to farmers' management. Pigeonpea grain yield increase was higher in Kolar (36%) and Ramnagara (41%), where actual productivity was also higher at more than 1 t ha^{-1} with FM and 1.5 t ha^{-1} with IM in these districts. Although pigeonpea grain yield increase with improved management was highest at 49% compared to grain yield in farmers' management in Bellary, observed grain yield in FM and IM were less than 1 ton ha^{-1} during the year.

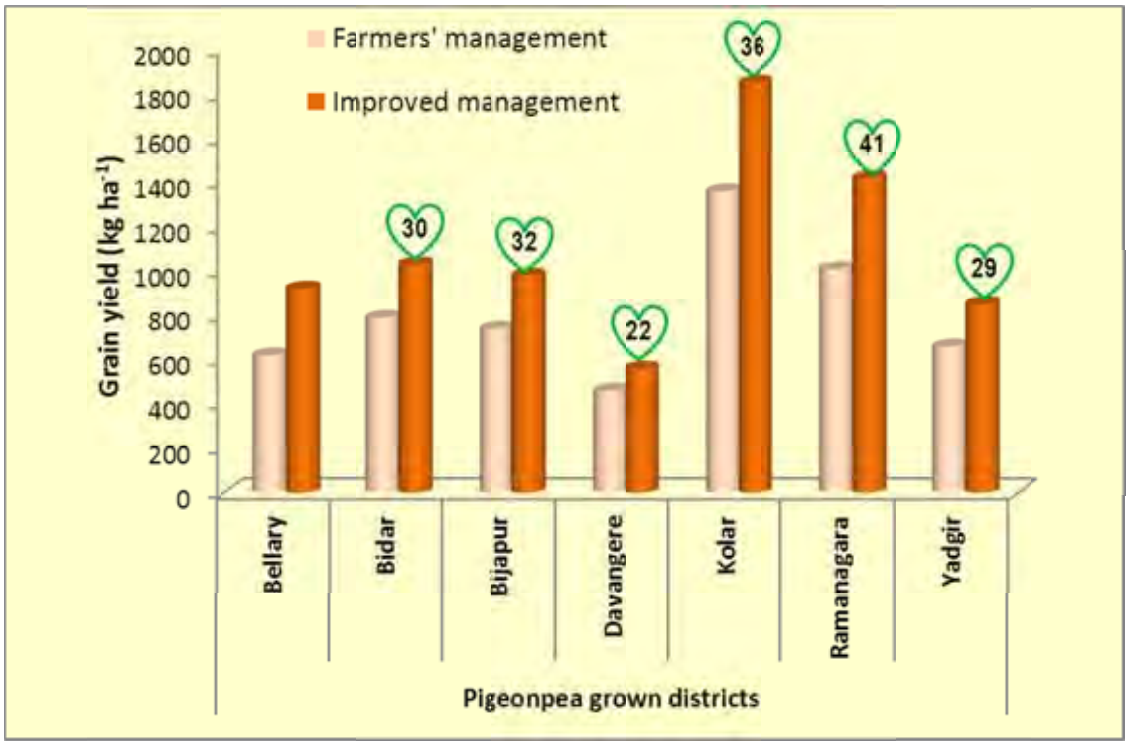

Figure 40. Pigeonpea grain yield response to IM and FM in various districts of Karnataka during 2011-12 kharif season

Enhanced productivity of pigeonpea in 7 districts with improved management, it is estimated that 5462 tons of grain yield additionally produced in the district as a result of implementing Bhoochetana programme.

Oilseeds

Soybean

Soybean was grown on 1.18 lakh ha in Bagalkot, Belgaum, Bidar, Haveri and Dharwad districts of Karnataka, more than the target area for productivity enhancement during kharif 2011. It is estimated based on fertilizer nutrient distribution that a total 18000 ha received balanced nutrient application including micronutrients under improved management for productivity enhancement. Belgaum occupies first place with largest area under soy bean and productivity is higher in Bidar and Belgaum among soy bean grown districts during the season. Soy bean grain yield increase with improved management was low at 26% in Belgaum (not presented in graph) and higher at 54% in Bagalkot compared to grain yield with farmers' management in the same district.

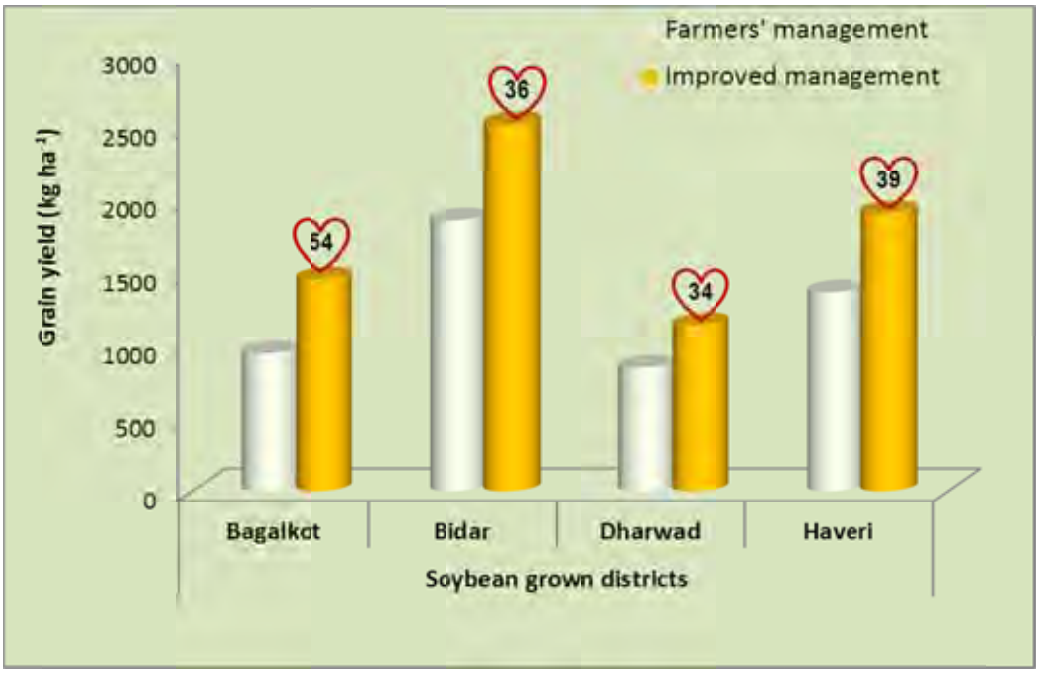

Figure 41. Soy beam grain yield response to IM and FM in various districts of Karnataka during 2011-12 kharif season

In Belgaum, Bidar and Haveri with favourable seasonal conditions, soy bean grain yield was recorded around 2 to 2.5 t ha^{-1} with improved management. Due to increased grain yield under improved management there was an estimated 8830 tons of soy bean seed was additionally produced from these five district of Karnataka.

Sunflower

Sunflower was grown on 43980 ha in Bagalkot, Bellary, Bijapur, Gulbarga, Raichur and Yadgiri districts of Karnataka under productivity enhancement. However, 11564 ha only received balanced nutrient application including micronutrients in these districts. Sunflower seed yield in Bagalkot and Bellary was higher with more than 2.5 t ha^{-1} with IM and 1.8 t ha^{-1} with FM treated fields. Sunflower yield increase was 31% in Bagalkot and 41% in Bellary with improved management compared to farmers' management. In Bijapur and Gulburga sunflower seed yield was moderate with deficit rainfall in July and August affecting crop yield. However the seed yield increase with improved management was 32% in Bijapur and 48% in Gulbarga districts. In Raichur and Yadgir districts, sunflower yield was around 1 t ha^{-1} even with improved management which is considered low yield because of deficit rainfall in September and October causing terminal stress in two districts. However sunflower seed yield increase was 23%in Raichur and 34% in Yadgir with IM compared to FM.

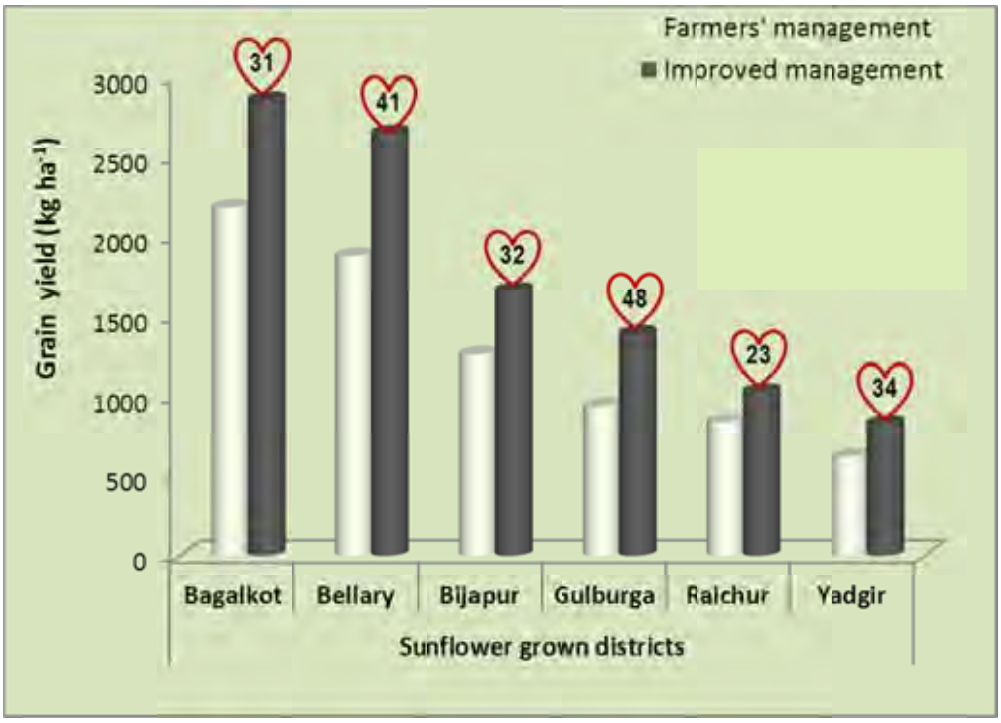

Figure 42. Sunflower seed yield response to IM and FM in various districts of Karnataka during 2011-12 kharif season

Because of improved management, sunflower productivity increased and an additional 5533 tons of sunflower seed produced in Karnataka during kharif 2011 under Bhoochetana initiative.

Groundnut

Groundnut pod yield was reported from 10 districts of Karnataka under Bhoochetana during the kharif season 2011. In Dharwad, Davangere, Gadag, Haveri and Koppal districts groundnut pod yield with FM was more than a ton ha^{-1} indicative of better pod yield during the season with farmers' management itself. Pod yield increase with IM was 39% in Dharwad, 26% in Davangere, 48% in Gadag, 42% in Haveri and 53% in Koppal and pod yield increase was exceeding one ton ha^{-1} over the FM treatment in these districts. Groundnut pod yield was much less than a ton ha^{-1} in Bijapur and Chitradurga with both managements. Pod yield was less than a ton ha^{-1} with farmers' management and the increase in pod yield was 42% in Bellary, 25% in Bijapur, 56% in Chikballapur, 38% in Chitradurga, and 30% Raichur with improved management in these districts (**Figure 43**). Pod yield increase was less than 0.5 ton ha^{-1} with improved management except in Chikballapur compared to FM in these districts. Even with stressful seasonal conditions for crop growth, groundnut produced nearly 0.5 t ha^{-1} yield gain in dryland districts of Karnataka with improved management.

