Final Draft

Impact Assessment of OCPF Agriculture Extension Services Project, Karnataka

Indian Society of Agribusiness Professionals (ISAP)

LIST OF ABBREVIATED TERMS

S.No.	Acronym	Details
1	ABC	Agri Business Centre
2	ADATS	Agricultural Development & Training Society
3	AES	Agricultural Extension Services
4	AVRC	Agri Village Resource Centre
5	BSRDS	Bayalu Seeme Rural Development
6	CHSC	Custom Hiring Service Centre
7	DSS	Decision Support System
8	FGD	Focus Group Discussion
9	FIG	Farmer Interest Group
10	FKL	Food Karnataka Limited
11	FPO	Farmer Producer Organisation
12	GAP	Good Agriculture Practices
13	GDP	Gross Domestic Product
14	Ha	Hectare
15	IARI	Indian Agricultural Research Institute
16	ICM	Integrated Crop Management
17	ICT	Information Communication & Technology
18	IFS	Integrated Farming System
19	INM	Integrated Nutrient Management
20	INRA	National Institute for Agricultural Research
21	IPM	Integrated Pest Management
22	ISAP	Indian Society of Agribusiness Profesionals
23	KCC	Kisan Call Centre
24	KFMS	Karnataka Farmers Maha Society
25	KVK	Kisan Vigyan Kendra
26	LSD	Large Scale Demonstration
27	NGO	Non-governmental Organisation
28	PoP	Package of Practices
29	SHC	Soil Health Card
30	SHG	Self Help Group
31	SSD	Small Scale Demonstration
32	UPIS	Unified Package Insurance Scheme

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1. Introduction

1.1 About OCP Foundation

Established in 1920, OCP has been a global leader in the phosphate and phosphate derivative markets across the world. The OCP group occupies an important position in Morocco's economic system and represents nearly a quarter of the country's exports and approximately 3.5% of the GDP in 2010. With phosphate rock mining and processing as its main activities, OCP has now become integrated across the entire phosphate value chain, from the production of fertiliser to phosphoric acid to its derivative products.

The OCP Foundation (OCPF) carries out the social and the societal commitment of the OCP Group. Its main goal is to develop and implement community programs, focusing mainly on human development. Thus, using a participatory approach, the OCPF establishes the basis of integrated citizen action for the economic and social development of Morocco, and of several Southern countries, within a South-South cooperation context.

OCPF's activities include the promotion of education and training, the enhancement of youth employability skills, the promotion of entrepreneurship, poverty reduction, the socio-economic development and the access to health care, social and cultural action & conservation of the national heritage and the support for food security programs.

1.2 About ISAP

Established in 2001, by a group of agriculture and management professionals, the Indian Society of Agribusiness Professionals (ISAP) works to build the capacity of small and marginal farmers' agricultural practices to help enhance livelihoods and income, thus resulting in an improved quality of life for rural communities. In the initial years of operation, ISAP's focus was on farmers' technical training through on-field and ICT based interventions for agricultural development. However, basis extensive on-ground experience, this focus has now evolved to include integrated farming, farmer aggregation and market linkages into a comprehensive and holistic sustainable livelihoods approach.

In its last decade and a half of operations, ISAP has directly engaged with more than 150,000 farmers on various components such as food and nutrition security alongside interventions on sustainable agriculture. Other focused interventions are centred around women empowerment and environmental sustainability.

Keeping in line with its focus on sustainable agriculture and improvement of farmers skills and knowledge on balanced nutrient application, OCPF, in association with ISAP initiated the OCP Agriculture Extension Services Project (OCPF-AES) in 2010 in Karnataka with the objective of improving soil health, increasing productivity, enhancing cropping intensity and resource base and positively impacting the income and livelihoods of 3000 pigeon pea farmers.

1.3 About the project

The goal of the OCPF-AES project is to disseminate and adopt improved technologies and governance to increase productivity of food legumes through participatory knowledge management systems under South-South collaboration.

Started in 2010, the first phase of the project continued for four years, with the addition of new dimensions each year. Currently, the project is in its second phase, and its specific objectives can be listed as follows:

1. Improving soil health, viz, the physical and chemical properties of soil
2. Improving crop productivity, with targeted productivity levels commensurate with agronomic potential
3. Enhancing cropping intensity and resource base and develop the market and the value chain linkages of the farmers
4. Creating institutional and technological sustainability through farmer organizations

The project is being implemented in six blocks of three districts in Karnataka, namely Gulbarga, Bidar and Raichur, covering more than 200,000 hectares. The total beneficiaries targeted under the project are 7000 farmers and the specific project locations include Afzalpur, Aland and Chittapur in Gulbarga district, Raichur in Raichur district and Basavkalyan and Bhalki in Bidar district. The farmer beneficiaries under the project mainly grow grain legumes under the rain-fed farming system, and the main crop cultivated is pigeon pea.

1.4 Purpose of the engagement

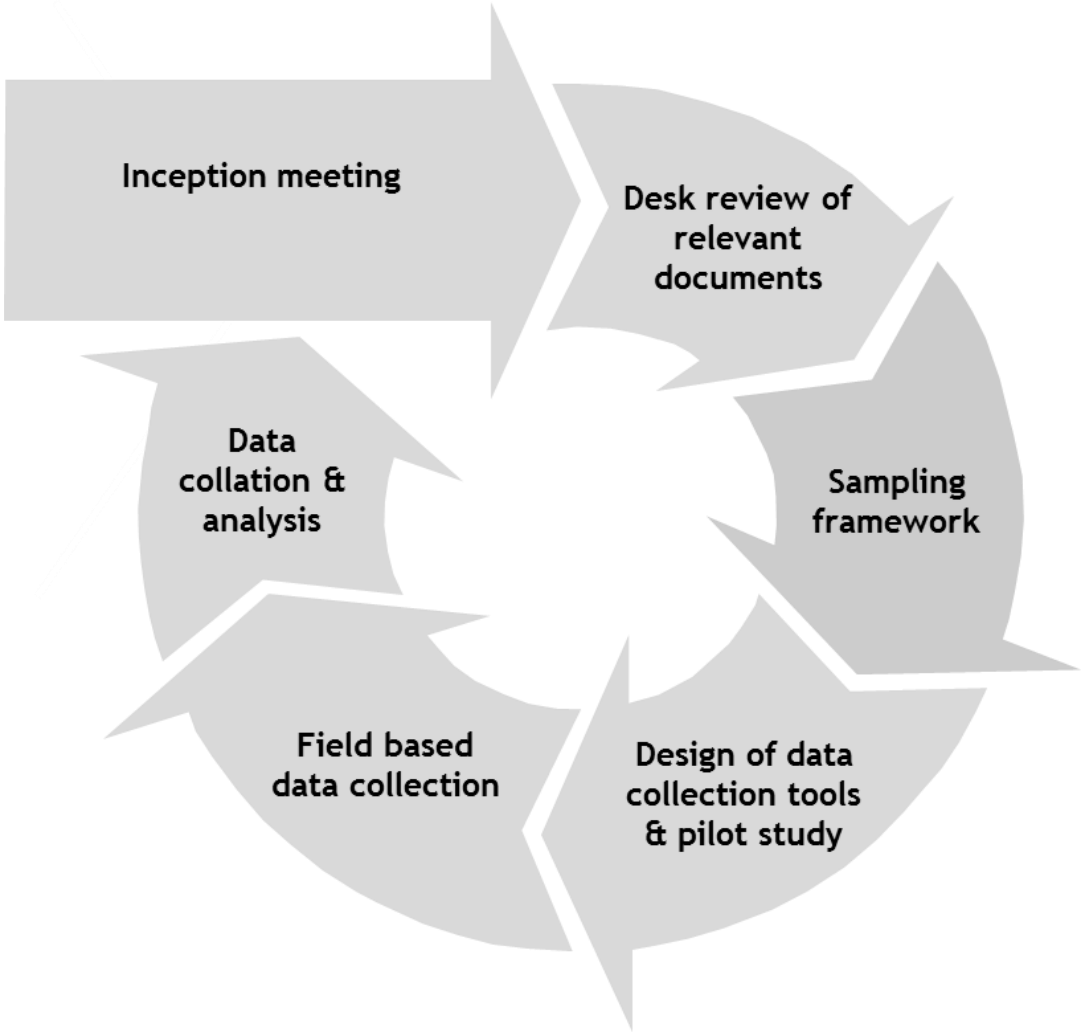
The impact assessment of the OCPF-AES project is expected to provide an outlook on the project progress, the outcomes and the corresponding impacts, achievements and recommendations for the way forward. The purpose of this assessment includes the following:

