Vicissitudes of Agriculture in the Fast Growing Indian Economy: Challenges, Strategies and the Way Forward

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INDIAN SOCIETY OF AGRICULTURAL ECONOMICS
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Fast Growing Indian Economy

Challenges, Strategies and the Way Forward

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Institutional Partnerships and Policy Process to Boost Productivity of Rainfed Agriculture in Karnataka, India
A Case Study of Bhoochetana

Background
The vast majority of farmers in the developing world are smallholders. An estimated 85 per cent of them farm less than 2 hectares (World Bank, 2008). Moreover, 75 per cent of poor people live in rural areas, of which 2.1 billion survive on less than $2 a day and 880 million on less than $1 a day. Most of them depend on agriculture for their livelihoods (World Bank, 2009). Thus, promoting integrated sustainable agriculture farming systems to meet food and nutrition needs is imperative for meeting the Millennium Development Goals (MDGs) of halving poverty and hunger by 2015 (United Nations, 1995). This requires complementary knowledge from formal agricultural R&D (research and development) and support from policies and other institutions. Therefore, in order to accelerate sustainable agricultural development, it is essential to link formal and informal knowledge and innovation. Innovations need to involve technologies, organisations, institutions or policies for significant improvement in performance.

In order to meet the growing food demand and nutritional security through public policy and institutional reforms, India has explored several innovative ways of agricultural development (GoI, 2011) Agricultural development plans are no longer concerned exclusively with staple food production, but presently give far more attention to diversification into new crops, products and markets, as well as adding value in order to serve new markets better (GoK, 2007;
To meet the nutritional demand of poor households in the country, the present Food Security Bill (FSB) (2011) emphasises on the inclusion of all types of foodgrains like finger millet, pearl millet and sorghum. As new markets for agricultural products and services change continuously, agricultural development depends more than ever on a process of continuous, incremental innovation. The scope for innovation includes not only technology and production but organisations, management and marketing changes (World Bank, 2006). The World Development Report (2008) states that in developing countries, investment in agricultural research resulted in a 43 per cent average return rate. This has come about more through a partnership mode than a vacuum. Partnership concepts emphasise on adaptive tendencies, convergence and synergies to reach the common goal of technology dissemination and improvement of rural livelihoods.

A recent policy review on food security states the challenges lying ahead in reducing poverty, food insecurity and malnutrition (GoI, 2011). The reviewers seemed to have overlooked the integration and convergence of knowledge, management aspects and socio-institutional components. How have these innovative solutions enabled policy processes to build sustainable agriculture development? This paper attempts to answer the question. It also identifies the changes needed to achieve the goal. This is done through:

(i) Analysing a scaling-up model to substantially increase crop yields of millions of smallholders in the drylands of Karnataka.
(ii) Analysing the policy processes followed and its usefulness in evolving an innovative partnership concept.
(iii) Guiding investments in order to support the development of an agricultural technology, thereby halving the poverty in a fragile environment.

The World Development Report (2008), which strongly advocates innovations in agriculture and technology, reveals that the knowledge divide between industrial and developing countries is widening. This is driven by rapid growth of private investments in R&D (research
and development). Developing countries such as India, invest only a ninth of what industrial countries put into agricultural R&D as a share of their agricultural GDP (gross domestic product) (World Bank, 2008). This is a matter of concern. Thus, in order to break free from the shackles of poverty there is an urgent need to improve productivity, profitability and sustainability of smallholder farming, through agricultural development (GoI, 2007). The role of small farms in development and poverty reduction is well recognised (Lipton, 2006). Global experience has demonstrated that GDP growth through agriculture is, atleast, twice as effective in reducing poverty as that compared to non-agricultural activities (World Bank, 2008). Small holdings face new challenges with respect to integration of value chains, liberalisation and globalisation effects, market volatility and other risks, as well as vulnerability, adaptation of climate change, etc. (Thapa and Gaiha, 2011). Hence, in the context of these worldwide processes of farm change, support is needed for small holdings; and inclusivity needs to be promoted proactively in market-oriented development (ICRISAT, 2009). It may be noted that agricultural technologies are "scale neutral and not resource neutral" (Singh et al., 2002). Adaptation of Integrated Genetic Natural Resource Management (IGNRM) approach by International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) and its partners have revealed that persistent yield increases are achieved through improved land, water, crop and nutrient management in rainfed agriculture. This has been the outcome of long-term on station research and participatory watershed management on farmers' fields in Asia. It has also been demonstrated that existing gaps between the farmers' yields and achievable potential can be bridged (Wani et al., 2003; 2012b).

