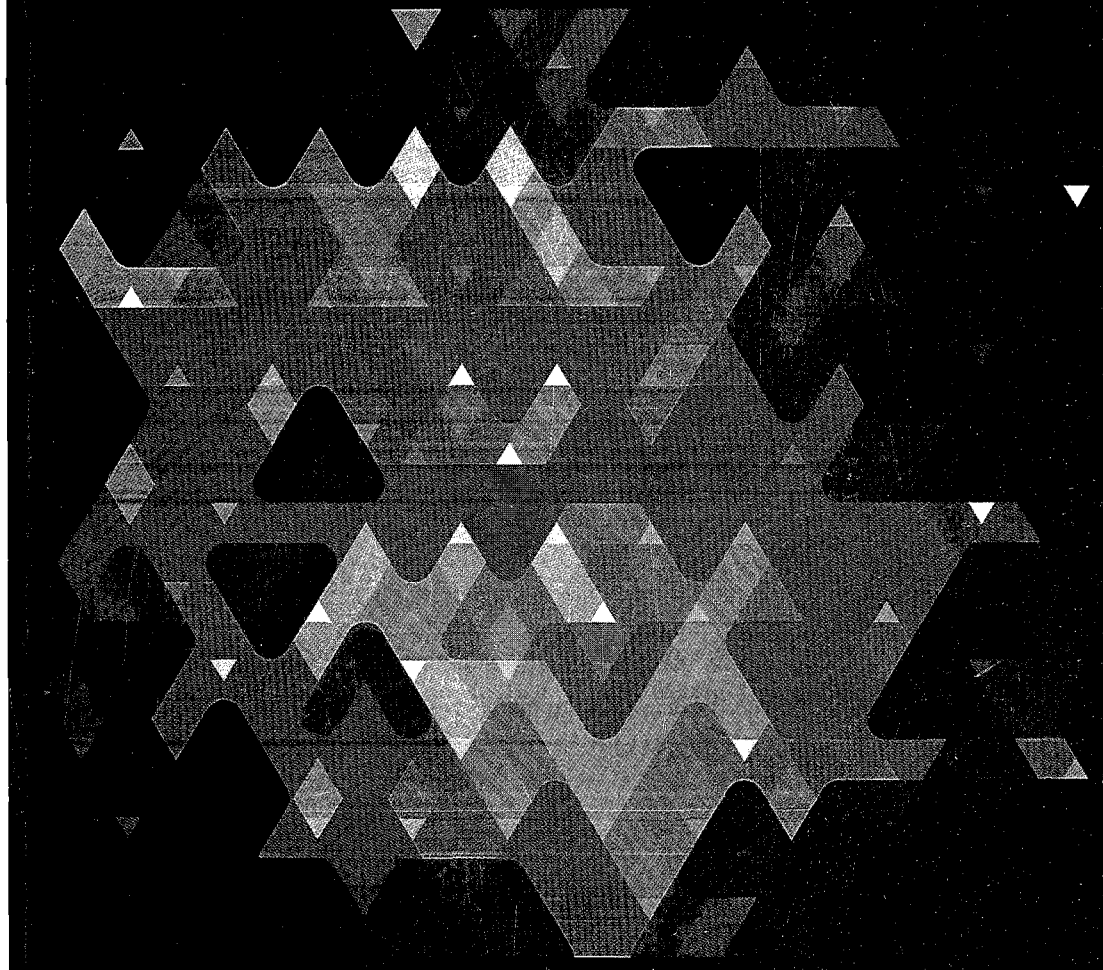
Vicissitudes of Agriculture in the Fast Growing Indian Economy: Challenges, Strategies and the Way Forward



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Editors

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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;

2011a; 2011b). 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 *Bhoochetana*[1] 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

