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Bhoochetana

A Compendium of Success Stories

ICRISAT
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International Crops Research Institute
for the Semi-Arid Tropics
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Bhoochetana

Mission to Boost Productivity of Rainfed Agriculture through Science-led Interventions in Karnataka

A Compendium of Success Stories

Editors

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ICRISAT
Science with a human face

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Background

The Government of Karnataka has upscaled the learnings from the Sujala-ICRISAT initiative to enhance agricultural productivity in the dryland areas of the state by bridging the yield gap between farmers' fields and achievable yields with the help of science-based productivity enhancement interventions. The mission project on rainfed agriculture called "Bhoochetana" was launched by the Government of Karnataka during 2009-10 to benefit dryland farmers in 30 districts. The principle of consortium, convergence, capacity building and collective action as proposed by ICRISAT to address the issues of efficiency, economics, equity and environmental protection was adopted. The consortium partners involved in Bhoochetana are three State Agricultural Universities (UAS, Bangalore; Dharwad; and Raichur;), the Watershed Development Department (WDD), the Department of Economics and Statistics (DES), and other line departments of the Government of Karnataka, ICRISAT and the Department of Agriculture which is the nodal agency for the mission project. Farm facilitators and Lead farmers have assumed the role of trainers to train large numbers of farmers on collective action and capacity building. During the second and third year, project activities were expanded to all 30 districts in addition to the six districts of the Sujala watershed program where soil health mapping had already been completed, along with participatory selection of appropriate cultivars of the major crops. In all 30 districts efforts have been made to collect soil samples by adopting a stratified soil sampling method and covering a large number of villages.

Bhoochetana is a novel pilot project in the country wherein a science-led integrated approach is being operationalized on a large scale, covering the entire state to unlock the potential of agriculture. This is also a unique initiative to develop an effective alternate extension system by adopting a consortium approach to build the capacity of the DoA officials, extension agents and farm facilitators. In turn this has enabled the establishment of a link between knowledge-generating institutions and knowledge-disseminating line departments with the help of farm facilitators. The mission program has also adopted and operationalized a scientific approach for data recording and data tracking and has integrated crop cutting experiments into state statistics with the help of Bhoochetana beneficiaries.

Objectives

The overall goal of this mission project is to increase the average productivity of selected crops in 30 districts by 20% in four years. The specific objectives are as follows: to identify and scale-up best-bet options (soil, crop and water management) including improved cultivars to enhance productivity of the selected crops by 20% in 24 (later extended to 30) districts; to train DoA staff in stratified soil sampling in the villages, to analyze macro and micronutrients and prepare GIS-based soil maps; to help the DoA establish a high quality soil analytical laboratory at Bengaluru, and to undertake stratified soil sampling as well as analysis and share the results in the districts; and to build the capacity of the stakeholders (farmers and consortium partners) in the sustainable management of natural resources and for enhancing productivity in dryland areas.

The Bhoochetana initiative undertaken by the Department of Agriculture, Government of Karnataka is a path breaking approach for development and inclusive growth which enhances productivity in dryland agriculture through use of science-based technologies and the sustainable use of natural resources. In this report, an effort has been made to document the success stories of Bhoochetana farmers in order to spread the advantage of new technologies to other farming communities and to document the impact pathways.

Exemplar Scaling out of soil need-based fertilizer management with millions of smallholders in Karnataka

The importance of agriculture in Karnataka is very well understood from the fact that it provides employment to more than about 60% of the people and directly contributes to 18% of the GDP. However, the current yield levels of rainfed agriculture are quite low compared to the potential levels. A stagnant to declining growth rate in agriculture during the years 2000 to 2008 necessitated the need to revive agriculture in the state. Realizing the urgency, the flagship initiative 'Bhoochetana' came into being to increase crop productivity and strengthen agriculture-based livelihoods in the state.

Realizing that land degradation is a rampant problem throughout the state threatening the livelihoods of small farmholders as well as the food security of the millions of poor, extensive soil mapping was initiated to reverse soil degradation. Soil mapping was adopted as an entry point activity to involve farmers in the process, for rapport building and to take the responsibility for the science-led development of agriculture for sustained and progressive benefits. Farmers were trained in the soil sampling process and collected samples themselves with handholding support from experts. Soil sampling being the weakest link as extremely small quantities of soil are used to represent the millions of tons of soil in the fields, a stratified soil sampling methodology was adopted to take care of the issue. Under this methodology, about 25% (using GIS) of the villages were taken as a representative sample and a target village was divided into three to po-sequences ie, upper, middle and lower. At each topo-sequence location, samples were taken proportionately from small, medium and large farm-holding sizes to represent all possible soil fertility variations as judged through soil color, texture, cropping system and agronomic management. At the ultimate sampling unit in a farmer's field, 8 to 10 cores of surface (0-0.15 m) soil samples were collected and mixed together to make a composite sample. With this methodology, 20-30 samples effectively represented a watershed of about 500 ha.

More than 100 thousand samples collected from farmers' fields in Karnataka were analyzed in state-of-the-art laboratories. Results revealed that the mining of nutrients over the years from cultivated soils has resulted in multiple nutrient deficiencies and that some of the micro and secondary nutrients have been depleted below the critical limit. This is adversely affecting nutrient and water use efficiency. Specific examples from farmers' fields revealed widespread deficiencies of micro and secondary nutrients like zinc (Zn), boron (B) and sulfur (S) along with nitrogen (N) and phosphorus (P) but no deficiency of potassium (K).

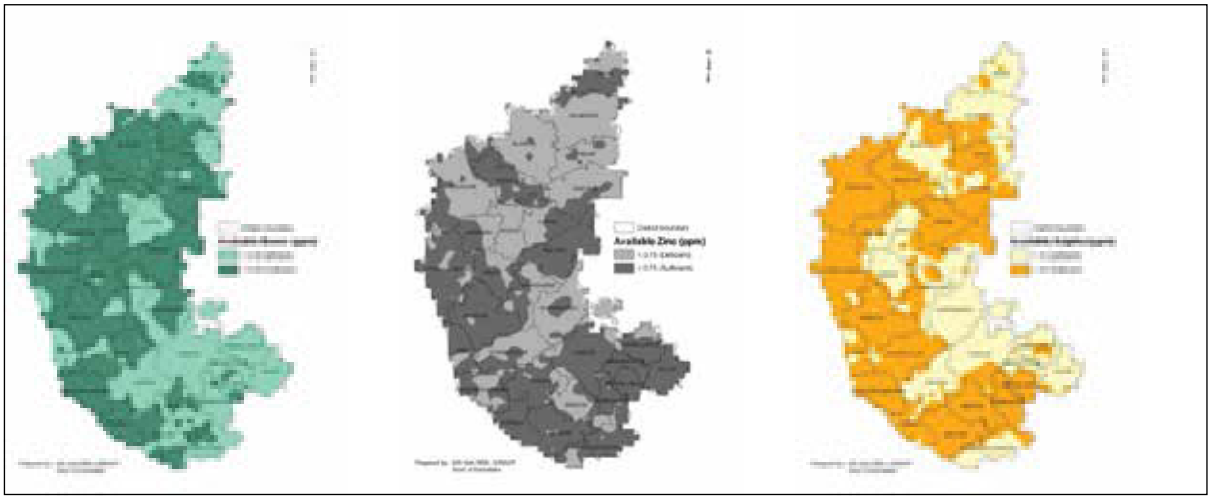


Fig 1. Extensive micro- & secondary nutrient deficiencies in Karnataka.

Soil mapping indicating individual nutrient deficiencies scattered differently provided a basis to develop soil-need based taluk (cluster of villages/block) level new fertilizer recommendations as opposed to state level ones. The new recommendations included deficient S, B and Zn in addition to N, P and K. Recommendations included the application of the full dose of a particular nutrient if its deficiency was on >50% of the fields in a block and half the dose of a nutrient if its deficiency was on <50% of the fields. This method of nutrient recommendation was adopted to target optimum yields while considering the existing risks and infrastructure available in rainfed agriculture in the state.

The policy reorientation to disseminate knowledge about soil test-based technology and to ensure timely and incentivized inputs for smallholders proved to be an exemplar in due course of time for other regions to follow. The distribution of soil health cards indicating field status and recommendations enhanced awareness and showed the way forward to farmers. The mechanism of hiring and training lead farmers to disseminate knowledge to fellow farmers proved to be very effective in scaling out soil health rejuvenation. Arranging logistics for inputs in the villages proved to be critical for farmers for timely and easy access to inputs.

With simple institutional arrangements, the improved fertility management practices were scaled out with 3.1 million farming families in the state covering 7.5 million ha during five years (2009-2013). The economic benefits were estimated to increase net profit for the farmers by US$230 million (₹1,267 crores) by the end of 2012. Increased resilience during abnormal rainfall years was also recorded with soil test-based nutrient management. This success has put a sound base in place and has just started the growth engine of agriculture in the state by winning the confidence of farmers and initiating collective actions of farmers with policy makers. It has also initiated knowledge generating and knowledge transforming institutions to upscale technologies not only for intensification but also for diversification and to develop allied enterprises across the value chain.

Table 1. Net benefits accrued due to Bhoochetana in Karnataka during 2009 to 2012.

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

Good soil heath is a very basic requirement for strengthening agri-based enterprises. So, this success story of soil mapping-based intervention to enhance productivity and bring farmers on board to be part of a science-led process of uplifting agriculture is worth emulating in other parts of the semi-arid tropics.

Integrated Crop Management

Current farmers' yields are lower than the potential yield both in irrigated and rainfed areas. The potential yield needs to be achieved to improve farmers' livelihoods. The major limiting factors are water, soil, and crop management practices. The yield gaps are not because of the lack of technologies but due to the lack of awareness amongst farmers. On station and pilot studies have indicated that crop yields can be increased by two to five times by following integrated management practices. Considering the large scope to bridge the yield gaps, a number of region specific integrated technologies have been promoted which paid rich dividends to farmers and a few of the success stories have been compiled here.

1 Balanced fertilization and good agronomic practices enhance green gram yield

Sri Ganapatha Rao, Doddapura Village, Bidar Taluk, Bidar District, Karnataka.

Improved practices help boost green gram yield in Ganapatha Rao's field.

Sri Ganapatha Rao, s/o Sri Vithal Rao, is a small farmer who used to cultivate green gram and other crops by following traditional methods. Recently, during the 2011-12 *kharif* season, he learnt about Bhoochetana through farm facilitators. He decided to participate in Bhoochetana activities by testing the new technologies developed in the Bhoochetana program. He decided to evaluate the performance of green gram as advised by the farm facilitators and made meticulous comparisons with his normal practice.

Sri Ganapatha Rao received inputs such as green gram seeds (5 kg per acre), DAP (30 kg per acre), gypsum (80 kg per acre), zinc sulfate (10 kg per acre), borax (2 kg per acre), trichoderma (200 g per acre) and neem oil (1 litre) from the Department. Sri Ganapatha Rao used improved technologies over his traditional practices. The improved technologies included (i) application of micronutrients as per the above recommendations as basal dosage and mixed in soil one week before sowing the seeds (ii) planting across the slope (iii) treating seeds with trichoderma (iv) maintenance of the recommended plant population (v) weeding twice (vi) taking up suitable plant protection measures with neem oil and (vii) rainfed farming with a check plot. More importantly, regular visits by farm facilitators and other departmental staff as well as by ICRISAT staff for technical guidance proved to be very useful for timely monitoring of the crop and to avail training regarding crop cultivation and post-harvest management.

After the harvest, Sri Ganapatha Rao noticed significant improvement in the yield of green gram compared to that from his traditional practices. As per his crop cutting experiments, he obtained 5.20 q per acre by following improved practices using Bhoochetana technologies, and 3.80 q per acre by following traditional practices. He achieved an increment of about 37 per cent in green gram yield by following the improved method of cultivation. He obtained an additional income of ₹4,900 per acre by selling his green gram at the rate of ₹3,500 per quintal.

Sri Ganapatha Rao is happy that he has adopted new technologies and he sincerely thanks the staff of the Department of Agriculture and ICRISAT as well as the farm facilitators for rendering all the required help in achieving the increased yield. 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.

2 Micro Nutrients and good cultivation practices enhance yields and benefits from hybrid sorghum

Sri Shyama Rao, S/o Sri Shankarappa, Chalakapura Village, Bhalki Taluk, Bidar District, Karnataka.

Shyama Rao displays healthy sorghum crop.

Sri Shyama Rao is a small farmer who used to cultivate sorghum, green gram and other dryland crops following traditional methods. He received information about Bhoochetana through farm facilitators and was interested in increasing the yield productivity. He decided to participate in Bhoochetana activities by testing the new technologies developed in the Bhoochetana program. He decided to evaluate the performance of hybrid sorghum as advised by concerned staff and farm facilitators and made meticulous comparisons with his normal practice.

Sri Shyama Rao received inputs such as sorghum seeds (3 kg per acre), DAP (40 kg per acre), urea (25 kg per acre), gypsum (80 kg per acre), zinc sulfate (10 kg per acre), borax (2 kg per acre), and trichoderma (200 g acre) from the Department. Sri Shyama Rao used improved technologies over his traditional practices. The improved technologies included (i) application of micronutrients applied as per the above recommendations as basal dosage and mixed in the soil one week before sowing the seeds, (ii) planting across the slope (iii) treating seeds with trichoderma (iv) maintenance of the recommended plant population and (v) weeding twice. More importantly, regular visits of farm facilitators and other Departmental staff, as well as ICRISAT staff for technical guidance proved to be very useful not only for the timely monitoring of the crops but also for imparting suitable training on crop cultivation and post-harvest management.

After the harvest, Sri Shyama Rao noticed a significant improvement in the yield of hybrid sorghum as compared to that from his traditional practices. As per his crop cutting experiments, he obtained 11.75 quintals per acre by following the improved practices advocated by Bhoochetana as against 8.50 quintals per acre through his traditional practice. This means, he achieved an increment of about 38 percent (about 3.25 quintals per acre) in sorghum yield by following the improved method of cultivation. He obtained an additional income of ₹9,425 per acre by selling his hybrid sorghum at the rate of ₹2,900 per quintal.

Sri Shyama Rao is happy that he has adopted new technologies and he sincerely thanks the staff of the Department of Agriculture, ICRISAT and the farm facilitators for all the help extended to make this achievement possible. 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.

3 Improved nutrient and water management practices enhance maize productivity

Sri Devaraju, S/o Sri Kannan, Kolipalya village, Chamarajanagara Taluk, Chamarajanagar District, Karnataka.

Farmer field day observed during Bhoochetana project.

Sri Devaraju is a small farmer who owns one hectare of land and cultivates dryland crops following traditional methods. Since he is a member of the cooperative society, he procured information from Bhoochetana on how to increase the productivity of dryland crops through farm facilitators. Thus, he decided to test the new technologies developed in the Bhoochetana program to improve his yield and income. He decided to evaluate the performance of maize as advised by concerned staff and farm facilitators and made comparisons with his own practice.

Sri Devaraju received inputs at subsidized rates from the Department of Agriculture. He adopted improved practices such as the effective moisture conservation practice and used micronutrient inputs such as gypsum, boron and zinc. He also used good quality seeds and ensured appropriate irrigation for the crop. More significantly, regular visits by farm facilitators and other departmental staff, as well as ICRISAT staff for technical guidance proved to be very useful for timely monitoring of the crops. He received training on crop cultivation and post-harvest management.

After the harvest, Sri Devaraju noticed a significant improvement in the yield of maize as compared to that from his traditional practices. As per his crop cutting experiments, he obtained only 45 quintals per ha through his own traditional practice as against 62.5 quintals per ha with the help of the improved practices suggested by Bhoochetana. He had achieved an increment of about 39 per cent (about 45 quintals per ha) in maize yield. He obtained ₹16,600 as net additional income per ha by selling his maize at the rate of ₹900 per quintal.

Table 2. Details of maize production using improved technologies.

Particulars	Improved technologies	Traditional practices
i) Productivity per ha (qt)	62.5	45
ii) Cost of production per ha	5900	4800
iii) Net income per ha	16,600	11,400

Sri Devaraju is happy that he has adopted new technologies and he sincerely thanks the staff of the Department of Agriculture and ICRISAT as well as the farm facilitators for all the help extended to make this achievement possible. 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.

4 Improved nutrient and water management practices enhance maize productivity

Sri BV Nagarajappa, Bisalavadi Village, Chamarajanagara Taluk, Chamarajanagar District, Karnataka.

Maize yields increase of the implementation of Bhoochetana technology.

Sri BV Nagarajappa is a small farmer who owns one hectare of land. He used to cultivate dryland crops following traditional methods. He learned about the Bhoochetana program through farm facilitators and got information on increasing crop productivity. He decided to test the new technologies developed in the Bhoochetana program for improving yield and income. He decided to evaluate the performance of maize as advised by the concerned staff and farm facilitators and made comparisons with his own practice.

Sri Nagarajappa received inputs at subsidized rates from the Department of Agriculture. He adopted improved practices such as the effective moisture conservation practice and used micronutrient inputs such as, gypsum, boron and zinc. He also used good quality seeds and ensured appropriate irrigation for the crop. More significantly, regular visits by farm facilitators and other Departmental staff as well as ICRISAT staff for technical guidance proved to be very useful for timely monitoring of the crop and to avail training regarding crop cultivation and post harvest management.

Sri Nagarajappa noticed a significant improvement in the yield of maize over that from his traditional practices. As per his crop cutting experiments, he obtained 25 quintals per hectare by the following traditional practice as against 39 quintals per ha by following the improved practices of Bhoochetana. He achieved an increment of about 36 per cent (about 9 quintals per ha) in maize yield by following the improved method of cultivation. He obtained a net additional income of ₹28,120/ha by selling his maize at the rate of ₹980 per quintal.

Sri Nagarajappa is happy that he has adopted new technologies and he sincerely thanks the staff of the Department of Agriculture and ICRISAT as well as the farm facilitators for all the help extended to make this achievement possible. 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.

Table 3. Details of maize production using improved technologies

Particulars	Improved technologies	Traditional practices
i) Productivity per ha (qt)	39	25
ii) Cost of production per ha	5200	4000
iii) Net income per ha	28,120	20,500

5 Integrated *in situ* moisture, seed and nutrient management fetches additional ₹30,000 in groundnut

Sri Devikere Nagappa, Alur Village, Davanagere District, Karnataka

Effect of improved management on groundnut yields in Devikere Nagappa's field.

Sri Devikere Nagappa holds nearly one fourth of a hectare of agricultural land and there is no irrigation facility available in the field. This region suffers with acute water scarcity, mainly due to the poor and erratic distribution of rainfall, the increasing population pressure and unsustainable water use. Annual rainfall in Davanagere is below 700 mm. Crop productivity under the rainfed system was below one ton per ha.

Improved agricultural practices were introduced in the villages under the Bhoochetana program. The focus was to enhance soil moisture by using several land form practices. The yield gap analysis undertaken by the ICRISAT revealed that a large yield gap exists for all the major rainfed crops grown in the semi-arid tropics, and there is potential to increase productivity by two to three folds using available technologies in the farmers' fields. In this context, micronutrients such as gypsum and zinc were introduced and were used by Sri Devikere Nagappa in the groundnut field during the *kharif* season. An improved variety of seed was used and organic fertilizer was also applied.

This improved package of practices has enhanced groundnut yield to 40 quintals per ha compared to a mere 15 quintal per ha obtained under the traditional system. Sri Devikere Nagappa gained ₹30,000 as additional revenues from the field. Product quality was also found to be better as pod size was bigger and the seeds had better nutritional value as compared to the traditionally grown groundnut crop.

To conclude, rainfed areas hold vast yield potential, which could be harnessed by adopting good agricultural practices/technologies and disseminating/sharing the existing knowledge.

6 Improved fertilization and water practices in HYV of maize improves the fortunes of a farmer in Davanagere

Sri Rajashekarappa, Jagalur Tehsil, Davanagere District, Karnataka.

Farmers field day observed during Bhoochetana project.

Sri Rajashekarappa is a farmer who holds 0.8 ha of agricultural land, which is the main source of his livelihood. Irrigation water is available and lifted through a bore well. Davanagere district suffers from acute water scarcity, mainly due to the poor and erratic distribution of rainfall. Occurrence of dry spells is very common in this region. Therefore even in the monsoon, crops require lifesaving irrigations. Annual rainfall in Davanagere is below 700 mm.

Improved agricultural practices were introduced into the villages under the Bhoochetana program. Despite the availability of irrigation facility, focus was given to enhancing *in situ* rainwater harvesting by implementing several land form practices so that the irrigation water in wells could be saved. The yield gap analysis undertaken by ICRISAT revealed that a large yield gap exists for all the major rainfed crops grown in the semi-arid tropics and that there is potential to increase productivity by two to three folds using available technologies in the farmers' fields. In this context, micronutrients such as gypsum and zinc were introduced and were used by Sri Rajashekarappa in the maize field during the *kharif* season. Improved variety of seed was used and organic fertilizer was also applied. Lifesaving irrigation was provided as per the crop's requirement. Intercultural operations were also performed to control weeds.

Results showed that the improved packages of practices enhanced crop productivity by 25% (from 62.5 quintal per ha to 87.5 quintal per ha). Net income also increased from ₹55,000 to ₹77,000.

Thus it can be concluded that the integration of 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 help improve their livelihood and social status.

7 Improved micronutrients and good agricultural practices enhance soybean yield

Sri Basappa G Mugadur, Kunimellihalli Tehsil, Haveri District, Karnataka.

Soyabean yield increased after improved agriculture practises in Basappa G Mugadur's field.

Sri Basappa G Mugadur is 52 years old. Agriculture is the main source of income and livelihood for Sri Basappa G Mugadur. He holds a small piece of agricultural land which is exclusively rainfed. Haveri district is typically under the semi-arid tropics with an average rainfall of 900 mm. This amount of rainfall is sufficient for cultivating *kharif* crops successfully and there is also potential for taking up a second crop. However, inappropriate management of land and water resources and the water scarcity situation in the district result in poor crop yields.

Improved agricultural practices were introduced into the villages under the Bhoochetana program. Sri Basappa G Mugadur has cultivated soybean crop during *kharif* in the year 2011. Farmers received fertilizer inputs and improved varieties of seeds at subsidized rates under the Government led program. A large soil sample collected from Karnataka by the ICRISAT revealed that there is a widespread deficiency of micronutrients and that there is potential to increase productivity in farmers' fields by two to three folds with the help of micronutrients and available technologies. In this context, micronutrients such as gypsum, zinc and borax were introduced to Sri Basappa G Mugadur who used them in his fields. The crop was planted across the slope to conserve more rainwater in the soil. Soybean seeds were treated with trichoderma. The recommended plant population was maintained and intercultural operations were performed for weed control. Sri Basappa G Mugadur interacted with the farm facilitator and other staff from ICRISAT and the Government Department for consistent technical guidance. He was also exposed to a short term capacity building program/training which helped him understand the technology and the importance of improved agricultural management.

The yield of soybean increased from 5 quintal per ha to 7 quintal per ha and Sri Basappa G Mugadur earned ₹5,000 as extra income from his field. Encouraged by this, his family is willing to adopt these interventions in the future even if they do not get government aid or subsidies.

G Pardhasaradhi and K Vishwanath

8 Micronutrients and good practices enhance maize groundnut and bajra productivity

Sri Nagappa Huilgola, Koluru Village, Hiresindogi Post, Koppal District, Karnataka

Maize benefitted by micronutrient application.

Sri Nagappa Huilgola is 52 years old and his land has a survey number of 77 in Koluru village which comes under the Kasaba Koppal Raitha Samparka Kendra. He planted maize on 02 June 2011 at a seed planting rate of 7.5 kg per acre. He applied DAP at 30 kg per acre, gypsum at 80 kg per acre, zinc sulfate at 10 kg per acre and borax at 2 kg per acre. He received all these inputs from the Department of Agriculture, Government of Karnataka.

Sri Nagappa adopted improved technologies instead of following his traditional practices. One week before sowing the seeds, he applied micronutrients as per the recommendations, as basal dosage and mixed in the soil. He planted across the slope and maintained the recommended plant population. He practiced rainfed farming and weeded twice. He also maintained a check plot. His farm was visited regularly by farm facilitators and other Departmental staff. Sri Nagappa has also received technical guidance from ICRISAT staff and has availed training.

The maize crop was harvested on 05 October 2011. With improved technologies the yield per acre increased by 14% from 14 quintal to 16 quintal. The average price of maize is about ₹950 per quintal. Thus by adopting Bhoochetana technologies, Sri Nagappa Huilgola was able to enhance his income by ₹2,600 per acre. Sri Nagappa's success was witnessed by several other farmers. These farmers are very keen to adopt improved technologies under Bhoochetana, which is being implemented and promoted by the Government of Karnataka with technical guidance from ICRISAT.

Macrobenefits with micronutrients in Maize

Mr Sharanappa Arald, Tommaraguddi Village, Yelburga Taluk, Koppal district, Karnataka.

Mr Sharanappa Arald associated with Bhoochetana during the rainy season of 2011 and followed the recommended improved management for maize. Mr Sharanappa Arald sowed the crop across

the slope on 5th July 2011 and used 7.5 kg per acre of seed to maintain the recommended plant population. He also applied the secondary micronutrients - 80 kg per acre gypsum, 10 kg per acre zinc sulfate and 2 kg per acre borax and weeded twice. He maintained an adjoining control maize plot which he cultivated with the traditional farmers' practice. The crop was harvested on 23 October 2011. With the improved practice, the yield per acre grew from 15 quintals to 17 quintals. Economic analysis showed that the improved practice brought in additional returns of ₹19,190 against an additional cost of ₹560. A farmers' week was organized at Mr Sharanappa's maize fields to show the benefits of improved management.

Improved practices increase groundnut productivity

Sri Sanna Amreshappa, Venkatagiri, Gangavathi Taluk, Koppal District, Karnataka.

Sri Sanna Amreshappa is 61 years old and his land has a survey number of 102 in Venkatagiri which comes under the Venkatagiri Raitha Samparka Kendra. He planted groundnut on 05 July 2011 at a seed planting rate of 40 kg per acre. He applied DAP at 40 kg per acre, gypsum at 100 kg per acre, zinc sulfate at 10 kg per acre and borax at 2 kg per acre. He received all these inputs from the Department of Agriculture, Government of Karnataka. Sri Amreshappa adopted improved technologies instead of following his traditional practices. One week before sowing the seeds, he applied micronutrients as per the recommendations - basal dosage mixed in the soil. He treated the seeds with trichoderma, planted across the slope and maintained the recommended plant population. He practiced rainfed farming and weeded twice. He also maintained a check plot. He took suitable plant protection measures using neem oil. His farm was visited regularly by farm facilitators and other Departmental staff. Sri Amreshappa has also received technical guidance from ICRISAT staff and availed training.

The groundnut crop was harvested on 30 October 2011. With improved technologies, the yield per acre increased by 11% from 3.10 quintals to 3.46 quintals.

Average price of groundnut is about ₹2,700 per quintal; thus, by adopting Bhoochetana technologies Sri Amreshappa was able to enhance his income by ₹972 per acre.

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

Improved management of bajra to enhance productivity

Mr Hirehanumappa Sadar, Chalgera Village, Kuntagi Taluk, Koppal District, Karnataka.

Mr Hirehanumappa Sadar associated with Bhoochetana during the rainy season of 2011 and followed the recommended improved management for bajra. He sowed the crop across the slope on 5 June 2011. He used 1.5 kg seed per acre to maintain the recommended plant population and treated the seeds with trichoderma (200 g per acre). He also applied the deficient secondary nutrient & micronutrients in addition to urea as basal, before sowing. In addition, he applied about 80 kg per acre gypsum, 10 kg per acre zinc sulfate and 2 kg per acre borax. He carried out manual weeding twice to check the growth of unwanted plants. Mr Hirehanumappa also maintained an adjoining plot as a control on which he cultivated bajra according to the traditional farmers' practice. With improved management the yield per acre grew from 4.93 quintals to 5.45 quintals. As such, improved management brought in an additional return of ₹512 per acre while the farmer spent just ₹280 on the purchase of the additional inputs of gypsum, zinc sulfate and borax. Visits were also arranged for other farmers to show them the benefits of improved management.

9 Micro nutrients and best practices increase productivity and income from rainfed bajra

Sri Venkateshagowda, s/o Sri Balanagowda, Nagalapura Village, Mudgal Hobli, Lingasugur Taluk, Raichur district, Karnataka.

Effects of micronutrient application on rainfed Bajra.

Sri Venkateshagowda heard from someone about the Bhoochetana mission whose goal is to enhance the productivity of rainfed systems in Karnataka by 15-20 per cent through small but effective interventions. He is 44 years old and has been practicing subsistence farming for many years. He wants to do something new to obtain optimum crop yield and maintain soil fertility as he is convinced that the poor fertility status of the soil has been the reason for the reduction in crop yield since the last few years.

Sri Venkateshagowda selected bajra for this initiative and purchased the inputs such as gypsum (200 kg per ha^{-1}), zinc sulfate (10 kg ha^{-1}) and borax (5 kg ha^{-1}), along with major nutrient fertilizers from RSK Mudgal. He applied all the nutrients in a balanced form as suggested by the staff before sowing except urea, which he top dressed twice at 30 and 50 days after sowing (days after sowing). One week before sowing the seeds, he applied the micronutrients as per the above recommendations - basal dosage and mixed in the soil. He planted across the slope, treated the seeds with Ridomil M.Z @ 2 g/kg and maintained the recommended plant population. He carried out weeding twice. He availed of the benefit of regular visits of farm facilitators and other departmental staff and ICRISAT staff for technical guidance, attended training sessions and followed the instructions given by them.

Sri Venkateshagowda found a remarkable improvement in crop growth compared to his previous practice of nutrient application. He obtained a yield of 4.8 quintals per acre as against the average yield of 3.5-3.6 q/acre that he had got for the last five years. As per his opinion, using balanced nutrition including the deficient micronutrients has proved to be a viable practice, which has given him a 33 per cent increase in crop yield that accounts for a benefit of about ₹3,360 per acre.

The farmer has expressed his happiness and thinks that “Bhoochetana” has the potential to become the torch bearer program for poor farmers to increase on-farm productivity and building.

Compiled LS Jangawad, Gajanan Sawargaonkar and Shankargouda

10 Micronutrients and good practices in red gram give bumper yields

Sri Tayappa / s/o Sri Doddarangappa, Hogernal Village, Turvihal Hobli, Sindhanur Taluk, Raichur District, Karnataka.

Tayappa speaks to officials from DoA & ICRISAT about Bhoochetana project.

Sri Tayappa has shown keen interest in the Bhoochetana activity which was initiated in Karnataka three years ago. He is 36 years old and has the courage to take risks and has shown a keen interest in the project. He was convinced that the poor fertility status of the soil has been the reason for the reduction in crop yield since the last few years. He wanted to do something new to maintain soil fertility and obtain optimum crop yield.

He chose red gram crop for this trial and obtained the inputs such as: gypsum (200 kg ha^{-1}), zinc sulfate (10 kg ha^{-1}), borax (5 kg ha^{-1}) and trichoderma (200 g/kg seed) from RSK handrabanda. One week before sowing the seeds, he applied micronutrients as per the above recommendations as basal dosage and mixed in the soil. He planted across the slope, treated seeds with trichoderma and maintained the recommended plant population. He carried out timely weeding. He took the help of farm facilitators, staff of the Department of Agriculture viz., agricultural assistant, agriculture officer as well as staff of ICRISAT based either at Hyderabad or in the district who visited the plot periodically and gave him the required technical help and inputs. He followed the instructions given by them.

He observed remarkable growth and good pods in red gram. The pod failure rate was also lower with the practice of balanced nutrition that he had adopted through the Bhoochetana initiative. He obtained a yield of 4.2 q per acre as against an average yield of 2.5-3 q per acre that he had been getting over the last five years. As per his opinion, adoption of balanced nutrition has proved to be a viable practice which has given him a 39 per cent increase in crop yield that corresponds to a benefit of about ₹3,700 per acre.

The farmer has thanked all the staff of the Department of Agriculture and ICRISAT who periodically visited and guided him. Now he has learned that balanced nutrition is the key to obtain maximum benefit with just a 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 is willing to purchase the inputs from RSK situated at Taluk place without any subsidy.

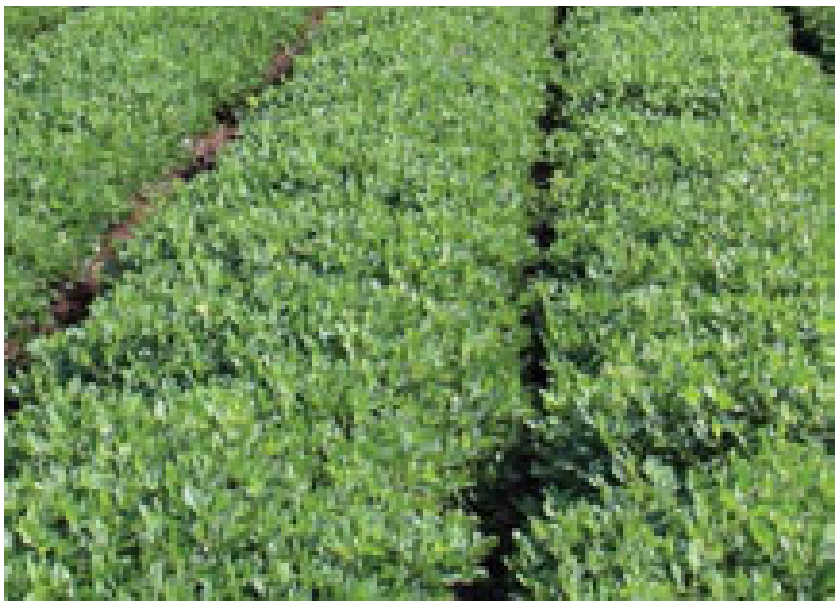
Groundnut productivity increased with balanced fertilization and good agronomic practices

Sri Laxmayya, S/o Doddaeashwarappa, Arisigera Village, Chandrabanda Hobli, Raichur District, Karnataka.

Sri Laxmayya is a small farmer who used to cultivate groundnut and other crops following traditional methods. Recently, during the 2011-12 *kharif* season, he got information about Bhoochetana through farm facilitators. He decided to participate in Bhoochetana activities and test the new technologies developed in the Bhoochetana program. He decided to evaluate the performance of groundnut as advised by the farm facilitators and made meticulous comparisons with his normal practice.

Sri Laxmayya received inputs such as groundnut seeds of TMV 2 variety, gypsum (500 kg ha^{-1}), zinc sulfate (10 kg ha^{-1}), borax (5 kg ha^{-1}) and trichoderma (200 g/kg) from RSK Chandrabanda. He used improved technologies over his traditional practices. The improved technologies included (i) application of micronutrients one week before sowing the seeds based on the above recommendations as basal dosage and mixed in the soil (ii) planting across the slope (iii) treating seeds with trichoderma (iv) maintaining the recommended plant population (v) carrying out weeding twice and (vi) taking up suitable plant protection measures with neem oil. He made full use of the periodic and regular visits of farm facilitators and other Departmental staff as well as staff from ICRISAT for technical guidance, which he found was very useful for the timely monitoring of the crop.

After harvest, he noticed a significant improvement in the yield of groundnut over his traditional practices. As per his crop cutting experiments, he got a yield of 3.20 q/acre by following his own traditional practice as against a yield of 4.48 q/acre which he got with the improved practices using Bhoochetana technologies. He achieved an increment of about 40 per cent in groundnut yield by following the improved method of cultivation. He obtained an additional income of ₹3,840 per acre by selling his groundnut at the rate of ₹3,500 per quintal. He is happy that he has adopted the new technologies and he sincerely thanked the staff of the Department of Agriculture and ICRISAT as well as the farm facilitators for all the help extended to make this achievement possible. The Department used his field for conducting field day and field visits to demonstrate and show the results of Bhoochetana technologies to other farmers.



Groundnut yield increased because of micronutrient application.

