



Research Report No. 60

ICRISAT Research Program
Resilient Dryland System

Bhoochetana: Process Documentation

A program that helped farmers come out of low productivity and poor economic status



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Abstract

To kick start the agricultural growth rate for improving the livelihoods of 60% of population dependent on agriculture, Government of Karnataka undertook a mission project to unlock the potential of rainfed agriculture across the state with the technical support from ICRISAT. The mission mode project referred as “Bhoochetana” was launched in 2009 covering all the 30 districts to increase crop productivity by 20% in four years. Bhoochetana adopted the strategy of convergence, consortium, capacity building and collective action to ensure efficiency, economic gain, equity and environmental protection. Soil health assessment was used as an entry point for increasing productivity of agriculture to improve livelihoods through soil test-based taluk-wise recommendations adopting integrated nutrient management (INM) approach with improved seeds of high yielding cultivars, seed treatment and other productivity enhancement measures.

Following stratified soil sampling approach, GIS maps for all the districts in the state were developed and *taluk*-wise balanced nutrient management recommendations were recommended. The process of Bhoochetana implementation and the learnings from the three years are documented. The average increase in yield during the three years ranged between 22 to 66% for different crops in different district, during 2011 rainy season, 2.4 million ha in 13,800 villages and 2.2 million farmers. Drivers of success and the bottlenecks to be addressed for enhancing the impact of Bhoochetana are recorded.

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A program that helped farmers **come out of
low productivity and poor economic status**

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Abbreviations

APPP	: Accelerate Pulse Production Program
ADA	: Assistant Director of Agriculture
ATMA	: Agriculture Technology Management Agency
BBF	: Broad bed and furrow
CBO	: Community-Based Organization
CEO	: Chief Executive Officer
DCC	: District level Coordination Committees
DDA	: Deputy Director of Agriculture
EACM	: Economic Adviser to Chief Minister
FFs	: Farmer Facilitators
FFS	: Farmer Field School
FCO	: Fertilizer Control Order
GSDP	: Gross State Domestic Product
GoK	: Government of Karnataka
GIS	: Geographical Information System
GoI	: Government of India
ICRISAT	: International Crops Research Institute for the Semi-Arid Tropics
ICAR	: Indian Council of Agriculture Research
ISOPAM	: Integrated Scheme for Oil, Pulses, Oilseeds and Maize Development
JDA	: Joint Director of Agriculture
KSDA	: Karnataka State Department of Agriculture
KSSC	: Karnataka State Seeds Corporation
LF	: Lead Farmer
MN	: Micronutrient
NIC	: National Informatics Centre
NGO	: Non Governmental Organization
NFSM	: National Food Security Mission
NPMSHESF	: National Program for Management of Soil Fertility and Health, Enrichment of Soil Fertility
PS	: Principal Secretary
PPP	: Public-Private Partnerships
RKVY	: Rashtriya Krishi Vikas Yojana
RSK	: Raitha Samparka Kendra
SAU	: State Agricultural Universities
SCC	: State level Coordination Committee
SRR	: seed replacement ratio
TCC	: <i>Taluk</i> level Coordination Committees
VC	: Video Conference
VC	: Vice Chancellor
WDD	: Watershed Development Department

Executive Summary

Agriculture is the major contributor to the growth of Karnataka and is still the mainstay for large number of population. Agriculture and allied sectors' contribution to Karnataka's GSDP was around 43% in 1980-81; however, that came down to 26% in 2001-02, and 16.8% during 2007-10. The agricultural growth rate in the state during 2000 to 2008 oscillated <2% and therefore, was a big concern for the state government to address the issue on priority as 60% of population depended on this sector for their livelihoods.

After series of discussions, and a brain storming session amongst the policy makers, beaurocracy and researchers, the Government of Karnataka decided to develop a mission project to address the issue of improving productivity of dryland agriculture across the state, as suggested by ICRISAT which proved to be a right and timely decision. The project was to be implemented in a mission mode and it was christened as "**Bhoochetana**" meaning rejuvenating soils. Bhoochetana project was launched to improve the livelihoods of the dryland farmers by increasing the agricultural productivity by 20% during four years (2009-10 to 2012-13). The goal of the mission was to improve the livelihoods of the dryland farmers as well as the state's economy by increasing the agricultural productivity through new scientific technologies, innovative approaches and methods. **Bhoochetana** project outputs in the dryland agriculture zones of the state were expanded to all districts.

The Honourable Chief Minister, Government of Karnataka launched the mission '**Bhoochetana**' in an inaugural ceremony held at Haveri on 23 May 2009. At this ceremony, the Honourable Minister for Agriculture, Government of Karnataka along with Dr David Hoisington, Deputy Director General (Research) of ICRISAT and other policy makers were also present.

The objective of Bhoochetana project was to make a difference in the lives of dryland farmers in 24 districts of Karnataka, including the six districts covered under the Sujala-ICRISAT initiative, by increasing average crop productivity by 20% in four years. Later the project area was expanded to cover all 30 districts and during later stage (fourth year) irrigated crops were also included.

The project was implemented in a mission mode across the state by adopting a consortium approach. This approach created favourable environment at all levels for implementers. Karnataka State Department of Agriculture (DoA), Watershed Development Department (WDD), three State Agriculture Universities (SAUs): Bengaluru, Raichur and Dharwad, and International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), Hyderabad as a consortium leader played crucial role in successful implementation of the project at field level.

The concept of '**4-Cs**' was adopted in the project. The **first C** is Consortium of research, education and field-based agencies to implement this program effectively at ground level. The **second C** is Convergence within the department schemes and other programs. The **third C** is Capacity building of the consortium partners, farm facilitators, lead farmers and other stakeholders. The **fourth C** is Collective action at all levels during program implementation in a mission mode.

Apart from adopting '**4 Cs**' concept, efforts were also made to ensure that the '**4 Es**' were also achieved at ground level which included **Efficiency, Economic gain, Equity and Environment protection**. These are the important pillars of the sustainable and inclusive development.

The Bhoochetana project was launched in 2009 in six districts viz, Kolar, Chikkaballapur, Tumkur, Chitradurga, Haveri and Dharwad of Karnataka state where World Bank supported '**Sujala Watershed**' project was implemented. In these districts a total of 2.25 lakh ha (0.225 million ha) area covered. Main crops were groundnut, ragi, maize and soybean. In first year of the project, 1,440 villages were covered benefiting two lakh farmers.

In the second year (2010-11) of the project, 16 districts (including 6 first year districts) were covered. In these districts 12 lakh ha (1.2 million ha) with 8 lakh farmers in of 5,030 villages was covered.

The project focused on activities like soil testing, farmers' registration, training, awareness generation, wall writings in selected villages depicting soil fertility status and crop specific best management practices, Farmer field school, Farmer Facilitator (FF) and Lead Farmers (LF), hiring of godowns at cluster village for stocking of inputs and transportation of inputs from Raitha Samparka Kendras (RSKs) to cluster village, distribution of inputs at 50% subsidy, seed treatment and major crops selection. These activities were carried out in all villages where the project was implemented.

For effective implementation of the program, guidelines were developed based on learning in first two years and all communications were compiled in the form of guidelines in Kannada. This helped the field team in implementation of the project activities in much more organised way through science-led participatory approach.

The project focused on conducting soil analysis and taking action on its recommendations at field level. Around 11,000 samples were collected from farmers' fields in several *taluks* of each district covering six districts during 2008 and later on, all districts with 90,000 soil samples were collected by adopting stratified soil sampling method standardized earlier. Soil-testing reports along with soil maps using Geographical Information System (GIS) interpolated soil nutrient status data for the benefit of policy makers for the district were prepared and a comprehensive Soil Atlas was released. This was a major contribution to the state.

In all project villages, suitable extension methods were used effectively involving large number of farmers, Farm Facilitators (FFs), Lead Farmers (LFs) who were trained suitably by the master trainers from SAUs & KSDA. The master trainers trained by the ICRISAT's team of scientists to deliver uniform messages using developed training modules, organising field days and field visits were the most effective and logical approach in explaining the benefits of new technologies and its contribution in enhancing agriculture production to the farming community.

For promotion of new technologies and practices, it is must to have proper farmer selection processes crafted and adopted at field level. Bhoochetana program also has set of a farmer selection criteria. This guided the selection process of farmers who can be selected for demonstration in a particular village under the Bhoochetana program. The FFs and LFs undertook registration of the farmers for Bhoochetana prior to onset of the season.

Promotion of soil test-based micronutrients was ensured through a well drafted and executed procurement process by the Department of Agriculture.

The project has been implemented in a Mission mode. To deliver timely outputs three-tier coordination mechanism was developed and operationalized. The *taluk*, district and State Level Coordination Committees (SLCC) contributed professionally in execution of the project interventions at ground level successfully. Rigorous review and monitoring from state level committee ensured that plans were better executed and reach of the project increased to the real farmers at village level. Video-conferencing at weekly intervals was the most effective mechanism adopted in this project to get things done at ground level and save time of field team who were earlier spending their quality time in travelling to state office just for review purpose. This mechanism also helped in taking stock of situations and providing solutions to address problems arising in the field. The video conferences were addressed by higher officials (Director, Commissioner, Principal Secretary, Additional Chief Secretary and Development Commissioner and Hon'ble Agriculture Minister) regularly.

The factors like personal relationship, use of opportunity, space for officials, pro-activeness, intensive monitoring and review, leadership, farmer facilitator, lead farmers, training and capacity building, storage, transportation, publicity, input arrangement, wider sharing of outcomes, documentation and technologies made this program successful at ground level. One must understand them in detail to know more about success of this program.

The outcome of organised and integrated efforts brought positive and progressive growth in the state agriculture sector. In the year 2009-10, agricultural growth rate increased by 5.9% from 0.5% in 2008-09.

Adoption of technology rate increased progressively with increasing number of districts covered (6 in 2009, 16 in 2010 and 30 in 2011 and 2012). The program had a very visible impact on ground. In the first year- 2009-10, the project was implemented in six districts covering 2.25 lakh ha (0.225 million ha), 1,440 villages and 2 lakh (0.2 million) farmers. During the second year (2010-11), the project was implemented in 16 districts covering 12 lakh ha (1.2 million ha), 5,030 villages and 8 lakh (0.87 million) farmers. During the third year (2011-12), the project was implemented in all 30 districts covering 25.40 lakh ha (2.54 million ha) in 13,800 villages and 22 lakh (2.2 million) farmers during rainy season.

During the last three years, 2.17 lakh t (0.217 million t) of quality seeds were made available at subsidized rates to 81 lakh (8.1 million) farmers for improving the productivity of crops.

The average increase in yield in the year 2009-10 for major crops was good in sample plots which can be generalised at 50% average growth and that is very good. The state experienced enhancement in yield in the treated areas for maize (44%), ragi (35 to 65%), groundnut (32 to 41%) and soybean (39%). Similarly, about 23-57% increase in yield were observed in treated plots as compared to non-treated plots during 2010-11 and 21-43% during 2011-12.

All learnings help in taking timely corrective measures in any program, and facilitates the process of taking better policy decisions. A few good policy decisions were also taken for Bhoochetana based on continuous learning from the field – for example, appointing farm facilitators and lead farmers, provision of godowns and transportation of fertilizers at cluster level. Conducting video conferences to review the program was a big policy decision and required frequent coordination, committee meetings at state, district and *taluk* levels. Appointment of a nodal officer at district level was another one. These types of decisions taken by the government made this program effective and systematic. The learning section provides more information about the learnings.

Innovations

- Science-led development approach through farmers' participatory action research
- Soil fertility status assessment as an entry point for unlocking the potential
- Soil fertility status GIS maps and soil test-based *taluk* wise nutrient management recommendations
- Capacity building of farmers, researchers and department staff and policy makers (new extension system)
- Convergence
- Consortium
- Collective responsibility, actions and sale of operation
- End to end solutions

How the Bhoochetana was Conceived?

This section shares information about the introduction part of the process documentation that gives an overview to reader about the agriculture scenario in Karnataka. Next point discussed in the section is about the need of the project. This will help in understanding the genuine state agriculture issues, which became basis for the program. Next point provides broader outline about origin of the concept followed by goal and objectives of the project.

Stagnant Agricultural Growth in the State

Agriculture is one of the main contributors in the Gross State Domestic Product (GSDP) of Karnataka and is still the mainstay of the state economy. However, trends are showing that the agriculture and allied sectors' contribution to Karnataka's GSDP was around 43% in 1980-81, which came down to 26% in 2001-02 and then again down to 16.8% during 2007-08 and remained stagnant during 2009-10. Albeit with the diminishing share of primary sector in GSDP, agriculture still remains the primary activity and main livelihood source for the 60% rural population in the state. Moreover, for a large number of industries agriculture is main source of raw materials. Agriculture is diversified in the state. The extent of dryland in Karnataka is second next only to Rajasthan in the country. Agriculture is highly dependent on the vagaries of the southwest monsoon. Out of the net area sown, irrigated area is only 30 per cent. The most important challenge for the state is to revive the agriculture, food security, but improving the livelihood of



the farmers, who constitute 60% of population in the state. Karnataka has achieved self-sufficiency in food grain, but has continuous deficit in the case of pulses. Strengthening of agriculture sector will improve the purchasing power of the agrarian and associated communities, mostly in rural areas, which in turn will help the development of other industries.

Nearly 55% of total food grain production and 74% of oilseeds production comes from rainfed agriculture in Karnataka. Therefore, rainfed agriculture plays an important role in total food grain production in the state. Thus, rainfed agriculture productivity is crucial for food security and well-being of the people in state.

Major issues which constrained agricultural productivity in the state were low rainwater use efficiency and degradation of natural resources as there existed a large yield gaps (Figure 1) for all the crops grown by the farmers as compared to their achievable potential yields. Commitment of the policymakers to improve well-being of the farmers which overtook the normal bureaucratic process and delays. Scientist and agriculture practitioners observed through demonstrations that rainfed agriculture has lot of untapped potential and current crop yields are lower than the potential yields. There is potential to increase crop yields in the dryland areas by adoption of various dryland production technologies.

In this background, the Government of Karnataka brainstormed the complex issue of stagnant growth of agriculture sector in the state and called for ICRISAT's help to suggest a strategy and operationalize in the state. The seriousness and urgency of the policy makers was evident as following the brainstorming session in March/April, the project was conceived, approved and launched on 23rd May 2009. The Hon'ble Chief Minister of Karnataka launched an innovative approach for promotion of tested technology through its novel project called 'Bhoochetana' to improve the livelihoods of the dryland farmers by increasing the agricultural productivity in the rainfed agriculture during a period of four years (2009-10 to 2012-13). The sole objective of the mission was to improve the livelihoods of the dryland farmers by increasing the agricultural productivity in the state through promotion of science-led development approach at the doorstep of the dryland farmers in the state. Bhoochetana project is an outcome of this concern of the state government for the dryland agriculture zones of the state, which was later expanded to all districts during the third year.

Vast Untapped Potential of Agriculture in the State

- An opportunity to tap vast potential of rainfed area in the state was not a problem as considered by the policy makers.
- Science-based approach could assess the yield gaps
- Large number of people, small farmers could be benefitted
- A win-win strategy to harness the potential of rainfed agriculture in the state.

Big area under dryland farming is one of the leading problems in the state. Poor production from large agriculture land is the second biggest problem. Poor living standards of large farming community including farmers and agriculture labourer is third biggest problem. Addressing these issues was most important challenge for the state. The state government wanted to increase agriculture production and farmers knowledge though it was not an easy task to work upon at big scale on these issues.

The fact about Karnataka major dryland agriculture crop yields in the rainfed areas is ranging from 1 t/ha to 1.5 t/ha, which is two to five times less than those on research farms (Wani et al, 2009). Only 35% to 45% of rainwater was used to grow dryland crops in the state. Hence, there was huge scope for improving rainwater harvesting and efficient use of it for rainfed crops. Scientific technologies including better cultivars could unlock the vast potential of rainfed agriculture (Figure 1).

According to a study carried out by (Singh et al., 2009) the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) reveals that a large gap exists between current farmers' crop yields and potential yields. This is the case with all the major rainfed crops (finger millet, groundnut, maize, sorghum and soybean) grown in Karnataka.

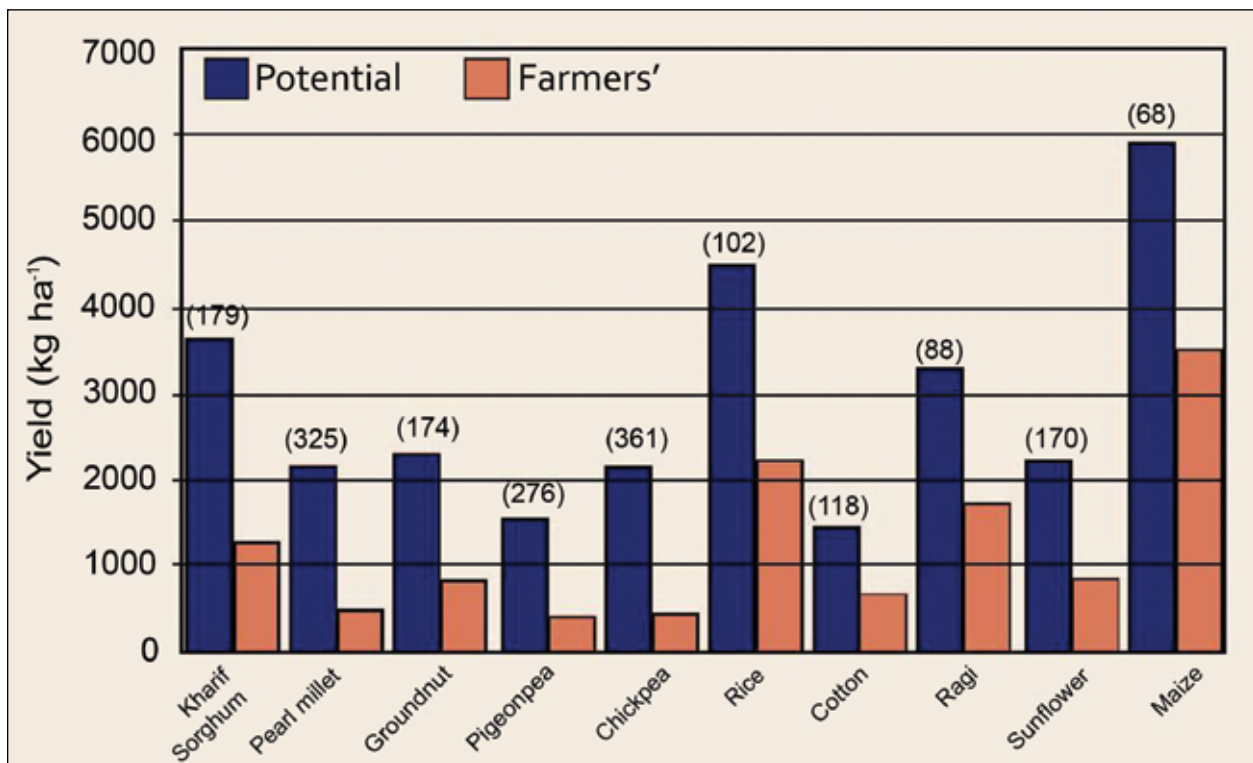


Figure 1. Yield gaps between farmers' field crop yield and potential yield of various dryland crops in Karnataka. (Source: ICRISAT, 2009).

Pilot to Scaling-up

A scientific study on productivity enhancement was conducted on pilot basis under Sujala watershed project districts to bridge the yield gaps.

Sujala-ICRISAT initiative addressed the productivity enhancement of rainfed crops in selected microwatersheds in six districts viz; Kolar, Chikkaballapur, Tumkur, Chitradurga, Haveri and Dharwad by adopting science-led development approach. This included soil health improvement by applying soil test-based nutrient management practice along with seeds of improved high yielding crop cultivars, soil water conservation measures, etc., on large scale farmers' fields to demonstrate that scientific technologies can bridge the existing crop yield gaps. The area of 3,700 ha was successfully treated in six districts. The

results demonstrated the power of science-led approach to unlock the potential of dryland agriculture in the state. The results are discussed in the following table, which creates strong logic for adoption of this concept at large scale.

Through farmers' participatory field evaluation, the Sujala-ICRISAT initiative identified the best management options to increase crop productivity in watersheds in various districts of Karnataka. Better nutrition along with improved cultivars, integrated pest management and land and water management practices increased yields of various crops by 33-58% (Table 1.) in spite of the poor rains during 2008 crop season (ICRISAT 2009: Progress Report 2008-09).

Table 1. Crop yield increase in farmers' fields of Karnataka with improved management compared to farmers' management during *kharif* crop season 2008. (Source: Progress report 2008-09, Sujala-ICRISAT project, 2009)

Crop	Grain yield (kg per hectare)		% yield increase in rainfed crops
	Farmers' management	Improved management	
Ragi	1750	2770	58
Groundnut	1300	1940	49
Maize	4760	6490	36
Soybean	1225	1635	33

Encouraged by the successes and lessons of the Sujala-ICRISAT initiative, Government of Karnataka (GoK) embarked on the path-breaking project in mission mode later named as 'Bhoochetana' for strengthening rainfed farming and enhancing crop productivity

Goal and Objectives

The goal of Bhoochetana project was to make a difference in the lives of dryland farmers in 24 (later extended to 30) districts of Karnataka, including the six districts covered under the Sujala-ICRISAT initiative, by increasing average crop productivity by 20% in four years. The objectives of Bhoochetana were:

- To identify and scale-up best bet options (soil, crop and water management) including improved cultivars to enhance productivity by 20% for the selected crops in the selected 24 districts (later extended to 30).
- Department of Agriculture (DoA) staff to perform stratified soil sampling, analyze micronutrients, and prepare GIS-based soil maps.
- Provide guidance to DoA to establish a state-of-the-art soil analysis laboratory in Bangaluru and Mandya.
- Improving skills of farmers and other consortium partners in the sustainable use of natural resources.

How the project coverage area extended from 20 to 24 to 30 districts

The scaling up process in Bhoochetana adopted a multi-level refinement strategy to increase the effectiveness of technologies and reach greater number of people. With effective monitoring and evaluation process, the knowledge acquired from the initial years was used to scaling up the model to create larger impacts in the entire state. The process occurred in an iterative and interactive cycle, as the experience from scaling up feeds back into new ideas and learning (Figure 2).

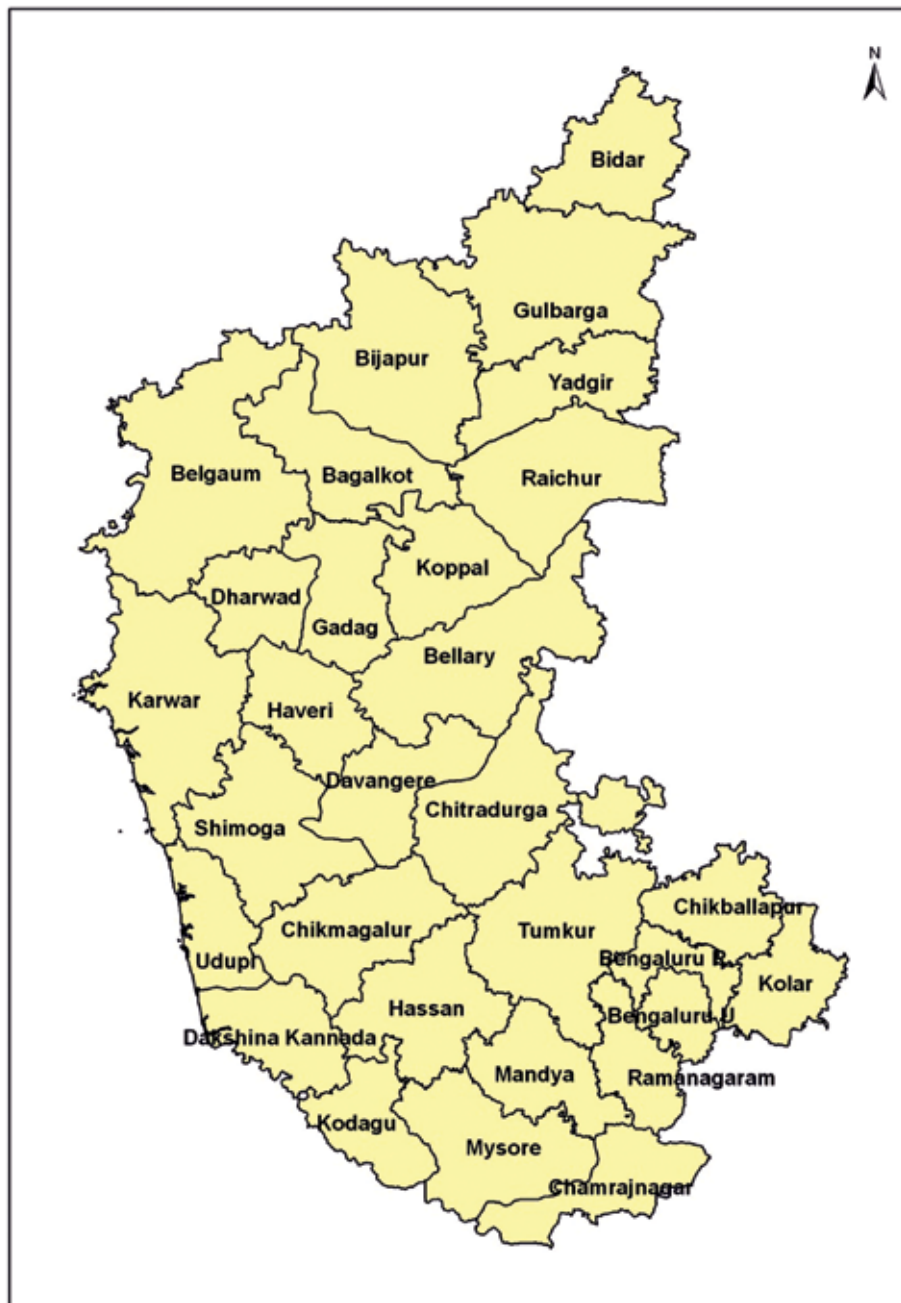


Figure 2. All 30 Districts included for productivity enhancement under the Bhoochetana program.

Rainfed to Irrigated

Around 30% of the area is under irrigation in the state but the yield level of irrigated crops is low. Considering this, to realize the full potential of irrigated crops government of Karnataka decided to scale up this successful strategy to irrigated areas with additional investment.

Strategy

For any project its strategy ensures how the project will run in future and what outputs will be realised. This section gives an insight about the larger strategy of Bhoochetana, its consortium structure and time line drawn for better project implementation.



For any large project, clarity on its strategy is very crucial. The project adopted mission approach through convergence of various government programs and schemes implemented by different line departments of Government of Karnataka. Consortium approach was adopted in the project whereas Karnataka State Department of Agriculture, Watershed Development Department, and three State Agriculture Universities (Bengaluru, Raichur and Dharwad) were consortium members with ICRISAT as the consortium leader.

For better planning, execution and monitoring, Government of Karnataka constituted a high-empowered committee chaired by Additional Chief Secretary and Development Commissioner (ACS & DC). The committee reviewed the performance of the project at regular intervals, during initial stages. The SLCC

met at fortnightly interval. Further more, each SLCC member took responsibility to review one district each by undertaking surprise field visits. It also played a crucial role in making this project successful in the state.

Most important factors of the strategy are like soil test-based nutrient management with a major thrust on micronutrients application, availability of inputs at 50% subsidy at cluster village level, services of farmer facilitators for sharing improved technology, wide publicity through wall writings, posters, village meetings and mass media, effective project monitoring and feedback (Economic Survey of Karnataka -2010-11).

Box 1. Key strategy points for implementation

- Identification & adoption of best management practices for the selected crops.
- Soil test-based nutrient management with major thrust to micronutrients application.
- Registration of all the farmers.
- Timely positioning and distribution of inputs for extension activities at village level.
- Conduct regular training for farmer facilitators, lead farmers and government employees.
- Wide publicity & awareness creation through wall writings, posters, village meetings and mass media.

Innovativeness for Effective Delivery of Services

- Identification of soil nutrient deficiency status and *taluk*-wise nutrient recommendations based on nutrition status supported by making available the necessary inputs at 50% subsidy.
- Focus on major dryland crops.
- Advance positioning of inputs at cluster village (one cluster for every 2-3 villages) apart from regular Raitha Samparka Kendra (RSK) at every hobli to make timely and easy availability of inputs.
- Distribution of all the inputs (seeds, seed treatment chemicals, gypsum, micronutrients and bio fertilizers) as a package.
- Services of farmer facilitators to take technologies at farmers' door steps.
- One week institutional training to all the farmer facilitators.
- Village meetings, wide publicity through mass media, wall writings in each of the selected villages
- Convergence of all the existing schemes

Special Features

- The concept of “**4-C**”s was adopted in the program. The **first C** is **Consortium** of research, education and field-based agencies to implement this program effectively at ground. The **second C** is **Convergence** within the department schemes and other programs. The **third C** is **Capacity building** of the consortium partners, farmer facilitators, lead farmers and other stakeholders. The **Fourth C** is **Collective action** at all level during program implementation in mission mode.
- Apart from adopting ‘**4 C**’s concept efforts were also made to ensure that the ‘**4 E**’s were also achieved at ground level which includes **Efficiency, Economic gain, Equity and Environment protection**, and these were the important pillars of the sustainable and inclusive development in the country.

- The mission approach also ensured that timely supply, availability and access to the necessary vital inputs such as knowledge-based soil nutrient management options, acquiring micro nutrients, availability of good quality seed, and other best practices at farmers' level. Under the project, necessary financial incentive to undertake best-bet options for increasing agricultural productivity were also provided.
- Wider sharing of best-bets within the state was done through video documentation and used for training purpose. This has made good impact on the farmers and adoption rate of micronutrients and other better practices also increased.
- Trained farmer facilitators and lead farmers provided service for extension activities to facilitate sharing of best technologies to farmers at the village level.
- Team building exercise for all the mission staff and awareness building among the mission team members were also taken up.

Consortium Structure and Key Players

To implement this project in mission mode consortium was proposed in the proposal submitted by ICRISAT to the state government. The consortium comprised Karnataka State Department of Agriculture, in lead role (with its commissioner and director as the nodal officers) for implementing the project and other partners include (Figure 3):

- International Crops Research Institute for the Semi-Arid Tropics, (ICRISAT) for facilitation of improved technologies to all stakeholders along with participating farmers
- Three Universities of Agricultural Sciences (Bengaluru, Raichur, Dharwad) with their Vice-Chancellors as SLCC members supporting technical help from university scientists.
- Community-Based Organizations (CBOs)
- Watershed Committees, user groups and watershed associations
- Watershed Development Department with its Commissioner as focal person to coordinate activities

Time Line

The time line was prepared in the beginning of the program. This shows the detailing of planning process and clarity at the planning level. During implementation, the consortium partners made their best efforts to stick to the time line. The time line was prepared focusing on key points (Table 2 & 3):

- Mapping of nutrients status of soils of the selected districts under Bhoochetana, and
- Capacity building of all the stakeholders at various levels

The Process

Good processes gives real strength to any program. Detailed observation of processes adopted in Bhoochetana program are discussed in this section. It also talks about key processes adopted in procurement of inputs and other aspects. It is also important to define roles of key players or contributors else it may lead to a wrong direction. This is also discussed in this section with observation on the status of their

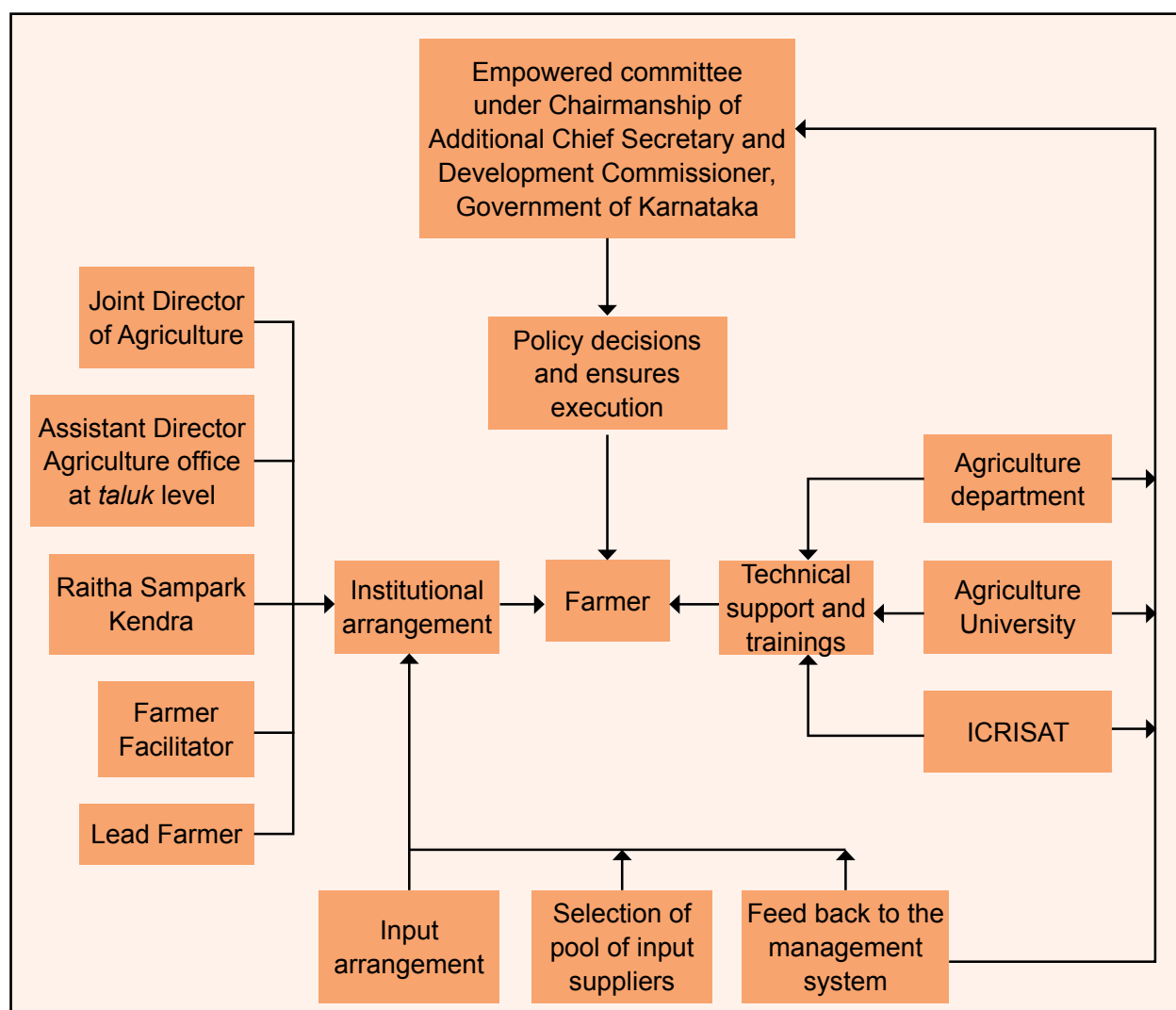


Figure 3. Flow diagram based on discussion with the different stakeholders about the program and its functioning.

Table 2. Timeline for execution of activities in Bhoochetana districts.

Activity	Year	% activity coverage in districts		
		1-6	7-15	16-24
Productivity enhancement	2009	25		
	2010	50	33	
	2011	75	66	50
	2012	100	100	100
Nutrient status mapping	2009	100		
	2010		100	
	2011			100
	2012			
Capacity-building	2009	100		
	2010		100	
	2011			100

Table 3. Time lines for Bhoochetana project from 2009 to 2012

Activity: Productivity enhancement of rainfed crops coverage																																	
Districts	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30			
Year I																																	
Year II																																	
Year III																																	
Year IV																																	
Legend	25%				33%			50%		66%				75%																	100% coverage of activity		
Activity: Soil sampling, nutrient analyses and status mapping																																	
Year I																																	
Year II																																	
Year III																																	
Legend	100% coverage with soil sampling and nutrient status																																
Activity: Capacity-building and awareness of the project																																	
2009																																	
2010																																	
2011																																	
Legend	100% coverage of stake holders with capacity building																																

role in the program. Next important point is management system of any program. One can understand it clearly by reading this section of the report.

Department of Agriculture, based on the discussions held in the meeting and decision taken, a proposal for technical assistance on bridging yield gaps through science-led interventions for sustainable use of natural resources in Karnataka was prepared with the help of ICRISAT and submitted to Government of Karnataka. It was for four years amounting to ₹ 100 million (US\$ 2.5 million) for technical backstopping by ICRISAT.



First step was agreement at government level to start work on mission mode to address the low productivity issue within state involving various agencies including scientific institutions as well. First task was collection of soil samples and soil testing. The project was for a period of four years. Crucial efforts to set the project were made in the first year of the project. In every year, what efforts were made and actions taken are detailed out in the following points.