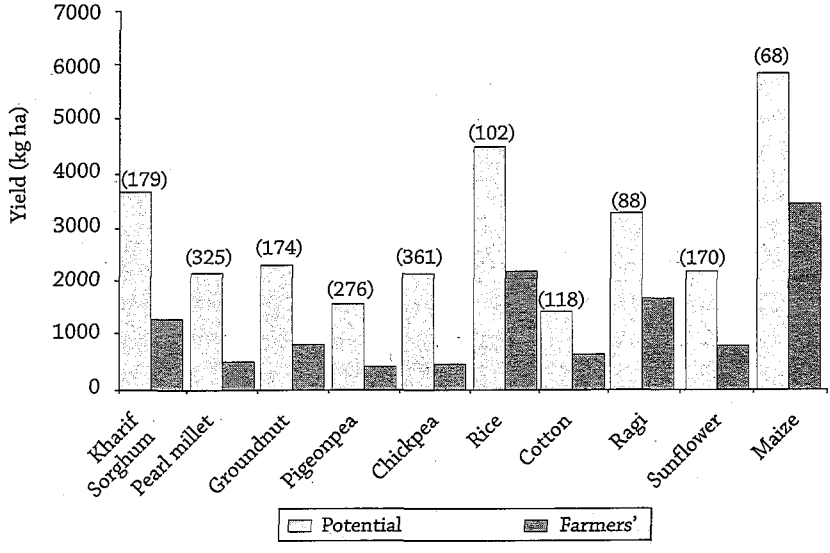
1. *Bhoochetana* in local Kannada language means rejuvenating soil strength.

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



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

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

Source: ICRISAT, 2009.

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.[2] 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

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

No.	*Key Processes*	*Major Decisions*	*Output*
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 rainfedarea 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

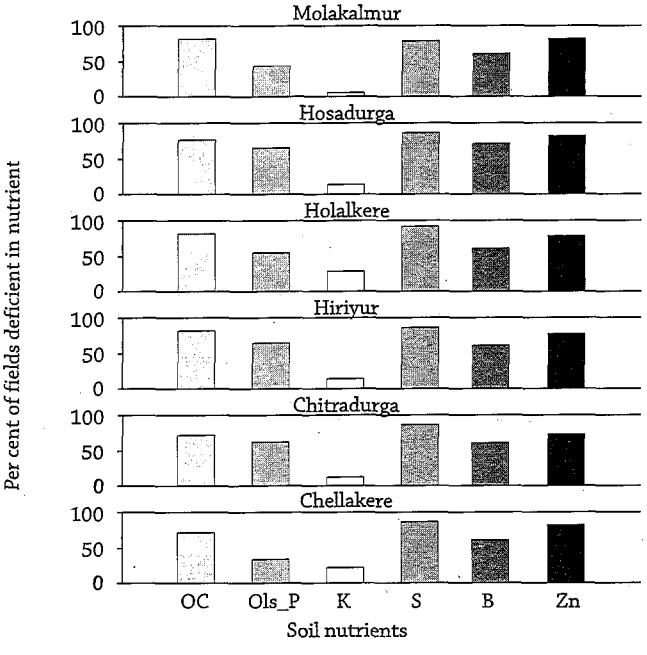
Ensuring Inputs Supply

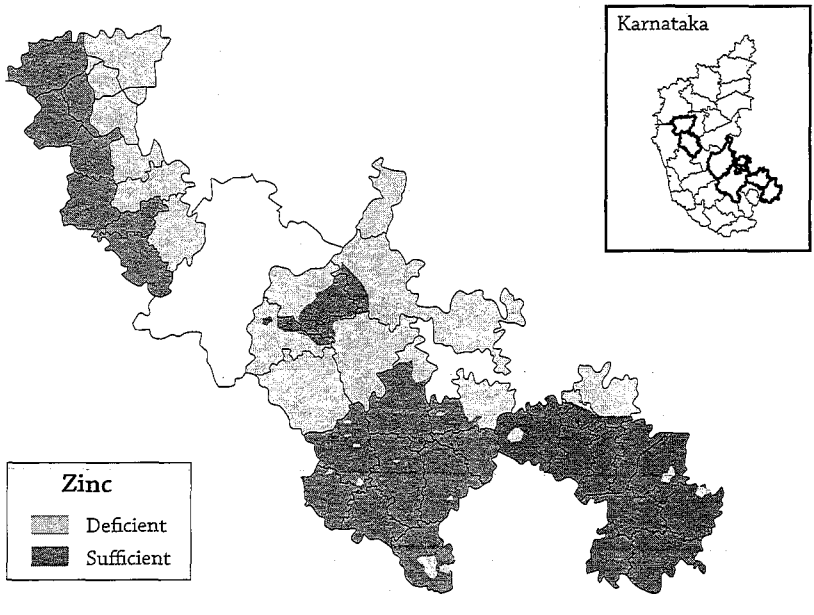
Proper and timely procurement of inputs is essential to ensure timely interventions at farmers' field level. In Karnataka, procurement of inputs is part of the ongoing process. To ensure transparency, etendering has been put to use in the state.