Good seed and balanced fertilizer improve the income from cultivating sunflower

Sri Somashekara, s/o Narsareddappa, Kodluru Village, Chandrabanda Hobli, Raichur District, Karnataka

Sri Somashekara cultivated sunflower crop under rainfed condition from 4 July 2011 to 15 October 2011. He adopted improved agronomic practices. He planted across the slope, maintained the appropriate plant population, carried out weeding twice and so on. He received regular recommendations about good farming practices from farm facilitators and scientific staff from the Department of Agriculture and ICRISAT. He also attended a training program which improved his awareness about improved agronomic practices. He participated in the field day and field visits organized to demonstrate and show the results of Bhoochetana technologies to farmers for awareness. He maintained a check plot to compare the productivity from improved agronomic practices with that from his traditional farming practices. He received inputs that included sunflower seeds (Kargil variety@ 2.5 kg/ acre), gypsum (200 kg ha^{-1}) zinc sulfate (10 kg ha^{-1}), and borax (5 kg ha^{-1}) from Raitha Samparka Kendra. One week before sowing the seeds, he applied the recommended nutrients mentioned above in his farm as basal dosage mixed in the soil.

As a result of the measures undertaken, there was an improvement of about 33% in yield as compared to that from the check plot. The yield per acre of the sunflower crop grew from 3.84 q with the traditional practice to 5.12 q. There was an additional income of ₹8,960 due to the increase in yield.

Soil test based fertilizer and good agronomy increase income from cotton cultivation

Sri Hanumappa, S/o Amakappa, Eklaspur Village, Pamanakallur Hobli, Manvi Taluk, Raichur District, Karnataka.

Sri Hanumappa is a cotton grower. He adopted the rainfed farming system with improved farming practices including fertilizer application based on soil tests, planting across the slope, maintaining the proper plant population and regular weeding operations (two times). He grew cotton crop from 2 July 2011 to 20 November 2011. He received technical and scientific support and input resources from Pamanakallur Raitha Samparka Kendra.

Sri Hanumappa received the recommended dosage of gypsum (200 kg ha^{-1}), zinc sulfate (10 kg ha^{-1}) and borax (5 kg ha^{-1}). One week before sowing the seeds, he applied micronutrients as per the above recommendations as basal dosage and mixed in the soil. He also participated in the field day and field visits which increased his awareness about improved agronomic practices.

As a result of adopting improved farming practices, Sri Hanumappa has achieved a 40% higher yield of cotton that corresponded to an increase of about ₹11,520 in income as compared to the yield and income from his traditional farming practices. With improved practices the yield of cotton per acre grew from 3.2 q to 4.48 q.

11 Pigeonpea with improved practices: a remunerative crop to cultivate

Sri Nagaraju, s/o late Sri Kemppaiah, Mayaganahalli Village, Ramanagar District, Karnataka.

Higher yield from ragi crop due to improved cultivation practices.

Sri Nagaraju is a pigeonpea producer. He cultivated the BRG-1 variety of pigeonpea under the rainfed farming system from 28 June 2011 to 02 December 2011. He received the recommended inputs including pigeonpea seeds (@ 5 kg/acre), DAP (22 kg/acre), gypsum (50 kg/acre), zinc sulfate (5 kg/acre), borax (2 kg/acre), trichoderma (200 g /acre) and neem oil (1 litre) from Kasaba Raitha Samparka Kendra. One week before sowing the seeds, he applied micronutrients as per the above recommendations as basal dosage and mixed in the soil. The improved farming practices that he adopted included planting across the slope, treating seeds with trichoderma, maintaining the appropriate plant population and weeding twice. He used neem oil as a plant protection measure. He also maintained a check plot which he cultivated using the traditional practices to compare the performance of traditional and improved farming practices. Regular visits of farm facilitators and scientific staff of the Department of Agriculture and ICRISAT has provided technical support to Sri Nagaraju and helped him hone his knowledge about farming. He also attended training programs.

The improved practices that were adopted have increased the productivity of pigeonpea by 39% as compared to that from traditional practices. The yield per acre grew from 6.2 q to 8.6 q. The yield increase acre^{-1} has increased Sri Nagaraju's income by ₹8,400.

Improved cultivation practices help increase ragi/finger millet yield

Sri S Ramaiah, Allalisandra Village, Ramanagara District, Karnataka.

Agriculture is the main source of income and livelihood for Sri S Ramaiah. He holds a small agricultural plot of land which is exclusively rainfed. Ramanagara district is typically under the semi-arid tropics and receives an average rainfall of 850 mm.

Improved agricultural practices were introduced into the villages under the Bhoochetana program. This farmer has cultivated ragi crop during *kharif* in the year 2011. The crop was planted across the slope to conserve more rain water in the soil. Micronutrients such as gypsum, zinc and borax were introduced and were used by Sri S Ramaiah. He maintained the recommended plant population and

performed intercultural operations for weed control. He consistently interacted with farm facilitators and other staff from ICRISAT and the Government Department to get technical guidance. He was also exposed to a short term capacity building program/training which helped him understand the technology and importance of improved agricultural management.

Ragi yield increased from 12 quintal per acre to 17 quintal per acre and Sri S Ramaiah earned ₹5,500 as extra income from his field. This has been appreciated and encouraged and his family is willing to adopt these interventions in future even if they do not get government aid or subsidies.

Mr S Ramaiah interacts with government department officials, farm facilitators and staff from ICRISAT.

12 Farmer's perception about Bhoochetana for improving productivity

Mr Somanath Bangera, Navoor Village, Belthangady Taluk, Karnataka.

Somanath Bangera's field has increased rice crop yields due to Bhoochetana technology

Mr Somanath Bangera, a farmer from Karnataka was impressed by the Bhoochetana project & says, "i have cultivated paddy for more than 40 years including the time I helped my parents on the farm. My qualification is S.S.L.C. However, I can say that I was really not aware that there were more effective methods of rice cultivation at various levels ranging from land preparation to post harvesting. After participating in the Bhoochetana Farmer Field School and cultivating a demonstration plot, I have learned improved methods of rice cultivation. We have learned many things along the way ranging from soil testing and the importance of nutrients, preparation and transplanting to harvesting time, through training and regular guidance from deputed officers and university scientists. I also learned an effective method of seed treatment using salty water from the System of Rice Intensification (SRI) training program and about the role of rice transplants in rice transplantation".

"I would like to add that we also learned other improved methods such as fertilizer application, compost making, how to maintain the soils of cultivated land and how to control pests and disease through IPM practices. Throughout the cultivation season we learned effective methods not only through training but also through regular guidance. But what really made me happy is that at the end of the season, i got a yield of 22 quintal per acre. The average yield of the previous years was only 17 quintal per acre".

"We realized that applying a mixture of compost, DAP, zinc sulfate, lime, boron and gypsum is most effective. So, I would like to say thank you to the Department of Agriculture, ICRISAT and the universities for your assistance in showing us how to improve our rice yield through simple and inexpensive technologies. Thank you so much".

Mr Narasappa, learns and benefits from micronutrients in ragi

Mr Narasappa, S/o Huttappa, Uttari Village, Uttarahalli Hobli, Bangalore South Taluk, Karnataka.

Mr Narasappa who is educated upto the fourth standard, has four acres of land. His major occupation is agriculture and he grows ragi along with other pulses like field bean, cowpea and red gram.

He has appraised the Bhoochetana scheme has applied fertilizers and the recommended dose of micronutrients as per soil testing results. He bought inputs like gypsum, zinc sulfate, borax, PSB (biofertilizer), and carbendizium for 1 ha of his land. He was apprehensive about the application of micronutrients as he was applying them for the first time. He applied these inputs only on 1 ha and continued his regular practices in another 1.5 acre of his land.

He actively participated in the Farmers Field School (FFS) conducted in the same village. He was very surprised to find a 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 tillers and larger ear heads as compared to the plot in which he had not applied these micronutrients. He is of the opinion that there was reduced weed growth in the treated plot. He got a yield of almost 14 quintal of grain per acre from his treated plot as compared to 12 quintal per acre from his untreated plot. He came forward and shared his opinion among fellow farmers in the FFS field days organized by the department.

By adopting improved technologies, involving the application of micronutrients and balanced fertilizers, the farmer has increased his yield from 12 quintals to 14 quintals ie, a difference of 2 quintals over the check plot. This means that for every rupee he invested, he gained a profit of ₹2.50. He is highly convinced about the technologies he has adopted and has assured us that he will continue using them in the future.

Higher yield levels of groundnut with use of micronutrients

Sri Yallappa K Totadavar, Annigeri Village, Navalagund Taluk, Karnataka.

Sri Yallappa is a traditional groundnut farmer. Sri Yallappa is happy with the increase in the yield of groundnut from 7 quintals to 10 quintals. He attributes this increase to the use of micronutrients, the timely intervention of the Department of Agriculture & ICRISAT recommendations.

Table 4. 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 cultivation	₹11200	₹13200
4	Yield ha-1	7 qtls	10 qtls
5	Gross income	₹20300	₹ 29000
6	Net income	₹ 9100	₹15800

He is happy with the increased groundnut yield from 7 to 10 quintals per ha, and the increase in net profit from ₹9,100 to ₹15,800. Sri Yallappa's achievement is significant and is a clear message to fellow farmers to use micronutrients and biofertilizers.

13 Science-led groundnut cultivation helps farmer reap higher returns

Mr Nelappa Kalimani, s/o Mr Guruappa, Chikkanellur VPO, Shiggaon Taluk, Haveri District, Karnataka.

Effects of farmers practice (left) and improved management (right) on groundnut yield in Mr Nelappa's field, in the rainy season of 2011.

This is the story of Mr Nelappa Kalimani, a farmer who is 35 years old. Farming is the main source of livelihood for Mr Nelappa Kalimani who supports the nine members in his family. He cultivates different crops like groundnut, cotton and maize in his 12 ha farm. Like millions of other farmers, he too was disillusioned with farming due to fast increasing costs of inputs, energy and labor and only stagnating or even declining crop response to the inputs. The Bhoochetana initiative at this juncture showed him a new ray of hope in farming.

During the rainy season of 2011, Mr Nelappa associated with Bhoochetana. He volunteered to participate in an on-farm research project to follow soil-test-based nutrient management in a 2.2 acre groundnut plot (improved management), and follow his traditional practice (farmers' practice) in a one acre groundnut plot for comparison. As advised by experts from ICRISAT/the Department of Agricuture, he added deficient secondary and micronutrients like sulphur (through gypsum), boron (through borax) and zinc (through zinc sulfate) in an improved management plot. In addition he added the nutrients, nitrogen (through urea and DAP), phosphorus (through DAP) and potassium (through MOP) just as in the farmers' practice plot. The science-led approach involves provision of adequate and proportionate amounts of nutrients to plants to ensure normal metabolic function that in turn supports good crop growth and yield. He also applied trichoderma @ 200 g $acre^{-1}$ and VAM (vesicular arbuscular mycorrhizae) @ 200 g $acre^{-1}$ in the improved management plot through seed treatment. Trichoderma is recommended to provide resistance against fungal infections and shocks during early plant growth. VAM is a fungus which inhabits plant roots and protruding fungal hyphae and acts as a nutrient mobilizer/solubilizer and thus enhances nutrient availability and uptake for plant growth and yield. While the science led management practice advocated the provision of additional nutrients, all the other agronomic practices remained the same as in the farmers' practice. The groundnut crop under both the practices was sown on 18 June 2011 and harvested on 29 September 2011.

Compiled by: Girish Chander, G Pardhasaradhi and K Vishwanath

Mr Nelappa got additional inputs like secondary and micronutrients, trichoderma and VAM from the Department of Agriculture (DoA) at 50% subsidy. All these inputs are being promoted under Bhoochetana and converged schemes to bring in the sustainable use of natural resources to improve farm-based livelihoods. The farmer had to incur an additional cost of around ₹700 $acre^{-1}$ on these inputs. As such he incurred a total expenditure of ₹8,300 $acre^{-1}$ in the farmers' practice plot. In the improved management plot he incurred a total expenditure of ₹9,000 $acre^{-1}$ due to various inputs and the farm operations of land preparation, sowing, interculture, weeding, harvesting, threshing and transport. The results of science-led farming surprised the farmer as he got 35% higher yields. The yield per acre grew from 780 kg under farmers' practice to 1,050 kg. He sold his produce at a farm gate price of ₹44 per kg and therefore, got additional net returns of about ₹11,200 per acre. During the rainy season of 2011, Mr Nelappa realized ₹24,600 as additional net returns from a 2.2 acre improved management plot. The unexpected increase in income made it possible for him to purchase a bike and a threshing machine. A science-led approach in the Bhoochetana mission not only brought a smile on his face, but also made him aware of the potential to further enhance his income by following a similar strategy in the remaning 10 acres of his land. The farmers' perception expressed in his own words is that the reason for his adopting improved practices with successful results was the awareness created by farm facilitators and the staff of ICRISAT/the Department of Agriculture supported by media publicity for the Bhoochetana mission. During farmers' day, other farmers were also shown the benefit of science-led strategy.

14 Scientific farming increases net returns in maize

Mr Basalingappa N Kunnur, Shiggaon Village, Shiggaon Taluk, Haveri District, Karnataka.

Effects of improved management on maize yield in Mr Basalingappa's field, in the rainy season of 2011.

Mr Basalingappa N Kunnur is 35 years old. Due to his educated (B Com) background, he is always looking out for ways to improve his farming and increase his income.

During the rainy season of 2011, Mr Basalingappa associated with Bhoochetana, and volunteered to participate in an on-farm research project to follow soil test based nutrient management in a one acre maize plot (improved management), and continue with his traditional practice (farmers' practice) in the rest of his land ie, two acres with maize crop for comparison. As advised by experts from ICRISAT/the Department of Agriculture, he added deficient secondary and micronutrients like sulphur (through gypsum), boron (through borax) and zinc (through zinc sulfate) in the plot under improved management in addition to the nutrients, nitrogen (through urea and DAP), phosphorus (through DAP) and potassium (through MOP) just as in the farmers' practice plot. The science-led approach involves provision of adequate and proportionate amounts of nutrients to plants to ensure normal metabolic function that in turn supports good crop growth and yield. He also applied trichoderma @ 200 g per acre and VAM (vesicular arbuscular mycorrhizae) @ 200 g per acre, in the plot under improved management through seed treatment. Trichoderma is recommended to provide resistance against fungal infections and shocks during early plant growth. VAM is a fungus which inhabits plant roots and protruding fungal hyphae and acts as a nutrient mobilizer/solubilizer and thus enhances nutrient availability and uptake for plant growth and yield. While the science-led management practice advocated the provision of additional nutrients, all the other agronomic practices remained the same as in the farmers' practice. For both the practices, the maize crop was sown on 10 June 2011 and harvested on 25 October 2011.

Mr Basalingappa got additional inputs like secondary and micronutrients, trichoderma and VAM from the Department of Agriculture (DoA) under 50% subsidy. These inputs are being promoted under Bhoochetana and converged schemes to bring in the sustainable use of natural resources to improve farm-based livelihoods. The farmer had to incur an additional cost of around ₹750 per acre on these inputs. As such he incurred a total expenditure of ₹7,150 per acre in the plot under farmers' practice. In the plot under improved management he incurred a total expenditure of ₹7,900 per acre

due to various inputs and the farm operations of land preparation, sowing, interculture, weeding, harvesting, threshing and transport. The science-led farming resulted in 30% higher yields. The yield per acre grew from 1,950 kg under farmers' practice to 2,540 kg. He sold his produce at a farm gate price of ₹10.3 per kg and therefore, got additional net returns of about ₹5,330 per acre.

Mr Basalingappa also runs a tailoring shop and earns around ₹50,000 per annum from this business. The Bhoochetana technologies have encouraged him to take farming more seriously and now he has decided to follow the Bhoochetana technologies in his entire farm to boost his off-farm income. The additional income that he got by following the science-led approach in the Bhoochetana mission has helped him clear his bank loan. He was also able to afford an education for his children and cater to his social needs. For him it showed a way forward to increase production for improved financial status and a better livelihood.

15 Higher returns with balanced fertilizers and good practices in Bengal gram

Mr Channapa Yallappa Dhariyappanavar, Kadakola Village, Savanur Taluk, Haveri District, Karnataka.

Mr Channapa's field, in the postrainy season of 2011 had an increase in Bengal gram yield due to improved management practises.

Mr Channapa Yallappa Dhariyappanavar is a farmer who is 50 years old. Farming is the main source of livelihood for Mr Channapa who has to support the 20 members in his family. He cultivates different crops including Bengal gram, wheat and sunflower in his 30 acre farm. He was really not happy with his farming on account of fast increasing costs of inputs, energy and labor and only stagnating or even declining crop response to the inputs. The mission mode Bhoochetana initiative at this juncture showed him a new ray of hope in farming.

During the postrainy season of 2011-12, Mr Channapa associated with Bhoochetana, and volunteered to participate in an on-farm research project to follow soil test-based nutrient management in a four acre Bengal gram plot (improved management), and follow his traditional practice (farmers' practice) in another 11 acres of land under Bengal gram for comparison. As advised by experts from ICRISAT/the Department of Agriculture, he added deficient secondary and micronutrients like sulphur (through gypsum), boron (through borax) and zinc (through zinc sulfate) in the plot under improved management in addition to the nutrients nitrogen (through urea and DAP), phosphorus (through DAP) and potassium (through MOP) just as in the farmers' practice plot. The science-led approach involves provision of adequate and proportionate amounts of nutrients to plants to ensure normal metabolic function that in turn supports good crop growth and yield. He also applied trichoderma and VAM (vesicular arbuscular *mycorrhizae*) in the plot under improved management through seed treatment. Trichoderma is recommended to provide resistance against fungal infections and shocks during early plant growth. VAM is a fungus which inhabits plant roots and protruding fungal hyphae and acts as a nutrient mobilizer/solubilizer and thus enhances nutrient availability and uptake for plant growth and yield. While the science-led management practice advocated the provision of additional nutrients, all the other agronomic practices remained the same as in the farmers' practice. The Bengal gram crop under both the practices was sown on 11 October 2011 and harvested on 18 January 2011.

Compiled by: Girish Chander, G Pardhasaradhi and K Vishwanath

Mr Channapa got additional inputs like secondary and micronutrients, trichoderma and VAM from the Department of Agriculture (DoA) under 50% subsidy. These inputs are being promoted under Bhoochetana and converged schemes to bring in the sustainable use of natural resources to improve farm-based livelihoods. The farmer had to incur an additional cost of around ₹600 per acre on these inputs. As such he incurred a total expenditure of ₹3,500 per acre in the plot under farmers' practice. In the plot under improved management he incurred a total expenditure of ₹4,100 per acre due to various inputs and the farm operations of land preparation, sowing, interculture, weeding, harvesting, threshing and transport. He was surprised when he got 50% higher yields with the improved management practice. The yield per acre grew from 400 kg under farmers' practice to 600 kg. He sold his produce at a farm gate price of ₹35 per kg and therefore, got additional net returns of about ₹6,400 per acre. During the rainy season of 2011, Mr Channapa realized ₹25,600 as additional net returns from a four acre improved management plot. The unexpected increase in income made it possible for him to purchase new agricultural implements, and comfortably spend money on the construction of a new house and on his childrens' education. A science-led approach in the Bhoochetana mission not only brought a smile on his face, but revealed the potential to further enhance his income by following a similar strategy in the remaining 26 acres of his land. He sees the improved benefit to cost ratio as a motivating force to adopt Bhoochetana practices in his entire farm land in future.

16 Higher benefits with balanced fertilizers and good practices, rejuvenate a farmer's faith in farming

Mr Basappa G Mugadur, Kunimellihalli VPO, Savanur Taluk, Haveri District, Karnataka.

Effects of improved management on soybean yield in Mr Basappa's field, in the rainy season of 2011.

Mr Basappa G Mugadur, a farmer who is 54 years old, cultivates different crops like soybean, cotton, maize and groundnut in his farm of 10 acres to support the five members of his family. Like other farmers, he too viewed farming as a mediocre profession that just supports only subsistence living due to fast increasing costs of inputs, energy and labor and stagnating or even declining crop response to the inputs. The mission mode Bhoochetana initiative at this juncture showed him a new ray of hope in farming.

During the rainy season of 2011, Mr Basappa associated with Bhoochetana and volunteered to participate in an on-farm research project to follow soil test-based nutrient management. He decided to use a one acre soybean plot (improved management), and follow his traditional practice (farmers' practice) in another one acre soybean plot for comparison. As advised by experts from ICRISAT/the Department of Agricuture, he added deficient secondary and micronutrients like sulphur (through gypsum), boron (through borax) and zinc (through zinc sulfate) in the plot under improved management. In addition he added the nutrients nitrogen (through urea and DAP), phosphorus (through DAP) and potassium (through MOP) just as in the farmers' practice plot. The science-led approach involves provision of adequate and proportionate amounts of nutrients to plants to ensure normal metabolic function that in turn supports good crop growth and yield. He also applied trichoderma @ 200 g per acre in the improved management plot through seed treatment. Trichoderma has been recommended to provide resistance against fungal infections and shocks during early plant growth. While the science-led management practice advocated the provision of additional nutrients, all the other agronomic practices remained the same as in the farmers' practice. The crop under both the practices was sown on 14 June 2011 and harvested on 20 September 2011.

Mr Basappa got additional inputs like secondary and micronutrients and trichoderma from the Department of Agriculture (DoA) under 50% subsidy. These inputs are being promoted under Bhoochetana and converged schemes to bring in the sustainable use of natural resources to improve

farm-based livelihoods. Mr Basappa had to incur an additional cost of around ₹700 per acre on these inputs. As such he incurred a total expenditure of ₹4,300 per acre in the plot under farmers' practice. In the plot under improved management, he incurred a total expenditure of about ₹5,000 per acre due to various inputs and the farm operations of land preparation, sowing, interculture, weeding, harvesting, threshing and transport. Mr Basappa was surprised with the 56% higher yields that he got with improved management practice. The yield per acre grew from 750 kg under farmers' practice to 1,170 kg. He sold his produce at a farm gate price of ₹22 per kg and therefore got additional net returns of about ₹8,500 per acre. During the rainy season of 2011, Mr Basappa realized ₹8,550 as additional net returns from the one acre plot under improved management. The unexpected increase in income made it possible for him to purchase a bullock cart and clear his debts. A science-led approach in the Bhoochetana mission not only brought a smile on his face, but regenerated his faith in farming as a means to improve his family's fortunes by extending a similar science-led strategy to his entire farm.

17 Micronutrients in maize help gain higher returns

Mr Basavaraj Yali, Byadagi VPO, Haveri District, Karnataka.

Effects of improved management on maize yield in Mr Basavaraj Yali's field, in the rainy season of 2011.

Mr Basavaraj Yali is a farmer who is 35 years old. Farming is his main source of livelihood and he has to support the 13 members in his family. He cultivates crops like maize and cotton in his 10 acre farm. Like millions of other farmers he too was disillusioned with farming on account of the fast increasing costs of inputs, energy and labor costs and stagnating or even declining crop response to the inputs. The mission mode Bhoochetana initiative at this juncture showed him a new ray of hope in farming.

During the rainy season of 2011, Mr Basavaraj Yali associated with Bhoochetana and volunteered to participate in an on-farm research project to follow soil test-based nutrient management. For this purpose he decided to use a 3.31 acre maize plot (improved management), and follow his traditional practice (farmers' practice) in a two acre maize plot for comparison. As advised by experts from ICRISAT/the Department of Agricuture, he added deficient secondary and micronutrients like sulphur (through gypsum), boron (through borax) and zinc (through zinc sulfate) in the plot under improved management. In addition, he added the nutrients nitrogen (through urea and DAP), phosphorus (through DAP) and potassium (through MOP) just as in the farmers' practice plot. The science-led approach involves provision of adequate and proportionate amounts of nutrients to plants to ensure normal metabolic function that in turn supports good crop growth and yield. He also applied trichoderma @ 200 g per acre in the plot under improved management through seed treatment. Trichoderma is recommended to provide resistance against fungal infections and shocks during early plant growth. While the science-led management practice advocated the provision of additional nutrients, all the other agronomic practices remained the same as in the farmers' practice. The groundnut crop under both the practices was sown on 6 June 2011 and harvested on 4 October 2011.

Mr Basavaraj Yali got additional inputs like secondary and micronutrients and trichoderma from the Department of Agriculture (DoA) under 50% subsidy. These inputs are being promoted under Bhoochetana and converged schemes to bring in the sustainable use of natural resources to improve farm-based livelihoods. The farmer had to incur an additional cost of around ₹600 per acre on these inputs. As such he incurred a total expenditure of ₹5,500 per acre in the plot under farmers' practice.

Compiled by: Girish Chander, G Pardhasaradhi and K Vishwanath

In the plot under improved management he incurred a total expenditure of ₹6,150 per acre due to various inputs and the farm operations of land preparation, sowing, interculture, weeding, harvesting, manual threshing and transport. The results of science-led farming surprised the farmer as he saw 25% higher yields. The yield per acre grew from 2,000 kg under farmers' practice to 2,500 kg. He sold his produce at a farm gate price of ₹10 per kg and therefore, got additional net returns of about ₹4,400 per acre. During the rainy season of 2011, Mr Basavaraj Yali realized ₹14,560 as additional net returns from a 3.31 acre plot under improved management. The unexpected increase in income made it possible for him to meet his social needs, educate his children and helped in clearing his debt. Mr Basavaraj is happy with the impact that the Bhoochetana initiative has had on his farm and livelihood. He gives credit to the awareness and training he received under Bhoochetana for his success in farming. Today he encourages and guides other fellow farmers and also helps them adopt science-led farming to increase productivity and income.

18 Soil test-based technology and good practices of crop cultivation enhance net profits.

Mr Adinarayanappa, s/o Mr Ramappa, Shyamanakere Village, D Palya RSK, Gowribidanur Taluk, Chikkaballapur District, Karnataka.

Mr Adinarayanappa obtained increased incomes due to improved practises implemented under Bhoochetana project.

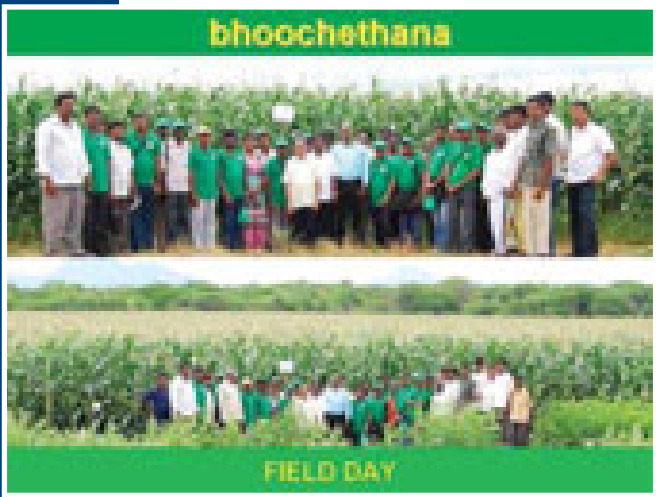
This is the success story of a big and innovative farmer Mr Adinarayanappa, who is 52 years old and has studied up to the seventh standard. Farming is the major source of livelihood for Mr Adinarayanappa who has to support the nine members in his family. He has 10 acres of land and two bore wells with drip irrigation in Survey Nos. 76/1, 76/4, 76/5, 76/7 and 76/8. He has grown maize (2 acre), sorghum (2 acre), groundnut (1 acre) and paddy (1 acre) during the rainy season and tomato (1.25 acre) during the postrainy season by using Bhoochetana inputs throughout land. He was no longer using farmers' practice as he was already convinced with the improved technology which had brought him success during the previous years. He has a grape orchard in four acres of land with drip irrigation that he planted two years back from which he is yet to get yields and income. He got information about the Bhoochetana project during the first year from officials of the Department of Agriculture, ICRISAT technicians and farm facilitators. He has adopted the recommended crop spacing, good quality seeds and biofertilizers. He has also treated the seeds with pesticides, applied trichoderma to the soil as well as 80 kg gypsum, 10 kg zinc sulfate and 2 kg borax along with the recommended doses of N, P and K. He had planted rainy season crops during the months of June and July on flat land as his land is levelled, used the drip facility for irrigation and harvested the crops during the months of October and November by using a brush cutter, multi crop thresher and also by using manual labor depending on the type of crop. He had planted tomato in the month of February 2012 and harvested the fruits up to May 2012.

He had incurred ₹76,000 towards cost of cultivation for growing sorghum (₹4,000), groundnut (₹4,000), maize (₹12,000), paddy (₹6,000) and tomato (₹50,000) crops. The paddy grain was used for household consumption and not sold in the market. He had harvested 2,600 kg sorghum grain, 800 kg groundnut pod, 9,800 kg maize grain, 3,000 kg paddy grain and 37,500 kg tomato fruits during 2011-12. He had harvested about 25% less yields during previous years when he not carried out soil test-based application of balanced fertilizers. The farmer got a total gross income of ₹545,420, net income of ₹469,420 and an additional benefit of ₹95,000 by adopting Bhoochetana

technology. He has availed all the Bhoochetana subsidized inputs from the Department of Agriculture as well as a tractor drawn furrow opener, leveler blade; tiller operated HDPE sprayer, brush cutter, bio-digester and drip irrigation for five acres under subsidy through other projects. Mr Adinarayanappa used his own tractor and power tiller for primary tillage with both improved implements and bullock drawn implements to sow the crops. He uses a brush cutter for harvesting paddy, ragi and forage crops and a multi-crop thresher for threshing paddy and maize grains. Mr Adinarayanappa uses his own house for storage and sells the produce whenever he gets a good price in the market. He is a progressive and innovative farmer. He is also a resource person for the Department of Agriculture. He conducts training sessions and helps disseminate all the improved technologies to other farmers. Adoption of soil test-based balanced application of fertilizers has helped him get 25% more yields and profits while bringing down the cost of cultivation due to the optimum use of N and P fertilizers. Regarding non-tangible benefits, the farmer says the scientific knowledge and experience gained is a good asset for him. He would like to intensify the adoption of all improved scientific technologies like integration of livestock, vermicomposting etc, for sustainable yields, incomes and livelihoods. Mr Adinarayanappa has recently purchased 25 sheep with the enhanced income he got by adopting Bhoochetana technologies. He has two improved breed cows and earns about ₹4,500 month^{-1} by selling milk. His annual domestic expenditure is about ₹70,000 and he is spending all his annual income on developing his farm.

19 Integrated soil, crop, water- and nutrient-management increases net returns in maize

Mr Srinivas, Chokkandanahalli Village, Jamkote Hobli, Sidlaghatta Taluk, Chikkaballapur District, Karnataka.



Field day observed during Bhoochetana project.

This is the success story of a medium farmer Mr Srinivas, who is 41 years old and has studied till the tenth standard. Farming is the major source of livelihood for Mr Srinivas who has to support the five members of his family. He has a total of 5.0 acres of land - 2.5 acres dryland and 2.5 acres drip irrigated land in Survey Nos. 56/2, 57 and 15/134. Mr Srinivas had planted maize crop on 30 July 2011 in two acres of land by using Bhoochetana inputs and cultivated 0.5 acre using the traditional practice. He cultivated mulberry crop in the remaining irrigated area. He got information about Bhoochetana project from the Department of Agriculture and farm facilitators. He used improved seed, soil application of trichoderma and PSB. He also applied 100 kg DAP, 100 kg urea, 160 kg gypsum, 20 kg zinc sulfate and 4 kg borax as per the recommendation. He planted the crop across the slope on flat land and made conservation furrows to conserve rain water. He harvested the maize crop with the help of manual labor on 26 November 2011. He used a thresher to separate the grain from the cobs. He incurred ₹17,000 towards the cost of cultivation in the two acres where he used improved practice and ₹4,000 as cost of cultivation in the 0.5 acre plot under farmers' practice. He has harvested 6,000 kg of maize grain from the two acre Bhoochetana plot and 1,000 kg from the 0.5 acre plot under farmers' practice during 2011. He sold the maize grain at ₹12 per kg and got an additional gross profit of ₹24,000 and net profit of ₹23,000 from the Bhoochetana plot. He has also availed all the Bhoochetana subsidized inputs from the Department of Agriculture. Mr Srinivas used his own tractor for primary tillage with a cultivator and used bullock drawn implements for sowing and inter-cultivation. He uses his own house for storage and sells the produce whenever he gets a good price in the market within a few months. Ever since he adopted the Bhoochetana technologies, he has got special respect in society and has been disseminating the information to other farmers. He has applied gypsum, zinc sulfate and borax to the mulberry crop due to which he has got increased quantity as well as quality of leaf material. Regarding the non-tangible benefits, he says reduction of soil erosion and conservation of rain water was observed due to conservation furrows. The application of gypsum and micronutrients helps in holding more moisture in the soil and the crop is able to withstand long dry spells better than in the absence of these inputs. All these benefits helped in harvesting more yields and earning more income which in turn have led to a better quality of life. He is spending the additional income on his childrens' education.

Compiled by Ch Srinivasa Rao and M Narasimhaiah

20 Mr Nagaraju increases cotton yields through balanced fertilization

Mr Nagaraju, s/o late Mr Kempegowda, Magudilu Village, HD Kote Taluk, Mysore District

Cotton crop was benefitted from micronutrient use.

I am Nagaraju, s/o late Kempegowda. I have three acres of rainfed land in Survey No. 17. Prior to the project, I cultivated cotton crop in the land as per our conventional practice. I applied urea 50 kg, DAP 50 kg and half a ton of FYM. I got a yield of 4 - 5 quintal of cotton per acre. The average expenditure per acre was ₹8,000-9,000".

"Last year in 2011-12, I attended a Bhoochetana training conducted at our Hobli Antara Sante. I realized the importance of the application to increase yields and reduce unnecessary application of fertilizers. I have availed inputs like seed micronutrients and biofertilizer and some pesticide through subsidy. As per the recommendation of ICRISAT and officials from the Department of Agriculture, I used 50 kg gypsum, 5 kg zinc sulfate and 2 kg borax per acre before planting and treating Bt cotton seeds. The cotton crop was very healthy and the stems were strong. Each plant had an average of 150-200 bolls and I observed a reduction in the fall of flowers. During October-November, when the picking started, staff from ICRISAT collected yield samples and sent them to Hyderabad".

"Due to the Bhoochetana Yojane practice, I got an average yield of 7 - 8 quintal per acre. I have also seen the benefit of fertilizer use based on the requirement of our soil, for healthy crop growth. The Bhoochetana Yojane provided the inputs on subsidy which helped me avoid a loan for the purchase of inputs. I am very happy with the economic benefit I have got due to the new technology".

21 Nagarajappa earns more with improved practices in maize

Mr BV Nagarajappa, s/o Mr Bankappa, Bisalwadi Village, Haradanhalli Hobli, Chamarajanagar Taluk, Mysore District, Karnataka.

Farmers' field day observed during Bhoochetana project.

I am BV Nagarajappa, s/o Bankappa. I hold 2.27 acres of land. I grow jowar, maize, sunflower and pulses as intercrop purely under the rainfed condition. Due to erratic rainfall, I have incurred a loss in most of the years as my expenditure on cultivation was always more than the income from it.

A meeting was conducted at Haradanahalli RSK to explain the Bhoochetana scheme. Initially, we did not take it seriously. But during a follow up meeting in our village, the AO and our village facilitator explained to us the degradation in the quality of our soil and the reason for the declining productivity. They also advised us on the use of inputs like seed, micronutrients, biofertilizer and compost, which are provided to farmers under the scheme. Furthermore, they gave us details of the technology like sowing across the slope, seed treatment, application of micronutrients and other fertilizers as per the soil requirement, use of biofertilizer etc. They told us that the farmers need not come up to the RSK for inputs and that the department has made arrangements to supply them at the distribution point (gram panchayat office) closest to our village. All this encouraged and enabled me to adopt the Bhoochetana yojane effectively in one ha of land with maize crop. As a coincidence, we received good rains. My maize crop was very healthy compared to the crops of other farmers who had not used micronutrients. A video was also recorded and several of the farmers in our village visited my field. I got a maize yield of 34 quintals per acre with the help of Bhoochetana technology. I sold the produce at the rate of ₹980 per quintal and I got ₹33,320. Last year the maize yield was 25 quintals from one ha with our normal practice and I got ₹21,250. I got a net additional benefit of ₹12,070, which was substantial. Really, this is a very good program. Prior to the Bhoochetana Yojane farmers like me were not aware of the requirement for micronutrients and of the importance of using the right amount of fertilizer to get a good yield and to reduce the wastage of fertilizers. Not only me, but several farmers in our village are impressed with Bhoochetana Yojane".