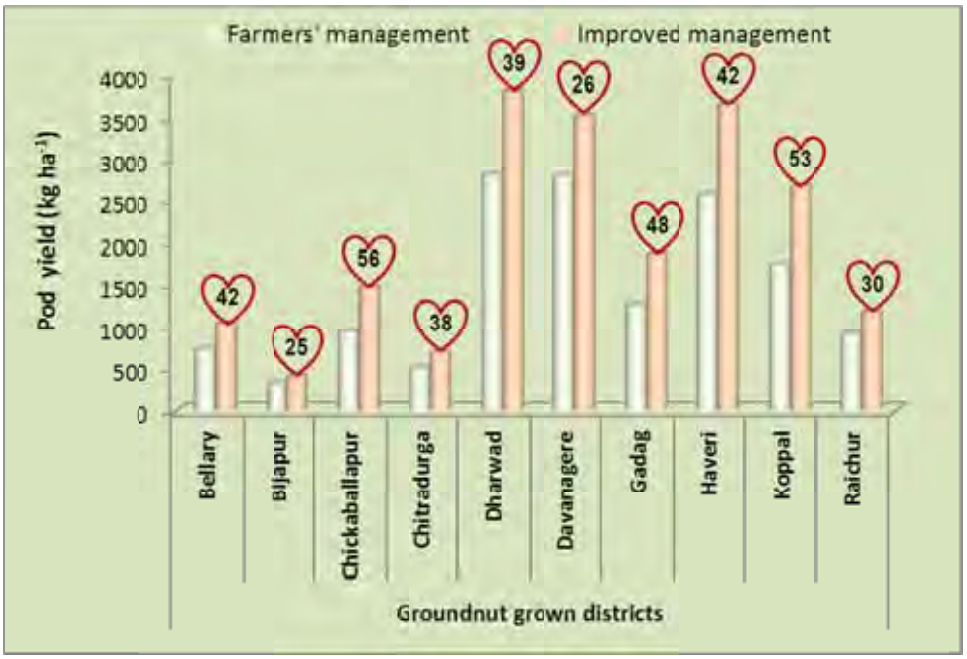

Figure 43. Groundnut pod yield response to IM and FM in various districts of Karnataka during 2011-12 kharif season

Enhanced Productivity Scaled up

During 2011-12, we reported productivity of 14 crops in 29 districts as these were available. We estimated the production increase with improved management (IM) from the cropped area that possibly received all micronutrients. We considered the micronutrient that was distributed lowest quantity in the district which can cover an area as per recommended dose. It is mentioned as nutrient applied area (**Tables 165, 166, 167)**. Remaining "area sown" to a crop was considered under farmers' management (FM) and estimated total "production with FM" by multiplying yield in FM with area sown to farmers' management. Summation of "production increase with IM" and "total production with FM" resulted in total production of the crop in the district. Further we estimated percent increase in production of a crop in the district (Table 21). We also derived total crop production in the state as a summation of total production for the crop in all districts of Karnataka.

- Contribution through increased pulses grain production (black gram, green gram, cowpea and field bean) at 2.22 lakh tons additionally in the state provide food and nutritional security in the rainfed districts as these pulses are important dietary items in rural and urban communities alike. Crop wise production estimates for each district are presented in table 165.

- Food grain production of cereals (maize, paddy, pearl millet, finger millet and sorghum) is estimated to have increased by 4.62 lakh tons additionally in the state during kharif 2011 as contribution of productivity enhancement initiative “Bhoochetana” in Karnataka. Crop wise food grain contributions in each district are presented in table 166. There is proportionate fodder production from cereals as a significant contribution for fodder security in the rainfed districts of Karnataka.
- Oil seed crops (soy bean, sunflower, and groundnut) contributed to state edible oilseed requirements through 0.53 lakh tons of additional production by enhanced crop productivity under Bhoochetana initiative. Crop-wise oil seeds increased production details are present in table 167.

In conclusion, this novel approach as a proof of concept for demonstrating productivity enhancement through science-based approach has benefitted large number of farmers during the three years and has laid a strong foundation for scaling-up the initiative to cover 100% of the trarget area in all 30 districts of Karnataka during the ensuing forth year. The success within a short period for Bhoochetana has been achieved largely because of close monitoring and guidance by the senior policy makers in the state and efforts of the DoA staff in all the districts ensuring the convergence of various government schemes through Bhoochetana. Capacity building has played an important role in the success what is achieved in this program.

Table165. Impact of improved technologies in Bhoochetana project evidenced by crop-wise enhanced productivity and increased total production (tons) of pulse crops in the districts of Karnataka during 2010-11 kharif crop season.

Crop	District	Target area	Area sown	Area nutrient applied (ha)	Yield with FM (kg ha^{-1})	Yield with IM (kg ha^{-1})	Production increase with IM	Production with FM	Total production	Production % increase
Black gram	Bidar	28481	20848	3930	820	1090	1061	17095	18157	6.2
	Gulbarga	39000	18834	2457	410	560	369	7722	8090	4.8
Total (Black gram)		**67481**	**39682**	**6387**			**1430**	**24817**	**26247**	
Cowpea	Mandya	2500	2234	575	270	400	75	603	678	12.4
Field bean	Kolar	4500	1417	608	1490	1940	273	2111	2385	12.9
Green gram	Bagalkot	8500	8500	6885	230	340	757	1955	2712	38.7
	Bidar	24812	16624	3424	810	1120	1061	13465	14527	7.9
	Bijapur	5500	2928	622	240	300	37	703	740	5.3
	Yadgir	32000	24357	4384	570	810	1052	13883	14936	7.6
	Dharwad	10000	7075	2640	950	1380	1135	6721	7856	16.9
	Gadag	73000	55211	32741	760	1080	10477	41960	52437	25.0
	Gulbarga	35000	9396	2205	480	690	463	4510	4973	10.3
Total (Green gram)		**188812**	**124091**	**52900**			**14983**	**83198**	**98182**	
Pigeonpea	Bellary	4300	4098	559	620	920	168	2541	2708	6.6
	Bidar	41038	40217	5663	790	1030	1359	31771	33131	4.3
	Bijapur	88500	44788	10001	740	980	2400	33143	35543	7.2
	Kolar	2200	2384	297	1360	1850	146	3242	3388	4.5
	Ramanagara	2700	2700	297	1010	1430	125	2727	2852	4.6
	Yadagir	40000	47366	5480	660	850	1041	31262	32303	3.3
	Davanagere	4000	3755	2480	470	560	223	1765	1988	12.6
Total (Pigeonpea)		**182738**	**145308**	**24777**			**5462**	**106451**	**111913**	
Grand Total (Pulses)		**446031**	**312732**	**85247**			**22223**	**217181**	**239404**	

Table166. Impact of improved technologies in Bhoochetana project evidenced by crop-wise enhanced productivity and increased total production (tons) of cereal crops in the districts of Karnataka during 2010-11 kharif crop season.

Crop	District	Target area	Area sown	Area nutrients applied (ha)	Yield with FM (kg ha^{-1})	Yield with IM (kg ha^{-1})	Production increase with IM	Productio n with FM	Total production	Production % increase
Maize	Bagalkot	27800	27800	22518	4560	6050	33552	126768	160320	26.5
	Bellary	32000	33,332	4160	1440	1990	2288	47998	50286	4.8
	Bengaluru_R	5600	5600	2016	4650	5780	2278	26040	28318	8.7
	Bijapur	34800	24080	3932	4160	5440	5033	100173	105206	5.0
	Chikballapur	27900	36992	4743	2620	3390	3652	96919	100571	3.8
	Chikkamagaluru	7500	7500	4883	4810	6760	9521	36075	45596	26.4
	Chitradurga	64500	63860	14448	2990	3920	13437	190941	204378	7.0
	Hassan	34800	34800	5881	4340	5610	7469	151032	158501	4.9
	Haveri	128500	128500	30429	6070	8070	60858	779995	840853	7.8
	Kodagu	2000	2000	329	7380	9670	753	14760	15513	5.1
	Koppal	12500	16968	3375	2810	4040	4151	47680	51831	8.7
	Mandya	1500	1482	345	930	1190	90	1378	1468	6.5
	Shimoga	16800	16800	4200	4370	5970	6720	73416	80136	9.2
	Davanagere	104000	103005	64480	5410	6960	99944	557257	657201	17.9
	Dharwad	20000	19750	5280	9260	11220	10349	182885	193234	5.7
	Uttara Kannada	2000	2000	100	2580	3250	214	5160	5374	4.2
	Gadag	54000	58095	24219	4500	6300	43594	261428	305022	16.7
Total (Maize)		**596200**	**612084**	**200958**			**311409**	**2840716**	**3152125**	
Paddy	Dkn. Kannada	5200	5200	4456	4320	5710	6194	22464	28658	27.6
	Uttara Kannada	22000	21600	3400	3840	5710	6358	82944	89302	7.7
	Kodagu	17000	17000	2797	6140	7460	3691	104380	108071	3.5
	Shimoga	35600	35600	8900	5050	6470	12638	179780	192418	7.0
	Udupi	10000	10000	880	4030	5210	1038	40300	41338	2.6
Total (Paddy)		**89800**	**89400**	**20433**			**29920**	**429868**	**459788**	

Pearl millet	Bagalkot	15000	15000	12150	3230	4580	16403	48450	64853	33.9
	Bijapur	17800	17742	2011	1560	2050	986	27678	28663	3.6
	Koppal	31000	32900	8370	760	1240	4018	25004	29022	16.1
	Raichur	25000	18,020	5800	1260	1520	1508	22705	24213	6.6
	Ydagir	22000	21403	3014	1690	2250	1688	36171	37859	4.7
	Gulbarga	19700	13228	1241	1670	2410	918	22091	23009	4.2
Total (Pearl millet)		**130500**	**118293**	**32587**			**25520**	**182099**	**207618**	
Ragi	Bengaluru (U)	11200	11200	5376	2180	2930	4032	24416	28448	16.5
	Bengaluru_R	30000	30000	10800	1930	2610	7344	57900	65244	12.7
	Hassan	44700	16830	7554	1470	1910	3324	24740	28064	13.4
	Kolar	44000	24550	5940	1470	1880	2435	36089	38524	6.7
	Mandya	19200	12285	4416	430	560	574	5283	5857	10.9
	Mysore	19500	13850	1775	2170	2680	905	30055	30959	3.0
	Ramanagara	47200	44806	5192	2210	3100	4621	99021	103642	4.7
	Tumkur	155000	146630	44330	790	820	1330	115838	117168	1.1
	Chitradurga	25000	24760	5600	510	740	1288	12628	13916	10.2
	Davanagere	5000	4105	3100	1400	1740	1054	5747	6801	18.3
Total (Ragi)		**400800**	**329016**	**94083**			**26907**	**411715**	**438622**	
Sorghum	Bellary	6000	5345	780	1960	2790	647	10476	11124	6.2
	Bidar	37314	27985	5149	2080	2800	3708	58209	61916	6.4
	Koppal	4000	1608	1080	1070	1570	540	1721	2261	31.4
	Davanagere	135600	130574	84072	2670	3780	93320	348633	441953	26.8
Total (sorghum)		**182914**	**165512**	**91081**			**98215**	**419038**	**517253**	
Grand Total (Cereals)		**1310414**	**1224905**	**418709**			**462051**	**3853566**	**4315619**	

Table167. Impact of improved technologies in Bhoochetana project evidenced by crop-wise enhanced productivity and increased total production (tons) of Oilseed crops in the districts of Karnataka during 2010-11 kharif crop season.