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





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.

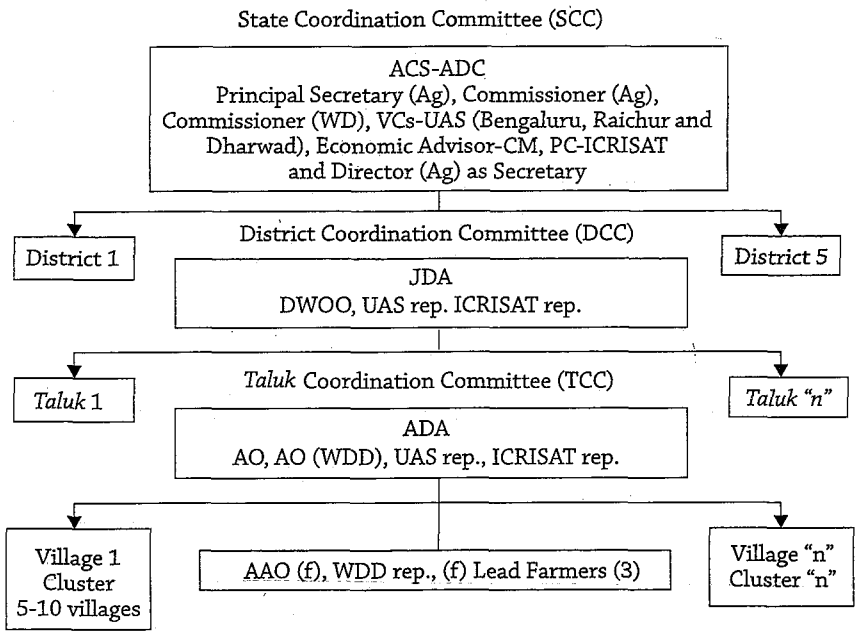
The SCC is a high powered committee constituted with state level senior administrators of GoK, Economic Advisor to Chief Minister, Directors of DoA and Watershed Development Department, three Vice-Chancellors of the University of Agricultural Sciences (UAS) in Bangalore, Raichur and Dharwad and Project 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



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)[4] 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 12.3

Timeline for Execution of Activities in Different Districts in Karnataka

Activity	*Year*	*% Activity Coverage in Districts*		
		Districts 1–6	*Districts 7–15*	*Districts 16–30*
Productivity enhancement	2009	25		
	2010	50	33	
	2011	75	66	50
	2012	100	100	100
Nutrient status mapping	2009	100		
	2010		100	
	2011			100
	2012			
Capacity building	2009	100		
	2010		100	
	2011			100

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

Increase in Yield (%) Over Farmers' Practice during Four Years of Bhoochetana

Year	*Chickpea*	*Greengram*	*Groundnut*	*Maize*	*Pigeon pea*	*Blackgram*	*Finger Millet*
2009	33.8	–	38.0	38.9	–	36.2	54.3
2010	34.4	39.8	39.9	34.1	34.6	35.6	36.3
2011	34.7	41.1	42.1	33.4	37.8	34.1	31.3
2012	–	32.6	32.8	31.9	29.1	35.2	33.4