22 Praveen invests in soil fertility and gets higher yields

Mr Praveen Mallanagowda Patil, Bableshwar village, Bijapur District, Karnataka.

Sunflower crop also saw a major boost in yields.

Praveen has a total farm holding of nine acres and 26 guntas. During the year 2011-12, he decided to grow sunflower following Bhoochetana practices. He adopted new technologies such as the use of micronutrients, seed treatment, planting across the slope and weeding twice. Apart from these, he availed training and got technical guidance from staff of the Department of Agriculture and ICRISAT on IPM and INM.

With the conventional practice, he got a yield of only 500 kg per acre and had invested ₹2,250 on agriculture operations. In contrast, with the Bhoochetana practice, he got a yield of 650 kg per acre and had invested ₹2,700 per acre. The economic benefit he got is ₹5,250 per acre.

He realized that with the addition of micronutrients, soil fertility has increased and application of gypsum has helped improve the physical properties of the soil as well as its sulphur and calcium status. The subsidy on micronutrients, biofertilizer and gypsum has helped him a lot. With the increase in his farm income, he is able to give his children good education and has developed a good rapport (relation) with his fellow farmers. Now he has decided to strictly follow Bhoochetana technologies.

23 Improved management fetches higher returns for Bheemaroygouda

Sri Bheemaroygouda, s/o Sri Madivalappagouda Biradar, Madinal Village, Muddebihal Taluk, Bijapur district, Karnataka.

Bajra crop has benefitted from integrated soil management.

Sri Bheemaroygouda, s/o Sri Madivalappagouda Biradar, is 34 years old and has four acres of land. During the year 2011-12, he had grown bajra crop by applying Bhoochetana practices. He adopted new technologies like use of trichoderma for seed treatment, added micronutrients like gypsum, zinc, and boron, used vermicompost, sowed the plants across the slope and carried out timely weeding. The staff of the Department of Agriculture and ICRISAT guided him from time to time in adopting the improved practices. With the conventional practice, he got a yield of 950 kg per acre and he had invested ₹2,500 on agriculture operations, a total return of ₹7,600 per acre; whereas with Bhoochetana practice, he got a yield of 1,400 kg per acre, invested ₹3,000 per acre and got a total return of ₹11,300 per acre. The additional economic benefit he got was ₹3,700 per acre.

The improved systems introduced were seed treatment and application of micronutrients, which helped increase crop yields. He also realized that even during poor rainfall, the crop had sustained itself which was not the case with the crop grown under the traditional system. He changed the cropping patterns and agriculture practices and thereby got a good yield. Earlier, he had practiced monocropping and had cultivated commercial crops. However the cost of cultivation had been higher and the yields lower. Now, most of the farmers are impressed on seeing his bajra crop.

24 Good seeds and balanced fertilization helped Anjanappa get a good yield of ragi

Mr Anjanappa, s/o Mr Patel Muniyappa, Baktharahalli Village, Nadavathi Post, Tyamagundlu Kasba Hobli, Hoskote Taluk, Bengaluru Rural District, Bangalore.

Mr Anjanappa in his ragi field under Bhoochetana technology during the year 2011.

Mr Anjanappa, s/o Patel Muniyappa is 63 years old and has studied till the twelfth standard. He has 22 acres of land consisting of 17 acres dryland and five acres of irrigated land in survey Nos. 24, 11, 145, 53 and 49. Agriculture is his main occupation through which he supports the 11 members in his family. He has planted eucalyptus in 11 acres, coconut in six acres, mulberry in two acres and grows field crops in three acres. He got information about Bhoochetana technology from a farm facilitator who explained the fertility status of soils in the taluk and the need for application of gypsum, zinc sulfate and borax. He has availed of seeds and fertilizers from the Department of Agriculture at 50% subsidy. He planted ragi crop in two acres of land on 20 July 2011 and harvested it on 28 November 2011. The cost of cultivation was ₹5,500 per acre during 2011, whereas it was ₹5,000 per acre during the previous year ie, 2010. Mr Anjanappa harvested 1.2 tons per acre of ragi grain during 2011, whereas he had harvested 1.0 ton per acre of ragi grain during 2010. He got an additional gross profit of ₹4,800 from the two acres of land and a net income of ₹3,800 by adopting Bhoochetana technology. He purchased a sprayer and a multiple furrow opener from the Department of Agriculture on subsidy by investing the additional profit. He used a hired tractor for land cultivation and bullock drawn implements for sowing and inter-cultivation. He used manual labor to harvest the crop and a tractor drawn roller for threshing. He applied gypsum, zinc sulfate and borax to a coconut plantation and appreciated the technology for enhancing the yields as well as quality of the produce. He also works as a secretary in the milk producers' cooperative society and earns ₹3,500 month^{-1}. Mr Anjanappa opined that rainfed agricultural technology with soil test-based balanced fertilizer application is good for enhancing crop productivity in general. Gypsum application in particular, helps in holding more soil moisture, which in turn helps in mitigating drought conditions and moisture stress.

25 Good seeds and balanced fertilizer application in maize help Sharanappa increase profits

Mr Sharanappa, s/o Mr Chigatereppa, Halavudara Village, Sirigere Post, Chitradurga Taluk, Chitradurga District, Karnataka.

Progressive farmer cum teacher in his Bhoochetana maize plot.

Mr Sharanappa, s/o Mr Chigatereppa, is a progressive farmer cum teacher, who lives in a joint family with his three brothers and their families. He is 44 years old and has a B. A. and a B. Ed. qualification and works as a teacher in a private school in Hiriyur town. His joint family has 14 ha of land - 8.8 ha dryland and 5.2 ha irrigated land in survey Nos. 121, 34, 32/2, 47, 161 and 163 B, to support its 18 members. Mr Sharanappa is also working as a secretary of the Dairy Cooperative Society and his brothers and their spouses run a private school in the village. He came to know about Bhoochetana technology through a farm facilitator and through the Department of Agriculture. He has visited the demonstration field with Bhoochetana technology in the neighboring village of the farm facilitator and has got detailed technical information from the Department of Agriculture. He has availed of subsidized Bhoochetana inputs and maize seeds from the Department of Agriculture. He has adopted Bhoochetana technology in 6.4 ha and followed the traditional farmers' practice in 0.8 ha by growing maize crop. He applied gypsum @ 200 kg per acre, zinc sulfate @10 kg per acre and borax @ 2 kg per acre in the Bhoochetana plot. He planted the maize crop on 20 July 2011 and harvested the crop on 26 November 2011. He planted the maize crop across the slope and made conservation furrows to conserve rainwater. The cost of cultivation was ₹6,000 per acre for the Bhoochetana plot and ₹5,500 per acre in the plot under farmers' practice. He has harvested on an average 3.6 ton per acre of maize grain from the Bhoochetana plot and 3.0 ton per acre from the plot under farmers' practice. He sold the maize grain at ₹10,500 per ton and obtained a gross profit of ₹100,800 and a net profit of ₹92,800 from 16 acres. He has invested this amount and other agricultural income amounting to a total of about ₹500,000/- in the construction of a school building. He used his own tractor for land cultivation and for planting the crops. He harvested the crops by using manual labor and used multi-crop threshers to thresh the grain. Mr Sharanappa is impressed with the Bhoochetana technology, especially with gypsum application @ 200 kg per acre, which he has experienced and has said will increase infiltration as well as the water holding capacity of the soil and mitigate drought conditions. He has shown lush green rainfed maize crop without stress under Bhoochetana technology and crop with severe stress under the traditional farmers' practice and says this is clear evidence of the advantage of Bhoochetana technology over farmers' practice.

26 Balanced fertilization and line sowing in ragi enhances productivity

Mr Jagadish, s/o Mr Surappa, Hoonayaknahalli Village, Bandikodgehalli Gram Panchayat, Jala hobli, Bengaluru North Taluk, Bengaluru Urban district, Karnataka.

Beneficiary farmer Mr Jagadish in his ragi crop under Bhoochetana technology (left) and farmers' practice (right).

Mr Jagadish, s/o Mr Surappa, is a progressive farmer and a beneficiary of the Bhoochetana project. He is 47 years old and has studied up to the eighth standard. He has eight acres of land, out of which 6.5 acres is dryland in survey Nos. 6/1, 15/5, 176 and 212. Agriculture is his main occupation through which he supports the seven members of his family. He adopted Bhoochetana technology by basal application of gypsum @ 80 kg per acre, zinc sulfate @ 10 kg per acre and borax @ 2 kg per acre in two acres of land in which he planted ragi crop. He planted the crop on 2 Aug 2011 and harvested it on 23 Nov 2011. On the remaining dryland he planted ragi crop under his own practice. The cost of cultivation was ₹7,500 per acre in the Bhoochetana plot and ₹7,000 per acre in the plot under farmers' practice. While he harvested 900 kg per acre of ragi grain from the Bhoochetana plot, he harvested only 700 kg per acre of grain from the non-Bhoochetana plot. He got an additional gross profit of ₹5,600 and a net profit of ₹4,600 from two acres of land by adopting soil test-based fertilizer application. Land cultivation and line planting of ragi crop across the slope along with field bunding was done to conserve rainwater. He has availed of all the Bhoochetana inputs as well as a power tiller and vermicompost structures under subsidy. He used a power tiller for land preparation and sowing and used bullock drawn implements for inter-cultivation. Ragi was harvested using manual labor and threshing was done by a tractor drawn roller. He has got a good number of livestock like buffaloes, cows, sheep, goats and bullocks and gets a good income from them. He has used the additional income to repay the loan had taken to buy the power tiller. He was impressed with the Bhoochetana technology and adopted it throughout his land during the year 2012, as he has observed increased production, ear head size and grain size due to soil test-based balanced application of fertilizers.

27 Benefits from ragi enhanced through balanced fertilization and good agronomic practices

Mr A Muniraju, s/o Mr Anjanappa, Gundur Village, Veerganagar Post, Bidralli Hobli, Bengaluru East Taluk, Bengaluru Urban District, Karnataka.

Bhoochetana ragi crop and fruit trees of beneficiary farmer Mr A. Muniraju who is happy with the technology.

This is the success story of Mr A Muniraju, s/o Mr Anjanappa, who is 47 years old. He is a progressive farmer and has studied up to the eighth standard. He has 8.75 acres of land with about two acres irrigated land in survey Nos. 57, 37, 57/13, 15/5, 176 and 212. He has planted sapota and guava fruit trees in the irrigated land and grows ragi, pigeonpea, maize and field beans in the dryland to support the seven members in his family. He adopted the Bhoochetana technology by treating the seeds with fungicide and biofertilizers and carrying out basal application of gypsum @ 80 kg per acre, zinc sulfate @ 10 kg per acre and borax @ 2 kg per acre in 4.25 acres of land. He planted ragi crop in 2.25 acres and sole pigeonpea crop in two acres. The remaining dryland area was under traditional farmers' practice with ragi and pigeonpea crops. He incurred an expenditure of about ₹10,000 per acre towards the cost of cultivation with improved practice and about ₹9,000 per acre with the traditional farmers' practice. He harvested 1.4 ton per acre of ragi grain with the improved practice and 1.0 ton per acre of ragi grain with the farmers' practice. While he harvested 400 kg per acre of pigeonpea grain yield with improved practice, he harvested just 300 kg per acre with the farmers' practice. He got an additional gross profit of ₹15,800 and net profit of ₹11,500 through Bhoochetana technology. Mr A Muniraju availed of all the Bhoochetana inputs from the Department of Agriculture on subsidy. He also applied these inputs to his fruit trees which helped in getting an enhanced fruit yield (300 kg) with increased fruit size and quality as compared to the previous years. He used a hired tractor for land preparation and bullock drawn implements for sowing and inter-cultivation. He used manual labor for crop harvesting and a tractor drawn roller for threshing. He also gets income from selling buffalo milk and sheep. With this increased income, he has purchased a Yamaha motor bike for household use.

28 Hybrid maize and balanced fertilizers are the key for higher productivity

Sri Shivangowda Basanagowda Sunagad, Hallur Taluk, Bagalkot district, Karnataka.

Maize yields of 60 quintals were obtained at farmer's field due to improved practises.

Sri Shivangowda Basanagowda Sunagad, attended a demonstration organized in the village on maize crop in an area of one ha during 2012-13. This turned out to be a successful case study of increasing crop productivity through timely technology interventions, by following the technology suggested by the staff of the Department of Agriculture and ICRISAT from time to time during the *kharif* season.

Many farmers have been growing different varieties of maize hybrids and realizing a yield of 75 quintal per ha with conventional cultivation practices. Sri Shivangowda Basavan Gowda Sunagad became the beneficiary of a demonstration in maize. The staff of the Department of Agriculture provided maize hybrid seeds, recommended fertilizers like urea 50 kg, 12:32:16 - 100 kg, city compost 2 qunitals, gypsum 2 quintals, the micronutrients zinc sulfate 15 kg and borax 4 kg, biofertilizers and neem oil. The proper spacing of 24" × 8" was done before the seeds were sown. The crop was raised in 1 ha with the improved technology, use of biofertilizers through seed treatment and alternate furrow irrigation. Crop growth was very healthy in the demonstration plot due to the beneficial effects of the micronutrients and biofertilizers that were used.

The maize yield in his field with improved practice was 60 quintals per ha and the yield in the check plot was 45 quintals per ha. Sri Shivangowda Basavan gowda Sunagad has been jubilant since his maize yield in the last three years in the same field had not crossed 40-45 quintals per ha. He is very happy and encourages other farmers in the village to adopt this program.

29 Science-led cultivation reduces costs and makes farming remunerative for Smt Noorjahan

Smt Noorjahan Husensab Rolli, Murnal Village, Bagalkot District, Karnataka.

Farmer and officials interact with Officer Mr Bharat Lal Meena (Right) a tractor hired in noorjahan's farm helps prepare the land.

Smt Noorjahan Husensab Rolli is recognized as the best progressive woman farmer in the district. By adopting the traditional method of agricultural practices, she never made a profit. This made her desperate to increase the yield from her 1.2 acre plot of land.

In that situation, she participated in a training program organized by the Bagalkot Agriculture Department under the Bhoochethana scheme. She wanted to do something new. She met Department officials and ICRISAT staff. She received technical information and inputs. As per the advice given to her by the officials and the information she got on new technologies through demonstrations, she has adopted Bhoochetana technology.

By taking technical guidance from the Department, she developed her 1.20 acre plot of land and has also taken another 10 acres on lease from her neighbor farmer. She grows maize, wheat, jowar, groundnut, sunflower, cotton, vegetable and fruit crops.

She has established a biodigester unit for the control of insects and pests. She also maintains a dairy farm where she has four buffalos and six cows and gets a good income from the sale of milk. She has hired a tractor to prepare the land, and if the driver is not available, she drives it herself.

Recently, the Principle Secretary of the Department of Agriculture, Sri Bharatlal Meena had visited her field and collected information about her agriculture activity and saw her driving a tractor. The District Joint Director of Agriculture, Apna Desh and Agriculture Department officials and many farmers were also present in the team that visited her.

She noted that programs like Bhoochetana are very useful for farmers to reduce the cost of cultivation and increase crop yield and income. She thanked the Department for the innovative program, which is very effective for farmers who are desperately trying to sustain agriculture as a profession.

Crop	Area	Yield	Amount (Rs)	Expenditure (Rs)
Cotton	Acre	8 q x 4200	40000	20000
Maize	Acre	22 q x 1320	29040	9000
Onion	Acre	100 Packet x 600	60000	30000
Marigold	Acre	23000 (Rs)	23000	5000
Coconut	40 plants	Lease/year	13000	5000
Mango (Drumstick income)	-	Development stage	10000	5000
		Total	175040	74000

30 Hybrid maize along with balanced fertilizers – key to enhance productivity

Sri Mallanagouda R Patil, Nandanur Taluk, Hunagund, Bagalkot District, Karnataka.

Timely technological interventions help increased maize yield in Mallanagouda R Patil's farm.

A Farmer Field School (FFS) demonstration was organized in the village on maize crop over an area of one acre during 2012-13. It turned out to be a successful case study of timely technology interventions and the crop was raised following the technology suggested by the staff of the Department of Agriculture from time to time during the *kharif* season.

Many farmers have been growing varieties of maize hybrids and realizing a yield of 20-22 quintals per acre with conventional cultivation practices. Sri Mallanagouda R Patil became the beneficiary of an FFS in maize. The staff of the agriculture department provided 900M-Gold Maize Hyb seeds, the recommended chemical fertilizers, 50 kg of urea, 51.8 kg of city compost, micronutrients such as zinc sulfate and borax as well as biofertilizers. The proper spacing of 24" x 8" was done before the seeds were sown. The crop was raised in one acre using improved technology, following the use of biofertilizers, seed treatment and alternate furrow irrigation due to instant rain for successful maize cultivation.

The maize yield was 32 quintals per acre using improved practice and 20 quintals per acre in the check plot.

Sri Mallanagouda R Patil has been jubilant since his maize yield in the last three years in the same field had not crossed 20-22 quintals per acre. Therefore, it is a success story of getting a net increase in yield of up to 10 quintals per acre.

31 Science-led management gets higher yields and rejuvenates a farmer's faith

Mr Lingaraju, s/o Mr Guthalegowda, H Byadarahalli Village, Maluru Hobli, Channapatana Taluk, Ramanagara District, Karnataka.

Bumper ragi crop of Mr Lingaraju due to Bhoochetana project.

This is the success story of a small and innovative farmer Mr Lingaraju, who is 40 years old, and has studied up to the tenth standard. Farming is the major source of livelihood for Mr Lingaraju who has to support the five members in his family. He has three acres of land in Survey No. 66 and grows ragi during the rainy season. He also has a coconut plantation. He voluntarily participated in the Bhoochetana program and applied the inputs throughout his land as he was convinced with the technology owing to the positive experience he had in previous years. He got information about the Bhoochetana project during the first year from officials of the Department of Agriculture, a technician from ICRISAT and a farm facilitator. He has adopted the recommended crop spacing, quality seeds and biofertilizers and has treated the seeds with pesticides. He has also carried out soil application of trichoderma and applied 50 kg gypsum, 5 kg zinc sulfate and 2 kg borax per acre along with the recommended doses of N, P and K. He had planted rainy season crops on the 2nd of August on flat land as his land is leveled and harvested the crops during November using manual labor. Before sowing he applied all the nutrients except nitrogen in balanced form as suggested by our staff. In the case of nitrogen, he applied 50% at sowing and the remaining at 30 days after sowing through urea. Mr Lingaraju has taken the help of farm facilitators, staff of the Department of Agriculture viz., agricultural assistant, agriculture officer as well as staff from ICRISAT based both at Hyderabad and in the district who visited the plot periodically and gave him the required technical help and inputs. He followed the instructions given by them.

Mr Lingaraju noticed a remarkably good ragi crop growth as compared to the last five years and was very sure of getting a good yield. As expected, he has obtained 15.4 quintals per acre of ragi yield as against an average yield of 11 quintals per acre that he got for for the last five 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. It has given him a 29 per cent increase in crop yield which accounts for a benefit of about ₹5,437 per acre. Mr Lingaraju has expressed his happiness at having received the technical inputs which have served to enhance his knowledge about enriching soil fertility and obtaining maximum benefit with only a small expenditure on deficient nutrients. He is ready to go with the project for the next year as well and is so convinced that he is willing to purchase the inputs from the RSK situated at Taluk place without any subsidy.

32 Improved management increases productivity and income from dryland agriculture

Sri Shivanagouda, s/o Sri Bhimaray Biradar, Ingleshwar Village, Basavan Bagewadi Taluk, Bijapur District, Karnataka.

Bengal gram from Sri Shivanagouda's farm .

Sri Shivanagouda, is a small farmer who has two ha of agricultural land on which he used to cultivate crops like Bengal gram, wheat and jowar by following traditional methods. Since he is a graduate, he is in regular contact with Raita Samparka Kendra Basavan Bagewadi and procured information about increasing dryland crop productivity from Bhoochetana. He decided to test the new technologies developed in the Bhoochetana program for improving yield and income. He decided to evaluate the performance of Bengal gram as advised by officials from the Department of Agriculture and ICRISAT and a farm facilitator and made comparisons with his own practice in two acres.

Mr Shivanagouda received inputs such as Bengal gram seeds (20 kg per acre), gypsum (80 kg per acre), zinc sulfate (5 kg per acre), borax (2 kg per acre), trichoderma (200 g per acre) and neem oil (1 liter) from the Raita Samparka Kendra Basavan Bagewadi at subsidized rates. Sri Shivanagouda used improved technologies over his traditional practices. The improved technologies included: applying micronutrients as per the above recommendations as basal dose and mixed in the soil one week before sowing the seeds; planting across the slope; treating seeds with trichoderma and *Rhizobium*; maintaining the recommended plant population; weeding twice; and taking up suitable plant protection measures with neem oil.

Sri Shivanagouda noticed a significant improvement in the yield of Bengal gram over his traditional practices. As per his crop cutting experiments, he obtained 3.2 quintals per acre by following his own traditional practice as against 4.0 quintals per acre following improved practices using Bhoochetana technologies. He achieved a 25% (0.8 quintals per acre) increase in Bengal gram yield by following the improved method of cultivation. He obtained ₹2,180 as net additional income per acre by selling his Bengal gram at the rate of ₹3,600 per quintal.

Details of Bengal gram production cost using improved technologies.

Particulars	Improved technologies	Traditional practices
1) Productivity per acre	4.00	3.2
2) Cost of production per acre in ₹	4700	4000
3) Net income per acre in ₹	9700	7520

Sri Shivanagouda is happy for having adopted new technologies and he sincerely thanked the staff of the Department of Agriculture and farm facilitators for all the help they extended to make this achievement possible. The Department used his field for conducting field day and field visits to demonstrate and show the results of Bhoochetana technologies to other farmers.

33 Venkkappa adopts improved practices to increase yields by 30-40%

Mr Venkkappa Saplya, s/o Mr Narayana Saplya, Ullala Village, Mangalore Taluk, Dakshina Kannada District, Karnataka.

Venkkappa Saplya witnessed an increase of 30-40% in yield due to Bhoochetana project .

Venkkappa Saplya, s/o Narayana Saplya, aged 55 years has 2.19 acres of land. He decided to grow paddy crop by applying Bhoochetana practices during the year 2012-13. He adopted new technologies like the use of MO4, a high yielding variety of paddy, salt water seed treatment, micronutrients like lime, zinc and boron and organic manure like vermicompost, along with timely sowing, and weeding. Apart from Department's and ICRISAT guidance, he also adopted Integrated Pest Management (IPM) and Integrated Nutrient Management (INM) with conventional practices. He got a yield of 3,996 kg per acre and had invested ₹14,000/- on cultivation with Bhoochetana practices.

He realized that adoption of improved farming systems and experiments have taken prime importance in the whole Bhoochetana program. Earlier he practiced the conventional system of cropping, which involved higher investment with a lower yield than the Bhoochetana practice. In his opinion there is an increase of at least 30-40 % in yield in the Bhoochetana field compared with the yield from normal practice in the previous year. This year he has adopted improved practice in his entire field. Most of the farmers are impressed with his paddy crop. Ovita dolorit, omnienis acidemo luptas sus.Rest aspelle cullign ihillo te re, sedi a et re ex et quatent ligendaest, sitate cuptature nihitate omnimod iciandi blani nis alit, qui sim qui dolorent et elitiis reperferis apedist, offic temosa

34 Ms Sundari advocates balanced fertilizer for higher yields and benefits

Smt Sundari, w/o RamanaShetty Panjjimoogaru, Pavoor Village, Mangalore Taluk, Dakshina Kannada Disrict, Karnataka

Smt Sundari's paddy crop benefited from the Bhoochetana project.

Smt Sundari has 1.76 acres of land. During 2012-13, she decided to grow paddy crop by adopting Bhoochetana practices. She adopted new technologies like use of MO4 which is a high yielding variety, seed treatment with salt water, application of micronutrients like lime, zinc and boron as well as organic manure like vermicompost, timely sowing and weeding. Apart from Departmental and ICRISAT guidance, she also adopted the well tested conventional practices of pest and disease management. By following Bhoochetana practices she got a yield of 3,317 kg per acre and she invested ₹13,000/- on agriculture operations. With the traditional system she got a yield of just 2,850 kg per acre with almost the same investment.

Although the benefit is not very high due to erratic rainfall, she is still a very happy farmer, as she has got a good increase in yield unlike many other farmers who have have incurred a loss this year due to poor rainfall. She advises others to follow the fertilizer recommendation to reduce the cost of cultivation and to avoid wasting money on the application of unnecessary fertilizers.

35 Mallappa reduces cost of cultivation & gets higher yields with improved practice

Mr Mallappa, Narendra Village, Dharwad district, Karnataka.

Mr Mallapa obtained an increased yield in groundnut crop due to Bhoochetana program.

Mr Mallappa, a farmer, shares his experience of Bhoochetana practice, which he adopted on three acres out of the four acres of land he has. He came to know about the program through wall writings and training sessions in his village. The farm facilitator of the villages explained the program, and asked him to visit Raitha Samparka Kendra (RSK) and register as a beneficiary. He participated in the Bhoochetana program. He has grown groundnut crop. He received all the technical guidance and inputs from Department and ICRISAT officials from time to time. From RSK, Mr Mallappa got inputs like zinc sulfate, borax, gypsum, trichoderma and *Rhizobium* culture for groundnut.

The total cost of cultivation for the three acre Bhoochetana plot was ₹17,500 (about ₹6,000 per acre), whereas for the one acre where he used his traditional practice the cost was ₹7,000. Cost of cultivation in improved practice reduced with the appropriate use of DAP. The yield per acre with improved practice was 115 kg and with the prevailing market price of ₹45 per kg the total income was ₹5,175. With the traditional practice the yield was only 90 kg and the total income was ₹3,700.

I am happy with the better yield I get with the improved package as compared to my traditional system. It is a great help for small farmers like me for whom agriculture is the only source of income. The efforts of the Department to encourage farmers are praiseworthy.

36 My dream comes true, says Deekshakumar

Mr Deekshakumar, s/o Mr Nanjappa, Maragodu Village, Madikeri Taluk, Kodagu District, Karnataka.

Micronutrient application helps increase yield in Deekshakumar's field.

"I am Deekshakumar, s/o Nanjappa. With the guidance I got from Raith Samparka Kendra and ICRISAT officials about the Bhoochetana Program I came to know about the importance of soil testing and the effectiveness of micronutrients in the soil. I practically adopted the Bhoochetana technologies recommended by the staff of the Department of Agriculture and ICRISAT.

I have six acres of land (survey no. 213) where I grow paddy, coffee, pepper, coconut and banana as the major crops. After adopting the improved technology, my crop yield increased and annual income reached nearly ₹50, 000. I had faced a lot of problems during the last five years due to the lack of the required information and proper technology.

In 2012-13, we were introduced to the Bhoochethana program in our district. I collected the agriculture related information and inputs from the Department and participated in all the training sessions organized by the Department. In 2012-13, I adopted these technologies which included summer plowing, application of micronutrients and seed treatment in my field. Thereby I achieved success in the first stage. I added secondary nutrients to my land in addition to the primary nutrients as per the guidance provided. The secondary nutrients were dolomite 100 kg, zinc sulfate 10 kg, borax 4 kg and PSB 2 kg. To my surprise this plot from which I got a yield of 15.5 quintals per acre last year, gave me a yield of 19.5 quintals per acre this year - 4.0 quintals more than what I had obtained earlier.

As a result of this achievement, I am planning to adopt the same technologies to other crops like coffee and pepper. With the additional income I have purchased a power tiller for agriculture operations and have used some of the money for my childrens' education. I also plan to plant 200 banana plants in my land next year.

Owing to the positive experience I have had I am planning to adopt the usage of micronutrients to other economically high value fetching crops and thereby increase my income. I would also like to disseminate the advantage of using integrated nutrient management to increase crop yields, to other farmers".

Compiled by LS Jangawad and KH Anantha

Because of the Bhoochetana Program I had witnessed good crop yields that encouraged me to try hard for the Best Farmer award. I thank all those who are responsible for the implementation of the Bhoochethana Program.

Sl No	Particulars	
1	Name of crop	Paddy
2	Area	1 Acre
3	Last year Micronutrient Applied	No
	This year Micronutrient Applied	Dolomite 100 kg, zinc sulfate 10 kg
4	Last year Total Expenditure	borax 4 kg
		PSB 2 kg
		13900-00
5	Last Year Yield	15.5 Q; Market price ₹1000
	Profit (Total income-Expenditure)	₹1600-00
	2012-13 year Total Expenditure	₹16600-00
6	2012-13 Year Yield	19 Q; Market price ₹1250/Q
	Profit (Total income-Expenditure)	₹7150-00
7	Additional income	₹7150-00

37 Simple scientific technologies fetch higher returns in green gram

Mr Devendrappa, S/O Motilal Pande, Janwada Village, Bidar Taluk, Bidar District, Karnataka.

Mr Devendrappa demonstrating the benefit of improved management in his green gram field during the rainy season of 2012.

This is the success story of Mr Devendrappa, a farmer who is 58 years old. Farming is the major source of livelihood for Mr Devendrappa who has to support the six members in his family. He cultivates different crops like green gram, black gram and soybean in his farm of seven acres. Like millions of other farmers he too was disillusioned with farming on account of fast increasing costs of inputs, energy and labor and stagnating or even declining crop response to the inputs. The mission mode Bhoochetana initiative at this juncture showed him a new ray of hope in farming.

During the rainy season of 2012, Mr Devendrappa associated with Bhoochetana, and volunteered to participate in an on-farm research project to follow soil test-based nutrient management in a one acre green gram plot (improved management), and follow his traditional practice (farmers' practice) in another one acre green gram plot for comparison. As advised by experts from ICRISAT/the Department of Agriculture, he added deficient secondary and micronutrients like sulphur (through gypsum), boron (through borax) and zinc (through zinc sulfate) in the improved management plot in addition to the nutrients nitrogen (through urea and DAP), phosphorus (through DAP) and potassium (through MOP) just as in the farmers' practice plot. The science-led approach involves provision of adequate and proportionate amounts of nutrients to plants to ensure normal metabolic function that in turn supports good crop growth and yield. He also applied trichoderma @ 200 g per acre and VAM (vesicular arbuscular *mycorrhizae*) @ 200 g per acre to the improved management plot through seed treatment. Trichoderma is recommended to provide resistance against fungal infections and shocks during early plant growth. VAM is a fungus which inhabits plant roots and protruding fungal hyphae and acts as a nutrient mobilizer/solubilizer and thus enhances nutrient availability and uptake for plant growth and yield. While the science-led management practice advocated the provision of additional nutrients, all the other agronomic practices remained the same as in the farmers' practice. The green gram crop under both the practices was sown on 25 June 2012 and harvested on 24 August 2012.

Mr Devendrappa got additional inputs like secondary and micronutrients, trichoderma and VAM from the Department of Agriculture (DoA) at 50% subsidy. These inputs are being promoted under Bhoochetana and converged schemes to bring in the sustainable use of natural resources to improve

farm based livelihoods. Mr Devendrappa farmer had to incur an additional cost of around ₹490 per acre on these inputs. As such, he incurred a total expenditure of ₹2,910 per acre in the farmers' practice plot. In the improved management plot he incurred a total expenditure of ₹3,400 per acre due to various inputs and the farm operations of land preparation, sowing, interculture, weeding, harvesting, threshing and transport. The results of science led-farming evident from the 43% higher yields surprised the farmer. The yield per acre grew from 350 kg under farmers' practice to 500 kg.

Mr Devendrappa sold his produce at a farm gate price of ₹40 per kg and therefore got additional net returns of about ₹5,500 per acre. With the unexpected increase in income he was able to afford a better education for his children and health care for his family. A science-led approach in the Bhoochetana mission not only brought a smile on his face, but has also revealed the potential for him to further enhance his income by following a similar strategy in the remaining six acres of his land. Mr Devendrappa's perception expressed in his own words is that the main reason for his adopting improved practices with successful results was the awareness created by farm facilitators and the staff of ICRISAT/the Department of Agriculture supported by media publicity for the Bhoochetana mission. During farmers' day, other farmers were also shown the benefit of the science-led strategy.

38 Soil test-based nutrient management reverses the declining trend in yield

Mr Chandra Kant, s/o Mr Sivappa Patil, HalliKhed-B Village, Humnabad Taluk, Bidar District, Karnataka.

Mr Chandra Kant in his chickpea field during the rainy season of 2012.

This is the success story of Mr Chandra Kant, a farmer who is 55 years old. He cultivates different crops like green gram, black gram, chickpea and soybean in his nine acre farm to support the three members in his family. Like other farmers he too viewed farming as a mediocre profession due to fast increasing costs of inputs, energy and labor and stagnating or even declining crop response to the inputs. The mission mode Bhoochetana initiative at this juncture showed him a new ray of hope in farming.

During the postrainy season of 2012, Mr Chandra Kant associated with Bhoochetana and volunteered to participate in an on-farm research project to follow soil test-based nutrient management in a one acre chickpea plot (improved management), and follow his traditional practice (farmers practice) in another one acre chickpea plot for comparison. As advised by ICRISAT/DoA experts, he added deficient secondary and micronutrients like sulphur (through gypsum), boron (through borax) and zinc (through zinc sulfate) in the improved management plot in addition to the nutrients nitrogen (through urea and DAP), phosphorus (through DAP) and potassium (through MOP) just as in the farmers' practice plot. The science-led approach involves provision of adequate and proportionate amounts of nutrients to plants to ensure normal metabolic function that in turn supports good crop growth and yield. He also applied trichoderma @ 200 g per acre in the improved management plot through seed treatment. Trichoderma is recommended to provide resistance against fungal infections and shocks during early plant growth. While the science-led management practice advocated the provision of additional nutrients, all the other agronomic practices remained the same as in the farmers' practice. The chickpea crop under both the practices was sown on 29 September 2012 and harvested on 30 December 2012.

Mr Chandra Kant got additional inputs like secondary and micronutrients and trichoderma from the Department of Agriculture (DoA) at 50% subsidy. These inputs are being promoted under Bhoochetana and converged schemes to bring in the sustainable use of natural resources to improve farm based livelihoods. Mr Chandra Kant had to incur an additional cost of around ₹550 per acre on these inputs. As such he incurred a total expenditure of ₹3,200 per acre in the farmers practice plot. In the improved management plot he incurred a total expenditure of about ₹3,750 per acre

due to various inputs and the farm operations of land preparation, sowing, interculture, weeding, harvesting, threshing and transport. Mr Chandra Kant was surprised with the 41% higher yields he got with the improved management practice. The yield per acre grew from 425 kg under farmers' practice to 600 kg per acre.

He sold his produce at a farm gate price of ₹33 per kg and therefore got additional net returns of about ₹5,225 per acre. During the postrainy season of 2012, he realized ₹5,225 as additional net returns from the one acre improved management plot. The unexpected increase in income made it possible for him to clear his debts. A science-led approach in the Bhoochetana mission not only brought a smile on his face, but has also restored his faith in farming as a means to improve his family's fortunes by extending a similar science-led strategy throughout his farm.

39 Guravayya enhances millet & maize yields with improved management

Mr Guravayya, K. Ayyanahalli Village, Kudligi Taluk, Bellary District, Karnataka.

Mr Guravayya demonstrating the benefit of improved management in his millet field during the rainy season of 2012.