**Stagnant Agricultural Growth in Karnataka**

Agriculture though is not a major contributor to the GSDP (gross state domestic product) of Karnataka anymore, its share has declined from 43 per cent in 1980-81 to 26 per cent in 2001-02 and 16.8 per cent during 2007-08. Yet, it remains the main source of livelihood for 60 per cent of the total population, whose improvement is a challenge.
Though Karnataka has achieved self-sufficiency in foodgrains, it experiences constant deficit in the case of pulses and oil seeds. Nearly 55 per cent of total foodgrain production and 74 per cent of oilseeds production comes from rainfed agriculture in Karnataka. Thus, enhancement of rainfed agriculture productivity is crucial for food security and well-being of the people in the state. According to a study carried out by ICRISAT (Singh et al., 2009), a huge gap exists between current farmers' crop yields and potential yields (Figure 12.1), with reference to major rainfed crops (finger millet, groundnut, maize, sorghum and soybean) grown in Karnataka. Scientists and agricultural practitioners have proved that rainfed agriculture has a lot of untapped potential, through various demonstrations (Wani et al., 2002; 2012a). Therefore, the solution demands adoption of various dryland production technologies available by undertaking R&D in partnership mode, through integrated approach with convergence, collective action, consortium and capacity building (Wani et al., 2003; 2008; 2011).

In the light of this, Government of Karnataka (GoK) brainstormed about the complex issue of stagnant growth of agricultural sector of the state and sought the assistance of ICRISAT in suggesting a strategy and execution suitable for local conditions. The project was launched as Bhoochetana¹ in livelihoods of dryland farmers during May 2009 (implementation period 2009-2012). The sole objective of the mission was to improve

From Pilot to Scaling-up

During 2005-2007, a scientific study on productivity enhancement in Karnataka was conducted on a pilot basis (Wani et al., 2008). By adopting science-based development approach, the Sujala-ICRISAT initiative addressed the problem in 50 micro-watersheds, covering 3,700 ha in six selected districts (Kolar, Chikkaballapur, Tumkur, Chitradurga, Haveri, and Dharwad). This included soil health assessment, mapping and improvement by applying soil test-based nutrient management practices, along with

¹. Bhoochetana in local Kannada language means rejuvenating soil strength.
seeds of improved high-yielding and stress-tolerant crop cultivars, soil water conservation measures, etc. This was carried out on large farmers' fields to demonstrate that scientific technologies can bridge the existing crop yield gaps. The results (Table 12.1) demonstrated the power of a science-based approach in unlocking the potential of dryland agriculture in the state; crop yields increased between 33-58 per cent, in spite of poor rains during 2008.

Bhoochetana, a path-breaking project focuses on: (i) boosting rainfed farming and enhancing crop productivity; (ii) science-based approach to assess yield gaps; (iii) ensuring benefits reach a large number of people and small farmers; and (iv) designing a win-win strategy to harness the potential of rainfed agriculture in the state.

**Figure 12.1**

*Yield Gaps Between Farmers’ Field Crop Yield and Potential Yield of Various Dryland Crops in Karnataka*

![Graph showing yield gaps between farmers' field crop yield and potential yield of various dryland crops in Karnataka.](image)

*Source: ICRISAT, 2009.*

**Innovation in Partnership**

*Government of Karnataka and ICRISAT*

The rainfed region is a complex system which needs inputs and expertise from many partners. Thus, partnership between national
and international scientific research organisations, along with the state government, is formed to achieve dissemination of new technologies to the end-users. This is also essential to understand the mechanisms needed for convergence among the various players and activities.

### Table 12.1

*Crop Yield Increase in Karnataka by Improved Management in Kharif Crop Season 2008*

<table>
<thead>
<tr>
<th>Crop</th>
<th>Grain Yield (kg per hectare)</th>
<th>% Yield Increase in Rainfed Crops</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Farmers' Management</td>
<td>Improved Management</td>
</tr>
<tr>
<td>Ragi</td>
<td>1750</td>
<td>2770</td>
</tr>
<tr>
<td>Groundnut</td>
<td>1300</td>
<td>1940</td>
</tr>
<tr>
<td>Maize</td>
<td>4760</td>
<td>6490</td>
</tr>
<tr>
<td>Soybean</td>
<td>1225</td>
<td>1635</td>
</tr>
</tbody>
</table>


With global scientific organisations, partnerships could lead to faster progress as well as attitudinal changes among state actors (officials and policy makers). Moreover, an external agency with good scientific knowledge and institutional back up and a neutral forum to act as facilitator is critical to bring key partners together. Both public and private sector organisations have their own strengths and could complement each other's efforts in taking research from lab to field. This can be done with an enabling system, through a consortium model developed and tested by ICRISAT (Shambhu Prasad *et al.*, 2006). This partnership has proved its strength over time and emerged as exemplary to other states.