1. Profiling of the surveyed beneficiaries, land holding and cropping patterns, average cost of cultivation, crop yield, income etc. for the members for the major crops
2. Assessment of the impact of the interventions:
   a. Increase in yields and income for the project as well as non-members
   b. Impact of individual interventions on members including soil testing, seed varieties, seed treatment, method of sowing (dibbling, transplanting), cropping pattern (spacing, mono cropping, intercropping, sequential cropping), hydrogel, vermi-compost, integrated nutrient management, integrated pest management.
   c. Impact of ICT interventions (Kisan Call center and krishi gyan App)
   d. Effect of water harvesting due to Farm ponds on ground water recharge, rabi crop and irrigation.
   e. Impact of custom hire farm machinery center at the Agribusiness center
   f. Impact of value addition due to mini dal mills in Karnataka
   g. Effectiveness of the concept of Agri Village Resource Center (The process of FPOs formation, setting up of the Agribusiness Center and Human Development blocs, scanning of public-private schemes, activities carried out (Agri and allied sector input, storage, food processing, value addition, custom hire farm machinery center, market integration, creation of SHG, preliminary health services, education, Capacity building of FPOs members
   h. Fertilization adoption by farmers (organic versus chemical)
   i. Immediate Socio-economic impact of the project on farmers (men, women, youth, children etc.) on household income, education, health, job creation
3. Highlighting success stories of the impact of the project interventions on the beneficiaries

2. Methodology

The impact assessment was initiated to monitor the outcomes of the project over the last three years against the baseline indicators. Given the scale of the project, the methodology for the impact assessment has been designed with due cognizance being given to the perspectives of all stakeholders involved. The views of both the implementing partner (ISAP) and the community have been taken into account whilst drafting this report. The methodology for the impact assessment has been designed keeping in mind the intricacies of the issues being addressed by the project and the interplay of multiple stakeholders and approaches towards sustainable agriculture. The assessment has been conducted using a credible scientific basis and techniques which include both quantitaive and qualitative methods to enquiry so as to ensure that the findings are verifiable and unbiased. It provides a basis for further reflection and decision making by capturing the key findings and observations, highlights some of the major enablers and provides recommendations for both OCPF and ISAP. The assessment uses a mix of both qualitative and quantitative techniques of data collection in order to capture the progress and achievements against the baseline indicators. The steps adopted for the assessment have been described below:

Figure 1: Methodology work steps



2.1 Inception meeting

An inception meeting with the ISAP team in Delhi was held with the objective of getting a better understanding of the project objectives, components and milestones. The discussion also helped in clarifying project assumptions, identifying stakeholders for primary research and understanding project management arrangements. The impact assessment team sought inputs from the project team members on overall geographic coverage and beneficiary details in order to finalise the sampling framework and field visit schedules. Feedback and suggestions provided by ISAP (both the Delhi and the Karnataka team) were incorporated into the assessment design.

2.2 Desk review of relevant documents

In order to do a deep dive analysis of the project the impact assessment team requested the ISAP team to share documents concerning project baseline, planning, management, outcomes and learning. The documents collected from ISAP were reviewed and used to formulate sample framework, research questions and data collection tools. The review of documents helped in developing greater insights on drafting the situational analysis of the region and the relevance of the project especially with regard to the needs of the disadvantaged groups of the region. Besides the desk review, a reconnaisance visit was conducted in Gulbarga in which the assessment team visited the field to gain an understanding of the project so as to be able to design the study tools accordingly. This visit alongside the desk review further helped in the identification/selection of districts, villages and beneficiaries for field based data collection.

2.3 Design of data collection tools and the pilot study

The analysis of secondary literature served as the basis for planning the field visits and also designing the data collection tools. The assessment was conducted using both qualitative and quantitative methods. The qualitative tools included focus groups discussions (FGDs), semi structured interviews with key informants, case studies and participatory observations. End term survey forms were used to gather quantitative data from the beneficiaries for further analysis.

A pilot study was conducted from the 2nd of April 2017 until the 5th of April 2017 after the preparation of the discussion guides and the survey questionnaire. The impact assessment team visited Gulbarga for three days during which discussions were held with the project team members including Dr. S.A Patil and a sample field visit was conducted. The team visited and interacted with project beneficiaries and other stakeholders at Tadkal in Aland Block, and Gudur in Afzalpur block. Modifications were made to the survey tools and the discussion guides. Based on the feedback, suggestions of the ISAP team and observations of the assessment team, the data collection tools were finalised.

2.4 The sampling framework

The sampling framework took into consideration the following criteria:

- The reference period for the study has been taken as March 2014 to March 2017;
- For estimating the sample for the impact assessment study the overall universe of beneficiaries was taken as 7000 farmers, which is the total number of beneficiaries that have been covered under the project till March 2017

- For population >10,000 n= $(z^2pq)/d^{2,}$ where, n= desired sample size; z= standard normal deviate; which is usually set at 1.96 (corresponds to 95 percent confidence interval; for confidence interval of 99 percent, z is set at 2.58; p= proportion in target population estimated to have similar characteristics; We have taken p as 50%; q= 1-p (proportion of target population not having the particular characteristic; d= degree of accuracy required; usually set at 0.05 level (0r 5% confidence interval); In order to determine the sample size the following scenario has been taken: Confidence level of 95% and confidence interval of 7.5% - the sample size is 167 farmers; these include both the project farmers and non project farmers from Gulbarga and Raichur
- Five blocks across the aforementioned two districts were selected for field based data collection. These include Aland, Afzalpur, Chittapur from Gulbarga and Bhalki and Basavkalyan from Bidar
- The sample further includes women's groups and children's groups which are covered by the project under its human resource development component
- Following is the total sample size with its different components:

Table 1: Sample coverage of the impact assessment study

District	Gulbarga & Bidar	
Mode	Target segment	Total
Survey	Project farmers (Members)	110
	Non project farmers (Non members)	55
Focused Group Discussions (FGDs)	Farmer's Groups	5
	Women's Groups	3
	Children's Groups	3
Semi structured interviews	FPO/AVRC representative	6
	Mini Dal Mill representative	3
	KCC Representative	1

- The above list represents the total number of beneficiaries covered in the survey, the focused group discussions and the semi structured interviews across all the five districts in Northern Karnataka

2.5 Field based data collection

The field plan (refer to Appendix C for a detailed itinerary) and tools were finalized upon receiving feedback from ISAP. The field visits and primary data collection were conducted from the 22nd of April 2017 until the 28th of April 2017.