Crop	District	Target area	Area sown	Area nutrient applied (ha)	Yield with FM (kg ha^{-1})	Yield with IM (kg ha^{-1})	Production increase with IM	Production with FM	Total production	Production % increase
Soybean	Bagalkot	1500	1500	1215	950	1460	620	1425	2045	43.5
	Belgaum	35000	64500	9450	1860	2340	4536	119970	124506	3.8
	Bidar	22050	35059	3043	1860	2530	2039	65210	67248	3.1
	Haveri	7000	7000	1658	1370	1910	895	9590	10485	9.3
	Dharwad	10000	10000	2640	850	1130	739	8500	9239	8.7
Total (Soybean)		**75550**	**118059**	**18006**			**8829**	**204695**	**213523**	
Sunflower	Bagalkot	6200	6200	5022	2190	2860	3365	13578	16943	24.8
	Bellary	2000	1700	260	1880	2650	200	3196	3396	6.3
	Bijapur	12600	8371	1424	1260	1660	570	10547	11117	5.4
	Gulbarga	27200	8057	1714	940	1390	771	7574	8345	10.2
	Raichur	7000	8575	1624	840	1030	309	7203	7512	4.3
	Yadagir	11100	11074	1521	620	830	319	6866	7185	4.7
Total (sunflower)		**66100**	**43977**	**11564**			**5533**	**48964**	**54497**	
Groundnut	Bellary	27800	28066	3614	730	1040	1120	20488	21609	5.5
	Bijapur	17800	7195	2011	320	400	161	2302	2463	7.0
	Belgaum	15000	26822	4050	2160	2803	2604	57936	60540	4.5
	Chikballapur	42000	29351	7140	940	1470	3784	27590	31374	13.7
	Chitradurga	96000	67951	21504	500	690	4086	33976	38061	12.0
	Davanagere	5000	3628	3100	2800	3520	2232	10158	12390	22.0
	Haveri	15000	15000	3552	2570	3660	3872	38550	42422	10.0
	Koppal	9000	4430	2430	1750	2670	2236	7753	9988	28.8
	Raichur	5500	2990	1276	910	1180	345	2721	3065	12.7
	Dharwad	20000	19000	5280	1500	1940	2323	28500	30823	8.2
	Gadag	59000	40956	26462	1260	1870	16142	51605	67746	31.3
Total (Groundnut)		**312100**	**245389**	**80419**			**38904**	**281578**	**320482**	
Grand Total (Oilseeds)		**453750**	**407425**	**109989**			**53266**	**535237**	**588503**	

Field Days and Field Visits 2011-12

ICRISAT Staff coordinated field days in all 30 districts with the full support and participation of DoA district-level staff during the cropping season in the months of October (black gram and green gram), November and December (ragi, groundnut, maize and sunflower) coinciding full grown mature or harvest-ripe kharif crops in most of the districts. Whereever long season kharif crops (pigeonpea and cotton) and rabi crops (chickpea and rabi sorghum) were grown, field days were organized to demonstrate crop growth and yield enhancement with improved management including use of micronutrients and suitable improved varieties in Bidar, Raichur, Gulburga districts during the month of February 2011 (Table 168). Besides, ICRISAT-DoA staffs were making several field visits to contact farmers and guide on rabi crops management to ensure proper sowing and appropriate plant stand which are more important for higher productivity.

567 field days were organized in 30 districts of Karnataka under Bhoochetana during the crop season 2011-12. Nearly 40 thousand farmers were exposed to science-led improved technologies to enhance crop productivity on drylands. These farmers include nearly 10 thousand women farmers in Karnataka.

Figure 44. Glimpse of Field Day

Table 168. Details of field days held in different districts of Karnataka during 2011-12 cropping seasons.

Sl. No	District	No. of Field Days held	No. of Farmers participated	Men	Women
1.	Bagalkote	22	1100	1000	100
2.	Bellary	16	1050	850	200
3.	Bengaluru Rural	18	850	800	50
4.	Bengaluru Urban	14	890	486	404
5.	Belgaum	41	5584	4824	760
6.	Bidar	32	2600	2040	560
7.	Bijapur	17	1169	935	234
8	Chamarajanagara	04	226	180	46
9.	Chikkaballapur	12	1086	814	272
10.	Chikkamangaluru	29	940	690	250
11.	Chitradurga	2	248	164	84
12.	Davangere	82	8698	5219	3479
13.	Dharwad	24	800	634	166
14.	Dakshina Kannada	10	500	460	40
15.	Gadag	4	300	225	75
16.	Gulburga	0	0	0	0
17.	Hassan	20	1358	1210	148
18.	Haveri	17	2084	1677	407
19.	Kolar	5	363	289	74
20.	Kodugu	4	650	410	240
21.	Koppal	10	1030	700	330
22.	Mandya	22	1540	1317	223
23.	Mysore	52	250	215	35
24.	Raichur	10	450	330	120
25.	Ramnagara	13	1019	886	133
26.	Shimago	42	2018	1413	605
27.	Tumkur	26	1700	1300	400
28.	Udipi	12	670	460	210
29.	Uttara Kannada	35	1260	960	300
30.	Yadgir	1	90	55	35
Total (30 districts)		**596**	**40523**	**30543**	**9980**

Impact of mobile based agro-advisories in Dharwad, Karnataka

Site: Dharwad (Implemented by KVK, Dharwad)

Period: August, 2011 to March, 2012

Number of farmers involved:

Services provided: Text and Voice agro-advisories

No. of Advisory: 15,211 (Voice)

2700 (Text)

Crops covered: Sorghum, Chickpea, Groundnut, Wheat, Soybean, Cotton, Green gram, Chilli / Maize

Salient findings:

- **Farmers covered**
  - 57% were small farmers
  - 52% had education up to high school
  - 97.97% practiced rain fed farming
- Pest and disease management topped the list of information requirement by the farmers (81%). Only 32% of the farmers wanted information on other production practices.
- Text messages were accessed directly only by 42% farmers as against 92% farmers in case of voice advisories.
- 24% farmers implemented the advisories received as SMS (text), the figure was 38% in case of voice advisories.
- 69% of the farmers shared the received information with fellow farmers.
- The percentage of farmers who adopted the recommendations went up from 5 to 30% in case of advisories related to plant protection and from 26 to 42% in case of harvesting related advisories.
- 88% of farmers felt that the content provided as agro-advisories was highly relevant and useful.

Table 169. Distribution of respondents as per background characteristics (N=99)			
Variable	**Category**	**Frequency**	**Percentage**
Age	Young (less than 30 years)	21	21.21
	Middle (30-52 years)	62	62.62
	Old (above 52 years)	16	16.16
Gender	Male	95	95.95
	Female	04	4.04
Education	Primary	35	35.35
	High school	17	17.17
	Intermediate	22	22.22
	Graduate	17	17.17
Marital status	Married	12	12.12
	Unmarried	87	87.87
Annual income	Low (less than ₹ 20930)	23	23.23
	Medium (₹20930-₹ 7,50,594)	57	57.57
	High (more than ₹ 7,50,594)	15	15.15
Land holding	Small farmers (2.51 to 5 ha)	57	57.57
	Marginal farmers (5.0 to 10 ha)	20	20.20
	Large farmers (above 10.01 ha)	22	22.22
Land ownership	Owned	95	95.95
	Leased	04	4.04
Farming type	Irrigated	02	2.02
	Rainfed	97	97.97
Communication media possession*	Radio	09	9.09
	TV	88	88.88
	Computer	03	3.03
	Mobile phone	99	100
Sources of agricultural information*	Agriculture department	66	66.66
	TV / Radio / Print media	31	31.31
	Input dealers	19	19.19
	Fellow farmers	17	17.17
	Seed company	14	14.14
Interest in getting agro-advisory in future	Interested	99	100
	Not Interested	NIL	NIL
Preferred format of information on mobile	Text	NIL	NIL
	Voice	72	72.72
	Both	27	27.27
Information need*	Pest & Disease management	81	81.81
	Agricultural loans	67	67.67
	Crop insurance	65	65.65
	Government schemes	54	54.54
	Market information	48	48.48
	Weather information	37	37.37
	Production practices	32	32.32
	Seed availability	21	21.21

***Multiple responses were allowed, hence total add up to more than 100.**

Table 170. Adoption of agro-advisory

Variable	Category	Frequency	Percentage
Regularity of agro-advisory by KVK	Regular	99	100
	Not Regular	NIL	NIL
Advisories from other sources	Getting advisories from other source	25	25.25
	Not getting	72	72.72
Types of agro-advisories received	Voice	02	2.02
	Text / Voice	98	98.98
Text advisory			
Accessing text agro-advisory	On your own	42	42.42
	With help of family members	16	16.16
	With the help of fellow farmers	14	14.14
	Do not bother to see	27	27.27
Using text agro-advisory	Deleted without reading	29	29.29
	Read and deleted	32	32.32
	Read and took notes	14	14.14
	Read and implemented	24	24.24
Voice advisory			
Voice clarity	Clear	99	100
	Not clear	NIL	NIL
Using voice advisory	Rejected without answering	03	3.03
	Received and immediately cut	04	4.04
	Heard the complete advisory	54	54.54
	Heard and practiced the recommended advisory	38	38.38
Information sharing behavior			
Nature of persons shared	Shared with family members& relatives	06	6.06
		69	69.69
	Shared with fellow farmers	24	24.24
	Not shared		
Number of persons shared	Less than five	34	34.34
	Six to ten	32	32.32
	More than ten	11	11.11
Satisfaction of the services of agro-advisory			
Results of recommended practices	Satisfied	99	100
	Not satisfied	NIL	NIL
Utilization of the knowledge gained			
	Utilized fully	33	33.33
	Utilized to some extent	17	17.17
	Not utilized	49	49.49
Time of broadcast of Agro-advisories			
	Least convenient	02	2.02
	Convenient	87	87.87
	Most convenient	NIL	NIL