Built on a strong foundation laid during the Sujala-ICRISAT initiative in 2005, an innovative partnership between the GoK and ICRISAT was developed. This was undertaken to enhance the impact by translating strategic research into research for development. Based on the Sujala-ICRISAT experience during 2009, the Department of Agriculture (DoA), GoK requested ICRISAT to provide technical support through a mission mode approach for increasing productivity of crops in rainfed areas through the *Bhoochetana* project.
**Bhoochetana**

The goal of Bhoochetana was to make a difference in the lives of dryland farmers by increasing average crop productivity by 20 per cent in the four year project period. The programme started in March 2009, when the first meeting was chaired by the Additional Chief Secretary and Development Commissioner, GoK. In this meeting, aspects relating to success of Sujala watershed project, its learning, possibilities for scaling up in a refined manner were discussed. A new programme to tackle poor productivity related aspects in dryland areas of Karnataka was identified. This helped in conceptualising the Bhoochetana programme. In the following weeks, a series of Government orders were issued to design and execute it. These orders were converted into guidelines during the years 2009-10 and 2010-2011, for effective execution, by the DoA.

**Scaling up**

To increase the effectiveness of technologies and reach a greater number of people, the scaling up process of Bhoochetana adopted a multi-level refinement strategy. In the first year, six districts where Sujala watershed project was implemented were taken up where soil mapping results were available. With an effective monitoring and evaluation process, knowledge acquired from the initial years (from 6 districts) was used to scale up (to 30 districts) the model, to create a larger impact in the entire state. The process occurred in an iterative and interactive cycle, as the experience from scaling up fed into new ideas and learning.

**Strategy**

Through convergence of various government programmes and schemes implemented by a consortium, the project adopted a mission approach. The consortium consisted of different line departments of

---

2. Participants of this meeting include, Principal Secretaries/Secretaries, Commissioners, Directors of all concerned departments (agriculture, horticulture, livestock, watershed, agriculture markets, cooperation), Economic Advisor to Chief Minister, scientists from ICRISAT, University of Agriculture Sciences, and University of Horticultural Sciences. Afterwards, the entire team used to meet once in a fortnight, to review and monitor. This was a major booster from the top level to all field level officers.
GoK, along with academic institutions like University of Agricultural Sciences located in Bengaluru, Dharwad and Raichur, and an international institution working in the area of dryland agriculture worldwide. For better planning, execution and monitoring, the GoK constituted a high-powered committee chaired by the Additional Chief Secretary and Development Commissioner. The committee reviewed the performance of the project every fortnight. It also played a crucial role in making this project successful in the state.

The most important factors of the strategy were: (i) soil-test based nutrient management with a major thrust on micronutrients application; (ii) supply and distribution of inputs at 50 per cent incentive at *hobli* and cluster village level; (iii) services of FFs (farmer facilitators) and LFs (lead farmers) for sharing of technology and disseminating knowledge; (iv) enabling policies to fill the gaps in a timely manner; (v) wide publicity through wall writings, posters, village meetings and mass media; (vi) effective project monitoring and feedback.3

The Mission adopted the principal of four Cs, i.e., consortium, convergence, capacity-building and collective action. A consortium of development agencies such as line departments of the state government and FFs, along with academic and research institutions was formed. Convergence of all schemes of DoA (state and central levels) into *Bhoochetana* was done followed with a creation of a dedicated *Bhoochetana* cell at DoA headquarters, to deal with implementation, planning and monitoring activities. Demand driven approach—farmers to register and pay 50 per cent of input costs—was one of the hallmarks of the project. This cultivates the habit of ownership among farmers and ensures better participation.

*The Process*

The project has been implemented on a mission mode and different levels of coordination have been established, starting with clusters of villages in each *taluk* linking-up with *Taluk Coordination*

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3. FFs are local level para workers (extension agents) to act as link between farmers and DoA. LFs are knowledgeable experienced local farmers for advising/sharing information with the farming community during peak period of a crop season.
Committees (TCCs), District Coordination Committees (DCCs) and State Coordination Committee (SCC). Communication was very regular and shared through video conferences and emails to speed up the process at field level. The high powered committee reviews the performance of the project every fortnight.

*Bhoochetana* was implemented strategically over a four-year period to make essential gains in an effort to improve agricultural productivity, rural incomes and nutrition. With effective monitoring and evaluation processes, knowledge acquired from the initial year was used to scale up the model. This was done 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 (Table 12.2).