First Year

- First year of the project was the most critical. All necessary systems required for implementing a large scale project were developed and established. This year also took lots of energy in developing common understanding amongst the consortium partners.

- During the first year, project activities were started in six districts of Sujala watershed program where soil health mapping was already completed earlier along with participatory selection of appropriate cultivars of the major crops.
- Development of *taluk*-wise soil test-based nutrient management recommendations for major crops.
- The six districts in year 2009-10, were Kolar, Chikkaballapur, Tumkur, Chitradugra, Haveri and Dharwad covering an area of 0.225 million ha with four crops viz: groundnut, ragi, maize and soybean.
- Project was implemented in 1,440 villages benefiting 0.2 million farmers.
- Services of 517 farmers facilitators (@ one FF for every 500 ha) for a period of 120 days, 1,867 lead farmers for a period of one week were utilized for effective-sharing of technology and knowledge at village level.
- Production inputs viz; 4309 t of gypsum, 425 t of micronutrients (zinc and boron), 200 t of bio-fertilizers, bio-pesticides and plant protection chemicals were distributed at cluster village level at 50% subsidy.
- During the year 2009-10, productivity enhanced in the range of 34 to 66% (crop wise average) in different districts was reported in the selected samples.
- Stratified soil sampling by adopting farmers participatory approach in 10 new districts included in second year was undertaken by ICRISAT with the help of Department of Agriculture.
- Training programs were conducted at district level in the month of May and June. ICRISAT conducted conceptual training for the field team of agriculture department and other consortium partners in six districts.

Second Year

- This was more challenging year for the team. As they had to implement the program in the first year six districts and implement the same in the new selected 10 districts. However, due to established system the team faced less hassles compared to first year.
- In second year expansion of area was based on a calculation that specify that 50% of the targeted area will be covered in 6 districts and 33% of total area in new 10 districts during the year 2010-11.
- Awareness campaigns as well as capacity building interventions were taken in all the 16 districts, which has shown very good impact even in new districts.
- During the year 2010-11 project was implemented in 16 districts (including six first year districts) covering an area of 12 lakh ha.
- Production inputs viz: 35,376 t of gypsum, 3,112 t of micronutrients, 1069 t of bio-fertilizers, bio-pesticides & plant protection chemicals were distributed at cluster village level at 50% subsidy.
- The number of farmer facilitators and lead farmers increased in the project villages. This was big support in implementation of project concepts. In second year services of 2,500 farmer facilitator for a period of 120 days, 10,500 lead farmers for a period of one week were utilized for effective transfer of technology at village level
- During second phase 8 lakh farmers from 5,030 villages benefited

Box 2: Discussion with Abhijeet Dasgupta, a Retired Additional Chief Secretary and Development Commissioner

He was of the opinion that since independence, farmers raised issues of dryland farming but there were very little actions taken at ground level. Government also tried to create as many number of irrigation projects to convert dryland area into irrigated area. Due to lack of resources both financial and natural, it was difficult for government to convert more area under irrigation. Another issue was, with all efforts in the state, agriculture growth rate was low in turn affecting overall growth of the state. Thus, government decided to address the issue of dryland farming, which is better and sustainable. The concept of Bhoochetana is the outcome of this thinking process. To review the situation a committee was set up by the state government. As a result, this concept was emerged. Due to over use of soil, its quality is being deteriorating. To start with, it was decided to identify the watershed treated area where better results could be observed at initial stage.

He told that, strategically large area was identified for soil sample collection, testing and preparing. Based on output of the results, it was decided to adopt micro nutrient application approach to address the issue. This was promoted with specific area and then scaled up to large area.

The state government announced this program and committed funds in state budget, which provided strength to the program team and assured finance to execute the planned activities. ICRISAT was invited to join the hands to support this program as an expert agency. In this program, more focus was given on soil testing. He told that government was keen to focus only rainfed area of these districts is not correct.

First year results were encouraging due to better planning, follow up and communication. Roughly 40-50% production and productivity enhanced in the demonstration plots. This can be observed while discussing with the farmers.

He told that, he was keen to visit field and monitor the progress. During his visit to field, couple of farmers told that they got double production from the same plot and same variety for same crop, majority of farmers told that they have got increase in the production by 50%. He also opined that demonstration at field level brought real adoption of this concept and later scaled up in larger area.

Strong monitoring helped in better implementation of planned activities at field level. Weekly review made it possible to keep program on track at field level. Later on video conference was started to monitor the progress on weekly basis. This made big impact at field level. It was felt that face to face communication is much stronger than written one. Some video conferences were attended by Hon'ble Agriculture Minister, Government of Karnataka to review the progress. Weekly meeting reduced chances of false reporting.

He strongly said that a clear message to field team was given that it is high priority from the state government and they need to give proper focus to execute the planned activities at field level. Finance was not an issue and there were no obstacles from finance department.

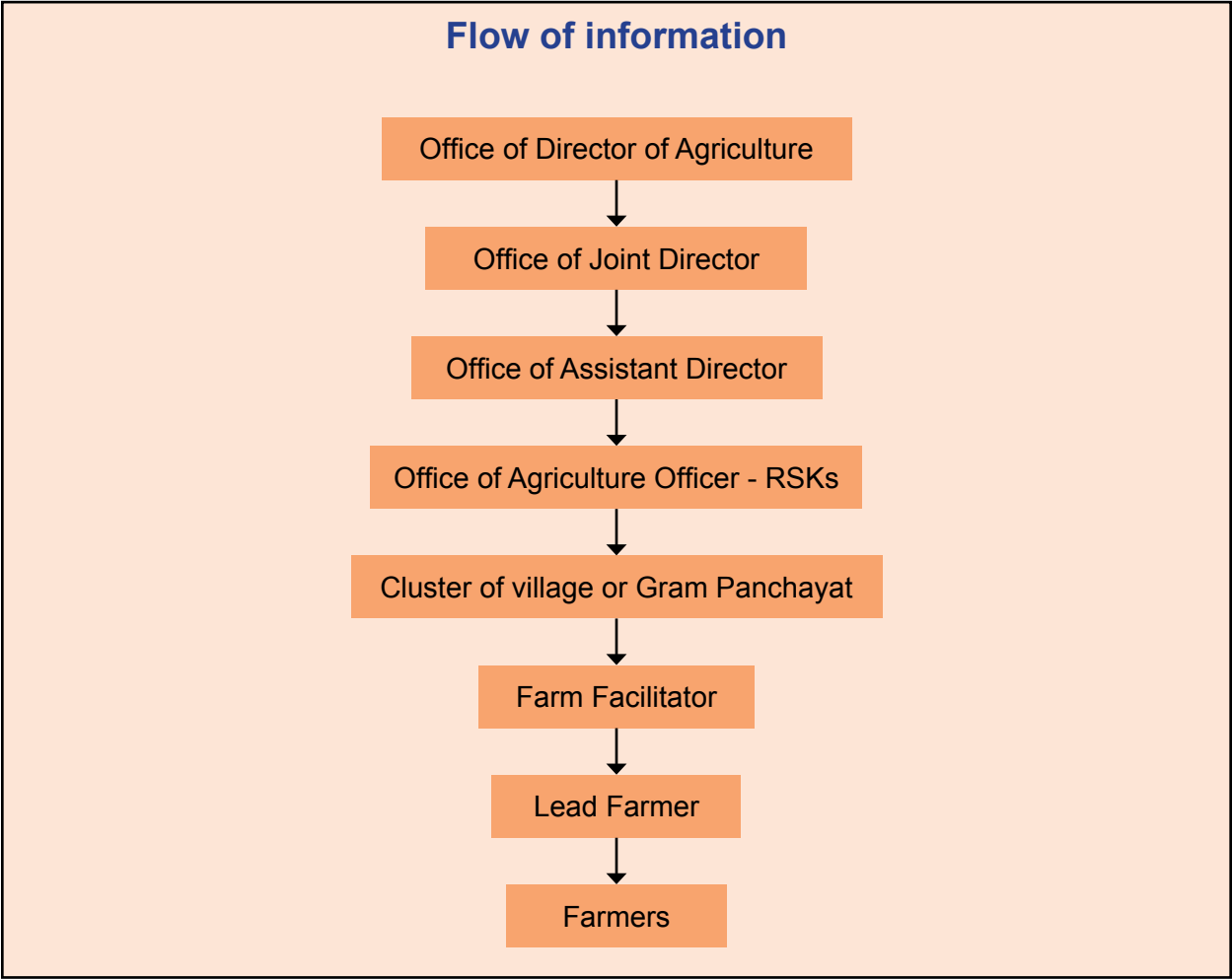
Hon'ble Chief Minister, Government of Karnataka provided free hand to implement this concept at ground. Inauguration by Hon'ble Chief Minister, GoK shows political commitment of the state government. This also provided strong support from the state cabinet. Approval to the budget prepared for this program is best indicator. All queries were with positive note by the cabinet to make this program strong and logically well structured. He suggested that there is need to review the economic impact of this program.

“War footing basis monitoring was the key force behind the success of this program”- Mr Abhijeet Dasgupta, Retired Additional Chief Secretary and Development Commissioner.

Table 4. Key processes and decision

S No	Key Processes	Major decisions	Output
1.	Selection of resource agencies	<ul style="list-style-type: none">• Invited ICRISAT as technical support organisation• Invited three state agriculture universities to provide region wise hand holding support to field team through training and technologies.	<ul style="list-style-type: none">• Timely availability of information and knowledge• Close follow up on adoption of technology
2.	Strong monitoring system	<ul style="list-style-type: none">• High Empowered committee review• Weekly progress review• Weekly video conference to address the issues discussed in the weekly review meeting• Field visit by district nodal officers. At initial stage senior officer were nodal for each district which made big impact in strengthening work at ground.	<ul style="list-style-type: none">• Better planning• Timely execution• Increased reach at field level• Properly shared information at all level
3.	Appointing farmer facilitators and lead farmers	<ul style="list-style-type: none">• For every 500 hectare area appointed one farmer facilitator from the village• Services of lead farmers to implement concepts at field level	<ul style="list-style-type: none">• A village link person is available for timely sharing of information and proper follow up• Easy demonstration of new and improved technologies
4.	Input procurement	<ul style="list-style-type: none">• A well-established procurement system to ensure quality procurement of inputs• Properly monitored at higher level	<ul style="list-style-type: none">• Quality input available at cluster and Hobli level• Easy access for farmers• Timely application on crop
5.	Storage facility at cluster and village level	<ul style="list-style-type: none">• To increase reach of farmers storage of inputs at cluster and village level	<ul style="list-style-type: none">• Inputs are stored at cluster level and available for farmers as per their requirement
6.	Special budget for farmer facilitator, lead farmer, storage and transportation of input	<ul style="list-style-type: none">• To ensure timely activities at field budget provision in the state budget	<ul style="list-style-type: none">• Inputs are stored well in time and close to villages• Transportation at farmers door step made application easy and timely• Farmer facilitator able to link more farmers to adopt better practices• Lead farmers could take up demonstrations on their plots.
7.	Efficient communication	<ul style="list-style-type: none">• Wall writings• Pocket booklets• Community meetings• Soil health cards• Web-based soil health information access to identify soil health issues and recommendations• Slogan writings• Soil maps on village walls	<ul style="list-style-type: none">• Farmers are aware about importance of micro nutrient in keeping crop healthy• Increased awareness• Farmer knew that what is outcome of each micro nutrient after application in the field

- The productivity enhancement in the range of 21 to 41 % in different crops was recorded in different crops data collected from crop cutting experiments.
- Conducting review and planning meeting for 2011 rainy season was done at ICRISAT in the presence of Honourable Minister of Agriculture, Mr Umesh V Katti and an important decision of extending the benefits of Bhoochetana program to irrigated crops in the remaining six districts was approved. This gave a message to the field team that government is concerned about the project and action is the ultimate outcome at ground level.



Key Tasks Performed during Project Implementation

- **Soil testing:** This is the most important and crucial feature of the program. It was carried out in all the project districts in phased manner. In the first year six districts, in second year ten districts and in third year, remaining districts were covered. In the project villages soil test results and soil fertility card

with fertilizers recommendation were given to farmers. These cards were prepared with *taluk* wise fertilizer recommendations and distributed amongst the farmers. During year 2007-08, soil samples were collected and ICRISAT did the analysis. Report was shared with department. Initially this was done on pilot basis for Sujala watershed districts only.

- **Farmers' registration:** This was new concept in such large-scale program for better monitoring, coverage and to improve farmers participation. After review, it emerged as a need of the program. After detailed discussions, it was decided to go for compulsory registration of farmers and one format for registration was prepared, mainly to monitor and to ensure that team is reaching to the correct farmers and this was mandatory.
- **Training:** This was big demand of the program and field team along with ICRISAT team did good job at field, district and state level by conducting timely quality trainings. ICRISAT contributed in developing master trainers at state and district level. University, district officials of agriculture department and Krishi Vigyan Kendras (KVKs) build the field level team to work on the program.
- **Awareness:** Beating drums and announcement, *jatras* were organised at village level for mass awareness generation and communication to the farmers about the program concept and its benefits. The awareness creation about the technologies was done through village meetings, posters, leaflets, Janapada, folk dance, paper advertisements, field days and mass media. District specific communication materials were developed and published.
- **Wall writings in selected villages depicting soil fertility status and crop specific best management practices:** Wall writing concept was picked from watershed department and it was used as an effective communication mechanism in Bhoochetana. Results were very encouraging. Later on its size, colour scheme, structure was finalised and simplified. Later its color coding, fonts, background color, and messages at field level were standardized. Now in all villages, common wall writing is done. Crop production technologies, soil fertility status, and related information are depicted through wall writings in each of the selected villages (Figure 4). Two-wall writing is written in every village @ ₹ 2000/wall writing. Wall writing was made compulsory.



Figure 4. Wall writings at village level to communicate soil status for various micronutrients.

- **Farmer field school (FFS):** One FFS per farmer facilitator is planned to demonstrate production technologies and effective transfer of technology through technology demonstration in the field @ ₹ 10,000/FFS. This concept helped the program adaptation at field level. Farmers who run farmers' field school were known as facilitator and thus farmer facilitator concept evolved.
- **Farmer Facilitator and lead farmers:** They are backbone of the program at ground level. These service providers were hired mainly on task basis at village level only. Their work is defined in each season. Initially, initially educated farmers from the village were selected as Farmer Facilitators. For every 500 ha one FF was appointed. Prior to appointment, two weeks training was imparted in addition to regular training during the cropping season. The support services of farmer facilitators are utilized for a period of 120 days for transfer of technologies at village level @ ₹ 150 day. Lead farmer services are utilised at village level mainly for demonstration of new technology on their field and sharing with the farmers at village level during crop sowing period. To support one farmer facilitator five lead farmers are identified. These lead farmers are paid ₹ 95/day for seven days during sowing period. Farmer facilitator concept was developed in Bhoochetana to reach large number of small farmers. Caps, T-shirts, shoulder bags and pens were given to farmer facilitators for identification, campaigning and documenting.
- **Hiring of godowns at cluster village for stocking of inputs and transportation of inputs from RSK to cluster village:** Cluster level storage of inputs concept emerged after interaction with the farmers. Apart from RSK, the inputs were stocked at cluster village level. For hiring of godown at village and cluster level an upper limit of ₹ 1000 per month is approved in the project. From RSK to cluster village level provision for transportation of inputs vehicle allowance is also made in the budget. Both the provisions supported in adoption of micronutrients at field level.
- **Distribution of inputs @ 50% subsidy:** Gypsum, micronutrients, Bio-pesticides, Bio-fertilizers, plant protection chemicals were made available at village and RSK level at subsidised rate. This policy encouraged greater adoption of micronutrient in the project villages.
- **Seed treatment:** Massive seed treatment campaign at village level using bio pesticides were organised. Seed treatment chemical was given to farmers. During discussion in village meetings farmers were explained about importance of bio pesticides for disease management and monitoring of pest. They were also told about alternative solutions if they do not have pesticides or chemicals for disease control and pest attacks.
- **Major Crops Selection:** A minimum of two major dryland crops were selected for each district for target area.

Involvement of ICRISAT as Technical Agency

Based on Sujala experience and the presentation made during the brainstorming session to achieve agricultural growth rate, Government of Karnataka decided to invite a technical agency for Bhoochetana program. ICRISAT was invited as technical support agency at state level. A delegation of state level officials from GoK include Dr. Subramanya, Principal Secretary of Agriculture, GoK, Mr. Baburao Mudbi, Commissioner of Agriculture and Dr. K. V. Sarvesh, Director of Agriculture visited ICRISAT on 7th September 2009 (Figure 5). Director General of ICRISAT, Dr William D. Dar and Dr. Subramanya of Government of Karnataka signed a Memorandum of Understanding (MoU) for the Bhoochetana mission program at



Figure 5. Dr WD Dar, Director General of ICRISAT and Dr Subramanya, Principal Secretary, GoK signed the MoU on Bhoochetana project, 7 September 2009 at ICRISAT, Patancheru.

ICRISAT. Dr Subramanya appreciated the contribution of ICRISAT's in strengthening agriculture of Karnataka. The senior officials of Karnataka Government were very much impressed with the development of dryland agriculture technologies including of high yielding, stress-tolerant, short duration cultivars.

The decision to get the international knowledge and learning by involving ICRISAT was good and appreciated after experiencing their value on ground. Department officials were not keen and enthusiastic at initial stage to bring in external agencies, value comes only after experience. MOU with ICRISAT was signed for four year to provide technical assistance and consultancy.

Bhoochetana Project Launching

Honourable Chief Minister, Government of Karnataka launched the state government owned mission 'Bhoochetana' in an inaugural ceremony held on 23rd May, 2009 in Haveri district. On this gracious occasion Mr SA Ravindranath, Hon'ble Minister of Agriculture, Government of Karnataka along with Dr. David Hoisington, Deputy Director General (Research) of ICRISAT were also present (Figure 6).

A team of senior policy makers include Dr Shanthakumari Sunder, Additional Chief Secretary and Development Commissioner; Dr KV Raju, Chief Economic Advisor to the Chief Minister; Mr E Venkataiah, Secretary (Agriculture and Horticulture) and Dr C Somasekhar, Commissioner of Agriculture attended the project launching meeting. Senior members of team ICRISAT led by Dr David Hoisington, DDG-R, Dr Suhas P Wani, Project Leader, Bhoochetana, Dr CLL Gowda, Director, Grain Legumes and Dr K. Krishnappa, Resident Scientist also participated in the event.



Figure 6. Bhoochetana project launching at Haveri.



Figure 7. Farmers visiting exhibition stalls of ICRIASAT at Haveri the occasion of Bhoochetana launching ceremony.

The project was initially approved for 20 districts covering 4 million ha; later the cabinet committee expanded the reach additionally for four more districts making it for 24 districts. Now state government extended the program in all 30 districts. This shows the success of the program and its impact at ground level.

Dryland areas in each *taluk* are given priority in Bhoochetana. For monitoring purpose separate list for irrigated and rainfed area is prepared. Planning process starts in the month of April every year. Plans are prepared as per early and late monsoon districts. *Kharif* workshop is organised in the month of April. In this workshop, detailed departmental program for rainy season crops is discussed in (Figure 7). Program plans are finalised by end of April. Stocking of inputs starts from May. There are three different sowing patterns in *Kharif* in the state. Bhoochetana was identified as flagship program at state level.

In the first year of the program, more focus was on demonstrations on farmers' fields. Field days organised mostly on 1 to 2 ha plots only. The focus was on intense demonstration at village level to establish the micronutrient concept in dryland crops. This created extreme work pressure on the field officials and they worked under high stress in conducting good quality field days.

In the first year, the team focused on collecting demand of bio-pesticides from first six districts for ragi (18500 + 10000 + 20000), groundnut (12500 + 35000 + 63000 + 6000 + 10000), maize (10000+28000) and soybean (12000) crops for an area of 225000 ha. This provided an indication that the work was started with large area under this program and that made good impact at field level and this reflected increase in area in these districts in the second year.

The team made efforts on three issues i) convincing authorities at all levels, ii) convergence of funds from different schemes within department, and iii) policy makers active involvement in the program. This made big impact at all levels.

In the first year, the team experienced following issues, which slowed down the speed of the work at field level.

- For dryland farmers- adoption of new technologies was a big challenge
- There was pressure to increase subsidy by 25% but SLCC endorsing recommendation of ICRISAT did not increase the subsidy.
- In first year no funds from state government- more stress on convergence. Second year special budget was given for Bhoochetana
- In the first year of the program, following processes were adopted:
- Calculation of inputs requirement for all selected villages as it was very crucial and important.
- Enhanced awareness amongst farmers and convincing them about use of micronutrients and its benefit

Box 3: Key project activities

- Capacity Building of Stakeholders
- Awareness and field publicity campaigns
- Awareness building on soil nutrient status
- Assisted in setting up analytical laboratory
- Scaling-up Soil, crop and water management technologies for boosting Productivity of Selected Crops.
- Organising field days
- Integrated Pest Management in the selected field
- Ensure input supply well in time
- Godown arrangement and stocking of inputs well in time

was very difficult but demonstration helped and some farmers had experience of using micronutrients under Sujala-ICRISAT for other crops came forward for demonstration on their field.

- Regular discussion and interface with the farmers. Involvement of farmers in preparing work plan so that they own the process and also ensured that this plan is timely executed at all level
- Timely sourcing and release of funds to field level was very crucial and it was felt that a working mechanism is needed.
- Timely payment to Farm Facilitators – if delayed it will seriously affect the work.
- Strong monitoring systems were developed.
- Exposure visit for cross learning.
- Identification of yield gap in each crop and supply of micronutrients to address the issue at large scale. Impact needs to be studied to assess the objective of the Bhoochetana

System that Develop Gradually

The program started in the month of March 2009, when first meeting took place with the Additional Chief Secretary & Development Commissioner, Government of Karnataka chaired the meeting where in success of Sujala watershed project was discussed and how Government can take forward learning of this program. This created the base for the program. Decisions were taken in this meeting to start a new program to address the issue of poor productivity and production of crops in larger dryland area of Karnataka. After that meeting, series of government orders were issued for starting and smooth implementation of the program. All these orders were issued based on the decisions taken in the meetings called for better implementation of Bhoochetana program. For effective implementation of program, Department of Agriculture decided to convert them in to a guideline in the year 2011. Important circulars were issued in the year 2009-10 and 2010-11

- 1.1 Bhoochetana name was given for easy identification and popularising amongst public but within system it is known as a project for 'increasing production using improved technologies'. First note was on formation of consortium and proposal submission to state government under RKVY. The project was initially approved for 20 districts covering 4 million ha; later the cabinet committee expanded adding four more districts and made it for 24 districts.
- 1.2 **Learning:** The officer who initiated the file should be part of the discussion so that he can initiate file properly and build a strong base for the program approval. The department adopted the concept of mix funding pattern for better utilisation of resources at state level.
- 1.3 On 20-06-2009 a circular was issued from Office of the Commissionerate of Agriculture office for the purpose of fixing the price of the micronutrients and other fertilizers which are needed for the implementation of various schemes in Karnataka including Bhoochetana. The prices were fixed using the tender system where many authorized dealers and suppliers participated in the tendering process. According to this, the Gypsum price per ton was ₹ 3180.
- 1.4 To ensure that quality inputs are supplied at field level, one circular was issued on 9th July 2009 to all suppliers from the office of the Commissioner of Agriculture. The circular states that inputs needed for the scheme implementation are to be issued from the authorized agencies and they must be tested in the laboratories for their quality analysis.

- 1.5 On 18-01-2010, a circular was issued from Commissionerate of Agriculture regarding the guidelines, responsibility and duties of implementing officers and developing program implementation time table for better and timely implementing Bhoochethana in Karnataka.
- 1.6 A circular was issued from the Commissionerate of Agriculture on 20-01-2010 regarding the supply of Borax and Agricultural lime from the authorized suppliers and fixing the prices for the year 2009-2010. The inputs needed for the implementation of various schemes were discussed and prices were fixed. The prices for Borax and Agriculture lime are as follows.

- Borax- For 2 kg Bag = ₹ 87.
- Agriculture Lime = ₹ 100/50 kg Bag.

It is also ensured that inputs obtained from the suppliers are tested in the laboratories for quality analysis and then only distributed to the farming community.

- 1.7 A circular was issued from the Commissioner's office regarding the supply of green manure, Seeds, Borax, Vermicompost and city compost from the authorized suppliers. The prices for the above inputs are also finalized and they are as follows.

- Daincha seeds– 25 kg bag = ₹ 739.75
- 1 Quintal seeds = ₹ 2959
- Sunhemp-25 kg bag = ₹ 1250
- 1 Quintal = ₹ 5000
- Borax- 2 kg packet = ₹ 108
- ₹ 54000 per ton.
- Vermicompost- 50 kg bag = ₹ 170
- ₹ 3400 per ton
- City compost- 50 kg bag = ₹ 160
- ₹ 3200 per ton

- 1.8 Government also ensured that all inputs are supplied at standard rates. Thus, another circular was issued from the office of the Commissionerate of Agriculture on 20 October 2010 about the cost of various inputs as per the tender. As per the tender the rates for various inputs are as below.

- Biofertilizers [(carrier based) for *Rhizobium*] = ₹ 4.40/200g pack.
- Biofertilizers [(carrier based) for *Azotobacter* and *Azospirillum* only]= ₹ 4.40/200g pack or ₹ 22/kg.
- Biofertilizers [(carrier based) for PSB only] = ₹ 18 per kg.
- Liquid Biofertilizers (for *Rhizobium*, *Azotobacter*, *Azospirillum* and PSB only) = ₹ 35/250 ml or ₹ 140 per litre.
- VAM Biofertilizers = ₹ 16/500g or ₹ 32/kg.
- Agricultural Lime = ₹ 112.50/50 kg or ₹ 2250/ton.
- Dolomite = ₹ 115/50 kg or ₹ 2300/ton.

Box 4: Discussion with Dr Shanthakumari Sunder, Former Additional Chief Secretary and Development Commissioner

Dr Shanthakumari started with her statement- “you have to lead from front” and without doing that, it is not possible to bring changes at ground level in any system. She secondly said that in the entire program solution approach was adopted which helped in creating positive environment. Later on, she elaborated on how this program was conceived and executed on the ground.

In March 2009 meeting was organised and decision was taken to implement this concept from this rainy season. In the meeting, all stakeholders were invited to discuss this concept and the Ex-Commissioner, Sujala program shared learning of Sujala program and involvement of ICRISAT in promotion of this approach at field level and its success. Then, The Commissioner of Watershed Development Department opined that, due to this approach production was enhanced in the project villages.

There was no baseline data available and it delayed the work at ground and team was under pressure. Raitha Samparka Kendras were brought into picture. Later the team visited ICRISAT to understand the concept and how ICRISAT works. In this visit, discussion and meeting Development Commissioner got convinced about this concept.

The program’s focus was on soil testing and production enhancement of major dryland crops in the selected districts. State level high committee was set up with the chairmanship of ACS & DC. Economic Adviser to Chief Minister is also member of this committee.

In early stage senior officials like ACS & DC, Economic Adviser to Chief Minister, Principal Secretary (Agriculture), Director, Watershed, Commissioner, Watershed, Director Agriculture, and Commissioner Agriculture were made nodal officer of each district. This made big difference at field level.

She herself made two visits to the field, her nodal district officers went up to Rythu Sampark Kendra, had discussion with the farmers, cross checked the records, and how reports are prepared. This gave clear picture to officers that this is taken on high priority and any mistake and lack of seriousness may cost heavy to them.

More focus was given on bringing inputs at village level by making arrangements and developing system and mechanisms, which supports the officials and farmers in procuring these inputs as per their requirements. This includes fertilizers, seeds, both chemical and bio pesticides, information and other communication materials.

More focus was given on regular interface workshops and meetings at district level to discuss about the program. All officials were asked to make frequent visit to the farmers’ field and interact with them and share the concept of Bhoochetana. Good part was production increased by 40 % in demonstration plots.

Focus on:

- Balance application of inputs as per recommendations.
- Soil conservation was also promoted on priority basis
- Collection of all data with the help of Farm Facilitators

Box 4: Continued.

Proactive role of ICRISAT made it possible to expand this program across the state. Not asking for any additional budget made this program successful and later on budget was made available by state government. Government of India was very positive about the program and approved the proposal under RKVY.

Success points:

- Soil testing results and application at field level
- Promoting concept of Farm Facilitators at village level
- Bringing all inputs at farmers' level
- Higher level officers took keen interest in the program
- No political hurdles
- Cooperation from ministers.
- No benefit distribution in terms of material was proposed therefore fair selection of beneficiaries.
- Energised all existing schemes in one concept and mission was adopted
- At Raitha Sampark Kenrda (RSK) level, ACS & DC visited and also reviewed input distribution mechanism. She visited nodal district for this scheme mainly and reviewed other schemes as well when got time.

Problems:

- Soil testing-department was not equipped with the facilities to carry out soil testing for such a large area.
- Fund was delayed initially to ICRISAT consultancy
- Delayed signing of Memorandum of Understanding
- Coordination between ICRISAT, universities and department was not good at earlier stage

- Gypsum ₹ 3180/ton - ₹ 159/50 kg
- Ferrous Sulphate ₹ 71/5 kg - ₹ 14200/ton

1.9 On 28-09-2011 a circular was issued from the Commissionerate of Agriculture regarding the implementation of Bhoochetana scheme. The major decisions taken were as follows.

- Field days to be conducted at every Hobli level and the expenditure will be born by the government (₹ 5000)
- At every *taluk* level one field day has to be conducted. The amount fixed was ₹ 25000 per *taluk* which was spent from the Government/Department.

1.10 On 05-04-2012 circular was issued from the Commissionerate of Agriculture regarding providing technical training to the farmer facilitators. The farm facilitators were trained by Master trainers, department officers/University scientists, ICRISAT scientists/SOs/RIs and also by watershed department officers for 6 days. The topics covered were as follows.

- Soil and Water management system.
- Nutrient management.
- Crop wise nutrient Recommendations
- Integrated Disease and Pest management
- Farmer Field Schools and Farmer power groups.
- Cultural practices to be followed to increase the yield in rainfed crops.
- The officers who are giving training to farmer facilitators are also trained by master trainers.

These series of orders issued from department shows that how the process moved from time to time and how better decisions were taken for smooth implementation of the program at ground level. Converting these orders in a form of guideline was good decision taken at head office level and this gave better shape to implementation processes at field level. The series of orders also give an understanding about thought process to ensure that this program runs properly at ground level.

Nutrients Diagnostic Studies

To understand the requirement of soil it is necessary to conduct diagnostic study based on carefully collected soil samples. Soils samples from around 11000 farmers' fields in several *taluk* of each district were collected in six districts during 2008 were analyzed for diagnosing macro and micronutrients status of farmers' fields (Table 5, 6 & 7) (Figure 8 & 9). Based on the established critical limits for each nutrient, fields were categorized as deficient or sufficient. Individual farmers were provided soil health cards based on the nutrient status in the soils of the farmers sampled in the village and the soils analysed were representative of the village soils as they were done following a stratified soil sampling methodology, mean data were used for wall- writing and booklet preparation. Soil nutrient status maps were developed and provided for each district using interpolated soil nutrient status data and GIS techniques for the benefit of policy makers. Sample map and card are shown in Figure 10 & 11.

Field Days and Field Visits

Organising field days and field visits was the most effective and logical approach to explain the benefit of new technologies and its contribution in enhancing agriculture production to the farming community. In Bhoochetana program, field days were conducted at village level. However, in first year little number of field days were organised. Like one field day with groundnut farmers in Kurubaramallapur village was conducted on 17 September 2009 and another field day for maize farmers in Kabur village of Haveri district on 12th September 2009 by DoA and ICRISAT successfully. More than 150 farmers participated in the field day. These field days contributed successfully in generating awareness on application of micronutrients for rain fed crops in dryland areas.

In the second year of the program, this very crucial event was organised in every district with better planning. The sole purpose of this activity was to bring awareness about the outcome of the efforts made

Table 5. Details of soil samples collected from farmers' fields in six districts of Karnataka during 2008-09 season.

S.No.	Name of the district	No of villages selected	No of samples collected	No of soil health cards distributed
1	Kolar	108	2161	2161
2	Chikkaballapur	113	2257	2257
3	Tumkur	152	3041	3041
4	Chitradurga	75	1489	1489
5	Haveri	77	1532	1532
6	Dharwad	57	1129	1129
Total 6		582	11609	11609

Table 6. Collection of soil samples in nine selected districts of Karnataka for soil nutrient analysis

S.No.	Name of the district	No of villages soil sampling completed by ICRISAT	Total number of farmers' fields sampled
1	Bidar	120	2400
2	Bijapur	140	2800
3	Gulbarga	284	5680
4	Raichur	171	3420
5	Gadag	68	1360
6	Bengaluru Rural	228	4560
7	Davanagere	157	3140
8	Chamarajnar	83	1660
9	Hassan	522	10440
Total	9 districts	1773	35460

Table 7. Soil nutrient (deficient in %) status of farmers' fields in different taluks of 10 districts in Karnataka.

District	Taluk	OC	P	K	Sulfur	Zinc	Boron
1. Bengaluru (R)	Devanahalli	48	9	16	97	40	78
	Doddaballapura	73	19	33	95	39	68
	Hoskote	81	15	39	88	15	71
	Nelamangala	82	21	29	97	47	58
2. Bidar	Aurad	56	54	0	89	84	86
	Basavakalyan	30	26	1	81	36	58
	Bhalki	57	64	0	71	81	66
	Bidar	26	41	0	93	44	60
3. Bijapur	Bagewadi	71	79	3	89	85	39
	Bijapur	77	80	3	72	92	35
	Indi	68	85	8	69	86	48
	Muddebihal	71	76	0	89	91	48
	Sindagi	65	86	3	66	90	44
	Bagewadi	71	79	3	89	85	39

Continued.

Table 7. Continued.

District	Taluk	OC	P	K	Sulfur	Zinc	Boron
4. C'raja nagara	Chamarajanagara	78	47	1	87	47	59
	Gundlupete	72	40	2	92	76	49
	Kollegaala	69	28	9	89	68	67
	Yellanduru	55	30	0	100	65	70
5. Davangere	Channagiri	41	26	14	66	52	60
	Davangere	56	29	10	87	75	74
	Harapanahlaly	61	44	12	82	87	73
	Harihara	36	35	3	35	65	32
	Honnali	37	21	10	75	62	76
	Jagalur	81	51	23	100	100	69
6. Gadag	Gadag	73	67	1	93	90	32
	Mundargi	54	63	5	77	89	41
	Naragund	77	56	0	63	92	3
	Ron	94	72	4	91	95	37
	Shirahalli	68	62	2	85	93	41
7. Gulburga	Aaland	48	68	0	89	91	70
	Afzalpur	61	72	0	74	64	89
	Chincholi	52	55	3	92	74	78
	Chittapur	77	46	0	84	71	88
	Gulbarga	51	73	0	87	69	87
	Jevargi	59	83	0	65	46	97
	Sedam	76	49	0	92	82	96
8. Hassan	Alur	23	25	18	87	36	93
	Arkalgud	30	18	8	68	48	89
	Arsikere	80	23	11	93	66	91
	Belur	33	25	35	79	50	89
	Channarayapattana	80	36	9	82	71	93
	Hassan	50	9	10	88	35	96
	Holenarsipur	57	19	19	74	55	88
	Sakleshpur	15	28	41	79	30	83
9. Raichur	Deodurg	85	54	6	70	84	46
	Manvi	64	54	4	84	86	52
	Lingsugur	79	49	0	70	85	18
	Raichur	77	45	14	73	78	63
	Sindhanur	40	31	0	26	53	12
10. Yadgir	Shahapur	85	45	4	68	53	96
	Surpur	57	54	0	67	46	86
	Yadgir	83	43	12	81	76	86

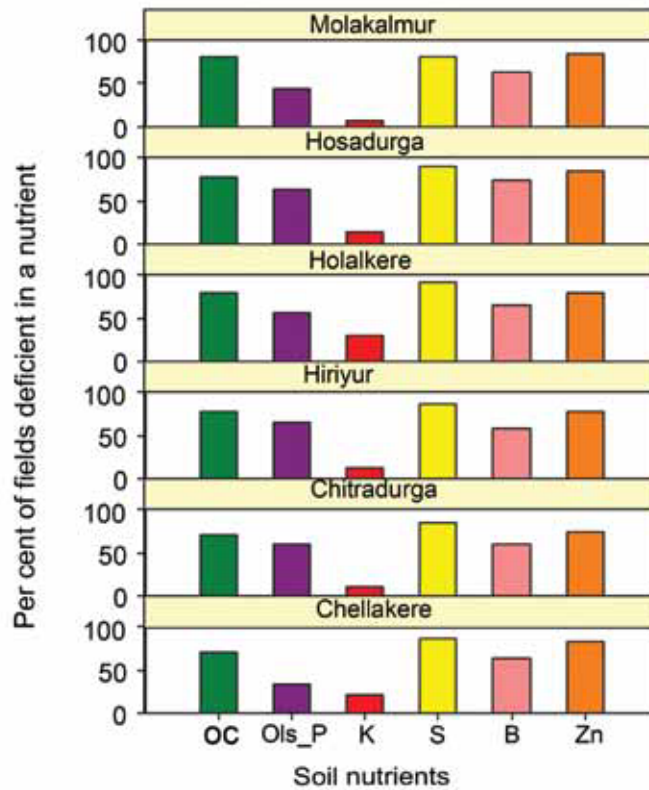


Figure 8. Nutrient status of farmers' fields in different taluks of Chitradurga district.