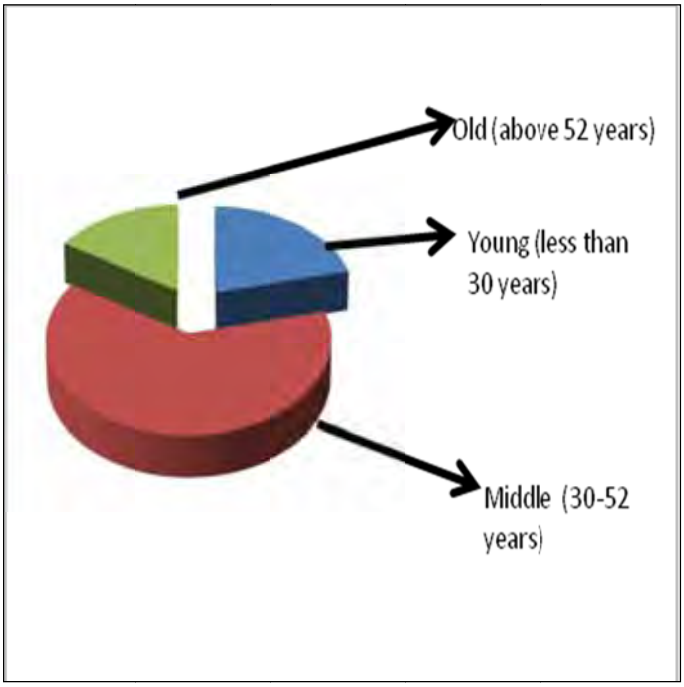

Figure 45. Age-wise distribution of farmers

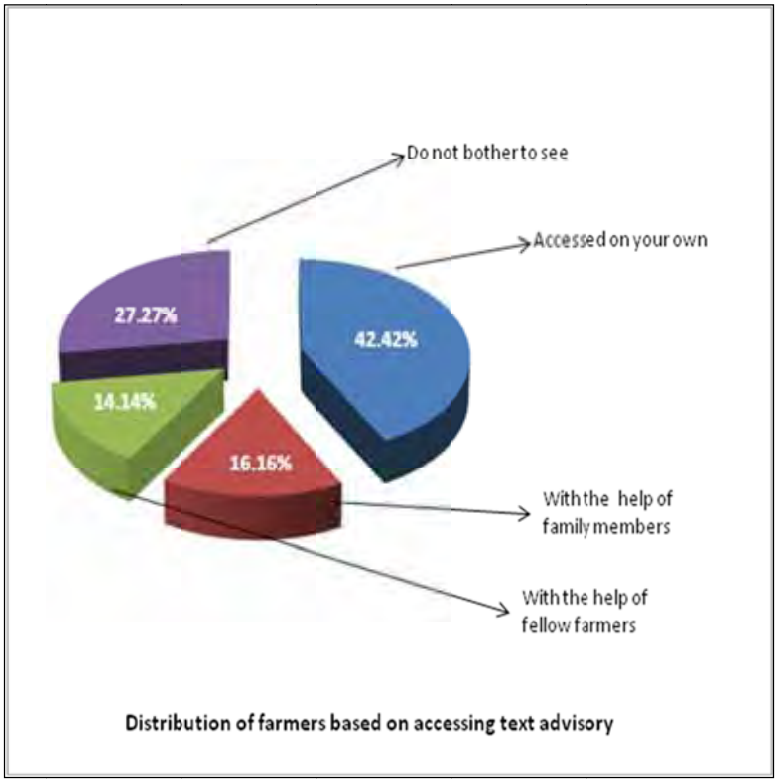

Figure 46. Distribution of farmers based on accessing text advisoruy

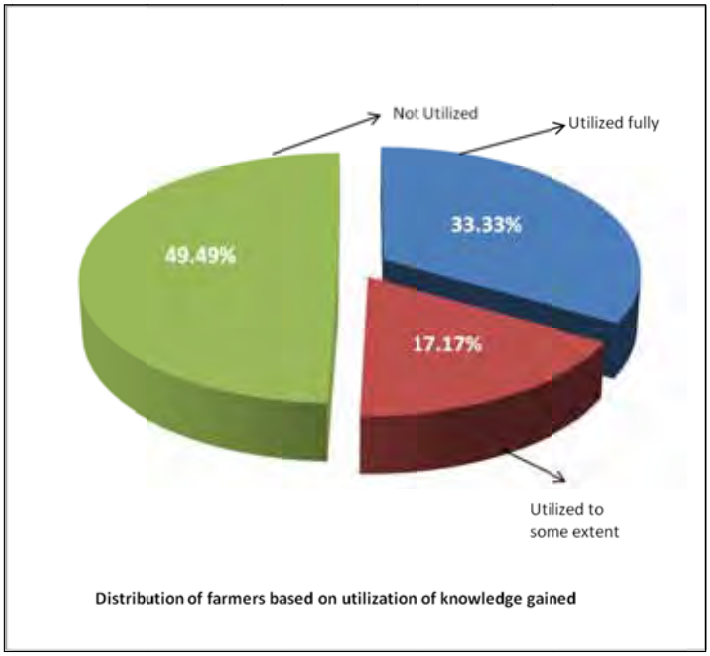

Figure 47. Distribution of farmers based on utilization of knowledge gained

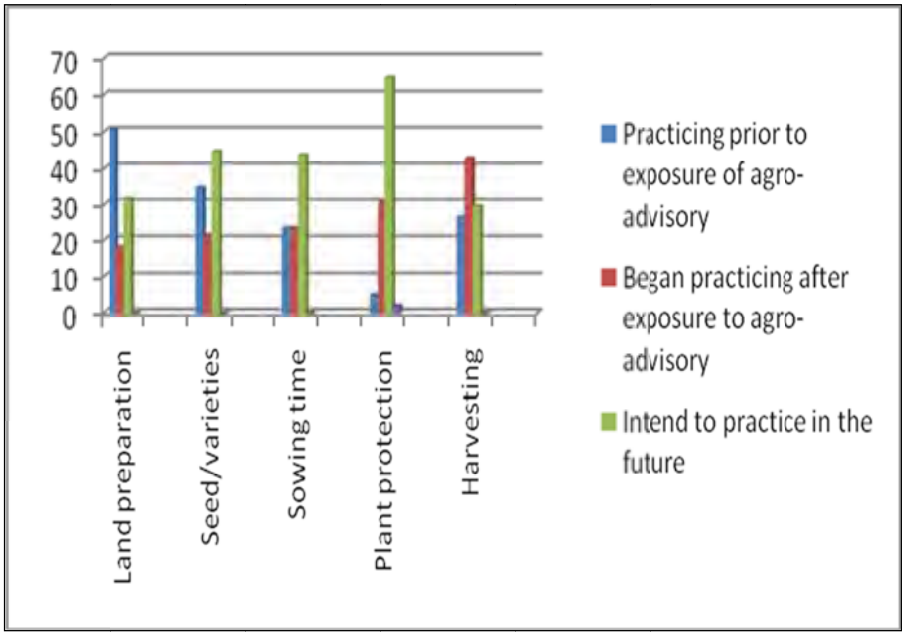

Figure 48. Extent of adoption of practices recommended through vKVK

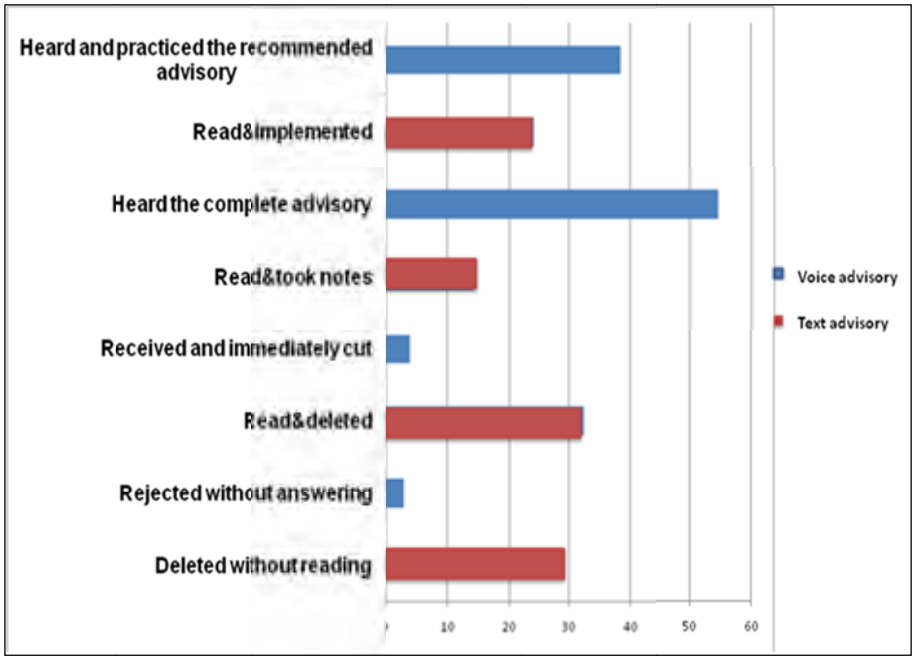

Figure 49. Distribution of farmers based on use of Text/Voice agro-advisory

Table 169. Opinion of the farmer about Agro-advisories (N=99)

S.No.	Category	Number of farmers	Percentage
1	**Speed of presentation** (voice message)		
	Slow	92	92.92
	Fast	NIL	NIL
	Appropriate	NIL	NIL
2	**Content Relevance**		
	Irrelevant	5	5.05
	Somewhat relevant	NIL	NIL
	Highly relevant	87	87.87
3	**Audio quality** (In case of voice message)		
	Poor	5	5.05
	Fair	NIL	NIL
	Good	87	87.87
4	**Treatment of message**		
	High technical words	NIL	NIL
	Moderate technical words	26	26.26
	Less technical words	66	66.66
5	**Usefulness of content**		
	Highly useful	NIL	NIL
	Moderately useful	87	87.87
	Least useful	5	5.05

Table 170. Extent of adoption of agro-advisory (N=99)

Practices recommended	Practicing prior to exposure to agro-advisory	Began practicing after exposure to agro-advisory	Intend to practice in the future	No plan to adopt
Land preparation	50 (50.50)	18 (18.18)	31 (31.31)	NIL
Seed / varieties	34 (34.34)	21 (21.21)	44 (44.44)	NIL
Sowing time	23 (23.23)	23 (23.23)	43 (43.43)	NIL
Plant protection	05 (5.05)	30 (30.30)	64 (64.64)	2 (2.02)
Harvesting	26 (26.26)	42 (42.42)	29 (29.29)	NIL

Note: Figures in parenthesis indicate percentage in the respective category

Table 171. Relationship between background characteristics of farmers and selected impact indicators (N=99)

	Practicing prior to exposure of agro-advisory	Began practicing after exposure to agro-advisory	Intend to practice in future	No plans to adopt
Age	-0.156	-0.209	-0.193	-0.007
Education	0.332	0.916**	0.882**	0.004
Annual income	0.606	0.340*	0.573*	0.278
Communication media possession	-0.057	0.916**	0.697**	-0.024
Sources of agricultural information	0.009	0.031	0.224*	-0.182
Land holding	0.149	0.200*	0.161	0.131

****Correlation is significant at 0.001 levels 2-tailed)**

*** Correlation is significant at 0.001 levels 2-tailed)**

A Compendium of Success Stories

District-wise farmer's success stories of Improving the productivity and income

BIDAR DISTRICT

Sri Ganapatha Rao S/O Vithal Rao

Sri Ganapatha Rao S/O Vithal Rao, Doddapura village, Bidar Taluk is a small farmer use to cultivate green gram and other crops following traditional methods. Recently during 2011-12 kharif season he got information about Bhoochetana through Farm Facilitators. He decided to participate in Bhoochetana activities through testing new technologies developed in Bhoochetana program. He decided to evaluate the performance of green gram as advised by the Farm Facilitators and compared meticulously with his normal practice.