The field visits focused on understanding the different components of the project through focus group discussions (FGDs) with beneficiary collectives such as the FPOs and the FIGs, women's groups and children's groups, participant observation and household based data

collection. Before initiating the data collection process, the team was sensitized and oriented on the criticality of collecting quality data and having meaningful interaction with the community. The orientation further focused on ensuring that all the field researchers were thorough with the different components of the survey.

The impact assessment team made a conscious effort to ensure that the participants of the FGDs were representative of different social groups in order to elicit different perspectives on project outcomes and impact. The groups were heterogeneous (including beneficiaries of multiple interventions) and consisted of 15-20 individuals. Each session of the FGD was facilitated by a core assessment team member using FGD guidelines for 45 minutes to 60 minutes. During the course of these interactions particular attention was directed towards components such as the recall value of beneficiaries, rates of attribution and frequencies at which the mention of interventions came up. Post the FGDs on site visits were conducted by the team to assess different types of project support that had been provided such as horticulture, vermicomposting etc. These visits were further used to design relevant case studies to demonstrate best practices.

The beneficiary survey was designed in a manner similar to the baseline survey so as to negate any methodological variances. This questionnaire was used to gather information on demography, current income, increase in income (if any), assets and perceptions of the beneficiaries with regard to the project and, a comparison and assessment of the contributions of the project interventions to yield, productivity and the socio economic development of the farmers. The questionnaire covered sections on personal details, income, assets etc. The data collected from the survey was further analysed to formulate observations and recommendations for the project.

In-depth interviews were conducted with the core project team at the ISAP project office in Gulbarga. The discussions focused on aspects related to project management arrangements, processes and systems, partnerships etc. Wherever applicable the impact assessment team interacted with some of the project beneficiaries to bring out success stories and best practices.

2.6 Data collation & analysis

Data analysis included both qualitative and quantitative analysis. The large volumes of data generated in the course of the study – through interactions and the survey were analysed to identify patterns. The data from the FGDs was recorded in a note sheet format, with the leading questions and subsequent probe areas mentioned alongside. A copy of this discussion guide has been attached in the annexures. All note sheets combined provide a comprehensive view of the findings of the entire study and have been used to gauge the impact of the project.

Quantitative data obtained from the survey and other sources were analysed statistically. Together with the findings of the discussion guides, the data was compiled, triangulated and comprehensively analysed. The analysis was done based on the agreed upon indicators o the project and the same were further compared to the baseline data that had been made available to the assessment team. As has already been mentioned, case studies have also been developed from first-person narrative accounts.

3. Project rationale and components

3.1 Rationale

In the past two to three decades, India has achieved significant breakthroughs in technology driven agriculture development. As per the CIA, 42 percent of the global agriculture output comes from just six countries, India being the second largest next only to China. In fact, China and India alone account for 30 percent of global agriculture output. According to the World Bank, India has brought about a landmark agricultural revolution that has transformed the nation from chronic dependence on grain imports into a global agricultural powerhouse that is now a net exporter of food. Today, India is the world's largest producer of milk and pulses, second largest producer of rice, wheat, fruits, vegetables and the overall third largest producer of food grains. Agriculture continues to remain the only sector that has a direct combined impact on poverty, rural livelihoods, health and nutrition.

Indian agriculture is however challenged by a range of unsolved and unaddressed issues of low productivity (even our best yield rates are 50-60% lower than that of China), non remunerative- low income benefits to farmers (the younger generation does not want to work on agriculture) and the looming challenges related to malnutrition owing to the insufficient availability of food (we have achieved grain self-sufficiency not nutritional self sufficiency). There are other challenges like predominantly rainfed, small holder driven, low input, low output agriculture system, poor infrastructure for procurement, storage, transportation, and ineffective policies to regulate price volitility etc.

Amongst various debates surrounding Indian agriculture, the issue of pulses production has received a wider focus especially during the last decade or so. In terms of food and nutritional security, pulses occupy a unique position in Indian dietary habits across the country. Pulses contains 22-24 percent of protein and is one of the most important sources of protein in a vegetarian diet. Pulses are undoubtedly the most important supplements to the staple cereals in the diets especially of poor households with health-sustaining ingredients viz. proteins, essential amino acids, vitamins and minerals. It is further known to reduce the impact of several non-communicable diseases such as colon cancer and cardiovascular diseases.

Pulses have a unique value proposition for agriculture as well. They are well suited to different farming systems, such as crop-rotation, mixed and inter-cropping system. As legumes, they help in fixing the atmospheric nitrogen in soil and release soil-bound phosphorus. They aid in checking soil erosion and maintain soil fertility levels.

Most pulse crops are of a short duration which facilitates the ability to grow an additional second crop on the same land in the same year. Pulses such as industrial crops provide raw materials to industries, such as the dal industry, roasted grain industry, papad industry etc. They also serve as a rich source of nutritious fodder for cattle. Also, pulses have low carbon emission and water needs which make them ideally suited to the Indian farming system.

With regard to the production of pulses, India is the largest producer, as well as the consumer and importer of pulses. The diversified agro-climatic condition in India supports a variety of pulses in various regions. In India, pulses are grown in around 24-26 million hectares of area producing 17-19 million tonnes of pulses annually. India accounts for over one third of the total world area and over 20 per cent of total world production. India primarily produces

Bengal gram (chickpeas), red gram (tur), lentil (masur), green gram (mung) and black gram (urad).

However, despite being one of the largest producer of pulses, India continues to be one of the biggest importers of pulses owing to the gap between potential and actual yield. Low pulse yield in India compared to other counties is attributed to poor spread of improved varieties and technologies, abrupt climatic changes, vulnerability to pests and diseases, and a generally declining growth rate of total factor productivity. Lack of knowledge on crop management and technological constraints such as the insufficient and untimely availability of high yielding varieties (HYVs) of seeds have affected the production of pulses. Research indicates that the adoption rate of pulses technologies is miserably low among the farmers mainly because of risky crops, low and unstable yields, poor infrastructure and the non-availability and lack of timeliness of critical inputs such as quality seeds.

It may further be noted that in India, pulses are cultivated primarily by small holders on marginal lands under rain fed conditions. Only 15% of the area under pulses has assured irrigation. Because of the high level of fluctuations in pulse production (due to biotic and abiotic stress) and prices (in the absence of an effective government price support mechanism) farmers are not very keen on taking up pulse cultivation despite high wholesale pulse prices in recent years. Trends indicate that farmers are getting attracted towards cash crops such as cotton, maize and oilseeds (mainly soybeans) because of better returns and lower risks.