The unique mechanism of scaling up with comprehensive planning, review and monitoring along with new institutions like FFs, LFs, Raitha Samparka Kendras (RSKs) and supporting policies enabled the consortium to cover large areas in the state. The project started with six districts covering 0.23 million ha in 1,440 villages during 2009-10 and touched a significant level of area coverage (around 3.73 million ha in 2012-13 with 4.39 million farmers in 30 districts).

**Key Tasks Performed**

**Soil Testing**

Soil testing was carried out in all the project districts in a phased manner. During the year 2007-08, soil testing was done through stratified sampling soil testing in were done by both ICRISAT and DoA. Based on these, recommendations for different crops were developed by ICRISAT (Sahrawat et al., 2008a; 2008b). Soil test results and soil fertility cards with *taluk*-wise fertilisers recommendation were given to farmers in the project villages.
Table 12.2  
**Key Processes, Major Decisions Made and Output**

<table>
<thead>
<tr>
<th>No.</th>
<th><strong>Key Processes</strong></th>
<th><strong>Major Decisions</strong></th>
<th><strong>Output</strong></th>
</tr>
</thead>
</table>
| 1.  | Selection of resource agencies | • 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 | • Timely availability of information and knowledge  
• Close follow up on adoption of technology |
| 2.  | Strong monitoring system | • High powered 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, there was a nodal senior officer for each district, which made a big impact in strengthening work at ground level. | • Better planning  
• Timely execution  
• Increased reach at field level  
• Proper information sharing at all levels |
| 3.  | Appointing FFs and LFs | • One FF from the village for every 500 ha LF to implement concepts at field level | • 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 | • A well established procurement system to ensure quality procurement of inputs  
• Properly monitored at higher level | • Quality input available at cluster and hobli level  
• Easy access for farmers  
• Timely application |
| 5.  | Storage facility at cluster level and village level | • To increase reach of farmers storage of inputs at cluster and village level | • Inputs are stored at cluster level and available for farmers as per their requirement |

*contd...*
contd...

6. Special budget for FF, LF, storage and transportation of input
   - Provision in the state budget to ensure timely activities at field
   - 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
   - LFs could take up demonstrations on their plots

7. Efficient communication
   - 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
   - Farmers are aware about importance of micronutrients in keeping crop healthy
   - Increased awareness
   - Farmer awareness regarding outcome of each micro nutrient, after application in the field

Note: The data collected from crop cutting experiments revealed that productivity enhancement in the range of 21 to 66 per cent was recorded in different crops during the four year period.

Farmers' Registration

This was a new concept in a large-scale program like Bhoochetana, for better monitoring, coverage and improvement of farmers' participation. A mandatory single format of registration for the farmers was prepared after brainstorming with stakeholders and implemented mainly to monitor and ensure that it reaches the target farmers.

Training

The project team, along with ICRISAT team did commendable work at field, district and state level, by conducting timely quality trainings. ICRISAT contributed in developing master trainers at state and district levels. Local Universities, district officials of agriculture department and Krishi Vigyan Kendras (KVKs) built the field level team to work on the programme.
Awareness

Mass awareness programmes were organised at village level to inform the farmers about programme. Awareness creation regarding technologies was done through village meetings, posters, leaflets, folk dance, paper advertisements, field days and mass media. District specific communication materials were developed and published.

**Box 12.1**

*Key Project Activities*

- Capacity Building of Stakeholders.
- Awareness and field publicity campaigns.
- Awareness building on soil nutrient status.
- Assistance in setting up analytical laboratory.
- Scaling-up soil, crop and water management technologies for boosting productivity of selected crops.
- Organising field days and awareness creation.
- Integrated Pest Management in the selected field
- Ensuring input supply and distribution well in time.
- Godown arrangement and stocking of inputs well in time.
- Detailed planning of the target areas, inputs needed and regular monitoring and evaluation.

**Wall Writings**

The wall writing concept adapted from the watershed department was used as an effective communication mechanism in Bhoochetana. The size, colour scheme and structures of the wall writings were finalised and simplified. Common wall writings are now done in all villages. Crop production technologies, soil fertility status, and related information are depicted through these.

The project was initially approved for 20 districts covering 4 million ha and was extended to four more districts by the cabinet committee. In 2013, the state government extended the programme to all 30 districts. Bhoochetana was identified as a flagship programme at the state level. Dryland areas in each taluk is given priority in Bhoochetana. Separate lists for irrigated and rainfed area have been prepared for monitoring purposes.
Soil Nutrients Diagnosis

To understand soil health and nutrient requirements, a diagnostic study was launched. By end of 2012, a total of 92,000 soil samples were tested (Raju et al., 2013). These soil samples were analysed for diagnosing macro and micronutrients status. Based on the established critical limit for each nutrient, fields were categorised as deficient or sufficient. Individual farmers were provided soil health cards indicating the nutrient status in the soils of the fields sampled in the village. Soil nutrient status in sample taluks, and sample area and soil health cards distributed to farmers in local Kannada language are shown in Figure 12.2.