Sri Ganapath Rao received inputs from the department such as green gram seeds (5 kg per acre), DAP (30 kg/acre), Gypsum (80 kg/acre), Zinc Sulphate (10 kg/acre), Borax (2 kg/acre), Trichoderma (200 gm/acre) and neem oil (1 litre). Sri Ganapath Rao used improved technologies over his traditional practices. The improved technologies such as (i) one week before sowing of the seeds, micronutrients were applied as per the above recommendations as basal dosage and mixed in soil (ii) planting across the slope (iii) Seeds were treated with the Trichoderma (iv) Maintained the recommended plant population (v) Two times weeding (vi) Suitable plant protection measures taken up with neem oil Rainfed farming with check plot. More importantly, regular visit of farm facilitators and other departmental staff, ICRISAT staff for technical guidance was very much useful in timely monitoring the crop and training was availed regarding crop cultivation and post harvest management.

After the harvest, Sri Ganapath Rao noticed significant improvement in yield of green gram over his traditional practices. As per his crop cutting experiments he obtained 3.80 quintals per acre by following his own traditional practice as against he got 5.20 quintals per acre following improved practices using Bhoochetana technologies. He achieved about 37 per cent increment in green gram yield by following improved method of cultivation. He obtained Rs. 4900/- additional income per acre by selling his green gram at the rate of Rs. 3500 per quintal.

Sri Ganapth Rao is happy for adopting new technologies and he sincerely thanks the Department of Agriculture staff, ICRISAT and Farm facilitators for all the required help to achieve the impact. The department has used his field for conducting field day and field visits to demonstrate and show the results of Bhoochetana technologies to other farmers.

Sri Shyama Rao S/O Shankarappa

Sri Shyama Rao S/O Shankarappa, Chalakapura village, Bhalki Taluk is a small farmer use to cultivate sorghum, green gram and other dryland crops following traditional methods. He got information about Bhoochetana through Farm Facilitators for increasing the productivity. He decided to participate in Bhoochetana activities through testing new technologies developed in Bhoochetana program. He decided to evaluate the performance of hybrid sorghum as advised by concerned staff and Farm Facilitators and compared meticulously with his normal practice.

Sri Shyama Rao received inputs from the department such as sorghum seeds (3kg per acre), DAP (40 kg/acre), Urea (25 kg/acre), Gypsum (80 kg/acre), Zinc Sulphate (10 kg/acre), Borax (2 kg/acre), and Trichoderma (200 gm/acre). Sri Shyama Rao used improved technologies over his traditional practices. The improved technologies such as (i) micronutrients were applied as per the above recommendations as basal dosage and mixed in soil one week before sowing of the seeds, (ii) planting across the slope (iii) Seeds were treated with the Trichoderma (iv) Maintained the recommended plant population (v) Two times weeding More importantly, regular visit of farm facilitators and other departmental staff, ICRISAT staff for technical guidance was very much useful in timely monitoring the crop and training was availed regarding crop cultivation and post harvest management.

After the harvest, Sri Shyama Rao noticed significant improvement in yield of hybrid sorghum over his traditional practices. As per his crop cutting experiments he obtained 8.50 quintals per acre by following his own traditional practice as against he got 11.75 quintals per acre following improved practices using Bhoochetana technologies. He achieved about 38 per cent increment (about 3.25 quintals per acre) in green gram yield by following improved method of cultivation. He obtained Rs. 9425 additional income per acre by selling his hybrid sorghum at the rate of Rs. 2900/- per quintal.

Sri Shyama Rao is happy for adopting new technologies and he sincerely thanks the Department of Agriculture staff, ICRISAT and Farm facilitators for all the required help to achieve the impact. The department has used his field for conducting field day and field visits to demonstrate and show the results of Bhoochetana technologies to other farmers.

CHAMARAJANAGAR DISTRICT

Sri Devaraju S/O Kannan

Sri Devaraju S/O Kannan, Kolipalya village, Chamarajanagara Taluk is a small farmer owning 1 hectare use to cultivate dryland crops following traditional methods. Since he is a member of the cooperative society he got information about Bhoochetana through Farm Facilitators for increasing dryland crops productivity. Thus, he decided to test new technologies developed in Bhoochetana program for improving yield and income. He decided to evaluate the performance of maize as advised by concerned staff and Farm Facilitators and compared with his own practice.

Sri Devaraju received inputs on subsidized rate from the department of agriculture. He practiced improved practices such as effective moisture conservation practice and used inputs such as micronutrient viz., Gypsum, boron and zinc, good quality seeds and irrigation for the crop. More importantly, regular visit of farm facilitators and other departmental staff, ICRISAT staff for technical guidance was very much useful in timely monitoring the crop and training was availed regarding crop cultivation and post harvest management.

After the harvest, Sri Devaraju noticed significant improvement in yield of maize over his traditional practices. As per his crop cutting experiments he obtained 18 quintals per acre by following his own traditional practice as against he got 25 quintals per acre following improved practices using Bhoochetana technologies. He achieved about 39 per cent increment (about 7.2 quintals per acre) in maize yield by following improved method of cultivation. He obtained Rs. 6640/- net additional income per acre by selling his maize at the rate of Rs. 900 per quintal.

Table. Details of maize production using improved technologies

Particulars	Improved technologies	Traditional practices
i) Productivity per acre (qt)	10	7.2
ii) Cost of Production per acre	2360	1920
iii) Net income per acre	6640	4560

Sri Devaraju is happy for adopting new technologies and he sincerely thanks the Department of Agriculture staff, ICRISAT and Farm facilitators for all the required help to achieve the impact. The department has used his field for conducting field day and field visits to demonstrate and show the results of Bhoochetana technologies to other farmers.

Sri B. V. Nagarajappa

Sri B. V. Nagarajappa, Bisalavadi village, Chamarajanagara Taluk is a small farmer owning 1 hectare use to cultivate dryland crops following traditional methods. He got information about Bhoochetana program through Farm Facilitators for increasing crops productivity. He decided to test new technologies developed in Bhoochetana program for improving yield and income. He decided to evaluate the performance of maize as advised by concerned staff and Farm Facilitators and compared with his own practice.

Sri Nagarajappa received inputs on subsidized rate from the department of agriculture. He practiced improved practices such as effective moisture conservation practice and used inputs such as micronutrient viz., Gypsum, boron and zinc, good quality seeds and irrigation for the crop. More importantly, regular visit of farm facilitators and other departmental staff, ICRISAT staff for technical guidance was very much useful in timely monitoring the crop and training was availed regarding crop cultivation and post harvest management.

Sri Nagarajappa noticed significant improvement in yield of maize over his traditional practices. As per his crop cutting experiments he obtained 10 quintals per acre by following his own traditional practice as against he got 13.6 quintals per acre following improved practices using Bhoochetana technologies. He achieved about 36 per cent increment (about 3.6 quintals per acre) in maize yield by following improved method of cultivation. He obtained Rs. 11,248/- net additional income per acre by selling his maize at the rate of Rs. 980 per quintal.

Table 2. Details of maize production using improved technologies

Particulars	**Improved technologies**	**Traditional practices**
i) Productivity per acre	13.6	10
ii) Cost of Production per acre	2080	1600
iii) Net income per hectare	11248	8200

Sri Nagarajappa is happy for adopting new technologies and he sincerely thanks the Department of Agriculture staff, ICRISAT and Farm facilitators for all the required help to achieve the impact. The department has used his field for conducting field day and field visits to demonstrate and show the results of Bhoochetana technologies to other farmers.

DAVANAGERE DISTRICT

Sri, Devikere Nagappa

We are presenting success story of a small and marginal farmer, Sri, Devikere Nagappa in Alur village, Davangere district of Karnataka. He holds nearly one forth ha of agricultural land; and no irrigation facility is available in the field. This region is suffering with acute water scarcity, mainly due to poor and erratic distribution of rainfall, increasing population pressure and unsustainable water use. Annual rainfall in Davangere is below 700 mm. Crop productivity under rainfed system was below one ton per ha.

Improved agricultural practices were introduced into the villages under the Boochetana program. Focus was given for enhancing soil moisture by several land form practices. The yield gap analysis undertaken by the ICRISAT revealed that large yield gap exists for all the major rainfed crops grown in the Semi-Arid Tropics; and there is a potential of increasing the productivity by 2 to 3 folds using available technologies in the farmers' fields. In this contest, micro-nutrients such as Gypsum, zinc were introduced and were used by this farmer in groundnut field during Kharif season. Improved variety of seed was used and organic fertilizer is also applied.

Improved packages of practice has enhanced groundnut yield as 40 Q ha^{-1} compare to mere 15 Q ha^{-1} under the traditional system. Farmer gained Rs 30000/- additional revenues from her field. Product quality was also found better as pod side was bigger with better nutritional seed value compare to traditionally grown groundnut crop. This concludes that rainfed area hold vast yield potential which could be harnessed by adopting good agricultural practices/technologies and disseminating/sharing the existing knowledge.

Rajashekarappa

We are presenting success story of a small and marginal farmer, Sri, Rajashekarappa in Jagalur tehsil, Davangere district of Karnataka. This farmer holds 0.8 ha of agricultural land, which is the main source of his livelihood. Irrigation water is available and lifted through bore well. Davangere district is suffering with acute water scarcity, mainly due to poor and erratic distribution of rainfall. Occurrence of dry spells is very common in this region, therefore crops even in monsoon requires life saving irrigations. Annual rainfall in Davangere is below 700 mm.

Improved agricultural practices were introduced into the villages under the Boochetana program. Despite the availability of irrigation facility, focus was given for enhancing *insitu* rainwater harvesting by implementing several land form practices so that irrigation water in well could be saved. The yield gap analysis undertaken by the ICRISAT revealed that large yield gap exists for all the major rainfed crops grown in the Semi-Arid Tropics; and there is a potential of increasing the productivity by 2 to 3 folds using available technologies in the farmers' fields. In this contest, micro-nutrients such as Gypsum, zinc were introduced and were used by this farmer in maize field during Kharif season. Improved variety of seed was used and organic fertilizer is also applied. Life saving irrigation is provided as per crop need. Intercultural operations were also performed to control weeds.