This is the success story of Mr Guravayya, a farmer who is 55 years old. Farming is the main source of livelihood for this man who has to support the four members of his family. He cultivates different crops like maize, groundnut and millet in his four acre farm. Like millions of other farmers he too was disillusioned with farming on account of fast increasing costs of inputs, energy and labor and only stagnating or even declining crop response to the inputs. The mission mode Bhoochetana initiative at this juncture showed him a new ray of hope in farming.

During the rainy season of 2012, Mr Guravayya associated with Bhoochetana, and volunteered to participate in an on-farm research project to follow soil test-based nutrient management in a one acre millet plot (improved management), and follow his traditional practice (farmers' practice) in another one acre millet plot for comparison. As advised by experts from ICRISAT/the Department of Agriculture, he added deficient secondary and micronutrients like sulphur (through gypsum), boron (through borax) and zinc (through zinc sulfate) in the improved management plot in addition to the nutrients nitrogen (through urea and DAP), phosphorus (through DAP) and potassium (through MOP) just as in the farmers' practice plot. The science-led approach involves provision of adequate and proportionate amounts of nutrients to plants to ensure normal metabolic function that in turn supports good crop growth and yield. In addition, he applied trichoderma @ 200 g per acre and VAM (vesicular arbuscular *mycorrhizae*) @ 200 g per acre in the improved management plot through seed treatment. Trichoderma is recommended to provide resistance against fungal infections and shocks during early plant growth. VAM is a fungus which inhabits plant roots and protruding fungal hyphae and acts as a nutrient mobilizer/solubilizer and thus enhances nutrient availability and uptake for plant growth and yield. While the science-led management practice advocated the provision of additional nutrients, all the other agronomic practices remained the same as in the farmers' practice. The maize crop under both the practices was sown on 10 July 2012 and harvested on 04 October 2012.

Mr Guravayya got additional inputs like secondary and micronutrients, trichoderma and VAM from the Department of Agriculture (DoA) at 50% subsidy. These inputs are being promoted under Bhoochetana and converged schemes to bring in the sustainable use of natural resources to improve

farm based livelihoods. Mr Guravayya had to incur an additional cost of around ₹490 per acre on these inputs. As such he incurred a total expenditure of ₹2,910 per acre in the farmers' practice plot. In the improved management plot, he incurred a total expenditure of ₹3,400 per acre due to various inputs and the farm operations of land preparation, sowing, interculture, weeding, harvesting, threshing and transport. The farmer himself was surprised with the results of science led farming as he got 34% higher yields with improved management practice. The yield per acre grew from 725 kg under farmers' practice to 990 kg.

Mr Guravayya sold his produce at a farm gate price of ₹12.5 per kg and therefore got additional net returns of about ₹2,823 per acre. With this unexpected increase in income he was able to afford a better education for his children and health care for his family. A science-led approach in the Bhoochetana mission not only brought a smile on his face, but revealed the potential to further enhance his income by following a similar strategy in the remaining two acres of his land. The farmer's perception expressed in his own words is that the reason for his adopting improved practices with successful results was the awareness created by farm facilitators and the staff of ICRISAT/the Department of Agriculture supported by media publicity for the Bhoochetana mission. During farmers' day, other farmers were also shown the benefit of the science-led strategy.

40 Balanced nutrients and nutrient mobilizers in groundnut for higher yields & returns

Mr MG Thippeswami, Shalapanhalli Post, Shalapanhalli Village, Sandur Taluk, Bellary District, Karnataka.

Groundnut field of Mr Thippeswami during the rainy season of 2012.

Mr Thippeswami, a farmer who is 49 years old, is always looking out for ways to improve his farming and increase his income. Farming is the main source of livelihood for Mr Thippeswami who has to support the six members in his family. He cultivates different crops like maize, groundnut and millet in his four acre farm. Like millions of other farmers he too was disillusioned with farming on account of the fast increasing costs of inputs, energy and labor and only stagnating or even declining crop response to the inputs. The mission mode Bhoochetana initiative at this juncture showed him a new ray of hope in farming.

During the rainy season of 2012, Mr Thippeswami associated with Bhoochetana and volunteered to participate in an on-farm research project to follow soil test-based nutrient management in a one acre groundnut plot (improved management), and continue with his traditional practice (farmers' practice) in another one acre with groundnut crop during the *kharif,* season for comparison. As advised by experts from ICRISAT/the Department of Agriculture, he added deficient secondary and micronutrients like sulphur (through gypsum), boron (through borax) and zinc (through zinc sulfate) in the improved management plot in addition to the nutrients nitrogen (through urea and DAP), phosphorus (through DAP) and potassium (through MOP) just as in the farmers' practice plot. The science-led approach involves provision of adequate and proportionate amounts of nutrients to plants to ensure normal metabolic function that in turn supports good crop growth and yield. He also applied trichoderma @ 200 g per acre and VAM (vesicular arbuscular *mycorrhizae*) @ 200 g per acre in the improved management plot through seed treatment. Trichoderma is recommended to provide resistance against fungal infections and shocks during early plant growth. VAM is a fungus which inhabits plant roots and protruding fungal hyphae and acts a nutrient mobilizer/solubilizer and thus enhances nutrient availability and uptake for plant growth and yield. While the science-led management practice advocated the provision of additional nutrients, all the other agronomic practices remained the same as in the farmers' practice. The groundnut crop under both the practices was sown on 25 July 2012 and harvested on 11 November 2012.

Mr Thippeswami got additional inputs like secondary and micronutrients, trichoderma and VAM from the Department of Agriculture (DoA) at 50% subsidy. These inputs are being promoted under Bhoochetana and converged schemes to bring in the sustainable use of natural resources to improve farm based livelihoods. Mr Thippeswami had to incur an additional cost of around ₹700 per acre on these inputs. As such he incurred a total expenditure of ₹9,500 per acre in the farmers' practice plot. In the improved management plot he incurred a total expenditure of ₹10,200 per acre due to inputs and the farm operations of land preparation, sowing, interculture, weeding, harvesting, threshing and transport. The science-led farming resulted in 31% higher yields with improved management practice. The yield per acre grew from 420 kg under farmers' practice to 550 kg.

Mr Thippeswami sold his produce at a farm gate price of ₹42 per kg and therefore got additional net returns of about ₹4,760 per acre. The Bhoochetana technologies have encouraged him to take farming more seriously and now he has decided to follow the Bhoochetana technologies throughout his farm to boost his off-farm income. The additional income from the science-led approach in the Bhoochetana mission helped him clear his bank loan, and provided him with the money required to educate his children and to meet his social needs. For him, it showed a way forward to increase production for improved financial status and a better livelihood.

41 Micronutrients and VAM get 24% higher yield in maize

Mr Chamaraj Shivappa Yalivala, Satenehalli Village, Hairekerur Taluk, Haveri District, Karnataka.

Mr Chamaraj Shivappa's field with maize crop during the rainy season of 2012.

This is the story of Mr Chamaraj Shivappa Yalivala, a farmer who is 45 years old. Farming is the main source of livelihood for Mr Chamaraj Shivappa Yalivala who has to support eight members in his family. He cultivates different crops like cotton and maize in his ten acre farm. Like millions of other farmers he too was disillusioned with farming on account of fast increasing costs of inputs, energy and labor and only stagnating or even declining crop response to the inputs. The mission mode Bhoochetana initiative at this juncture showed him a new ray of hope in farming.

During the rainy season of 2012, Mr Chamaraj Shivappa Yalivala associated with Bhoochetana and volunteered to participate in an on-farm research project to follow soil test-based nutrient management in a three acre maize plot (improved management), and follow his traditional practice (farmers' practice) in a four acre maize plot for comparison. As advised by experts from ICRISAT/the Department of Agriculture, he added deficient secondary and micronutrients like sulphur (through gypsum), boron (through borax) and zinc (through zinc sulfate) in the improved management plot in addition to the nutrients nitrogen (through urea and DAP), phosphorus (through DAP) and potassium (through MOP) just as in the farmers' practice plot. The science-led approach involves provision of adequate and proportionate amounts of nutrients to plants to ensure normal metabolic function that in turn supports good crop growth and yield. He also applied trichoderma @ 200 g per acre and VAM (vesicular arbuscular *mycorrhizae*) @ 200 per acre in the improved management plot through seed treatment. Trichoderma is recommended to provide resistance against fungal infections and shocks during early plant growth. VAM is a fungus which inhabits plant roots and protruding fungal hyphae and acts as a nutrient mobilizer/solubilizer and thus enhances nutrient availability and uptake for plant growth and yield. While the science-led management practice advocated the provision of additional nutrients, all the other agronomic practices remained the same as in the farmers' practice. The maize crop under both the practices was sown on 20 June 2012 and harvested on 28 October 2012.

Mr Shivappa got additional inputs like secondary and micronutrients, trichoderma and VAM from the Department of Agriculture (DoA) at 50% subsidy. These inputs are being promoted under Bhoochetana and converged schemes to bring in the sustainable use of natural resources to improve farm based livelihoods. Mr Shivappa had to incur an additional cost of around ₹550 per acre on these inputs. As such he incurred a total expenditure of ₹9,750 per acre in the farmers' practice plot. In the improved management plot he incurred a total expenditure of ₹10,300 per acre due to various inputs and the farm operations of land preparation, sowing, interculture, weeding, harvesting, threshing and transport. The farmer himself was surprised at the 24% higher yields that came as result of science-led farming. The yield per acre grew from 2,500 kg with farmers' practice to 3,100 kg. He sold his produce at a farm gate price of ₹12 per kg and therefore got additional net returns of about ₹6,650 per acre. During the rainy season of 2012, Mr Shivappa realized ₹19,950 as additional net returns from the three acre improved management plot. With the unexpected increase in income he was able to clear his debts. A science-led approach in the Bhoochetana mission not only brought a smile on his face, but also revealed the potential to further enhance his income by following a similar strategy in the remaining seven acres of his land. The farmer's perception expressed in his own words is that the main reason for his adopting improved practices with successful results was the awareness that was created by farm facilitators and the staff of ICRISAT/the Department of Agriculture supported by media publicity for the Bhoochetana mission. During farmers' day, other farmers were also shown the benefit of the science-led strategy.

42 Improved practice records 41% higher productivity in soybean

Mr Hajarthali Nabi sab Nadaf, Thavarmellihalli Villiage, Savanur Taluk, Haveri District, Karnataka.

Soybean crop in Mr Hajarthali Nabi sab's field, in the rainy season of 2012.

Mr Hajarthali Nabi sab is a farmer who is 42 years old. He is always looking out for ways to improve his farming and to increase his income to support the 15 members in his family. He cultivates different crops like cotton, chillies, groundnut and soybean in his 12 acre farm. Like millions of other farmers he too was disillusioned with farming on account of the fast increasing costs of inputs, energy and labor and only stagnating or even declining crop response to the inputs. The mission mode Bhoochetana initiative at this juncture showed him a new ray of hope in farming.

During the rainy season of 2012, Mr Hajarthali Nabi sab got associated with Bhoochetana, and volunteered to participate in an on-farm research project to follow soil test-based nutrient management in a two acre soybean plot (improved management), and continue with his traditional practice (farmers' practice) in another two acre plot with soybean crop for comparison. As advised by experts from ICRISAT/the Department of Agriculture, he added deficient secondary and micronutrients like sulphur (through gypsum), boron (through borax) and zinc (through zinc sulfate) in the improved management plot in addition to the nutrients nitrogen (through urea and DAP), phosphorus (through DAP) and potassium (through MOP) just as in the farmers' practice plot. The science-led approach involves provision of adequate and proportionate inputs of nutrients to plants to ensure normal metabolic function and that in turn supports good crop growth and yield. He also applied trichoderma @ 200 g per acre and VAM (vesicular arbuscular *mycorrhizae*) @ 200 g per acre in the improved management plot through seed treatment. Trichoderma is recommended to provide resistance against fungal infections and shocks during early plant growth. VAM is a fungus which inhabits plant roots and protruding fungal hyphae and acts as a nutrient mobilizer/solubilizer and thus enhances nutrient availability and uptake for plant growth and yield. While the science-led management practice advocated the provision of additional nutrients, all the other agronomic practices remained the same as in the farmers' practice. The soybean crop under both the practices was sown on 18 June 2012 and harvested on 23 September 2012.

Mr Hajarthali Nabi sab got additional inputs like secondary and micronutrients, trichoderma and VAM from the Department of Agriculture (DoA) at 50% subsidy. These inputs are being promoted under Bhoochetana and converged schemes to bring in the sustainable use of natural resources to improve farm based livelihoods. Mr Hajarthali had to incur an additional cost of around ₹700 per acre on these inputs. As such he incurred a total expenditure of ₹5,800 per acre in the farmer's practice plot. In the improved management plot he incurred a total expenditure of ₹6,500 per acre due to various inputs and the farm operations of land preparation, sowing, interculture, weeding, harvesting, threshing and transport. The science-led farming resulted in 41% higher yields with improved management practice. The yield per acre grew from 780 kg with farmer's practice to 1,100 kg. He sold his produce at a farm gate price of ₹30 per kg and therefore got additional net returns of about ₹8,900 per acre, ie, ₹17,800 from the two acre improved management plot. The Bhoochetana technologies have encouraged him to take farming more seriously and now he has decided to follow Bhoochetana technologies throughout his farm to boost his off-farm income.The additional income from the science-led approach in the Bhoochetana mission has helped him clear his loans and purchase agricultural equipment. For him it showed a way forward to increase production for improved economic status and a better livelihood.

43 Macro benefits with micronutrients in paddy

Mr Devendra Nayak, s/o Mr Nagappa, Shirva Village, Udupi Taluk, Udupi District, Karnataka.

Effects of improved management on paddy yield in Mr Devendra Nayak's field, in the rainy season of 2012.

This is the story of Mr Devendra Nayak who is 45 years old and has studied upto the third standard. Farming is the major source of livelihood for this farmer who has to support six members in his family. He has two acres of dryland in Survey Nos. 278. Due to fast increasing costs of inputs, energy and labor and only stagnating or even declining crop response to the inputs, income from farming supported only a subsistence level existence for his family. The mission mode Bhoochetana initiative at this juncture showed him a new ray of hope in farming.

During 2012, Mr Devendra Nayak associated with Bhoochetana, and volunteered to participate in an on-farm research project to follow soil test-based nutrient management in a one acre paddy plot (improved management), and follow his traditional practice (farmers' practice) in another one acre paddy plot for comparison. As advised by experts from ICRISAT/the Department of Agriculture, he added deficient secondary and micronutrients like sulphur (through gypsum), boron (through borax) and zinc (through zinc sulfate) in the improved management plot in addition to 50 kg Suffala complex (15:15:15) as basal application and 40 kg urea applied twice as top dressing. He applied the same dose of NPK inputs in both the improved management and farmers' practice plots. The science-led approach involves provision of adequate and proportionate inputs of nutrients to plants to ensure normal metabolic function and that in turn supports good crop growth and yield. While the science-led management practice advocated the provision of additional nutrients, all the other agronomic practices remained the same as in the farmers' practice. The paddy crop under both the practices was sown on 22 June 2012 and harvested on 8 November 2012.

Mr Devendra Nayak got additional inputs like secondary and micronutrients from the Department of Agriculture (DoA) at 50% subsidy. These inputs are being promoted under Bhoochetana and converged schemes to bring in the sustainable use of natural resources to improve farm based livelihoods. Mr Devendra Nayak had to incur an additional cost of around ₹430 per acre on these inputs. As such he incurred a total expenditure of ₹12,920 per acre in the farmers' practice plot. In the improved management plot he incurred a total expenditure of ₹13,500 per acre due to various

inputs and the farm operations of land preparation, transplanting, weeding, pesticides, harvesting, threshing and transport. The farmer himself was surprised by the 24% higher yields that came as a result of science-led farming. The yield per acre grew from 2,160 kg with farmers' practice to 2,688 kg. He sold his produce at a farm gate price of ₹13.5 per kg and therefore got additional net returns of about ₹6,698 per acre. During the rainy season of 2012, a science-led approach in the Bhoochetana mission revealed the potential to further enhance his income by following a similar strategy in the rest of his land. Now Mr Ananta Naik is a satisfied person with a changed outlook towards agriculture. He is also working now as a farm facilitator to encourage other farmers to adopt the science-led strategy in farming to increase productivity and farm incomes.

44 Ananta Naik gets macro-benefits with micronutrients in paddy

Mr Ananta Naik, s/o Mr Rama Naik, Belampalli Village, Brahmavara RSK, Udupi Taluk, Udupi District, Karnataka.

Mr Ananta Naik's paddy field and CCE samples collected and yield measuring during the rainy season of 2012.

This is the story of Mr Ananta Naik, who is 52 years old and has studied up to the second standard. Farming is the major source of livelihood for Mr Ananta Naik who has to support six members of his family. He has four acres of wetland. Due to fast increasing costs of inputs, energy and labor and only stagnating or even declining crop response to the inputs, income from farming supported only a subsistence level existence for his family. The mission mode Bhoochetana initiative at this juncture showed him a new ray of hope in farming.

During 2012, Mr Ananta Naik associated with Bhoochetana and volunteered to participate in an on-farm research project to follow soil test-based nutrient management in a one acre paddy plot (improved management), and follow his traditional practice (farmers' practice) in another one acre paddy plot for comparison. As advised by experts from ICRISAT/theDepartment of Agriculture, he added deficient secondary and micronutrients like lime, boron (through borax) and zinc (through zinc sulfate) in the improved management plot in addition to 50 kg Suffala complex (15:15:15) as basal application and 40 kg urea applied twice as top dressing. He applied the same dose of NPK inputs in both the improved management and farmers' practice plots. The science-led approach involves provision of adequate and proportionate inputs of nutrients to plants to ensure normal metabolic function and that in turn supports good crop growth and yield. While the science-led management practice advocated the provision of additional nutrients, all the other agronomic practices remained the same as in the farmers' practice. The paddy crop under both the practices was sown on 21 June 2012 and harvested on 9 November 2012.

Mr Ananta Naik got additional inputs like secondary and micronutrients from the Department of Agriculture (DoA) at 50% subsidy. These inputs are being promoted under Bhoochetana and converged schemes to bring in the sustainable use of natural resources to improve farm based livelihoods. Mr Ananta Naik had to incur an additional cost of around ₹600 per acre on these inputs. As such he incurred a total expenditure of ₹13,400 per acre in the farmers' practice plot. In the improved management plot he incurred a total expenditure of ₹14,000 per acre due to various

inputs and the farm operations of land preparation, transplanting, weeding, pesticides, harvesting, threshing and transport. The farmer himself was surprised by the 37% higher yields which came as a result of science-led farming. The yield per acre grew from 1,904 kg under famers' practice to 2,600 kg. He sold his produce at a farm gate price of ₹13 per kg and therefore got additional net returns of about ₹8,448 per acre. During the rainy season of 2012, a science-led approach in the Bhoochetana mission revealed the potential to further enhance his income by following a similar strategy in the rest of his land. Now he is a satisfied person with a changed outlook towards agriculture. He is also working now as a farm facilitator to encourage other farmers to adopt the science-led strategy in farming to increase productivity and farm incomes.

45 ‘Science led farming helps change the face of farming and the way farmers think’

Mr Kallappa Sharanappa Ramashetty, Mygere Village, Yalaburga Taluk, Koppal District, Karnataka.

Mr Kallappa Sharanappa Ramashetty in his groundnut field during the rainy season of 2012.

Farming is the main source of livelihood for Mr Kallappa Sharanappa Ramashetty who is 58 years old, and has to support five members in his family. He cultivates groundnut crop in his two acre farm. Due to fast increasing costs of inputs, energy and labor only stagnating or even declining crop response to the inputs, he was not happy with the state of affairs until he learned about the Bhoochetana initiative which completely changed his perspective.

During the rainy season of 2012, Mr Kallappa Sharanappa Ramashetty, a small farmer associated with Bhoochetana, volunteered to participate in an on-farm research project to follow soil test-based nutrient management in a one acre groundnut plot (improved management), and to follow his traditional practice (farmers’ practice) in another one acre groundnut plot for comparison. As advised by experts from ICRISAT/the Department of Agriculture, he added deficient secondary and micronutrients like sulphur (through gypsum), boron (through borax) and zinc (through zinc sulfate) in the improved management plot in addition to the nutrients nitrogen (through urea and DAP), phosphorus (through DAP) and potassium (through MOP) just as in the farmers’ practice plot. The science-led approach involves provision of adequate and proportionate inputs of nutrients to plants to ensure normal metabolic function and that in turn supports good crop growth and yield. While the science-led management practice advocated the provision of additional nutrients, all the other agronomic practices remained the same as in the farmers’ practice. The groundnut crop under both the practices was sown on 13 June 2012 and harvested on 30 September 2012.

Mr Kallappa Sharanappa Ramashetty used additional inputs like secondary and micronutrients from the Department of Agriculture (DoA) which are under 50% subsidy. These inputs are being promoted under Bhoochetana and converged schemes to bring in the sustainable use of natural resources to improve farm based livelihoods. The farmer had to incur an additional cost of around ₹700 per acre on these inputs. As such, he incurred a total expenditure of ₹7,100 per acre in the farmers’ practice plot. In the improved management plot he incurred a total expenditure of ₹7,800 per acre due to various inputs and the farm operations of land preparation, sowing, interculture,

weeding, harvesting/picking, manual threshing and transport. The farmer himself was surprised with the 34% higher yields that came as a result of science-led farming. The yield per acre grew from 320 kg under farmers' practice to 430 kg. He sold his produce at a farm gate price of ₹32 per kg and therefore got additional net returns of about ₹2,820 per acre during the rainy season of 2012. The significant additional income supported a better livelihood for his family. A science-led approach in the Bhoochetana mission also revealed the potential to further enhance his income by following a similar strategy in the remaining one acre of his land. The farmer's perception expressed in his own words is that the main reason for his adopting improved practices with successful results was the awareness created by farm facilitators, and the staff of ICRISAT/the Department of Agriculture supported by media publicity for the Bhoochetana mission. The success through science-led farming under Bhoochetana has completely changed the way he thinks about agriculture and has filled him with an enthusiasm to move forward.

46 Improved practice for higher productivity and returns in green gram

Mr Ganapathi Rao S, s/o Mr Vittal Rao, Daddapura Village, Janwada VPO, Bidar Taluk, Bidar District, Karnataka

Mr Ganapathi Rao demonstrating the benefit of improved management in his green gram field during the rainy season of 2011.

This is the success story of Mr Ganapathi Rao, a farmer who is 55 years old. Farming is the main source of livelihood for Mr Ganapathi Rao who has to support five members in his family. He cultivates different crops like green gram, black gram and soybean in his six acre farm. Like millions of other farmers he too was disillusioned with farming on account of fast increasing costs of inputs and energy as well as other costs and stagnating or even declining crop response to the inputs. The mission mode Bhoochetana initiative at this juncture showed him a new ray of hope in farming.

During the rainy season of 2011, Mr Ganapathi Rao associated with Bhoochetana, and volunteered to participate in an on-farm research project to follow soil test-based nutrient management in a one acre green gram plot (improved management), and follow his traditional practice (farmers' practice) in another one acre green gram plot for comparison. As advised by experts from ICRISAT/the Department of Agriculture, he added deficient secondary and micronutrients like sulphur (through gypsum), boron (through borax) and zinc (through zinc sulfate) in the improved management plot in addition to the nutrients nitrogen (through urea and DAP), phosphorus (through DAP) and potassium (through MOP) just as in the farmers' practice plot. The science-led approach involves provision of adequate and proportionate inputs of nutrients to plants to ensure normal metabolic function and that in turn supports good crop growth and yield. He also applied trichoderma@ 200 g per acre and VAM (vesicular arbuscular *mycorrhizae*) @ 200 g per acre in the improved management plot through seed treatment. Trichoderma is recommended to provide resistance against fungal infections and shocks during early plant growth. VAM is a fungus which inhabits plant roots and protruding fungal hyphae and acts as a nutrient mobilizer/solubilizer and thus enhances nutrient availability and uptake for plant growth and yield. While the science-led management practice advocated the provision of additional nutrients, all the other agronomic practices remained the same as in farmers' practice. The green gram crop under both the practices was sown on 28 June 2011 and harvested on 11 September 2011.

Mr Ganapathi Rao got additional inputs like secondary and micronutrients, trichoderma and VAM from the Department of Agriculture (DoA) at 50% subsidy. These inputs are being promoted under Bhoochetana and converged schemes to bring in the sustainable use of natural resources to improve farm based livelihoods. Mr Ganapathi Rao had to incur an additional cost of around ₹ 500 per acre on these inputs. As such he incurred a total expenditure of ₹ 5,750 per acre in the farmer's practice plot. In the improved management plot he incurred a total expenditure of ₹ 6,250 per acre due to various inputs and the farm operations of land preparation, sowing, interculture, weeding, harvesting, threshing and transport. The farmer himself was surprised with the 37% higher yields that came as a result of science-led farming. The yield per acre grew from 380 kg under farmer's practice to 580 kg. Mr Ganapathi Rao sold his produce at a farm gate price of ₹ 40 per kg and therefore got additional net returns of about ₹ 5,100/- ha^{-1}. With the unexpected increase in income he was able to afford a better education for his children and health care for his family. A science-led approach in the Bhoochetana mission not only brought a smile on his face, but also revealed the potential to further enhance his income by following a similar strategy in the remaining six acres of his land. The farmer's perception expressed in his own words was that the main reason for his adopting improved practices with successful results was the awareness created by farm facilitators, and the staff of ICRISAT/the Department of Agriculture supported by media publicity for the Bhoochetana mission. During farmers' day, other farmers were also shown the benefit of science-led strategy.

47 Improved practice records higher productivity and returns in sorghum

Mr Shyam Rao, s/o Mr Sankarappa, Chalakapura Village, Chalakapura Post, Bhalki Taluk, Bidar district, Karnataka.

Mr Shyam Rao happily demonstrating the benefits of Bhoochetana in his sorghum field during the rainy season of 2011.

Mr Shyam Rao, due to his educated (PUC) background is always looking out for ways to improve his farming and increase his income. During the rainy season of 2011, Mr Shyam Rao associated with Bhoochetana, and volunteered to participate in an on-farm research project to follow soil test-based nutrient management in a one acre *kharif* sorghum plot (improved management), and continue with his traditional practice (farmers' practice) in the remaining one acre with sorghum crop for comparison. As advised by experts from ICRISAT/the Department of Agriculture, he added deficient secondary and micronutrients like sulphur (through gypsum), boron (through borax) and zinc (through zinc sulfate) in the improved management plot in addition to the nutrients nitrogen (through urea and DAP), phosphorus (through DAP) and potassium (through MOP) just as in the farmers' practice plot. The science-led approach involves provision of adequate and proportionate inputs of nutrients to plants to ensure normal metabolic function and that in turn supports good crop growth and yield. He also applied trichoderma @ 200 g per acre and VAM (vesicular arbuscular *mycorrhizae*) @ 200 g per acre in the improved management plot through seed treatment. Trichoderma is recommended to provide resistance against fungal infections and shocks during early plant growth. VAM is a fungus which inhabits plant roots and protruding fungal hyphae and acts as a nutrient mobilizer/solubilizer and thus enhances nutrient availability and uptake for plant growth and yield. While the science-led management practice advocated the provision of additional nutrients, all the other agronomic practices remained the same as in the farmers' practice. The sorghum crop under both the practices was sown on 30 June 2011 and harvested on 12 October 2011.

Mr Shyam Rao got additional inputs like secondary and micronutrients, trichoderma and VAM from the Department of Agriculture (DoA) at 50% subsidy. These inputs are being promoted under Bhoochetana and converged schemes to bring in the sustainable use of natural resources to improve farm based livelihoods. The farmer had to incur an additional cost of around ₹500 per acre on these inputs. As such he incurred a total expenditure of ₹6,000 per acre in the farmer's practice plot. In the improved management plot he incurred a total expenditure of ₹6,500 per acre due to various inputs

and the farm operations of land preparation, sowing, interculture, weeding, harvesting, threshing and transport. The science-led farming resulted in 38% higher yields. The yield per acre grew from 850 kg under farmers' practice to 1,175 kg.

He sold his produce at a farm gate price of ₹13 per kg and therefore got additional net returns of about ₹3,725 per acre. The Bhoochetana technologies have encouraged him to take farming more seriously and now he has decided to follow the Bhoochetana technologies in his entire farm to boost his off-farm income. The additional income from the science-led approach in the Bhoochetana mission helped him clear his bank loan and provided him with the money required to educate his children and meet social needs. For him it showed the way forward to increase production for improved financial status and a better livelihood.

48 Scientific cultivation of pigeonpea records 55% increase in productivity

Mr Dattatre Sivaji, Joldabhaka Village, Joldabhaka Post, Bhalki Taluk, Bidar District, Karnataka

Mr Dattatre Sivaji's pigeonpea field and farmer's field visit during the rainy season of 2011.

Mr Dattatre Sivaji who is a farmer is 35 years old. Farming is the major source of livelihood for Mr Dattatre Sivaji who has to support the four members in his family. He cultivates different crops like ginger and pigeonpea in his 5.5 acre farm. He was really not happy with his farming on account of fast increasing costs of inputs, energy and labor and stagnating or even declining crop response to the inputs. The mission mode Bhoochetana initiative at this juncture showed him a new ray of hope in farming.

During the rainy season of 2011-12, Mr Dattatre Sivaji associated with Bhoochetana, and volunteered to participate in an on-farm research project to follow soil test-based nutrient management in a one acre pigeonpea plot (improved management), and follow his traditional practice (farmers' practice) in another one acre pigeonpea plot for comparison. As advised by experts from ICRISAT/the Department of Agriculture, he added deficient secondary and micronutrients like sulphur (through gypsum), boron (through borax) and zinc (through zinc sulfate) in the improved management plot in addition to the nutrients nitrogen (through urea and DAP), phosphorus (through DAP) and potassium (through MOP) just as in the farmers' practice plot. The science-led approach involves provision of adequate and proportionate inputs of nutrients to plants to ensure normal metabolic function and that in turn supports good crop growth and yield. In addition, he applied trichoderma and VAM (vesicular arbuscular *mycorrhizae*) in the improved management plot through seed treatment. Trichoderma is recommended to provide resistance against fungal infections and shocks during early plant growth. VAM is a fungus which inhabits plant roots and protruding fungal hyphae and acts as a nutrient mobilizer/solubilizer and thus enhances nutrient availability and uptake for plant growth and yield. While the science-led management practice advocated the provision of additional nutrients, all the other agronomic practices remained the same as in the farmers' practice. The pigeonpea crop under both the practices was sown on 12 June 2011 and harvested on 10 January 2012.

Mr Dattatre Sivaji got additional inputs like secondary and micronutrients, trichoderma and VAM from the Department of Agriculture (DoA) at 50% subsidy. These inputs are being promoted

under Bhoochetana and converged schemes to bring in the sustainable use of natural resources to improve farm based livelihoods. Mr Dattatre Sivaji had to incur an additional cost of around ₹500 per acre on these inputs. As such he incurred a total expenditure of ₹3,500 per acre in the farmer's practice plot. In the improved management plot he incurred a total expenditure of ₹4,000 per acre due to various inputs and the farm operations of land preparation, sowing, interculture, weeding, harvesting, threshing and transport. He was surprised when he got 55% higher yields with improved management practice. The yield per acre grew from 450 kg under farmer's practice to 700 kg.

He sold his produce at a farm gate price of ₹38 per kg and therefore got additional net returns of about ₹9,000 per acre. During the rainy season of 2011, the unexpected increase in income made it possible for him to purchase new agricultural implements and comfortably spend on his childrens' education. A science-led approach in the Bhoochetana mission not only brought a smile on his face, but revealed the potential to further enhance his income by following a similar strategy in the remaining 4.5 acres of his land. The farmer's perception expressed in his own words is that the main reason for his adopting improved practices with successful results was the awareness created by farm facilitators and the staff of ICRISAT/the Department of Agriculture supported by media publicity for the Bhoochetana mission. He sees the far better benefit to cost ratio as a motivating force to adopt the Bhoochetana practice in his entire farm land in future.

49 Micronutrients enhancing a farmer's income and changing his perception about agriculture in the semi-arid tropics

Mr Sharanappa Haralad, Thummaragudi VPO, Yalabutga Taluk, Bidar District, Karnataka.

Micronutrient application has benefitted many farmers' during Bhoochetana project.

Farming is the main source of livelihood for Mr Sharanappa Haralad who is 60 years old and has to support the ten members in his family. He cultivates different maize crops in his six acre farm. Due to fast increasing costs of inputs, energy and labor and stagnating or even declining crop response to the inputs, he was not happy with the state of affairs before the Bhoochetana initiative, which entirely changed his perspective.

During the rainy season of 2011, Mr Sharanappa Haralad associated with Bhoochetana, and volunteered to participate in an on-farm research project to follow soil test-based nutrient management in a three acre maize plot (improved management), and follow his traditional practice (farmers' practice) in another three acre maize plot for comparison. As advised by experts from ICRISAT/the Depratment of Agriculture, he added deficient secondary and micronutrients like sulphur (through gypsum), boron (through borax) and zinc (through zinc sulfate) in the improved management plot in addition to the nutrients nitrogen (through urea and DAP), phosphorus (through DAP) and potassium (through MOP) just as in the farmer's practice plot. The science-led approach involves provision of adequate and proportionate inputs of nutrients to plants to ensure normal metabolic function and that in turn supports good crop growth and yield. While the science-led management practice advocated the provision of additional nutrients, all the other agronomic practices remained the same as in the farmer's practice. The maize crop under both the practices was sown on 4 July 2011 and harvested on 20 October 2011.

Mr Sharanappa Haralad got additional inputs like secondary and micronutrients from the Department of Agriculture (DoA) at 50% subsidy. These inputs are being promoted under Bhoochetana and converged schemes to bring in the sustainable use of natural resources to improve farm based livelihoods. He had to incur an additional cost of around ₹ 500 per acre on these inputs. As such, he incurred a total expenditure of ₹ 6,500 per acre in the farmer's practice plot. In the improved management plot, he incurred a total expenditure of ₹ 7,000 per acre due to various inputs and the farm operations of land preparation, sowing, interculture, weeding, harvesting/ picking, manual threshing and transport. The farmer himself was surprised by the 31% higher yields which came as a result of science-led farming. The yield per acre grew from 1,525 kg under farmers' practice to 2,000 kg. Mr Sharanappa sold his produce at a farm gate price of ₹10.2 per kg and therefore got additional net returns of about ₹4,345 per acre during the rainy season of 2011. With the significant additional income he was able to purchase a new house. A science-led approach in the Bhoochetana mission also revealed the potential to further enhance his income by following a similar strategy in the remaining three acres of his land. The farmer's perception expressed in his own words is that main reason for his adopting improved practices with successful results was the awareness created by farm facilitators and the staff of ICRISAT/the Department of Agriculture supported by media publicity for the Bhoochetana mission. The success through science-led farming under Bhoochetana has completely changed his thinking about agriculture and filled him with an enthusiasm to move forward.

50 Gouramma gets more benefits from sorghum with improved practice

Smt Gouramma S, Sonna Village, Hagaribommanahalli Taluk, Bellary District, Karnataka.

Smt Gouramma happily demonstrating her sorghum heads during the rainy season of 2011.

Smt Gouramma, a farmer who is 50 years old is always looking out for ways to improve her farming and increase her income to support the six members in her family. She cultivates sorghum crop in her three acre farm. Due to fast increasing costs of inputs, energy and labor and stagnating or even declining crop response to the inputs, she was not happy with the state of affairs until she learned about the Bhoochetana initiative, which completely changed her perspective.