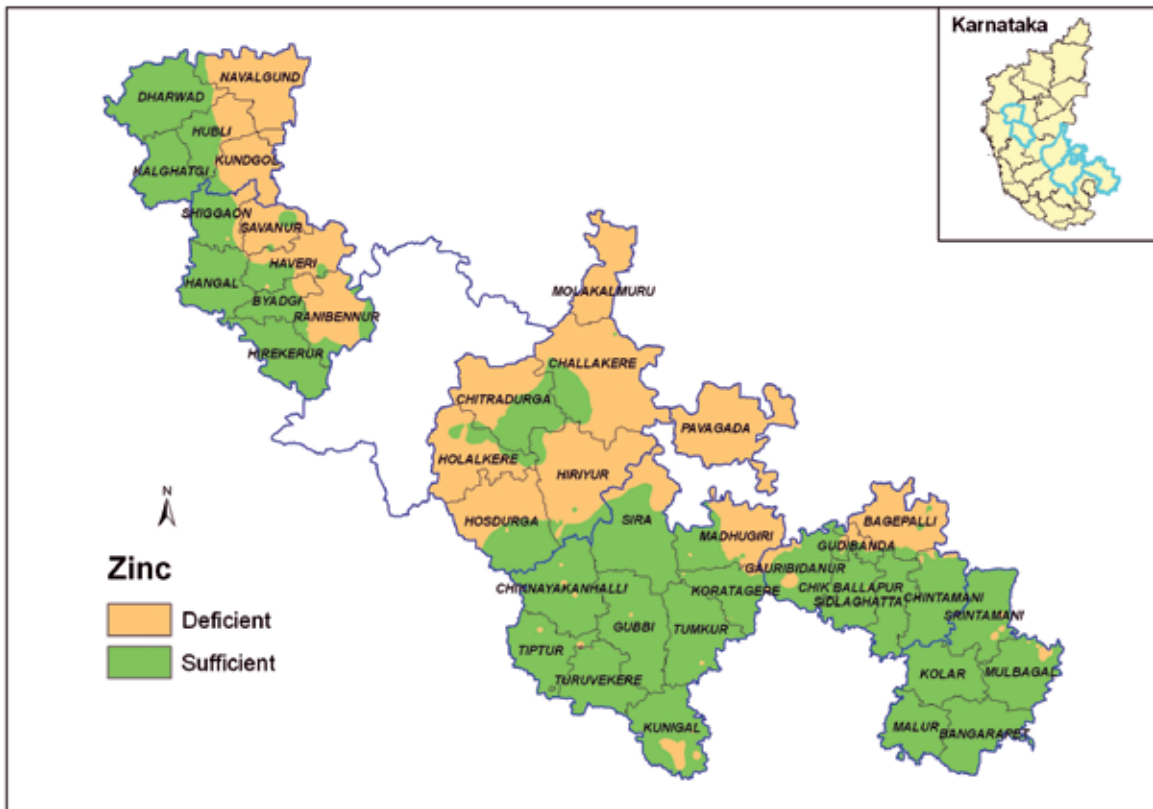


Figure 9. Status of available zinc in soils of selected six districts in Karnataka during 2008.

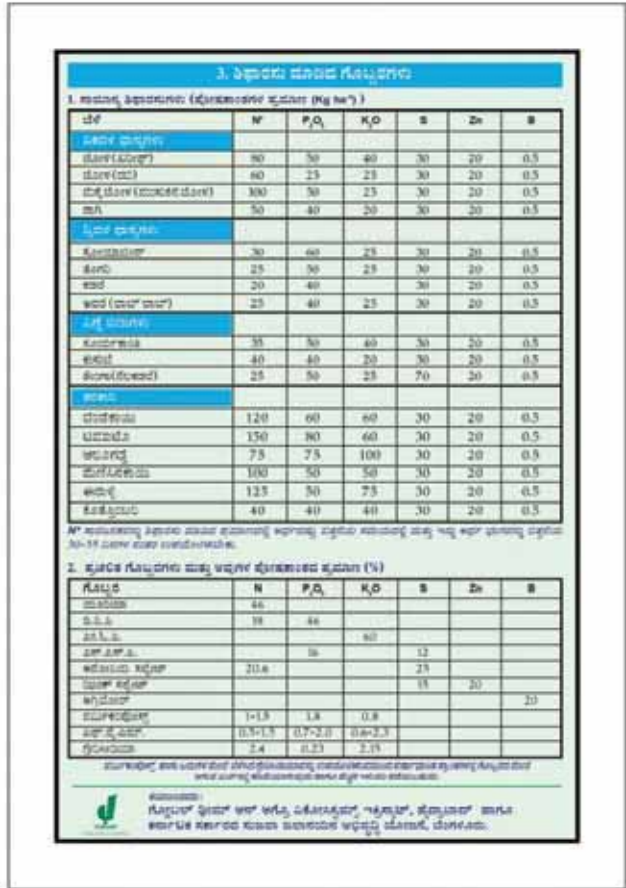
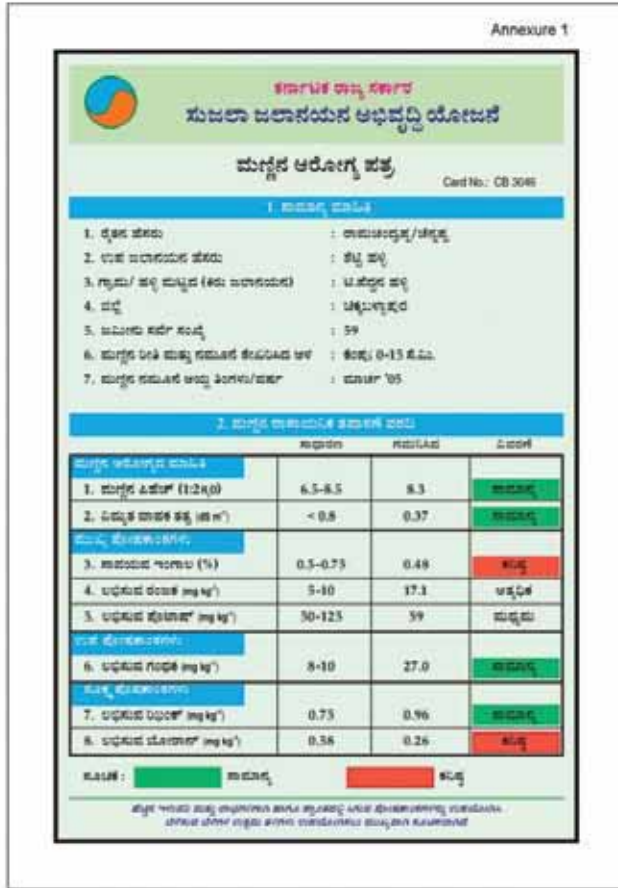


Figure 10. Soil health card of a farmer.



Figure 11. Farmer with his soil health card.

Table 8. Details of field days held in different districts of Karnataka during 2010-11 cropping seasons.

Sl. No	District	No. of Field Days held	No. of Farmers Participated	Men	Women
1	Bidar	14	1954	1774	180
2	Bijapur	18	1240	817	423
3	Chamarajanagar	14	310	261	49
4	Chickballapur	5	215	155	60
5	Chitradurga	10	1360	660	700
6	Davanagere	39	5072	3043	2029
7	Dharwad	65	2390	2170	220
8	Gadag	6	489	448	41
9	Gulbarga	5	775	624	151
10	Hassan	14	800	565	235
11	Haveri	16	1672	1387	285
12	Kolar	4	450	335	115
13	Raichur	2	400	350	50
14	Tumkur	31	1840	1300	540
15	Yadgiri	5	407	307	100
Total		203	15493	10939	4554



Field Day at Dharwad



Field Day at Belgaum



Field Day at Haveri



Field day at Chamarajanagar

Figure 12. Field days held at different districts.

by the program team at field level with large number of practitioners. Greater participation of farmers and other practitioners in this event proves that field day is an important event to understand the outcome of technology demonstrated at field level and sharing it with all the stakeholders. Agriculture Department field team in all 16 districts played lead role with better coordination of ICRISAT team in organising all field days in year 2010-11. Total 203 field days were conducted in sixteen districts during rainy and post rainy seasons (Table 8). Total number of farmers participated in the field days were 15493 including 10939 men and 4554 women. In the field days, two major crops of each season were covered as per district priority. Details of field days of each district are given in the following table. Field days organised were also monitored by state level official to ensure the quality of the interventions (Figure 12).

Field days are an important activity that helps in promotion of micronutrients and improved management practices at field level. Like in one district total 64 field days were conducted in year 2010-11 and Krishi Utsav- farm festival were also organised. Inputs were transported up to village level. These utsavas are like road show to promote this concept.

A Carefully Selected Crop Sampling Process

Technically guided sample selection process of demonstrations of new technologies in the program village was developed. It had a set of criteria that helps in selection of farmers who can be selected for demonstration in a particular village under the Bhoochetana program. The process is as follows:

- In each *taluk* 10% of villages were considered for crop sampling in the farmers' fields during first year. With increasing districts, second year onwards, in each *taluk* 3-5 villages were randomly selected for undertaking crop cutting experiments (CCES).
- In each village, three farmers' fields were sampled in both farmers' management and improved management as advised in Bhoochetana guidelines.
- A minimum of three randomly selected samples in each treatment from a farmers' field with a minimum sample size of 9 m² or even more crop area based on crop row orientation, aggregating to a minimum of 27 m² or more crop area was sampled in each treatment.
- Total fresh weight of each sample (9 m² or more) was measured for three samples, and a sub-sample of 10-15 whole plants weighing up to 2 to 3 kg fresh weight was collected, weighed for recording fresh weight of sub-sample.



Figure 13a. Finger millet crop sampling in Chikballapur district.



Figure 13b. Green gram crop sampling in Bidar district.

- In this process, one sub-sample was collected each from farmers' managed plot and improved BC management of a farmer's field for moisture estimation and yield components estimation.
- The whole plant sub-samples were processed to separate pods and ear-heads from haulms and stalk.
- Thus collected two plant parts were properly labelled and bagged in kora cloth bags (pod or ear head) and muslin cloth bags (stalk) by ICRISAT Technicians for air /sun drying for two to three days, and were sent to ICRISAT Patancheru Campus for further processing and yield estimations.
- At ICRISAT, these plant samples were dried at constant temperature of 65-70°C for 48 hrs in stabilized dryer temperature and dry weights were recorded.
- Grain/pod attributes were measured to understand quality and marketability of the produce.
- Although mean crop yields are provided for the purpose of summaries, individual farmers-wise crop yields are also provided as annexure to the report (Figure 13).

Inputs Arrangement Processes

Proper and timely procurement is essential to ensure timely implementation of agriculture interventions at field level. In Karnataka, procurement of inputs is part of ongoing process. Tendering process is adopted for procurement of inputs. The department follows the norms of Karnataka Transparency in Public Procurement Act, 1999. It is mainly to ensure transparent procurement process within government system.

Inputs requirements is based on the calculation of total demand submitted by the various wings of the department. Central rate contract is issued for all program. As per the proposed area to be adopted under Bhoochetana, department made arrangements for input supply. ICRISAT did soil analysis and submitted recommendation for application of nutrients including micronutrients in different districts. This became basis for planning of inputs. During planning of inputs achievable targets are set up to 50 to 60 % of total planned area demand.

Commissioner is tender accepting authority, Director is inviting authority. A committee for issuing tender is constituted looks into this matter at state level. After approval for tendering, tender document is prepared and issued in the public domain like newspaper and website. It is clearly mentioned in the document about the peak period of input requirements. Approval is taken from government before issuing the tender. E-tendering is adopted in the state. Tender process starts in the December every year and rates are finalized in the month of March.

Requirement for different inputs is compiled at district level as per defined procedure and compiled at state level. Based on the demand, a pool of 4-5 suppliers are allocated for each district. Indents are given by the Joint Director Agriculture (JDA). Office of JDA is responsible for placing the order to the supplier to ensure timely supply of micronutrient (MN). This is mainly for major sources of micronutrient formulations like gypsum, zinc sulphate and borax.

Elected representatives also provided good cooperation and contributed in ensuring success of the program. They played crucial role in training programs, inputs distribution, and awareness.

Input Supply Monitoring

- At head office, all suppliers are called for meeting to review the process of supply and address the issues emerged in supply of inputs at field level. In *kharif* season, it is done on weekly basis.

- All information is collected through e-mail only.
- Information about supply is shared with Bhoochetana cell.
- Bio-fertilizers are also supplied to the farmer through this system.
- More focus is on multiple supply sources. Therefore, team negotiates with all suppliers to agree supply of products in L-1 basis. This is the process to facilitate the timely availability of inputs at farmers' level.
- Source of inputs are also collected during tendering process from suppliers.
- All requirements are ordered based on consignment basis and based on utilisation, next order will be placed.
- Every year process of tendering starts in the month of November/December.
- Based on the assessment of the state, Government of India (GoI) fix the quantum of fertilizers for major nutrients.

Box 5: Procurement of Inputs Process

- Process input order placement
- Total requirement calculation
- Three month advanced action plan preparation
- Placing indent with short listed agency
- If not supplied then, other agency can be selected approved in the RC for supply of inputs. But not other than registered agency.

Management System

- Fertilizer requirement for major nutrients is assessed twice in a year and demand is sent to GoI.
- For better coordination and supply of inputs, every week, three meetings are organised at Director office level during the season.
- First meeting is on Tuesday headed by Commissioner and Director, Wednesday video conferencing with district JDAs on all issues and third one is on Saturday with inputs suppliers.
- In peak season Minister and Secretary, also attend these meetings to speed up the progress if there are any issues emerged from field are discussed in the meeting itself.
- At field, one vigilance team ensures the quality of inputs supply. It is constituted by the department at district level. Assistant Director of Agriculture heads the vigilance team and other supported by two agriculture officers. This team works with JDA and other agriculture officers. This vigilance team ensures that all inputs are as per prescribed quality. Take samples and test it in the laboratory. Most of the samples are of good quality. If any sample is not of good quality or as per standard that supplier has to supply after replacing that material and ensure that quality is maintained.
- The team ensures that all material is distributed at Raitha Sampark Kendra (RSK).
- In Karnataka cropping season starts early. Last week of May the season starts therefore, they need to ensure that buffer stocking of fertilizers is done as per requirement. A part of quantity received every year is stored in the warehouse at district level based on the recommendation, these suppliers release the buffer stock and this is done with marketing federation and cooperative society for *kharif* season. Fifty% of total produce will be issued through cooperative societies.

- Buffer stock is released in emergency only. If supply is delayed, it is distributed and this way department manages the fertilizer supply properly. In year 2008, situation was bad. Fertilizers were not easily available in the market and government was in trouble. Then government decided to develop a system to avoid such situation at field level and the concept of buffer stocking emerged.
- Package inputs concept was promoted. This concept emerged to ensure that there is balance application of all nutrients and therefore this was promoted otherwise farmers apply only one or two nutrients as per their understanding. Therefore, it was emphasized to ensure that all recommended inputs including seeds, bio-fertilizers and micronutrients reach to the farmer.

Funds

Funds are converged from all schemes of both central and state sectors like Integrated Scheme for Oil, Pulses, Oilseeds and Maize Development (ISOPOM), National Food Security Mission (NFSM), - Accelerated Pulse Production Program, National Program for Management of Soil Health and Fertility, Enrichment of Soil Fertility- state sector scheme, etc.

Quantum of inputs

With the effort of the field team, there is major change in the demand of micronutrients (zypsum, ZnSO₄ & borax) within state. Its usage reached up to 2500 tons this year. This change came mainly due to increased adoption by the farmers

Challenges

- Rainfed area is the biggest challenge for the field team. If there is, delay in monsoon then it is very difficult to dispatch all inputs to farmers because farmer will not come forward to apply recommended nutrients.
- Poor economic status of farmers also affects application of recommended nutrients.
- Timely rainfall affects the optimum utilisation of desirable target of micronutrients
- Unless first instalment given is not liquidated in time and funds are not paid to suppliers it delays the next instalment of inputs. Due to this constraint, it is very difficult to achieve the target well in time. Therefore, economic cycle needs to be maintained.

Monitoring

Systematic monitoring mechanism is developed which ensures that status of inputs is reviewed on weekly basis at *taluka*, district and state level. The team also ensures that material is supplied as per the quality listed in the tender document. The team ensures that input procurement reaches at logical end. It requires a lot of energy of the team in the peak season. For quality supply, the team ensures that samples are taken from each lot supplied and tested in the government laboratory. Approval of lot is based on the report and if there is any mismatch with the approved quality then suppliers are asked to re-supply the material or action is taken as per the law. Fertilizer Control Order (FCO)–bio fertilizers, micronutrient and fertilizers

are covered under FCO. All Central Government Act are applied in the state and department can take disciplinary action on the supplier. Rake point at district level from railway is monitored by the JDA and they ensured that it is distributed properly to the farmers. Poor quality fertilizers are sent back.

Problem

Even if allotment is there sometimes supply is not done as per the approval. It all depends on the import status.

Inputs Supply Mechanism

Assessment of inputs is done twice in a year for both the seasons. At district level, joint Director do the planning for inputs required based on consumption pattern of last 3-4 years in different crops. They also study the changes in the cropping pattern in their district. This helps in assessing realistic requirement of inputs at district level. After assessment for every season, demand of inputs is sent to government of India. For *Kharif*, it is sent in the month of February and for *Rabi* it is sent in September month. Based on the demand and presentation from the state, Government of India finalise monthly supply of fertilizer and for entire season. At state level, supply of inputs is divided as per district demand. Apart from this, state government also try to get additional inputs through private suppliers and cooperative institutions. In the state 50 to 60% of input supply is made through private suppliers and rest through cooperative institutions (Table 9).

Every Wednesday state government reviews status of inputs mainly chemical fertilizers and on Friday Government of India review the status of inputs. However, even it is allotted for the state to ensure that timely railway rake is available for transportation of fertilizers is a big challenge for them. Another big issue is late arrival of vessel from other fertilizer supplying countries. Each vessel contains 35-40,000 tons of fertilizers. Thus, state government is putting more focus on better planning to address the demand of inputs.

Tenders were issued to finalize rate contracts. After finalizing rate contracts list of suppliers is sent to district to initiate procurement process as per their demand. District level officer is responsible to put indent as per their demand and to ensure that supply is as per date and place mentioned in the order. Suppliers are bound to supply as per the indent. If not supplied well in time the district can change the supplier and if not maintained the quality they can black list them. In few districts they have done so. Joint Director of Agriculture (Inputs) review the status of input supply on weekly basis with all suppliers short-listed.

With Joint Director of Agriculture (Inputs) and a team of Deputy Directors are working at different capacity on different tasks. Four Deputy Directors look after fertilizer and micronutrients, seeds, plant protection, and Organic manure.

As stated by the department officials, it is ensured that all payments to input suppliers are made well in time after all quality check and confirmation at field level. It keeps better relationship of department with the suppliers and maintained good reputation in the market. Cooperatives were involved for stocking of inputs at field level. Every Saturday review meeting with input suppliers in peak season is organized. Good scope exists to streamline the process of timely payments to the suppliers.

Table 9. Target quantities of Fertilizers and micronutrient inputs those were actually distributed to farmers at their doorstep in the selected Bhoochetana villages in the districts 2010-11.

S No	District	Crops	Target quantity (tons)			Quantity distributed (% target)		
			Gypsum	ZnSO ₄	Borax	Gypsum	ZnSO ₄	Borax
1	Bengaluru Rural	<i>Kharif</i> Maize, Ragi	3934.4	491.8	18.4	519 (13.1)*	51.7 (10.5)	9.5 (51.6)
2	Bidar	<i>Kharif</i> Green gram, Pigeonpea,	17563	3702	403	1767.5 (10)	195.3 (5)	17.4 (4.3)
3	Bijapur	<i>Kharif</i> Green gram, Black gram, Pearl millet, Sun flower, Pigeonpea	28551	7137.8	427.4	895 (3)	135.2 (2)	8.3 (2)
4	Chamarajana-nagar	<i>Kharif</i>	5679.1	271.9	33.9	1793 (31.6)	81.4 (23.7)	20.1 (59.3)
5	Chikkaballpur	<i>Kharif</i>	3600	650	45	1415 (39.3)	49.5 (7.6)	28.0 (62.2)
6	Chitradurga	<i>Kharif</i> Groundnut, Maize, Ragi	7560	1395	140	4112 (54.3)	323.9 (23.2)	50.7 (36.2)
7	Haveri	<i>Kharif</i> Maize, Groundnut, soybean	18800	3875	320	3935 (20.9)	404 (10.4)	80.8 (25.3)
8	Kolar	<i>Kharif</i> G'nut / Pigeonpea, Ragi	7400	925	185	1957.5 (26.5)	77.36 (8.4)	35.85 (19.4)
9	Raichur	<i>Kharif</i>	12718	1100	-	1404 (11)	219 (19.9)	-
10	Tumkur	<i>kharif</i> Groundnut, Ragi	16426	4610	274	3690 (22.4)	430.5 (9.3)	67.2 (24.5)
11	Yadgiri	<i>Kharif</i> Green gram, Black gram, Pearl millet, Sun flower, Pigeonpea	1792	2948	294.8	521 (4.4)	60 (2.0)	21.02 (7.1)
Total			124023.5	19968.7	2141.5	22009	2027.86	338.87

* Figures in parenthesis represent % value of the targeted quantities.

Seeds

Seed requirement is assessed at field level and district-wise compiled at state level. The estimates are based on seed replacement ratio (SRR), barring hybrid seed, at field level. SRR is fixed by government of India. Seed demand is calculated based on changes in cropping pattern at field level.

There is a big change in cropping pattern in some area in the state. Like Bt cotton and maize, area is increasing gradually. It is mainly due to better market price farmers are growing these two crops. Small and marginal farmers are more focusing on maize. Another major reason is supply of hybrid seed with subsidy under various government schemes.

To procure seeds, tender process is adopted. A well-prepared tender document is the basis to ensure supply of better quality seeds at field level. This includes quality of seeds and assured germination. Agriculture



Figure 14. Farmer buying inputs from RSK.

department appointed a technical committee for seed procurement. This committee is comprised of various organizations including representatives from SAUs; KSSC: NSC and DoA and they take decision on approval of crop variety.

Suppliers have to submit basic papers to department, which includes:

- Results last two years trial data
- Copy of reports duly signed by Indian Council of Agricultural Research (ICAR) or by Directors of Research from SAUs is mandatory
- Must conduct demonstrations in different agro-climatic zones
- Response to pest and diseases attack
- Yield data

Timely Distribution and Application of Inputs

It is the most tough task for the field team. Reason is farmers were not sure that micronutrients can bring change in the overall production and it was perceived an additional economic burden. Therefore, additional planning was required to ensure that micronutrients are applied in the field. At the moment the field team is facing shortage of human resource and they are totally dependent on RSK and farmer facilitators on timely placing of inputs at village level.



Figure 15. Farmers taking seed material from RSK.



Figure 16. Farmer Facilitator at village level godown.

The next herculean task was motivating farmers to use micronutrients in their current crops. This was difficult, as they need to pay 50% cost of micronutrients and ensure that they procure it at the time of application. At the same time, it was necessary to follow up with suppliers to supply it well in time as per quality standards. There is a need to short list suppliers who can supply quality inputs well in time at field level as per demand.

At district level, task force is created which looks after input supply including monitoring, status of availability as per requirement. Deputy Commissioner is chairperson of the committee and does periodic review of input status at district level. Joint Director of Agriculture, at district headquarters is the secretary of this committee who plays crucial role in management of inputs at district level. After Bhoochetana implementation pressure on field team has increased due to increased awareness about use of micronutrients in their rainfed crops.

For better monitoring vigilance squad is formed at district level. This mechanism is based on learning of Bhoochetana. Main task of vigilance team is to ensure quality control of inputs.

It is ensured that all payments to input suppliers are made in time after all quality check and confirmation at field level.

Role of Key Players

State Level Co-ordination Committee

State level co-ordination committee (SLCC) chaired by Additional Chief Secretary and Development Commissioner guides the mission and helps in deciding the targets and mechanisms to achieve the objectives. The key role and its status is detailed out as bellow:

- Necessary convergence of different line departments and consortium partners through appropriate Govt. orders. **Status:** *More efforts are required in active participation of Watershed and State agriculture universities.*
- Guide the consortium partners for resources (human and financial) to achieve the targets. **Status:** *the committee did it professionally. Regular field visits, review meetings and later on video conferences show keen interest of the committee to implement this program successfully.*
- Periodical review and monitoring of the progress and call for the reports from the district and taluka co-ordination committees through nodal officer. **Status:** *the department established a very good review and monitoring mechanism. It is very effective. It contributed in making this program successful. Now there is need to review the mechanism and strengthen it with decentralization and accountability at all levels.*
- Identify suitable strategies for successful implementation of the mission project by mobilizing necessary support from the concerned line departments as well as policy makers and politicians to make the mission successful. **Status:** *Strategies were defined initially by ICRISAT in the joint proposal. Later on little changes were made as per field requirements. For example budgetary provision for storage of inputs at field level, supply of inputs well in time, etc.,* The high level committee played very effective role in implementation of the program.

Department of Agriculture

- To identify atleast two major rainfed crops in each of the six selected districts where Sujala program has already implemented watershed program during the first year. **Status:** *Crops were selected and action plan to strengthen the production in each district was also executed at field which resulted in increased production.*
- During the subsequent years, additional area in each district will be adjusted accordingly including new sixteen districts to ensure that by the year four, 100% of the area for the selected crops in the selected districts will be covered by the mission. **Status:** *Plan for covering 100% area in each selected district is prepared. Area selection is done as per the criteria finalised.*
- Director, Agriculture is the nodal officer and will implement the project in all the districts through appropriate staff from Department of Agriculture with the help of FFS and LFs in each *Taluka* and guide the farmers in each village to undertake mission project activities. **Status:** *Properly implemented at field*
- DoA will organize timely availability of necessary quality inputs (seeds, fertilizers including micro-nutrients, machinery, pest control measures) for enhancing the agricultural productivity of the target crops. **Status:** *Time bound planning process is in place and inputs are procured well in time. However, due to shortage in the market, some time supply is delayed and lack of timely payments to the inputs suppliers delays the supply.*
- ICRISAT recommends soil application of micro and secondary nutrients as recommended based on the soil test analysis to ensure the residual benefits from the nutrients applied during the second and third year. **Status:** *ICRISAT provided report to the department after soil sample collection and analysis. Soil health cards with technical guidance was also provided by ICRISAT.*
- Department can procure fertilizers particularly the micronutrients to ensure quality and economy directly from the manufacturers rather than from the suppliers. **Status:** *A well-defined logical procurement mechanism is in place at state level for procurement of all inputs, however, many dealers are suppliers rather than the manufacturers.*
- The necessary stocks of fertilizers and seeds need to be ensured at cluster level before the on-set of monsoon as generally farmers procure the materials ahead of starting of the rains. **Status:** *Inputs stock is maintained at RSK level as per demand of the districts. Special budgetary provisions are made to Taluka and Hobli level offices for stocking and transportation of inputs, however, there is a scope to improve the timely supply of inputs.*
- Organize trainers training with the faculty from ICRISAT, SAUs and lead NGOs, department staff for internalizing nuances of various interventions to be undertaken from the mission project. **Status:** *Trainers training was organised at GKVK by ICRISAT and after that district level training programs were conducted. Adoption of micro nutrient application concept by the farmers and increase in demand of micronutrients at local level is a best indicator.*
- Department will provide day-to-day supervision, timely supply of nutrients and ensure required target to be made to cover planned areas in the district. **Status:** *A well defined system of inputs procurement is in place. A professional team is working on procuring inputs and ensuring that it reaches to field on time.*
- Crop cutting experiments to record yield data. **Status:** *This is carried out very carefully with the help of ICRISAT field team and data are well recorded.*

- Nodal officer will ensure timely implementation and organize meetings, planning and implanting meetings at different levels regularly to review the progress as well as undertake mid-course correction. **Status:** The concept of Nodal Officer was executed very well at the ground level. It started with very senior officials contributing as Nodal officer for six first year districts which later on carried out by other state level officers.
- ICRISAT will facilitate the mission project and provide guidance and technical support for undertaking productivity enhancement activities in the selected districts of Karnataka. **Status:** *The role is better performed by the team ICRISAT under leadership of Dr Wani and result can be seen at ground level.*
- Provide soil test-based nutrient recommendations for the selected six districts where the activities will be initiated during 2009 rainy season based on the soil mapping done under Sujala-ICRISAT initiative. **Status:** *This is completed for first year districts with the help of department and state agriculture universities.*
- During the year 2009-10 and 2010-11, ICRISAT has undertaken soil mapping in the remaining 15 districts to develop soil test-based nutrient recommendations for the identified crops by adopting stratified sampling method in the districts to prepare GIS-based nutrient status map for the targeted districts. **Status:** *This was done properly with the help of department field team and ICRISAT team. ICRISAT also contributed in strengthening the capacity of department for conducting soil testing for micro nutrient.*
- Training of trainers at district level will be undertaken by ICRISAT for implementing the mission project to enhance the productivity of agricultural crops in the districts. **Status:** *The training of trainer and further they conducted training of farmer facilitators and lead farmers.*
- Team building exercises with different consortium partners was undertaken by ICRISAT. *This was done with all consortium partners.* **Status:** *Some of the consortium partners feel that it is ICRISAT project and they have limited role to do or it is not their job.*
- **ICRISAT** will facilitate the mission project through ICRISAT scientist based in Bengaluru and a technician in each district supported by a multi-disciplinary team of scientists and scientific officers from ICRISAT headquarters, Patancheru. The project leader will co-ordinate all the facilitation with Department of Agriculture, consortium partners and ICRISAT for the mission project. **Status:** *This is done with proper planning.*
- Monitoring and evaluation by adopting participatory approach and recording yields of controlled and untreated plots along with Department of Agriculture staff, NGO representatives and lead farmers will be undertaken. **Status:** *Although a clear role for SAUs; WDD; to train Lead Farmers and Farm Facilitators was envisaged, the SLCC decided to use services of SAUs for training. Reason for deviation: There was no further discussion held on involvement of NGOs at district level and thus it became only part of the proposal.*
- Detailed annual reports after completion of the *Kharif* and *Rabi* trials will be provided. **Status:** *Properly managed at field level. The reports were jointly prepared by department field team, ICRISAT Research Technician located at field and ICRISAT head office.*
- Facilitation will be through participation of ICRISAT team members at district and state level co-ordination committees. **Status:** *Proactive participation of ICRISAT team at state and district level.*
- ICRISAT will continuously communicate with different consortium partners regarding the status of work as well as required help and mid-course. **Status:** *This is done properly but there were some gaps in communication with state agriculture universities which needs to be addressed on priority basis.*

What ICRISAT did at ground

As a lead technical support provider, ICRISAT was responsible for soil testing, new technology introduction and coordinate with the consortium collaborates through state agriculture department.

Coordination with DoA staff for inputs mobilization, especially expediting the procurements or placing inputs at the disposal of field staff for easy distribution to farmers timely was harmonized. ICRISAT facilitated timely procurement of bajra hybrids, groundnut (ICGV 91114), pigeonpea and soybean cultivars.

ICRISAT arranged seeds of improved cultivars of sorghum, safflower, chickpea for *rabi* sowings to farmers of Haveri and Dharwad through DoA, as these districts were flood affected and farmers had lost their stored seeds.

ICRISAT staff participated and facilitated weekly review meetings in each district to provide update of field activities and any assistance required for farmers' problems. ICRISAT & DoA developed format for weekly progress reporting and Bhoochetana technical officers in the O/o the Joint Director of Agriculture and ICRISAT staff facilitated regular weekly feedback from districts to ICRISAT and weekly video conferences using the comprehensive checklist format.

Intense monitoring of field trials by DoA, ICRISAT and SLCC members through direct contact of ICRISAT staff, farmers and field facilitators.

Besides participation of project coordinator from ICRISAT and Resident Scientist in regular SLCC review meetings, their field visits in districts as well as meeting with UAS scientists in Bengaluru and Dharwad had helped to invigorate ICRISAT staff morale and commitment for project activities.

Watershed Development Department

Watershed Development Department, which has implemented soil and conservation measures in six districts, will help the consortium by providing necessary technical information and human resources in the district for implementation of the mission activities. **Status:** *This was not observed during discussion with officials at district level. Reason for deviation: New orders are issued to focus on the activities in the watershed villages and converge with the watershed program*

State Agricultural Universities

Local SAUs are responsible to provide technical support and that is being provided by the university. The data are available with the universities. Specific recommendations are essential and then only success can be obtained. Micronutrients have differential roles in different places. State Agricultural Universities representatives and staff will play an important role in the mission project at state, district and *taluka* level appropriately for providing knowledge as well as guidance and local logistical support to share knowledge with the farmers. Within the district and *taluka*, University need to identify responsible nodal person and staff to participate in the mission project for enhancing agricultural productivity at different levels.

- Universities will assist in identifying suitable high-yielding cultivars of the identified crops as well as appropriate management practices including pest control measures at district levels. **Status:** *High-yielding cultivars' information was provided by universities to concerned district officials and demonstrations were taken at field level.*

Box 6: Discussion with Commissioner Agriculture Dr Baburao Mudbi

He started discussion with his quote “Meeting of mind is very important to implement any big program”. He said Rashtriya Krishi Vikas Yojana fund played crucial role in setting up the program. He also said that the program is based on the learning of Sujala program.

He shared hurdles and teething problems, which slowed down the program pace at its initial stage

The department was very happy because all consortium partners extended good support in implementation of the program. Additional Chief Secretary and Development Commissioner played crucial role in framing, implementation and establishing this program at all levels.

“Over protection should not be done or promoted in any program it may kill the original spirit of the program” – Dr Baburao Mudbi.

It is important to keep space for mid course correction. There should be space to incorporate learnings during implementation of the program. Computerisation is one of them at RSK level. Capacity enhancement of program is ongoing task and one has to keep space in the program plan. Farmer facilitator is a big pillar. They are actual transformer at field level.

Constraints: Main constraints were promotion of new technologies along with knowledge. Assured inputs supply was biggest hurdle at field level after knowledge transfer. Mobilising inputs was challenge and due to market fluctuation, it was more problematic.

Learning:

- Mission mode approach plays important role in such large program
- Constant review and monitoring is must
- Convergence approach in such large program is beneficial.
- Farm Facilitator played crucial role
- Government of India also started paying attention to the progress and achievements.

- Assist ICRISAT in undertaking training programs for the NGOs and lead farmers. **Status:** *Provided support in conducting training program mainly for Farmer Facilitators.*
- Scientists at district and *taluka* level will regularly visit the project areas along with other partners and guide the project implementation accordingly. **Status:** *Few universities require to provide technical support as desired under the program.*
- Participate in M&E of the project activities.

Box 7: Vice Chancellor of State Agriculture University, Bengaluru

There are multiple issues in agriculture and micronutrient deficiency in soil is one out of them. Functional linkages are very crucial for success of such problem. More focus has to be on educating the farmers. Easy availability of these critical inputs at right place and right time are must for sustainable adoption of these technologies. There are total 76 lac farmers in Karnataka and out of this 58 lac are small and marginal farmers. They cannot go too far away to procure these inputs. They can go to nearby market like Hobali market or RSK or Gram Panchayat then only they can continue adopting new technology. No institution is complete now to execute work at the ground. More involvement of KVKs is needed at the moment in this program. They are not properly utilised in Bhoochetana.

Suggestion: At the grassroots level, input availability is a big question. From each panchayat one young farmer can be trained to operate the new farm machineries. Empowerment of user groups with the help of KVK. In any agriculture program University involvement is must because at the end of project there will be or may be post project issue and if university is not involved then it will be difficult to address it. Success is one output but sustainability is a big question. Head of consortium agency has to be briefed on regular basis as chances of changes are high in these institutions.