Field Days and Field Visits

As part of the Bhoochetana programme, field days were conducted at village level. Roughly more than 150 farmers participated in each field day. These field days were successful in generating awareness on application of micronutrients for rainfed crops.

Greater participation of farmers and other practitioners in these events enabled sharing of outcomes of field demonstrations and discussions with stakeholders. A well-coordinated effort between the DoA and ICRISAT scientists led to the success of these events of

Ensuring Inputs Supply

Proper and timely procurement of inputs is essential to ensure timely interventions at farmers' field level. In Karnataka, procurement of inputs is part of the ongoing process. To ensure transparency, etendering has been put to use in the state.

Demand for various inputs elicited at district level is aligned at the state level. ICRISAT's recommendations, based on soil analysis, are the basis for planning input supply. At this stage, achievable targets are set up to 50 to 60 per cent of total planned area demand. Based on this demand, a pool of 4 to 5 selected suppliers are allocated for each district. Indents are given by the Joint Director of Agriculture (JDA) at district level. This is primarily for major sources of micronutrient formulations like gypsum, zinc sulphate and borax.
Figure 12.2

Nutrient Status of Farmers' Fields in Different Taluks of Chitradurga District

[Graph showing nutrient status for different locations: Molakalmur, Hosadurga, Holalkere, Hiriyur, Chitradurga, Chellakere. Each bar represents the percentage of fields deficient in specific nutrients: OC, Olsen P, K, S, B, Zn.]

[Map of Karnataka showing distribution of zinc deficiency in Chitradurga District.]
Input Supply Monitoring

At the head office of the DoA, all suppliers are called for a meeting to review the supply process and address the issues emerging in supply of inputs at field level. All relevant information is collected only through email. Information about supply is shared with the Bhoochetana cell. Bio-fertilisers are supplied to the farmer through this system as well. This has ensured timely availability of inputs at farmers' level. Fertiliser requirement for major nutrients was assessed twice a year and demand was forwarded to GoI. For better coordination and supply of inputs, three meetings were organised at the Directors' level during the season. At the field level, the vigilance team ensures quality of inputs supply.

Convergence of Funds for Input Supply

Funds were 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 Programme, National Program me for Management of Soil Health and Fertility, Enrichment of Soil Fertility-state sector scheme, etc.

Implementation

Coordination Committees

Coordination was done at different levels, starting with a cluster of villages in each taluk by linking up with taluk coordination committees, DCCs and SCC. To speed up the process at field level, communication was regular and shared through emails. The JDA was given special responsibility of overseeing Bhoochetana activities; this has improved the process of implementation and decision-making.

The SCC is a high powered committee constituted with state level senior administrators of GoK, Economic Advisor to Chief Minister, Directors of DoA and Watershed Development Department, three Vice-Chancellors of the University of Agricultural Sciences (UAS) in Bangalore, Raichur and Dharwad and Project Coordinator of ICRISAT. It was chaired by the Additional Chief Secretary and Development
Commissioner, who guided the mission and helped in fixing targets and mechanisms to achieve them.

The SCC dealt with various issues: (i) Convergence of different line departments and consortium partners through appropriate administrative and legal guidelines; (ii) Guiding the consortium partners for resources and targets; (iii) Periodic review and progress monitoring, including reviewing reports from the district and taluk level; (iv) Identification of suitable strategies for successful execution of the project by marshalling support from concerned line departments, policymakers and elected leaders, e.g., budgetary provision for storage of inputs at field level and supply of inputs on time.

**Figure 12.3**

*Structure of State Coordination Committee*

**Planning and Monitoring Mechanism**

**State Coordination Committee (SCC)**

ACS-ADC
Principal Secretary (Ag), Commissioner (Ag), Commissioner (WD), VCs-UAS (Bengaluru, Raichur and Dharwad), Economic Advisor-CM, PC-ICRISAT
and Director (Ag) as Secretary

**District Coordination Committee (DCC)**

JDA
DWOO, UAS rep., ICRISAT rep.

**Taluk Coordination Committee (TCC)**

ADA
AO, AO (WDD), UAS rep., ICRISAT rep.