Karnataka is one of the leading producers of pulses in India with approximately 24% of its gross cropped area under pulses (second highest after Madhya Pradesh). In terms of production, Karnataka showed a growth of 82% in pulses production between 2001-2012. Gulbarga in Northern Karnataka accounts for almost 50% of the area under pulses cultivation. Bidar and Raichur are other important pulses producing districts in Karnataka. The important pulses grown in Karnataka are pigeonpea, chickpea, horsegram, greengram and blackgram. More than 60 per cent of the area under total pulses in Karnataka is covered by pigeonpea (khariff) and chickpea (rabi) crops. As per ISAP data, in Karnataka Pigeonpea is being cultivated on 891.000 ha area. Among the total food legumes, the red gram accounts for 31.9 % in area and 33.8% in production thus making pigeon pea is the dominant food legumes crop in Karnataka.

While Karnataka features amongst the highest gross comand areas (GCA) under pulses, it has struggled to achieve significant breakthrough in terms of yield enhancements. As per National Food Security Mission (NFSM) pulses update 2016, Karnataka had the lowest yield for pulses compared to other pulses producing states in India during Xth plan. While the yield improved in XIth and XIIth five year plans, it remained consistently below the national average. Similar trends were observed for Khariff pulses like Pigeon Pea. The challenges of poor yield led poor remuneration for pulses in Karnataka is related to a number of factors:

- Use of low yielding varieties
- Imbalanced use of fertilizers
- Lack of awareness on Integrated Nutrient Management and maintenance of soil fertility
- Poor level of management practices, particularly plant protection measures
- Management of plant population (Transplanting, line sowing and dibbling)
- Not adopting proper agronomic practices
- Damage due to dry spells / heavy rains in rainfed areas
- Spread of diseases such as Sterility Mosaic disease, phytophthora blight, fusarium udum and cercospora leaf spot.

In addition to the factors mentioned above constraints include the lack of access to improved implements, plant protection appliances, transportation, grading, storage, procurement and marketing facilities. Additionally, farmers also face problems with regard to middlemen who exploit the farmers by buying produce at give away prices and selling the same to consumers at outrageously high rates, lack of cooperative institutional structures, lack of handling facilities of produce, lack of knowledge about prevailing prices and access to suitable marketing agencies.

In order to address some of these challenges and develop a model that can be replicated elsewhere within a similar context, the OCP Foundation (OCPF) collaborated with the Indian Society of Agribusiness Professionals (ISAP), to initiate a project on Agricultural Extension Services in North Karnataka. The project is a part of OCPF's overall goal of promoting the dissemination and adoption of improved technologies and governance to increase productivity of food legumes through participatory knowledge management systems under a South-South collaboration.

The OCPF-Agricultural Extension Services (AES) project aims at improving the productivity of pigeon-pea (Cajanus cajan Millsp., Redgram, Tur, Arhar) in select regions of North-Eastern Karnataka. The project was conceptualised and designed jointly by a team of experts from OCPF and ISAP and senior agricultural scientists. The first phase of the project was started in 2010, funded by OCPF and implemented by ISAP.

During its first phase of implementation, the project demonstrated improved package of practices (PoPs) with respect to red gram cultivation. These included better soil management, appropriate plant geometry and integrated fertilizer and pest management systems. The project also facilitated the creation and institutionalization of farmer collectives through farmer interest groups (FIGs) and farmer producer organizations (FPO) to enable better access to Government aided support and schemes and strengthen forward and backward linkages.

The first phase of the project indicated good outcomes in the form of improvement in soil health, better awareness and technology adoption. An impact assessment study carried out at the end of the first phase of the project observed/indicated:

- An increase in total cropped area under red gram cultivation in the project area. It was observed that with increased knowledge and technical know how on issues such as monocropping and intercropping, a sizeable number of project farmers started taking up intercrops along with red gram;
- The study attributed an increase in the production of red gram from 11197 quintals in 2009-10 to 21355 quintals indicating a higher markeatable surplus for the crop; and a drop in the average cost of cultivation by around 18 percent as compared to the baseline;
- Project attribution towards a wider adoption of improved seed varieties such as TS3R and BSMR-736; and a decline in seed rate from 4.2 kg/acre to 2.5 kg/acre through adoption of the dibbling method;
- Increased soil fertility and nutrient balance with a noted decline in the application of Zinc by the project farmers to upto 5kg/acre;

Based on the experiences and learning from the first phase, the project was extended for a period of three years starting 2014. Phase II of the project focused on scaling up its outreach to more number of farmers and further enhancing the capabilities of the farmers institutions including FPOs through interventions around strengthening the procurement base, scaling up the value addition activities, i.e. the dal mill facilities, identifying and establishing forward

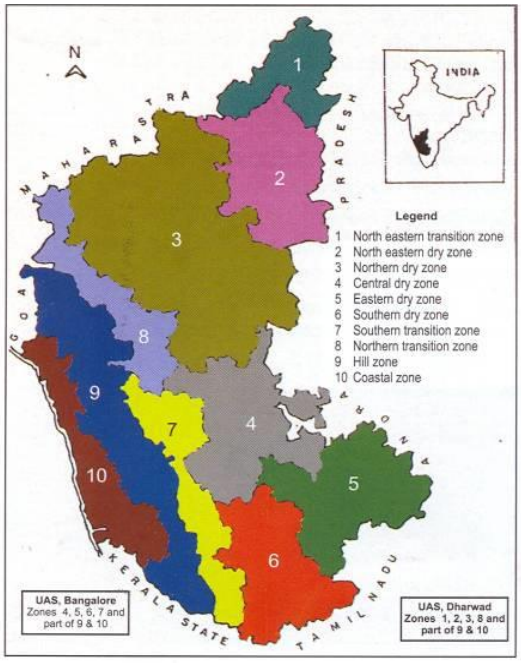
and backward linkages, formulating business plans for the agri business centres, training and capacity building initiatives and facilitating increased convergence with government schemes.

The project in its second phase works directly with seven FPOs spread across 6 blocks of Gulbarga, Bidar and Raichur, covering approximately 7000 member farmers. The project primarily engages with the small holders farmers and focuses on better integration and adoption of improved technologies and method of cultivation through the agriculture value chain. The project refrains from any subsidy based or input centric model of agriculture development and focuses on a holistic approach of 'inputs-throughput-output' model in order to introduce the most suitable and adaptable package of practices for improving soil health, yield enhancement and improved income. Overall, the project seeks to bring a behaviourial change with regard to farming practices. In addition to agricultural extension services, the project promotes integrated farming systems, farmer producer organizations and market integration through targeted interventions on value addition and pulse procurement and using ICT for agricultural development.

3.2 Project area profile

The project selected the districts of Gulbarga, Bidar and Raichur for implementation of AES project - three districts and six blocks of Gulbarga (Aland, Afzalpur and Chittapur blocks), Bidar (Bhalki and Basavkalyan blocks) and Raichur (Raichur block). These three districts also represent three different agroclimatic zones- the North Eastern Transition Zone, North Eastern Dry Zone and Northern Dry Zone of Karnataka.