During the rainy season of 2011, Smt Gouramma associated with Bhoochetana, and volunteered to participate in an on-farm research project to follow soil test based-nutrient management in one acre with *kharif* sorghum (improved management), and continue with her traditional practice (farmers' practice) in another one acre with sorghum crop for comparison. As advised by experts from ICRISAT/the Department of Agriculture, she added deficient secondary and micronutrients like sulphur (through gypsum), boron (through borax) and zinc (through zinc sulfate) in the improved management plot in addition to the nutrients nitrogen (through urea and DAP), phosphorus (through DAP) and potassium (through MOP) just as in the farmers' practice plot. The science-led approach involves provision of adequate and proportionate inputs of nutrients to plants to ensure normal metabolic function and that in turn supports good crop growth and yield. She also applied trichoderma @ 200 g per acre and VAM (vesicular arbuscular *mycorrhizae*) @ 200 g per acre in the improved management plot through seed treatment. Trichoderma is recommended to provide resistance against fungal infections and shocks during early plant growth. VAM is a fungus which inhabits plant roots and protruding fungal hyphae and acts as a nutrient mobilizer/solubilizer and thus enhances nutrient availability and uptake for plant growth and yield. While the science-led management practice advocated the provision of additional nutrients, all the other agronomic practices remained the same as in the farmers' practice. The sorghum crop under both the practices was sown on 15 June 2011 and harvested on 18 September 2011.

Smt Gouramma got additional inputs like secondary and micronutrients, trichoderma and VAM from the Department of Agriculture (DoA) at 50% subsidy. These inputs are being promoted

under Bhoochetana and converged schemes to bring in the sustainable use of natural resources to improve farm based livelihoods. Smt Gouramma had to incur an additional cost of around ₹500 per acre on these inputs. As such, she incurred a total expenditure of ₹5,800 per acre in the farmers' practice plot. In the improved management plot she incurred a total expenditure of ₹6,300 per acre due to various inputs and the farm operations of land preparation, sowing, interculture, weeding, harvesting, threshing and transport. The science-led farming resulted in 32% higher yields. The yield per acre grew from 1,664 kg under famers' practice to 2,192 kg. She sold her produce at a farm gate price of ₹10 per kg and therefore got additional net returns of about ₹4,780 per acre. The Bhoochetana technologies have encouraged her to take farming more seriously and now she has decided to follow the Bhoochetana technologies in her entire farm to boost her off-farm income. The additional income from the science-led approach in the Bhoochetana mission helped her clear her bank loan, and she also had the money required to educate her children and to meet social needs. For her it showed a way forward to increase production for improved financial status and a better livelihood.

51 Best practices in sunflower increase yield by 50%

Mr Poojari Nagaraj, s/o Mr Devappa, Havinal Village, Havinal VPO, Siruguppa Taluk, Bellary District, Karnataka.

Mr Poojari Nagaraj in his improved management sunflower field during the rainy season of 2011.

Mr Poojari Nagaraj is a farmer who is 28 years old. Farming is the main source of livelihood for Mr Poojari Nagaraj who has to support the eight members in his family. He cultivated sunflower crop in his five acre farm. He was really not happy with farming on account of fast increasing costs of inputs, energy and labor and stagnating or even declining crop response to the inputs. The mission mode Bhoochetana initiative at this juncture showed him a new ray of hope in farming.

During the rainy season of 2011-12, Mr Poojari Nagaraj associated with Bhoochetana, and volunteered to participate in an on-farm research project to follow soil test-based nutrient management in a one acre sunflower plot (improved management), and follow his traditional practice (farmers' practice) in the remaining four acres of his land with sunflower for comparison. As advised by experts from ICRISAT/the Department of Agriculture, he added deficient secondary and micronutrients like sulphur (through gypsum), boron (through borax) and zinc (through zinc sulfate) in the improved management plot in addition to the nutrients nitrogen (through urea and DAP), phosphorus (through DAP) and potassium (through MOP) just as in the farmers' practice plot. The science-led approach involves provision of adequate and proportionate inputs of nutrients to plants to ensure normal metabolic function and that in turn supports good crop growth and yield. He also applied trichoderma and VAM (vesicular arbuscular *mycorrhizae*) in the improved management plot through seed treatment. Trichoderma is recommended to provide resistance against fungal infections and shocks during early plant growth. VAM is a fungus which inhabits plant roots and protruding fungal hyphae and acts as a nutrient mobilizer/solubilizer and thus enhances nutrient availability and uptake for plant growth and yield. While the science-led management practice advocated the provision of additional nutrients, all the other agronomic practices remained the same as in the farmers' practice. The sunflower crop under both the practices was sown on 4 June 2011 and harvested on 15 September 2011.

Mr Poojari Nagaraj got additional inputs like secondary and micronutrients, trichoderma and VAM from the Department of Agriculture (DoA) at 50% subsidy. These inputs are being promoted under Bhoochetana and converged schemes to bring in the sustainable use of natural resources to improve farm based livelihoods. The farmer had to incur an additional cost of around ₹800 per acre on these inputs. As such he incurred a total expenditure of ₹5,200 per acre in the farmers' practice plot. In the improved management plot he incurred a total expenditure of ₹6,000 per acre due to various inputs and the farm operations of land preparation, sowing, interculture, weeding, harvesting, threshing and transport. He was surprised on getting 50% higher yields with improved management practice. The yield per acre grew from 300 kg under farmers' practice to 450 kg.

He sold his produce at a farm gate price of ₹29.5 per kg and therefore got additional net returns of about ₹3,625 per acre during the rainy season of 2011. The unexpected increase in income made it possible for him to spend comfortably on his childrens' education. A science-led approach in the Bhoochetana mission not only brought in a smile on his face, but also revealed the potential to further enhance his income by following a similar strategy in the remaining five acres of his land. The farmer's perception expressed in his own words is that the main reason for his adopting improved practices with successful results was the awareness created by farm facilitators, and the staff of ICRISAT/the Department of Agriculture supported by media publicity for the Bhoochetana mission. He sees the far better benefit to cost ratio as a motivating force to adopt the Bhoochetana practice in his entire farm in the future.

52 Small investments on micronutrients in paddy gets big returns for Sumitra

Smt Sumitra Nayak, w/o Mr Ramakrishna Nayak, Shirva Village, Udupi Taluk, Udupi District, Karnataka.

Effects of improved management on paddy yield in Smt Sumitra Nayak's field, in the rainy season of 2011.

This is the story of Smt Sumitra Nayak who is 53 years old and has studied up to the seventh standard. Farming is the major source of livelihood for Smt Sumitra Nayak who has 3.2 acres of dryland and has to support the four members in her family. Due to the fast increasing costs of inputs, energy and labor and only stagnating or even declining crop response to the inputs, income from farming supported only a subsistence level existence for the family. The mission mode Bhoochetana initiative at this juncture showed her a new ray of hope in farming.

During 2011, Smt Sumitra Nayak got associated with Bhoochetana, and volunteered to participate in an on-farm research project to follow soil test-based nutrient management in a one acre paddy plot (improved management), and follow her traditional practice (farmers practice) in a 2.2 acre paddy plot for comparison. As advised by experts from ICRISAT/ the Department of Agriculture, she added deficient secondary and micronutrients like sulphur (through gypsum), boron (through borax) and zinc (through zinc sulfate) in the improved management plot in addition to 50 kg Suffala complex (15:15:15) as basal application and 40 kg urea which she applied twice as top dressing. She applied the same dose of NPK inputs as in the farmers' practice plot. The science-led approach involves provision of adequate and proportionate inputs of nutrients to plants to ensure normal metabolic function and that in turn supports good crop growth and yield. While the science-led management practice advocated the provision of additional nutrients, all the other agronomic practices remained the same as in the farmers' practice. The paddy crop under both the practices was sown on 19 May 2011 and harvested on 30 September 2011.

Smt Sumitra Nayak got additional inputs like secondary and micronutrients from the Department of Agriculture (DoA) at 50% subsidy. These inputs are being promoted under Bhoochetana and converged schemes to bring in the sustainable use of natural resources to improve farm based livelihoods. Smt Sumitra Nayak had to incur an additional cost of around ₹ 480 per acre on these inputs. As such she incurred a total expenditure of ₹ 13,320 per acre in the farmers' practice plot. In

the improved management plot she incurred a total expenditure of ₹13,800 per acre due to various inputs and the farm operations of land preparation, transplanting, weeding, pesticides, harvesting, threshing and transport. The farmer herself was surprised on getting 36% higher yields which came as a result of science-led farming. The yield per acre grew from 1,650 kg with the farmers' practice to 2,250 kg. She sold her produce at a farm gate price of ₹13 per kg and therefore got additional net returns of about ₹7,320 per acre. During the rainy season of 2011, a science-led approach in the Bhoochetana mission revealed the potential to further enhance her income by following a similar strategy in the rest of her land. Now she is a satisfied person with a changed outlook towards agriculture. She is also working now as a farm facilitator to encourage other farmers to adopt the science-led strategy in farming to increase productivity and farm incomes.

53 Applying deficient micronutrients for macro benefits

Mr Bhaskar Shetty, s/o Mr Vittal Shetty, Manuru Village, Udupi Taluk, Udupi District, Karnataka.

Mr Bhaskar Shetty's paddy field during the rainy season of 2011.

This is the story of Mr Bhaskar Shetty, who is 48 years old and is a B Com graduate. Even though he is a graduate he is very interested in the advances in farming. He has six members in his family and has three acres of land. Due to fast increasing costs of inputs, energy and labor and only stagnating or even declining crop response to the inputs, income from farming supported only a subsistence level existence for the family. The mission mode Bhoochetana initiative at this juncture showed him a new ray of hope in farming.

During 2011, Mr Bhaskar Shetty associated with Bhoochetana, and volunteered to participate in an on-farm research project to follow soil test-based nutrient management in a one acre paddy plot (improved management), and follow his traditional practice (farmers' practice) in another one acre paddy plot for comparison. As advised by experts from ICRISAT/the Department of Agriculture, he added deficient secondary and micronutrients like lime, boron (through borax) and zinc (through zinc sulfate) in the improved management plot in addition to 50 kg Suffala complex (15:15:15) as basal application and 40 kg urea which he applied twice as top dressing. He applied the same dose of NPK inputs as in the farmers' practice plot. The science-led approach involves provision of adequate and proportionate inputs of nutrients to plants to ensure normal metabolic function and that in turn supports good crop growth and yield. While the science-led management practice advocated the provision of additional nutrients, all the other agronomic practices remained the same as in the farmers' practice. The paddy crop under both the practices was sown on 1 June 2011 and harvested on 13 October 2011.

Mr Bhaskar Shetty got additional inputs like secondary and micronutrients from the Department of Agriculture (DoA) at 50% subsidy. These inputs are being promoted under Bhoochetana and converged schemes to bring in the sustainable use of natural resources to improve farm based livelihoods. Mr Bhaskar Shetty had to incur an additional cost of around ₹ 500 per acre on these

inputs. As such, he incurred a total expenditure of ₹13,350 per acre in the farmers' practice plot. In the improved management plot he incurred a total expenditure of ₹13,850 per acre due to various inputs and the farm operations of land preparation, transplanting, weeding, pesticides, harvesting, threshing and transport. The farmer himself was surprised on getting 21% higher yields which came as a result of science-led farming. The yield per acre grew from 3,175 kg under farmers' practice to 3,850 kg. He sold his produce at a farm gate price of ₹9.5 per kg and therefore got additional net returns of about ₹5,912 per acre. During the rainy season of 2011, a science-led approach in the Bhoochetana mission revealed the potential to further enhance his income by following a similar strategy in the rest of his land. Now Mr Bhaskar Shetty is a satisfied person with a changed outlook towards agriculture. He is also working now as a farm facilitator to encourage other farmers to adopt the science-led strategy in farming to increase productivity and farm incomes.

54 Soil test based micronutrients addition for bridging yield gap

Mr Krishnegowda, s/o Mr Kalegowda, Gonibeedu Village, Mudgere Taluk, Chikkamagalur District, Karnataka.

Paddy in farmer's field after implementation of improved practises

Mr KG Krishnegowda, s/o Mr Kalegowda, is a famer who has actively participated in the Bhoochetana program. There are five members in his family and he has four acres of agricultural land which is his main source of livelihood. He has grown paddy crop and utilized micronutrient inputs such as lime, zinc sulfate and borax as well as green manure seeds which he procured from the Department of Agriculture at subsidized rates.

The traditional practice of growing paddy using only FYM and NPK (DAP + Urea) as nutrients is the usual practice. He applied the micronutrients lime, zinc sulfate and borax in addition to FYM, DAP and urea as a balanced nutrient application based on the soil test recommendation of the Department of Agriculture, as an improved practice. He has grown paddy crop with traditional and improved nutrient management practice, each on an area of one acre during the rainy season of 2012. He transplanted the paddy crop on 20 June 2012 and harvested it on 18 October 2012 in both the practices. All normal agronomic operations starting from land preparation and right up to harvest were carried out in both the practices.

Mr Krishnegowda got a paddy grain yield of 1,537 kg per acre with the traditional practice and a yield of 1,894 kg per acre with the improved practice. Similarly the fodder yield was 2,770 kg per acre with the traditional practice and 3400 kg per acre with the improved practice. Due to the addition of micronutrients there was an additional yield of 357 kg per acre of paddy grain and 630 kg per acre of fodder. The cost of cultivation was ₹ 9,300 for the traditional practice and ₹ 10,050 for the improved practice. The total income was ₹ 29,828 for the traditional practice and ₹ 36,716 for the improved practice. The net profit was ₹ 20,528 with the traditional practice and ₹ 26,666 with the improved practice.

The overall economic benefit was ₹6,888 higher with the improved practice. The additional cost incurred due to the application of micronutrients was ₹750 and the benefit was ₹6,888. In other words, for every additional rupee spent Mr Krishnegowda got a return of ₹9.18. Thus he got a considerable benefit by adopting a soil test-based nutrient application with which he had a good experience. He is very happy and continues to apply this practice to all his crops. His overall family income has increased and his livelihood has improved. He advises other farmers to adopt this technology to improve the financial status of their families.

Compiled by KH Anantha

55 Big returns for money spent on improved agricultural practices

Mr Ravindra Appa Balikai, r/o Hebbal, Hukkeri Tq, Belgaum dictrict, Karnataka.

Soyabean crop in Ravindra Appa Balikai's field.

Mr Ravindra Appa Balikai adopted balanced nutrient application under the Bhoochetana project. His land has black soil and he grows maize and soybean in the rainy season. During the winter he grows wheat and chickpea crop. He has seven acres of land and eight members in his family.

During the rainy season of 2012-13 he had grown soybean crop in one acre with his traditional practice to which he applied DAP + urea. He also cultivated another one acre with soybean as an improved Bhoochetana plot to which he added the micronutrients gypsum (100 kg) + zinc sulfate (5 kg) + borax (2 kg) as well as DAP + urea and Farmyard Manure (FYM) according to soil test-based nutrient recommendation. He got a yield of 820 kg per acre with his traditional method and a yield of 1,050 kg per acre with the improved practice of Bhoochetana. The additional yield of 230 kg per acre with the improved practice fetched him an additional net profit of ₹6,400. The soybean grown in both the traditional and Bhoochetana plots was JS-335 which was recommended by the Department of Agriculture. Appropriate seed treatment was done before sowing. Biofertilizer and biopesticides like PSB 2 kg and trichoderma 2 kg were mixed with Farm Yield Manure and used for soil application along with 10 kg per acre of zinc sulfate. Sowing was taken up in 30 cm rows at 10 cm seed spacing at 5 cm depth on 25 June 2012. Timely inter cultivation & weeding was done in both plots. Harvesting was taken up on 10 October 2012 with proper CCE methodology. The yield data was recorded and is tabulated in the table below.

Sl no	Particulars	Bhoochetana Plot	Farmers' Practice
1	Grains yield (kg)	1050	820
2	Income from grains @ 30 per kg (Rs)	31500	24600
3	Total input cost /Acre (Rs)	4700	4200
4	Net income (Rs)	26800	20400
5	Cost benefit ratio	1:5.7	1:4.86
6	Net Income with additional cost over traditional practice for every one Rupee spent (Rs)	12.8	-

It is very clear from the above that the inputs supplied ie, biofertilizers, biopesticides & micronutrients under the Boochetana program helped in enhancing the soil fertility to increase crop yield. Sri Ravindhra Appa Balikai is very happy with the results he got and the additional income. He is also very appreciative of the Bhoochetana program in which the facility extended by the Government on micronutrients and biofertilizers is really helpful for improving soil fertility. He got ₹12.8 for every additional rupee he had spent on the input cost of micronutrients, biofertilizers and biopesticides. He said this program has improved their family income with just a small additional input cost. He said all farmers should use the inputs supplied under this program and benefit from it.

56 Improved farming practices for better livelihoods

Mr Shenkarappa, s/o Mr Guthiyanna, Harambali, Talale Post, Hosanagara Taluk, Shivamogga District, Karnataka.

Maize crop in Shenkarappa's field after implementation of Bhoochetana technology.

Mr Shenkarappa has been actively participating in the Bhoochetana program. He has six members in his family and has three acres of agriculture land which is his main source of livelihood. He has grown maize crop and utilized micronutrient inputs such as lime, zinc sulfate and borax and green manure seeds which he got from the Department of Agriculture at subsidized rates.

The traditional practice of growing paddy using only FYM and NPK (DAP + urea) as nutrients is the usual practice. He applied the micronutrients lime, zinc sulfate and borax in addition to FYM, DAP and urea as balanced nutrient inputs based on the soil test recommendation of the Department of Agriculture, as an improved practice. He has grown maize crop with both traditional and improved nutrient management practices each on an area of one acre during the rainy season of 2012. He planted the maize crop on 15 June 2012 and harvested it on 01 October 2012 in both the practices. All normal agronomic operations, right from land preparation to harvest were carried out in both the practices.

He got a maize grain yield of 1,300 kg per acre with the traditional practice and a yield of 2,200 kg per acre with the improved practice. Due to the addition of micronutrients there was an additional yield of 900 kg per acre of maize grain. The cost of cultivation was ₹13,000 for the traditional practice and ₹14,000 for the improved practice. The total income was ₹15,600 from the traditional practice and ₹24,600 from the improved practice. The net profit was ₹2,600 with the traditional practice and ₹10,600 with the improved practice.

The overall economic benefit was ₹8,000 with the improved practice. The additional cost incurred for micronutrients was ₹1,000 and the benefit was ₹8,000 which translates to a return of ₹8 for every additional rupee spent. He got this considerable benefit by adopting a soil test-based nutrient application with which he has had a good experience. He is happy and continues to use this practice for all his crops. His overall family income has increased and his livelihood has improved. He has used his additional income to repair the house for his family.

57 Balanced fertilization help gain higher grain, straw yields and income

Mr Nanjappa, s/o Mr Byrasiddappa, Lakkavalli Hobli, Tarikere Taluk, Chikkamagalur District, Karnataka.

Micronutrient application in paddy field has increased yield for Mr Nanjappa.

Mr Nanjappa has actively participated in the Bhoochetana program. There are six members in his family and he has six acres of agricultural land which is his main source of livelihood. He has grown paddy crop and has utilized micronutrient inputs such as lime, zinc sulfate and borax and green manure seeds which he got from the Department of Agriculture at subsidized rates.

The traditional practice of growing paddy using only FYM, NPK (DAP + urea) as nutrients is the usual practice. He applied micronutrients such as lime, zinc sulfate and borax in addition to FYM, DAP and urea as balanced nutrient inputs based on the soil test recommendation of the Department of Agriculture as an improved practice. He has grown paddy crop both with traditional and improved nutrient management practice each on an area of one acre during the rainy season of 2012. He transplanted the paddy crop on 15 June 2012 and harvested it on 05 October 2012 in both the practices. All normal agronomic operations right from land preparation to harvest were carried out in both the practices.

Mr Nanjappa got a paddy grain yield of 1,315 kg per acre with the traditional practice and 1,840 kg per acre with the improved practice. Similarly the fodder yield was 2,630 kg per acre for the traditional practice and 3,300 kg per acre for the improved practice. Due to the addition of micronutrients there was an additional yield of 535 kg per acre of paddy grain and 670 kg per acre of fodder. The cost of cultivation was ₹9,000 with the traditional practice and ₹10,200 with the improved practice. The total income was ₹26,300 with the traditional practice and ₹35,660 with the improved practice. The net profit was ₹17,300 for the traditional practice and ₹25,460 for the improved practice.

The overall economic benefit was ₹8,160 in the improved practice. The additional cost incurred for micronutrient application was ₹1,200 and the benefit was ₹8,160 which translates to a return of ₹6.00 for every additional rupee spent. Mr Nanjappa got this considerable benefit by adopting a soil test-based nutrient application with which he had a good experience. He is happy and continues to apply this practice for all his crops.

Mr Nanjappa overall family income increased has and his livelihood has improved. He advises other farmers to adopt this technology to improve their financial status.

Compiled by KH Anantha

58 Increased family income with minimal investments due to improved practices

Mr Mallapa Shankar Bagi, Kerur Village, Chikodi Taluk, Belgaum district, Karnataka.

Balanced nutrient application helps increase maize yields.

Mr Mallapa Shankar Bagi is a progressive farmer who has adopted balanced nutrient application under the Bhoochetana project. His land is cultivated with the help of canal irrigation from the Gaaprabha river project. His land has black soil and he grows maize, soybean and sugarcane during the rainy season. During the winter he grows wheat and chickpea crop.

During the rainy season of 2012-13 he had grown maize crop in one acre with his traditional practice where he had applied NPK + FYM. He also grew maize on another one acre plot with the addition of micronutrients (gypsum + zinc sulfate + borax + ferrous sulfate) as an improved Bhoochetana plot. To the improved plot he applied NPK and FYM in addition to following the soil test-based nutrient recommendation. He got a yield of 2,315 kg per acre with his traditional method and a yield of 3,150 kg per acre with the improved practice of Bhoochetana. This corresponded to an additional yield of 835 kg per acre compared to that from the traditional practice. The maize hybrid grown in both the traditional and Bhoochetana plots was CP-818 and was recommended by the Department of Agriculture. Appropriate seed treatment was carried out before sowing. Also biofertilizer & biopesticides like *Azospirillum* - 2 kg, PSB 2 kg, VAM - 2 kg and trichoderma - 2 kg were mixed with FYM and used for soil application along with zinc sulfate - 10 kg and ferrous sulfate - 10 kg per acre. Sowing was taken up in 60 cm rows at 20 cm seed spacing and at 5 cm depth on 28 July 2012. Timely inter-cultivation and weeding was done in both plots. Harvesting was taken up on 4 November 2012 with proper CCE methodology. The yield data was recorded and has been tabulated in the table below.

Sl.no	Particulars	Bhoochetana Plot	Farmers' Practice
1	Yield per acre		
	1) Grains (kg)	3150	2135
	2) straw, ton	2.9	2.6
2	income /acre		
	1) Grains (13 ₹kg^{-1})	40950	30095
	2) Straw (5 ₹kg^{-1})	14500	13000
	Total income Rs	55450	43095
3	Total expenditure /Acre Rs	18680	15740
4	Net income Rs	36770	27355
5	Cost benefit ratio	1:2.97	1:2.74
6	Net Income with additional cost over traditional practice for every one Rupee	₹3.20	-

It is very clear from the above that the inputs supplied under the Boochetana program ie, biofertilizers, biopesticides and micronutrients have helped in enhancing the fertility of the soil to increase crop yield. Sri Mallapa Shankar Bagi is very happy with the results he got and the additional income. He is also appreciative of the Bhoochetana program in which the facility extended by the Government on micronutrients and biofertilizers is really helpful for improving soil fertility. He got ₹3.20 for every additional rupee he spent on the input cost of micronutrients, biofertilizers and biopesticides. He said this program has improved their family income with just a small additional input cost. He said all farmers should use the inputs supplied under this program and benefit from it.

59 Soil fertility management for higher productivity and economic benefits

Mr Nagendra Mani, s/o Mr Narayana Rao, Togare Village, Nagara Kodage Post, Hosanagara Taluk, Shivamogga district, Karnataka.

Farmers' field day under Bhoochetana program.

Mr Nagendra Mani has actively participated in the Bhoochetana program. He has 12 members in his family and has five acres of horticulture land and three acres of agricultural land. He has grown hybrid paddy crop and utilized micronutrient inputs such as lime, zinc sulfate and borax and green manure seeds which he procured from the Department of Agriculture at subsidized rates.

The traditional practice of growing hybrid paddy using only FYM and NPK (DAP + urea) as nutrients is the usual practice. Mr Nagendra Mani applied micronutrients such as lime, zinc sulfate and borax in addition to FYM, DAP and urea as balanced nutrient inputs based on the soil test recommendation of the Department of Agriculture, as an improved practice. He has grown hybrid paddy crop with both traditional and improved nutrient management practice each on an area of one acre during the rainy season of 2012. He transplanted the paddy crop on 29 August 2012 and harvested it on 8 December 2012 in both the practices. The normal operations right from land preparation to harvest were carried out in both the practices.

Mr Nagendra Mani got a paddy grain yield of 1,800 kg per acre with the traditional practice and a yield of 2,400 kg per acre with the improved practice. Similarly the fodder yield was 3,070 kg per acre with the traditional and 3,950 kg per acre with the improved practice. Due to the addition of micronutrients there was an additional yield of 600 kg per acre of paddy grain and 630 kg per acre of fodder. The cost of cultivation was ₹12,000 for the traditional practice and ₹13,200 for the improved practice. The total income was ₹32,610 with the traditional practice and ₹43,050 with the improved practice. The net profit was ₹20,610 for the traditional and ₹29,850 for the improved practice.

The overall economic benefit was ₹9,240 with the improved practice. The additional cost incurred due to the application of micronutrients was ₹1,320 and the benefit was ₹6,888 which is a return of ₹7.0 for every additional rupee spent. Mr Nagendra Mani got this considerable benefit by adopting a soil test-based nutrient application with which he has had a good experience. He is happy and is continuing with the practice for all his crops. His overall family income has increased and his livelihood has improved. He advises other farmers to adopt this technology to improve their financial status.

60 Macro benefits with micronutrients

Mr Mallappa, s/o Mr Narsappa, Kallur Village, Manvi Taluk, Raichur District, Karnataka.

Cotton picking by farmers' after implementation of Bhoochetana technology.

Mr Mallappa is a small farmer who has adopted balanced nutrient application under the Bhoochetana project. His land has black soil and he grows cotton, pigeonpea, sorghum and groundnut during the rainy season. During the winter he grows *rabi* sorghum and chickpea crop.

During the rainy season of 2012-13 he had grown cotton crop in one acre with his traditional practice where he applied DAP + urea. He also grew cotton in another one acre plot with the addition of micronutrients (gypsum+ zinc sulfate + borax) along with DAP + urea following soil test-based nutrient recommendation as an improved Bhoochetana plot. He got a cotton yield of 800 kg per acre with his traditional method and a yield of 1,120 kg per acre with the improved practice of Bhoochetana ie, an additional yield of 300 kg per acre. The cotton was grown as recommended by the Department of Agriculture in both the traditional and Bhoochetana plots. Appropriate seed treatment was done before sowing the seeds. Biofertilizer PSB - 2 kg and trichoderma - 2 kg were mixed with FYM and used for soil application along with zinc sulfate - 5 kg, borax - 2 kg and gypsum - 80 kg per acre. Sowing was taken up in 75 cm rows at 45 cm seed spacing at 5 cm depth on 2 July 2012. Timely inter cultivation and weeding was done in both plots. The harvesting was taken up on 20 November 2012 with proper CCE methodology. The yield data was recorded and tabulated in the table below.

Sl.no	Particulars	Bhoochetana Plot	Farmers' Practice
1	Yield per acre, Cotton Yield (kg)	900	1200
2	income /acre	25200	33600
3	Total expenditure/acre Rs	8680	9740
4	Net income Rs	24320	33460
5	Cost benefit ratio	1:2.81	1:3.44
6	Net Income with additional cost over traditional practice for every one Rupee	8.62	-

It is very clear from the above that the inputs supplied under the Bhoochetana program ie, biofertilizers, biopesticides and micronutrients helped in enhancing the fertility to increase the crop yield. Sri Mallappa is very happy with the results he got and the additional income. He is also very appreciative of the Bhoochetana program in which the facility extended by the Government on micronutrients and biofertilizers is really helpful for improving soil fertility. He got ₹8.62 for every additional rupee that he spent on the input cost of micronutrients and biofertilizers. He said this program has improved their family income with just a small additional input cost. He has paid his loans with the additional income and learned the importance of soil test-based nutrient application.

Balanced Nutrient Management

Soil fertility degradation is one of the major stumbling blocks for realization of potential yields. Soil mapping of farmers' fields has indicated widespread deficiencies of micro and secondary nutrients along with primary nutrients. Considering the potential of enhancing yields and linking farmers with markets, soil nutrient management is adopted as an entry level activity under the Bhoochetana program.

Under this activity secondary and micro nutrients along with primary nutrients are included in fertilizer recommendations. The inputs required are made available at the village at 50% incentive. This activity witnessed huge benefits to farmers and some of the success stories are compiled for various cereals, pulses and oilseed crops.

61 Bhoochetana helps farmer understand the benefits of micronutrients.

Location- Melkunda, Gulbarga District, Karnataka.

A farmer in his field showing the Bhoochetana plot.

Introduction

The Green Revolution in India changed the entire scenario of agriculture in the country. Now Indian agriculture largely depends on chemical fertilizers, but not in a balanced way. With the change in production practices, animal rearing has decreased and thus organic manure is not available to meet the demands of crop production.

The soils in Gulbarga district are deficient in micronutrients like boron, zinc, sulphur and phosphorus. Officials from the Department of Agriculture were concerned about the adoption of micronutrient application by farmers.

Why balanced nutrition?

Soil deficiency of various nutrients is the major problem in the cluster of villages. In the northern Karnataka region, soils are deficient in sulphur, zinc, phosphorus and boron and without addressing these deficiencies it is very difficult to improve production.

Conducting representative soil analysis

Soils are sampled to determine their physical conditions, fertility status, and chemical properties that affect their suitability as plant growing media. After analysis of the soil, the soil status is ascertained and the dose of fertilizer that has to be applied is determined. Following soil analysis, deficiencies of micro and secondary nutrients were observed and that necessitated the applications of zinc sulfate, borax and gypsum (as a source of S).

How the technology reached the village

Incentivized micro and secondary nutrient fertilizers were provided to the farmers for a demo-plot to be cultivated against a control plot for comparison. The plots in which micronutrients were

applied got higher yields compared to the farmers' practice plots. The technology of micronutrient application is being gradually upscaled through the network of farm facilitators, ICRISAT and RSK.

Visit to pigeon pea field in Melkunda.

Major issues of micronutrient application

- Poor awareness, which is common across the area, is the major issue that needs to be overcome to promote balanced application and adoption of micronutrients.
- There is a lack of awareness about soil testing. Thus the farmers do not know what the deficiency is and how to address it.
- There is no proper demonstration of improved technology in this area. Therefore there is a need for extension officials to conduct demonstrations on a large scale for cost-effectiveness and easy adoption by all categories of farmers.
- There is no follow-up mechanism to get feedback from farmers on their problems.

Technical inputs from officers helped farmers' during Bhoochetana project.

Results

Ever since demo-plots were initiated in farmers' fields in this area, farmers have been very keen to use micronutrients like gypsum, boron and zinc. Farmers are able to get the micronutrients in time through the Bhoochetana initiative and are now getting higher yields (670 kg/acre in the traditional vs 980 kg/acre in the demo plot). After seeing the yield difference beween demo-plots and farmers' practice plots, farmers are convinced about the use of micronutrients. However working only with the large scale farmers will not serve the purpose. There is a need to involve the small and marginal farmers in these villages. Adoption of micronutrients on a large scale needs strategic long-term planning.

Farmer's view

The farmer has expressed his happiness to shift from his traditional practice of pigeonpea cultivation to the Bhoochetana practice of cultivation. He also feels that the technical inputs received through this project helped enhance his knowledge about enriching soil fertility and obtaining maximum benefit. He got an additional income of ₹9,000 from the pigeonpea crop. The farmer says that soil testing and applying the recommended dose of micronutrients were playing a major role in upgrading the soil condition for better plant growth and yield.

62 Use of micronutrients is the best method to get higher yields, says farmer.

Location - Halliasagar, Yadgir District, Karnataka

A farmer in his field showing the Bhoochetana plot yield.

Introduction

Maintaining soil health by using better farming systems is fundamental to sustainable agriculture. Better nutrient management is still not being practiced and is not widely known to farmers. The concept of productivity enhancement is closely linked with better nutrient management especially, the use of micronutrients, and is the key for good production.

Settlement in the village

Halliasagar is small village in Yadgir District. The soil is a deep black clayey type of soil and the average annual rainfall in this area is 835 mm/year. Agriculture is the major occupation of the farmer and he also works as a daily wage laborer. The major crops in this area are pigeonpea, paddy and cotton.

Why balanced nutrition?

Nutrient analysis is an important first step to improve soil health. To understand the soil health condition, soil testing was conducted for this region and this village. On analysis, soils were found to be acidic in nature and deficient in boron and zinc. Increased use of chemical fertilizers as a source of major nutrients, combined with the declining use of organic sources of nutrients over time has led to a deficiency of micronutrients in the soil. This has resulted in decreasing soil fertility and productivity.

Conducting representative soil analysis

Soils are sampled to determine their physical conditions, fertility status, and chemical properties that affect their suitability as plant growing media. After analysis of the soil, the soil status is ascertained and the dose of fertilizer that needs to be applied is determined. Following soil analysis, deficiencies of micro & secondary nutrients were observed which necessitated the application of zinc sulfate, borax and gypsum (as a source of S).

How the technology reached the village

Incentivized micro and secondary nutrient fertilizers were provided to farmers for a demo-plot to be cutivated against a control plot for comparison. The plots in which micronutrients were applied got higher yields compared to the farmers' practice plots. The technology of micronutrient application is being gradually upscaled through the network of farm facilitators, ICRISAT and RSK.

Increase in cotton yield due to application of micronutrients.

Major issues of micronutrient application

- Poor awareness, which is common across the area, is the major obstacle that needs to be overcome to promote balanced application and adoption of micronutrients.
- There is a lack of awareness about soil testing. Thus the farmers do not know what the deficiency is and how to address it.
- There is no proper demonstration of improved technology in this area. Therefore there is a need for extension officials to conduct demonstrations on a large scale for cost-effectiveness and easy adoption by all categories of farmers.
- There is no follow-up mechanism to get feedback from farmers on their problems.

Results

Ever since demo-plots were initiated in farmers' fields in this area, farmers have been very keen to use micronutrient inputs like gypsum, borax and zinc sulfate. Farmers get the micronutrients in time through the Bhoochetana initiative and are now getting higher yields (1,500 kg/acre with traditional practice vs 2,000 kg/acre in the demo plot). After seeing the yield difference between demo-plots and plots under farmers' practice, farmers are convinced about the use of micronutrients. Working only with the large scale farmers will not serve the purpose. There is a need to involve small and marginal farmers in these villages. Adoption of micronutrients on a large scale needs strategic long-term planning.

Farmer's view

The farmer has expressed his happiness to shift from his traditional practice of cotton cultivation to the Bhoochetana practice of cultivation. He also feels that the technical inputs received through this project enhanced his knowledge about enriching soil fertility and obtaining maximum benefit. He got an additional income of ₹6,000 per acre for the cotton crop. The farmer says that soil testing and applying the recommended dose of micronutrients played a major role in upgrading the soil condition for better plant growth and yield. His yield from the Bhoochtana plot has increased by 21 per cent as compared to yield from the non Bhoochetana plot.

63 Mrs. Sannamma gets higher returns in ragi through balanced nutrient management

Mrs. Sannamma, Bidarahalli Village, HD Kote Taluk, Mysore District, Karnataka.

Balanced nutrition management helped Mrs Sannamma to increase ragi yield.

Mrs. Sannamma who practices rainfed farming associated with Bhoochetana during the rainy season of 2011 and followed the recommended improved management in ragi. The crop was sown on 20 July 2011. The soil test recommended gypsum, zinc sulfate and borax; vermicompost was added in addition. An adjoining control ragi plot with traditional farmers' practice without the addition of gypsum, zinc sulfate, borax and vermicompost was also maintained. The crop was harvested on 13 Dec 2011. The plot with the improved practice recorded a yield of 14.5 q/per acre as against the yield of 12 q/per acre which she got from the plot under farmers' practice. An economic analysis showed that improved management brought in an additional cost of about ₹550 on account of gypsum, zinc sulfate and borax. However, the additional returns (₹2,000 per acre) were far higher and justified the adoption of this technology at the farmer's level. Mrs. Sannamma has expressed her happiness over the technology and the benefits she has got from it.