Results showed that improved packages of practices have enhanced crop productivity by 25% (from 62.5 Q ha^{-1} to 87.5 Q ha^{-1}). Net income is also enhanced from Rs. 55000 to 77000/-

This concludes that integrating improved packages of practices can reduce the yield gap. Small and marginal farmers could easily double food production by adopting such practices which would also helpful for improving their livelihood and social status.

HAVERI DISTRICT

Sri, Basappa G Mugadur

We are presenting success story of a small and marginal farmer, Sri, Basappa G Mugadur (52 years), Kunimellihalli tehsil, Haveri district of Karnataka. Agriculture is the main source for his income and livelihood. He holds a small agricultural land completely under rainfed condition. Haveri district is typically under semi-arid tropics with average rainfall of 900 mm. This amount of rainfall however is sufficient enough for cultivating Kharif crop successfully and also have potential for taking second crop but inappropriate management of land and water resources, district faces the water scarcity situation resulting poor crop yields.

Improved agricultural practices were introduced into the villages under the Boochetana program. This farmer has cultivated Soybean crop during Kharif in year 2011. Farmers received fertilizer inputs and improved variety seed with subsidized rate under the government led program. Large soil sample collected from Karnataka by the ICRISAT revealed that wide scale deficiency exists for micronutrient; and there is a potential of increasing the productivity by 2 to 3 folds using micronutrients and available technologies in the farmers' fields. In this contest, micro-nutrients such as Gypsum, zinc, Borex were introduced and were used by this farmer. Crop was planted across the slope for conserving more rainfall into the soil. Soybean seeds were treated with the Trichoderma. Recommended plant population was maintained and intercultural operation was performed for weed control. Farmer interacted with farm facilitator and other stuff from ICRISAT and government department for getting technical guidance consistently. Farmer was also exposed to short term capacity building program/training which helped him to understand the technology and importance of the improved agricultural management.

Soybean yield increased from 5 Q ha^{-1} to 7 Q ha^{-1} and farmer earned Rs. 5000/- extra income from his field. This is appreciated and encouraged by farmers' family and they are willing to adopt these interventions in future even if they do not get government aid or subsidies.

KOPPAL DISTRICT

Koppal district: Maize crop

Sri Nagappa Huilgola is an enthusiastic farmer of Koluru village, Hiresindogi Post of Koppal district. He is aged 52 years and his land has a survey number of 77 in the Koluru village which comes under the Kasaba Koppal Raitha Samparka Kendra. He has planted maize on 02 Jun 2011 at a seed planting rate of 7.5 kg per acre. He has applied DAP of 30 kg per acre, Gypsum of 80 kg per acre, Zinc Sulphate of 10 kg per acre and Borax of 2 kg per acre. All these inputs were received from the Department of Agriculture, Government of Karnataka.

Improved technologies were adopted by Sri Nagappa instead of his usual traditional practices. One week before sowing of the seeds, he has applied micronutrients as per the recommendations as basal dosage and mixed in soil. Planting was done across the slope and he maintained the recommended plant population. Rainfed farming was practiced and weeding was done twice. He has also maintained a check plot. His farm was visited regularly by farm facilitators and other departmental staff. Sri Nagappa has also received technical guidance by ICRISAT staff. Training was availed by the farmer. Maize crop was harvested on 05 October 2011 and the check plot without the adoption of improved technologies recorded about 14 quintals per acre, while the farm cultivated adopting improved technologies has yielded 16 quintals per acre, which was 14% higher. Average price of maize is about Rs.950/- per quintal and thus by adopting Bhoochetana technologies Sri Nagappa Huilgola could enhance his income by Rs.2600/- per acre. The success of Sri Nagappa was witnessed by several other farmers and now these farmers are also enthusiastic to adopt improved technologies under the Bhoochetana being implemented and promoted by the Government of Karnataka with technical guidance from ICRISAT.

Mr.Sharanappa Arald

Mr.Sharanappa Arald (65years) practies farming in Tommaraguddi village, Yelburga taluk in Koppal district. He got associated with Bhoochetana during the rainy season 2011 and fallowed the recommended improved management in maize. The crop was sown across the on 5th July, 2011 and used 7.5 kg/acre seed to maintain the recommended plant population. The secondary micronutrients were also applied in addition to acre as based before during through 80 kg/acre gypsum, 10 kg/ac Zinc Sulphate and 2 kgs/acre Borax. Weeding was done twice to check the growth of weeds. An adjoining control Maize plot with traditional framer practice was also maintained. The crop was harvested on 23 October 2011. The plot was with Improved practice recorded a yield of 17 Quintals/acre in coritrast to 15 Quintal under the farmer practice plot. An economic analysis showed that the improved practice brought in an additions returns of Rs.19190 against additional cost of Rs.560 and secondary and micronutrients. With a purpose of scaling up the visits of other farmers week also oraganised to Mr.Sharanappa's maize fields, to show the benefits of improved management.

Sri Sanna Amreshappa

Sri Sanna Amreshappa is an enthusiastic farmer of Venkatagiri, Gangavathi taluk of Koppal district. He is aged 61 years and his land has a survey number of 102 in Venkatagiri which comes under the Venkatagiri Raitha Samparka Kendra. He has planted groundnut on 05 Jul 2011 at a seed planting rate of 40 kg per acre. He has applied DAP of 40 kg per acre, Gypsum of 100 kg per acre, Zinc Sulphate of 10 kg per acre and Borax of 2 kg per acre. All these inputs were received from the Department of Agriculture, Government of Karnataka.

Improved technologies were adopted by Sri Amreshappa instead of his traditional practices. One week before sowing of the seeds, he has applied micronutrients as per the recommendations as basal dosage and mixed in soil. Seeds were treated with Trichoderma and planting was done across the slope and he maintained the recommended plant population. Rainfed farming was practiced and weeding was done twice. He has also maintained a check plot. Suitable plant protection measures were taken by him using neem oil. His farm was visited regularly by farm facilitators and other departmental staff. Sri Amreshappa has also received technical guidance by ICRISAT staff. Training was availed by the farmer.

Groundnut crop was harvested on 30 October 2011 and the check plot without the adoption of improved technologies recorded about 3.10 quintals per acre, while the farm cultivated adopting improved technologies has yielded 3.46 quintals per acre, which was 11% higher.

Average price of groundnut is about Rs.2,700/- per quintal and thus by adopting Bhoochetana technologies Sri Amreshappa could enhance his income by Rs.972/- per acre.

The success of Sri Sanna Amreshappa was witnessed by several other farmers and now these farmers are also enthusiastic to adopt improved technologies under the Bhoochetana being implemented and promoted by the Government of Karnataka with technical guidance from ICRISAT.

Mr.Hirehanumappa sadar

Mr.Hirehanumappa sadar (54 years) a farmer in chalgera village, Kuntagi taluk in Koppal district got associated with Bhoochetana during the rainy season 2011 and followed the recommended improved management in Bajra. The crop was sown across the slope on 5th June, 2011 and used 1.5 kg/acre seed to maintain the recommended plant population. The seeds were treated with trichoderma (200 gm/acre). The deficient secondary and micro nutrients were also applied in addition to Urea as basal before sowing through 80 kg/acre Gypsum, 10 kg/acre Zinc sulphate and 2 kg/acre Borax. Manual weeding was done twice to check the growth of unwanted plants. An adjoing controle bajra plot with tradional farmers practice was also maintained the plot with improved management recorded a yield of 5.45q/ccer in contrast to 4.93 q/acre in the plot with the farmers practice. As suc, improved management brought in additional return of Rs. 512/- per care while the farmer spent Rs. 280/- on the purchase of additional inputs of gypsum, zinc sulphate and borax

from RSK. Other farmers' visits were also arranged to show them the benefits of improved management.

MYSORE DISTRICT

Mrs. Sannamma (55years) is a women farmer in Bidarahalli village, HD Kote taluinMysore district who practices rainfed farming. She got associated with Bhoochetana during the rainy season 2011 and followed the recommended improved management in ragi. The crop was sown on 20 July 2011. The soil test based recommended gupsum, zinc sulphate, borax, vermicompost were added in addition o DAP. An adjoining control ragi plot with traditional farmers practice without gypsum, zinc sulphate, borax, vermicompost was also maintained. The crop was harvested on 13th Dec 2011. The plot with the improved practice recorded a yield of 14.5 q/acre in contrast to 12q/acre under the farmers practice. An economic analysis showed that improved management brought in an additional cost of about RS. 550/- on account of gypsum, zinc sulphate and borax. However the additional returns (Rs 2000/- per acre) were far higher to adopt technology at farmer level. Mrs. Sannamma has expressed her happiness over the technology and benefits of it.

Mr. Raju S/o Puttappa

Mr. Raju S/o Puttappa, a residence of Benegal Village and Post, Piriyapattana Taluk, Mysore District is actively involved in the Bhoochetana activity started in Karnataka since last three years. He is belonging to general category and has shown a keen interest in the project. He was convinced about the fact that poor fertility status of soil causing the reduction in crop yield since last few years and he has to do something new to maintain soil fertility and obtain optimum crop yield.

He selected maize crop for this novel initiative and purchased the inputs viz, Gypsum, zinc sulphate and Borax from RSK at Piriyapattana Taluk alnong with major nutrients fertilizers. All the nutrient were applied in balanced form as suggested by our staff before sowing except urea which was top dressed two times at 30 and 50 DAS. He has taken the help of Farmer facilitators, agriculture department staff viz., Agricultural Assistant, Agriculture officer and ICRISAT staff both based at Hyderabad and in the district who were visiting periodically to the plot and giving the required technical help and inputs. He followed the instructions given by them.

He noticed a remarkable good maize crop growth as compared to last five years crop and was very sure of getting good yield. Similarly, he has obtained 19.5 quintals per acre of maize yield compared to average of 15-16 q/acre average yield for last 5 years. As per his opinion, the simple technology of adoption of balanced nutrition including the deficient micro and secondary nutrients has proved to be a viable practice which has given him 22 per cent increase in crop yield which accounts for benefit of about Rs 3500-4000 per acre.

Farmer has expressed his happiness for receiving of technical inputs which leads to enhance his knowledge towards enriching the soil fertility and obtaining maximum benefit with little expenditure on deficient nutrients. He is ready to go with the project for the next year as well and is so convinced that he himself without any subsidy is ready to purchase the inputs from RSK situated at taluka place.