Figure 2: The different agro climatic zones



1. North Eastern Transition Zone

- Covers Aland block of Gulbarga and Basavkalyan and Bhalki blocks of Bidar district;
- Rainfall in the range of 829.5 mm to 919.00mm
- Features Shallow to medium black clay soils in major areas. Red lateritic soils in remaining areas

2. North Eastern Dry Zone

- Covers Afzalpur and Chitapur blocks of Gulbarga
- Slightly lower average rainfall (633.22mm to 806.6mm)
- Features Deep to very deep black clay soils in major areas. Shallow to medium black soils in minor pockets

3. Northern Dry Zone

- Raichur block
- Average rainfall in the range of 464.5mm to 785.7mm
- Features black clay medium and deep in major areas, sand loams in remaining areas

Socio-economically, the region is amongst the most backward in the State and in Southern India. Agriculture is primarily rainfed and is characterised by inconsistent rainfall pattern with intermittent spell of draught and low productivity and yield due to poor technical knowhow and resource constraints. The average annual rainfall of the region varies, with 750 mm in

Bidar, 650 mm in Gulbarga and 550 mm in Raichur district respectively. Land distribution is skewed with almost 80 percent of the farmer population being marginal and small farmers. The project area is known for the cultivation of pulses- chickpea, horsegram, green gram and blackgram; pigeon pea however is the most widely produced crop that is cultivated during the Khariff season and is the mainstay of agriculture based livelihood of the region. The Project area profile based on key geographical, demographic, socio-economic and human development indicators are provided in tables 2 and 3.

Table 2: The geographical characteristics of the project areas, i.e. Gulbarga, Bidar & Raichur

Characteristics	Gulbarga	Bidar	Raichur
Map			
Administrative	• Seven Talukas; Aland, Afzalpur and Chitapur are covered under the project	• The Bidar district is constituted by five talukas, Bhalki and Basavkalyan are covered under the project	• Raichur has five talukas; Raichur taluka is covered under the project
Location	• Northern Karnataka bordering Solapur and Zahirabad districts of Maharashtra and Telangana; Also borders Bijapur and Yadgir districts of Karnataka	• Northernmost district of Karnataka bounded by Nizamabad and Medak districts of Telangana on the eastern side, Latur and Osmanabad districts of Maharashtra state on the western side, Nanded district of Maharashtra state on the northern side and Gulbarga district on the southern side.	• Located in the northeast part of the state and is bounded by Yadgir district in the north, Vijayapura and Bagalkot district in the northwest, Koppal district in the west, Bellari district in the south, Mahabubnagar district of Telangana and Kurnool district of Andhra Pradesh in the east.
Area ('000 ha)	• 1610.2	• 541.8	• 835.8
Topography	• Situated on the Deccan Plateau at an altitude of 472 meters above Mean Sea Level. • Undulating plain- There is a gentle slope from North to South and from East to West which affects sunlight and wind direction	• The entire district forms a part of the Deccan Plateau. • The northern part is characterized by expanses of level and treeless surface with flat and undulating hillocks, black soils and basaltic rocks. • The southern half of the district is high plateau and are well drained.	• Situated at an altitude of 400 meters above Mean Sea Level • Monotonous landscape with stretches of small rock clusters and hills • It is endowed with good water sources in perennial rivers the Krishna & the Tungabhadra

Soil types	• About 35% of the soil is deep black clayey soils, followed by 30% of shallow mixed black clayey and loamy soils and then some amount deep alluvial black calcareous clayey soils	• Very shallow, mixed clayey & red loamy soils, deep alluvial black calcareous clayey soils, deep black clayey soils, deep lateritic gravely clay soils are all found in abundance	• Majority of the soil is Deep black calcareous clayey soils or Medium deep red gravelly clay soils.
Annual rainfall	• 594mm	• 727mm	• 353mm
Climate[1]	• The climate here is tropical. In winter, there is much less rainfall than in summer. The average temperature is 27.2 °C.	• Bidar's climate is classified as tropical. In winter, there is much less rainfall in Bidar than in summer. The temperature here averages 25.8 °C.	• The prevailing climate in Raichur is known as a local steppe climate. There is not much rainfall in all year long. The average annual temperature is 27.7 °C.
Land Use Pattern	• Net sown area is 72%, with 12% of land remaining fallow, and 4% as uncultivable/barren land and other land area, including forests making up only 9% of total geographical area	• Net sown area is 66%, with 18% of land remaining fallow, and 3% as uncultivable/barren land and other land area, including forests making up only 6% of total geographical area	• Net sown area is 67%, with 19% of land remaining fallow, and 3% as uncultivable/barren land and other land area, including forests making up only 8% of total geographical area
Irrigation status- **Rain fed area as percent (%) of net sown area**	• 84 percent	• 86.7 percent	• 72.3 percent
Major crops	• Pulses are the most important crops with most farmers cultivating them. Cereals are the second most important crops next to pulses followed by oilseeds in terms of areas under farming. Tur is the major pulse crop of Gulbarga followed by bengal gram, black gram and green gram in terms of areas under production. Sunflower is the major oilseed crop and jawar is the major millet crop of Gulbarga	• Pulses are the most important crops of with a majority of farms cultivating them. Cereals are the second most important crops. Tur is the major pulse crop followed by bengal gram, black gram and green gram in terms of areas under production. Jawar is the major millet crop and soyabean is the major oilseed crop.	• Cereals are the most important crops of Raichur with a majority of the land under the crops. Pulses are the second most important crops next to cereals, followed by oilseeds, in terms of the areas under farming.

[1] climate-data.org

As can be seen in the table above, the area is predominantly rainfed with pulses being a major crop. Raichur receives the least amount of rainfall. The demographic and socio-economic profile presented below establishes the relative backwardness and under development status of the project area.

Table 3: Socio-economic and human development profile in Gulbarga, Raichur & Bidar

Characteristics	Gulbarga	Bidar	Raichur
Total population	• 25.66 lakh (67.44% rural population)	• 17.03 lakh (74.99% rural population)	• 19.28 lakh (75.48% rural population)
Literacy rate (%)	• 64.85	• 70.51	• 59.56
Percentage of total cultivators and agricultural laborers to total workers (with state level data of 49%)	• 58.4%	• 59%	• 69.6%
Small and Marginal farmers	• 58% of the farmers are small/marginal, with only 29% of land area	• 71% of the farmers are small/marginal, with only 40% of land area	• 64% of the farmers are small/marginal, with only 31% of land area
Human Development Index **(State average of 0.508)**	• 0.407 • (Ranked 20 among 30 districts; falls under botton 13 poor performing districts)	• 0.43 • (Ranked 19 among 30 districts; falls under botton 13 poor performing districts)	• 0.165 • (Ranked 30 among 30 districts; is the poorest performing district)
Reproductive Health Index	• 0.649 • (Ranked 18 among 30 districts)	• 0.661 • (Ranked 14 among 30 districts)	• 0.603 • (Ranked 28 among 30 districts)
Empowerment Index	• 0.544 • (Ranked 27 among 30 districts)	• 0.56 • (Ranked 19 among 30 districts)	• 0.529 • (Ranked 29 among 30 districts)
Labour Index	• 0.405 • (Ranked 13 among 30 districts)	• 0.328 • (Ranked 25 among 30 districts)	• 0.307 • (Ranked 26 among 30 districts)
GII (Gender Inequality Index)	• 0.13 • (Ranked 26 among 30 districts)	• 0.115 • (Ranked 23 among 30 districts)	• 0.15 • (Ranked 28 among 30 districts)
Child Health Index	• 0.328 • (Ranked 25 among 30 districts)	• 0.656 • (Ranked 12 among 30 districts)	• 0 • (Ranked 30 among 30 districts)
Nutrition Index	• 0.336 • (Ranked 27 among 30 districts)	• 0.515 • (Ranked 21 among 30 districts)	• 0.185 • (Ranked 30 among 30 districts)