Discussion with Raichur University scientists

During interaction with the university scientists, they told that in the district ICRISAT team visited to collect soil samples with the help of agriculture department. The soil maps were based on the micro nutrient deficiency mainly zinc, boron, and sulphur. General recommendations were given like

- Zinc-12.5 kg ZnSO₄ for normal soil, 25 kg for deficient soil per ha per year
- Boron-2.5 kg for normal soil and 5 kg for deficient soil per ha per year
- Sulphur through gypsum-200 kg ha two doses -100 kg for normal and 200 kg for deficient soil per ha per year

Earlier ICRISAT suggested applying ZnSO₄ 50 kg/ha once in three years after discussion within scientists and department officials it was agreed 25 kg/ha every year. This was shared by university scientist at Dharwad University.

Targeted area in each district for different crops was fixed and micro nutrient calculation assessment is based on the area under each crop in each district and supplied by agriculture department.

Department asked university to appoint a resource person for each district. University nominated one scientist for each district. There are four scientists involved from Raichur University. Total six districts are covered by the university. Raichur, Gulbarga, Bidar, Yedgiri, Koppal and Bellary.

In master trainers training total eight scientists participated from Raichur university. These scientists were also trained at university level for different districts and different zones. They further conduct training for application of inputs for major crops at district level.

General output observed:

- Total 900 farmer facilitators have been trained from six districts by the University
- Farmers learned about micro nutrient application

- Production increase in general is observed in these districts
- 70-80% farmers may apply all the nutrients purchased by them.

Issues and suggestion:

- Farmers want one product for all nutrients for easy application
- Delay in supply of inputs has to be addressed
- Immediate application of micronutrients is required for better results. More work is needed to bring awareness at farmers' level.
- The area of 500 ha is large for one farmer facilitator to cover. It is suggested that it should be 200 ha to ensure effective implementation.
- Temporary appointment where no incharge at *taluk* level under Bhoochetana
- to speed up the progress

Krishi Vignan Kendra (KVK) and their contribution in Bhoochetana

Krishi Vignan Kendra (KVK) has very positive and proactive role in the program and this match with their mandate defined by ICAR. In the Bhoochetana program, Krishi Vignan Kendra was visualised as a technical support agency to strengthen agriculture in dryland farming.

Three key points where KVK is contributing: a) awareness generation, b) Training program, and c) transfer of new technology.

The KVK team felt that this program is very beneficial in addressing the production issues in reainfed farming condition. However, there is a lot needs to be done at ground but start is good. The apprehension of KVK team is that farmers are using it for few crop but they do not understand its wider impact on soil health and productivity enhancement. This need to be addressed with separate strategy in the district and it is only possible with regular demonstration followed by field days at village level at a scale.

In most of the districts, KVK team is aware about the Bhoochetana program and they are participating activities whenever invited. A few of them also attended one training program of trainers on micronutrient concept program organised by agriculture department on Bhoochetana at Bengaluru. KVK acted as training agency and provided technical knowledge as and when required. In the watershed treated area, this program is implemented on priority basis. KVK also conducts trials at their level and share learning with the department and farmers. This includes demonstration of new technology. Some KVKs got involved in the program in the year 2011-12 only.

The KVK team also felt that FFs are doing good job in mobilising farmers in their villages. Technicians take proactive step on this aspect and provide handholding supports to FFs. This program increases access to micronutrients at village level, which assured application of micronutrients in their field. Training programs for farm facilitators, farmers and field functionaries of agriculture department is the major activity conducted in this program. More focus on micro nutrient application in training program. Awareness increased in the farming community about application of micronutrients in dryland crops. Now farmers are applying micronutrients as tonic. However, farmers are more inclined towards horticulture crops.

In general, there is need to review the role of KVKs in the program and how best they can contribute in the program has to be defined clearly. A clear road map has to be prepared for involvement of KVK.

Activities conducted by KVKs

ICRISAT conducted one-day master trainers' training at Bengaluru on Bhoochetana. During the training program, detailed discussions were held with master trainers about how to conduct training of farmer facilitator. Based on the module-schedule 06 days training of farm facilitators was conducted at KVK.

- Conducted training of farmer facilitators on INM, IPM, and safe use of pesticides
- Conducted field demonstrations as part of on job training of farmer facilitators. Scientist visited demonstration plots and also provide handhold support to farmer facilitators and addresses their problems and queries on site. All scientists' mobile numbers are given to farmer facilitators for communication and they can discuss with them for their queries.
- Content of training: about district, soil fertility status of district, fertilizer recommendation according to deficiency in soil for major crops, INM, IPM, how to conduct field days, one-day field visit, what is Bhoochetana etc. One week training is enough for FFs on above topics.
- Provide technical information in village meeting –when they are invited

Good Practice

- Seed treatment and germination test promoted along with micro nutrient and FFs are able to spread this easily due to simple technology.

Issues observed by KVK team

- FFs are worried about their honorarium payment.
- Less technical officers are available at taluk and hobli level.
- No specific strategy for benefit sharing with small and marginal farm women
- Collecting baseline data on sample basis took more time and energy of FFs and thus they could not concentrate on their original task in early stage

Suggestions

- In Bhoochetana, minimum two woman farm facilitators are required.
- Gypsum blanket application may increase toxicity in the saline soil. This has to be discussed.
- KVK should be involved in implementation also. Conduct demonstrations through KVK in selected fields.
- Integrated crops farming management – IFS- ICM Module should be promoted through such demonstrations.
- Better training to field functionaries of agriculture department is required. Capacity building of KVK team is also required on new technologies. All KVK members should be trained on Bhoochetana. All Subject Matter Specialists should be involved in the program.

- Every third year soil testing in the district to assess the change in the soil status.
- Training on input storage and application should be organised.
- Village demonstration is more important. More number of demonstrations every year are required.

Special program run by KVK

The Gulbarga KVK is implementing a special project with the technical and financial support from ICRISAT in the district. This is mainly on creating awareness on new technologies & practices and register new farmers for adopting these technologies. Daily SMS is also sent to registered farmers on crop specific package of practice for main crops. Total 6000 farmers are registered in district and 1200 are Bhoochetana registered farmers in this. University issues standing instructions for providing technical support for Bhoochetana program as and when required by the department.

Taluk wise farmers list based on name, crops, village and mobile is prepared at KVK level. Farmers' detailed profile is compiled at KVK level. One field investigator is appointed for Bhoochetana work. One soil scientist is in-charge of Bhoochetana. A register is maintained about problem encountered by farmers and based on that SMS is sent to farmers

A database is managed in a register which covers following informations:

Name of farmers	Village	<i>Taluk</i>	Crop	Problem faced	Solution suggested	Name of scientist

Solution about the problems is shared with farmers through voice message using KVK web site. KVK is maintaining a website to send voice messages to farmers. This is a collaborative project between university and ICRISAT. Voice messages are recorded first at KVK and then sent to registered farmers in local languages. Concerned KVK scientist cross checked these messages and then sent to the farmers. There is good response on this approach from the farming community. Crop specific messages are sent to the farmers who grow these crops and registered with KVK with specific crop.

In August 2011, this system was started for Bhoochetana program. However, KVK is using it since 2010. Good response from farmers. Earlier 1000 farmers were registered under Bhoochetana, now there is big demand from the farmers and more farmers will be registered under this program.

For this program 3 KVKs are selected under Bhoochetana program by ICRISAT. Dr Yeduraj from ICRISAT is coordinating this initiative. These KVKs are Dharwad, Gulbarga and Raichur. Website is www.vkvv.in.

One voice message per day is compulsory to send to the farmers but cannot send more voice messages from this website. This website is managed by IIT Kanpur. Coordinator is Mr Jitendra Singh. If more messages are sent website is blocked. For text messages, there is no restriction. Mailbox system is arranged so any time they can hear their voice messages from message receivers. Earlier these messages got deleted and they were not able to read these messages. This concept can be promoted in all Bhoochetana districts.

Lead Farmers

In each village, two lead farmers will be identified by the department to guide, train and assist other farmers in the village to undertake various interventions for the productivity enhancement initiative.

Lead farmers would assist in organizing Gram Sabhas and social mobilization of the farmers to undertake various activities to achieve the target. **Status:** *Lead farmers are appointed during peak season to assist the FFs.*

Provide necessary help to the farmers to implement interventions and help the DoA and other consortium partners to achieve the targets. **Status:** *They are mainly contributing in taking up demonstrations in their field, helping farmer facilitator in training etc.*

Economic Adviser to Chief Minister

Prof. KV Raju, as Economic Adviser to Hon'ble Chief Minister, Government of Karnataka boosted the program with his efforts. He made himself available to ensure that this program runs effectively and efficiently at ground level. He was given responsibility as a nodal officer for one district and he took keen interest in the entire role given to him which gave very positive message to field officials that Hon'ble CM is also taking personal interest and progress is directly shared with Hon'ble CM. The EA to Hon'ble CM played very crucial role in conceptualisation of the program and making it a flagship program of state government.

Box 8: Prof K. V. Raju, Economic Adviser to Chief Minister, Government of Karnataka

Growth rate of state was low. Fundamental change was required in agriculture sector this was part of initial discussion. During initial discussion it was accepted that most critical factor in agriculture is 'soil' and we need to work on strengthening soil health and its status. Thus soil testing was taken on priority basis.

At this juncture ICRISAT was involved with long term vision and starting with small area.

International variable lab indicators were used in soil testing report preparation

Political will: Hon'ble Chief Minister provided space for new ideas, Hon'ble Agriculture Minister, Horticulture Minister have trust on Economic Adviser to Hon'ble CM and they provided space to his ideas.

No complaint about Bhoochetana so far. Scientific and Low-cost approaches are adopted.

Agro climate specific approach were given due importance at field level.

Raitha Sampark Kendra

RSK plays crucial role in implementation of Bhoochetana and it is centre of wider circulation. Looking at the role of these centres it was decided to fully computerise these centres so that they can contribute more at field level in execution of other programs as well.

Nodal Officer

The concept of nodal officer was very effectively implemented in this program. In the very beginning of the program six very senior officials of state government were given responsibility to monitor and review the progress of their nodal district. These officials were Additional Chief Secretary and Development Commissioner, Government of Karnataka, Economic Adviser to Hon'ble Chief Minister, Government of Karnataka, Principal

Box 9: New Monitoring Indicator

In Dharwad district per hectare intake of micro nutrient was analyzed in year 2010 as per supply and crop sown. This was new thought process of assessment was promoted by the district officials. Later on this was adopted at state level and reviews are conducted on this concept only. Now reports are compiled for each district on the basis of area and quantity of micro nutrients consumption (each one).

Secretary Agriculture, Government of Karnataka, Commissioner for Agriculture, Director of Agriculture and Director of Watershed Development Department were made first nodal officers in this program. They ensured visit to their district and ensure that program is implemented in true sense. This mechanism worked effectively and small issues were addressed on straight away basis at field only. This was the first time when six senior officials were made nodal for state program and they reviewed the program on regular interval, which helped in setting up the program at field level.

In the second year of the program, district increased up to 16 and then other officials were made nodal to all these districts.

Importance is given to nodal officers and their visit notes. Now they are acting as liaison officers. Earlier more time was spent on review of the program. Now the system is established so more time is spent on liaison with other schemes within department. Within district, also concept of nodal officer was introduced. Every fortnight visit to nodal district is compulsory. Sample verification of demonstration is part of visit. Interaction with the demonstration farmer as follows up of report submitted by district nodal officer. Priority visit to the *taluk*, along with university representatives, where progress is poor.

Frequent visits of nodal officers at initial stage of the program and regular proper feedback to the higher officials helped in shaping the program properly. There is a need to conduct residual impact study at field level.

Role of Vigilance Officer

Concept of vigilance was promoted based on learning of the program. This helps in maintaining quality of inputs at field level and checks whether it is reaching to the needy people or not. Main tasks of vigilance officer are as follows:

- Quality control at local dealer shops
- To ensure that input supplied at district level reaches to realistic farmers who are registered
- Share information with JDA and state level JDA in-charge inputs if there is delay in supply or poor quality supply of inputs
- Inspection of material at field level



Figure 17. Inputs stored at RSK.

- There role is only to ensure quality of inputs not distribution of inputs
- Collect samples and send it to the state level laboratory for quality check
- Refuse material if not as per quality parameters and send it back to concerned supplier/s
- Seed testing to ensure that no poor quality seeds are supplied to farmers.

Supervisor Responsibility for Crop Sampling

In every district, supervisor/s is/are deputed for crop sampling. Following steps were finalised after detailed discussion with JDA. The planning is also done under guidance, support and supervision of the respective JDAs by scheduling the entire process in the district well in advance.

- JDA constitute a joint team of officials in each district that supervises the crop sampling at their designated villages.

Box 10: Task of District Nodal Officer

- Regular communication with Joint Director of Agriculture at district level
- Interaction with Farm Facilitator and facilitate their issues
- Follow up with input supply program as per plan and ensure prepositioned with micro nutrients and also visit sample villages.
- Follow up of demonstration.
- Build technical knowledge of farm facilitators
- During peak season it is compulsory to spend two to three days in concerned district for all nodal officers.
- Visit Raitha Sampark Kendra and review progress.
- Share inspection visit note with the state head quarter and concern district head. Regular follow up based on visit note.
- Timely release of grant, achieving financial progress as per multi level monthly review, ensuring prepositioning of inputs, follow up of district specific issues at state level with different wings of directorate
- Every Monday meeting with fertilizer manufacturer.

- All the representatives of Karnataka State Department of Agriculture (KSDA), Department of Economics and Statistics (DES), SAU, WDD, ICRISAT, FFs, LFs, participating farmers and those suggested by JDAs are part of the Team.
- Name of the farmer with date and location of sampling were recorded for each sample from farmers' fields.
- At the time of crop sample harvest, same field photographs were taken along with the farmer to provide authenticity to the sampling.
- Farmers' opinions are also recorded in a sheet when the crop data are recorded at harvest sampling, and all other representatives attending the crop sampling signed on record of sample weights for each farmer's field.
- A copy of the duly signed fresh weights data sheet was available with DoA officer or their representatives
- Some subsamples of whole plant randomly collected were retained for processing by DoA staff which might serve as a counter check for yield estimations provided by ICRISAT.

Project Management System

The project is being implemented in a Mission mode and coordination at different levels starting with cluster of villages in each *Taluk*, linking-up with *Taluk* level coordination committees (TCCs). TCCs are linked-up with district level coordination committees (DCCs) and state level co-ordination committee (SLCC).

In all the project communication, it was compulsory to write it as a mission mode project and has to be implemented in mission mode only. Communication was very regular and later on all communications were sent through email to speed up the processes at field level.

For better and timely reporting standardisation of reporting format was done. It took long time but now it is structured and finalised.

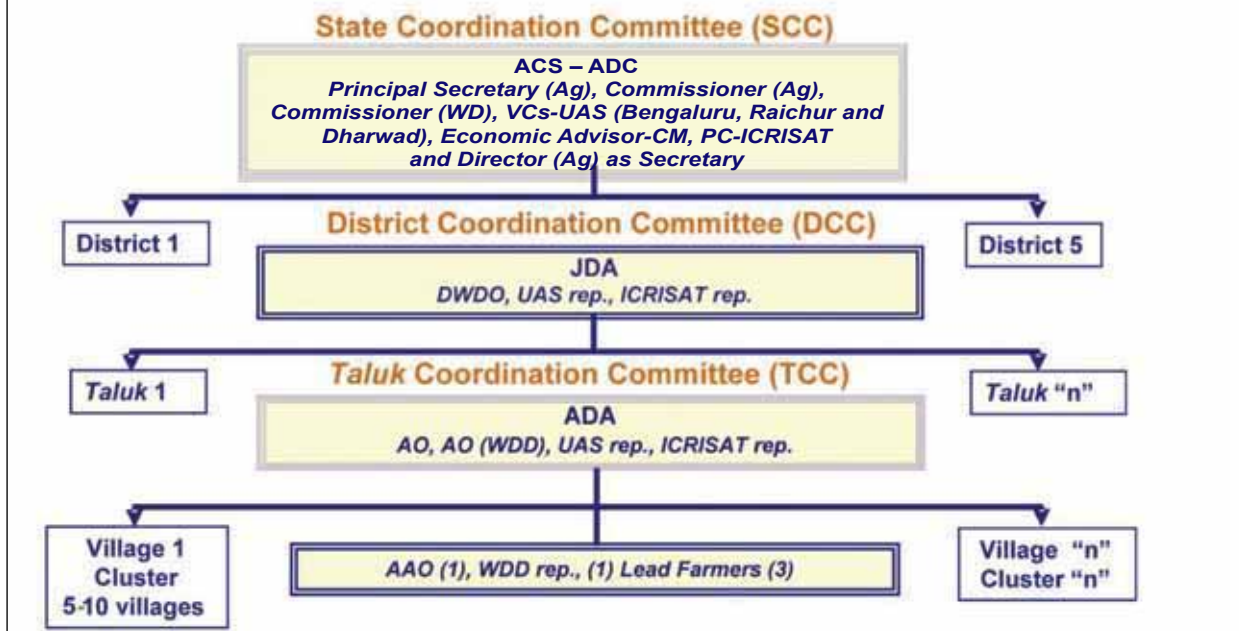
Program management system is well thought and working effectively. At state level, regular review meetings are organised. Initially it was started with fortnight review, which converted into weekly review of the programme. The reviews are conducted at district and *taluk* level on weekly basis. The reports generated at *Taluk* level office. Thus, first level review is conducted at *taluk* level and these review meetings helps in preparing reports and submitted to district, which comes to state on weekly basis. The system is more into number feeding rather focusing on quality as it is becoming older. Therefore, it would be good to do an analysis at *taluk* level and then share with the district and at state level.

Performance-based ranking mechanism is adopted and every district is given a rank every month. It is very good system for developing a competitive environment in the program. This helps in maintaining pace of the work at ground level. Poor performing districts are reviewed with special attention in video conferencing.

The management system ensured that inputs are stocked at Raitha Kendra and micronutrients are consumed on time. Cooperatives were involved for stocking of inputs at field level.

During discussion with the district officials, they told that there is no clear role of Deputy commissioner. It would be good if there were some role defined for reviewing the program on monthly basis under the chairmanship of Deputy Commissioner. This would help in strengthening the program at district level. Community to community exposure visits can be planned at large scale for wider adoption of this concept.

Planning and Monitoring Mechanism



Now training programs are organised but it would be good if a structured training program is planned for lead farmers, field level official and farmer facilitators on regular training to strengthen the program.

Monitoring and Evaluation by State Coordination Committee (SCC)

State level coordination committee is a high power committee constituted with state level senior administrators of Government of Karnataka, Economic Advisor to Hon'ble Chief Minister, Government of Karnataka, Directors of Department of Agriculture and Watershed Development Department, Vice-Chancellors of the three Universities of Agriculture in Bengaluru, Raichur and Dharwad, and Project Coordinator from ICRISAT.

The committee meetings are organised frequently during the beginning of the season to take stock of inputs procurement and distribution arrangements, monsoon progression and crop-sown statistics. To fetch complete information from cluster villages, taluks to district, ICRISAT prepared a checklist for weekly activity progress report and ensured follow-up weekly reporting synchronized from JDA office and ICRISAT staff.

State level committee reviews the progress of project activities and interacts with district level officials instantaneously through video-conferencing and take stock of solutions to address problems arising in the field and issue directives for each district. In the initial stage of the program, Hon'ble Minister of Agriculture, also attended a district level committee meeting and reviewed the progress and success achieved in enhancing the crop yields of ragi and groundnut during *kharif* season. In year, 2009 Hon'ble Chief Minister also reviewed the progress of Bhoochetana. This gave additional boost to the program.

State level Coordination Committee members attended District Coordination Committee meetings, did field visits along with JDA of the district to monitor and provided onboard guidance to problems in the district. High level monitoring by senior officials helped in arranging inputs. This close monitoring also made this program rolling at field level.

Monthly Program Implementation Calendar

Monthly program implementation calendar (MPIC) guidelines were developed for better monitoring of the program. MPIC aims at apportioning the budget allocation for a scheme based on physical activities during the twelve months of the financial year and thereby achieving satisfactory implementation of state plan and non-plan schemes. Spending the allocation in the last month of the financial year can be prevented and the developmental objectives of the schemes can be achieved.

It includes state, district, *taluk* and gram panchayat level activities. It also provides space for monthly planning of grant and its timely releases. The document has defined output and outcomes linked with the plan. It also helps in review of the program implementation at district level to the concerned Chief Executive Officer (CEO) of Zilla Panchayat.

Review Meetings

The program was reviewed in special meeting in its initial stage. These review meetings were mainly to rectify field problems, taking policy decision to implement the concept in positive mode. The review mechanism also helped in building relationship between all consortium partners. Review meetings were initially conducted on fortnightly basis later on looking at the need nodal officers meeting on Tuesday and video conferences on Wednesday are organised on weekly basis. In these review meetings, other departmental programs are also reviewed.

Funds are disbursed based on financial progress to each district and it is a forcing mechanism by peer review. Concept of vigilance was promoted based on learning of the program. This helps in maintaining quality of inputs at field level and checks whether inputs are reaching to the needy people or not. Review meetings were base for planning and monitoring of program at field level.

Progress review started from June 2009. Weekly review was based on the report against plan and task given in the last meeting and random check was compulsory for the nodal officers. Every Thursday, ACS & DC does thorough progress review of Bhoochetana at 3.00 pm. In the meeting, issues, which required policy or higher-level decision, were taken up to CS level. Follow up of progress mainly through email. Bhoochetana is a high priority program for government. JD Agriculture and DWDO/DD watershed did joint review on weekly basis at field level (Table 10).

Video Conference

The concept of video conference based review is outcome of need of the program for close monitoring and review by head office. This also saves time of field officials who were earlier visiting head office just for the review meeting on higher frequency.

Earlier agriculture department used to do review by routine meetings either at district, divisional or state level. In a meeting, it was decided to use the technology for better monitoring and review. In very first meeting, government realised its usefulness and it was decided to continue review through video

Table 10. Key decisions taken in meetings, which strengthen the program to achieve its objectives

Date & Key decisions	Chaired by
<p>Date: 28 May, 2009 Focus was on input positioning, village, cluster, farmer facilitator and lead farmers identification, awareness creation, training and capacity building, 2 June 2009 dead line for all above points, ICRISAT provide technical support at district level, National Informatics Centre (NIC) was roped in for data entry with the help of ICRISAT, clarity of heads was made for account point of view and booking of expenditures, Karnataka State Remote Sensing Application Centre was also involved in developing special program for data management, year II district names were finalised, conduct soil sampling on priority basis, dovetailing of budget with other schemes, every Wednesday review at 4.00 pm, Non-Government Organisations (NGOs), supposed to involved in extension work, but proposal were dropped, reason not explained,</p>	Additional Chief Secretary and Development Commissioner, Government of Karnataka
<p>Date: 10 June, 2009 Progress is weak, need to work on it, farmers registration on priority basis, recommendations given by ICRISAT has to be followed properly, distribution of soil health card with all recommendations, focus on prepositioning of inputs, each member of SLCC will visit one district and monitor progress,</p>	Additional Chief Secretary and Development Commissioner, Government of Karnataka
<p>Date: 17 June, 2009 State Level Monitoring Committee visited six Bhoochetana districts. Six senior officials were made nodal to project district made visit to their respective district and submitted report. Based on observation what has to be done in each district was identified and priorities were fixed, input supply needs to be speedup, awareness –more work is needed, uniform reporting is needed develop simple formats as per demand, wall writing, should be done on priority basis.</p>	Additional Chief Secretary and Development Commissioner, Government of Karnataka
<p>Date: 10 July, 2009 Basic work at field like survey, registration of farmers, wall writing is over, more efforts are required to promote micro nutrients, focus on documentation of activities, targets should be given at all level, <i>Rabi</i> Bhoochetana only in three districts- Chitradurga, Dharwad and Haveri, soil sampling in six district is over, MoU is finalised between DoA and ICRISAT, focus on training of farmers, reward for good performer by giving certificate</p>	Additional Chief Secretary and Development Commissioner, Government of Karnataka
<p>Date: 29 July, 2009 In three districts detailed soil analysis was completed and recommendations were made by ICRISAT to all for major crops and applications were made at field level and based on this plans were made for <i>Rabi</i> for three districts, Dharwad and Haveri are doing good in first year, better planning is required for promotion of micronutrients and Gypsum in <i>Rabi</i> 2009-10,</p>	Additional Chief Secretary and Development Commissioner, Government of Karnataka, it was video conference
<p>Date: 30th July 09</p> <ul style="list-style-type: none">• Gol increased the allocation under RKVY for year 2009-10 to ₹ 410 crores for Karnataka.• Deputy Secretary Gol suggested that obtain project completion reports from the department head, include component wise costing in the project submitted to Gol, ensure timely audit, integrate training program under ATMA,• Budget of ₹ 14.00 crore rupees was approved for Bhoochetana Program.• GoK submitted proposal to Gol to release funds under RKVY which also includes Bhoochetana (₹ 10.91 crore only)• ICRISAT component was ₹ 3.79 crore• Additional budget of ₹ 2.00 crore was sanctioned under RKVY mainly to utilise the administrative cost.	Additional chief secretary and development commissioner and Chairmen SLCC in RKVY meeting Additional Chief Secretary and Development Commissioner

Continued

Table 10. Continued.

Date & Key decisions	Chaired by
<p>Date: 12 November, 2009 Forward linkages with market is one agenda, convergence is in loop, focus on soil fertility and varietal improvement, third party monitoring, Integrated Farming System, demonstration on organic farming in selected blocks, gap identification in project implementation so that it can be addressed properly well in time, calculate CB ratios to explain it to farmers so that they can adopt it, third party monitoring and evaluation and use learning for next season, review in the chairmanship of Principal Secretary (PS), Agriculture</p>	Principal Secretary (Agriculture)
<p>Date: 13 January, 2010 Economic Adviser to Hon'ble Chief Minister congratulated the team and asked them to prepare action plan to implement this program with high quality. Point of increase in subsidy was raised but no decision on it. Focus on better planning and its timely execution during meeting. Focus on major 8 crops in coming <i>Kharif</i>. Preparation for phase II districts discussed</p>	Commissioner of Agriculture
<p>Date: 10 February, 2010 Video conference was found most effective mechanism of review and monitoring. It was decided to continue with it on fortnightly basis. Government appreciated the success of Bhoochetana in its first year. New district officials will learn from phase I districts. Focus on convergence for better management of financial resources. Exclusive nodal officers will be appointed for big districts with large area. Focus to involve SAUs and KVKs in Bhoochetana. Take farmer facilitator only for four months. Focus on convergence with other schemes in Bhoochetana villages. Develop standard planning format,</p>	Commissioner of Agriculture
<p>Date: 1 April, 2010 Detailed review on all aspects of Bhoochetana for coming <i>Kharif</i> season, focus on lead farmers, publicity, Drought Monitoring Cell, SAUs sit together and prepare crop wise strategy and do publicity through various means like radio, TV, newspaper etc, involve DEs in crop cutting experiments, focus on publicity, ensure timely payment to FFs and LF</p>	Principal Secretary (Agriculture)
<p>Date: 6 May, 2010 Check list was revised, monitoring of lead farmers in regular progress report, formed a separate scientists group to discuss and finalise soil testing methodology from ICRISAT and SAUs, ensure KVKs involvement,</p>	Principal Secretary
<p>Date: 11 June, 2010 Special meeting to finalise soil sample collection strategy and coverage per village, 20-40% coverage is from each village is must as per soil type and cropping system, soil health cards will be given to those whose soil samples were collected,</p>	Director of Agriculture
<p>Date: 1 July , 2010 Inputs distribution is not in proportion with sowing area there nodal officer will do close monitoring and ensure it is addressed properly, focus on strengthening Bhoochetana cell,</p>	Commissioner for Agriculture
<p>Date: 16 & 19 July 2010 Distribution of inputs has to be done in campaign mode, follow up of soil sampling of year III districts, follow up with the reports where it is not matching with actual status, SAUs and ICRISAT has to rectify the differences in their micronutrient and inputs recommendations, nodal officers to visit districts and review progress, VC regularly on fortnightly basis</p>	Additional Chief Secretary and Development Commissioner, Government of Karnataka (video conference)

Continued

Table 10. Continued.

Date & Key decisions	Chaired by
<p>Date: 6 August, 2010 Monitor progress on daily basis, block wise micronutrient distribution targets were fixed, FFs were also given targets, change in explaining method to farmers about use of micronutrient by CB examples, emphasis on ICIRSAT soil test-based recommendation, follow up of Boron supply and timely payment to input suppliers,</p>	<p>Additional Chief Secretary and Development Commissioner, Government of Karnataka (video conference)</p>
<p>Date: 19 August, 2010 Focus on target and area covered, inputs positioning, and comparison with last year progress, subsidy issue was discussed but no decision on it whether to increase it or not from 50%, focus on convergence with Directorate of Economic and Statistics for their crop cutting experiences, report should specifically mentioned about consumption of Gypsum and micronutrients in all 16 districts, difference in recommendations of ICRISAT and SAUs on application of micronutrients and other inputs, make common recommendations</p>	<p>Additional Chief Secretary and Development Commissioner, Government of Karnataka</p>
<p>Date: 02 September 2010 Acceptance of scientists recommendation about application of micro nutrients, to conduct a study why there is low adaptation of micronutrient in spite of its better results, active participation of SAU scientists to address issues like pest attack & disease incidences, nodal person from SAUs to be appointed for Bhoochetana, SAUs involved in soil testing for third year districts, focus on documentation, crop specific reviews, planning for next <i>khariif</i> at early stage, involve FFs in crop cutting experiments, involve Directorate of Economics and Statistics in crop cutting experiment in their routine work- institutionalisation,</p>	<p>Additional Chief Secretary and Development Commissioner, Government of Karnataka</p>
<p>Date: 02 September 2010 – special meeting Dose micronutrient application were finalised based on the soil testing result in consultation with scientists from three state agriculture universities, department of agriculture and ICRISAT team</p>	<p>Director Agriculture</p>
<p>Date: 8 October, 2010 Treated watershed areas were also included in the program, input placement should be well in time with proper planning, budgetary provisions under state budget will be made for next financial year for payment of FFs and LFs, documentation of success stories, SAU involvement needs to be involved more effectively and visit Bhoochetana villages more frequently,</p>	<p>Principal Secretary (Agriculture)</p>
<p>Date: 4 November, 2010 Video documentation of major crops and documentation of good agricultural practices, documentation of success stories, FFs to provide services for 5 month in each session ,</p>	<p>Principal Secretary</p>
<p>Date: 12 April , 2011 SAUs conducted master's training programs, input supply is arranged, soil testing is done at state level and only data is shared with ICRISAT for further recommendation, issue of payment release to ICRISAT</p>	<p>Director agriculture –in charge</p>
<p>Date: 19 April, 2011 Payment release was an issue for ICRISAT</p>	<p>Director Agriculture</p>
<p>Date: 10 May, 2011 Input suppliers were also invited to participate in video conference, Farmer Field School at every 500 ha in Bhoochetana Blocks lining with ATMA through convergence with other schemes, recommendations for 5 new Bhoochetana districts were finalised till the soil testing report comes</p>	<p>Director Agriculture</p>

Continued

Table 10. Continued.

Date & Key decisions	Chaired by
Date: 17 May, 2011 Decision to organise weekly video conference, convergence with Suvarna Bhoomi and Bhoochetana at field level, focus on prepositioning of inputs and regular review at field level, for better communication provide laptop and TATA Photon to all officials above Deputy Director (DD) cadre	Director Agriculture
Date: 7 June, 2011 Soil testing report for new districts has to be submitted by ICRISAT for new districts, identification of districts with zero stock of inputs,	ADA (Crop Development and Planning)
Date: 2 August, 2011 Format for developing data base of Farmer Facilitator finalised, unique identity numbers to provided to farmers facilitators, rewarding good performing FFs and lead farmers, revised system of review of FFs approved, computerisation of farmer registration data, follow up of convergence activities, field visit system finalised for FFs for better coverage	Commissioner for Agriculture
Date: 23 August, 2011 Mid-course correction, refresher course for Farmer Facilitators on disease management and crop cutting experiment, and plan for ensuring <i>Rabi</i> season	Director of Agriculture
Date: 8 November, 2011 Adoption of ICRISAT recommendations for <i>Rabi</i> season where Bhoochetana is being implemented first time. Preparation for video conference.	ADA (Crop Development and Planning)
Date: 22 November, 2011 Review cum planning workshop for next <i>Kharif</i> , UAS, Bengaluru was asked to conduct soil analysis.	Director of Agriculture

conference. Earlier this review was carried out on fortnightly basis later on it became weekly. The concept of video conference was given by Professor KV Raju, Economic Adviser to Chief Minister and government accepted it.

The change in monitoring and review mechanism brought immediate change at field level. Plans were prepared on more realistic basis, execution was more close to plans prepared, and reports were more realistically submitted to head office, timely interaction with the field team, timely decision to address the field level issues, one to one review, time saved can be used in better execution of program. These are few benefits of video conference. Now department of agriculture has their own video conference set up and they organise video conference at their own office. This saves time and they can arrange it any time (Figure 21).

Main reason for success of video conference was face-to-face review and better preparation at district and state level. Effective monitoring and review of program keeps the pace of program and helps in executing its plans with best of team efforts. It is also a kind of documentation. The department could bring change in overall implementation of Bhoochetana by using video conference methodology for monitoring and review. JDA is responsible for managing video conference at district level. Video Conference contributed positively.

It is better use of technology that helps in strict monitoring of inputs at field level and force officials to work at ground level to bring positive outputs. Field officials are forced to update their reports and do close



Figure 18. Review and planning meeting of Bhoochetana Project at ICRISAT, Patancheru during 27-29 November 2010.



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



Figure 19b. Release of Soil Atlas book in Review and Planning Meeting.



Figure 20. Review and planning meeting of Bhoochetana Project at ICRISAT, Patancheru during 28 Feb to 2 Mar 2013.



Figure 21. State level coordination committee (SCC) reviews the progress in the districts through video conferencing from Bengaluru.

follow up of activities as per plan. It helped in achieving the targets well in time. Issues are discussed in depth and if needed decisions are taken on immediate basis and issues are also taken up to higher level looking at the need and demand.

It helps in interacting with the field officials on face-to-face basis, which brings intimacy and helps in addressing issues. It increases quality of communication across the state that reduces confusion on instructions. Review of decisions and instruction given in the video conference in next video conference ensures that action is taken at field level or not. All senior officials attend video conference, which keeps them updated and well informed about decisions taken.

First half in a routine video conference is communication from head office (DoA) and in the second half district officials were asked to share their problems, concerns, constraints. Every district put their queries in the video conference and accordingly orders/guidance are given by the head of the department. District wise ranking is shown in video conference and shared with all districts. Action points are prepared for every video conference. Funds are disbursed based on financial progress to each district and it is a forcing mechanism by peer review.

Box 11: What is reviewed and how?

- Ranking of every district based on their performance
- Poor performing districts were also reviewed in video conferencing which is good system
- Farmer registration is must
- It is ensured that inputs are stocked at Raitha Sampark Kendra and regularly reviewed.
- More focus is on consumption of micronutrients.
- Nodal officers are made in charge for each district from head office. They mainly review the progress of the program and act as link person between state and district
- Detailed reporting formats are developed and reviews and reports are made accordingly.

Concerns about video conference

It is good arrangement from monitoring point of view. However, if we see the efficacy of such arrangement it is more time consuming for field team and some time they also make excuse of such conferences that this killed their productive time every week and therefore they could not address the real field issues. There is need to work on two-way communication in video conference. If planned properly than this issue can be addressed properly.

What Made the Program a Success?

A few interventions make great contribution in making any program successful. This section deals with key activities those were crucial to make this program operational and established at ground level. Further it also provide information about detailing of major activities followed by production outcome which established a pathway in the state in adoption of micro nutrient in addressing productivity issues at large scale

- **Personal relationship:** This is very interesting observation during discussion with the team. At every level, personal relationship made the program move faster and strengthened. Personnel from every consortium were involved with personal feeling, which brought a different type of sincerity. This helped in strengthening the program positively. The personal relationship is mainly to push the program as per plan at field.
- **Use of opportunity:** ICRISAT was given an opportunity to prove the theory of micronutrients application at mass scale involving the department officials. This was done very nicely. The concept was accepted at higher level was percolated at farmers' level using this opportunity and support. There was an opportunity to debate on concept and prove it at field level. Another opportunity was to work with the scientific organisations and the lead extension department in agriculture at field level.
- **Space for officials:** Field level officials were given space to work with field reality. They were allowed to raise their issues in the meeting in positive manner that created healthy working environment within the department.
- **Pro-activeness:** This is what mostly lack in most of the other programs. At higher level, proactiveness is observed and this is not common in other programs where a senior official pro-actively take lead and make the program operational. Three field level functionaries played crucial role: a) agriculture assistant, b) assistant agriculture officer, and c) agriculture officer at hobli level
- **Intensive monitoring and review:** Constant review, visit to field, meeting and interaction made this program live. Intense monitoring by high-power state coordination committee at regular intervals. Sometimes it kept most of the field officials in preparing reports only.
- **Leadership:** It is proven that a good leader can change the scenario and this happened with this program. Started with various negative and positive assumptions led to result oriented program. Then conviction of officials, who were at decision level, has motivated the team to implement those tasks at ground. Initial push from leaders to execute the program was essential. Additional Chief Secretary took personal interest and made this program running at field level
- **Farmer facilitator:** Selection of 'Farmer facilitator' for an area of 500 ha each was good decision. Farm Facilitators supported at field level in better implementation of program and maintaining good relationship with farmers at village level (Figure 22).