Compiled by Sudi Raghavendra ao and Shivalinga Nayak

64 Soil test based fertilization in maize improves the fortunes of a farmer in Mysore

Mr Raju, s/o Mr Puttappa, Benegal Village, Benegal Post, Piriyapattana Taluk, Mysore district, Karnataka.

Mr Raju, displays his maize crop after using improved practices.

Mr Raju has been actively involved in the Bhoochetana activity which started in Karnataka three years ago. He belongs to the general category and has shown a keen interest in the project. He was convinced that poor fertility status of the soil causes reduction in crop yield and that he will have to do something new to maintain soil fertility and obtain optimum crop yield.

Mr Raju selected maize crop for this novel initiative and purchased the inputs viz., gypsum, zinc sulfate and borax from RSK at Piriyapattana Taluk along with the fertilizers for major nutrients. He applied all the nutrients except urea in balanced form as suggested by the staff of ICRISAT/ the Department of Agriculture before sowing. Urea was top dressed twice at 30 and 50 days after sowing. He took the help of farmer facilitators, staff from the Department of Agriculture viz., agricultural assistant, agriculture officer as well as staff from ICRISAT both based at Hyderabad and in the district, who were visiting the plot periodically and providing the required technical help and inputs. He carefully followed the instructions given by them.

He noticed remarkably good maize crop growth as compared to the last five years' crop and was very sure of getting a good yield. He obtained 19.5 kg per acre of maize yield as against the average yield of 15-16 kg per acre which he had been getting for the last five 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 a 22 per cent increase in crop yield. This translates to a benefit of about ₹3500-4000 per acre.

The farmer has expressed his happiness at receiving technical inputs which have enhanced his knowledge about enriching soil fertility and obtaining maximum benefit with just a small expenditure on deficient nutrients. He is ready to go with the project for the next year as well and is so convinced that is is prepared to purchase the inputs without any subsidy, from RSK situated at the taluk place.

65 Doubling the net returns from rainfed maize with Bhoochetana

Sri K Rangaswamy, Tupakanahalli Village, Kudligi Taluk, Karnataka.

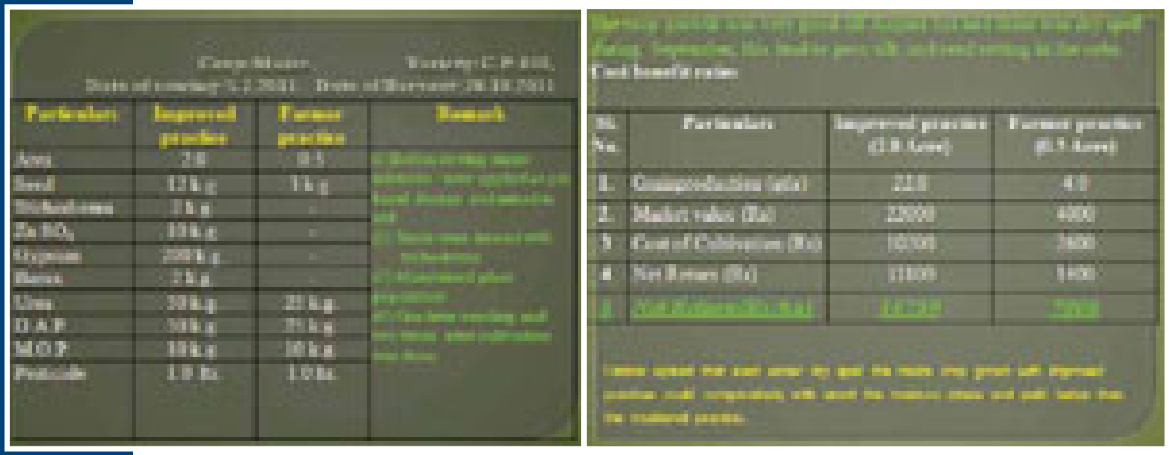


Chart comparing improved practice over farmer's practice for maize crop.

Sri K Rangaswamy is a small farmer who has 2.5 acres of dryland on which he grows maize, sunflower and other dryland crops following traditional practices. During *kharif* 2011-12, Sri K Rangaswamy got information about Bhoochetana from a farm facilitator in the district. He decided to test and evaluate the performance of maize crop which he grew as advised by the farm facilitator and made meticulous comparisons with his normal practice. He used the maize cultivar CP 848 and applied the balanced nutrients as advised by the Bhoochetana team consisting of officials from the Department of Agriculture, the farm facilitator and a technician from ICRISAT.

He applied zinc sulfate, 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 in the soil before sowing the crop. In the 0.5 acre plot, which he cultivated as per his normal practice he applied only nitrogen, phosphorus and potash in suboptimal doses. The details of both the plots, one grown with improved management and the other as per his normal practice are given in the Table.

The crop was grown as a rainfed crop and he harvested the crops as advised by the Bhoochetana team and recorded the crop yields in his field.

Mr Rangaswamy was very convinced about the benefits he got from the Bhoochetana program and he was very happy that the net returns from his one ha farm had doubled. He earned ₹11,800 from the two acres of land that he had cultivated with improved practices. He said he had made a mistake by not using the improved practice for the 0.5 acre plot of land as well, as he would have then procured an additional income of ₹1,400. He thanked the Department of Agriculture, Government of Karnataka for a good scheme, which enabled him to double his net profit.

Compiled by G Pardhasaradhi

66 Science-led farming - strengthening agri-based livelihoods

Mr Chikkap Chatrad, Byadagi Village, Byadagi Taluk, Haveri district, Karnataka.

Effects of farmers' practice (left) and improved management (right) on cotton yield in Mr Chikkap Chatrad's field, in the rainy season of 2011.

Farming is the main source of livelihood for Mr Chikkap Chatrad, who has to support the 20 members in his family. He cultivates different crops such as cotton, maize and vegetables in his 17.2 acre farm. Due to fast increasing costs of inputs, energy and labor and stagnating or even declining crop response to the inputs, he was not happy with the state of affairs until he learned about the Bhoochetana initiative which completely changed his perspective.

During the rainy season of 2011, Mr Chikkap Chatrad associated with Bhoochetana, and volunteered to participate in an on-farm research project to follow soil test-based nutrient management in a 5.29 acre cotton plot (improved management), and follow his traditional practice (farmers' practice) in a five acre cotton plot for comparison. As advised by experts from ICRISAT/the Department of Agriculture, he added deficient secondary and micronutrients like sulphur (through gypsum), boron (through borax) and zinc (through zinc sulfate) in the improved management plot in addition to the nutrients nitrogen (through urea and DAP), phosphorus (through DAP) and potassium (through MOP) just as in the farmers' practice plot. The science-led approach involves provision of adequate and proportionate inputs of nutrients to plants to ensure normal metabolic function and that in turn supports good crop growth and yield. While the science-led management practice advocated the provision of additional nutrients, all the other agronomic practices remained the same as in the farmers' practice. The groundnut crop under both the practices was sown on 26 June 2011 and harvested on 18 November 2011.

Mr Chikkap Chatrad got additional inputs like secondary and micronutrients from the Department of Agriculture (DoA) at 50% subsidy. These inputs are being promoted under Bhoochetana and converged schemes to bring in the sustainable use of natural resources to improve farm based livelihoods. The farmer had to incur an additional cost of around ₹1,200 per acre on these inputs. As such he incurred a total expenditure of ₹9,300 per acre in the farmers' practice plot. In the improved management plot he incurred a total expenditure of ₹10,500 per acre due to various inputs and the farm operations of land preparation, sowing, interculture, weeding, harvesting/picking, manual

threshing and transport. The farmer was surprised as he got 50% higher yields which came as a result of science-led farming. The yield per acre grew from 800 kg under farmers' practice to 1,200 kg. He sold his produce at a farm gate price of ₹45 per kg and therefore got additional net returns of about ₹16,800 per acre. During the rainy season of 2011, Mr Chikkap Chatrad realized about ₹89,000 as additional net returns from the 5.29 acre improved management plot. With the significant additional income he was able to purchase a new house. A science-led approach in the Bhoochetana mission also revealed the potential to enhance his income further by following a similar strategy in the remaining 12 acres of his land. Success through science-led farming under Bhoochetana has completely changed his thinking about agriculture and filled him with an enthusiasm to move forward.

67 Balanced plant nutrients in paddy improve a farmer's fortunes

Mr Hanumanthappa, Koppa Village, Halivana PO, HariharaTaluk, Davangere District, Karnataka.

Effects of improved management on paddy yield in Mr .Hanumanthappa's field in the rainy season of 2011.

This is the story of Mr Hanumanthappa, a farmer who is 50 years old. Farming is the main source of livelihood for Mr Hanumanthappa who has to support the 12 members in his family. He cultivates different crops like paddy and maize, in his eight acre farm and has fruit plantations of mango, coconut and areca nut in about 18 acres of land. Due to increasing costs of inputs, energy and labor and stagnating or even declining crop response to the inputs, he was not happy with farming. The Bhoochetana initiative at this juncture was a turning point for him to change his perspective about agriculture.

During the rainy season of 2011, Mr Hanumanthappa associated with Bhoochetana, and volunteered to participate in an on-farm research project to follow soil test-based nutrient management in a two acre paddy plot (Improved management), and follow his traditional practice (farmers' practice) in a three acre paddy plot for comparison. As advised by experts from ICRISAT/the Department of Agriculture, he added deficient secondary and micronutrients like sulphur (through gypsum), boron (through borax) and zinc (through zinc sulfate) in the improved management plot in addition to the nutrients nitrogen (through urea and DAP), phosphorus (through DAP) and potassium (through MOP) just as in the farmers' practice plot. The science-led approach involves provision of adequate and proportionate inputs of nutrients to plants to ensure normal metabolic function and that in turn supports good crop growth and yield. While the science-led management practice advocated the provision of additional nutrients, all the other agronomic practices remained the same as in the farmers' practice. The groundnut crop under both the practices was sown on 13 July 2011 and harvested on 15 November 2011.

Mr Hanumanthappa got additional inputs like secondary and micronutrients from the Department of Agriculture (DoA) at 50% subsidy. These inputs are being promoted under Bhoochetana and converged schemes to bring in the sustainable use of natural resources to improve farm based

Contributing person: Girish Chander, Prakash Naik and Ch Srinivasa Rao

livelihoods. The farmer had to incur an additional cost of around ₹500 per acre on these inputs. As such he incurred a total expenditure of about ₹12,200 per acre in the farmers' practice plot. In the improved management plot he incurred a total expenditure of ₹12,700 per acre due to various inputs and the farm operations of land preparation, transplanting, weeding, pesticides, harvesting and transport. The farmer himself was surprised by by the 35% higher yields which came as a result of science-led farming. The yield per acre grew from 2,600 kg under farmers' practice to 3,500 kg. He sold his produce at a farm gate price of ₹11.5 per kg and therefore got additional net returns of about ₹9,850 per acre. During the rainy season of 2011, Mr Hanumanthappa realized ₹19,700 as additional net returns from the two acre improved management plot. This revealed the potential to further enhance his income by following a similar strategy in the rest of his land. Enthused with the results, this year he has planned to add S, B and Zn to his fruit plants as well. A science-led approach in the Bhoochetana mission has not only increased his income, but has also earned him recognition at the taluk level. He has received the Krishi Prashsthi Award for following good agricultural practices.

68 Balanced plant nutrients in paddy for higher yields and benefits

Mr KR Channabasppa, Devarabelakere Village, Harihara Taluk, Davanagere District, Karnataka.

Effects of improved management on paddy yield in Mr KR Channabasppa's field, in the rainy season of 2011.

This is the story of Mr KR Channabasppa, a farmer who is 46 years old. He cultivates crops like paddy and areca nut in his five acre farm to support the nine members in his family. Due to fast increasing costs of inputs, energy and labor and stagnating or even declining crop response to the inputs he was not happy with farming. The Bhoochetana initiative at this juncture showed him a new ray of hope in farming.

During 2012, Mr Channabasppa associated with Bhoochetana, and volunteered to participate in an on-farm research project to follow soil test-based nutrient management in a two acre paddy plot (improved management), and follow his traditional practice (farmers' practice) in another two acre paddy plot for comparison. As advised by experts from ICRISAT/the Department of Agriculture, he added deficient secondary and micronutrients like sulphur (through gypsum), boron (through borax) and zinc (through zinc sulfate) in the improved management plot in addition to the nutrients nitrogen (through urea and DAP), phosphorus (through DAP) and potassium (through MOP) inputs just as in the farmers' practice plot. The science-led approach involves provision of adequate and proportionate inputs of nutrients to plants to ensure normal metabolic function and that in turn supports good crop growth and yield. While the science-led management practice advocated the provision of additional nutrients, all the other agronomic practices remained the same as in the farmers' practice. The paddy crop under both the practices was sown on 6 February 2012 and harvested on 18 June 2012.

Mr Channabasppa got additional inputs like secondary and micronutrients from the Department of Agriculture at 50% subsidy. These inputs are being promoted under Bhoochetana and converged schemes to bring in the sustainable use of natural resources to improve farm based livelihoods. Mr Channabasppa had to incur an additional cost of around ₹500 per acre on these inputs. As such he incurred a total expenditure of ₹14,000 per acre in the farmers' practice plot. In the improved management plot he incurred a total expenditure of ₹14,500 per acre due to various inputs and

Contributing person: Girish Chander, Prakash Naik and Ch Srinivasa Rao

the farm operations of land preparation, transplanting, weeding, pesticides, harvesting, threshing and transport. The farmer was surprised when he saw 18% higher yields which came as a result of science-led farming. The yield per acre grew from 2,875 kg under farmers' practice to 3,400 kg. He sold his produce at a farm gate price of ₹12.5 per kg and therefore got additional net returns of about ₹6,050 per acre. During the rainy season of 2011, Mr Channabasppa realized ₹12,100 as additional net returns from the two acre improved management plot. A science-led approach in the Bhoochetana mission revealed the potential to enhance his income further by following a similar strategy in the rest of his land. Now he is a satisfied person with a changed outlook towards agriculture. Now he is also working now as a farm facilitator to encourage other farmers to adopt the science-led strategy in farming to increase productivity and farm incomes.

69 Soil test-based nutrient management in maize for higher benefits

Mr MR Marulasiddayya, Belludi Village, Harihara Taluk, Davanagere District, Karnataka.

Effects of improved management on maize yield in Mr MR Marulasiddayya's field, in the rainy season of 2011.

This is a story of Mr MR Marulasiddayya, a farmer who is 51 years old and has an M. Com. Farming is the main source of livelihood for Mr MR Marulasiddayya who has to support the 17 members in his family. He cultivates different crops like maize, paddy and banana in his 20 acre farm. He was not satisfied with farming on account of fast increasing costs of inputs, energy and labor and stagnating or even declining crop response to the inputs. Being a well-educated farmer he is always willing to adopt science-led ways in his farm and so he readily associated with Bhoochetana in the rainy season of 2011.

During the rainy season of 2011, he volunteered to participate in an on-farm research project to follow soil test-based nutrient management in a 4.27 acre maize plot as improved management, and follow his traditional practice (farmers' practice) in a 1.20 acre maize plot for comparison. As advised by experts from ICRISAT/the Department of Agriculture, he added deficient secondary and micronutrients like sulphur (through gypsum), boron (through borax) and zinc (through zinc sulfate) in the improved management plot in addition to the nutrients nitrogen (through urea and DAP), phosphorus (through DAP) and potassium (through MOP) just as in the farmers' practice plot. The science-led approach involves provision of adequate and proportionate inputs of nutrients to plants to ensure normal metabolic function and that in turn supports good crop growth and yield.

Mr Marulasiddayya got additional inputs like secondary and micronutrients from the Department of Agriculture at 50% subsidy. These inputs are being promoted under Bhoochetana and converged schemes to bring in the sustainable use of natural resources to improve farm based livelihoods. Mr Marulasiddayya had to incur an additional cost of around ₹500 per acre on these inputs. As such he incurred a total expenditure of ₹7,100 per acre in the farmers' practice plot. In the improved management plot he incurred a total expenditure of ₹7,600 per acre due to various inputs and the farm operations of land preparation, sowing, interculture, weeding, harvesting, threshing and transport. The results showed 38% higher yields with improved management practice. The yield per acre grew from 2,400 kg under farmers' practice to 3,300 kg. He sold his produce at a farm gate price of ₹11 per kg and therefore got additional net returns of about ₹9,400 per acre. During the rainy season of 2011, Mr MR Marulasiddayya realized ₹40,100 as additional net returns from the 4.27 acre improved management plot. This income has raised his confidence in agriculture.

Contributing person: Girish Chander, Prakash Naik and Ch Srinivasa Rao

70 Balanced fertilization in maize for higher benefits

Mr K Shekarappa, Kenchanahalli Village, Harihara Taluk, Davanagere District, Karnataka.

Effects of improved management on maize yield in Mr K Shekarappa's field, in the rainy season of 2011.

Mr K Shekarappa is a farmer who is 52 years old. Farming is the main source of livelihood for Mr K Shekarappa who has to support the three members in his family. He cultivates different crops like maize, ginger and sugarcane in his 3.5 acre farm. Due to increasing costs of inputs, energy and labor and only stagnating or even declining crop response to the inputs, he was not happy with farming. The mission mode Bhoochetana initiative at this juncture showed him a new ray of hope in farming.

During the rainy season of 2011, Mr K Shekarappa associated with Bhoochetana, and volunteered to participate in an on-farm research project to follow soil test-based nutrient management in a one acre maize plot (improved management), and follow his traditional practice (farmers' practice) in a two acre maize plot for comparison. As advised by experts from ICRISAT/the Department of Agriculture, he added deficient secondary and micronutrients like sulphur (through gypsum), boron (through borax) and zinc (through zinc sulfate) in the improved management plot in addition to the nutrients nitrogen (through urea and DAP), phosphorus (through DAP) and potassium (through MOP) just as in the farmers' practice plot. The science-led approach advocates provision of adequate and proportionate inputs of nutrients to young plants to ensure metabolic function that in turn supports good crop growth and yield.

Mr K Shekarappa got additional inputs like secondary and micronutrients from the Department of Agriculture (DoA) at 50% subsidy. These inputs are being promoted under Bhoochetana and converged schemes to bring in the sustainable use of natural resources to improve farm based livelihoods. Mr K Shekarappa had to incur an additional cost of around ₹500 per acre on these inputs. As such he incurred a total expenditure of ₹8,300 per acre in the farmers' practice plot. In the improved management plot he incurred a total expenditure of ₹8,800 per acre due to various inputs and the farm operations of land preparation, sowing, interculture, weeding, harvesting, threshing and transport. The farmer himself was surprised at the 50% higher yields that came as a result of science-led farming. The yield per acre increased from 2,000 kg under the farmers' practice to 3,000 kg. He sold his produce at a farm gate price of ₹12 per kg and therefore got additional net returns

Contributing person: Girish Chander, Prakash Naik and Ch Srinivasa Rao

of about ₹12,000 per acre. During the rainy season of 2011, Mr K Shekarappa realized ₹12,000 as additional net returns from the one acre improved management plot. A science-led approach in the Bhoochetana mission not only brought a smile on his face, but also revealed the potential to further enhance his income by following a similar strategy in the rest of his land. He also rears two cows and sells around five liters of milk a day. He earns around ₹90 day^{-1} from his dairy activities. The Bhoochetana initiative has also increased the crop straw (fodder for cattle) yield along with the grain yield and hence has increased the availability of fodder for his cattle. Today, not only does he feel that his financial status has improved, but he also feels socially respected as a progressive farmer in the village.

71 Soil, crop, water and nutrient-management enhances red gram yield by 86%.

Mr Sharanbasappa, s/o Mr Hanmanthraya, Khalhangarga Village, Gulbarga Taluk, Gulbarga District, Karnataka.

Farmers' field day observed under Bhoochetana project.

This is the success story of a small farmer Mr Sharanbasappa, who is 51 years old and has studied till the sixth standard. Farming is the major source of livelihood for this farmer who has to support the three members in his family. He has two acres of dryland in Survey No 169. Mr Sharanbasappa planted red gram on 19 June 2011 on his two acres of land by using Bhoochetana inputs. He got information about the Bhoochetana project from the Department of Agriculture. He treated the seeds with trichoderma. He planted the crop across the slope, left every eighth row open for moisture conservation and also used techniques such as earthing up. He obtained a subsidy of 50% on seeds, micronutrients, zinc sulfate, gypsum, borax, vermicompost, city compost, agrigold, green manure (sun hemp), phosphorous solubilizing bacteria (PSB), *Rhizobium*, VAM, neem oil, trichoderma, etc. He incurred ₹11,260 towards cost of cultivation in two acres and ₹1,400 towards Bhoochetana field crops. He harvested 535 kg per acre while he had harvested 362 kg per acre before adoption of the improved technology. He used bullock drawn implements for ploughing, sowing, inter-cultivation, etc, and multicrop threshers for harvesting. He stored the produce locally. Overall, there was an 86% increase in yield due to adoption of Bhoochetana technology. Finally, Mr Sharanbasappa is happy to have gained knowledge regarding seed treatment, the importance of nutrients, time of sowing, timely spraying and post-harvest technology through TV, mobile, Krushi Mela, the Andolana Program and field days.

Compiled by V Rameshwar Rao

72 Improved practices in green gram for higher yield

Mr Revansidappa, s/o Mr Chanbasappa, Kuddur Village, Chitapur Taluk, Gulbarga District, Karnataka.

Green gram crop was also a success due to implementation of improved practices.

This is the success story of a small farmer Mr Revansidappa, who is 51 years old and has studied till the sixth standard. Farming is the major source of livelihood for Mr Revansidappa who has to support the five members in his family. He has five acres of dryland in Survey No 186. He planted green gram on 06 June 2011 on five acres of land by using Bhoochetana inputs. He got information about the Bhoochetana project from the Department of Agriculture. He treated the seeds with trichoderma. He planted the crop across the slope, kept every eighth row open for moisture conservation and used techniques such as earthing up. He obtained a subsidy of 50% on seeds, micronutrients, zinc sulfate, gypsum, borax, vermicompost, city compost, agrigold, green manure (sun hemp), phosphorous solubilizing bacteria (PSB), *Rhizobium*, VAM, neem oil, trichoderma, etc. He incurred
₹25,750/- towards cost of cultivation in two acres and ₹2,655/- towards Bhoochetana field crops. He harvested 425 kg per acre while he had harvested 296 kg per acre before adoption of the improved technology. He used bullock drawn implements for ploughing, sowing inter-cultivation, etc, and multicrop threshers for harvesting. He stored the produce locally. Overall, there was a 26% increase in yield due to adoption of Bhoochetana technology. His annual domestic expenditure is between ₹40,000 and 45,000. He needs inputs in package form (kit). Finally, Mr Revansidappa is happy to have gained knowledge regarding seed treatment, the importance of nutrients, time of sowing, timely spraying and post-harvest technology through TV, mobile, Krushi Mela, the Andolana Program and field days.

73 On-farm crop productivity increased with improved practices

Mr Basanthrao, s/o Mr Permalappa, Kudampalli Village, Chincholi Taluk, Gulbarga District, Karnataka.

Black gram yield witnessed a boost due to implementation of Bhoochetana technology.

This is the success story of a small farmer Mr Basanthrao, who is 51 years old and has studied till the sixth standard. Farming is the major source of livelihood for Mr Basanthrao who has to support the five members in his family. He has three acres of dryland in Survey No 15/1 on which he planted black gram on 15 June 2011 using Bhoochetana inputs. He got information about the Bhoochetana project from the Department of Agriculture. He treated the seeds with trichoderma. He planted the crop across the slope, kept every eighth row open for moisture conservation and did earthing up. He has obtained a subsidy of 50% on seeds, micronutrients, $ZnSO_4$, gypsum, borax, vermicompost, city compost, agrigold, green manure (sun hemp), phosphorous solubilizing bacteria (PSB), *Rhizobium*, VAM, neem oil, trichoderma, etc. He incurred ₹17,480 towards cost of cultivation in two acres and ₹1,980 towards Bhoochetana field crops. He harvested 471 kg per acre while he had harvested 370 kg per acre before adoption of the improved technology. He used bullock drawn implements for ploughing, sowing, inter-cultivation, etc, and multicrop threshers for harvesting. He stored the produce locally. Overall, there was a 34% increase in yield due to adoption of Bhoochetana technology. His annual domestic expenditure now is between ₹50,000 and 55,000. He needs inputs in package form (kit). Finally, Mr Basanthrao is happy to have gained knowledge regarding seed treatment, the importance of nutrients, time of sowing, timely spraying and post-harvest technology through TV, mobile, Krushi Mela, the Andolana Program and field days.

Compiled by V Rameshwar Rao

74 Higher crop productivity with improved practices

Mr Shantabhai, Aurad (B) Village, Gulbarga Taluk, Gulbarga District, Karnataka.

Improved management fetched higher yields for sunflower crop in Gulbarga

This is the success story of a small farmer Mr Shantabhai who is 55 years old and has studied till the sixth standard. Farming is the major source of livelihood for Mr Shantabhai who has to support the seven members in his family. He has five acres of dryland in Survey No 49 and planted sunflower on 13 July 2011 on all five acres using Bhoochetana inputs. He got information about the Bhoochetana project from the Department of Agriculture. He treated the seeds with trichoderma. He planted the crop across the slope, kept every eighth row open for moisture conservation and used techniques such as earthing up. He obtained a subsidy of 50% on seeds, micronutrients, zinc sulfate, gypsum, borax, vermicompost, city compost, agrigold, green manure (sun hemp), phosphorous solubilizing bacteria (PSB), *Rhizobium*, VAM, neem oil, Trichoderma, etc. He incurred ₹30,525 towards cost of cultivation in two acres and ₹2,435 towards Bhoochetana field crops. He harvested 612 kg per acre while he had harvested 430 kg per acre before adoption of the improved technology. He used bullock drawn implements for ploughing, sowing, inter-cultivation, etc, and multicrop threshers for harvesting. He stored the produce locally. Overall, there was a 36% increase in yield due to adoption of Bhoochetana technology. His annual domestic expenditure now is ₹60,000-70,000/- . He needs inputs in package form (kit). Finally, Mr Shantabhai is happy to have gained knowledge regarding seed treatment, the importance of nutrients, time of sowing, timely spraying and post-harvest technology through TV, mobile, Krushi Mela, the Andolana Program and field days.

75 Science-led management enhances crop productivity

Mr Ananda, Kalahangarga Village, Gulbarga Taluk, Gulbarga District, Karnataka.

Pearl Millet crop fetched higher returns due to implementation of improved practices

This is the success story of a small farmer Mr Ananda, who is 33 years old and has studied till the tenth standard. Farming is the major source of livelihood for Mr Ananda who has to support the four members in his family. He has two acres of dryland in Survey No 169/1 on which he planted pearl millet on 12 July 2011 using Bhoochetana inputs. He got information about the Bhoochetana project from the Department of Agriculture. He treated the seeds with trichoderma. He planted the crop across the slope, kept every eighth row open for moisture conservation and used techniques such as earthing up. He obtained a subsidy of 50% on seeds, micronutrients, $ZnSO_4$, gypsum, borax, vermicompost, city compost, agrigold, green manure (sun hemp), phosphorous solubilizing bacteria (PSB), *Rhizobium*, VAM, neem oil, trichoderma, etc. He incurred ₹9,800 towards the cost of cultivation in two acres and ₹1,280 towards Bhoochetana field crops. He harvested 842 kg per acre while he had harvested 740 kg per acre before adoption of the improved technology. He used bullock drawn implements for ploughing, sowing, intercultivation, etc, and multicrop threshers for harvesting. He stored the produce locally. Overall, there was a 51% increase in yield due to adoption of Bhoochetana technology. His annual domestic expenditure now is ₹40,000-45,000/-. He needs inputs in package form (kit). Finally, Mr Ananda is happy to have gained knowledge regarding seed treatment, the importance of nutrients, time of sowing, timely spraying and post-harvest technology through TV, mobile, Krushi Mela, the Andolana Program and field days.

Compiled by V Rameshwar Rao

76 Bhoochetana: A Case Study on Sorghum Crop

Sri Neelakanta Raya, s/o Sri Shivappa Gowda Kyathnal, Kyathnal Village, Saidapur Hobbli, Yadagiri Taluk, Karnataka.

Sri Neelakanta Raya showing jowar earheads.

Kyathnal is a small remote village in Saidapur Hobbli of Yadagiri Taluk. Located about 35 km away from the Taluk head quarters, Kyathnal village is only five km away from the Raith Samparka Kendra in Saidapur next to Narayanpet road railway station. There are about 150-200 households in the village and the majority of the people are small and marginal farmers. During our benchmark survey we came to know that most of the farmers use urea, DAP and complex fertilizers. Kyathnal village was covered under the Bhoochetana program from 2010-11 to 2012-13 and will continue to be covered in the coming year too.

Sri Neelakanta Raya, s/o Sri Shivappa Gowda Kyathnal, has three ha of land with Survey No.71. The soil in his farm land is deep black. Usually 1-2 ha of land is sown with *kharif* crop and the remaining one ha is left fallow for *rabi* sorghum. During 2012-13, only one ha of land was sown in *kharif* and two ha of land had been left for sowing sorghum in *rabi*. Due to the continuous effort that we have made towards training at the cluster village, the farmer has understood how to use biofertilizer for seed treatment and micronutrients.

Sri Neelakanta Raya Kyathnal actively participated in all the training sessions and came forward to implement all the technology prescribed by the Bhoochetana program. Accordingly he implemented technologies like seed treatment with biofertilizer, use of gypsum as well as application of zinc sulfate and boron in his field. During 2012-13, he implemented the Bhoochetana program for sorghum crop in the *rabi* season in two ha of land and the result was clearly evident in the field at the end of the season.

Dr MB Agnal, Asso. proff. Agronomy explaining use of micronutrients in Jowar on field day at Kyathnall.

Compiled by V Rameshwar Rao

Table 5. Comparative cost of cultivation in Bhoochetana plot and control plot.

Sl.No	Activity	Bhoochetana Plot (1 ha)	Control Plot (1 ha)
1	Field preparation and sowing	5500	5500
2	Seed cost	150	150
3	Seed treatment with biofertilizer	25	-
4	application of Gypsum (200 kg per ha)	380	-
5	application of Zinc sulfate (10 kg per ha)	220	-
6	Boron (5 kg per ha)	135	-
7	DAP (50 kg per ha)	1250 (50 Kg)	2500 (100 Kg)
8	Carbo furan (5 kg per ha)	-	300
9	Inter-cultivation	500	500
10	Harvesting	1500	1500
11	Transportation and Marketing	1200	1000
	Total	10860	11450

Table 6. Comparative yield and net profit.

Sl.No	Activity	Bhoochetana Plot	Control Plot
1	Yield	23.75 (q)	20.50 (q)
2	Grain color and texture	White shining	Dull white
3	Gross Profit	36812	30750
4	Cost of cultivation	10860	11450
5	Net income	25952	19300

From the Table above it is evident that the yield in the Bhoochetana plot is 23.75 quintals of sorghum whereas it is 20.50 quintals in the control plot. The yield that was recorded in the Bhoochetana plot was 3.25 quintals higher due to use of biofertilizer and micronutrients. The net profit in the treated plot is ₹25,952 whereas it is only ₹19,300 in the control plot. A field day was organized in his field to showcase the results and farmers realized the difference between the Bhoochetana plot and the control plot.

Farmer's opinion: Initially I was reluctant to implement the inputs of the Bhoochetana program such as use of biofertilizer and micronutrients, seed treatment, etc. However, the field facilitator and RSK staff forced me to take up the new technology. When I saw the difference in results at the end of the season, I was motivated. Other farmers appreciated my effort. I not only earned extra profit but also gained respect in the village.

77 Micronutrients for more food production

Mr Ramana, s/o Mr Hanamantappa, Kadarapur Village, Wadigera Hobli, Shahapur Taluk, Yadgir District, Karnataka.

Mr Ramanappa displays healthy pearl millet crop after implementation of Bhoochetana technology.

This is the success story of a small farmer Mr Ramanappa, who is 51 years old and has studied till the third standard. Farming is the major source of livelihood for Mr Ramanappa who has to support the ten members in his family. He has five acres of dryland in Survey No 72 on which he planted pearl millet, sunflower and cotton on 15 June 2011 using Bhoochetana inputs. He got information about the Bhoochetana project from the Department of Agriculture and availed the facility of seeds, micronutrients, biofertilizers, biopesticides, implements, irrigation, equipment, extension services and marketing activity benefits which were provided at subsidized rates. He planted the crops across the slope, treated the seed with trichoderma, *Rhizobium*, and PSB and applied micronutrients. He incurred ₹4,000/- towards investment on all the agricultural operations in farmers' practice and ₹4,500/- towards Bhoochetana field crops. He harvested 820 kg per acre while he had harvested 630 kg per acre before adoption of the improved technology. He did ploughing, harrowing, etc and manually threshed after harvesting. He stored the produce in a small godown at home. Overall there was an economic benefit of ₹3,600 per acre due to adoption of Bhoochetana technology. Mr Ramana is happy with the increase in food grain production as well as with the improvement in social activities, financial status, health and education of his children. In future he has decided to strictly follow Bhoochetana technologies like utilization of micronutrients and improved management systems. His annual domestic expenditure now is ₹100,000. The benefits he obtained through Bhoochetana helped him clear his debts and improve the welfare of his family. Due to the increased C.B. ratio through Bhoochetana technologies, other farmers have shown interest in adopting the application of micronutrients.

78 Shivappa adopts science-led farming to get higher returns

Mr Shivappa, s/o Mr Chandrappa Ganapur, Hattikuni Village, Hattikuni Hobli, Yadgir Taluk, Yadgir District, Karnataka.

Mr Shivappa used integrated management techniques to obtain increased yields.

This is the success story of a small farmer Mr Shivappa, who is 65 years old and has studied up to the fifth standard. Farming is the major source of livelihood for Mr Shivappa who has to support the eight members in his family. He has six acres of dryland in Survey No 228 on which he planted green gram, pearl millet and paddy on 16 June 2011 using Bhoochetana inputs. He got information about the Bhoochetana project from the Department of Agriculture and availed of seeds, micronutrients, biofertilizers, biopesticides, implements and irrigation equipment at subsidized rates. He planted the crops across the slope, treated the seed with trichoderma, *Rhizobium*, and PSB, and has applied micronutrients and neem oil to control aphids. He incurred ₹3,900/- towards investment on all the agricultural operations in farmers' practice and ₹4,500/- towards Bhoochetana field crops. He harvested 450 kg per acre as against 360 kg per acre that he had harvested before adoption of the improved technology. He did ploughing, harrowing, etc and manually threshed after harvesting. He stored the produce in a small godown at home. Overall, there was an economic benefit of ₹3,200 per acre due to adoption of Bhoochetana technology. Mr Shivappa is happy with the increase in food grain production as well as with the improved financial status, health and education of his children. In future he has decided to follow Bhoochetana technologies like utilization of micronutrients and improved management systems. Now, his annual domestic expenditure is ₹80,000. The benefits he obtained through Bhoochetana helped him clear his debts and improve the welfare of his family including health and the education of his children. Due to the increased C.B. ratio through Bhoochetana technologies other farmers have shown interest in the application of micronutrients.

79 Basappa gets higher returns through scientific farming

Mr Basappa, s/o Mr Sabanna, Hattikuni Village, Hattikuni Hobli, Yadgir Taluk, Yadgir District, Karnataka.

Pearl Millet yields were higher in Mr Basappa's field.