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

Year	*Districts*	*Crop Season*	*Crops*	*Target Area Crop-wise (million ha)*	*Total Area Sown (million ha)*	*% Area Sown*
2009-10	6	*Kharif*	Finger millet, maize, groundnut Soybean	0.188	0.16	84.6
	3	*Rabi*		0.6	0.05	81.2
2010-11	16	*Kharif*	Finger millet, maize, groundnut, soybean, cotton, pigeon pea, pearl millet, black gram, sorghum, green gram, chick-pea	1.32	1.2	91.3
	10	*Rabi*		0.036	0.33	91.4
2011-12	30	*Kharif*	Finger millet, maize, groundnut, soybean, cotton, pigeon pea, pearl millet, black gram, sorghum, green gram, chickpea	2.95	2.66	90
	11	*Rabi*		0.79	0.64	81
2012-13	30	*Kharif*	Finger millet, groundnut, pigeon pea, soybean, cowpea, green gram, maize, pearl millet, sunflower, safflower, sorghum, cotton, rainfed paddy	5.0	3.73	75
	15	*Rabi*		4.0	2.7	68

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 12.6

Use of Micronutrients Under Bhoochetana Project during 2009-10 to 2012-13

Crop season	Area Covered (million ha)	Quantity Consumed (t)			Nutrient Used (kg ha^{-1})		
		$ZnSO_4$	Gypsum	Borax	$ZnSO_4$	Gypsum	Borax
2009 (*Kharif*)	0.23	372	4309	53	1.65	19.15	0.23
2009-10 (*Rabi*)	0.06	-	-	-	-	-	-
2010 (*Kharif*)	1.27	2723	35376	389	2.27	29.50	0.32
2010-11 (*Rabi*)	0.37	362	5595	113	1.09	16.86	0.34
2011 (*Kharif*)	2.84	8775	96234	2781	3.46	37.90	1.10
2011-12 (*Rabi*)	0.66	1678	12475	432	2.94	21.87	0.76
2012 (*Kharif*)	3.57	6803	59935	3104	2.25	21.50	0.77
2012-13(*Rabi*)	2075	5109	36746	1494	1.89	14.85	0.55

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 Illocus 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.

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Annexure Table A-12.1

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

Crop	District	Farmers' management (kg ha-1)		Improved management (kg ha-1)		% increase in production		Additional income at MSP (₹ ha-1)	Additional income per ₹ invested
		Stalk	Grain	Stalk	Grain	Stalk	Grain		
Finger Millet	Bengaluru R	4730	2040	6240	2760	32	35	9060	5.7
	Chikkaballapura	2090	2610	3290	3710	57	42	12300	7.8
	Chitradurga	2820	2050	3730	2680	32	31	7350	4.7
	Davanagere	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
	Chamarajanagar	1930	1331	2183	2093	13		7710	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
	Davanagere	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
	Chamarajanagar	5333	1776	9194	3078	72	73	13660	8.6
Pearl Millet	Gulbarga	1600	1590	2060	2080	29	31	4580	2.9
	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
	Davanagere	3420	1780	4230	2320	24	30	5220	3.3
	Chamarajanagar	2227	1428	3031	2215	36	55	7390	4.7
Blackgram	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
	Gulbarga	1520	460	2180	590	43	28	4120	2.6
	Yadgir	470	540	590	710	26	31	3800	2.4

Pigeon pea	Bidar	5990	1230	7950	1700	33	38	14100	8.9
	Bijapur	1870	920	2550	1160	36	26	7200	4.6
	Gulbarga	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	1.4
Groundnut	Bijapur	680	320	950	470	40	47	3990	2.5
	Chikkaballapur	1090	1350	1760	2010	61	49	16520	10.5
	Dharwad	1737	2062	2090	2906	20		20118	12.7
	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	–	
	Chamarajanagar	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

Source: Adopted from Wani *et al.* (2012a).