Figure 22. Farm Facilitator at RSK.

- **Lead farmers concept** was introduced and initially they were used mainly for doing demonstrations on their farm. They were paid ₹ 95 per day for 7 days in season.
- **Training and capacity building:** Specific training by ICRISAT and State Agriculture University, lead farmers, FF, department staff was crucial in capacity building of farmers.
- **Storage:** Storage facility to stock inputs at cluster level and in some places at village level too.
- **Publicity:** Proper publicity at village, cluster, *taluk* and district level. Mainly wall writing in local language covering information about technologies
- **Input arrangement:** Special meeting with inputs suppliers. Stocking of inputs well in advance at *taluk* and hobli level

Box 12: Key points

- Implemented in mission mode
- Decisions are taken at higher level and ensured that they are executed as such at ground level
- Special budget for : a) seed, b) farm facilitators, and c) proper publicity
- Low growth rate forced entire system to execute this program
- Empowered committee was another key force behind action on time
- Converged budget at state level
- Package approach was adopted
- More focus on promotion and use of micro nutrients and need based plant protection chemicals
- Strict time line for each activity and its implementation at ground

- **Wider sharing of outcomes:** Regular field days were organised to share the outcome of inputs
- **Technologies:** This is the project that takes up the integrated genetic and natural resource management through consortium of national and international research institutions to take care of the entire 'seed to food' chain. Bringing improved agricultural technologies, seeds and other inputs for farmers' doorstep, besides building capacities of stakeholders. Farmer-friendly technologies besides improving soil quality helped farmers increased crop productivity in the range of 32 to 66% in rainfed groundnut, finger millet, maize and soybean during *kharif* 2009.
- More focus on treated area under Sujala watershed program and improved crop production technology. Regular interaction with elected representatives. Focus on dryland crops in districts and focused approach. Two to three main crops in each district based on the large area covered in each district. Priority to Bhoochetana districts. Special guidelines were prepared. Extension of Sujala learnings. Better coordination with Raitha Sampark Kendra Analysis of massive scale soil samples collected from farmers' fields in the districts to map nutrient status of soils using GIS. Public-private partnerships (PPPs) to ensure backward and forward linkages to benefit farmers are envisaged in the mission mode project.
- State level high power committee was constituted for better implementation of the program. This was active and made this program operational in its initial stage. In the beginning of the program committee did weekly review of the program. ACS & Development Commissioner as chairperson of the high power committee provided active support and ensured that all decisions taken in the meeting are executed at ground. The then Development Commissioner took lead and made this program priority for state government.
- Making provision of subsidy in budget was big decision and financial support under RKVY
- State agriculture universities contributed from the beginning of the program. Apart from this, senior official and department officials extended their support in program implementation. Active involvement of local politicians in some of the districts also contributed in program implementation. Positive support from Hon'ble Agriculture Minister, Government of Karnataka made it successful.

Box 13: Farmer Mr Mehboob Ali, Village Vadrati

For his groundnut crop he applied 6 kg/ha borax, 20 kg/ha zinc sulphate and 200 kg/ha gypsum. He got 60 bags from his 1.10 acre land where one bag carry 75 kg of paddy. Earlier he was getting only 36 bags from same land when he was not applying anything. Last year rate of paddy was ₹ 930/ quintal and this year it was ` 1100/ quintal.

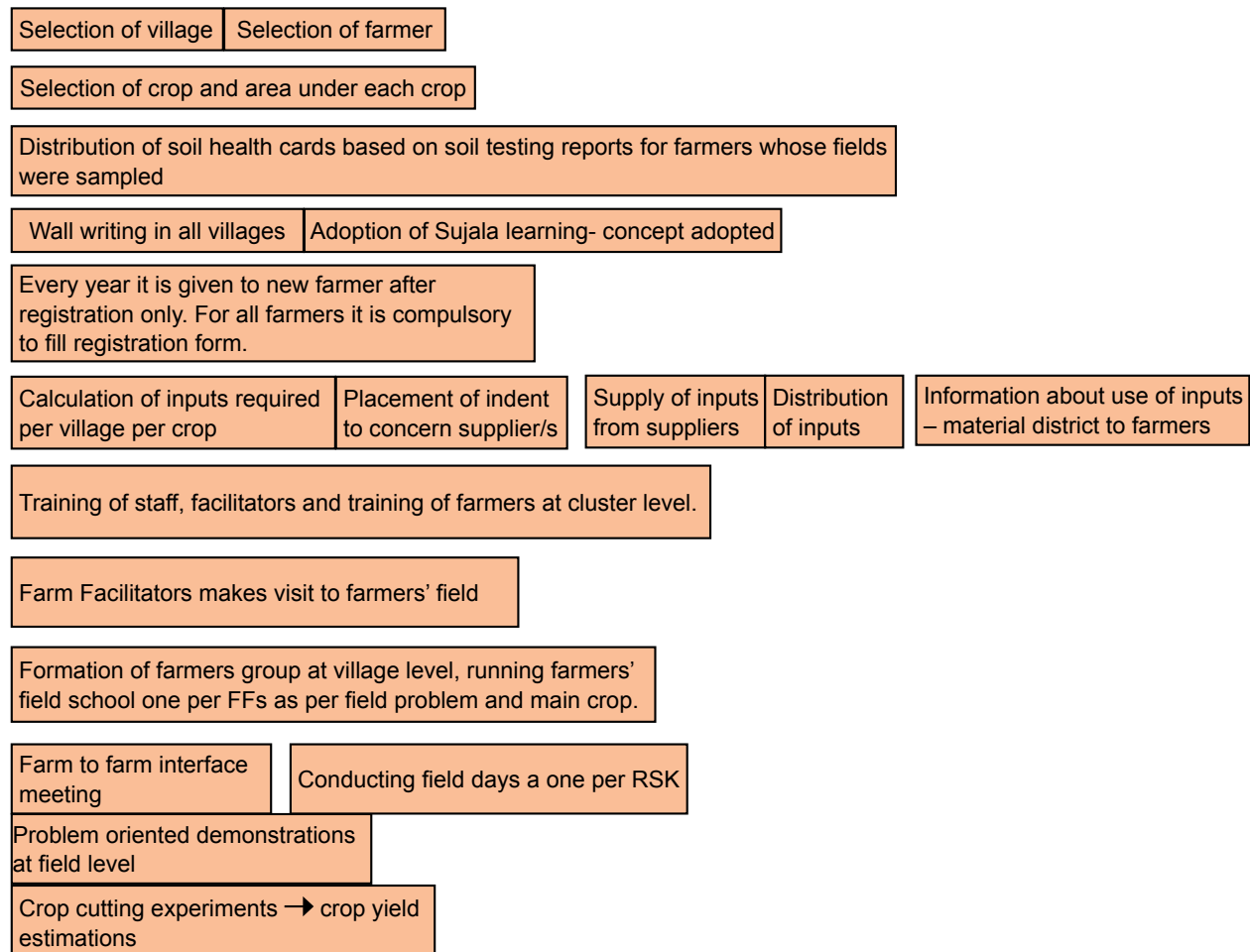
Summary of different activities and processes based on field visit

Key points based on the discussion with the district officials

- Collection of soil sample, testing and report sharing with farmers. This played crucial role in program success.
- More importance to training and exposure visits to successful area
- Farmer to farmer technology transfer helps in better promotion of new concept.
- Market linkages are crucial to promote any new concept in agriculture sector.
- Farmer Field School is good tool for transfer of technology.

- Godowns are important at Hobli and cluster level.
- Economic viability is important
- Area selection by department based on target
- Raitha Sampark Kendra is playing very vital role in implementation of the program. This needs to be strengthened looking at their contribution.
- Village level, hobli level, and *taluk* level meetings to involve more number of farmers and information sharing.
- Focus on main crops initially and then on other crops
- Selection of better farmer facilitators if possible educated up to higher secondary. Training of Farm Facilitator about scheme, crop husbandry is essential. One training program for a period of eight day was conducted for the FFs at district training centre and KVKs. In all districts, FF appointed with proper process. Weekly review of FFs is conducted at hobali level. Farm Facilitator training program are also conducted at departmental training centre.
- All the issues are discussed and decisions are taken in the district level meeting. These are further discussed in the *taluk* level meeting followed by village level meeting. After that, awareness creation activities are conducted at village level.
- Benchmark survey was also carried out in few districts in the month of February and March 2010. Farmers' registration is done on yearly basis.
- Trainings of farmers were conducted at Hobli, *taluk* and district level. ICRISAT, State Agriculture University, KVK conducted all training programs.
- **Awareness campaign:** A very good mechanism is made in some of the Raitha Samparka Kendras. They sent phone message to all concern villagers, PRI members, FF about stocks and schemes on regular basis. Phone message is basis for villagers to visit RSK. Awareness about use of inputs, especially micronutrients, by conducting well organised awareness campaign and wall writing. Publicity using auto rikshaw and using improved extension methods etc.
- **Input supply:** Availability of inputs at close vicinity to farmers on time and at subsidised rate. Only seed subsidy is given to small and marginal farmers. For other inputs subsidy is given to all farmers. All inputs storage is done well in time at site. Package approach of input under subsidy schemes/ programs was adopted. At the time of sale period RSK in-charge, hire two people to support him @ ₹ 100/day for three months. They are called sales assistant. Rate list from department to RSK along with subsidy list is provided well in time.
- **Technology promotion:** In one district community play concept is also introduced.
- **Output analysis:** This is compulsory part in the entire process in every district. Yield estimation by statistical officer, ICRISAT and department officials and FF team. Ensure that correct measurement of yield is taken and data are more trusted. Proper output sharing with the farmers
- **Monitoring and review:** Visit to better plot every day and share learnings. Push from department with package approach. State and district officials do regular follow up and monitoring on priority basis. Vigilance concept was promoted. A sample check is also done to know whether subsidy given is really reaching to small & marginal farmers or not. Land holding for the farmers is basis of subsidy.
- During peak season RSK team works late in the evening to ensure better sale and distribution of inputs. It is open until the farmers are there in Kendra thus there is no closing time. During season, it is also opened on Sunday.

Process of activity execution at field level



Experience of a *Taluk* office in implementation of this program – example of Byadgi *Taluk* office of Haveri district

The office is like other field offices of agriculture department. The team is very motivated and working with zeal. Team made efforts with the farming community to address the larger issue. The results of soil analysis state that the soil is deficient in sulphur, zinc and boron. The big hurdle they face is rigidity of farmers about gypsum application in their crops. They only applied zinc and boron due to demonstration effects of last year. In the year 2011-12, this program is also linked with Suvarna Bhoomi Yojane (SBY) scheme. Involving politicians in mobilising people for procuring inputs on payment basis can help in increasing awareness about application of micronutrients. Orientation of politicians is a good idea.

Key process adopted in implementation of Bhoochetana program

- **Clarity about the concept:** Awareness to farmers, community to community extension, demonstration at RSK level. Earlier farmers refused
- **Farmer selection:** Close relatives of FFs were contacted at initial stage and that way scaling-up could be made possible.
- **Farmer facilitator:** Facilitators are given special dress code- green cap and T-shirt with Bhoochetana logo on it. Progressive educated farmers were selected as Farm Facilitators. Now FF become Resource Person due to their better selection and training.
- Training is must before starting in new area
- **Inputs:** Compulsory with subsidised seeds. Inputs are given for an area of not more than half acre to farmers under demonstration at initial stages
- **Regular follow up:** Follow up using farmer facilitators whether farmers applied these inputs in their farm or not. Demonstration – visit to farmers field, some demonstrations were taken on the land of public representatives also made good impact.
- Made one video of success and shared with the farmers at local platforms like Krishi Mela etc
- No hidden agenda from promoting micronutrients is essential
- Night meetings also played crucial role in adoption of this concept.

Constraints:

- Poor awareness at early stage
- Application of micro-nutrients was a big problem because farmers were not confident of the technology at the initial stage
- Supply of inputs on time is must if delayed it creates problem
- All inputs must be ready at RSK level for better implementation and it is a big challenge
- Shortage of staff- only 6 staff for 10-11 villages
- Handling of money is big problem due to shortage of staff. FFs can not do this
- Opening additional seed distribution centre is difficult due to less staff strength at RSK level
- Result oriented approach was felt a constraint.

Output

- Applying micronutrients for all crops is becoming popular gradually
- Staff are also farmers so first they take demonstration at their field and then discuss it with farmers
- Interface in technical meet once in two months at training centre – university scientists and department officials take part and discuss about the success and learning from the field.
- All FFs are having well maintained record for their village/s.

Detailing of Activities which made this Program a Successful

Publicity:

For better communication about the Bhoochetana program road shows were organised. A mobile exhibition was created on Tata ace mini truck. In this mobile exhibition photographs of successful farmers and their experiences were displayed. “Bhoochetana Chaitanya Ratha” name was given to it, which made it more popular. This helped in sending message to the farmers directly. In May 2011, hobli level Krishi Utsavas were organised by visiting each gram panchayat. Big campaign was started to promote it. Even small tasks also played crucial role like advertising, media coverage to farmers adoption rate and it helped in increased adoption. District level Krishi Utsav helped in publicity of the program. There was an exclusive program about Bhoochetana on television – doordarshan. These types of activities were carried out almost in every district.



Figure 23. Bhoochetana awareness program through Chaitanya Ratha in Davengere District, Karnataka.

Soil testing:

District-wise Soil Nutrient Status Mapping is completed and a *Taluka* wise maps with nutrient status are prepared. *Taluk*-wise nutrient recommendations, fertilizer dosage for *kharif* crops were developed. From every selected village 20 soil samples were collected through stratified sampling process and ICRISAT conducted soil testing and prepared soil health cards. Point raised by few officials is that this is good effort now there is need to do indepth soil testing every year and cover more area. Next point was do soil analysis of the same plot after five year to understand changes in the soil after application of nutrients and what else is needed to do at ground level to enhance production and productivity. Testing of soil, input supply, and support subsidy for processing inputs.

Farmer Facilitator:

Selection of farmer facilitator is done at village level based on criteria finalised. RSK office conducts selection process. Agriculture Officer verifies marks of all applicants for the position of farmer facilitator. List is approved by JDA office. They work for six days in a week. Sunday no work, however, no continuity of work. All FFs need to submit their daily diary and this is basis for their payment. Payment is made directly to their accounts. No written communication to FF. However, a list is prepared that who is working as FF in each village. Therefore, they cannot be involved in any financial transaction.

Farm Facilitators share information, knowledge with farmers as per crops and their need. This helped a lot in proper implementation of the plan at field level. These farm facilitators are trained properly. If they have any query they can directly ask department official and scientist from Krishi Vignan Kendra. This helped in addressing local issues successfully and spread the knowledge and information. They are going to be good communicator and can be used for other extension activities.

Work chart is given to FFs during training program. ID card is now demanded by FFs but not issued due to technical reasons. For identity, they are given green T-shirts and cap with logo of Bhoochetana. Targets are also given to FFs to promote balanced nutrient recommendations and other improved practices and Farm Facilitators are called as 'RAITHA ANUVUGARA' at field level. Ranking and selection of Farm Facilitator is completed in the beginning of the program. Now adding them for new areas only.

Box 14: Farm Facilitator selection process

- The candidate has to be higher secondary pass
- The candidate has to be local
- Priority given to person who already worked with department under any other program or scheme;
- After selection farm facilitator get training and certificate;
- Based on completion of training they become eligible to work as farm facilitator in their village.

Discussion with Mr A. B. Shivarnanavar, a Farm Facilitator

It was interesting discussion with the Farmer Facilitator, a key player at ground, who made this program successful. He told that this is the only organisation created to look after issues related to Farm Facilitator in this district. He shared that farmers are very smart and they are not including their entire crop in the scheme because they do not want to take any risk and want to invest low amount. He said subsidy played crucial role in linking with other schemes and it was made compulsory that with seed or any other benefit they have to take micronutrients as well. He told that farmer facilitators should get travel allowance for travel from home to office when they come for meeting and move outside village. In early stage of the program irregular supply of inputs made difficult to achieve the targets. First year experience created base to convince farmers about use of micronutrients. He was sure that without farmer facilitator it is not possible to make this program successful. He also believes that it is a kind of social service with low payment and getting respect within village. He told that the federation has representative at *taluk* and cluster level and they are from the FF only.

Lead Farmer

In each village, a lead farmer is selected. They are paid ₹ 95/day for 7 days per season. Information about lead farmers is compiled at RSK level in the prescribed formats with the help of farmer facilitators.

Selection of Farmers

In every district a proper farmer selection criteria was finalised. It was mostly based on land holding and their willingness.

Capacity Building

- In every district, regular training programs were conducted with the help of KVK and their own staff. These training programs were organised at training centre and at field level. In phase one district training programs were conducted in the month of June. In few districts post rainy season training programs were conducted in the month of December 2009. There is need to conduct series of training programs (Table 11).

Table 11. Details of training conducted in last three years under Bhoochetana

Year	Districts	District-level		Taluk level		Village-level	
		No of Trainings	No. of Participants	No of Trainings	No of Participants	No of Trainings	No of Participants
I year	6	16	1126	53	1934	227	14992
II Year	15	38	3707	163	6848	1576	81269
III Year	30	51	5279	321	20938	2856	152099
Total	30	105	10112	537	29720	4659	248360

Note: details of training programs conducted in last three years are given in annex 1

- Field visits were organised for officials to the demonstration villages and had interaction on demonstration site with other farmers. The objective of such exposure visit was first level learning, observation and follow-ups. First, convince the technical team and then start work at ground. Exposure visit of master trainers were organised. First year they had problem due to lack of exposure and therefore this was taken care in the second year. Persuasion at all levels is must.
- At district headquarters level one-Deputy director looks after training and capacity building programs. Training program conducted mainly for farmers, field staff at district training centre (Figure 24 & 25). Training of farm facilitators was conducted at this centre and KVKs. All training programs were conducted on “need basis”. JDAs were trained at ICRIASAT. The training was mainly on crop cutting, use and application of micronutrients etc.

The above graph clearly indicates that every year participation of farmers increased in training programs conducted at village level. This also proves that the project outcomes are visible at village level which motivated other farmers to join this program and also adopt the concept of balanced micro nutrient application in crop production.

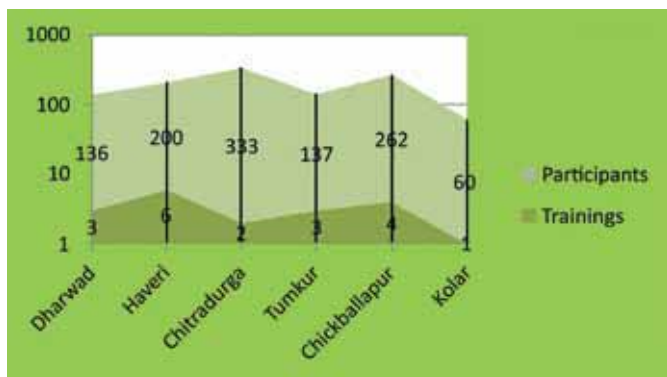


Figure 24. Training programmes organized at district level in first year of the project.



Figure 25. Training programs organised in three years at village level.

Micronutrients

Awareness campaigns were organised on use and application of micronutrients mainly on 'why' part. Application of micronutrients in poor soil condition increases production by 20%. Supply of micronutrients with seed and bio fertilizers was made compulsory. Fifty% subsidy on purchase of micronutrients. Micronutrients were bundled with benefits of other schemes and this proved to be a good approach. Zinc sulphate and boron are popular in the few *taluks* because they are applied for horticultural crops. Demand increased after Bhoochetana program. Now farmers are coming to buy micronutrients. Fertilizer dealers also tagging micronutrients but this is very less only 5 – 10% are selling good quality micronutrients. Dealers are selling good quantity of micronutrients. More than 50% of private dealers are selling micronutrients in the district. Marketing federation is also supplying micronutrient at *taluk* level. In irrigated area, adoption is better compared to dryland area. Some farmers tried micronutrients in other crops also and got better results.

Box 15: Preparatory work

- Training of selected farmers
- Basic survey and soil testing need to be done at early stage
- Essential to conduct demonstration before introducing such schemes as done through Sujala-ICRISAT program Bhoochetana
- Publicity in time and it should be very simple so that a common farmer can understand
- Separate godown arrangement of pre positioning of inputs
- Extension functionaries should be trained in advance
- FFs have to be selected well in advance and given training

Supplier

Orders are placed from district to enlisted suppliers and payments are made by *Taluk* level officers. This is good mechanism. All demands are allocated to *taluk* and RSK level and weekly review at district Joint Director Office level.

For procurement of inputs, rates are fixed at directorate level. List of suppliers is shared with the district as per their requirement. For final payment, 2-3 months are needed. Based on payment schedule they



Exposure visit of Gadag farmers to ICRISAT



Exposure visit of Bidar farmers to ICRISAT



Exposure visit of Bidar farmers to ICRISAT



Exposure visit of Kodagu farmers

Figure 26. Exposure visit of different districts.

supply inputs. If payment is not in time, they don't supply next lot and it affects target at ground. It should be standardised procedure and not at the discretion of the officer. Payment procedure has to be robust with better quality check. Simple test mechanism should be introduced from quality check at storage level.

Demonstration

March 2010- pre positioning of micro nutrients: Boron was not available but zinc and gypsum were available. In Harihar *taluka* farmers applied all these micro nutrients. Kadagji village took first demonstration in the district on maize crop. Farmers observed outcome on micronutrients. It is good if we can have two or three masterpiece demonstrations at every *taluk* level for exposure and cross learning. Do not restrict it to selected crops for better adoption at farmer level. Ask them to try in different crops. This approach helped them in reaching at comfortable situation.

Better demonstration under the leadership of Assistant Director of Agriculture (ADA). All crops demonstrations were taken at field level to know about the response of crops with micronutrients application. Department staff played vital role in first year of the program as facilitator. Next year onwards FFs were selected and trained to work on this concept at field level. Trials were also conducted at

government farms for internal learning and outputs were shared with the farmers during exposure visits. Varieties released by ICRISAT were also promoted here under Bhoochetana. Farmers procure inputs as per their requirements.

Management

- *Taluk* level ADA reviews the progress of the program. These are a kind of informal orientation also because technical issues are also discussed and shared with the FF. Reports are submitted on weekly basis. FFs submit their report to RSK officer. RSK in-charge officers submits their reports to ADA and ADA submits their reports to JDA. A consolidated report is prepared at district level and submitted to head office. Report has to be submitted on weekly meeting on every Monday. Every Saturday ADA submits their report to JDA. Strict review also contributed in increasing their motivation
- In some of the districts two model villages in each *Taluka* were selected for promotion of Bhoochetana program. In these model villages, demonstration with 100% input support as prescribed in major crop. However, 50% payment is received from all farmers. The program is also linked with Suvarna Bhoomi Yojane (SBY) so that farmers can utilise the subsidy amount in procuring the material.
- Now farmers visit RSK to procure quality seed. These farmers were provided seed in package approach along with micronutrients.
- Sample tests are conducted to ensure better quality inputs are supplied at district level. Samples are collected and sent to lab. Only after confirmed report, these materials are sent to field.
- District ranking is another factor that motivates team at all levels because ranking is announced on monthly basis in Video Conference (VC). All expenditure is monitored online by treasury. Once in two months conduct 'technical meet' for farmer facilitators and field staff i.e. agriculture assistant, assistant agriculture officer, and agriculture officers. These officials are key persons of agriculture department for sharing key messages, knowledge and technology transfer at village level. Mobile technology is used for sharing information with Farmer Facilitators by sending messages. This is introduced in the year 2011 only. Mobile helped in direct communication with farmer facilitators.
- Below Hobli, there is a cluster of 3-4 villages where one godown is taken on rented basis to store the inputs.
- District level bimonthly technical workshops are organised.

Finance

- Financial monitoring is very essential in such a big program. Release of funds on time by treasury plays crucial role in making the program successful. Surety of funds in Bhoochetana compare to other schemes made this program functional.
- Part payment after supply of demanded quantity is released and remaining is released only after sale of complete material and receipt of money from the farmers.
- Farmer facilitators' payment is given directly to their bank account to keep transparency.
- Most of the time Farm facilitators' payment is linked with the outputs. They are asked to ensure input distribution, monitoring of its application, seed distribution under various schemes, storage of inputs etc and collection of payment.
- Timely and simple payment mechanism is needed because payment is sensitive issue at any level.

General outputs observed

Earlier farmers were not doing any seed treatment and not applying micronutrients in their crops. In red gram, yield increased from 4 quintal to 7 quintal/acre. 10-12 quintal/acre production of red gram is average. This year (2011) rains are poor but adoption rate is good. In Alanda *taluka*, crops condition was good where micronutrients were applied compared to non applied plots.

Farmers also felt that production is good with better quality inputs (Table 12). High demand of gypsum for groundnut and zinc for sugarcane are good indicators of adoption of this technology.

Box 16: Building Resilience to Drought

In village Okala farmer facilitator applied micronutrients in Red Gram crop. Due to poor rains crop was not very good but compared to other crops it was good. In this village, small farmer holders are risk prone so it is difficult to involve them. They lease their land to big farmers. Only big farmers apply it because they understand its impact and have resources to invest and take risk.

Table 12. Comparison before and after application of micronutrients in various crops

Crop	Before micro nutrient input	After micro nutrient inputs
Zinc	-	37 kg/ha
Boron	-	5 kg/ha
Gypsum	-	200 kg/ha
Production	8.75 kg/ha	15 kg/ha

Good results after application of micronutrients and demand for micronutrients are increasing. Crop cutting experiments- poor output in year 2011-12 due to poor rainfall. However, farmers got good return after applying micronutrients. Better documentation of media reports and its sharing with other farmers contributed a lot. Promoted intercropping of French bean and maize. In JDA office welcome to farmer is good indicator.

Production Outcomes

In non-remunerative crop, farmer doesn't want to put extra investments. Apart from this they prefer for brand and for them it is very important. Attractive packaging makes difference and marketing becomes easy. Now farmers are demanding for particular brand only. Year 2011 faced setback due to poor rainfall.

Year 2009-10

Scaling-up Soil, crop and water management technologies for boosting Productivity of Selected Crops (Table 13).

Table 13. Kharif season cropping planned and actual area sown during 2009.

District	Crop	Target area		
		Crop-wise (ha)	Total areas sown (ha)	% area sown
Kolar	Groundnut	3500	2800	80
	Ragi	15000	8635	57.6
Chickballapur	Groundnut	12500	12203	97.6
	Ragi	10000	9350	93.5
	Groundnut	35000	18200	52.7
	Contingent crops	13708	39	
Tumkur	Ragi	20000	19830	99
	Groundnut	33000	17308	52
	Ragi	10000	9850	99
Chitradurga	Maize	20000	19883	99
Haveri	Groundnut	6000	6000	100
	Maize	38000	38000	100
Dharwad	Groundnut	10000	10000	100
	Soybean	12000	12000	100
Total		188000	159546	

Crop Yield Estimation

Year 2009

Rainy Season 2009

This was the first year of the program therefore more efforts were required. Due to beginning of the program field team was not clear about the program and this was a big concern. For the season, crops were selected as per the district suitability and nutrient recommendation was also given as per crops. This was followed by capacity-building of stakeholders on sustainable natural resource management. Apart from this regular training program were organised at district, *taluk*, and cluster/village level for master trainers, officers and farmers.

The team was focusing more on awareness and field publicity campaigns on Bhoochetana for farmers. Soil nutrient diagnostic studies were carried out for selected district and awareness building was must on this sensitive issue. A small pocket guide was developed and distributed to farmers for awareness generation in Kannada language.

To understand the dryland area rainfall pattern daily rainfall monitoring, seasonal rainfall situation was carried out for the year 2009. Activities like crop cutting experiments for crop yield estimation by joint evaluation approach, promotion of *in-situ* soil and water conservation techniques like conservation furrow system, cultivation across slope, Broad Bed and Furrow (BBF), tropicultor and Integrated nutrient management techniques like balanced nutrient application, biofertilizers, biocontrol agents, Glyricidia planting on field bunds, and Vermicomposting were also promoted in the demonstrations (Figure 27 & 28).



Figure 26. Glyricidia planting on field bunds as green manure and reduce soil erosion.



Figure 27. Adoption of Vermicompost preparation methods by rural women in Bhoochetana project.

Following section discussed about outcome of inputs like micro nutrient, balanced fertilizer application and use of quality seed and change in farming practices for major crops.

Groundnut

Groundnut pod yield and total dry matter (TDM) were estimated from a total of 317 farmers' fields in Chickballapur (110), Chitradurga (40), Dharwad (11), Haveri (15), Kolar (50) and Tumkur (91) to assess overall performance of improved management and micronutrient application (IM) compared to farmers' management (FM). The outcome of first year application of micronutrients in the farmers' fields are given in the table for first year districts.

Groundnut pod yields increased across all *taluks* of six districts (Table 14 and 15) in the range of 32% to 41%, which varied from a lowest increase of 18% in Molakalmur *taluk* of Chitradurga to the highest yield increase of 52% in Hubli *taluk* of Dharwad district. Although considerable yield increase was seen due to improved management, correcting nutrient deficiencies across all groundnut growing *taluks* in these districts, the variable increase was due to seasonal and temporal variability in rainfall affecting crop growth in rainfed system.

Table 14. Details of production in first year districts

District	Number of farmers	Pod yield estimated Kg/ha FM		Pod yield estimated Kg/ha IM		Pod yield increase %
		Minimum	Maximum	Minimum	Maximum	
Kolar	50	540	2070	880	2440	41%
Chickballapur	110	300	650	430	950	42%
Chitradurga	40	410	1390	670	1870	32%
Dharwad	11	840	2050	1100-	2560	32%
Haveri	15	1440	2820	1540	4190	41%
Tumkur	91	660	1410	800	1980	32%
Total	317					

Table 15. Groundnut pod yield increase recorded in farmers' fields with improved management and micronutrients application compared to farmers' management in different taluks of six districts during Kharif 2009.

Districts	Taluk	Farmers' practice (FM)		IM+ micronutrients		% Yield increase
		Pod (kg/ha)	TDM (kg/ha)	Pod (kg/ha)	TDM (kg/ha)	
Chickballapur	Bagepalli	550	1240	800	1660	45
	Chintamani	430	860	650	1080	51
	Gudibande	410	950	560	1240	37
Chitradurga	Chellakere	550	1000	680	1180	24
	Hiriyur	1210	2020	1770	2950	46
	Molakalmor	660	1210	710	1470	18
Dharwad	Kundgol	1600	2680	1940	3340	21
	Hubli	850	1740	1290	2760	52
Haveri	Savanur	1770	3800	2470	4170	39
	Shiggaon	2460	4540	3570	5270	45
Kolar	Mulabagal	1190	2940	1670	3920	41
Tumkur	Pavagada	1100	3230	1460	3770	32
	Madhugiri	1000	2220	1320	3010	32

Ragi (Finger millet)

Ragi which is mainly grown in three districts of first year also showed good results after application of micronutrients. The production increase in the sampled plots was ranging between 28.5 to 66% yield increase with improved management over the farmers' practice. Highest in Kolar taluk of Kolar district and lowest is in Gubbi taluk of Tumkur district (Table 16).

Maize

Maize also showed good results after application of micronutrients in sampled plots with 22 to 51% increased yields and this made big change in the area coverage with improved management in the coming year. Details are given in the Table 17.

Soybean

Soybean crop also showed positive results at field in first year of the program. The Figure 29 shows that in Chikkaballapur district results were very good where 43% yield increased with improved management was observed and lowest was in Tumkur.

Summary of major rainy season crops is given in the table 18. It shows that all crops showed good response to micronutrients.

Table 16. Ragi grain yield increase in farmers' fields with improved management and micronutrients application compared to farmers' management in different taluks of Chitradurga, Kolar and Tumkur districts during Kharif 2009.

Districts	Taluks	Farmers' practice (FP)		IM+ micronutrients		% Yield increase
		Grain (kg/ha)	TDM (kg/ha)	Grain (kg/ha)	TDM (kg/ha)	
Chitradurga	Hosadurga	1890	7300	2550	9100	35
Kolar	Bangarpet	1630	5060	2690	7540	65
	Kolar	1690	5320	2810	8180	66
Tumkur	Chikkanaya kanahalli	1380	4510	2070	6140	50
	Gubbi	1490	5240	1910	6670	28
	Kunigal	2110	7090	2930	9630	39

Table 17. Maize grain yield increase recorded in farmers' fields with improved management and micronutrients application compared to farmers' management in different taluks of Chitradurga and Haveri districts during Kharif 2009.

Districts	Taluks	Farmers' practice (FP)		IM+ micronutrients		% Yield increase
		Grain (kg/ha)	TDM (kg/ha)	Grain (kg/ha)	TDM (kg/ha)	
Chitradurga	Chitradurga	4750	9530	6840	13650	44
	Holalkere	6410	13260	7840	17380	22
Haveri	Hirekerur	5440	9480	7900	12940	45
	Haveri	5820	7610	7960	10230	37
	Ranebennur	4940	6420	7460	9700	51

Table 18. District-wise crop yield increase in farmers' fields with improved management compared to farmers' management under Bhoochetana project, 2009

Crop	District	Farmers' Management	Improved management + Micronutrients	% yield increase
Groundnut	Kolar	1190	1660	41
	Chickballapur	460	660	43
	Tumkur	1030	1350	32
	Chitradurga	730	960	32
	Haveri	2000	2830	41
	Dharwad	1410	1640	35
Ragi	Kolar	1660	2750	66
	Tumkur	1630	2210	36
	Chitradurga	1890	2550	35
Maize	Chitradurga	5080	7040	39
	Haveri	5420	7800	44
Soybean	Dharwad	1580	2190	39

Post rainy Season 2009

In Chitradurga, Haveri and Dharwad, Vertisols provide opportunity for post rainy season rainfed crops based on available stored soil moisture in the profile. Some unseasonal rains during November and December also add some moisture for crop requirements. Predominant *rabi* season crops in the area are chickpea, *rabi* sorghum and sunflower with life saving irrigation. The area planned with these crops for productivity enhancement is given in Table 19. The DoA and ICRISAT staff coordinated efforts were rendered to support farmers by supplying inputs like seed, fertilizers and insecticides timely in the mission project and were successful in achieving target upto 78% in case of late sown sorghum, however, with early sown soybean, chickpea and sunflower 90 to 100% targets of sowing were achieved. Maize crop sampling in watersheds of Haveri and groundnut crop sampling in Chickballapur districts.

Table 19. *Rabi* cropping planned and area of sowing completed in different districts during *rabi* season 2009.

District	Taluk(s)	Crop(s)	Target Area (ha)	Area covered (ha)
Chitradurga	Chitradurga, Hiriyur	Chickpea	5840	5302 (91.5%)
Dharwad	Dharwad, Hubli, Kundagol, Kalghataki, Navalgund	<i>Rabi</i> sorghum	18000	13990 (77.72%)
	Dharwad, Hubli, Kundagol, Navalgund	Chickpea	16500	16500 (100%)
Haveri	Haveri, Hirekerur, Savanur	Sunflower	3000	2654 (88.47%)
Haveri,	Hirekerur, Savanur, Shiggao, Ranebennur, Byadagi	<i>Rabi</i> Sorghum	16000	14550(90.93%)

Second Year Outcome after Field-based Efforts

Average rate of success in covering area under various crops is 91.3% and that was very good. Highest coverage than the plan is in the Davengere district where total area under groundnut reached up to 5153 ha which is 1053 ha more than the plan. Lowest was Bijapur district where sunflower crop was taken only in 21% of total planned area due to various reasons. If we analyse the total highest area under the crop covered as per plan then it comes for the crop pigeonpea, which covered 230957 ha, area against 215795 ha planned area and this comes 107% achievement against plan. This proves that most of the plans were very realistic and achievable on ground (Table 20).

Table 20. District-wise target cropping area sown to major crops during *kharif* 2010-11 crop season.