Education Index	• 0.336 • (Ranked 25 among 30 districts)	• 0.432 • (Ranked 22 among 30 districts)	• 0.555 • (Ranked 17 among 30 districts)
CDI (Child Development Index)	• 0.334 • (Ranked 28 among 30 districts)	• 0.53 • (Ranked 21 among 30 districts); Bhalki in Bidar had lowest CDI among all 176 Taluks- 0.327	• 0.231 • (Ranked 30 among 30 districts)
Food Availability Index	• 0.546 • (Ranked 3 among 30 districts) •	• 0.465 • (Ranked 5 among 30 districts) •	• 0.298 • (Ranked 11 among 30 districts) •
Food Accessibility Index	• 0.529 • (Ranked 12 among 30 districts) •	• 0.678 • (Ranked 8 among 30 districts) •	• 0.413 • (Ranked 17 among 30 districts) •
Food Absorption Index	• 0.324 • (Ranked 27 among 30 districts)	• 0.564 • (Ranked 17 among 30 districts) •	• 0.086 • (Ranked 30 among 30 districts) •
Food Security Index (FSI)	• 0.466 • (Ranked 12 among 30 districts)	• 0.569 • (Ranked 5 among 30 districts) •	• 0.266 • (Ranked 29 among 30 districts) •
District Composite Development Index (DCDI)	• 0.345 • (Ranked 28 among 30 districts)	• 0.408 • (Ranked 23 among 30 districts) •	• 0.371 • (Ranked 27 among 30 districts) •
Sanitation Index	• 0.118 • (Ranked 25 among 30 districts)	• 0.123 • (Ranked 24 among 30 districts) •	• 0.071 • (Ranked 28 among 30 districts) •
Livelihood Index	• 0.231 • (Ranked 29 among 30 districts)	• 0.244 • (Ranked 30 among 30 districts) •	• 0.346 • (Ranked 16 among 30 districts) •
Water Index	• 0.573 • (Ranked 22 among 30 districts)	• 0.490 • (Ranked 26 among 30 districts) •	• 0.493 • (Ranked 25 among 30 districts) •

4. Project components, strategies, and outputs

While the core construct of the project revolves around agricultural extension services, the project since its inception advocated a comprehensive approach to capacity development and farmers empowerment, focusing not just on yield improvement for selected crops but bringing food and nutritional security and overall livelihood development. The comprehensive set of strategies across the agriculture value chain was termed as the "inputs-throughput-output" model which proved to be one of the key determinants of success in the first phase of project implementation. The model with its different activities has been depicted below:

The "Input-Throughput-Output" Agri Extension Model

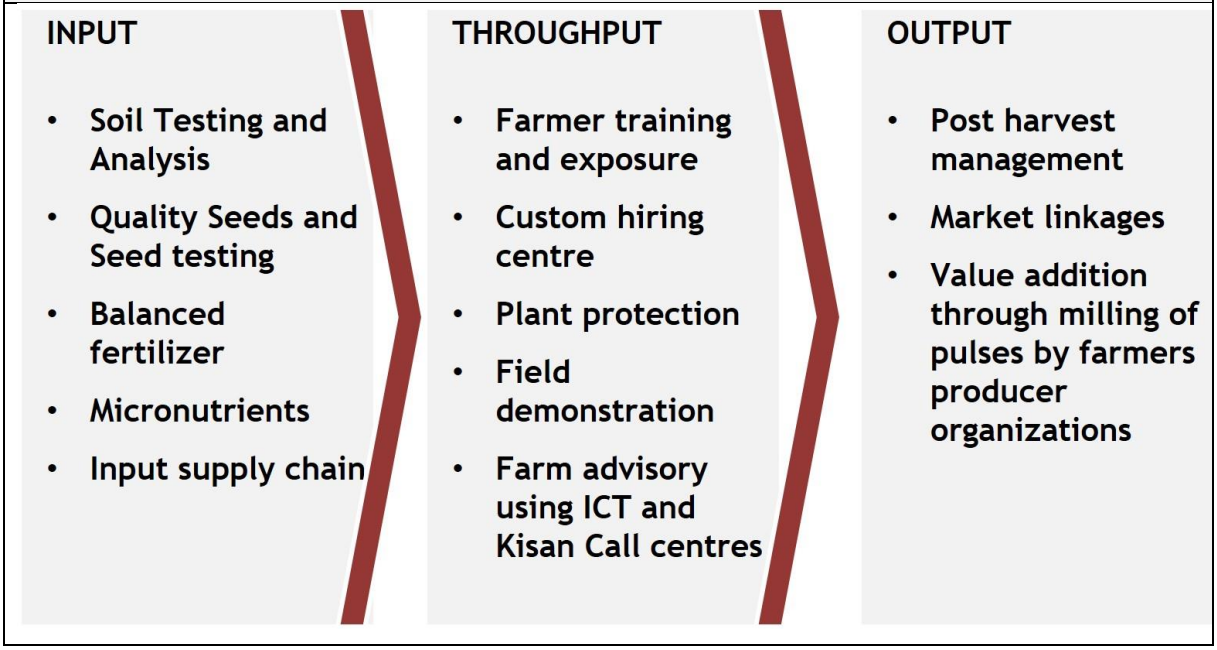


Table 4: Activities under the "Input-Throughput-Output" Model

The project continued with its stated model in its second phase of implementation. The agriculture extension services were scaled up to include more project beneficiaries. The components on integrated farming system were also scaled up to create more number of farmers as role models demonstrating a holistic model for livelihood development through better resource utilization for agriculture and allied activities. More importantly, the second phase worked extensively on the establishing and strengthening the agricultural village resource centres to strengthen the market integration and commodity processing services. The components of the project during second phase were as follows:

- Component 1- Agricultural Extension Services (AES)
- Component 2: Promoting integrated farming systems (IFS)
- Component 3: Enabling ICT in agriculture
- Component 4: Strengthening Farmer Producer Organizations (FPOs)
- Component 5: Establishing Agri-Village Resource Centres (AVRCs)

Each of these components, related set of activities/interventions and achievements has been discussed below:

4.1 Component 1: Agricultural Extension Services (AES)

Agricultural extension is the application of scientific research and knowledge to agricutural practices through education of farmers. Generally, agricultural extension can be defined as the "delivery of information inputs to farmers" and are key in teaching a farmer about how to improve the farmland's productivity. They are instrumental in informing and influencing research and in ensuring that knowledge that is assimilated is further implemented on the field as innovative practices.

Extension services can be classified into three broad types- technology transfer, advisory services and facilitation. The project is working on each of these three aspects of extension services. The key activities include:

Soil testing and analysis

A continuation from phase I, soil testing and analysis helps in determining the exact requirements for fertilizers and micronutrient inputs without causing any adverse impact on the soil and maintaining its fertlility in the long run. During phase II of the project, soil samples were collected from the plots of 467 farmers each year that were further analysed for pH, electrical conductivity (EC) and available micro-nutrients like Nitrogen (N), Phosphorous (P), Potassium (K),Sulpher (S) Zinc (Zn), Iron (Fe), Boron (B) and Molybdenum (Mo). The individual report cards after the soil testing issued to the beneficiary farmers helped them in determining the appropriate quantity of fertilisers to meet specific crop requirements while taking advantage of nutrients that were already present in the soil.