**Village 1 Cluster 5-10 villages**

AAO (f), WDD rep., (f) Lead Farmers (3)

**District 1**

**District 5**

Taluk “n”

Village “n” Cluster “n”
Pivotal Role by Department of Agriculture

During the first year, the DoA identified two major rainfed crops in six selected districts. In the subsequent years, in a gradual manner, entire crop area for the selected crops was targeted (Table 12.3). The Director (Agriculture) served as the nodal officer and steered the implementation, with support from district, taluk level officers and support from FFs and LFs in each village. The DoA ensured timely availability of necessary quality inputs (seeds, fertilisers including micronutrients, sowing machinery, pest control measures).

<table>
<thead>
<tr>
<th>Activity</th>
<th>Year</th>
<th>Districts 1–6</th>
<th>Districts 7–15</th>
<th>Districts 16–30</th>
</tr>
</thead>
<tbody>
<tr>
<td>Productivity enhancement</td>
<td>2009</td>
<td>25</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2010</td>
<td>50</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2011</td>
<td>75</td>
<td>66</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>2012</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Nutrient status mapping</td>
<td>2009</td>
<td>100</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2010</td>
<td></td>
<td>100</td>
<td></td>
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<tr>
<td></td>
<td>2011</td>
<td></td>
<td></td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>2012</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capacity building</td>
<td>2009</td>
<td>100</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2010</td>
<td></td>
<td>100</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2011</td>
<td></td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

Since farmers generally procure materials ahead of the start of the season, adequate stocks were ensured at cluster level, before the onset of monsoon. To cover planned area in the district, the department provided day-to-day supervision, timely supply of nutrients and ensured required target to be made. The Department staff, along with other consortium partners, undertook crop cutting experiments to record yield data.

4. Director (Agriculture) is the administrative head below the rank of Commissioner and the Principal Secretary (Agriculture)
Proactive Role by Consortium Partners

ICRISAT facilitated the mission project and provided guidance, strategy, and technical support for undertaking productivity enhancement activities in the selected districts of Karnataka. ICRISAT deployed a large pool of field staff to provide soil test-based nutrient recommendations. It was based on the soil mapping done by stratified sampling method in the districts and preparing GIS-based nutrient maps. Led by ICRISAT, training of farmers at district level was held with SAUs (state agricultural universities) tie ups.

By providing knowledge as well as guidance and local logistical support for knowledge-sharing with farmers, the SAUs provided technical support. They assisted in developing fertiliser recommendations, identifying suitable high-yielding cultivars of the identified crops, management practices and pest control measures at district level. Scientists at district and taluk level, besides assisting ICRISAT in undertaking training programmes for the FFs and LFs, regularly visited the project areas along with other partners and guided the project implementation.

Key Results

Higher Crop Productivity

Grain production increased by 18 per cent in finger millet (in Tumkur district) and was highest (73%) in maize (in Chamarajanagar district), as shown in Annexure Table A-12.1 and Table 12.4. During the 2011-12 kharif season, increase in crop production was at a maximum of 21 per cent for paddy in Kodagu district to 63 per cent for pearl millet in Koppal district.

Table 12.4

<table>
<thead>
<tr>
<th>Year</th>
<th>Chickpea</th>
<th>Greengram</th>
<th>Groundnut</th>
<th>Maize</th>
<th>Pigeon pea</th>
<th>Blackgram</th>
<th>Finger Millet</th>
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<td>34.1</td>
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<td>31.9</td>
<td>29.1</td>
<td>35.2</td>
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</table>
Better Crop Planning to Enhance Crop Productivity

Major crops were identified in the selected 30 target districts of Karnataka. Cropping targets for kharif and rabi seasons were scaled up in a gradual manner during 2009-10 to 2012-13 (Table 12.5). This approach has made it possible to disseminate results to neighbouring areas in a more convincing manner.

Table 12.5
Cropping Planned and Actual Area Sown during 2009-10 to 2012-13

<table>
<thead>
<tr>
<th>Year</th>
<th>Districts</th>
<th>Crop Season</th>
<th>Crops</th>
<th>Target Area Crop-wise (million ha)</th>
<th>Total Area Sown (million ha)</th>
<th>% Area Sown</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009-10</td>
<td>6 Kharif</td>
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<td>Finger millet, maize, groundnut, soybean</td>
<td>0.188</td>
<td>0.16</td>
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<tr>
<td></td>
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<td></td>
<td>0.6</td>
<td>0.05</td>
<td>81.2</td>
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<td>2010-11</td>
<td>16 Kharif</td>
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<td>Finger millet, maize, groundnut, soybean, cotton, pigeon pea, pearl millet, black gram, sorghum, green gram, chickpea</td>
<td>1.32</td>
<td>1.2</td>
<td>91.3</td>
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<td></td>
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<td></td>
<td>0.036</td>
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<td>91.4</td>
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<td>2011-12</td>
<td>30 Kharif</td>
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<td>Finger millet, maize, groundnut, soybean, cotton, pigeon pea, pearl millet, black gram, sorghum, green gram, chickpea</td>
<td>2.95</td>
<td>2.66</td>
<td>90</td>
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<tr>
<td></td>
<td>11 Rabi</td>
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<td></td>
<td>0.79</td>
<td>0.64</td>
<td>81</td>
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<tr>
<td>2012-13</td>
<td>30 Kharif</td>
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<td>Finger millet, groundnut, pigeon pea, soybean, cowpea, green gram, maize, pearl millet, sunflower, safflower, sorghum, cotton, rainfed paddy</td>
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</table>