S. No	District	Major rainfed crop	Target area	Area sown	% Achieved
1.	Bengaluru Rural	Finger Millet (Ragi)	16676	16532	99
		Maize	19672	19528	99
2.	Bidar	Soybean	12600	10080	80
		Green gram	14175	14175	100
		Black gram	16275	16275	100
		Pigeonpea	23450	21105	90
		Sorghum	21322	19189	90

Continued

Table 20. Continued.

S. No	District	Major rainfed crop	Target area	Area sown	% Achieved
3.	Bijapur	Maize	15841	13433	87
		Pearl millet	40729	17314	43
		Mung bean	15647	8642	55
		Pigeonpea	27487	47809	174
		Sunflower	20468	4325	21
		Groundnut	22583	10321	46
4.	Chamarajanagar	Sorghum	4801	3908	81
		Maize	12533	11328	90
		Finger millet	4433	4877	110
		Sunflower	3120	3281	105
		Groundnut	2305	2440	105
5.	Chikkaballpur	Groundnut	27000	26833	99
		Finger Millet (Ragi)	45000	44833	100
6.	Chitradurga	Groundnut	66000	65510	99
		Maize	40000	39860	100
		Finger Millet (Ragi)	20000	19650	98
7.	Dharwad	Soybean	24000	21700	90
		Groundnut	20000	15200	76
8.	Davangere	Sorghum	12148	8182	67
		Finger Millet (Ragi)	8773	6446	74
		Maize	52606	53778	102
		Groundnut	500	5153	1031
9.	Gadag	Sorghum	6500	4676	72
		Maize	4000	4005	100
		Green gram	42500	33582	79
		Groundnut	24000	18791	78
		Sunflower	6500	2513	39
10.	Gulburga	Mung Bean	22823	20611	90
		Black Gram	25978	25196	97
		Bajra	10613	10263	97
		Sunflower	16625	14245	86
		Pigeonpea	130261	123749	95
11.	Hassan	Maize	14000	14000	100
		Sunflower	5000	3580	72
		Cowpea	3000	2635	88
		Ragi	20000	15250	76

Continued

Table 20. Continued.

S. No	District	Major rainfed crop	Target area	Area sown	% Achieved
12.	Haveri	Maize	79000	79000	100
		Groundnut	10000	10000	100
		Soybean	5000	5000	100
13.	Kolar	Ragi	28000	20646	74
		Groundnut	9000	8250	92
14.	Raichur	Millet	28354	27664	98
		pigeonpea	14500	14058	97
		Groundnut	5200	5018	97
		Cotton	12955	11609	90
		Sunflower	12360	11885	96
15.	Tumkur	Groundnut	70628	70150	98
		Ragi	40065	37900	94
16.	Yadgiri	Mung Bean	17785	17470	98
		Black Gram	944	150	16
		Pearl Millet	11039	10871	98
		Sunflower	9095	3477	38
		Pigeonpea	20097	24236	122
Total	All districts	All crops	1315966	1202187	91.3

Rabi season 2010-11

Chickpea grain yield across three districts (Bidar, Bijapur, and Raichur) are presented in Figure 29 to compare the yield advantage of improved management over farmers' management in the district. In Bidar and Raichur, chickpea was sown in September after the soil profiles were saturated at the end of *kharif* season with more than normal rainfall in August. While seasonal rainfall was scanty during *kharif*, September and October rainfall was less than normal in Bijapur, low response due to moisture stress limiting crop uptake of water and nutrients resulted in low productivity of chickpea in both improved management and farmers' practice as well.

Although confined by localized soil constraints and seasonal conditions, on an average farmers in Bidar enhanced chickpea grain yield to the tune of 650 kg/ha (39%), in Bidar chickpea grain yield increased by 360 kg/ha (30%) and in Raichur also farmers gained by 360 kg/ha (27%) with improved management compared to usual farmers' management under Bhoochetana project.

Summary of Crop Yields across All Districts

Groundnut

Normal onset and proper distribution of good rainfall in the monsoon-helped farmers reap increased groundnut pod yields up to 1.5 t/ha even with farmers' management, which was well above the long-term average pod yields in the groundnut growing five districts.

Groundnut pod yield in Bijapur were exceptional and low in farmers' management as well as improved management due to longer dry spells at floral initiation in July and pod filling at mid September to early October in this district as evident from rainfall in Bijapur.

Groundnut crop mean pod yields varied between the lowest of 320 kg/ha with farmers' management as compared to pod yield of 470 kg/ha (47% increase) with improved management including addition of micronutrients in Bijapur district and the highest mean pod yield of 2680 kg/ha with farmers' management compared to pod yield of 3610 kg/ha (35% increase) estimated in Haveri district with improved management. Across districts groundnut pod yield increases were between 33% and 49% when compared to groundnut pod yield from farmers' management for the same district (Figure 29 and 30).

Groundnut pod yield increase of 33% in Kolar, 49% in Chickballapur, 43%in Gadag with improved management in Bhoochetana project established the fact that farmers can advantageously adopt improved management for enhancing dryland crop productivity and seasonal gains with relatively investment intense crops like groundnut (Table 21).

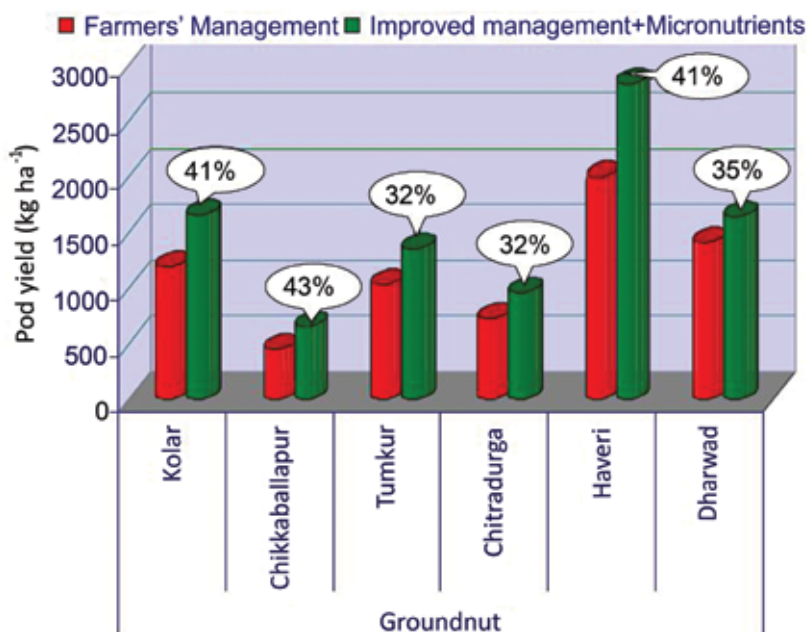


Figure 29. Groundnut yield analysis in first year district.

Table 21. Groundnut yields in farmers' fields with improved management compared to farmers' management during 2010-11 crop season in various districts.

District	Crop	Farmers' management (FM) (kg/ha)			Improved management (IM) (kg/ha)			% Yield increase with IM	
		TDM	Stalk	Pod	TDM	Stalk	Pod	Stalk	Pod
Tumkur	Groundnut	1950	1050	900	2420	1305	1120	27	26
Kolar	Groundnut	3250	1790	1460	4500	2560	1940	43	33
Haveri	Groundnut	5780	3100	2680	7550	3950	3610	27	35
Gadag	Groundnut	2610	1750	1590	3640	2580	2280	34	43
Chikkaballapur	Groundnut	2440	1090	1350	3770	1760	2010	61	49
Bijapur	Groundnut	1000	680	320	1420	950	470	40	47

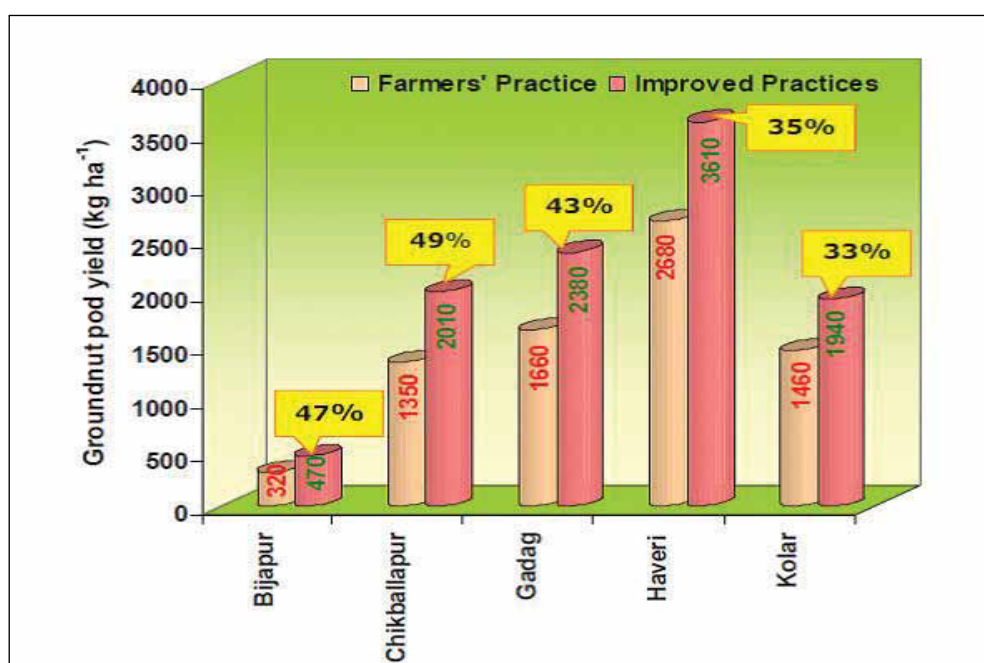


Figure 30. Groundnut pod yield analysis in first year districts.

Green gram

Green gram grain yields across the four districts were much lower in this season (2010-11) with farmers' management as well as improved management especially in Bijapur and Gadag as the crop was affected by dry spells in the short growing period of July and August in these districts.

A good contrast of useful rainfall in July or August helped farmers for an overall increase in mean grain yields of 870 kg/ha with farmers' management as well as grain yield of 1200 kg/ha with improved management in Bidar and mean grain yields of 540 kg/ha with farmers' management compared to grain yield of 710 kg/ha with improved management in Yadgir was achieved (Table 22). Even with low rainfall or good rainfall, the difference between improved management over farmers' management was maintained in terms of grain yield and fodder yield. Grain yield of green gram increased with improved management in the range of 31% in Yadgir to 57% in Gadag, and the highest grain yield of green gram was observed in Bidar (Figure 31).

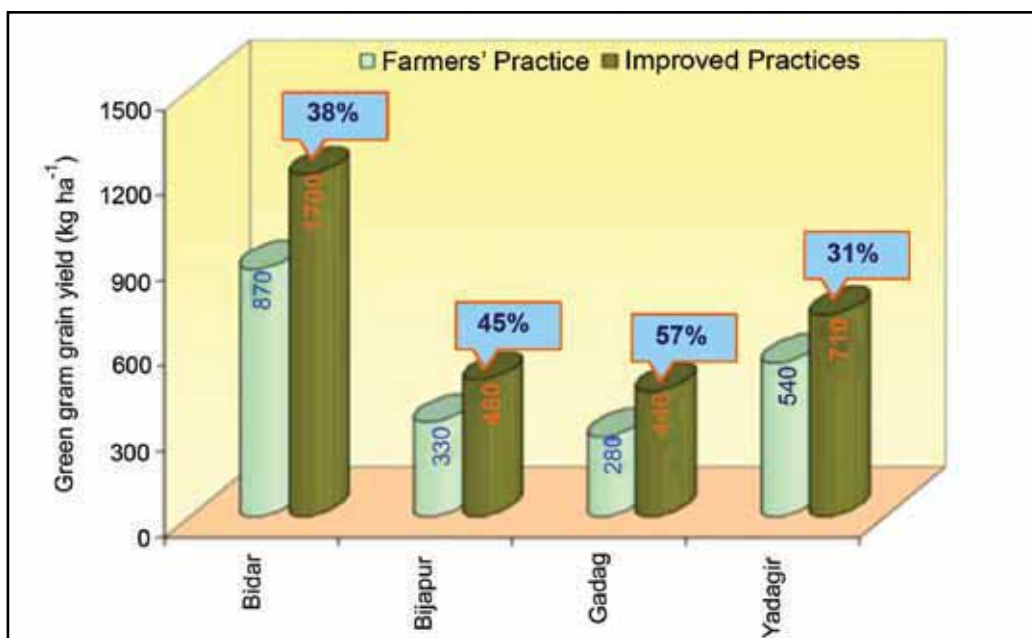


Figure 31. Green gram production analysis in four districts rainy season 2010.

Table 22. Mean green gram yields in farmers' fields with improved management compared to farmers' management during 2010-11 crop season in various districts.

District	Crop	Farmers' management (FM) (kg/ha)			Improved management (IM) (kg/ha)			% Yield increase with IM	
		TDM	Stalk	Grain	TDM	Stalk	Grain	Stalk	Grain
Yadagir	Green gram	1260	470	540	1710	590	710	26	31
Gulbarga	Greengram	2110	1520	460	3040	2180	590	43	28
Gadag	Greengram	870	590	280	1260	820	440	39	57
Bijapur	Greengram	980	460	330	1380	620	480	35	45
Bidar	GreenGram	2580	1310	870	3540	1790	1200	37	38

Maize

Maize is one the farmers' favourite crops as the farmers in Karnataka are exploiting higher genetic potential of hybrid maize even in their own management. In a good rainfall season like the year 2010-11, the lowest mean grain yield of 3840 kg/ha was observed in Chitradurga and highest mean grain yield of 7510 kg/ha was observed in Haveri district with farmers' management itself, indicates the harnessing genetic potential of maize by farmers in these districts.

However, farmers' fields deficient in macro and micronutrients, these grain yields were proved to be lower when farmers adopted improved management practices including balanced nutrient application. Lower mean grain yield of 5340 kg/ha maize was observed in Chitradurga and higher mean grain yield of 9680 kg/ha maize was observed in Haveri (Figure 32).

Maize grain yield increase was lowest at 26% in Davangere, followed by 29% in Haveri to a maximum increase of 42% in Bengaluru Rural district, and similar increase in fodder yield was also observed across different districts to provide fodder security in the rainfed districts of Karnataka (Table 23).

Table 23. Mean maize yields in farmers' fields with improved management compared to farmers' management during 2010 rainy season in various districts.

District	Crop	Farmers' management (FM) (kg/ha)			Improved management (IM) (kg/ha)			% Yield increase with IM	
		TDM	Stalk	Grain	TDM	Stalk	Grain	Stalk	Grain
Haveri	Maize	14640	5940	7510	18590	7370	9680	24	29
Hassan	Maize	19180	14260	3850	26320	19260	6000	35	56
Gadag	Maize	11190	3210	6300	15720	4920	8340	53	32
Davanagere	Maize	8850	2170	5220	11890	2860	6600	32	26
Chitradurga	Maize	6740	2160	3840	9430	2850	5340	32	39
Bijapur	Maize	10340	3160	5590	13590	4130	7250	31	30
Bengaluru Rural	Maize	8720	3460	4600	12560	4450	6530	29	42

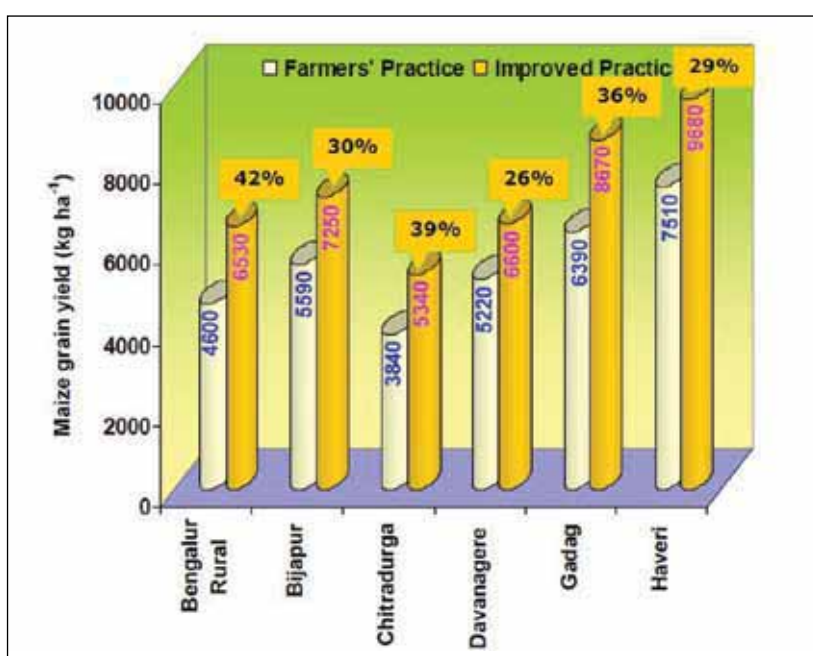


Figure 32. Maize yield analysis in districts, rainy season 2010.

Finger Millet (Ragi)

Finger millet is the staple food crop in most of the rural northern and north eastern Karnataka districts. Farmers consider it as low input requiring hardy crop with low productivity in rainfed areas. However, with improved varieties and improved management of nutrients and water farmers now started believing the higher potential of finger millet, gradually improving the management for this crop also under Bhoochetana project.

Grain yield estimations during *kharif* crop season 2010-11 from ragi growing five districts in Karnataka indicate that over all crop yield even with farmers' management was relatively higher with good monsoon rainfall conditions prevailed during the season. The exceptions were low rainfall during August in Kolar and low rainfall during July and August in Davangere that must have reduced yield in both the treatments. Ragi mean grain yield was lowest at 1420 kg/ha in Davangere district and highest at 2610 kg/ha in Chickballapur during *kharif* season 2010 from farmers' management (Table 24). Corresponding estimates for ragi grain

Table 24. Mean finger millet yields in farmers' fields with improved management compared to farmers' management during 2010 rainy season in various districts.

District	Crop	Farmers' management (FM) (kg/ha)			Improved management (IM) (kg/ha)			% Yield increase with IM	
		TDM	Stalk	Grain	TDM	Stalk	Grain	Stalk	Grain
Tumkur	Ragi	4070	2890	830	4870	3540	980	22	18
Kolar	Ragi	5080	2720	1710	7290	3820	2550	40	49
Hassan	Ragi	6910	4020	1650	8320	5420	2290	35	39
Davanagere	Ragi	4980	2970	1420	6850	3970	1850	34	30
Chitradurga	Ragi	5570	2820	2050	7250	3730	2680	32	31
Chickballapur	Ragi	5440	2090	2610	8200	3290	3710	57	42
Bengaluru Rural	Ragi	7640	4730	2040	10170	6240	2760	32	35

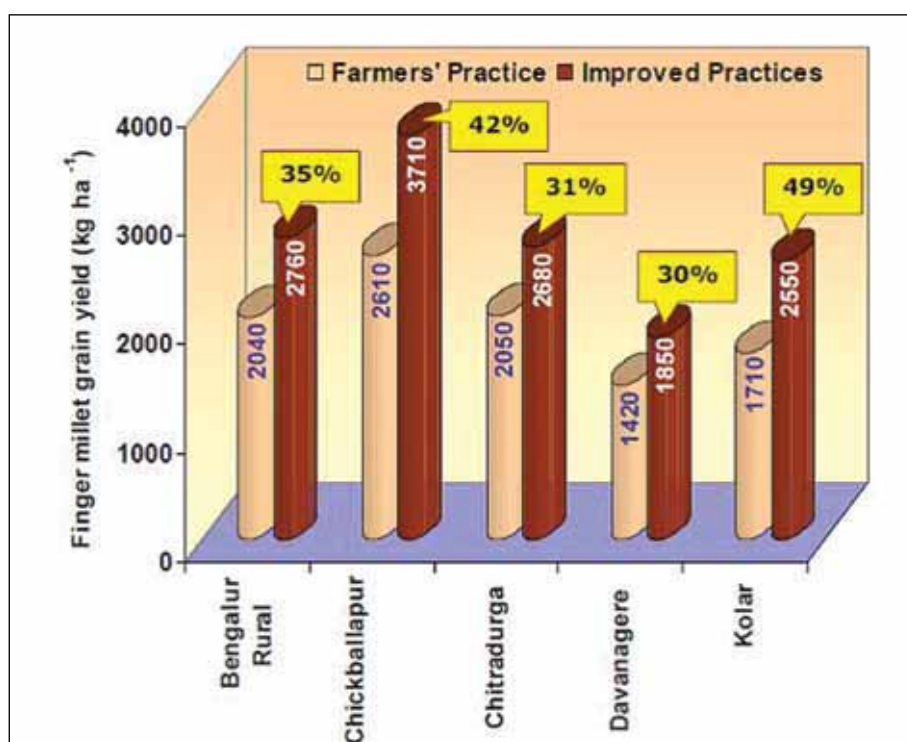


Figure 33. Finger millet grain yield analysis in districts, rainy season 2010.

yields with improved management were also lower at 1850 kg/ha in Davangere with an increase of 30% over farmers' management in the same district, while higher grain yields of 3710 kg/ha with an increase of 42% compared to farmers' management in Chickballapur (Figure 33).

In adjoining districts, ragi grain yield increase was 49% in Kolar, 35% grain yield increase in Bengaluru rural and 31% grain yield increase in faraway district Chitradurga when compared to grain yield with farmers' management in the same district. More or less similar trend was observed with increase in fodder yield of ragi in these districts.

Pearl Millet

Pearl millet is a staple food crop in parts of Bijapur, Raichur and Yadgir mostly on lighter Alfisols intercropped with pigeonpea or groundnut. Area cropped to pearl millet was 17310 ha in Bijapur, 27660 ha in Raichur and 10870 ha in Yadgir. Pearl millet was sown in the month of June in Bijapur and Yadgir, but was sown late in the first fortnight of July in Raichur.

Mean grain yield of pearl millet varied from a minimum of 1260 kg/ha in Raichur to 1960 kg/ha with farmers' management in Bijapur (Figure 34). While mean grain yield was at minimum of 1530 kg/ha in Raichur to maximum of 2670 kg/ha in Bijapur with improved management. In Bijapur, pearl millet grain yield was higher even with low amounts of rainfall during the crop vegetative phase in June and early July followed up by good rainfall in July-August helped pearl millet crop during grain filling stage. Contrastingly pearl millet was sown late in July, and crop grain filling synchronized with dry spells in September affecting reduction in grain yield in farmers' management as well as improved management in Raichur district. However, mean grain yield in pearl millet increased by 21% in Raichur, 36% in Bijapur and 37% in Yadgir with improved management compared to farmers' management in the same district. Similar trends were observed with fodder yield increase of 35% in Bijapur, 30% in Raichur and 29% in Yadgir as pearl millet stalk is generally used as fodder (Table 25).

Table 25. Mean pearl millet yields in farmers' fields with improved management compared to farmers' management during 2010 rainy season in various districts.

District	Crop	Farmers' management (FM) (kg/ha)			Improved management (IM) (kg/ha)			% Yield increase with IM	
		TDM	Stalk	Grain	TDM	Stalk	Grain	Stalk	Grain
Yadagir	Pearl Millet	7570	3270	1850	10110	4220	2540	29	37
Raichur	Pearl Millet	3220	1580	1260	3960	2050	1530	30	21
Gulbarga	Pearl Millet	3850	1600	1590	4860	2060	2080	29	31
Bijapur	Pearl Millet	4560	2020	1960	6150	2730	2670	35	36

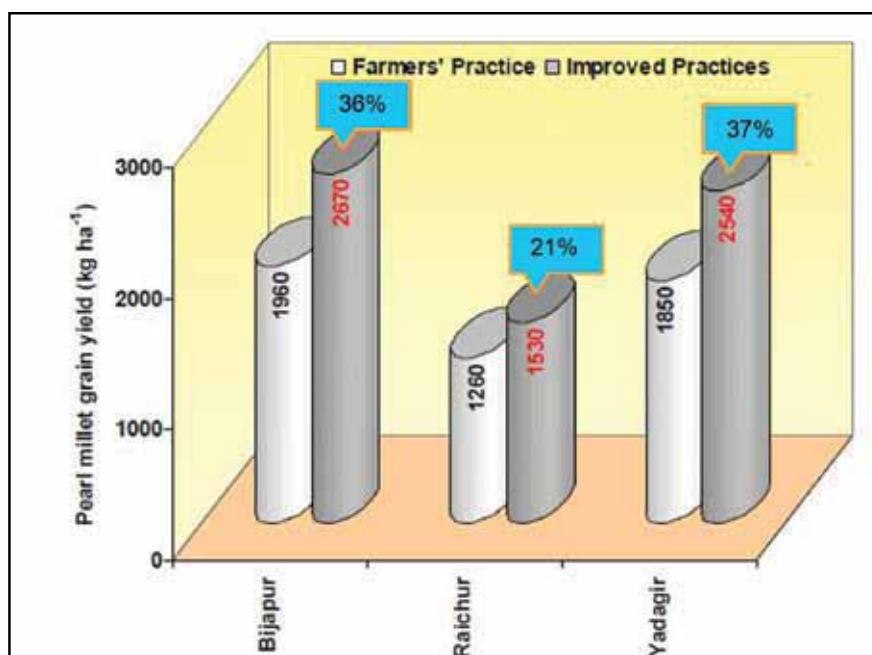


Figure 34. Pearl millet yield analysis in three districts.

Sorghum

Rainy season sorghum was grown in Bidar, Chamarajanagar, Davangere and Gadag to a total extent of 36000 ha under Bhoochetana project during 2010. Sorghum was sown during April and May in Chamarajanagar, and in Gadag sorghum was sown in 4th week of May to 2nd week of June. In Bidar and Davangere sorghum was sown in the 2nd week of June to 2nd week of July.

Sorghum mean grain yield estimates available from Bidar and Davangere indicate that grain yield of 2320 kg/ha with improved management was an increase of 25% compared to grain yield of 1780 kg/ha with farmers' management in Davangere (Table 26). Mean grain yield of 2290 kg/ha with improved management was an increase of 39% compared to mean grain yield of 1630 kg/ha sorghum with farmers' management in the Bidar district (Figure 35).

Table 26. Mean sorghum yields in farmers' fields with improved management compared to farmers' management during 2010-11 rainy season in various districts.

District	Crop	Farmers' management (FM) (kg/ha)			Improved management (IM) (kg/ha)			% Yield increase with IM	
		TDM	Stalk	Grain	TDM	Stalk	Grain	Stalk	Grain
Davanagere	Sorghum	5860	3420	1780	7520	4230	2320	24	30
Bidar	Sorghum	4100	1840	1630	5520	2500	2290	36	40

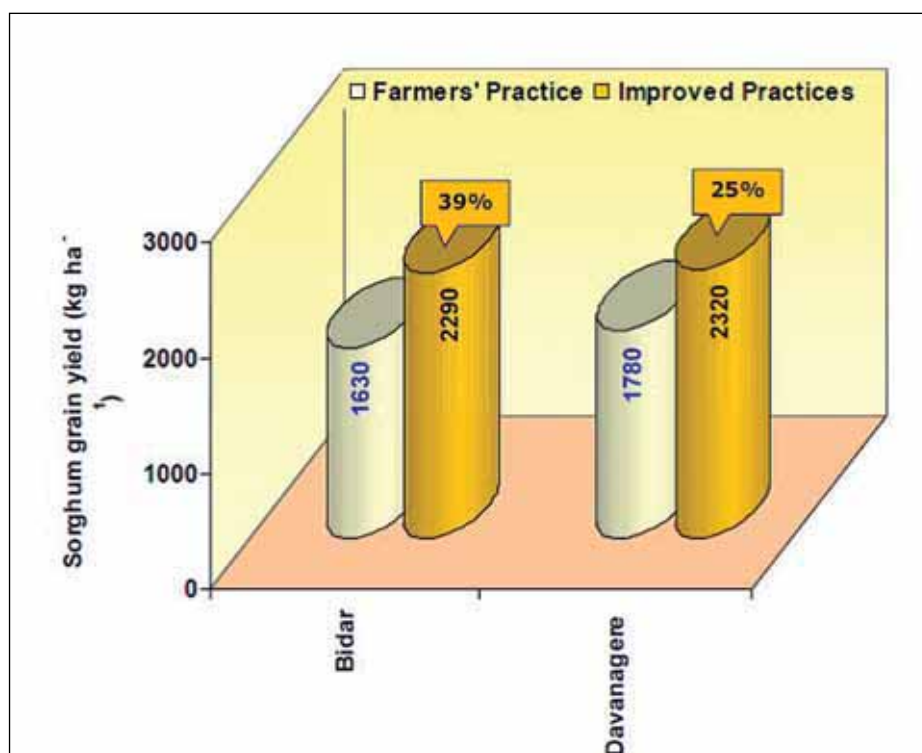


Figure 35. Soybean grain yield analysis, rainy season 2010.

Pigeonpea

Table 27. Mean pigeonpea yields in farmers' fields with improved management compared to farmers' management during 2010 rainy season in various districts.

District	Crop	Farmers' management (FM) (kg/ha)			Improved management (IM) (kg/ha)			% Yield increase with IM	
		TDM	Stalk	Grain	TDM	Stalk	Grain	Stalk	Grain
Gulbarga	Pigeonpea	7140	5090	1380	9420	6620	1870	31	36
Bijapur	Pigeonpea	3260	1870	920	4280	2550	1160	36	26
Bidar	Pigeonpea	10530	7950	1700	33	38	7900	5990	1230

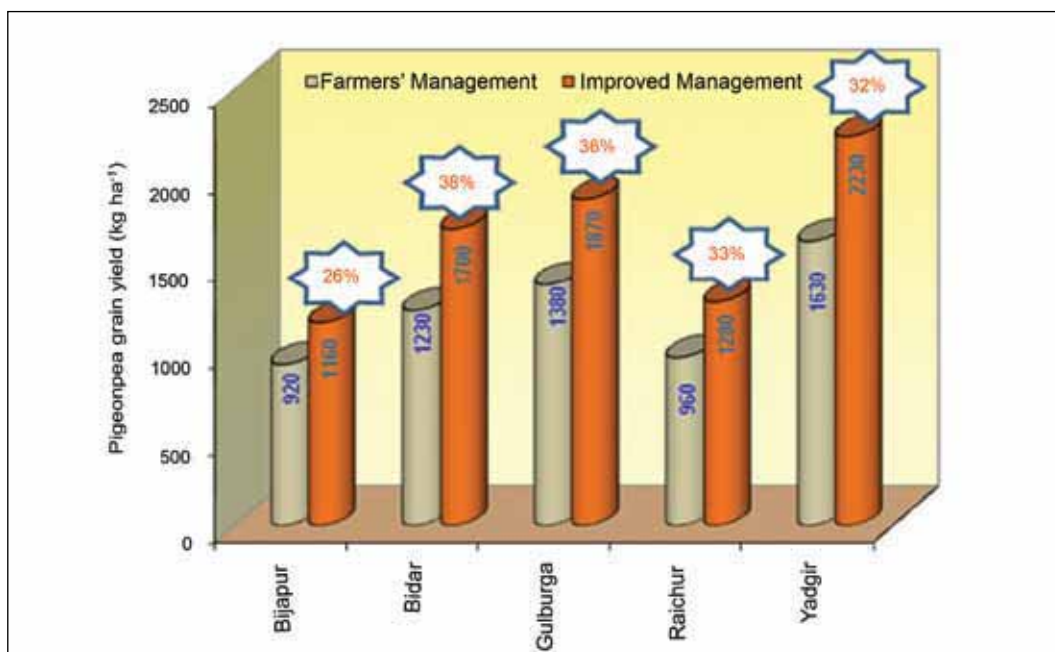


Figure 36. Pigeonpea grain yield in different districts, rainy season 2010.

Sunflower

Table 28. Sunflower yields in farmers' fields with improved management compared to farmers' management during 2010 rainy season in different districts.

District	Taluks	Crop	Farmers' management (FM) (kg/ha)			Improved management (IM) (kg/ha)			% Yield increase with IM	
			TDM	Stalk	Seed	TDM	Stalk	Seed	Stalk	Seed
Bijapur	Bijapur	Sunflower	3850	1960	870	4680	2470	1060	26	22
Yadagir	Shahapur	Sunflower	2960	1950	410	3530	2310	490	18	20

Soybean

Table 29. Soybean yields in farmers' fields with improved management compared to farmers' management during 2010 rainy season in different districts.

District	Crop	Farmers' management (FM) (kg/ha)			Improved management (IM) (kg/ha)			% Yield increase with IM	
		TDM	Stalk	Grain	TDM	Stalk	Grain	Stalk	Grain
Haveri	Soybean	3520	900	1790	4820	1540	2230	71	25
Bidar	Soybean	4020	890	2100	5380	1260	2910	42	39

Black Gram

Table 30. Black gram yields in farmers' fields with improved management and farmers' management during *Kharif* 2010 in various districts.

District	Crop	Farmers' management (FM) (kg/ha)			Improved management (IM) (kg/ha)			% Yield increase with IM	
		TDM	Stalk	Grain	TDM	Stalk	Grain	Stalk	Grain
Aurad	Blackgram	3490	2240	910	5050	3310	1310	48	44
Basvkalyan	Blackgram	4070	2160	1530	5720	2850	2120	32	39
Bhalki	Blackgram	1100	510	380	1580	730	550	43	45
Bidar	Blackgram	2270	1220	530	3090	1910	710	57	34
Humnabad	BlackGram	4060	2310	1290	5350	3510	1630	52	26
Bidar Mean	BlackGram	3000	1690	930	4160	2460	1260	46	35

Concerns

There are certain concerns, which are very crucial while implementing any program. This section detailed out all such concerns, which field people felt while implementing the program at large and corrective measures need to be taken on priority basis. Apart from this reader will also get information of funding in last three years followed by short-term impact at ground level.

In any big program operational process in large area, small problems may come and it is obvious too. However, some serious issues were observed needs to be addressed on priority basis.

Human Resource

- Main concern noted was almost lack of extension staff in the department. There is an urgent need to address this issue to overcome the lacunae through innovative extension system. The introduced system of FFS can be developed into a sustainable business model through public private partnership.
- For better implementation of the program human resources should be hired on contract basis or ensure that all posts are filled. The team has full conviction on the concept but due to shortage of human resources, they cannot go to field in peak season. Additional work pressure forces them to work in late hours during peak season.

- For example in some *taluks* six officials are working against position of 38 posts. Most officers are at the verge of retirement. More specialists are required at *taluk* level who could be hired on contact basis.
- Opening additional seed distribution centre is difficult due to less staff strength at RSK level.

Inputs

- There is need to build awareness about use of micronutrient specially zinc and boron in remote locations. Some farmers are not applying gypsum in red gram and restricting to DAP only.
- There is big gap between demand and supply. Only 20-30% farmers are approaching to RSK now. Delay in supply of inputs is a big concern. Less number of suppliers at district level is concern for most of the district officials. Restricted suppliers and distance location of suppliers creates problem in procurement of inputs. Without demand there is supply of inputs like PSB in some cases, sometimes it reaches after season, and then it becomes difficult to sell these products. This needs to be improved on priority basis.
- Increase in cost of micronutrient is big concern for small and marginal land holding farmers. Because after increase in demand companies are increasing its cost every year and this is big hurdle for promotion of micronutrient and its application. If we compare the prices of micronutrient then it gives clear idea. Increase in rate is one problem for poor farmers (Table 31).

Micro nutrients	Year 2010 (₹/kg)	Year 2011 (₹/kg)
ZnSO ₄	145/5 kg	191/5 kg
Borax	87/2 kg	100/2 kg
Gypsum	3180/ton	3180/ton

- Demand of micronutrients is increasing in phase one districts but poor supply is another problem. District officials cannot depend on one supplier only. In the year 2011-12 quality of gypsum and borax was not good in few districts. ZnSO₄ supply was good. If supplied on time then supplier needs money on time and this is a critical bottleneck which needs early solution. Drought also affects procurement of micronutrients.
- In one of the districts (Bidar), supply of inputs was poor by 20%. The field team stated that if supply of total inputs demand is delayed it affects the total coverage in the district. Some time it is not supplied due to lack of transport facility. District received only zinc (60-70 % of its total demand). Bulk handling of inputs is difficult. Supply of inputs well in time is big constraint. No storage facility of inputs thus output is affected
- During peak season, distribution of inputs beyond RSK is a big challenge due to shortage of staff. No visible impact after applying micronutrient is a concern in some of the areas.

Capacity Building

- This is the most challenging task which requires multiple efforts. Most of the training and capacity building need is at Gram Panchayat level.
- Timely education of farmers using different means of communication is required. This is possible only with complete staff strength. Most of the staff are predominantly involved in inputs sale.
- Convincing farmers was big challenge in first year of program.
- Training of farmers using FFs is more challenging as they are not confident on few issues and therefore we need to have sustained efforts to train this cadre. To build basic knowledge of FFs took almost one year.
- Perception of farmers on use of micronutrient was poor, more efforts are required to convince them.
- Refresher trainings for *Kharif* and fresh trainings for *Rabi* crops to farmers and FFs to be organized.