Table 5: District wise distribution of soil health cards

Year	Gulbarga	Bidar	Raichur
2016	430	37	NA
2015	264	133	67
2014	275	126	66

Field based demonstrations

Behavioral economics has shown that losses hurt more than the feel-good factor arising from equivalent gains. Thus, there is a natural tendency towards risk aversion—preferring lower returns and certainty over uncertainty alongside potentially large payoffs.

The project works primarily with small holder farmers who often perceive risks in adopting new practices and technologies. As already discussed earlier in the report, farming conditions are not very conducive due to predominantly dryland farming, recurrant drought and risk of crop failure due to pests and insects. The market is also volatile and pricing systems are not uniform. Within this context, the risk taking ability of the farmers is minimal and their propensity to accept newer cultivation practice or technology adoption is low.

Within this scenario, field demonstrations are effective agents to address perceived risks. Such demonstrations are designed in a way to take new innovations out of the unreal, unseen scientifc realm of the research lab and place them in the farmer's everyday environment. They are used to first demonstrate the results of adopting a new practice and then give the farmer the opportunity to practice and adopt the new methods. Farm demonstrations usually conduct side by side comparisons of new and traditional techniques. They are conducted in the farmer's own field to show that experimental results can be reproduced locally.

As part of the project, farm demonstrations were conducted on three types of plots – large scale demonstrations (LSDs), small scale demonstrations (SSDs) and block level demonstrations (BLDs). SSDs were undertaken on an average one acre plot, LSDs were undertaken on an average 10 acre plots whereas BLDs were undertaken on a 15 acres plot.

While SSDs was a continuation from phase I of the project, the reasons to introduce LSDs was to showcase increased ease of access and visibility to both project and non project farmers, project staff, thought leaders and policy makers.

For each demo plot, the project provided the required inputs in the form of seeds, organic seed treatment material (Trichoderma, PSB, Rizhobium), weedicide (Pendamethalin), insecticides (Lancergold, Profenophos, DDVP (Dichlorvos), Coragen, Acephate, Fame), fertilizers (Vermicompost, DAP, Sulfozinc, 19:19:19, DNP), and plant growth regulant (planofix). The seed varieties used for the demonstrations included BSMR-736 and ICPH-2740 (Bidar district) and TS-3R (Gulbarga and Raichur district).

Promoting improved variety of seeds

High quality inputs are a precursor to increased productivity. Improved varieties of seeds or high yielding varieties of seeds are developed after thorough research to test the resistance and suitability of a crop under a particular agro-climatic zone.

The project played a key role in introducing and promoting the use of high quality seeds that were considered the most appropriate for disease, were wilt free and ensured higher productivity of pigion pea in the region. The project introduced and promoted the use of TS3R, a new seed variety that was produced by the Agricultural University of Gulbarga. BMSR 736 is a high quality seed that was introduced back in 1980s and 1990s but which saw limited application. The project promoted the use of BSMR-736 and demonstrated its impact on productivity, with directions on proper management & treatment. While TS-3R was promoted in Gulbarga and Raichur. BSMR-736 was promoted in Bidar.

Recommended production technology (Package of Practices) for pigeon pea

In order to ensure the best possible outcomes for red gram and encourage the use of the most appropriate methods of cultivation, the project farmers were recommended a variety of activities that included land preparation, seed treatment, application of organic and chemical fertilisers, integrated pest management and nutrient management activities. All the activities had varying benefits but were interlinked and contributed to increasing productivity. Key recommendations made were with regard to using rhizobia for seed germination, biofertilizers through vermicomposting, moderate application of DAP and Sulpho-zinc etc. Activities with regard to water management and plant protection were suggested for the holisic coverage of the crop during the various stages of cultivation.

Intercropping

Intercropping is the practice of growing two or more crops simultaneously on the same piece of land. The advantages of intercropping are numerous such as the reduced incidence of disease, insects/pests, and hillside erosion and improved utilization of land, total production and crop productivity.

As part of its extension activities, the project encouraged farmers to adopt different intercrops of a short duration variety using minimal quantities of fertilisers. This was done to increase the per unit area production, to minimize production related risks and promote crop diversity.

Capacity building of farmers

The project worked on a cascading model to train its farmers. For the same, progressive farmers with a proven track record of innovative practices were identified and trained as lead farmers. Together with the lead farmers and using a range of methods such as exposure, lectures by experts, field based demonstrations, interactive learning and cross learning , the project built the capacity of the local farmers on the entire cycle of cultivation starting with treatment of seeds, land preparation, methods of sowing, fertilizer and nutrient management

etc to harvesting, grading and marketing of the produce. For these trainings, collaborations were initiated with agricultural scientists from the local KVKs and experts from the State Agricultural Department.

4.2 Component 2: Integrated Farming System (IFS)

Integrated farming (or integrated agriculture) is a commonly and broadly used term that denotes a more integrated approach to farming as compared to the existing monocultural approaches. It refers to agricultural systems that integrate livestock and crop production. The integrated farming system has revolutionized the conventional approach to farming by integrating it with livestock, aquaculture, agro-industry and allied activities. It could be crop-fish integration, livestock-fish integration, crop-fish-livestock integration or combinations of crop, livestock, fish and other allied enterprises.The IFS approach thus ensures the optimal utilization of resources. Farm wastes are recycled for productive purposes in this system and a judicious mix of agricultural practices such as dairy, poultry, piggery, fishery and sericulture best suited to the local environment are leveraged upon for increased profitability.

A total of 210 farmers were identified and ssupported to adopt integrated farming system during the second phase of the project. These farmers were given assistance to start different components such as azolla cultivation, vermi-composting, horticultural activities, agro forestry, and goat rearing/poultry activities.

Table 6: Number of IFS farmers over the last three years

Year	Gulbarga	Bidar	Total
2014	47	23	70
2015	50	20	70
2016	54	16`	70
Total			210

Exposure visits were organized for farmers selected for IFS support to visit the most successful demonstration plots and the farms of leading IFS farmers. Through such kind of experiences, farmers were able to view many additional beneficial components such as farm ponds which could aid them in increasing their own productivity and understanding how the best value can be derived from a given set of technology.

4.3 Component 3: Enabling ICT in Agriculture

The use of information and communication technologies in agriculture (ICT in agriculture), also now increasingly known as e-agriculture, is fast developing and applied innovatively in the rural domain, especially agriculture. The purpose of enabling and including ICT in agricuture is varied and includes the ability of farming communities across the world to share opinions, experiences and good practices. This will ensure that the knowledge created is shared and used by communities everywhere. The key project interventions under enabling ICT for agriculture component are the Kisan Call Centre, the ISAP Krishi Gyan Programme, and Agripole.

The Kisan Call Centre (KCC)

The idea behind the initiation of the KCC is to provide a consistent back-up extension support on a 24/7 basis that farmers could easily access. The centre consists of a combination of telecommunication infrastructure, computer support and human resources organized to effectively manage the queries of the farmers in their native language. The KCC was first set up in Gulbarga and a toll free number (1800-425-5052) was made available to all the farmers in the project area.

The Krishi Gyan Programme

The Krishi Gyan (KG) Programme, literally meaning Agriculture Knowledge was an android based decision support system (DSS) that was developed to aid extension workers. Extension workers visiting the farm carry KG enabled tablets that helps them in diagnosing problems of probable pests or disease infestation on the farmer's land. Using the app, the agents were able to access high resolution pictures of diseases and pest infestations along with the description of symptoms and control measures. These pictures helped in diagnosing the disease and enabled the workers to provide on the spot solutions to the farmers. In cases of additional assistance required, the pictures were sent to a KCC expert. Using these images, the KCC experts further diagnosed the problem and provided contextual solutions.