RAICHUR DISTRICT

Sri Venkateshagowda S/o Balanagowda

Sri Venkateshagowda S/o Balanagowda, a residence of Village Nagalapura of Mudgal Hobli, Lingasugur Taluk, in Raichur district has heard from somewhere about Bhoochetana mission which has a goal to enhance productivity of rainfed system in Karnataka by 15-20 per cent with the small but effective interventions. He is 44 years of age and doing subsistence farming since many years. He want to do something new to obtain optimum crop yield and maintain soil fertility as he was convinced about the fact that poor fertility status of soil causing the reduction in crop yield since last few years and

He selected Bajara crop for this initiative and purchased the inputs received inputs from RSK Mudgal such as: Gypsum (200 kg ha^{-1}) Zinc sulphate (10 kg ha^{-1}) Borax (5 kg ha^{-1}) viz, along with major nutrients fertilizers. All the nutrient were applied in balanced form as suggested by our staff before sowing except urea which was top dressed two times at 30 and 50 DAS. One week before sowing of the seeds, micronutrients were applied as per the above recommendations as basal dosage and mixed in soil. Planting was done across the slope, Seeds were treated with the Ridomil M.Z @ 2 gm/ Kg and maintained the recommended plant population. He followed two times weeding. He has taken the benefit of regular visit of farm facilitators and other departmental staff, ICRISAT staff for technical guidance and attended trainings.He followed the instructions given by them.

He observed that Bhoochetana is a unique initiative for developing an effective alternate extension system by adopting consortium approach involving the DoA officials, extension agents, farm facilitators and ICRISAT which enabled farmers to raise their income. A remarkable improvement in the crop growth was realized by him compared to his previous practice of nutrient application. He has obtained 4.8 quintals per acre of yield compared to average of 3.5-3.6 q/acre average yield for last 5 years. As per his opinion, using balanced nutrition including the deficient micronutrients has proved to be a viable practice which has given him 33 per cent increase in crop yield which accounts for benefit of about Rs 3360 per acre.

Farmer has expressed his happiness and think that “Bhoo Chetana” is one of its kind mission initiative in the country designed and planned by ICRISAT which is implemented by the Government of Karnataka with the technical support from ICRISAT – led consortium and has the potential to become the torch bearer program for the poor farmer to increase on-farm productivity and resilience building.

Sri Tayappa / Doddarangappa

Sri Tayappa / Doddarangappa, a residence of Village Hogernal of Hobli Turvihal, Sindhanur Taluk has shown keen interest in the Bhoochetana activity which was started in Karnataka since last three years. He is 36 years young man with courage to take risk and has shown a keen interest in the project. He was convinced about the fact that poor fertility

status of soil causing the reduction in crop yield since last few years and he has to do something new to maintain soil fertility and obtain optimum crop yield.

He opted red gram crop for this trail and obtained the inputs from RSK handrabanda such as: Gypsum (200 kg ha^{-1}), Zinc sulphate (10 kg ha^{-1}), Borax (5 kg ha^{-1}), Trichoderma (200 gm kg^{-1} seed). One week before sowing of the seeds, micronutrients were applied as per the above recommendations as basal dosage and mixed in soil. Planting has been done across the slope, seeds were treated with the Trichoderma and maintained the recommended plant population. He has given two hand weeding's. He has taken the help of Farmer facilitators, agriculture department staff viz., Agricultural Assistant, Agriculture officer and ICRISAT staff both based at Hyderabad and in the district who were visiting periodically to the plot and giving the required technical help and inputs. He followed the instructions given by them.

He has observed remarkable good red gram growths which bear good pods. The pod failure rate was also less with the practice of balanced nutrition adopted by him thru this Bhoochetana initiative. He has obtained 4.2 quintals per acre of yield compared to average of 2.5-3 q/acre yield for last 5 years. As per his opinion, adoption of balanced nutrition including the deficient micro nutrients has proved to be a viable practice which has given him 39 per cent increase in crop yield which accounts for benefit of about Rs 3700 per acre.

Farmer thanks all the agriculture department staff, ICRISAT staff who periodically visited and guided them because of which only he could achieved maximum benefit. Now he learned that balanced nutrition is the key to obtain maximum benefit with little expenditure on deficient nutrients. He is ready to go with the project for the next year as well and is so convinced that he himself without any subsidy is ready to purchase the inputs from RSK situated at taluka place.

Sri Laxmayya S/o Doddaeashwarappa

Sri Laxmayya S/o Doddaeashwarappa, Arisigera village, Chandrabanda Hobli, Raichur, Karnataka is a small farmer use to cultivate ground nut and other crops following traditional methods. Recently during 2011-12 kharif season he got information about Bhoochetana through Farm Facilitators. He decided to participate in Bhoochetana activities through testing new technologies developed in Bhoochetana program. He decided to evaluate the performance of ground nut as advised by the Farm Facilitators and compared meticulously with his normal practice.

Sri Laxmayya received inputs from the from RSK Chandrabanda such as Groundnut seeds of TMV-2 Variety, Gypsum (500 kg ha^{-1}), Zinc sulphate (10 kg ha^{-1}), Borax (5 kg ha^{-1}) and Trichoderma (200 gm kg^{-1}). Sri Laxmayya used improved technologies over his traditional practices. The improved technologies such as (i) one week before sowing of the seeds, micronutrients were applied as per the above recommendations as basal dosage and mixed in soil (ii) planting across the slope (iii) Seeds were treated with the Trichoderma (iv)

Maintained the recommended plant population (v) Two times weeding (vi) Suitable plant protection measures taken up with neem oil Rainfed farming with check plot. He has fully utilized the periodic and regular visits of farm facilitators and other departmental staff, ICRISAT staff for technical guidance which was very much useful for him in timely monitoring the crop.

After the harvest, he noticed significant improvement in yield of ground nut over his traditional practices. As per his crop cutting experiments he obtained 3.20 quintals per acre by following his own traditional practice as against he got 4.48 quintals per acre following improved practices using Bhoochetana technologies. He achieved about 40 per cent increment in green gram yield by following improved method of cultivation. He obtained Rs. 3840 additional income per acre by selling his ground nut at the rate of Rs. 3500 per quintal. He is happy for adopting new technologies and he sincerely thanks the Department of Agriculture staff, ICRISAT and Farm facilitators for all the required help to achieve the impact. The department has used his field for conducting field day and field visits to demonstrate and show the results of Bhoochetana technologies to other farmers.

Sri Somashekara S/o Narsareddappa, Chandrabanda

Sri Somashekara S/o Narsareddappa, aged 38, is resident of Kodluru village (Hobli: Chandrabanda,Karnataka) under juridition of Chandrabanda Raitha Samparka Kendra. He cultivated sunflower crop under rainfed condition during July 4, 2011 to October 15, 2011. Improved agronomic practices were adapted planting across the slope, maintaining appropriate plant population, two time weeding, etc. Regular recommendation about good farming practices were given through farm facilitator and by scientific staff from agricultural department and ICRISAT. He also attended a training program which improved his awareness about improved agronomic practices. He also participated in the field day and field visits organized to demonstrate and show results of the Bhoochetana technologies among farmers for awareness. To compare the improvement in productivity, a check plot maintained with tradition farming practices. He received input from Raitha Samparka Kendra including sunflower seeds (Kargil variety@ 2.5 kg/acre), gypsum (200 kg ha^{-1}) zinc sulphate (10 kg ha^{-1}), and borax (5 kg ha^{-1}). One week before sowing of the seeds, he applied above recommended nutrients were in his farm as basal dosage and mixed in soil.

As a result of the measures undertaken, about 33% improvement in yield have been reported as compare to check plot. Yield of the Sunflower crop was 5.12 quintal/acre with improved practices as compare to 3.84 quintal/acre for check plot. An additional income of Rs. 8960 was acvhived through increase in yield.

Sri Hanumappa S/o Amakappa, Pamanakallur

Sri Hanumappa S/o Amakappa, aged 38, resident of Eklaspur village (Hobli: Pamanakallur, Taluk: Manvi) is a cotton grower. He adapted rainfed farming system with improved farming practices including fertilizer application based on soil tests, planting across the slope, maintaining proper plant population, regular weeding operations (two times). He took cotton crop during July 2, 2011 to November 20, 2011. He received technical and scientific support and input resources from Pamanakallur Raitha Samparka Kendra. Sri Hanumappa received recommended dosage of gypsum (200 kg ha^{-1}), zinc sulphate (10 kg ha^{-1}), and borax (5 kg ha^{-1}). One week before sowing of the seeds, he applied micronutrients as per the above recommendations as basal dosage and mixed in soil. He also participated in the field day and field visits that improved his awareness about improved agronomic practices.

As results of adapting improved farming practices, Sri Hanumappa has achieved 40% more yield of cotton that worth about Rs. 11520/- increase in income as compare to yield and income obtained from traditional farming practices. Yield of cotton with improved practices was 4.48 quintals/acre and with traditional practices was only 3.2 quintals/acre.

RAMANAGAR DISTRICT

Sri Nagaraju S/o Late Kemppaiah, Village: Mayaganahalli, Taluka & Dist: Ramanagara, Karnataka

Sri Nagaraju S/o Late Kemppaiah, aged 48, resident of Mayaganahalli village (Taluka & Dist: Ramanagara) is a pigeonpea producer. He cultivated BRG-1 variety of pigeonpea under rainfed farming system during June 28, 2011 to December 02, 2011. He received recommended inputs from Kasaba Raitha Samparka Kendra including pigeonpea seeds (@

5 kg/acre), DAP (22 kg/acre), gypsum (50 kg/acre), zinc sulphate (5 kg/acre), borax (2 kg/acre), trichoderma (200 gm/acre), neem oil (1 litre). One week before sowing of the seeds, micronutrients were applied as per the above recommendations as basal dosage and mixed in soil. The improved farming practices adapted by him were planting across the slope, seeds treatment with the trichoderma, appropriate plant population, two times weeding, etc. Neem oil was also used as plant protection measure. A check plot with traditional practices was also maintained to compare the performance of improved farming practices. Regular visit of farm facilitators and scientific staff of agriculture department and ICRISAT has provided a technical support to Sri Nagaraju that honed hiw knowledge about farming. He also attended training programs.

Adapted improved practices have increased the productivity of pigeonpea by 39% as compared to traditional practices. Yield obtained from improved practices was 8.6 quintals/acre as that of 6.2 quintals/acre from traditional practices. Increase in yield per acre have increased income of Sri Nagaraju by Rs: 8400/-

Sri, Ramaiah

We are presenting success story of a small and marginal farmer, Sri, Ramaiah S (55 years), Allalisandra village, Ramanagara district of Karnataka. Agriculture is the main source for his income and livelihood. He holds a small agricultural land completely under rainfed condition. Ramanagara district is typically under semi-arid tropics with average rainfall of 850 mm.

Improved agricultural practices were introduced into the villages under the Boochetana program. This farmer has cultivated Ragi crop during Kharif in year 2011. Crop was planted across the slope for conserving more rainfall into the soil. Micro-nutrients such as Gypsum, zinc, Borex were introduced and were used by this farmer. Recommended plant population

was maintained and intercultural operation was performed for weed control. Farmer interacted with farm facilitator and other stuff from ICRISAT and government department for getting technical guidance consistently. Farmer was also exposed to short term capacity building program / training which helped him to understand the technology and importance of the improved agricultural management.

Ragi yield increased from 12 Q acre^{-1} to 17 Q acre^{-1} and farmer earned 5500 INR extra income from his field. This is appreciated and encouraged by farmers' family and they are willing to adopt these interventions in future even if they do not get government aid or subsidies.