This is the success story of a small farmer Mr Basappa, who is 58 years old. Farming is the major source of livelihood for Mr Basappa who has to support the six members in his family. He has three acres of dryland in Survey No 79, on which he planted pearl millet and green gram on 15 June 2011 using Bhoochetana inputs. He got information about the Bhoochetana project from the Department of Agriculture and he availed seeds, micronutrients, biofertilizers, biopesticides, irrigation equipment, extension services and marketing activity benefits at subsidized rates. He planted the crops across the slope, had done seed hardening with 2% $CaCl_2$, treated the seeds with trichoderma, *Rhizobium*, and PSB and applied micronutrients. He incurred ₹4,000/- towards investment on following farmers' practice and ₹4,500/- towards Bhoochetana field crops. He harvested 850 kg per acre as against 650 kg per acre that he had harvested before adoption of improved technologies. He himself did the ploughing, harrowing, etc, and manually threshed after harvesting. He stored the produce in a small godown at home. Overall, there was an economic benefit of ₹3,200 per acre due to adoption of Bhoochetana technology. Mr Basappa is happy to have increased the food grain production, and has been able to improve his financial status as well as his health and provide a better education to his children. In future, he has decided to follow Bhoochetana technologies such as application of micronutrients and improved management systems. Now his annual domestic expenditure is ₹60,000. The benefits he obtained through Bhoochetana has helped him clear his debts, provide health care for his family and an education for his children. Due to the increased C.B. ratio through Bhoochetana technologies, other farmers too have shown interest in the application of micronutrients.

80 Scientific farming - the way forward to improve farm-based livelihoods

Mr Venkatareddy, s/o Mr Sharanappa, Hattikuni Village, Hattikuni Hobli, Yadgir Taluk, Yadgir District, Karnataka.

Mr Venkatareddy poses in his Pearl Millet field after obtaining increased yield due to Bhoochetana project.

This is the success story of a small farmer Mr Venkatreddy, who is 58 years old, and has studied till the tenth standard. Farming is the major source of livelihood for Mr Venkatreddy who has to support the six members in his family. He has four acres of dryland in Survey No 29 on which he planted pearl millet, green gram and paddy on 15 June 2011, using Bhoochetana inputs. He came to know about the Bhoochetana project from the Department of Agriculture and availed seeds, micronutrients, biofertilizers, biopesticides, irrigation equipment, extension services and marketing activity benefits at subsidized rates. He planted the crops across the slope, carried out seed hardening with 2% $CaCl_2$, treated the seeds with trichoderma, *Rhizobium*, and PSB and applied micronutrients. He incurred ₹4,100/- towards investment on following farmers' practice and ₹4,600/- on following Bhoochetana technology. He harvested 830 kg per acre while he had harvested 650 kg per acre before adoption of the improved technology. He did the ploughing and harrowing etc, and manually threshed after harvesting. He stored the produce in a small godown at home. Overall, there was an economic benefit of ₹2,100 per acre due to adoption of Bhoochetana technology. Mr Venkatreddy is happy to have increased food grain production. It has enabled him to raise his financial status, provide better health care to his family and education to his children. In future, he has decided to implement Bhoochetana technologies such as application of micronutrients and improved management systems. Now, his annual domestic expenditure is ₹70,000/-. The benefits he obtained through Bhoochetana helped him clear his debts and improve his family welfare which included health and education. Due to the increased C.B. ratio because of implementation of Bhoochetana technologies, farmers have shown an interest in the application of micronutrients.

Compiled by V Rameshwar Rao

81 Science-led technologies bridging yield gaps in rainfed agriculture

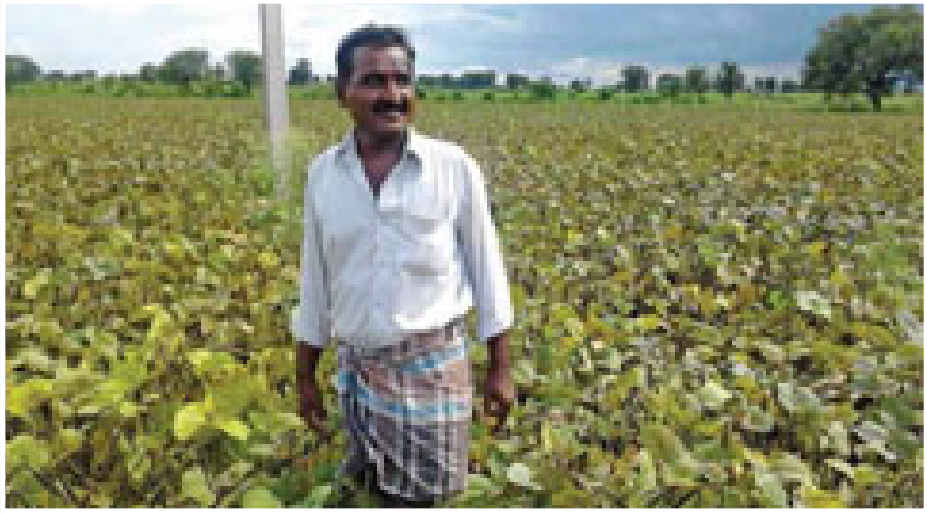
Mr Sharanbasappa, s/o Mr Hanmanthraya, Khalhangarga Village, Gulbarga Taluk, Gulbarga District, Karnataka.

Mr Sharanbasappa is a happy farmer after implementing Bhoochetana project in his field.

This is the success story of a small farmer Mr Sharanbasappa, who is 51 years old and has studied till the sixth standard. Farming is the major source of livelihood for Mr Sharanbasappa who has to support the three members in his family. He has two acres of dryland in Survey No 169, on which he planted red gram on 19 June 2011 using Bhoochetana inputs. He came to know about the Bhoochetana project from the Department of Agriculture. He took up seed treatment with trichoderma. He planted the crop across the slope, kept every eighth row open for moisture conservation and implemented techniques such as earthing up. He obtained a subsidy of 50% on seeds, micronutrients, $ZnSO_4$, gypsum, borax, vermicompost, city compost, agrigold, green manure (sun hemp), phosphorous solubilizing bacteria (PSB), *Rhizobium*, VAM, neem oil, trichoderma, etc. He incurred ₹11,260/- towards cost of cultivation of two acres on following farmers' practice and ₹1,400 on following Bhoochetana technologies. He harvested 535 kg per acre while he had harvested 362 kg per acre before adoption of the improved technology. He used bullock drawn implements for ploughing, sowing, inter-cultivation, etc and multicrop threshers for harvesting. He stored the produce locally. Overall, there was an 86% increase in yield due to adoption of Bhoochetana technologies. Finally, Mr Sharanbasappa is happy to have gained knowledge regarding seed treatment, nutrients, time of sowing, timely spraying and post-harvest technology through TV, mobile, Krushi Mela, the Andolana Program and field days.

82 Increasing productivity with improved practices

Mr Revansidappa, s/o Mr Chanbasappa, Kuddur Village, Chitapur Taluk, Gulbarga District, Karnataka.



Mr Ravansidappa witnessed an increase in green gram yield after implementing techniques used in Bhoochetana project.

This is the success story of a small farmer Mr Revansidappa, who is 51 years old and has studied till the sixth standard. Farming is the major source of livelihood for Mr Revansidappa who has to support the five members in his family. He has five acres of dryland in Survey No 186 on which he planted green gram on 06 June 2011 using Bhoochetana inputs. He got information about the Bhoochetana project from the Department of Agriculture. He treated the seeds with trichoderma. He planted the crop across the slope, kept every eighth row open for moisture conservation and inplemented techniques such as earthing up. He obtained a subsidy of 50% on seeds, micronutrients, $ZnSO_4$, gypsum, borax, vermicompost, city compost, agrigold, green manure (sun hemp), phosphorous solubilizing bacteria (PSB), *Rhizobium*, VAM, neem oil, trichoderma, etc. He incurred ₹25,750/- towards cost of cultivation in two acres and ₹2,655 on following Bhoochetana technologies. He harvested 425 kg per acre as against 296 kg per acre that he had harvested before adoption of the improved technologies. He used bullock drawn implements for ploughing, sowing, intercultivation, etc and used multicrop threshers for harvesting. He stored the produce locally. Overall, there was a 26% increase in yield due to adoption of Bhoochetana technologies. His annual domestic expenditure is now between ₹40,000 and ₹45,000. He needs inputs in package form (kit). Finally, Mr Revansidappa is happy to have gained knowledge regarding seed treatment, the importance of nutrients, time of sowing, timely spraying and post-harvest technology through TV, mobile, Krushi Mela, the Andolana Program and field days.

Compiled by V Rameshwar Rao

83 Improved technologies to improve productivity and incomes of smallholders

Mr Basanthrao, s/o Mr.Permalappa, Kudampalli Village, Chincholi Taluk, Gulbarga District, Karnataka.

Improved technology has boosted black gram yields in Basanthrao's field.

This is the success story of Mr Basanthrao, a small farmer, who is 51 years old, and has studied till the sixth standard. Farming is the major source of livelihood for Mr Basantrao who has to support the five members in his family. He has three acres of dryland in Survey No 15/1 on which he planted black gram on 15 June 2011 using Bhoochetana inputs. He got information about the Bhoochetana project from the Department of Agriculture. He treated the seeds with trichoderma and planted the crop across the slope, leaving every eighth row open for moisture conservation and used techniques such as earthing up. He obtained a subsidy of 50% on seeds, micronutrients, $ZnSO_4$, gypsum, borax, vermicompost, city compost, agrigold, green manure (sun hemp), phosphorous solubilizing bacteria (PSB), *Rhizobium*, VAM, neem oil, trichoderma, etc. He incurred ₹17,480 towards cost of cultivation of two acres on following farmers' practice and ₹1,980 on following Bhoochetana technologies. He harvested 471 kg per acre as against 370 kg per acre which he had harvested before adoption of improved technology. He used bullock drawn implements for ploughing, sowing and intercultivation, etc, and multicrop threshers for harvesting. He stored the produce locally. Overall, there was a 34% increase in yield due to adoption of Bhoochetana technology. Now, his annual domestic expenditure is between ₹50,000 and 55,000. He needs inputs in package form (kit). Finally, Mr Basanthrao is happy to have gained knowledge regarding seed treatment, the importance of nutrients, time of sowing, timely spraying and post-harvest technology through TV, mobile, Krushi Mela, the Andolana Program and field days.

84 Scientific management - a key for intensification in dry land tropics

Mr Shantabhai, w/o Shanappa, Aurad (B) Village, Gulbarga Taluk, Gulbarga District, Karnataka.

Sunflower crop saw an increase in yield in Mr Shantabhai's field.

This is the success story of a small farmer Mr Shantabhai, who is 55 years old and has studied till the sixth standard. Farming is the major source of livelihood for Mr Shantabhai who has to support the seven members in his family. He has five acres of dryland in Survey No 49 on which he planted sunflower on 13 July 2011 using Bhoochetana inputs. He got information about the Bhoochetana project from the Department of Agriculture. He treated the seeds with trichoderma and planted the crop across the slope, left every eighth row open for moisture conservation and implemented earthing up. He obtained a subsidy of 50% on seeds, micronutrients, $ZnSO_4$, gypsum, borax, vermicompost, city compost, agrigold, green manure (sun hemp), phosphorous solubilizing bacteria (PSB), *Rhizobium*, VAM, neem oil, trichoderma, etc. He incurred ₹30,525/- towards cost of cultivation in two acres and ₹2,435 towards Bhoochetana field crops. He harvested 612 kg per acre while he had harvested 430 kg per acre before adoption of the improved technology. He used bullock drawn implements for ploughing, sowing, inter-cultivation, etc, and used multicrop threshers for harvesting. Later, he stored the produce locally. Overall, there was a 36% increase in yield on adoption of Bhoochetana technology. His annual domestic expenditure now is ₹60,000-70,000/-. He needs inputs in package form (kit). Finally, Mr Shantabhai is happy to have gained knowledge regarding seed treatment, the importance of nutrients, time of sowing, timely spraying and post-harvest technology through TV, mobile, Krushi Mela, the Andolana Program and field days.

Compiled by V Rameshwar Rao

85 Scientific management for higher crop productivity

Mr Anand, w/o Yashvanthrao Neloor, Kalahangarga (B) Village, Gulbarga Taluk, Gulbarga District, Karnataka.

Pearl Millet crop in Mr Anand's field saw a boost in yield due to Bhoochetana project.

This is the success story of a small farmer Mr Anand, who is 33 years old, and has studied till the tenth standard. Farming is the major source of livelihood for this farmer who has to support the four members in his family. He has two acres of dryland in Survey No 169/1 on which he planted pearl millet on 12 July 2011 using Bhoochetana inputs. He got information about the Bhoochetana project from the Department of Agriculture. He treated the seeds with trichoderma and planted the crop across the slope, leaving every eighth row open for moisture conservation and implemented earthing up. He obtained a subsidy of 50% on seeds, micronutrients, $ZnSO_4$, gypsum, borax, vermicompost, city compost, agrigold, green manure (sun hemp), phosphorous solubilizing bacteria (PSB), *Rhizobium*, VAM, neem oil, trichoderma etc. He incurred ₹9,800/- towards cost of cultivation in two acres and ₹1,280/- towards Bhoochetana field crops. He harvested 842 kg per acre as against 740 kg per acre that he had harvested before adoption of the improved technology. He used bullock drawn implements for ploughing, sowing, inter-cultivation, etc and multicrop threshers for harvesting. Later he stored the produce locally. Overall, there was a 51% increase in yield due to adoption of Bhoochetana technology. Now, his annual domestic expenditure is between ₹40,000 and 45,000/-. He needs inputs in package form (kit). Finally, he is happy to have gained knowledge regarding seed treatment, the importance of nutrients, time of sowing, timely spraying and post-harvest technology through TV, mobile, Krushi Mela, the Andolana Program and field days.

86 A farmer's testimony about the program

Bhoochetana improves quality of soil for farmer

Mr Raju Puttappa, Benagal Village, Periyapatnam Taluk, Karnataka.

Micronutrient application in farmer's field during Bhoochetana project.

"My name is Raju Puttappa. I am a farmer and my family is totally dependent on agriculture as a source of livelihood. We have three acres of rainfed land. Earlier, we did not have any knowledge of improved practices like soil testing and the use of appropriate fertilizers. We used to apply fertilizers indiscriminately based on local advice. Due to this, the costs of cultivation used to be high. There was little or no margin between our expenditure and the agricultural income. It was not uncommon for us to incur losses due to erratic rainfall. Last year, when we visited RSK, an official from the Department of Agriculture and the local farm facilitator advised me and explained the Bhoochetana Yojane to me. They provided me with the required inputs on a 50% subsidy basis and offered technical advice. As per their advice, in 2011-12, i applied the micronutrients zinc sulfate, borax and gypsum along with other fertilizers before sowing maize. The season was good and the crop was very good. I got an average yield of 23-25 quintal per acre. Previously, on following our practice I used to get a yield of about 18-20 quintal per acre. This Yojane has saved me the unnecessary expenditure on fertilizer, and provided me with micronutrients on subsidy and has thereby brought down the cost of cultivation. Bhoochetana has not only benefited us economically, but has also improved the quality of the soil.

This Bhoochetana Yojane is really good and beneficial to poor farmers in rainfed areas. This year, a large number of farmers have adopted the improved technologies in our village. I would like to emphasize that this will certainly benefit us financially and improve the quality of the soil in the long run".

Compiled by Sudi Raghavendra Rao and Shivalinga Nayak

87 Kumar, says Bhoochetana is a boon to poor farmers

Mr Kumar, Gonahalli Village, Biligeri Hobli, Nanjanagudu Taluk, Mysore district, Karnataka.

Groundnut showed increased yields with improved practices

I am Kumar, a farmer from Gonahalli village. After completing my graduation and getting a BA, I opted for my family profession of farming instead of finding a job. As farming was not remunerative, no one in the family showed an interest in farming. So I had to stop my studies and take up farming. I have been into this profession for the last eight years.

I have been farming following the conventional system. On following my traditional practice, the groundnut yield used to be around 3-4 quintal per acre. But I was always looking for some new information or practice that could get me higher yields and a better income with less expenditure. There were several schemes running but there was not enough time, so we could not use those benefits effectively. It was mainly due to a lack of guidance rather than time, that I missed out on these opportunities.

Fortunately, during 2010-11, Bhoochetana was introduced in our district. Our village farm facilitator Mr Chikka Rama Naik conducted a meeting and explained the facilities provided under the program. We were given the reason for the low yield and told about the importance of soil testing. We were also told about the soil status and the deficiencies in our soil. The soils in our field were tested at ICRISAT, Hyderabad. We were advised to adopt Bhoochetana technology to improve the soil and get higher yields. We have been provided with the micronutrients that are deficient in our soils by our RSK as per the recommendation provided by ICRISAT, Hyderabad. I have applied 75 kg gypsum, 5 kg zinc sulfate and 2 kg borax and one bag of compost before transplanting paddy in five acres of land. The crop cultivated in the field where Bhoochetana Yojane was adopted was very good. Besides, it had very low pest and disease attack, grain falling was low and good grain filling was observed. That year I got a yield of 110 quintal from five acres (22 quintals per acre). Previously, we used to get 16-18 quintals per acre. Bhoochetana technology is clearly advantageous for farmers. The inputs were made available at the nearest location to our village. This yojane has reached us on time, providing continuous technical advice to the needy farmers at the village or RSK level. I can confidently say that the Bhoochetana yojane is a boon to poor farmers.

88 Sannamma increases profits through micronutrient use

Mrs. Sannamma, w/o late Mr Manchanaik, Bidarhalli Village, Kandalike Hobli, HD Kote Taluk, Mysore district, Karnataka.

Micronutrient application in cotton crop benefitted farmer with higher returns.

I Sannamma, w/o late Mr Manchanaik, belong to Bidarhalli village of Mysore district. We are seven members in our family and farming is our main source of income. We have three acres of dryland in Survey. No. 4. We generally cultivate ragi and cotton under the rainfed condition. So far, we were not aware of the use of micronutrients. Generally, we used to apply only chemical fertilizers like urea, DAP and potash. Our yield levels were very low and expenditure was high, due to which our loan burden increased.

Our village farm facilitator Mr Mahesh encouraged us to adopt the Bhoochetana yojane package. He explained to us the use and benefits of micronutrients and told us about the Department's facility to provide the required inputs on subsidy. As per the recommendation, we have used 3 kg of FYM, 100 kg of gypsum, 5 kg of zinc sulfate and 2 kg of borax and reduced the quantity of other chemical fertilizers. As a result we received 3-4 quintals more per acre of ragi yield than we used to get using our traditional system. I have also got ₹9,500 as net additional profit excluding the expenditure.

Timely advice and input supply were the key factors. I am thankful to the officials of the Department of Agriculture and ICRISAT for their guidance and technical help. I am very happy with this program. I am sure many small farmers like me have similar experiences.

Compiled by Sudi Raghavendra Rao and Shivalinga Nayak

89 Babu harvests bumper crop with micronutrients

Higher yields were ensured for bajra crop by implementing Bhoochetana technology

Pearl Millet is a boon to the farmer. Bajra is a principal crop grown in North Karnataka and a majority of the people use it as staple food crop. The crop requires very little moisture to grow.

A farmer from Devar Hipparagi, Sri Babu Adiveppa Metagar, has been practicing agriculture since a few decades and has been growing bajra. He narrates his story of growing bajra crop successfully.

"I am not a very progressive farmer. Earlier, I never used micronutrients and fertilizers. I used to sow the seeds using a seed drill at a distance of 12"-14". I used to get a yield of only one quintal per acre.

However, the agriculture officers of the Department of Agriculture and a technician from ICRISAT advised me on good farming practices. I was supplied the inputs zinc, boron, gypsum, *Azospirilium* and fertilizer at subsidized rates. Sowing of seeds was done after drilling at 3" and 12" distance. Now I am using all the inputs and the new technology.

I have harvested a bumper crop and whenever neighbouring farmers have asked about the technology, I have imparted my knowledge to them and advised them to take up the technology".

On 18 October 2011, a field day was conducted and scientists advised farmers to adopt the technology to grow bajra crop.

Bhoochetana Program Responsible for high yield in maize

About 60% of the agricultural land in Dharwad is under dryland. Maize, ragi and cowpea are some of the major dryland crops in the area, but the average productivity of these crops is lower than

the state average. This is mainly due to the low productivity of the soil, injudicious use of major nutrient fertilizers, no application of micronutrient fertilizer, low use of organic manure, unscientific cultivation practices, etc.

The Government of Karnataka initiated a program called Bhoochetana in 2009 to improve the productivity of rainfed dryland crops. One of the objectives of the program, was to improve the productivity of dryland/rainfed crops in Dharwad by at least 20%.

Under this flagship program of Bhoochetana, farm facilitators were selected for every 500 ha of dryland area and five progressive farmers were assigned to every farm facilitator. Farm facilitators were given training. Registration of dryland farmers was done and training sessions were conducted in all the selected villages. Demonstrations of scientific cultivation of these crops were given, field days were conducted and finally farm facilitators were given training for the crop cutting experiment.

Manju Basavanthappa Mahaldavar, Dharwad Kasaba, who belongs to a farming family, registered under the Bhoochetana scheme and grew maize. He got a high yield by following scientific methods of crop production like cultivation across the slope, use of micronutrients, gypsum, increased application of organic manures and *in situ* soil and water conservation practices. He received technical guidance and gypsum micronutrient fertilizers from the Department of Agriculture under the Bhoochetana program.

Manju Basavanthappa Mahaldavar, Dharwad Kasaba, had four acres of dryland in the village and used to grow soybean, maize and some pulses regularly in his field. Over a period of a few years, he noticed that there was a gradual decline in yield and quality, due to which he got a low market value for his produce. Finally, he started losing interest in agriculture. He narrates his experience of maize cultivation using Bhoochetana inputs.

“One fine day officers from the Department of Agriculture came to our village to conduct a village level training program for farmers under the Bhoochetana program. I registered under the scheme and also attended the training program. In the training program an Agriculture Officer from the Department of Agriculture highlighted the significance of ploughing across the slope, which in turn conserves moisture and avoids erosion”. He also spoke about the importance of micronutrients, biofertilizers, soil testing, etc. Finally, he assured us that a minimum increase of 20-25% in yield can be realized with very little expenditure.

“The next day I went to the Dharwad Raita Samparka Kendra and consulted the Agriculture Officer. I explained the condition of my field to him and asked him to suggest a good cultivation practice for growing maize. The Agricultural Officer insisted that I use micronutrients, biofertilizer and farm yard manure and take up good cultivation practices like cultivation across the slope. I brought seeds, gypsum, PSB biofertilizer and zinc sulfate at a subsidised rate from the Department of Agriculture. On their suggestion, I applied five cart loads of farm yard manure and used PSB biofertilizer for seed treatment. I applied gypsum to the field 15 days before sowing and ploughed the field across the slope. During the second week of June, sowing was taken up when the farm facilitator from the Department of Agriculture visited our field. He guided us in applying micronutrients, taking up seed treatment, making furrows across the slope and on the spacing for sowing. I applied 70 kg of inorganic complex fertilizer (10:26:26) and 10 kg of zinc sulfate before sowing. Sowing was done maintaining a two feet distance between rows and one foot distance between the plants. Inter-cultivation was done on the 35th day after sowing and top dressing was done with 60 kg urea. I had not found any pest or insect damage in the field. Although there was moisture stress during the grain filling stage of the crop, it did not lead to any great reduction in yield. I applied gypsum, zinc sulfate, borax, farm yard manure and biofertilizer. By adopting new practies this year I got the highest yield of that I have had so far 23.5 quintal per acre. It was clearly higher than the previous year’s yield of 19 quintal per acre.

Before the maize crop was harvested, officers of the Department of Agriculture conducted a field day in my field and about 95-100 farmers of different villages visited my plot. I shared my experience on following new practices in maize cultivation with them".

"The significant difference which I observed was that the crops were filled with grains and seeds were of high quality. Finally my produce fetched a higher price in the market.

I realized that use of micronutrients, gypsum, FYM and other improved cultivation practices can get me good yield and higher market value even in the dryland condition. Finally, I thank Bhoochetana and the Department of Agriculture".

Emerging Messages

- The study of soil health and the recommendation of the use of micronutrients and gypsum is a big hallmark of the Bhoochetana scheme.
- Awareness about Bhoochetana technologies has been created in the districts and farmer adoption levels are increasing.
- Seed treatment under the assured rainfall condition provides initial strength and vigor to the crops. Many farmers are voluntarily opting for seed treatment.
- Farmers are convinced that under the assured rainfall condition, supplementing micronutrients using zinc sulfate, boron and gypsum in addition to applying the recommended dosage of fertilizer would certainly result in a remarkable increase in crop yields.
- Supplementing with biofertilizers and biopesticides will also contribute to yield increase and indirectly encourage eco-friendly farming.
- Farmers are convinced about the importance of micronutrients for enhancing productivity.
- Bhoochetana campaigns have motivated large numbers of farmers to adopt seed treatment.
- The Bhoochetana Program has promoted the use of biofertilizers, biopesticides and green manures which has resulted in the revival of soil fertility.

90 Line planting and balanced fertilizers increase ragi and maize yields

Mr R Nagaraju, s/o Mr Ramaswamy, Vaddarahalli Village, Adonanahalli Post, Kasba Hobli, Doddaballapur Taluk, Bengaluru Rural District, Karnataka.

Farmer cum farm facilitator, Mr R Nagaraju (left) with his Bhoochetana Ragi and Maize crops

Mr R Nagaraju is an innovative farmer and farm facilitator in the Bhoochetana Project. He is 50 years old and has studied till the tenth standard. He has five acres of dryland in survey Nos. 163 and 53/2 to support the six members in his family. Being a farm facilitator, he adopted Bhoochetana technology in 2.5 acres of ragi and 2 acres of maize crops to demonstrate the results to other farmers in the village. He had done line planting of ragi on 7 August 2011 and harvested it on 5 December 2011. He planted maize during the last week of June and harvested it in the third week of October 2011. He applied gypsum @ 80 kg per acre, zinc sulfate @10 kg per acre and borax @ 2 kg per acre and got good yields as compared to the previous year, 2010. He harvested a ragi grain yield of 1.0 ton per acre and a maize grain yield of 1.8 ton per acre during 2011. In contrast, he had got a ragi grain yield of 0.8 ton per acre and a maize grain yield of 1.2 ton per acre during 2010 without using Bhoochetana inputs. Cost of cultivation was ₹7,000 per acre during 2011, whereas it was ₹6,000 per acre during 2010. He sold ragi grain @ ₹12,000 per ton and maize grain @11,000 per ton and got an additional gross profit of ₹19,200 and net profit of ₹14,700 due to adoption of Bhoochetana technology in his land during 2011. He has availed of all the Bhoochetana inputs from the Department of Agriculture on subsidy. He uses a hired tractor for land preparation and bullock drawn implements to sow the crops and for inter-cultivation operations. He harvested the crops manually and used machines for threshing. All the farmers in the village now contact him for technical information and he has earned good social respect in the village.

91 Balanced nutrient application in maize crop enhances returns

Mr M K Jagadeesh, s/o Mr Kariyappa, Siddapura Village, Sirigere Post, Chitradurga Taluk, Chitradurga District, Karnataka.

Fig. 4. Bhoochetana farmer, Mr M K Jagadish with his Maize crop during 2011.

Mr M K Jagadeesh is a progressive farmer who adopted Bhoochetana technology by watching a telecast on the Bhoochetana project on Chandana TV during 2010. He was impressed with the technology and adopted it in two ha of land by planting maize crop during 2011. Mr M K Jagadeesh is 42 years old and has studied till the tenth standard. He has 5.3 ha land, two ha dryland and the remaining area irrigated in survey No. 92/2 and 5/1A. Agriculture is his main occupation through which he has to support the five members in his family. He grows maize crop in the dryland and areca nut in the irrigated land. He adopted Bhoochetana technology in two ha of land by basal application of gypsum @80 kg per acre, zinc sulfate @ 10 kg per acre and borax @ 2 kg per acre. He planted maize crop on 17 July 2011 and harvested the crop on 20 October 2011. Cost of cultivation was ₹9,000 per acre during 2011, whereas it was ₹8,000 per acre during 2010. Grain yield production was 2.8 ton per acre during 2011, whereas it was 1.8 ton per acre during 2010. Mr M K Jagadeesh is happy with the technology and has applied these nutrients to areca nut as well. He got an additional gross profit of ₹55,000/- and a net profit of ₹50,000/- from five acres of land as compared to the previous year, 2010. He has spent this additional income on his childrens' education as his daughter is pursuing her B.E. and his son is studying for the S.S.L.C. in Harihara town. He used a hired tractor for land cultivation and bullock drawn implements for sowing and inter-cultivation. Harvesting of crop was done using manual labor and threshing by multicrop threshers. He is availing of organic and inorganic fertilizers from the Department of Agriculture at 50% subsidy and applying these inputs in his entire farm. He proudly said that this project is very good for building soil fertility as well as for productivity enhancement and that timely supply of these inputs will play a crucial role.

92 Increased yield due to micronutrients in maize experienced by Sadappa Sangappa Jamakhandi

Maize yields incresed in Sadappa Sangappa's field due to proper application of micronutrients.

In the year 2011-12, when the farmer approached the Department of Agriculture about the micronutrients, the agriculture officers told him about Bhoochetana Yojane which was doing very well. Then the AO, AAO and farm facilitator along with the farmers visited his farm. The farm facilitator took soil samples from 5.2 acres of farmer Sadappa Sangappa Jamakhandi's land in the village called Hanchnal p.m with the survey no. 37/2. The soil samples were sent to ICRISAT, Patancheru. The farm facilitator advised him about the micronutrient level in the field and also conducted meetings. Field demonstrations were also organized for the application of micronutrients because seeing is believing and learning by doing has worked here. Sadappa Sangappa Jamakhandi wanted to grow a higher yielding crop, so they took maize seeds from the Raith Samparka Kendra Mamadapur along with some PSB, *Azatobacter*, zinc sulfate, gypsum, boron, and some liquid biofertilizers. Mr Sadappa Sangappa Jamakhandi contacted ICRISAT, officials from the Department of Agriculture and the farm facilitator who demonstrated the seed treatment with biofertilizers in his field. They advised 10 kg of zinc, 3 kg boron and 80 kg gypsum, per acre. The farmer cultivated maize crop in a two acre area and applied gypsum at 80 kg per acre and boron at 3 kg per acre. *Azatobacter* was mixed with cow dung and broadcast in the field. The liquid biofertilizers were sprayed on the crop after 40 days.

After 55-60 days of sowing, the crop showed a clear difference in its superior growth compared with the normal practice crop.

At the harvesting stage, the farmer observed that the seed setting in maize corn was fully filled. Each plant had four corns and fodder quality was very good.

After harvesting, the farmer hopes to get 40 quintals from 2 acres. Sadappa Sangappa Jamakhandi said that this Yojane is good and effective. Finally he is fully convinced that application of micronutrients not only increases crop yield but also helps in moisture conservation during dry spells. He proudly explains the technology to fellow farmers and advises them to implement it.

Compiled by Sudi Raghavendra Rao and Manjunath Jangawad

93 Soil fertility management significantly increases sunflower yields

Sri Dattatreya Dhondiba Gujjar, Babaleshwar village, Bijapur District, Karnataka.

Sunflower crop in DD Gujjar's field.

Sri D.D. Gujjar has a total farm holding of eight acres. During the year 2012-13, he has grown sunflower by following Bhoochetana practices. He adopted new technology like the use of micronutrients, seed treatment, planting across the slope and weeding twice. Apart from this he availed training and got technical guidance from the staff of the Department of Agriculture and ICRISAT on IPM and INM practices.

While other farmers got only 500 kg per acre and had invested ₹4,800/- on agricultural operations, by using Bhoochetana practices, Sri D.D. Gujjar got 625 kg per acre even though the had crop faced severe drought.

Sri D.D. Gujjar had invested ₹5,500 per acre. He has realized that the addition of micronutrients to the soil and the application of gypsum helped improve soil moisture apart from improving sulphur and calcium status in the soil. Subsidy on micronutrients, biofertilizers & gypsum has helped him a lot. Now he has decided to follow Bhoochetana technologies in future. He is of the opinion that despite the poor rainfall during the year, he has benefitted by implementing the new technology.

94 Bhoochetana motivated me to excel, says Kannan

Mr Kannan, s/o Mr Ramanakute, Aattoor village, Somawarpet Taluk, Karnataka.

Agricultural officials inspect Kannan's field .

I am Kannan and for the last 40 years I have been depending upon five acres of land for my livelihood. We are a family of four. My wife is also involved with me in all the agricultural work. My children are studying and to bear their educational expenses I depend entirely on technologies which increase productivity and income. Cost of inputs like fertilizers and pesticides are increasing along with the cost of labor. Due to unavailability of labor, it has become very difficult for me to carry out my agricultural activities. Expenses are very high and the income is very low. Hence I have left a part of my land fallow. Now with the introduction of the 'Bhoochethana' program, I have come to know about the methods which I have to adopt to make my unproductive land fertile and useful. Through the training sessions I learned a lot about these innovative methods even though I am basically illiterate. Earlier I did not have any knowledge regarding soil testing and identification of deficiencies to increase crop yields with improved technologies. After undergoing training I came to know a lot about these aspects. I was able to follow the soil test-based fertilizer recommendations. Based on the advice given I applied the required fertilizers like zinc sulfate, borax, PSB and dolomite to my soil. Now I have got a wonderful crop from land that was once unproductive.The Bhoochethana program has given me hope in the world of misery.

I have lots and lots dreams of becoming an ideal farmer. The Bhoochethana program has helped me develop a sort of confidence within myself.

Maize, ginger, cauliflower and paddy are my major crops and in addition to agriculture, I am engaged in other activities like poultry farming and vermicompost production.

In the future too, I will continue with this improved technology to obtain good yields and maintain the fertility of the soil.

I hope that in the future, more and more such programs will continue to provide me with a lot of information so that we are able to improve our livelihoods and income to sustain the increasing family expenses.

95 Improved management techniques helped Laxmi boost paddy yield

Mrs. Laxmi Shanka Gowda, Madangeri Village, Kumta Taluk, Dakshin Kannada District, Karnataka.

Paddy yield in Laxmi's field increased due to Bhoochetana project .

In this village a majority of the families belong to the Hindu backward class of Halakki Gowdas. Here a majority of the farmers have very small land holdings of 10 gunta, 20 gunta, etc. The major crops in this region are paddy, coconut, vegetables and cashew. In this area farmers grow paddy during the rainy season.

Now-a-days farmers are renouncing agricultural cultivation because of the labor problem and the high cost of fertilizers. However, some young and enthusiastic farmers are still interested in agriculture.

When the Department of Agriculture started training sessions to create awareness for Bhoochetana, many small farmers like Mrs. Laxmi Gowda were motivated to adopt Bhoochetana technologies. Mrs. Laxmi implemented the method as per the instructions of the AOs and officials from ICRISAT. She started applying fertilizers and micronutrients as per the recommendations of ICRISAT. She brought the lime, zinc, borax and PSB from RSK at subsidized rates and applied them in her paddy field.

By adopting the improved technology she got ₹19,900.00 more than last year. She is very happy and interested in continuing with the method in the coming years as well.

Cost of Cultivation (2 acres)		
Particulars	2011-12 Traditional system	2012-13 Improved system
Ploughing, transplanting, harvesting etc	19000.00	22000.00
FYM	12000.00	13000.00
Chemical fertilizers	5000.00	3000.00
Micronutrients	-	1500.00
Others	3500.00	2500.00
Total	39500.00	42000.00
Total income	Paddy Grain yield -5200 kg at ₹10.00 = ₹52000.00 Dry matter- 12000 kg @ 1.20= ₹14400.00 Total---₹66400.00 Net income (₹66400.00-39500.00)= ₹26900.00	Paddy grain yield -6000.00 at ₹12.00= ₹72000.00 Dry matter- 14000 kg at 1.20= ₹16800.00 Total- ₹88800.00 Net income- ₹88800.00-42000.00) = ₹46800.00
NET INCOME 2012-13 - NET INCOME 2011-12	₹46800.00 - ₹26900.00= ₹19900.00	

96 Science-led agriculture rejuvenates interest in Vishnu Narayan

Mr.Vishnu Narayan Naik, Gulaadkeri Manki Village, RSK of Honnavarl Taluk, Uttara Kannada District, Karnataka.