Enhanced Use of Inputs

During the first year of the Bhoochetana project, use of recommended fertilisers and micronutrients by farmers was low in selected districts. Owing to its advantage in enhancing crop...
productivity and income (Table 12.6), in some districts already covered earlier, farmers purchased inputs. During the third year of the project, consumption of zinc sulphate (ZnSO₄) doubled and boron by five folds. During the fourth year of the programme, the consumption of micronutrients marginally declined as compared to previous years due to unfavorable rainfall in the state.

<table>
<thead>
<tr>
<th>Crop season</th>
<th>Area Covered (million ha)</th>
<th>Quantity Consumed (t)</th>
<th>Nutrient Used (kg ha⁻¹)</th>
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<td>2009-10 (Rabi)</td>
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**Agricultural Growth at the State Level**

It is important to note that agricultural growth rate of the state prior to implementation of Bhoochetana varied between negative and 0.5 per cent. Interest and commitment at the top level (both people's representatives as well as bureaucrats) has helped to achieve the desired impact. It is highly satisfying that this initiative has shown a growth rate of 5.9 per cent even by the second year of the project. After many years, this rate of agricultural growth has been possible. During 2009-10, 0.87 million farmers cultivating 1.2 million hectares of dryland in 16 districts have benefitted from this scheme. This has been brought about through an increase in yield by 25 to 40 per cent. During the last 3 years, 2.17 million quintals of quality seeds have been distributed at subsidised rates to 8.1 million farmers for improving crop productivity.
Under this scheme, 16 crops were covered, and yield increase varying from 21 to 43 per cent has been achieved (GoK, 2013). It was reported by the government that 12.5 million tonnes of foodgrain production was estimated in 2012-13, which was more than 11.8 million tonnes for 2011-12. This achievement, despite the drought situation, stands testimony to the efforts made by our farmers and the government. Due to our constant efforts, share of the agricultural sector is 15.3 per cent of State GDP during 2012-13. Despite drought situation, growth has shown 4 per cent increase on a year to year basis (GoK, 2013).

**Triggers for Success and Key Lessons**

**Soil Testing**

District-wise soil nutrient status mapping has been completed and Taluk-wise maps with nutrient status have been prepared. Taluk-wise nutrient recommendations and fertiliser dosage of *kharif* crops were developed. From each selected village, 20 soil samples were collected through stratified sampling process; ICRISAT conducted soil testing and prepared soil health cards.

**Developing Partnerships**

A consortium of partners including knowledge-generating and knowledge-transforming institutions has helped millions of small and marginal farmers in Karnataka. The partnership helped in dealing with agricultural extension services by creating new institutional arrangements such as FFs, LFs, convergence and creation of a *Bhoochetana* cell in the state. Since the inception of this initiative, FFs and LFs are the new extension agents effectively disseminating knowledge in the community, thereby creating a huge impact on the state’s agricultural scenario. The importance of FF in the extension system was realised. Thus, the partnership provided time for each partner to find his/her own place.

As a result, this concept was adopted by other departments of the state government also; e.g., Departments of Horticulture and Sericulture implemented schemes such as *Suvarna Bhoomi Yojana* in the state. The *Bhoochetana* cell contributed to effective
management of financial and administrative problems as well as smooth implementation, monitoring, and evaluation of the scheme.

**Role Clarity**

The success of *Bhoochetana* is the culmination of a variety of factors. First of all, the coordination and cooperation of diverse institutions under the umbrella of the consortium provided a strong foundation for the partnership, towards its implementation which aimed at bridging the large yield gaps that existed in the state. This has been accompanied by specific roles clarified and agreed by them, to strengthen the process and for building the commitment towards a set goal. One of the features of effective partnership systems is the way organisations beyond the state play a proactive role in compartmentalised and rigidly defined roles. Often flexibility leads to innovations. However, minimum level of check is necessary to avoid over-confidence among partners.