Farmer's Perception about Bhoochetana for Improving the Productivity

Name: Somantah Bangera S/O Anthappa Pujari, Post: Morthage House, Village: Navoor, Taluk: Belthangady; Education qualification: S.S.L.C

My name is Somanath Bangera from Navoor village Belthangady Taluk. I have cultivated paddy more than 40 years including the time I helped my parents on the farm. My qualification is S.S.L.C, However, since that time, I can say that I was really not aware that there were more effective methods of rice cultivation ranging from land preparation to post harvesting. After participating in Bhoochetana Farmer Field School and conducting demonstration plot I have learned First hand improved methods of Rice cultivation. We have learned along the way from soil testing importance of nutrients that to micronutrients

and preparation, transplanting to harvesting time, through training and regular guidance from depute officers and University scientists. I also learned an effective method of seed treatment using salty water from SRI trainings (System of Rice Intensification) and Role of Rice transplanters in Rice transplantation.

I would like to say that we also learned other improved methods such as fertilizer application methods. Compost making, how to maintain the soils of cultivated land, how to control pest and disease through IPM practices. Through out the cultivation season we learned effective methods not only from training but also from regular guidance. But what really made me happy is that at the end of the season I got a yield of 22 quintals / acre. The average yield of previous years was only 17 quintals / acre.

We realized that applying the mixture of compost, DAP, Zinc sulphate, Lime, Boron and Gypsum is most effective. So, I would like to say thank you to Department of Agriculture, ICRISAT and Universities for your assistance in showing us how to improve our rice yield through simple and inexpensive testimonies. Thank you so much.

A farmer Narasappa S/o Huttappa, 65 years old, of Uttari village, Uttarahalli Hobli, BengaluruSouth Taluk with education upto 4th standard, having four acres of land and whose major occupation is agriculture grows Ragi along with other pulses like field bean, Cowpea and Redgram.

When he was apprised of the Bhoochetana scheme where in fertilizers and recommended dose of micronutrients are applied as per soil testing results. He bought the inputs like Gypsum, Zinc sulphate, Borax, PSB (biofertilizer), and Carbendizium for one acre of his land. Being very apprehensive about the application of Micronutrients as he was applying it for the first time. He applied only to one acre and continued his regular practices in another 1.05 acre of his land.

Narasappa S/o Huttappa, BengaluruSouth Taluk

He actively participated in Farmers Field School (FFS) conducted in the same village, He was very surprised to find remarkable difference between his two plots(Treated and check)According to him the plot in which he applied all the micronutrients, had better plant growth, more no.of tillers and larger ear heads in comparison to the plot in which he has not applied these micronutrients. He is of the opinion that there was reduced weed growth in treated plot. Treated plot of his yielded almost 14 qof grain yield per acre as compared to 12 q in untreated plot. He came forward and shared his opinion in the FFS field days organized by the department among fellow farmers.

In addition to improved technologies, by application of micronutrients and balanced fertilizers this farmer has increased his yield from 12quintals to 14 quintals i.e., a difference of 2quintals over the check plot, for every one rupee invested he gains a profit of 2.5 rupees. He is highly convinced about the technologies he has adapted and assures to continue them in the future.

Higher yield levels of groundnut by use of micronutrients

Shri Yallappa K Totadavar of Annigeri village in Navalagund taluk is a traditional groundnut farmer. Shri Yallappa is happy with yield levels of groundnut from 7 qtls to 10 qtls. He attributes this increase and proud to say that use of micronutrients and timely intervention of Dept.of Agriculture & ICRISAT recommendations is the cause.


Table.Comparison of yield and income between Traditional and improved practices			
Sl. No.	Details	Traditional method	Bhoochetana model
1	Seeds	Groundnut TMV-2 CS	Groundnut TMV-2 CS
2	Date of sowing	06.06.2011	06.06.2011
3	Cost of cultivations	Rs. 11200/-	Rs. 13200/-
4	Yield per ha	7 qtls	10 qtls
5	Gross Income	Rs. 20300/-	Rs. 29000/-
6	Net Income	Rs. 9100/-	Rs. 15800/-

He is happy with the yield levels from 7 to 10 qtls per ha in Groundnut with a net profit from Rs. 9100/- to 15800/- of the 300 beneficiaries identified in 500 ha programme of Bhoochetana, the achievement of Shri Yallappa is significant and a clear message to fellow farmers to use micronutrients and biofertilisers.


Doubling the Net Returns from Rainfed Maize with Bhoochetana in Bellari District

Sri K.Rangaswamy, Tupakanahalli village, Kudligi taluk is a small farmer having 2.5 acre dryland use to grow maize, Sunflower and other dryland crops following traditional practices. During Kharif 2011-12, this farmer got information about Bhoochetana and with the help of Farm Facilitator in the district. He decided to test and evaluate the performance of the maize crop grown as advised by the Farm Facilitator and compared meticulously with his normal practice. He used the maize cultivar CP 848 and applied the balanced nutrients as advised by the Bhoochetana team consisting of DoA officials, the farm facilitator and ICRISAT Technician. He applied Zinc sulphate, borax and gypsum along with nitrogen, phosphorus and potash to his maize crop as per the Bhoochetana package. He applied micro and secondary nutrients as a basal dose thru soil application before sowing of the crop. In the plot of 0.5 acre which he cultivated as per his normal practice he applied only nitrogen, phosphorus and potash that too suboptimal doses. The details of both the plots grown with improved management and as per his normal practice are given in the table.

Crop: Maize, Variety: C.P. 848,
Date of sowing: 5.7.2011. Date of Harvest: 20.10.2011

Particulars	Improved practice	Farmer practice	Remark
Area	2.0	0.5	(1)Before sowing micro nutrients were applied as per basal dosage and mixed in soil (2) Seeds were treated with trichoderma (3) Maintained plant population (4) One time weeding and two times inter cultivation was done
Seed	12 k.g.	3 k.g.	
Trichoderma	2 k.g.	-	
Zn SO_4	10 k.g.	-	
Gypsum	200 k.g.	-	
Borax	2 k.g.	-	
Urea	50 k.g.	25 k.g.	
D.A.P.	50 k.g.	25 k.g.	
M.O.P.	10 k.g.	10 k.g.	
Pesticide	1.0 ltr.	1.0 ltr.	

The crop was grown as a rainfed crop and then he harvested the crops as advised by the Bhoochetana team and recorded the crop yields in his field itself.

Mr. Rangaswamy was very much convinced about the benefits from Bhoochetana program and he was very happy that his net returns from his one ha farm has doubled and has earned Rs. 11800 from his two acres land cultivated with improved practices. He was saying he made a mistake that he did not use the improved practice for the 0.5 acre land else he would have made additional 1400 Rs from the same land. He thanks the DoA, Government of Karnataka for such a good scheme which has enabled him to double his net profit and can happily cultivate the land with maize with Bhoochetana package and reap better benefits with normal rainfall situation.

The crop growth was very good till August but and there was dry spell during September, this lead to poor silk and seed setting in the cobs.

Cost benefit ratio:

Sl. No.	Particulars	Improved practice (2.0 Acre)	Farmer practice (0.5 Acre)
1.	Grain production (qtls)	22.0	4.0
2.	Market value (Rs)	22000	4000
3	Cost of Cultivation (Rs)	10200	2600
4	Net Return (Rs)	11800	1400
5	Net Return (Rs/ha)	11800	2800

Farmer opined that even under dry spell the maize crop grown with improved practices could comparatively with stand the moisture stress and yield better than the traditional practice.

Lessons learned

- The study of soil health and recommendation of use of micronutrients and gypsum is a big headway of bhoochetana scheme.
- Awareness about bhoochetana technologies has been created in the districts and farmer adoption levels are increasing.
- Seed treatment under assured rainfall condition provides initial strength and vigor to the crops. Many farmers are going for seed treatment voluntarily.
- Farmers are convinced that under assured rainfall condition, supplementation of micronutrients such as zinc sulphate, boron and gypsum along with recommended dosage of fertilizer would certainly increase crop yields remarkably.
- Supplementation of bio fertilizers and bio pesticides also contribute for yield increase and indirectly encourages eco-friendly farming.
- Farmers have been convinced the importance of micronutrients for productivity enhancement.
- Bhoochetana Campaigns - motivated the large number of farmers to adopt the seed treatment.
- Promoted the use of bio-fertilizers, bio-pesticides and green manures which resulted in revival of soil fertility.

Learnings

- Although target area projections were done rightly, micronutrient requirement were under-projected based on recommendations (lower dose of micronutrients) given in package of practices to individual crops in different districts, ignoring soil test based recommendations provided by ICRISAT. This is biggest concern for promotion of application of balanced nutrient application in soil to improve soil health. Action needs to be taken on priority basis.
- Based on experiences in the previous year monsoon conditions and difficulties in the distribution of left over stocks in the previous year, officials took a conservative approach of partial stock positioning, and accordingly indented for partial requirement of micronutrients, with a view to supply micronutrients as and when the demand arises.
- Early monsoon is big challenge for the official to manage the inputs. If not arranged then farmer chose the way they want to take crops. Like happened in few of the districts farmers did sowing of crops like groundnut in Kolar, Chikkaballapur and pigeonpea in Gulburga and Bidar with good monsoon rains quite early. The districts where sowings

have been completed more than 50%, the supply of one or all the micronutrients ($ZnSO_4$ in some districts) were either insufficient to meet the demand or was not available (Ex. Boron in Raichur) at that time when farmers needed it most.

- Although a complete package of nutrients need to be supplied to enhance crop yields, involvement of local polity in politically sensitive areas to demand issue of selective nutrients and quantities also affected the implementation, reflecting low in take of micronutrients in few districts.
- For promotion of any new technology farmers selection is very crucial. Thus it is important that for improved quality seed distribution first organise orientation at RSK level and farmers who participate in the orientation get priority for seed. They also distributed material to non selected village farmers who shows their interest in this concept.
- Initially farmers refused to apply micronutrients. Therefore lead farmers were provide inputs in place of their honorarium this trick worked and outputs of demonstration were good and next year farmers came forward to apply micro nutrients in their field. Such innovative approaches has to be adopted in new operational areas.
- Farmer to farmer communication give better results

About ICRISAT

ICRISAT
Science with a human face

The International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) is a non-profit, non-political organization that conducts agricultural research for development in Asia and sub-Saharan Africa with a wide array of partners throughout the world. Covering 6.5 million square kilometers of land in 55 countries, the semi-arid tropics have over 2 billion people, and 644 million of these are the poorest of the poor. ICRISAT and its partners help empower these poor people to overcome poverty, hunger, malnutrition and a degraded environment through better and more resilient agriculture.

ICRISAT is headquartered in Hyderabad, Andhra Pradesh, India, with two regional hubs and four country offices in sub-Saharan Africa. It belongs to the Consortium of Centers supported by the Consultative Group on International Agricultural Research (CGIAR).

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