Paddy yield witnessed a major boost in Mr Vishnu Narayana Naik's field.

Mr.Vishnu Narayan Naik belongs to Gulaadkeri Manki Village.This place is 14 kms away from the famous tourist and religious destination, Murudeshwar. It is located between Honnavar and Bhatkal on NH-17.

The whole village consists of small and medium farmers who own landholdings that vary in size from 10 gunta to 3 acres. Paddy, coconut, betel vine and cashew are the major crops grown in this area. Some farmers also take up vegetable cultivation in the *rabi*/summer season.

These days farmers are expressing a lack of interest in agriculture and agri-business due to the inavailability of labor. Inspite of this, Mr Vishnu Narayan Naik took up paddy production along with his family members using traditional methods. Due to the lack of knowledge about modern agri-techniques he was getting lower yields and hence poor income.

The Government of Karnataka, implemented the Bhoochetana project in 2012-13 in Uttara Kannada District. Agriculture officers and farm facilitators motivated him to implement Bhoochetana. First, he did the soil testing. As per the results and recommendations of ICRISAT he then started applying fertilizers and micronutrients like lime, zinc, boron and PSB.

In the beginning of the project, Mr Vishnu Narayan Naik showed a lack of interest, but after attending the training sessions and farmers' field school, he actively implemented the improved technology and got a higher yield.

When we asked him, he said, "In the beginning I thought that this project is also like other projects that just have a big name but are not really of any use to us. But later on attending the training program and farmers' field school I realized it was different and got interested in implementing the inputs recommended by the program. This has helped me get a higher yield and income."

Cost of cultivation		
Particulars	Farmer Method	Bhoochetana Method
Ploughing, transplanting, harvesting and other cultivation expenses	7000.00	8500.00
FYM	4000.00	4500.00
Chemical fertilizers	3000.00	1500.00
Micronutrients	-	1000.00
others		500.00
Total	14000.00	16000.00

Total Income

Farmers practice

Paddy grain yield: 2000 kg at ₹10.00= ₹20,000.00

Dry matter: 6000 kg at ₹1.20= ₹7200.00

Net Income: ₹27200.00 –₹14,000.00 = ₹13,200.00

Bhoochetana practice

Paddy grain yield: 2400 kg at ₹12.00= ₹28,800.00

Dry matter: 6500 kg at ₹1.20= ₹7,800.00

Total = ₹36,600.00

Net Income: ₹36,600.00- ₹16,000.00= ₹2o,600.00

Net Income in Bhoochetana technology: ₹26,600.00- ₹13,200.00= ₹13400.00

97 Micronutrients help harvest more yields and higher incomes

Mr Basappa, s/o Mr Basappa, Tataval Village, Kasba Hobli, Magadi Taluk, Ramanagara District, Karnataka.

Bhoochetana project has provided a ray of hope for Mr Basappa.

This is the success story of a marginal farmer Mr Basappa who is 65 years old. Farming is the major source of livelihood for Mr Basappa who has to support the eight members in his family. He has eight acres of dryland in survey Nos. 72/1 and planted ragi inter crop on 12 July 2011 in one acre of land using Bhoochetana inputs. He planted pigeonpea, cowpea and brinjal crops in the remaining area. He got information about the Bhoochetana project from the Department of Agriculture and a farm facilitator. He procured inputs viz., ragi seeds (@5 kg per acre), gypsum (@50 kg per acre), zinc sulfate (@5 kg per acre), borax (@2 kg per acre) and *Azosprillum* (@150 g per acre) from the Department of Agriculture. He has treated the seeds with fungicide and biofertilizers, carried out soil application of trichoderma and applied 22 kg DAP, and other procured nutrients as per the recommendation in one acre of land as basal dosage and mixed in soil.

He planted the crops across the slope on flat land and maintained a spacing of 30 x 10 cm. He harvested the crop by using manual labor on 18 November 2011. He has incurred ₹6,850/- towards cost of cultivation in the one acre in which he grew the crop. He has harvested 1,668 kg of ragi grain from the one acre Bhoochetana plot during 2011 where as he had harvested 1,247 kg of ragi grain yield during 2010 from the same area. Thus he got an additional net profit of ₹6,240/- from the Bhoochetana plot. He has availed of all the Bhoochetana subsidized inputs from the Department of Agriculture. Mr Basappa used improved bullock drawn implements for sowing and inter-cultivation. He uses his own house for storage and sells the produce within a few months whenever he gets a good price in the market. Since he has adopted the Bhoochetana technologies, he has got special respect in the society and people come and ask him about his experience. During the rainy season of 2012, Mr Basappa adopted the technology in two acres of land with ragi crops. Next year he would like to adopt this technology for all the crops throughout his land. Regarding non-tangible benefits, Mr Basappa says reduction of soil erosion and conservation of rain water was observed due to conservation furrows. The application of gypsum and micronutrients help in holding more moisture in the soil and the crop is able to withstand long dry spells far better than a crop cultivated without these technologies. All these benefits helped in harvesting higher yields and brought him more income and a better quality of life. Mr Basappa has a cow and he gets about ₹6,000/ annum by selling milk every year. This is his net saving which he has spent on a good diet, clothes, medicine and so on, for a better quality of life.

98 Improving farming practices helps get more income and rejuvenate a farmer's faith

Mr K B Narayana, s/o Mr Boregowda , Kashuvinahalli Village, Nagamangala Taluk, Mandya District, Karnataka.

Department officials inspect Mr K B Narayana's field .

This is the success story of Mr K B Narayana, a marginal farmer, who is 65 years old. Rainfed farming is the major livelihood option for Mr K B Narayana who has to support the five members in his family. He has two acres of dryland in Survey Nos. 17/4 and has two local cows and three goats. He planted ragi inter crop on 20 August 2011 in one acre of land using Bhoochetana inputs. He has been engaged in subsistence farming for many years. However, he wants to do something new to obtain optimum crop yield to increase his income and thereby improve his livelihood. He got information about the Bhoochetana project from the Department of Agriculture and a farm facilitator. He procured inputs viz., ragi seeds (@5 kg per acre), gypsum (@50 kg per acre), zinc sulfate (@5 kg per acre) and borax (@2 kg per acre) from the Department of Agriculture. He has done seed treatment with fungicide and biofertilizers, carried out soil application of trichoderma and applied nutrients as a basal dose.

He planted the crops across the slope on flat land and harvested the crop by using manual labor on 21 December 2011. He has incurred ₹4500/- towards cost of cultivation for growing the crop in an area of one acre. He has harvested 1,010 kg of ragi grain from the one acre Bhoochetana plot during 2011, whereas, he had harvested 880 kg of ragi yield during 2010 from the same area. Thus he got an additional net profit of ₹2,240/- from the Bhoochetana plot along with a higher income of ₹3500/- per annum from livestock and a goat. He has availed of all the Bhoochetana subsidized inputs from the Department of Agriculture. He used improved bullock drawn implements for sowing and inter- cultivation. Mr Basappa uses his own house for storage and sells the produce within a few months whenever he gets a good price in the market. Ever since he has adopted the Bhoochetana technologies, he has got special respect in society and people come and ask him about his experience. Regarding non-tangible benefits, Mr Basappa says reduction of soil erosion and conservation of rain water was observed due to conservation furrows. The application of gypsum and micronutrients helps in holding more moisture in the soil. The crop is able to withstand long dry spells far better than crops cultivated without these technologies. All these benefits helped in harvesting more yields and improved his income and quality of life. Mr Basappa has a cow and a goat and he is getting about ₹12,000 per annum by selling milk and a goat every year. This is his net saving which he has spent on a good diet, clothes, medicine and so on for a better quality of life.

99 Small investments on micronutrients bring a smile to a farmer's face

Mr Kalaiah , s/o Mr Sannaiah, Shilpapura Village, Nagamangala Taluk, Mandya District, Karnataka.

Ragi crop shows an increased yield in Mr Kalaiah's field.

This is the success story of a small and innovative farmer Mr Kalaiah, who is 60 years old and is uneducated. Farming is the major source of livelihood for Mr Kalaiah who has to support the four members in his family. He has one acre of land in survey No. 21, and grows ragi during the rainy season. He voluntarily participated in the Bhoochetana program and applied the inputs in his entire land as he was convinced with the technology on looking at the results from another farmer's field. He got information about the Bhoochetana project during the first year from officials of the Department of Agriculture, a technician from ICRISAT and a farm facilitator. He has adopted the recommended crop spacing, quality of seed, seed treatment with pesticides and biofertilizers as well as soil application of trichoderma. He has also applied 50 kg gypsum, 5 kg zinc sulfate and 2 kg borax per acre along with the recommended doses of N, P and K. He had planted rainy season crops on the 18th of August and harvested the crops on 23 November 2012 using manual labor. He has taken the help of farm facilitators, staff of the Department of agriculture viz., agricultural assistant, agriculture officer as well as staff from ICRISAT both based at Hyderabad and in the district who were visiting the plot periodically and giving him the required technical help and inputs. He followed the instructions given by them.

He noticed a remarkably good ragi crop growth as compared to the last two years crop and was very sure of getting a good yield. Similarly, he has obtained 12 quintals per acre of ragi yield compared to the average yield of 9.9 quintals per acre that he had got in the last two years. As per his opinion, the simple technology of adoption of balanced nutrition including the deficient micro and secondary nutrients along with improved cultivar has proved to be a viable practice. It has given him a 19 per cent increase in crop yield which accounts for a benefit of about ₹4100 ha^{-1}. Additionally, he maintains livestock which gives him ₹8,500 annually. has expressed his happiness at having received technical inputs which have enhanced his knowledge towards enriching soil fertility and obtaining maximum benefit with a small expenditure on deficient nutrients. He is ready to go with the project for the next year as well and is so convinced that he is prepared to purchase the inputs from RSK situated at Taluk place without any subsidy. All these benefits have helped in harvesting more yields and have improved his income and quality of life. He is spending the increased income on his childrens' education by sending them to schools of a good standard.

100 Science-led technologies make farming viable and farmers happy

Mr Gurappa, s/o Mr Sajiwala, Mangalpete Village, Lingsugur Taluk, Raichur district, Karnataka.

Mr Gurappa 's Pearl Millet crop benefitted from Bhoochetana project.

Mr Gurappa is a small farmer who adopted balanced nutrient application under the Bhoochetana project. His land has red soil and he grows pearl millet, pigeonpea, castor and groundnut during the rainy season.

During the rainy season of 2012-13, he had grown pearl millet crop in one acre with his traditional practice in which he had applied DAP + urea. He also cultivated another one acre plot with the addition of micronutrients (gypsum+ zinc sulfate + borax) along with DAP+ urea as per soil test-based nutrient recommendation. These recommendations improved the Bhoochetana plot. He got a grain yield of 900 kg per acre and fodder of 2,600 kg per acre with his traditional method. With the improved practice of Bhoochetana he got a yield of 1,200 kg per acre and fodder of 3,200 kg per acre. This was an additional yield of 300 kg per acre of grain and 600 kg per acre of fodder over the traditional practice. The pearl millet grown was recommended by the Department of Agriculture for both the traditional and Bhoochetana plots. Appropriate seed treatment was done before sowing with 2 g rodomil per kg seed. Biofertilizer PSB 2 kg and trichoderma -2 kg were mixed with FYM and used for soil application along with 10 kg zinc sulfate, 2 kg borax & 80 kg gypsum per acre. Sowing was taken up in 45 cm rows at 15 cm seed spacing at 5 cm depth on 28-06-2012. Inter-cultivation & weeding were taken up at the right time in both plots. The harvesting was taken up on 20-09-2012 with proper CCE methodology. The yield data was recorded and has been tabulated in the Table below.

Sl.no	Particulars	Bhoochetana Plot	Farmers' Practice
1	Yield per acre		
	1) Grains (t)	1200	900
	2) straw (t)	3.2	2.6
2	income /acre		
	1) Grains (28 ₹kg -1)	25200	33600
	2) Straw (3 ₹kg -1)	7800	9600
	Total income ₹	33000	43200
3	Total expenditure /Acre ₹	8680	9740
4	Net income ₹	24320	33460
5	Cost benefit ratio	1:2.81	1:3.44
6	Net Income with every rupee of additional cost over traditional practice	₹8.62	-

Sri Gurappa is very happy with results he got from the Bhoochetana program and with the additional income. He said that the facility extended by the Government on micronutrients and biofertilizer is really helpful for improving the soil fertility. He got ₹8. 62 per every additional rupee he spent on the input cost of micronutrients and biofertilizers. He said this program has improved their family income with just a small additional input cost. He has paid his loans with the additional income and learned the importance of soil test-based nutrient application for crops. He says he will continue to apply nutrients as per the recommendations for all the crops and get the benefits.

Integrated Watershed Management

Karnataka state occupies the largest rainfed agriculture areas next only to Rajasthan. Considering the current scenario, improving productivity and mainstreaming farmers is a major priority in these regions. Integrated watershed management has been proved as a tested technology to upgrade rainfed agriculture while simultaneously addressing ecosystem services, equity and livelihoods. Considering this, various watershed programs are supported by public-private enterprises to develop as sites of learning to replicate success in other parts of the state. The interventions are targeted at efficient natural resource management through institutional building for intensification, diversification and developing microenterprises along the value chain.

101 JSW watershed initiative brings changes in SHG woman's life

Vanajakshi, Joga Village, Sandur Taluk, Bellary District, Karnataka.

Vanajakshi who has been a role model for woman farmers', inspects her nursery.

Vanajakshi is the group leader of Manasa, a women's self help group. Her husband works as an agricultural laborer. Under her dynamic leadership, the Manasa Self Help Group has grown a Gliricidia nursery during 2013-2014 in the village and has also supplied plants to the villages in the watershed and earned an income of more than ₹22,000/- per year during off season.

She was proactive and instrumental in taking up the income generating activity of vegetable cultivation in a small piece of land. It improved the availability and nutritional quality of the vegetables. The women of the group sold these vegetables to other farmers at ₹10/- per kg and earned an income of about ₹1000/- per month.

The JSW watershed project helped Vanajakshi adopt income generating activities. She became the proud owner of a small grocery store and a woman with net savings of about ₹500/- per month.

Before ICRISAT started its JSW watershed project in the village her financial condition was very poor. Her family meals used to be chapattis with a little chutney. They could afford fresh vegetables such as okra, cluster bean and leafy vegetables only twice a week. With her leadership qualities and capabilities she was able to rise above these circumstances and become a role model for others.

Compiled by Sudi Raghavendra Rao, G Pardhasaradhi, Nadaf and Ganga Banvi

102 The watershed well wisher

Mr Nayanappa, Kodalu Village, Sandur Taluk, Bellary District, Karnataka.

Water conservation through JSW watershed project has benefitted farmers like Mr Nayanappa.

Mr Nayanappa is engaged in agricultural activity. He has five acres of farm land, which he cultivates. He has played a crucial role in motivating other farmers in the village to take active part in implementation of various activities. He specially motivated people to get involved in water conservation activity to improve water resources in order to overcome the common problem of erratic rainfall in the region.

Water, water every where

The JSW watershed project started in the village in 2013. Watershed committee members played an active part in watershed interventions such as selecting sites for check wall/check dams and other interventions. Due to the committee's collective action and effort, check dams have been built, and the water is used for livestock and domestic purposes. The check dams have resulted in a 2-3 meter rise in the water table in bore wells and dug wells. Mr Nayanappa motivated farmers and actively participated in the construction of water harvesting structures as a laborer. He has also participated as a farmer in productivity enhancement initiatives through improved cultivars and balanced nutrient management. He learned how to conserve soil and water within the field. Now the farmers in the watershed are very happy to see lots of water in structures as well as improved groundwater resources.

He is always encouraging fellow farmers to participate in watershed projects to improve their livelihoods and be financially independent. He regularly attends the awareness and village development meetings.

Mr Nayanappa, is a bold person and a good communicator. He is looked up to as a leader among the farmers in village. He motivates other farmers to take part in the meetings and manage major issues such as livelihood improvement, sanitation and the availiability of water.

103 Watershed committee initiative brings cheers to farmers

Mr Murtheppa, Doddanthapur Village, Sandur Taluk, Bellary District, Karnataka.

Watershed interventions has helped many farmer's such as Mr Murtheppa.

Mr Murtheppa is a farmer who has four acres of agricultural land. Agriculture in the village is rainfed and the groundwater source is also declining. It is difficult to go for double cropping. However because of watershed interventions, 50% of the land is now under double cropping.

Watershed project changed the farming scenario

The watershed committee members proposed to Mr Murtheppa that he construct a farm pond in his field for collecting and storing runoff water. Runoff is guided through a diversion drain with grassed waterways to a farm pond. He actively participated in construction as a labourer. To reap the benefit of the rain water that has collected in the farm pond he has participated in productivity enhancement initiatives. Now with increased availability of surface and groundwater he is able to carry out double cropping. He plans to take up vegetable (onion) cultivation with drip irrigation.

His concerns for community

Earlier he rarely participated in meetings. However soon after he became a beneficiary farmer of the watershed and realized the benefit, he started to participate in watershed activities viz. proposals for water storage structures and construction. He also took responsibility for completion of structures under the watershed development project.

104 Case study from Model watershed Dharwad

Mr Vinay Ayyappa Desai, Singanahalli Village, Dharwad Taluk, Dharwad District, Karnataka

Broad bed and furrow system of land management with drip irrigation.

The farm pond has helped us during uneven distribution of rainfall: Mr Vinaya Desai Mr Vinay Ayyappa Desai has 14.04 acres (Sy. No-98) of dryland. Singanahalli is one of the four villages under the Model Watershed project supported by the Ministry of Agriculture.

Before the Model Watershed Project, Mr Vinay was not aware about the importance of water conservation. During the Project period, Mr Vinay attended various awareness building and training programs conducted in watershed. Under this project, Mr Vinay has constructed a farm pond of size 12 x 12 x 2 m for rain water harvesting. Staff from BIRDS, an NGO and from ICRISAT have provided him with technical support. After the construction of the farm pond, the water level in the bore well which is situated downstream of the pond has increased substantially. As there is increased availability of water, Mr Vinay has switched from annual crop to chilli crop in two acres of land. After construction of the farm pond, they experienced two uneven rainy seasons. He proudly mentions that his crop has not been affected, while other farmers have suffered due to water scarcity. He is able to grow both *kharif* and *rabi* crops. He has bought three buffaloes to run a dairy.

Mr Vinay says “I am very grateful to the Watershed Project for providing technical and financial help. Earlier we were not keen to adopt water conservation works. However, now-a-days considering the erratic nature of rainfall, we have realized that water conservation works play an important role in reducing the risk of crop failure.”

Compiled by Sudi Raghavendra Rao and M Agasinamundin (BIRD-NGO)

The model watershed in Dharwad has medium to deep black soils with around 800 mm rainfall. When the watershed project started in 2009-10, an improved land management system, “broadbed and furrow” was introduced. Farmers have adopted this system for the prevailing annual crops. An improved farm implement, the “tropicultor” was provided and extensive training on use of the implement was given to farmers. The tropicultor is a multi-purpose farm implement that can be used for all field operations ranging from land preparation to seed cum fertilizer application. The implement can be drawn by a pair of bullocks or a tractor.

Mr RS Patil, one of the progressive farmers says that, initially he adopted the BBF land form system for maize, soybean and chickpea crops. He is of the opinion that the system while resulting in increased yield, also helps in speedy field operations. Rills and sheet erosion are also prevented in the BBF system. Now he has been cultivating flower and vegetables crops with the BBF and drip system. Mr Patil has grown Sevanthi flower, which he is selling in Pune and Vijayawada. Mr Patil is explaining the advantage of the system to the Joint Director of Agriculture and department officers.

Tropicultor being used for field operations in Mr Vinay Ayyappa Desai’s field.

105 Field scale research conducted to evaluate soil and moisture conservation systems

Singanahalli Village, Dharwad Taluk, Dharwad District, Karnataka

BBF land management system with groundnut during kharif and wheat during rabi, Model watershed, Singanahalli, Dharwad.

A field experiment was conducted in a Model Watershed (farmers' field) at Singanahalli of Dharwad district during 2010-11 and 2011-12. The objective of the study was the "Evaluation of soil and moisture conservation practices on productivity of cropping systems in a model watershed in Dharwad". The experiment was laid out in spilt plot design with 12 treatment combinations involving three soil and moisture conservation measures viz., broad bed and furrow (BBF), conservation furrow (CF) and farmers' practice (FP) as the main plot treatments and four cropping systems viz., maize-chickpea, soybean-sorghum, groundnut-wheat and maize-pigeonpea as sub plot treatments. The salient findings of the experiment are:

- Among the three land management systems BBF consistently recorded higher moisture content as well as higher crop yields and returns.
- Among the different cropping systems, the groundnut-wheat system recorded higher maize yield equivalent yield (9404 kg/ha).
- The interaction of the broad bed and furrow landform with the groundnut-wheat cropping system recorded significantly higher MEY (11,564 kg/ha) production efficiency (55.07 kg/ha/day), economic efficiency (356.91 Rs/ha/day) and water use efficiency (12.26 kg/ha/mm).

Compiled by Sudi Raghavendra Rao, Palakshagouda (PhD Scholar UASD) and M Agasinamundin (BIRD-NGO)

106 Integrated water resource management in Kolar district for increasing agricultural productivity and improving livelihoods

Interaction with community for planning the watershed activities.

Groundwater depletion and erratic rainfall are a major concern for agriculture in Kolar district. Groundwater is being used for irrigating vegetables such as tomato and chili. Cattle were abandoned due to shortage of water and reduced availability of fodder. Similar degradation of agro-ecosystems and declining sustainability are major concerns for agricultural development in many poor regions of India where rural livelihoods depend directly on management of land and water resources. In such conditions, a watershed development program is an effective intervention which could enhance groundwater recharge and reduce the water stress situation. The Coca-Cola India Foundation and ICRISAT led consortium along with MYRADA, farmers and the Government of Karnataka identified a micro-watershed in Kolar taluk of the district. This was a pilot site for improving water use efficiency and groundwater recharge and strengthening ecosystem services through a community watershed management program. The watershed is spread over an area of 1,300 ha with 1,411 households and covers eight villages. The eight villages of Vakkaleri Hobli are in the vicinity of Kolar town that is at a distance of about 6-16 km. The selected villages in the watershed have a dry climate and average rainfall is about 700 mm. About 67% of the households are in the small, 27% in the medium and 3% each are in the big and landless category.

Community participation in implementation

Farmers are the primary stakeholders and beneficiaries. Hence, involvement of the community was important for successful execution of project activity/interventions and to ensure long term sustainability of the project. Several gram sabha meetings were conducted with farmers to start the process of watershed committee (WC) formation. As per the guidelines 50% of the members (7) are women and there are an appropriate number of other landless and SC communities represented in the WC. Mr Vemanna was elected unanimously as the President of the “Markandeya Samgra Jala Samnmula Niravahane Samithi” Watershed committee by committee members and villagers. The right approach and a knowledge based entry point enabled the village community to take up the responsibility, bring in transparency and accelerate the execution process.

Compiled by Sudi Raghavendra Rao, Mukun Patil, Srigowri and Imran (MYRADA-NGO)

Rainwater Harvesting

Constructing low-cost water harvesting structures is one of the important interventions considered for groundwater recharge. With the technical backstopping of ICRISAT and MYRADA staff, potential locations for soil and water conservation structures were identified by the watershed committee and by the villagers themselves. These structures harvest substantial amount of surface runoff, allow it to percolate into aquifers and facilitate groundwater recharge. Through this project, farm ponds are promoted in these villages. Farm ponds serve a dual purpose as a means of water storage as well as groundwater recharge. Nearly 7,000 m^3 of storage capacity was developed which would facilitate conserving on an average 20,000 m^3 of runoff water for groundwater recharge. Mr Sreenivas from Jangalahalli village has constructed a farm pond (15 x 7 x 3 m) through the watershed project. He has three acres of land and used to cultivate tomato, groundnut, pigeonpea, and mango orchards. The farm pond has served as a recharge source for groundwater for a tube-well nearby and also as a temporary surface water body. Sreenivas's farm pond was filled with water twice during the rainy season (2015). This allowed him to irrigate his patch of land (10 guntha) 3-4 times during dry spells. He has grown fodder grass by using this harvested water. He was thereby able to save ₹10,000/- which he otherwise spends on fodder. Srinivas has also indicated that the water level in his tube well increased after he constructed the farm pond in his field.

Farm ponds filled with rainwater.

Women empowerment through strengthening Self-help Groups

Self-help Groups (SHGs) are the important CBO in rural communities. The watershed team has worked along with SHGs to improve livelihoods. Capacity building programs were conducted on various livelihood activities and facilitated for accessing small loans from NABARD for starting small activities. One such success story is of Mrs. Ratnamma. Mrs. Ratnamma who is 35 years old has three children and lives in Jangalahalli village. The daily wages earned by her husband was the only source of income for her house. She is a member of one of the SHGs in the watershed villages. She has attended a capacity building program where she gained information about income generating activities. The watershed team has facilitated Mrs. Ratnamma to avail of a loan of ₹33,000 from NABARD. By investing an additional amount of ₹7,000, Mrs. Ratnamma has purchased one HF bred cow. She received training in livestock management from the watershed team. The HF breed cow gives 16 litres of milk daily. The milk is being sold at ₹20 per liter. Including the cost of management, Mrs. Ratnamma is making a profit ₹5,000-6,000 per month. She says that with this additional money she has improved her financial status. She has remodeled her home and purchased a gas cylinder.

Just as in Mrs. Ratnamma's case, information gained from the watershed team has transformed the life of Mrs. Venkatratna. Mrs. Venkatratna is 26 years old and belongs to a poor family and she had daily wages as source of income. She has taken a loan of ₹36,000 from NABARD and invested an additional amount of ₹7,000 to start a small grocery store in her village. Now she is earning ₹15000/- from her store. Mrs Venkatratna is happy to see that she has transformed her status from a daily wage laborer to a shop owner.

Mrs Ratnamma with HF bred cow (left) and Mrs. Venkatratna with small shop in background (right).

107 SHG revolving fund helped us improve my livelihood - says Ms. Susheela B Yettinagudda

Susheela Basappa, Neeralakatti Village, Dharwad District, Karnataka.

(Smt Susheela discusses a point with Mr Naganna Keriholad, Community Organiser, BIRDS, Dharwad).

"My name is Susheela Basappa Yettinagudda and I belong to a poor family. I was struggling to support our livelihood by working as a farm laborer. I was desperately looking for some support from a project or program so that I could have a sustainable income to look after my family. I saw some of the SHG meetings and approached them to include me as one of the SHG members in the Renukadevi SHG. Every week we meet and save ₹10/- each. People from ICRISAT gave our sangha a revolving fund. Through that I have availed of a loan of ₹5,000/- and with my savings and loan from Bank, I have purchased four goats. I have improved my income source and have benefitted from the SHG activities of the watershed project".

108 Women's livelihoods enhanced through SHG activity

Kashwa Mathapati in Kotur Village.

(Smt Kashwwa & Other SHG members with Naganna-Keriholad, Community Organizer).

"My name is Kashwa Mathapati and there are nine other members from Kotur in our group. We are all from poor families. We all met and formed Shri Bhagirathi SHG with 20 members in the ICRISAT Model Watershed. Every week we meet and save ₹10/- each. The savings as of now amount to a total of ₹17,680. ICRISAT gave our SHG a revolving fund. We utilized the money to start making Agarabattis. We make agaribathis and sell them at the weekly markets at Garag Kotur and Bellur villages.

We are able to work at home after completing our routine home and field work. Each of us is able to earn ₹3,000-5,000 per month depending on the season and the time we have for making agarbattis. We now have a reliable source of livelihood to support our family".

109 Income generating activity helps improve livelihood of Jai Hanuman SHG group members

Mr Karibassappa (top) and his other SHG member making bamboo basket.

Jai Hanuman SHG was started in 2008-09 with support from the Model Watershed project. One of the members Mr Karibasappa says, that in our SHG we started with a weekly saving of ₹10/- each and started income generating activities like making bamboo baskets and broomsticks with assistance from an ICRISAT revolving fund and a loan from Indian overseas bank (Garag). Before this activity we were earning ₹1,000-1,500/- per member per month. Now we are earning ₹4,000-5,000/- per month. We are able to support our livelihood through this activity.

110 Inter crop of groundnut and pigeonpea with improved practices yield higher returns

Mr Siddappa, s/o Mr Hanumanthappa, Krishnarajapura Village, Nagaregere Hobli, Gowribidanur Taluk, Chikkaballapur District, Karnataka.

Bhoochetana technology used in Mr Siddappa field has enhanced yields of groundnut and Pigeonpea.

This is the success story of small farmer Mr Siddappa. He is 58 years old, and has studied till fourth standard. Farming is the major source of livelihood for Mr Siddappa who has to support the four members in his family. He has 3.5 acres of dryland in Survey Nos. 29 and 35. He planted groundnut / pigeonpea inter crop on 23 July 2011 in one acre of land using Bhoochetana inputs. He cultivated maize and ragi crops in the remaining area. He got information about the Bhoochetana project from the Department of Agriculture and farm facilitators. He has treated the seeds with fungicide and biofertilizers, carried out soil application of trichoderma and applied 40 kg DAP, 100 kg gypsum, 10 kg zinc sulphate and 2 kg borax as per the recommendation, in one acre of land. He planted the crops across the slope with paired row planting of pigeonpea in 8:2 ratios. He also made conservation furrows in between pigeonpea rows to conserve rain water. He harvested the groundnut crop by using manual labor on 4 November 2011, and did pod picking manually. He has incurred ₹9,800 towards cost of cultivation for growing groundnut in one acre whereas during 2010 the cost of cultivation in one acre was ₹9,200. He has harvested 550 kg of groundnut pod and 150 kg of pigeonpea grain from the one acre Bhoochetana plot during 2011. In 2010 on the other hand, he had harvested 410 kg of groundnut pod from the same area. The pigeonpea grain was used for household consumption and groundnut pod was sold at ₹30 per kg. Thus he got an additional gross profit of ₹4,200 and a net profit of ₹3,600 from the Bhoochetana plot. He has availed of all the Bhoochetana subsidized inputs from the Department of Agriculture. Mr Siddappa used a hired tractor with a cultivator for primary tillage and used bullock drawn implements for sowing and inter-cultivation.

He uses his own house for storage and sells the produce within a few months whenever he gets a good price in the market. Ever since he has adopted the Bhoochetana technology, he has received special respect in society and has given interviews to media like DD and newspapers. During the rainy season of 2012, Mr Siddappa adopted the technology in two acres of land with maize and ragi crops. Next year he would like to adopt this technology for all the crops in his farm. Regarding non-tangible benefits, Mr Siddappa says reduction of soil erosion and conservation of rain water was observed due to conservation furrows. Application of gypsum and micronutrients helps in holding more moisture in the soil. The crop is able to withstand long dry spells far better than crop that is cultivated without this technology. All these benefits helped in harvesting more yields and improved income and the quality of life. The farmer has sheep and he gets about ₹6,000 annum^{-1} by selling two sheep every year. His annual domestic expenditure was ₹24,000 and annual income was about ₹30,000. His total saving was about ₹6,000 which he spent on maintaing a good diet, clothes and medicines, The Bhoochetana project has helped improve his quality of life.

Compiled by Ch Srinivasa Rao and M Narasimhaiah

111 Improved practices for higher productivity and returns

Mr Buggappa, s/o Mr Ningappa, Hattikuni Village, Hattikuni Hobli, Yadgir Taluk, Yadgir District, Karnataka.

Mr Burgappa cleared debts and improved family welfare due to Bhoochetana.

This is the success story of a small farmer Mr Buggappa, who is 41 years old and has studied up to PUC. Farming is the major source of livelihood for Mr Buggappa who has to support the nine members (five elders and four children) in his family. He has five acres of dryland in Survey No 140 on which he planted green gram, pearl millet and sunflower on 15 June 2011 by using Bhoochetana inputs. He got information about the Bhoochetana project from the Department of Agriculture and he availed of seeds, micronutrients, biofertilizers, biopesticides and irrigation equipment at subsidized rates. He planted the crops across the slope, treated seeds with trichoderma, *Rhizobium*, and PSB and applied micronutrients as well as neem oil to control aphids. He incurred ₹4,200 towards investment on farmers' practice and ₹4,800 towards Bhoochetana practices. He harvested 480 kg per acre as against 380 kg per acre that he had harvested before adoption of the improved technologies. He did ploughing, harrowing, etc and manually threshed after harvesting. He stored the produce in a small godown at home. Overall, there was an economic benefit of ₹3,500 per acre due to adoption of Bhoochetana technology. He is happy to have increased food grain production, improved his financial status and his health as well as the education of his children. In future, he has decided to follow Bhoochetana technologies like utilization of micronutrients and improved management systems. His annual domestic expenditure now is ₹72,000. The benefits he obtained through Bhoochetana helped him clear his debts and improve his family welfare which included health and education. Due to the increased C.B. ratio through Bhoochetana technologies, other farmers too have shown an interest in the application of micronutrients.

112 Improved practice leading to sustainable intensification, says Nagaraju

Sri Nagaraju s/o Late Sri Kempaiah, Mayaganahalli Village, Ramanagara Taluk, Ramanagara District, Karnataka.

Bhoochetana project helped Nagaraju obtain increased yield with pigeonpea.

This is the success story of medium holder farmer Mr Nagaraju, who is 50 years old and has a Diploma in Mechanical Engineering from AMIE in Ramanagara district, Karnataka. Farming is the major source of livelihood for Mr Nagaraju who has to support the seven members in his family. He has a total of ten acres of dryland in survey Nos. 123/1. He generally cultivates pigeonpea, ragi, paddy, cowpea and horse gram with his conventional and traditional way of agricultural practices. However, when he came across the Bhoochetana program, he understood that this program can significantly increase his farm income and help him come out of poverty. Mr Nagaraju had planted pigeonpea crop on 25 June 2011 in one acre of land using Bhoochetana inputs. He got information about the Bhoochetana project from the Department of Agriculture and a farm facilitator. He has availed of all the Bhoochetana subsidized inputs from the Department of Agriculture. Mr Nagaraju used his own tractor for primary tillage with a cultivator and used bullock drawn implements for sowing and inter-cultivation. He uses his own house for storage and sells the produce within a few months whenever he gets a good price in the market. Since he has adopted the Bhoochetana technologies, he has got special respect in society and is disseminating the information to other farmers. He has applied gypsum, zinc sulfate and borax to the mulberry crop and is getting increased quantity as well as quality of leaf material.

Mr Nagaraju displays his crop after implementation of Bhoochetana technology.

He has used improved seed, soil application of trichoderma and PSB and applied 50 kg gypsum, 10 kg zinc sulfate and 2 kg borax as per the

recommendation. He planted the crop across the slope on flat land and made conservation furrows to conserve rain water. He harvested the crop by using manual labor on 02 Dec 2011 and threshed it using a thresher for separating the grain from the pods. He observed that Bhoochetana, is an unique initiative for developing an effective alternate extension system by adopting a consortium approach involving officials from the Department of Agriculture, extension agents, farm facilitators and ICRISAT which has enabled farmers to raise their income. He realized a remarkable improvement in the crop growth compared to his previous practice of nutrient application. He has incurred ₹7,100/- towards cost of cultivation with the improved practice. He harvested 860 kg of grain from a one acre of Bhoochetana plot as against an average of 620 kg, over the last three years. He got an additional net profit of ₹9,600/- from the Bhoochetana plot. Regarding non-tangible benefits, Mr Nagaraju says reduction of soil erosion and conservation of rain water was observed due to conservation furrows. The application of gypsum and micronutrients helps hold more moisture in the soil and the crop is able to withstand long dry spells much better than the crop that is culitivated without this technology. All these benefits helped in harvesting more yields and have improved his income and quality of life. He is spending the additional income on his childrens' education by sending them to schools that are of a good standard.

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International Crops Research Institute
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ICRISAT works in agricultural research for development across the drylands of Africa and Asia, making farming profitable for smallholder farmers while reducing malnutrition and environmental degradation.

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