**Sharing Resources and Risks**

*Bhoochetana* provided a platform for better resource allocation with added responsibility among partners. The convergence of programmes/schemes and knowledge was useful in allocating human as well as financial resources, all major programmes in the DoA have been converged and treated as ‘single file system’ in *Bhoochetana*. The major chunk of resource is from the Central government (75%) and the remaining share is from the state government (25%). A major learning that emerged from this was that R&D practitioners, line departments, and non-state actors must be willing to work with emerging concepts and must recognise that interventions planned by them evolve as a part of the learning process. The partnership concept provides a framework for inclusive, knowledge-intensive agricultural development.

**Governance Mechanism**

The M&E (monitoring & evaluation) framework being used is one of the more thorough monitoring systems in place for agriculture service delivery in Karnataka. This needs further strengthening. An
area which requires increased support is further professionalisation of the FFs. The impact of regular review meetings conducted by DoA is visible and the sincere efforts of top level officials have contributed largely to the success.

**Improved Extension System**

The partnership has explored new ways of extension system, which is unique in its composition and functioning. It is essential that traditional extension systems are exchanged for this model, where research supports innovation at the local level. The important learning from this was that support to research systems need to focus more on developing an interface with other sectors to achieve desired growth in the agricultural sector. Mechanism governing the research system needs major attention, as well as the ability and attitudes required for engaging in partnerships. Attention needs to be given towards implementation of public awareness strategies through print and mass media, along with training and exposure activities. Extension investments should create the capacity to identify new, promising alternatives at farm level and ensure that they are supported in the right way through engaging potential partners.

**Out-Scaling**

*Bhoochetana* caught the attention of officials from the Ministry of Agriculture, GoI. Other states recognised the progress as well. The AP government was impressed with *Bhoochetana* and a programme was planned for all districts of AP with technical backstopping from the ICRISAT. The results of *Bhoochetana* programme were also presented at national and international fora e.g., World Water Forum (held in 2012) in France, CGIAR’s Fund Council Meeting in New Delhi in 2013 by scientists as well as senior officials of the GoK. Other state governments like TN and Maharashtra have also interacted with ICRISAT for details and project proposals on *Bhoochetana*.

As senior policy maker from Philippines, Vice Governor D. Salvanio visited Karnataka and went on a field visit to Chikkaballapur, to visit *Bhoochetana* farmers. Looking at the progress on the ground level and his interactions with the DoA officials and farmers, he
recommended that Illocos Sur, a province, in Philippines, should undertake and implement *Bhoochetana*, with technical support from ICRISAT. At present, two projects on *Bhoochetana Principles and Practices for Productivity Enhancement* are being implemented by the Bureau of Agriculture (BAR) in three pilot sites. The provincial Government of Illocos Sur with ICRISAT's technical support is implementing this as well.

**Conclusion**

This paper deals with the process of institutional partnership for sustainable intensification of agricultural sector in Karnataka. It is part of an innovative pathway of agricultural development in the state, which began more than a decade ago. A strong foundation was laid for this during the Sujala-ICRISAT initiative in 2005. By translating strategic research into research for development and impact, the strategic partnership aimed at enhancing the impact. Adopting research for development, the project takes a holistic, end-to-end approach for scaling-up development. This is done by involving relevant actors and addressing all links in the impact pathway through a consortium approach.

A successful partnership depends on the cooperation and collective decision-making power among the partners, as well as necessary support from the facilitating agencies. In this regard, the government should support investments that encourage heterogeneity in service providers and in organisations that have the attitude and ability to find the right approach in different situations. An effective partnership also requires a cadre of professionals with new skills and mindset. Thus, the government should re-engage in agricultural education investments to modernise support staff training and establish state-of-the-art facilities to cater to the needs of the sector. This needs a change in the mindset, which is a tough but an achievable task. The R&D impact pathway is complex and without involving the, the impact keeps eluding. There is an urgent need to bring in a change in the mindset of the researchers and development investors to make R&D a success. This can be done through a
convergence of actors and their actions in a consortium. To work collectively with all the stakeholders, they need to be empowered.

References


### Annexure Table A-12.1

*Increased Crop Production Along with Additional Income Generated at Farm Level Across All Districts 2011*

<table>
<thead>
<tr>
<th>Crop</th>
<th>District</th>
<th>Farmers’ management (kg ha⁻¹)</th>
<th>Improved management (kg ha⁻¹)</th>
<th>% increase in production</th>
<th>Additional income at MSP (₹ ha⁻¹)</th>
<th>Additional income per X invested</th>
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<td>Stalk Grain</td>
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Source: Adopted from Wani et al. (2012a).