Farmer Facilitator

- If farm Facilitator and lead farmer are not selected properly then problem may come at field level. Farm facilitator (120 day paid work)-> lead farmer (7 days paid work)-> farmers. Lead farmers services can be used for given additional task of visiting demonstration plots where micronutrient applications are planned.
- No control on farm facilitator so he/she works with his own freedom and if no work done then also the team faces lots of problem in promotion of the program. Without their timely support, it is impossible to sell inputs at village level.
- FFs are not technically sound and they can do only certain minimum tasks. FFs require technical knowledge on regular basis. Quality training is required.
- Remuneration to FFs is delayed some times. It creates lots of problem for the field officials and work get affected. Element of security is not there with farmer.

Storage Facility

- At field level, storage is big problem. Approval is only for six month to hire a godwon at field level. However, practically it is not possible to sell out all inputs during this period. It should be given on demand basis. Sometimes there is delay in payment of rent of these godowns and field level official face lots of problem and it affects their relationship with other people. No godown facilities at hobli level. At village level, it is very difficult to hire godown, most of owners ask for advance rent, and which is not possible for them.

Technical Issues

- University scientists' involvement has to be increased to address technical issues.
- In Raichur district, department officials are in dilemma whether they follow ICRISAT recommendations or follow university recommendations, which created unnecessary confusion.

Management Issues

- **Subsidy:** All subsidy scheme- micronutrient has to be tagged on priority basis but not done yet. Small and marginal farm holders expect more help
- Oral communication or instruction creates problems sometimes and field officials work in dilemma. There is strong need of one technical officer specifically agriculture graduate at hobli level to manage technical issues and also manage such big technical programs
- For timely release of funds for payment of FFs, mechanism has to be developed.
- Regular meeting at field level is must and if not done then problem arises. Regular reviews, meeting, follow up on fortnightly basis helps in keeping program on track.
- Proper planning is missing at local level involving local officials and gram panchayat. Proper and timely execution of planned activities at field level is big problem due to various reasons.

Other Issues

- Sometimes local politicians also interfere and create problems.
- Poor market prices of crops is another constraint in promotion of micronutrients.
- Getting inputs at farmers' level was the biggest problem at initial stage of program. Due to subsidy, it was not possible to sale these inputs through the private parties. Cooperative societies, who can sale these inputs, are located at far distance from the villages.
- Input supply on time was the most difficult task. To address the issue in the first year it was not possible to have agreement with major suppliers. This forced the department to look at this matter well in advance and work on developing a full proof mechanism for supply of inputs on time at farmers' doorstep.
- Mismatch of inputs between order and supply created many hassles to arrange it on time at field level.
- It is difficult to manage immediate demand of inputs at field level for the team. No proper mechanism to distribute the inputs.
- Talking to farmers and explaining them about use of micronutrient was not sufficient unless they see some demonstration at local level or in village.
- Farmers not accepted idea of paying their share to procure micronutrients initially but still this is big issue at field level and some people raise it with hidden agenda to gain political score at field level.
- Data recording is very good but documentation on change indicators is very limited within the department. Few case studies are there but on particular issues, documents are rare. Therefore, it is clear that documentation is not structured and was not on priority.

Funding Pattern

The program was conceptualised on concept of generating funds using state resources and central resource. The proposal was developed based on this and funds were received under Rashtriya Krishi Vikas Yojana. It is innovative approach to converge with the ongoing program to address the larger issues in

scientific manner. To implement this ambitious program state government made provision for 25% of total program cost from state budget and rest 75% from central schemes. Budget was created using funds of different schemes like ISOPOM, NFSM, APPP, etc and an additional funds required were met under RKVY by submitting special project.

Impact

The program had a very visible impact at ground. In the first year- 2009-10, the project was implemented in six districts covering 0.225 million ha, 1440 villages and 0.2 million farmers. The second year of the project was implemented during 2010-11 in 16 districts covering 1.2 million ha, 5030 villages and 0.87 million farmers. The third year of the project was implemented during 2011-12 in all 30 districts covering 2.54 million ha, 13800 villages and 2.0 million farmers.

An enhancement in yields up to 44% in maize, 35 to 66% in ragi, 32 to 41% in groundnut and 39% in soybean has been observed in the treated areas during 2009-10.

During 2010-11 *Kharif* this program was implemented in 16 districts (including the 6 districts of 2009-10) viz. Kolar, Chikkaballapur, Tumkur, Chitradurga, Haveri, Dharwad, Bidar, Gulbarga, Yadgir, Raichur, Gadag, Davanagere, Chamarajanagar, Bijapur, Bengaluru Rural and Hassan in about 12 lakh hectares. About 0.80 million farmers of 5030 villages availed the benefits of the scheme. **(Economic Survey of 2010-11)**

It is highly satisfying that the growth in agriculture sector, in the year, 2009-10 was 5.6% and in 2010-11 it was 5.7%. in the state has increased by 5.9%. (This was 0.5% and 5.43% in the years 2008-09 and 2009-10 respectively). In the budget speech Hon. Chief Minister stated that “I wish to state that after many years this rate of agricultural growth has been possible because of several measures taken by us. During 2010-11, 8.0 lakh farmers cultivating 12 lakh hectares of dryland in 16 districts have benefited from this scheme through increase in yield of 25 to 40%. During the last 3 years, 21.7 lakh quintals of quality seeds have been distributed at subsidized rates to 81 lakh farmers for improving the productivity of crops. *(Karnataka Budget 2010-2011)*

In 2009-10, enhancement in yield was observed in the treated areas for maize (44%), ragi (35 to 65%), groundnut (32 to 41%) and soybean (39%). Similarly, about 23-57% increase in yield were observed in treated plots as compared to non-treated plots during 2010-11. **(Economic survey 2011-12)**

Karnataka Budget 2010-2011 Highlights: It has been possible during the last two years to increase crop productivity considerably by conducting soil quality tests and supplying necessary micronutrients in about 2.25 lakh hectares of land in six districts under ‘Bhoochetana’ program. This experiment will be extended to 12.5 lakh hectares of land in 15 more districts of the State.

Bhoochetana: The objective of the Bhoochetana program, being implemented through the technical assistance of ICRISAT, is to increase the crop productivity by at least 20% during 2009-2012 through technological inputs and supply of micro nutrients. During 2010-11, 8.0 lakh farmers cultivating 12 lakh hectares of dryland in 16 districts have benefited from this scheme through increase in yield of 25 to 40%.

Qualitative Impacts of Technology Interventions

In groundnut, shelling per centage has improved in the range of 2% to 7% in four districts for which data is available. Due to application of micronutrients with improved management treatment, their availability helped pod-filling considerable at that crop stage and fully filled pods are responsible for shelling per centage or out-turn in market parlance. This variation has considerable value to the farmer, as he sells groundnut pods in the market higher shell per centage fetches good price for the produce (Table 32).

Table 32. Effect of micronutrients on groundnut pod filling with improved management compared to farmers' management in different districts of Karnataka

District	FM	IM+micronutrients
	% Shelling	% Shelling
Haveri	67.8	74.9
Dharwad	57.7	59.2
Kolar	65	65.3
Tumkur	64.9	65.5

Farmers and DoA officials observed it during crop growth that root growth and tillers were profuse in ragi with improved management compared to farmers' management in Chickballapur.

Economic

Simple measure of additional income per every rupee of additional investment was calculated based on additional net income a farmer fetches on increased yield of fodder and pod or grain per hectare with improved management over the farmers' management and divided by the additional investment on new technology i.e. investment on micronutrients per hectare (Table 33).

Key Learning

Learning gives strength to planning processes. This section broadly explains about the major learning at every level. In next point, it provides an overview of observation of district level officials about the program. This is very important section of the report.

Learning is very important in any program. If, there is no learning it meant it is not carried out properly. Mostly people take failure as learning but in this program various processes and peoples' need gave bigger learning and base to the program that contributed in making it more structured and organised. These learning also helped in taking corrective measures from time to time and a few policy decisions were also taken to strengthen the program. For example conducting video conferences to review the program weekly was big policy decision, appoint vigilance officer at district level was another one. These types of decisions taken by the government make this program effective and systematic. But still there is list of learnings which are yet to be incorporated in to policy decision process or some hard policy decision or corrective measures needs to be taken at government level to strengthen the program at ground level and achieve the target set by the program.

Table 33. District-wise crop yield increase in farmers' fields with improved management compared to farmers' management under Bhoochetana project, 2010-11.

Crop	District	Farmers' Management (kg/ha)		Improved Management (kg/ha)		% increase in production		Additional Income at MSP (ha ⁻¹)	Additional income per Rupee Invested
		Stalk	Grain	Stalk	Grain	% stalk increase	% grain increase		
Ragi	Bengaluru R	4730	2040	6240	2760	32	35%	9060	5.7
	Chikkballapur	2090	2610	3290	3710	57	42	12300	7.8
	Chitradurga	2820	2050	3730	2680	32	31	7350	4.7
	Davangere	2970	1420	3970	1850	34	30	5550	3.5
	Hassan	4020	1650	5420	2290	35	39	8140	5.1
	Kolar	2720	1710	3820	2250	40	49	6750	4.3
	Tumkur	2890	830	3540	980	22	18	2360	1.5
	C'raja-nagar	1930	1331	2183	2093	13	77	10	4.9
Maize	Bengaluru R	3460	4600	4450	6530	29	42	17550	11.1
	Bijapur	3160	5590	4130	7250	31	30	15160	9.6
	Chitradurga	2160	3840	2850	5340	32	39	13590	8.6
	Davangere	2170	5220	2860	6600	32	26	12540	7.9
	Gadag	3210	6300	4920	8340	53	32	18930	12.0
	Haveri	5940	7510	7370	9680	24	29	19910	12.6
	C'raja-nagar	5333	1776	9194	3078	72	73	13660	8.6
	Pearl millet	Gulburga	1600	1590	2060	2080	29	31	4580
Bijapur		2020	1960	2730	2670	35	36	6650	4.2
Yadgir		3270	1850	4220	2540	29	37	6620	4.2
Raichur		1580	1260	2050	1530	30	21	2650	1.7
Sorghum	Bidar	1840	1630	2500	2290	36	40	6190	3.9
	Davangere	3420	1780	4230	2320	24	30	5220	3.3
	C'raja-nagar	2227	1428	3031	2215	36	55	7390	4.7
Black gram	Bidar	1690	930	2460	1260	46	35	9570	6.1
Green gram	Bidar	1310	870	1790	1200	37	38	10460	6.6
	Bijapur	460	330	620	480	35	45	4760	3.0
	Gadag	590	280	820	440	39	57	5070	3.2
	Gulburga	1520	460	2180	590	43	28	4120	2.6
	Yadgir	470	540	590	710	26	31	3800	2.4
Pigeonpea	Bidar	5990	1230	7950	1700	33	38	14100	8.9
	Bijapur	1870	920	2550	1160	36	26	7200	4.6
	Gulburga	5090	1380	6620	1870	30	36	14700	9.3
	Raichur	1470	960	1860	1280	27	33	9600	6.1
	Yadgir	8520	1630	11080	2230	30	37	18000	11.4
	Groundnut	Bijapur	680	320	950	470	40	47	3990
Chikkaballapur		1090	1350	1760	2010	61	49	16520	10.5
Dharwad		1737	2062	2090	2906	20		20118	12.7

Continued

Table 33. Continued.

Crop	District	Farmers' Management (kg/ha)		Improved Management (kg/ha)		% increase in production		Additional Income at MSP (ha ⁻¹)	Additional income per Rupee Invested
		Stalk	Grain	Stalk	Grain	% stalk increase	% grain increase		
	Gadag	1750	1590	2580	2230	47	43	16380	10.4
	Haveri	3100	2680	3950	3610	27	35	23090	14.6
	Kolar	1900	1460	2560	1940	47	33	15780	10.0
	Tumkur	1049	899	1305	1120	27	25		
	Charmrajnagar	1105	1109	1553	1733	41	56	15248	9.7
Soybean	Bidar	890	2100	1260	2910	42	39	11660	7.4
	Haveri	900	1790	1540	2230	71	25	6340	4.0
	Dharwad	3033	1516	4810	2333	59	55	11770	7.4
Sunflower	Bijapur	1960	870	2470	1060	26	22	4470	2.8
	Yadgir	1950	410	2310	490	18	20	1880	1.2



First Year Learnings

- Better approach can help in organising communities for effective utilisation for increasing productivity of dryland agriculture. To enhance crop productivity adoption of scientific approach and technical support is essential for dryland farmers (32 to 66%).

- All the incentivized inputs must be bundled together as a package because in general farmers are tempted to go for seeds only. Arranging all inputs well in time was big challenge for the team. There is need to develop a mechanism for smooth procurement of inputs at field level. Development of Seed banks by farmers' groups within villages help farmers to get quality seeds of their choice variety at cheaper rates, also help to certain extent use of high yielding varieties to increase productivity when invests on costly inputs like nutrients is hard to afford by risk averse farmers.
- A proper and timely process of identification of target villages, beneficiaries, lead farmers, facilitators and their training is critical for the success. Agriculture is time sensitive therefore to promote any technology inputs like micronutrients and improved seeds must be made available well in advance of the monsoon and *kharif* season sowings for farmers to adopt and reap the benefits of the technologies. Supply chain for quality inputs need to be strengthened and put in place ahead of the beginning of the season i.e., April end for northern Karnataka districts.
- To overcome from the various bottlenecks it is required to have high frequency of SLCC meetings at initial stage of the program. Internalization and institutionalization of program has benefitted the Mission in few districts and impacts can be improved further.
- For effective execution and timely action, clear and timely flow of written communication to districts is very crucial and has to be ensured. Timely and well ahead planning increased success and last minute fire fighting operations only built pressure without clear results. In the event of unfavourable and delayed monsoon conditions, farmers not only need to understand the contingency crop planning which was given, but they should be provided with some mitigation options if they chose to grow their favourite crops.
- Timely release and availability of funds to districts enhanced commitments of staff, which contributed for enhanced impacts.
- As an example, farmers should be encouraged to apply foliar spray of micronutrients and urea at lesser doses to get compensatory yield increase. In the agriculture department, changes in approach are changing based on learning of Bhoochetana. For any consortium, it is important to bring right attitudinal changes for the program success and it was visible on ground.
- Based on learning it was decided to link watershed department at ground level to implement this concept in the watershed villages on priority basis this is learning of success in Sujala program village where watershed work was done initially and later on this concept was scaled up. It was mainly promoted as watershed plus activity at ground level, and convergence of watershed program is much needed.

Second Year Learnings

- Dryland farming Community in Karnataka are receptive to knowledge-based improved agricultural practices and come forward willingly to undertake evaluations through participatory research as evident from good coverage up to 40% area with micronutrients in Bidar district during *rabi* season can be effectively organized and utilized for increasing productivity of dryland agriculture.
- For achieving the desired impact in terms of increasing agricultural productivity of dryland systems, small and marginal farmers need to be enabled through training, exposure, demonstrations, ensuring availability of necessary inputs and handholding support.

- Timely availability of inputs as well as quality of the inputs were becoming bottlenecks for scaling-up the Bhoochetana in spite of good efforts from the DoA
- Supply chain for quality inputs need to be strengthened and put in place ahead of the beginning of the season i.e., April end for northern Karnataka districts.
- During second year of the mission program farmers in six districts where program was launched earlier adopted the improved management practices in higher number than the new ten districts.
- Internalization of soil-test-based recommendations amongst DoA officials has to be a continuous process as new officers come with some fixed ideas need to be sensitized as well as made aware with the mission strategy and approach. Such officers do pull back the implementation in particular districts.
- Regular review meetings conducted by DoA are good and showing its impact and Director and Commissioner have put good team efforts which have contributed largely for the success as evident from the results during the second year. Similarly regular video conferencing improved the adopting with increased clarity and accountability.
- In new districts early identification of beneficiaries, farm facilitators and ensuring publicity and awareness building is must. Good officers in the district can do the job of achieving the mission target.
- Frequent meetings of the SLCC at regular intervals are very effective and such meetings facilitated the mission project and helped in overcoming the bottlenecks to an extent and such meetings are must.
- Scientific approach and technical support enabled dryland farmers to enhance crop productivity significantly (32 to 66%) not only in the first year of implementation in 6 districts, but also continued and exceedingly well over a larger areas in sixteen districts with significant increase in crop productivity by 21 to 57% during rainy season for different crops.
- Availability of good quality seeds of improved cultivars of groundnut, pigeonpea, ragi, chickpea, green gram, black gram is a problem in many districts. Development of seed banks by farmers' groups within villages help farmers to get quality seeds of their choice variety at cheaper rates. Concerted efforts are needed to scale-up village seed bank initiative with policy and financial support along with needed technical backstopping.
- In spite of unfavourable rainfall situation in particular districts, improved management practices showed increased crop yields over the farmer's practices suggesting that improved practices are also proving as good adaptation strategies to cope with unfavourable rains.

Third Year Learnings

- Although target area projections were done rightly, soil test-based recommendations provided by ICRISAT were ignored. This is the biggest concern for promotion of application of balanced nutrient application in soil to improve soil health. Action needs to be taken on priority basis.
- Based on experiences in the previous year monsoon conditions and difficulties in the distribution of left over stocks in the previous year, officials took a conservative approach of partial stock positioning, and accordingly indented for partial requirement of micronutrients, with a view to supply micronutrients as and when the demand arises.

- Early monsoon is big challenge for the officials to manage the inputs. If not arranged then farmer chose the way they want to take crops. Like it happened in few of the districts farmers did sowing of crops like groundnut in Kolar, Chikkaballapur and pigeonpea in Gulbarga and Bidar with good monsoon rains quite early. The districts where sowings have been completed more than 50%, the supply of one or all the micronutrients ($ZnSO_4$ in some districts) were either insufficient to meet the demand or was not available (eg. Boron in Raichur) at that time when farmers needed it most.
- Even though 50% subsidy was available on all micronutrients, increased nutrient cost added to the non affordability and less interest to poor farmers hence opting for lower doses of micronutrients than recommended.
- Ragi is a major crop at least in 4-5 districts and less adoption of micronutrients by ragi farmers because farmers and researchers feel that it is a nonresponsive crop it will obviously take more seasons to fully appreciate the impact of micronutrients, and hence nutrient adoption rate is relatively lower in these districts.
- Although a complete package of nutrients need to be supplied to enhance crop yields, involvement of local politicians in sensitive areas to demand issue of selective nutrients and quantities also affected the implementation, reflecting low in take of micronutrients in few districts
- In entire discussion, visits and meetings it clearly came out that all inputs has to be stored at Raitha Samparka Kendras level that is lowest unit of the department before the farming season starts.
- For promotion of any new technology farmers selection is very crucial. Thus, it is important that for improved quality seed distribution, first organise orientation at RSK level and farmers who participate in the orientation get priority for seed. They also distributed material to non-selected village farmers who shows their interest in this concept.
- Initially farmers refused to apply micronutrients. Therefore lead farmers were provided with inputs in place of their honorarium this trick worked and outputs of demonstration were good and next year farmers came forward to apply micronutrients in their field. Such innovative approaches have to be adopted in new operational areas.
- If there is any delay in receiving basal dose at RSK than it creates problem at field level.
- Farmer to farmer communication give better results
- In non-remunerative crops, farmers do not want to put extra investments. For any input, brand is very important. Attractive packaging makes difference and marketing becomes easy. Now farmers are demanding for particular brand only. Year 2011 was a setback due to poor rainfall.

Issues related to Institutional arrangements

- Every institution wanted to be in win-win situation while implementation of program. This was not pushing the program agenda in its initial stage and thus government had to push it hard at ground level.
- At initial stage, there was a fear of extra work.
- Participation was not proactive, poor cooperation at field level
- No constant representation in the beginning from University side
- Less staff issue in better functioning of consortium in second year onward better coordination

Administrative issues

- Full strength of farmer facilitators and lead farmers need to be restored during 2011-12, where ever insufficiency was observed.
- Difficulties with attrition of new staff appointed by ICRISAT in the Bhoochetana districts covered previous year, as older staff were posted to new districts for vigorous implementation.
- There were instances of problems related to transporting nutrients to farmers' door steps as the suppliers dumped inputs at RSKs, and there were difficulties in storage and supply inputs to farmers in the watershed villages. Transportation costs and storage space problems was addressed later.

Suggestions

Cropping Pattern

- District official suggested that mix cropping as per area requirement would be more appropriate for promotion of micronutrients. Promote crops accepted by the farmers. Village demonstration is more important for promotion of appropriate cropping pattern. Every year more number of demonstrations as per cropping pattern is required. Farmers don't want to increase production cost

Training and awareness generation

- Good quality training help is developing strong base. Therefore, program must focus on proper and regular training to Farmer Facilitators. Resource person from outside make the training more effective as local officials are always available with them. All stakeholders should get proper training before they are involved in to implementation.
- Long training program should not be planned. Short duration training is better especially for beneficiary. District level training, capsule training is better option and it should be completed in two-three spells.
- Better training to field functionaries of agriculture department is required. Demonstration has to be given to KVK through department. Capacity building of KVK team is also required on new technologies. All KVK members should be trained on Bhoochetana. All subject matter specialists (SMS) should be involved in the program.
- Three level training – a) basic orientation program for one week; b) *taluk* level workshops for farm facilitators, lead farmers, department officials and scientists for one day; and c) mid-season training on plant protection and post harvesting technology for one day. Technical guidance, orientation by inviting scientist from universities and local KVKs in the training programs and farmer interface meetings.
- Farmers should be given more orientation, exposure on monthly basis. Cross learning through training program, farmer to farmer learning by exposure visit and training and visit system should be promoted now.
- Immediate application of micronutrient is required for better result. More work is needed to bring awareness at farmers' level.
- Training on input storage and application should be organised.

Inputs

- Slow adoption of micronutrients. It will take minimum 3-4 years time to become popular. For 100% coverage, it will take another 5-6 years. Currently 20% farmers are buying it with incentive. For better promotion of micronutrients, basket approach of distribution or sale has to be adopted.
- Well planned input supply and distribution mechanism needs to be adopted
- Balance between input supply and knowledge & technology transfer is essential which is lacking now. More focus is on input supply. Separate arrangement for input distribution is needed.
- Quality of inputs provided under subsidy has to be good because there is doubt at village level about quality of products.
- Supportive price is important for promotion of micronutrients.

Storage

- Stock should not be kept at godown for longer period
- Farmer Facilitator
- Priority should be given to young agriculture oriented educated youths to work as Farm Facilitators. Training as agriculture facilitator should be given to FFs. FFs remuneration should be considered with prevailing situations.
- In Bhoochetana minimum two women farm facilitators are required in a cluster of village. These farmer facilitators should work mainly with women in the cluster of village mainly to build awareness amongst women farmers.
- All FFs have to run one FFS in their village for one crop in each season. Finance support can be made under other schemes
- Farmer Facilitator period has to be for at least six months.

Management

- For comparison, good quality baseline data has to be collected and an analytical report has to be prepared.
- Video documentation started but there is need to have a planned sharing mechanism with the large number of farmers who will start in next season and who are still not convinced about this concept.
- Temporary appointment where no incharge at *taluk* level under Bhoochetana to speed up the progress
- Grass root level systems need to be strengthened on priority basis. Record maintenance is not proper due to lack of proper training and knowledge and mechanism for record maintenance.
- Villages near by Raitha Samparka Kendras should be selected in first year for better monitoring purpose.
- Large scale field days needs to be conducted at demonstration plots in all Hobli's
- Timely release of funds is big constraint. Clarity about budget available for all heads at field level is required on priority basis.

Review and Monitoring

- Weekly review meeting at hobli level should be organised. Group meeting and individual discussions on regular basis at village level. Appoint field workers like FFs in a timely manner to ensure proper training
- There is no review or monitoring committee formed so far at district level, which is needed. Bimonthly review of Bhoochetana at district level can be planned for FFs.
- Close and to the point review, makes program functional and helps in achieving the goal. Higher-level officers should do general and specific review.
- Every week interaction between field officer, farmer and senior officers at all level
- Timely and proper monitoring by external agency with positive attitude

Technical Issues

- More active role of Krishi Vigyan Kendra in implementation of the program. Demonstration through KVK in selected field.
- Integrated farming system-integrated crop management (IFS-ICM) Modules to be promoted.
- Farmers want one product for all nutrients for easy application
- Field bund should be promoted in the field under watershed program for better result.
- Field days should not be restricted once at hobli level. It should be organised at cluster level also
- Promote other technologies as well

Innovativeness

- Farmer field school concept can be promoted in Bhoochetana at bigger scale.
- In one district, local politicians were also involved actively in Bhoochetana and made positive impact at field level. It would be good if a planned approach is adopted to involve politicians in promotion of the program.

Other

Farmer organisations need to be involved in such program. This concept should be promoted at scheme level.

State Level Recommendation

- KVK can play vital role but there is greater need to strengthen KVKs to work on such complex issues
- ICAR should adopt this concept in its program

- Subsidy should be on reducing trends
- Withdrawal strategy should be well defined
- Human resource issues have to be addressed on priority basis.
- A road map has to be prepared identifying shortage of critical human resource at Raitha Samparka Kendras, *Taluk* level on priority basis.

District level recommendation

- A separate wing has to be formulated like ATMA cell with a good team of three professionals.

Taluk level recommendation

- Full proof system of subsidy distribution is needed
- Stakeholders have to be informed about any program systematically
- Farmers profile in soft format for all villages

Capacity Building

Knowledge

- There is need to develop a mechanism for strengthening knowledge base of field team and farmers on regular basis.

Skill

- Special training programs has to be organised on specific subject on quarterly basis for field staff and farmers on six monthly basis.

Following questions can be asked on quarterly basis to do an internal assessment on the adaption rate of these technologies at field level.

- How better performers are rewarded?
- Time sensitivity is must in agriculture, how it is managed in Bhoochetana?
- What is the procurement procedure at field level to speed up the program?
- What are the powers given to field official to implement the porgramme successfully?
- What is mechanism to share the progress with the farmers?
- How success is celebrated?
- Type of orders issues time to time

Annexure 1 – Tables

Trainings conducted in six districts under Bhoochetana program during 2009-10

District	Taluks	District-level		Taluk /village-level			
		No. of		No. of trainings			
		Trainings	Participants	Taluk level	Partici-pants	Village level	Partici-pants
Dharwad	Dharwad, Hubli, Kalaghatagi, Kundagol, Navalgund	3	136	4	126	36	1506
Haveri	Haveri, Byadagi, Hangal, Hirekere, Ranebennur, Savanur, Shiggaon	1	115	7	355	95	3230
Chitradurga	Chitradurga, Hiriya, Holalkere, Hosadurga, Challakere, Molakalmor	2	333	17	689	80	8116
Chickballapur	Chickballapur, Bagepalli, Shidlagatta, Chintamani, Gudibandae	4	262	8	345	13	1010
Tumkur	Sira, Koratagere, Madhugiri, Pavagada, Gubbi, CN Halli, Kunigal	5	220	14	329	-	-
Kolar	Bangarpet, Kolar, Mulbagula	1	60	3	90	3	1130
Total		16	1126	53	1934	227	14992

Trainings conducted in all districts under Bhoochetana program during 2010-11

District	Taluks	District-level		Taluk/village-level			
		No. of		No. of trainings			
		Trainings	Participants	Taluk level	Partici-pants	Village level	Partici-pants
Dharwad	Dharwad, Hubli, Kalaghatagi, Kundagol, Navalgund	3	172	10	197	114	4874
Bijapur	Bijapur, B. Bagewadi, Indi, Sindagi, Muddebihal	4	1058	11	1250	97	8644
Chamarajanagar	Chamarajanagar, Gundlupet, Kollegal, Yelandur	2	60	24	574	58	1200
Chitradurga	Chitradurga, Hiriya, Holalkere, Hosadurga, Challakere, Molakalmor	2	767	6	346	401	17885
Davangere	Davanagere, Harapanahalli Harihar, Honnali, Jagaluru Channagiri	4	270	6	250	156	17419

Continued

Table continued

District	Taluk	District-level		Taluk/village-level			
		No. of		No. of trainings			
		Trainings	Participants	Taluk level	Participants	Village level	Participants
Chickballapur	Chickballapur, Bagepalli, Shidlagatta, Chintamani, Gudibandae	4	99	25	706	30	1326
Bengaluru Rural	Devanahalli, Nelamangala, Doddaballapura, Hoskore	1	65	4	257	60	2298
Gulbarga	Afzalpur, Aland, Chincholi, Chittapur, Gulbarga, Jewargi, Sedam, Shashpur, Shorapur, Yadgiri	3	211	10	393	-	-
Kolar	Bangarpet, Kolar, Mulbagula, Malur, Srinivaspura	3	155	6	166	2	215
Haveri	Haveri, Byadagi, Hangal, Hirekere, Ranebennur, Savanur, Shiggaon	2	241	7	396	74	3634
Bidar	Bidar, Bhalki, Aurad, Humnabad and Basavakalyan	1	82	5	368	120	6920
Tumkur	Sira, Koratagere, Madhugiri, Pavagada, Gubbi, CN Halli, Kunigal	5	140	20	696	14	762
Hassan	Hassan, Arsikere, Channarayapattana, Belur, Alur, Holenarsipura, Arkalgudu	1	175	20	759	418	13760
Gadag	Gadag, Mundargi, Nargund, Ron, Shirahatti	1	60	4	270	16	990
Raichur	Raichur, Deodurg, Manvi, Sindhanur, Lingsugur	2	152	5	220	16	1342
Total		38	3707	163	6848	1576	81269

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

District	Taluks	District-level		Taluk/village-level			
		No. of Trainings		No. of trainings			
		District level	Partici-pants	Taluk level	Partici-pants	Village level	Partici-pants
Bagalkote	Badami, Bagalkot, Bilagi, Hungund, Jamakhandi, Mudhol	2	316	10	1368	115	5810
Bellary	Bellary, Kudligi, Sandur, Hospet, Siryguppa, H.B.halli, Hadagali	1	120	7	172	260	4120
Bengaluru Rural	Devanahalli, Nelamangala, Doddaballapura, Hoskore,.	2	77	26	1285	77	2360
Bengaluru Urban	Anekal, Bengaluru (S), Bengaluru(N), Bengaluru(E)	1	50	4	180	25	625
Belgaum	Belgaum, Khanapur, Bailhongal, Gokak, Hukkeri, Rayabag, Chiikodi, Ramdurg, Saundatti, Athani	1	300	10	525	No info	No info
Bidar	Bidar, Bhalki, Aurad, Humnabad, Basavakalyan	1	120	10	647	335	18550
Bijapur	B. Bagewadi, Bijapur, Indi, Muddebihal, Sindagi	1	395	2	302	122	6800
Chamarajanagara	Chamarajanagara, Kollegal, Gundalpet, Yelandur	2	224	8	336	92	1092
Chikkaballapur	Chickballapur, Bagepalli, Shidlagatta, Chintamani, Gouribidanur, Gudibandae	2	580	8	1350	218	3280
Chikkamangaluru	Chickmagalur, Sringeri, Tarikere, Mudgere, NR Pura, Kadur, Koppa	1	145	8	540	128	5936
Chitradurga	Challakere, Chitradurga, Hiriyuru, Holalkere, Hosadurga, Molakalmuru	2	186	9	843	30	1121
Davangere	Davanagere, Harapanahalli Harihar, Honnali, Jagaluru Channagiri	1	467	27	7371	195	60303
Dharwad	Dharwad, Hubli, Kalghatgi, Kundgol, Navalgund	2	NA	38	NA	120	NA
Dakshina Kannada	Mangalore, Bantwal, Belthangady, Puttur, Sulia	01	70	08	400	12	360
Gadag	Gadag, Mundargi, Naragund, Ron, Shirahatti	5	220	5	400	22	880
Gulbarga	Afzalpur, Aland, Chincholi, Chittapur, Gulbarga, Jewargi, Sedam	1	13	7	294	32	1444

Continued

Table continued.

District	Taluks	District-level		Taluk/village-level			
		No. of Trainings		No. of trainings			
		District level	Partici-pants	Taluk level	Partici-pants	Village level	Partici-pants
Hassan	Hassan, Arsikere, Channarayapattana, Belur, Alur, Holenarsipura, Arkalgudu	1	157	7	278	227	8250
Haveri	Haveri, Hangal, Savanur, Hirekerur, Ranebennur, Byadagi, Shiggaon	2	241	7	396	74	3634
Kolar	Bangarpet, Kolar, Mulbagula, Malur, Srinivaspura	1	16	5	110	250	1850
Kodugu	Somwarpet, Madikeri, Virajpet	1	39	3	42	6	305
Koppal	Gangaavathi, Koppala, Kustagi, Yalburga	1	50	6	325	28	2128
Mandya	Mandya, Malavalli, Maddur, Pandavapura, Srirangapatna, K R Pet, Nagamangala	1	78	1	68	47	2820
Mysore	H D Kote, Piriya-pattana Hunasuru, Mysore, K R Nagara, T Narasipura, Nanjanagudu	3	109	7	16	13	215
Raichur	Raichur, Deodurg, Manvi, Sindhanur, Lingsugur	3	314	5	268	Nil	nil
Ramnagara	Ramanagera, Magidi, Chanapatatna, Kankapura	2	262	22	820	85	2550
Shiva mogha	Shivamogha, Bhadravathi, Sagar, Hosanagar, Thithahalli, Shikaripur, Sorabha	2	320	9	450	50	1750
Tumkur	Tumkur, Sira, Koratagere, Madhugiri, Pavagada, Gubbi, Turvekere, Tiptur, CN Halli, Kunigal	3	160	21	660	31	1300
Udupi	Udupi, Kundapura, Karkala	1	55	3	212	70	4301
Uttara Kannada	Karwar, Ankola, Bhaktal, Kumta, Honnavar, Sirsi	1	50	35	1100	96	2000
Yadgiri	Shashpur, Shorapur, Yadgiri	3	145	3	180	96	8315
Total		51	5279	321	20938	2856	152099

Annexure 2

Summary of District Observation

Discussion with Agriculture Department Officials- Raichur

It is year three district. Not big variation in procedure. Everything is as per orders. Small differences at field level. Area demarcated based on main crops. Requirement calculation is based on seed demand, micro nutrient requirement and bio pesticides. Seed demand is higher compared to other inputs. Company specific seeds are on high demand. More sales of gypsum, ZnSO₄ Borax. Soil health card and recommendations are given for five major crops. Wall writing, convergence with other schemes and NGOs are also involved mainly for awareness generation and motivation purpose. SPREED organisation provide support in Raichur taluk. BAIF in Manvi taluk and Sajalshree in other linkages. These NGOs are implementing organic farming and watershed program in the same villages and therefore they are asked to provide support in awareness generation about this concept.

After Bhoochetana program coverage area under micro nutrient application increased by three to four times compared to earlier situation in the district. Targets are given by the headquarter. Crops are better after application of micronutrients.

It is generally believed that this is a poor district in Karnataka. To implement Bhoochetana in the district department is providing good support and pressure both. Close monitoring at initial stage but now field officials believe that they need better training on some technical issues. In the district, one monthly review workshop is organised at KVK campus. Field officials believe that regular field visits are a must to make this program successful.

Discussion with Agriculture Department Officials- Gulbarga

This is year two district. Survey of villages and farmer identification for baseline data collection was carried out in the district. This includes information about type of technologies adopted in use, per acre crop production etc. Selection of farm facilitator following criteria –a) should be progressing farmer; b) literate –read and write and understand; c) good at communication; d) ability to work with farmers; and 5) leadership quality.

Shortage of staff is a big issue in the district. Thus, farm facilitator contributed a lot in implementation of departmental activities. These FFs are trained by State Agriculture University. They got training for 8 to 15 days. With the help of FF extension works are started in the district. They became support hand of Hobli office. In Sedam taluk, 28 FFs were in year 2009-10 and in year 2010-11, total 23 FFs are providing their services. In first year, 40% area was covered, second, and third year respectively 30% area will be covered as per plan. This increased the workload of the officials due to large area in the first year. Last year due to rain, results were good and become favourable condition to introduce micronutrients concept.

Training of farmers was conducted on regular basis. Most important point raised by the district was - work is taken based on field reality. They suggested that continuous relationship with farmers helps in implementation of the program.

Discussion with Agriculture Department officials – Bidar

This is year two district. A total 100 villages covered in five *talukas*. Total 75 % farmers covered in the villages. Due to low awareness, there was poor response in *kharif* 2010 about use of micronutrients. *Kharif* experience of farmers increased demand of micronutrients in *rabi*.

Discussion with agriculture department officials – Chamrajanagar

The department official believe that they work hard to apply theory in the field and there are good results after application of micronutrients. Now farmers are also using bio fertilizers and micronutrients in their dryland crops.

Interestingly one of the field officer shared that he also applied micronutrient in his brothers' farm to have first hand experiences. These are few indicators, which shares success of this concept at the field.

He told that production in dryland maize got increased by 2-3 quintal/ha. For dryland area, baseline production of maize was 45 kg/ha. After application of micronutrients, it went up to 65 kg/ha in less rains area and 75 kg/ha in good rain condition.

There is good response for micronutrients application for crops like maize, groundnut, and sunflower. There is good return in crops likes ragi and sorghum too but due to poor economic return farmers are less interested to spend additional money in production of these crops.

If farmers get better income after application of micronutrients then next year demand for micronutrients gets increased and adoption also increases. Farmers are more interested to apply micronutrients in commercial crops mainly. Thus, there is need to do more work on extension of this concept. Economics of micronutrients is main indicator for its adoption in larger area. In this district, small and marginal farmers are about 80% but only 40 to 50% farmers are applying it due to financial constraints. Good publicity makes difference.

First Saturday of every month village meeting organized at Gram Panchayat. In this meeting elected representatives, official, farmers, and local officers interface and discuss about promotion of micro nutrient concept and Bhoochetana program. More farmers are interested in vegetable farming and commercial crops like turmeric, and these are all better off farmers. Photos and video were used for communication.

Discussion with agriculture department – Tumkur

Bhoochetana is in its third year of implementation. Human resource is also a big constraint in this district. Therefore, they feel that Farm Facilitator is good support at field level. Awareness about micronutrient is

Box 17: Government officials tested micronutrient in his brother's field

Dr Smutharaju, Assistant Director Agriculture told that his brother living in village Dedinduvadi, Kollegal *Taluk*, District Chamrajanagar applied 5 kg borax, 5 kg zinc sulphate, 100 kg gypsum and PSB and Trichoderma in his one acre plot of maize and groundnut in year 2010. In addition, gave irrigation to his field. Maize production was 25-30 quintal/acre earlier after application it increased up to 35-40 quintal/acre. In groundnut crop, earlier production was 8-10 quintal/acre after application it went up to 13-14 quintal/acre. Now his relatives are also applying micronutrients in their crops.

better compared to other districts. At present subsidy in this program is 50% but they demand increase in subsidy for dryland area as most of the small and marginal farmers have poor purchasing capacity. In dryland area, adoption of micronutrient is poor and market is big problem. Tagging with the seed given on subsidized rate is the best strategy. Understanding is that once farmer purchase these nutrients then they will apply it into field. However, in irrigated area there is no problem in promotion of micronutrients. If rainfall is poor, results are poor. As this year, crop failed due to poor rainfall. Groundnut farmers knew importance of gypsum application. Increase in production is there but not substantial. Now micronutrients are not easily available in the market. If popularity is not there, crop variety has to be changed. Around 2.85 lakh ha area is under Bhoochetana in the district. In Gubbi *taluk* of the district, first year 7000 ha, second year 14000 ha and third year 28000 ha area is covered. Total area is 28000 ha and it is 100% area covered.

Discussion with agriculture department – Davangere

This is second year Bhoochetana district. Preparation started in the year 2009-10. Selection of village and farmer facilitators was done carefully. Summary results of soil testing were shared with farmers. Based on these reports planning was done at village level. All planning was on pilot basis. Application of micronutrients is a new concept in the district. Earlier no micronutrient demonstration was taken. Therefore, more focus was on successful demonstration at field.

Point of view of a JDA – Davangere

Must create feel good atmosphere. During year 2009-10, zinc and gypsum supply was good. However, boron supply was not good. That is why it is needed to ensure that all inputs are available at field level. Masterpiece demonstration plots helps in promotion and adoption of any new technology. Brand image is very important to promote any input. It should be with good quality. In year 2010 krishi utsav programs were organised for mass awareness at hobli, *taluk* level followed by 60 field days. This made big impact at field level. In 2011, in *kharif* season celebrated krishi utsava at hobli level and reached at gram panchayat level. Every hobli has one tablo – mobile exhibition van like TATA ACE especially for Bhoochetana and show case successful farmer along with photo of field. Name was given as Bhoochetana Chaitanya Ratha and this helped in increasing awareness at village level. His views were clear that it should be promoted with all positive thought process with full commitment and innovation at ground. One should give their 100% in such approaches.

Point of view of an Assistant Director of Agriculture

Demonstration nearby *Taluk* and Hobli office should be taken on priority basis for better application and monitoring purpose. Forcefully supply of inputs for small area as demonstration. For assured application of additional inputs farmer facilitators play crucial role. Video is prepared and shown in all awareness campaigns. Close relatives were first contacted. Farmer facilitator has to be a progressive farmer or a seed producer and educated. Understand farmers and tell them that this is for increase in their crop production. Clear training and instructions are very important. Farmers must know about its benefit. Now farmers applying it for all crops. If staffs are also farmers and they apply in their field than it makes a big difference.

Case Studies

This section covers farmers learning in the form of case studies. There are total twenty case studies from across the state for different crops are documented. It will help in understanding farmers' observation.



Continuous Application of micronutrients increased Production – Story of Rudragauda

Mr Rudragauda Shankarguada Harti is a traditional farmer of village Devihosur, of Devihosure Gram Panchayat in Haveri *Taluk* of Haveri district. He and his brothers are having total 12.8 ha agriculture land in this village. He has 12.8 ha in joint family. He has four brothers. The following table shows that how he has increased area under micronutrients application after experiencing benefits every year. When he discussed in depth, he told that still farmers need orientation on use of micronutrient application. They could apply it as they are in position to do it. However, in most of the small and marginal farmers it is difficult to take risk. These are crop production details for last three year.

Now only farmers are aware and using micronutrients even after seeing the impact of its application adaption is limited. Still large number of farmers demanding it free then only they will apply in their field. The village has 50 % small and marginal farmers and around 450 farmers are small and marginal in the village. Total population of the village is around 10000. 1800 households live in the village.

Year	2009		2010		2011		
Crops	Maize	Maize	Soybean	Maize	Soybean	Cotton	
Area in acre	2	6	3	7	5	15	
Inputs applied	Zinc - 7.5 kg/ha Boron -5 kg/ha, Gypsum -125 kg/ha	Zinc - 25 kg/ha Boron - 5 kg/ha					
Additional expenditure	₹ 1000/ha *2 = 2000						
Production							
Before application of MN	3 t/ha		1 t/ha			12.5-15 t/ha	
After	5 t/ha	6.2 t/ha	1.5 t/ha	8.75 t/ha	1.75 t/ha	2 t/ha	
Income	@ 7500/t market rate			₹ 9000/t	18000/t	48000/t**	

** Price was low due to bumper production compare to last year when it was ₹ 70,000/ton. Production is depending upon rainfall.

Message: let all farmers apply micronutrients and they will get better production in their field.

Story of a Progressive Village

Village – Daddapur, Gram Panchayat Janwada, Taluk Bidar

Farmer facilitator Mr Shashi Rao s/o Amritha Rao Biradar, studies Bachelor of Arts, told the story of this village during meeting. He told that this is a model village selected under department scheme. This concept is mainly to develop villages with inputs of all schemes in one village and develop as a demonstration site.

Farmers are aware about soil testing in their village and based on the soil testing report application of micronutrient is being practiced. Demonstration method was adopted for developing common understanding about use of micronutrients in rainfed crops and its impact.

Community to community learning is the best method and this was adopted in this village. One exposure visit was organised to Chamol village where they experienced benefits of micro nutrient application and discussed with the farmers. In this village, total number of households is 120 but only 60 households have agriculture land. Out of 60 households 50 applied micronutrients in their field.

During discussion, farmers shared the comparative benefits of use of micronutrients in their field. This is given in the following table.

Inputs	Demonstration plot	Check plot
DAP	50 kg/ha	50 kg/ha
Gypsum	200 kg/ha	-
Zinc	25 kg/ha	-
Boron	5 kg/ha	-
Ragi	1.5 t/ha	1.0 t/ha
Soybean	2.7 t/ha	2 t/ha
Urad	1.5 t /ha	1 t/ha
Additional expenditure	₹ 625/ha	-
Benefit in soybean crops	₹ 4000	-

Initially women opposed to apply micronutrient but after experiencing benefits of it agreed to apply micronutrients in their field. When asked women in the meeting, will they purchase these input at full cost the reply was yes – loudly. Mrs Somabai W/o Lamanrao Biradar, a women farmer also shared her experience of applying micro nutrient in her crop. Benefits she got after applying micronutrients in her field are given in the following table.

Crops	Year 2010 before application	Year 2011 after application
Soybean	1.5 t from 0.44 ha	1.5 t/0.44 ha
Moongbean	0.75 t/ha	1.5 t/ha

Micronutrients gave three quintals additional bajara to Venkateshagowda

Village Nagalapura comes under Mudgal Hobli of Lingasugur taluka. In village Nagalapura, 44 years old Shri Venkateshagowda is one of the small and marginal farmers doing agriculture in rainfed condition. He was taking pearl millet in traditional practices. He also joined the Bhoochetana program after getting information and benefits of it. He religiously did all work which were told to him and was very happy when he got the results. The change, which he never expected, was there in the production with small changes in application of nutrient and his farming practices. He got all the inputs from his Mudgal Raitha Samparka Kendra. Some basic information about his land, date of sowing and harvesting is given in the following table

Sl.	Information	Details
1	Crop and water sources	Bajra ,Rainfed farming
2	Survey number	2/1
3	Date of planting	28-06-2011
4	Date of harvesting	24-9-2011

He was given training before application of any input and why he needs to apply it in his rainfed crops. He agreed to apply micronutrients in his pearl millet crop. He applied gypsum @ 200 kg/ha, zinc sulphate 10 kg/ha and borax @ 5 kg/ha.

He also adopted improved technologies after training and orientation. He made following changes in his farming practices

- One week before sowing of the seeds, micronutrients were applied as per the above recommendations as basal dosage and mixed in soil.
- Planting across the slope
- Seeds were treated with the Ridomil M.Z @ 2 gm/kg
- Maintained the recommended plant population
- Two times weeding
- Training was availed:

Regular visit of farm facilitators and other departmental staff, ICRISAT staff for technical guidance helped him in taking good crop. Before adopting improved practices he was getting 0.9 t/ha production of pearl millets from his field. He was not very happy but not able to increase production with the current practices. He tried the way he was asked to apply improved technologies under Bhoochetana and he got 0.3 tons additional production in the very first year. This gave him additional income of ₹ 8400 @ rate of 28,000 to 32,000/t in the local market.

For this success, he also got support from the local farmer facilitator and department officials who made regular visit to his field after application of micronutrients as suggested by them.

Application of micronutrients brought smile on my face

The story of this very young farmer is same but it is little different as this young chap want to learn and do farming as business. Mr Tayappa Doddarangappa, a 36 yearas old farmer, has taken red gram as one of the main crops in his field. In village Hogernal, which falls in the Turvihal Hobli fo Sindhanur *taluk*, he has farming land. Most of his land is in rainfed and thus he was not in a position to earn good amount from his crops. He came to know about the Bhoochetana program and concept of micro nutrient application to strengthen his farm soil. He attended all training programs and did all the steps carefully as explained in the training program. He also took help from field level agriculture officers and farmer facilitator in application of micronutrients and other inputs. Details about his crop are given in the following table.

Sl.	Information	Details
1	Crop and water sources	Groundnut,Rainfed farming
2	Survey number	85
3	Date of planting	02-07-2011
4	Date of harvesting	02-10-2011

He also got support under the Bhochetana program. He applied gypsum (200 kg/ha), zinc sulphate (10 kg/ha), borax (5 kg/ha) and trichoderma (200 gm/kg seed) which he procured from RSK Chandrabanda. He applied simple technologies in his field after training and got handholding support at the field under Bhoochetana program. He also adopted following improved technologies in his farm:

1. One week before sowing of the seeds, micronutrients were applied as per the above recommendations as basal dosage and mixed in soil.
2. Planting across the slope
3. Seeds were treated with the Trichoderma

4. Maintained the recommended plant population
5. Two times weeding
6. Rainfed farming with check plot
7. Training was availed

Regular visit of farm facilitators and other departmental staff, ICRISAT staff for technical guidance. He told that earlier he used to get only 0.75 t/ha production of redgram from his farm in rainfed condition. However after application of these inputs which increases little production gave him 1.04 t/ha that is 0.29 t/h additional. This gave him additional income of ₹ 9280. The average price was ₹ 32000 to 38000/t during year 2011. The field day and field visits organized to demonstrate and show the results of the Bhoochethana technologies to the other farmers.

Micronutrients are beneficial in oilseed crops also: experience of Shri Laxmayya

Oilseed crops gives him good economic return as he told to Bhoochetana people but he was not sure that he can increase his production in current situation as he was taking groundnut production in rainfed condition only. Shri Laxmayya S/o Doddaseashwarappa is a 40 years old farmer from village Arisigera. The village comes under Chandrabanda hobli of Raichur taluk, district Raichur.

Sl.	Information	Details
1	Crop and water sources	Sunflower, Rainfed farming
2	Survey number	362
3	Date of planting	04-07-2011
4	Date of harvesting	15-10-2011

After his conviction, he also procured inputs from the nearest Ritha Sampark Kendra, Chandrabanda and applied in his field as told in the training program and village meetings. He applied following inputs:

1. Groundnut seeds TMV-2 Variety
2. Gypsum (500 kg/ha)
3. Zinc sulphate (10 kg/ha)
4. Borax (5 kg/ha)
5. Trichoderma (200 gm/kg)

He was also provided information about improved technologies which he adopted as such in his field. He also got support in the form on regular visit of farm facilitators and other departmental staff, ICRISAT staff for technical guidance.

1. One week before sowing of the seeds, micronutrients were applied as per the above recommendations as basal dosage and mixed in soil.
2. Planting across the slope
3. Seeds were treated with the Trichoderma
4. Two times weeding

5. Rainfed farming with check plot

6. Training was availed

He was very happy when he got production of 1.12 t/ha from the same land where earlier he used to get only 0.8 t/ha production of groundnut crop in rainfed condition. He got 0.32 t/ha additional production, which gave him additional income of ₹ 9600 after selling his produce at the rate of ₹ 30,000 to 35000 t/ha in local market. He is very happy. The field day and field visits organized to demonstrate and showed results of the Bhoochethana technologies to the other farmers for awareness.

My flowers are smiling now after application of micronutrients: a story of sunflower growing farmer

I always wanted to see my sunflower smile like sun in rainfed condition and I get good return from it. However, it was not happening and I was not sure why I am not getting good crop even doing all operations on time. This is the story of a 38 years young farmer Sri Somashekara S/o Narsareddappa, who lives in Kodluru of Chandrabanda Hobli.

He joined one meeting of Bhoochetana program in his village and he was explained to adopt the concept of maintaining soil health by application of micronutrient in his micronutrients deficient soil. He was also shown the results of soil testing. He agreed to apply these inputs in his soil.

Sl	Information	Details
1	Raitha Samparka Kendra	Chandrabanda
2	Crop and water sources	Sunflower, Rainfed farming
3	Survey number	362
4	Date of planting	04-07-2011
5	Date of harvesting	15-10-2011

He got support from agriculture department in procuring inputs from nearest Chandrabanda Raitha Samparka Kendras and following inputs, he applied in his field

1. Sunflower seeds (Kargil variety@ 6.25 kg/acre)
2. Gypsum (200 kg/ha)
3. Zinc sulphate (10 kg/ha)
4. Borax (5 kg/ha)

He told that he adopted following simple but effective improved technologies. With the regular visit of farm facilitators and other departmental staff, ICRISAT staff for technical guidance could manage all the practices he was told to adopt in his field.

1. One week before sowing of the seeds, micronutrients were applied as per the
2. above recommendations as basal dosage and mixed in soil.
3. Planting across the slope
4. Maintained the recommended plant population
5. Two times weeding

6. Rainfed farming with check plot

7. Training was availed

When he discussed about his experiences about application of micronutrients, happily, he said my flowers are smiling now and me too. He got better yield of 1.28 t/ha just after application of micronutrients. Earlier he was getting only 0.9 t/ha production from the same field. Additional production of 0.32 t/ha gave him benefit of ₹ 8960 and he also got better price for his crop. The average price of sunflower was between ₹ 28000 to 32000/t in the year 2011. Now agriculture department is organising regular field day and field visits to such farmers' plots and share results of the Bhoochethana technologies to the other farmers for awareness.

Happily growing my white gold

I wanted to grow more white gold in my field. This was dream of a 38 years old farmer Shri Hanumappa S/o Amakappa resident of village Eklaapur, Pamanakallur Hobli, and Manvi Taluk. However, he was not able to take good crop due to rainfed farming.

Sl.	Information	Details
1	Raitha Samparka Kendra	Pamanakallur
2	Crop and water sources	Cotton, Rainfed farming
3	Survey number	94
4	Date of planting	02-07-2011
5	Date of harvesting	20-11-2011

He learnt about Bhoochetana in his village and at Raitha Samparka Kendras. He attended meetings, training program at village level. Farmer facilitator of his village convinced him for applying micronutrients in his cotton field in this *kharif* season. He went to nearest RSK Pamanakallur, procured inputs, and applied it as follows:

1. Gypsum (200 kg/ha)
2. Zinc sulphate (10 kg/ha)
3. Borax (5 kg/ha)

He tried following improved technologies in his cotton field and changed his practices. eh also got support like other farmers got under the project by regular visit of farm facilitators and other departmental staff, ICRISAT staff for technical guidance.

1. One week before sowing of the seeds, micronutrients were applied as per the above recommendations as basal dosage and mixed in soil.
2. Planting across the slope
3. Maintained the recommended plant population
4. Two times weeding
5. Rainfed farming with check plot
6. Training was availed

A happy smiling man told that he never thought micronutrients can bring this much change. He got 1.12 t/ha yield in his farm where he applied all these inputs. He said earlier he used to get only 0.8 t/ha from the same field. However, this time change is visible and he gained additional economic benefit of ₹ 11520 when he sold cotton between 36000 to 41000/t in local market. He got 0.32 t/ha additional production in this season and he wish it goes on every year. Now department is following him and organising field days on such farmers' field and bring other farmers for interaction so that they can also adopt these technologies and gain benefit.

Micronutrients gave me more soya protein

Soybean farmers are facing low production issue in the rainfed condition in Haveri district of Karnataka. Nutrient deficiency was identified as one of the main reason for low productivity in rainfed condition. This was discussed with the farmers. Shri Basappa G Mugadur also learnt about this concept when he attended one meeting at village and then got some training. This 52 years old farmer of village Kunimellihalli of Savanur taluka decided to adopt this concept in his soybean field.

Sl.	Information	Details
1	Raitha Samparka Kendra	Savanur, Savanur, Taluka
2	Crop and water sources	Soya bean (JS-335), Rainfed farming
3	Survey	number 78/2A
4	Date of planting	14-06-2011
5	Date of harvesting	20-09-2011

He procured inputs from nearby RSK and applied these inputs as per instruction. His doses were as follows:

1. Soybean seeds (70 kg/ha)
2. DAP (125 kg/ha)
3. Complex (50 kg/ha)
4. Gypsum (200 kg/ha) & Urea (62.5 kg/ha), Top dressing
5. Zinc sulphate (25 kg/ha)
6. Borax (5 kg/ha)
7. Trichoderma (200 gm/kg seed)

The results were encouraging. He said he applied following technologies in his soybean field

1. One week before sowing of the seeds, micronutrients were applied as per the above recommendations as basal dosage and mixed in soil
2. One time using top dressing.
3. Planting across the slope
4. Seeds were treated with the Trichoderma
5. Maintained the recommended plant population
6. Two times weeding & Three times inter cultivation
7. Training was availed

Happy soybean farmer shared his success with all farmers of his village. He said he never thought production would increase by just adding these small inputs. He said that earlier he used to get average production of 1.3 t/ha. After application of micronutrients and other inputs, he got 1.78 t/ha. Around 37.5% increase in production compare to check plot. Additional production was 3.9 t/ha. The average price he got for his crop was ₹ 24,000/t, which gave him ₹ 11,700/ha additional income in this year. The field day and field visits organized to demonstrate and show the results of the Bhoochetana technologies to the other farmers. Documentation done for future use.

Now I can buy real pearl

Pearl millet is the crop in which farmers do not want to spent more money. Therefore, it is not a common practice to give additional inputs in rainfed crops. When the concept of micronutrient was discussed with the farmers in the village meeting, it was difficult to convince them about application of additional inputs. Sri Venkateshagowda S/o Balanagowda got convinced when explained in depth, about the concept of soil structure. How these nutrients help in strengthening soil health and its benefit. This 44 years old farmer of Nagalapura village, Hobli Mudgal, Taluk Lingasugur agreed to adopt this concept in his pearl millet field.

Sl.	Information	Details
1	Raitha Samparka Kendra	Mudgal
2	Crop and water sources	Bajra, Rainfed farming
3	Survey number	2/1
4	Date of planting	28-06-2011
5	Date of harvesting	24-9-2011

He was given training and orientation at village level about how to apply nutrient and other inputs. He procured inputs as prescribed to him from nearest Raitha Samparka Kendras and applied in the field. How much he applied in his field is given below:

1. Gypsum (200 kg/ha)
2. Zinc sulphate (10 kg/ha)
3. Borax (5 kg/ha)

The above-mentioned inputs gave him good production compared to last year. He happily shared about technologies he adopted in this season. The was given following support:

1. One week before sowing of the seeds, micronutrients were applied as per the above recommendations as basal dosage and mixed in soil.
2. Planting across the slope
3. Seeds were treated with the Ridomil M.Z @ 2 gm/kg
4. Maintained the recommended plant population
5. Two times weeding
6. Training was availed

Like other happy farmer, he openly shared the changes in the production. He got good yield after application of micronutrients. He said he got additional 0.3 t/ha production in the same field by applying these inputs.

Total production was 1.2 t/ha compared to 0.9 t/ha he used to get before application of these inputs. He said this gave him additional income of ₹ 8400. He got market price between ₹ 28000 to 32000/t. In his field, department also organised field day and field visits organized to demonstrate and showed results of the Bhoochethana technologies to other farmers for awareness.

Now no one can beat my BT

Farmer name Sri Rajshekar N Chatrad / Chikkappa Chatrad Age 55 years

Address: Village & Post: Byadagi Taluka: Byadagi Dist: Haveri, Karnataka

Sl.	Information	Details
1	Raitha Samparka Kendra	Byadagi, Byadagi, Taluka
2	Crop and water sources	Bt-Cotton (Mycho Niraj), Rainfed farming
3	Survey number	100
4	Date of planting	26-06-2011
5	Date of harvesting	18-11-2011

The facility/scheme availed from Department of Agriculture and the usage per acre with received inputs and seeds such as basal dosage

1. Bt-cotton seeds (3.75 kg/ha)
2. DAP (125 kg/ha) (50% basal & 50% top dressing)
3. Potayash 125 kg/ha (50% basal & 50% top dressing)
4. Three TL FYM before planting/acre
5. Gypsum (250 kg/ha) & Urea 125 (kg/ha), (50 % basal & 50% top dressing)
6. Zinc sulphate (25 kg/ha)
7. Borax (5 kg/ha)
8. Spring 3 times (Confider 5 ml/lit, Monocot pass 8 ml/lit, Neem oil 20 ml/lit)

Improved technologies adopted by farmer over his practices

1. One week before sowing of the seeds, micronutrients were applied as per the above recommendations as basal dosage and mixed in soil
2. Two time using top dressing & Three times using Spring (PPC)
3. Planting across the slope
4. Seeds were treated with the Trichoderma
5. Maintained the recommended plant population (60x30 size)
6. Two times weeding & 5 times inter cultivation
7. Training was availed

The yield levels before adoption of the improved technologies was only 2.06 t/ha and after applying micronutrients, she got production of 2.7 t/ha which gave him additional production about 0.7 t/ha (33.33 % over check plot). This way he also got additional financial benefits by adopting Bhoochetana technologies. The average price was ₹ 38000/t. This gave him ₹ 26125/t additional income.

Follow up: The field day and field visits organized to demonstrate and show the results of the Bhoochetana technologies to the other farmers. Documentation done for future use.

Farmers opinion: Farmers are very happy, he told continued this program and also recommendations inputs, encourage other farmers.

My moong is the best moong

Ganapatha Rao was a worried farmer in his village because he was not able to get better production of his moong bean in spite of making all efforts. He was not able to know why he is not able to get good production of moong bean when his soil is good. Sri Ganapatha Rao S/o Vitthal rao lives in village Daddapura, Post: Janawada, Taluka & Dist: Bidar. He is 52 years old and mainly does farming for his livelihood.

Like other farmers, he was also not getting good production shared his concern in a village meeting organised for Bhoochetana. There he learnt about micro nutrient application to improve soil health which strengthen the production process by meeting micronutrients requirement of plant. He decided to apply it in his moong crop.



Figure 37. Moogbeen crops at farmers and field organised at same field.

Sl.	Information	Details
1	Raitha Samparka Kendra	Janwada RSK, Bidar taluka
2	Crop and water sources	Moong bean, Rainfed farming
3	Survey number	37
4	Date of planting	28-06-2011
5	Date of harvesting	11-09-2011

He applied all practices explained to him in training and also got support from farmer facilitator at field level. He also received inputs like

1. Moong bean seeds (@ 12.5 kg/ha)
2. DAP (70 kg/ha)
3. Gypsum (200 kg/ha)

4. Zinc sulphate (25 kg/ha)
5. Borax (5 kg/ha)
6. Trichoderma (200 gm)
7. Neem oil (1 litre)

Apart from applying inputs, he also adopted standard package of practices in his field. He applied micronutrients as per recommendations as basal dosage and mixed with soil one week before sowing of the seeds. He also did planting across the slope. Before he ensured that all seeds are treated using Trichoderma. By maintaining seed rate he could manage recommended plant population in his field. Did weeding twice in season and applied neem oil for plant protection measures.

Rainfed farming with check plot

The yield levels before adoption of the improved technologies in check plot was 3.95 t/ha. He got good return after application on micronutrients as suggested. His yield reached upto 1.3 t/ha. He got additional 0.35 t/ha (37 % over check plot). He fetched good financial benefits by adopting Bhoochetana technologies. He got average price ₹ 35000/t and got ₹ 4900 additional income.

Follow up

The field day and field visits organized to demonstrate and show the results of the Bhoochetana technologies to the other farmers.

My corn is the best

Nagrajaappa s/o Bankappa Visalwadi village, Bastipura, decided to apply micronutrients in one fourth of his total land which is 0.8 ha land where he takes maize. He has total 3.2 ha of land. Two bag, 50 kg each, gypsum, 2-bag borax, trico darma, and two bags zinc sulphate he applied in this field. In 2010-11 he started applying micro nutrients. He was oriented by agriculture officer about use of micro nutrients. Before use of micronutrients he used to get 50-55 t/ha maize production. Now he got 65 t/ha. Every year yield is increasing. His plot become example for other farmers and they started buying inputs from RSK and this year 20 farmers bought 200 bags of micronutrients. He said



Figure 38. Farmer with his maize crop.

farmers are demanding more subsidies. He got additional income after application of inputs but still he is demanding more subsidies. 8750/ha additional income he got after applying inputs. After application he got additional income of ₹ 3500.

This hand is full with finger millet...

Mr Siddhesh is a farmer of Sujala village. He owns 0.8 ha of land where he grows Ragi. He was not giving much attention as it was used for own consumption and therefore he was not getting good results. He also participated one meeting of Bhoochetana program. He learned about soil testing and soil health issues and its impact if soil is deficient of micronutrients on crop production. He decided to try in his Ragi field. He told that soil samples were taken from his field and his field is found sulphur deficient. He was asked to apply 40 kg gypsum, 1 kg borax in soil. Before applying micronutrients. He was getting 3-4 quintal/acre of Ragi from his plot after application it reached to 6-7 quintal/acre. He also changed seed after 2009 and now sowing MR-1 variety. He told that agribore and zinc is expensive. He requested to reduce the price or give more subsidies. He told that most of the farmers are ready to buy gypsum. Organising village meeting is big problem. In year 2009, number of farmers was only 20 to 30 now it is increasing slowly every year. Now 40 farmers are applying micronutrient. There are total 100 farmers reside in the village.



Figure 39. Farmers in finger millet crop.

Persons Met

1. Additional Chief Secretary, Ms Meera Saxena, IAS, Government of Karnataka
2. Retired Additional Chief Secretary and Development Commissioner, Mr Abhijit Das Gupta, IAS, Government of Karnataka
3. Retired Additional Chief Secretary and Development Commissioner, Dr Shanthakumari, IAS, Government of Karnataka
4. Economic Adviser to Chief Minister of Karnataka, Prof KV Raju
5. Commissioner for Agriculture, Government of Karnataka, Dr Baburao Mudbi, IAS
6. Director Agriculture, Government of Karnataka, Dr KV Sarvesh
7. Director of Watershed Development, Government of Karnataka, Dr Rajanna
8. Joint Director Watershed, Government of Karnataka, Dr PV Veeraraju
9. Additional Director Agriculture, Government of Karnataka, Dr Dharmaraju
10. Joint Director of Agriculture(Inputs), Government of Karnataka, Mr Siddaraju
11. Deputy Director (Fertilizers & Manures), Government of Karnataka, Mrs Rajsulochana
12. Agriculture Officer, Joint Director (Inputs), Government of Karnataka, Ms Soumya Iyyannagouda
13. Deputy Director of Agriculture, Bhoochetana cell, Government of Karnataka, Mrs Deepaja
14. Associate Director of Extension, State Agriculture University, Dr K Jagadishwara

Raichur District

1. Dr Pramod Kutti, Program Coordinator, KVK
2. Dr Ravi, Soil Scientist, Asst Professor, UAS, Raichur
3. Dr SR Balanagoutar- Soil Scientist Incharge Bhoochetana
4. Mr Naresh Kumar, Technical Assistant
5. Dr Ravi, Senior Assistant Professor, Department of Soil Science, State Agriculture University, Raichur
6. Mr P Narsappa- Assistant AO
7. Mr Hanumantha Reddy, Joint Director, Raichur
8. Mr Basvaraj- AO technical- incharge, Bhoochetana.

District Gulbarga

1. Dr Raju G. Teggilli, Program Coordinator – KVK
2. Mr Manjunath, Computer Programmer

Kamalapur Hobli Headquarter, Taluk Gulbarga

1. Mr Sunil Kumar- Agriculture Officer
2. Mr Ramesh Das – Assistant Agriculture Officer – Technical

3. Mr Gulam Rasul – Agriculture Assistant
4. MR D. Lingamathan, Assistant Director of Agriculture, *Taluk Sedam*.
5. Mr Julfikar Ahmed, ADA SMS Headquarter
6. Dr J S Hilli – Program Coordinator KVK Gulbarga
7. Dr Sarojini K SMS Home Science
8. Sharvan Gauda – Okali Farm Facilitator – BA
9. Vijay Kumar – Kamalapur FF BA

District Bidar

1. Mr Mohan Rao, Research Technician, ICRISAT, Bidar
2. Mr MA Kaleem, Technical Officer, Incharge Bhoochetana Section

Village – Daddapur, Gram Panchayat Janwada, Taluk Bidar

1. Mr Shashi Rao S/o Amritha Rao Biradar- BA, Farmer Facilitator

RSK Jawada, Taluka Bidar

1. Mr Sayed Alimuddin – Assistant Agriculture Officer
2. Mrs Aarati Patil – Agriculture Officer
3. Mr T Babu Miya Agriculture Assistant
4. Mr Abdul Khudus- Islampur, Farmer Facilitator
5. Mr Sai Prakash S/o Namdev Rao –Janwada, Farmer Facilitator
6. Mr Mohmd Arshal Ibrahim – Silapura, Farmer Facilitator

Visit to KVK Bidar

1. Mr Hinderali Mallikarjun SMS Horticulture
2. Mr Ravi S – SMS Soil Science

District Chamrajnagar

1. Dr Smutharaju, Assistant Director Agriculture

Discussion with RSK Hardanhalli team

1. Mr M Ramachandran, Assistant Agriculture Officer

Discussion with KVK, Hurdanhallo, Chamrajnagar

1. Dr Umesh H R – soil science
2. Dr Naresh- Asst Professor Extension
3. Dr Krishnamurthi – Asst Professor Animal Husbandry
4. Dr Navi- Antomologist

District Tumkur

1. Mr BA Shriram Reddy, Joint Director

Gubbi Taluk

1. Mr Siddalinga Prasad, Assistant Director Agriculture –last 12 years
2. Mr D Nanajayah, Agriculture Officer, RSK Nittu
3. Mr Samoshekhar, Technical Officer, RSK Kasba
4. Mr S Shivshankar, Agriculture Assistant- RSK Incharge

District Tumkur

1. Mr D Umesha, Assistant Director of Agriculture
2. Mr Sudahkar- Agriculture Officer
3. Mr Chamakes Avamurthy, Agriculture Officer Raitha Samparka Kendra, Nina vinaters
4. Mr Rudrappa, Assistant Agriculture Officer, Raitha Samparka Kendra, Kalale

Village Mosahalli, Gram Panchayat- Rangapura

1. Farmer- Harish S/o Vijayshankar
2. Sarpanch Prakash S/o Shankar Hingappa
3. Farmer Facilitator- Mr Ashok S/o Guru moria- educated up to degree.

District Davangere

1. Dr RG Gollar, Joint Director Agriculture
2. Mr Shiva Rudrappa, Vice President of *Taluk* Panchayat Dhavangere
3. Mrs Pratibha Mallikarjun, President of *Taluk* Panchayat Dhavangere
4. Dr Devraj, Program Coordinator, Krishi Vigyan Kendra, Taralabalu Rural Development Foundation
5. Dr BO Mallikarjun, Agronomist, KVK Taralabalu Rural Development Foundation

District Haveri

1. Mr SK Kemparaju, Joint Director of Agriculture.
2. Mrs R Devika, Deputy Director- Incharge Training Centre
3. Mr VK Shiva Lingappa– Technical Officer 2009
4. *Taluk* Office – Byadgi, Assistant Director- Mr Shivshankar, H. D.
5. Mr AB Shivannanavar, President of Farm Facilitators Federation

Discussion with the farmers at Raitha Samparka Kendras

1. Mr Ganganna Eli. P village Bydgi
2. Mr Chikkappa Chaitrad – Vilalge Bydgi
3. Mr Tippanna Saler- Village Kadarmandgi
4. Mr GR Yogikoppa – Village Sidenor

5. Farmer Facilitator – Mr MB Pujar – Village Bannihatti
6. Farmer Facilitator – Mr P Annappa – Village Belekera

Discussion with ATMA team

1. Dr S Purushottam, Deputy Director – Samiti South, Bengaluru Urban.
2. Dr Shridhar Adige, Agriculture Officer

Discussion with Nodal Officers for each district

1. Mr D Raju - Nodal Officer, Davanagere district, phase II

Discussion with

1. Prof N Devkumar – coordinator RKVY and
2. Mrs L Ropa, Deputy Director – in-charge RKVY.
3. Discussion with Dr PL Patil, Head, Department of Soil Science.

References

1. Budget notes of Karnataka state government 2009-10, 2010-11 and 2011-12
2. Economic Survey of 2010-11
3. Economic Survey of 2011-12
4. **KV Raju, Mudbi Babu Rao, KV Sarvesh, NC Muniyappa, Abhijit Dasgupta and SP Wani.** *A Mission to Enhance Productivity of Rainfed Crops in Rainfed Districts of Karnataka, India.*
5. **Annual Progress Report 2009-10.** 2010. Bhoochetana: Mission Project on Rainfed Agriculture: Bridging Yield Gaps through Science-led Interventions for Sustainable Use of Natural Resources in Karnataka. February 2009, ICRISAT, Patancheru, India.
6. **ICRISAT.** 2009. Bhoochetana: Boosting Rainfed Agriculture in Karnataka, In Mission Mode: Bridging Yield Gaps in Dryland Crops, Karnataka Department of Agriculture. 472-2009, Booklet, February 2010, ICRISAT, Patancheru, India.
7. **ICRISAT.** 2010. Bhoochetana: Mission to Enhance Productivity of Rainfed Crops in Karnataka, Brochure, October 2010, ICRISAT, Patancheru, India.
8. **Wani SP, Sahrawat KL, Sarvesh KV, Baburao Mudbi and Krishnappa K (eds.).** 2011. Soil Fertility Atlas for Karnataka, India. Patancheru 502 324, Andhra Pradesh, India: International Crops Research Institute for the Semi-Arid Tropics. 312 pp. ISBN 978-92-9066- 543-4. Order code: BOE 055.



International Crops Research Institute for the Semi-Arid Tropics

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