KG also provided animation videos on various farming and crop related techniques. These were used by agents to educate farmers in appropriate methods that were simple to understand. Currently, the KG programme is available in Hindi and Kannada.

Agripole

Through the agripole, farmers were able to download applications without being connected to the internet. The process to do the same involved coming close to the agripole, switching on the bluetooth, selecting the relevant crop app and downloading it on one's phone.

4.4 Component 4: Strengthening farmer producer organizations (FPOs)

While the farmer producer organizations were formed during phase I of the project, the focus during phase II was on strengthening these FPOs and making them sustainable.

Convergence with other schemes to strengthen market integration

For effective market integration, it is important that the producers establish connections with key people in the value chain. Through project interventions, the FPOs were linked with Banks and existing Government Schemes, or with private and corporate schemes. The FPO's were also linked with the custom hiring service centre (CHSC) scheme initiated by the State Agriculture Department of Karnataka.

The CHSCs were run by the FPOs formed under the project in the particular regions. Equipments and machinery such as tractors, power rotavators, combine harvestors, excavators etc were kept and rented out as per the requirements of the farmers based on identified needs of the particular geographical area. However, based on the field visits conducted, it has been noted that the CHSC facility is not available or functional across all the AVRCs. For eg: disussions at the Tadkal AVRC did not indicate much usage of this facility whereas at Bhalki, despite machinery being available, the same was out of order.

Creation of the FPO Federation

The Karnataka Farmers Maha Society (KFMS) was set up in Gulbarga to provide technical support to the FPO's in monitoring and sustaining existing projects, providing market linkages through urban outlets, acting as a catalyst, and a bridge between vendors/customers and FPO's. The federation has been constituted by members from all the seven FPOs. The Presidents of these seven FPOs forms the board of directors and are involved in the decision making processes.

New initiative under market integration: Kisan Fresh (Producer to Consumer)

The KFMS, Gulbarga along with the support of ISAP has set up "Kisan Fresh" at Kanni Market, Gulbarga. The urban outlet currently sells vegetables, jaggery, pulses through this initiative. As reported by ISAP, the plan is to use the outlet for the sale of fruits, rice, ground nuts etc through women SHG groups.

4.5 Component 5: Establishing Agri-Village Resource Centers (AVRCs)

The Agri Village Resource Centre (AVRC) is an extension to the Agri Business Centre (ABC) that was promoted during phase I of the project. The AVRC works towards strengthening the market integration of the FPOs and also has a value addition component, i.e. the dal mill facility. In addition to agri business units, the project also initiated social development units including Primary Health Centre, Women's Skill Development Centre, Computer Education Centre and Children's Recreation Centre. Each registered FPO has an Agri Village Resource Centre (AVRC).

Table 7: Different components at the AVRC centres

S. No	Component	Category
1	Custom Hiring Service Centre (CHSC)	Agribusiness units
2	Fertilizer sales	
3	Pesticide sales	
4	Dal Mill	
5	Nursery	
6	Vermi-compost units	
7	Seed business/Aggregation/Procurement	
8	Computer education centre	Social development units
9	Women's training centre	
10	Primary health centre	

The AVRC is considered to be an important output of the project with different activities. Besides being a hub of all agri business activities, it is also a coordinating centre for the different training and manufacturing activities. The AVRCs have been designed in a way so as to be equipped to locally deliver the immediate needs of the farmers. It is further connected to the ISAP Call Centre and provides inputs to the farmers such as market rates.

During the field study, the procurement process was found to be ongoing at the AVRCs that the assessment team visited. The team observed the process of grading, weighing, sealing and also had discussions with the farmer groups regarding the entire procurement procurement process. The discussions also indicated that farmers usually came to these centres and were able to interact with other farmers to discuss new ideas. The team also noted the nursery facility that was functional in some of the AVRCs like Aland. CHSC facility was available at Bhalki but was not in use owing to maintenance issues.

5. Project outcome and impact

5.1 Profile of project beneficiaries

The standard challenge of any impact evaluation is determining what would have happened in the absence of the project. To truly understand the impact of a project on a given indicator,information would ideally be available on project beneficiaries with the project and those same beneficiaries without the project. One of the limitations faced by the assessment team was the non availability of any baseline informationfor the project. Another challenge usually faced while evaluating agriculture extension projects is to determine the spill over effect to the non targeted beneficiaries. The OCPF-AES project worked on certain direct interventions like field demonstration, soil testing and integrated farming systems. Formation of farmers interest groups, farmer producer organisation and the Mahasangha were interventions that engaged with selected project beneficiaries. The impact of these direct interventions had a huge spill-over effect on a wider section of farmer communities in the project area. The interventions related to capacity development, exposure visits, value addition through dal mills, access to CSHCs and pulse procurement was not exclusively meant for FPO members and hence had a far wider impact in the project area.

The project was implemented across 186 villages of six talukas of Gulbarga, Bidar and Raichur districts. A representative group of people from these villages were then mobilised through project team members to form farmers interest group and the FIGs were later on federated at the block level to form FPOs.

SN	FPO Name	Villages outreach	AVRC Location	Members
1	Afzalpur Farmers Federation	25	Gudur, Afzalpur	1000
2	Dr. S A Patil Farmers Society	28	Ankalaga, Afzalpur	1000
3	Shri Negilayogi Aland Farmers Federation	9	Tadkal, Aland	1000
4	Shri Annaveerabhadershwar Chitapur Farmers Federation	21	Hebbal, Chitapur	1000
5	Shri Basaveshwar Multipurpose Society	39	Satapur, Basavkalyan	1000
6	Shri Jai Kisan Multipurpose Cooperative	43	Halabarga, Bhalki	1000
7	Shri Basaveshwar Raichur Farmers Federation	21	Gonal, Raichur	1000
		186		**7000**

Table 8: Names of the project supported AVRC's with no of villages, location and members

Discussions with members of the FPOs indicated that initially, some membership fees were charged for FPO membership. However, later, the membership fees were reduced or waived off. The number of members for each FPO was however capped at 1000 members. All the talukas have one project supported FPO except Afzalpur that has two FPOs. All the FPOs were already instutionalized towards the beginning of 2014. While other initiatives like field demonstrations, IFS, soil testing etc continued, the key activity undertaken during phase II was construction and operationalization of the AVRC centres at the locations mentioned above. At the time of assessment (the assessment team visited all the AVRCs except in Raichur), all the

AVRCs were operational, being managed by a board of directors constituted from amongst the selected FPO members itself.

While each FPO/AVRC centre caters 25-30 villages on an average, the catchment area for Bhalki taluka is the highest while that of Aland is the lowest.

With respect to the overall demography of the project supported villages, the six talukas can be compared with respect to the outreach of the project. In the graph below the districts have been located multivariate parameters of total population, taluka level number of FPO members and talukas with literacy rates more than 50%. It can be seen that there is considerable amount of variation among the blocks when ranked by these three parameters. For example Afzalpur has concentration of project supported beneficiaries in comparison to census population, while Aland has a high census population but low concentration of beneficiaries. Raichur and Chiitarpur have less than 50% literacy rates , high census population and the number of beneficiaries is close to 1000- they present potential cases of expansion of the program through targeted awareness.

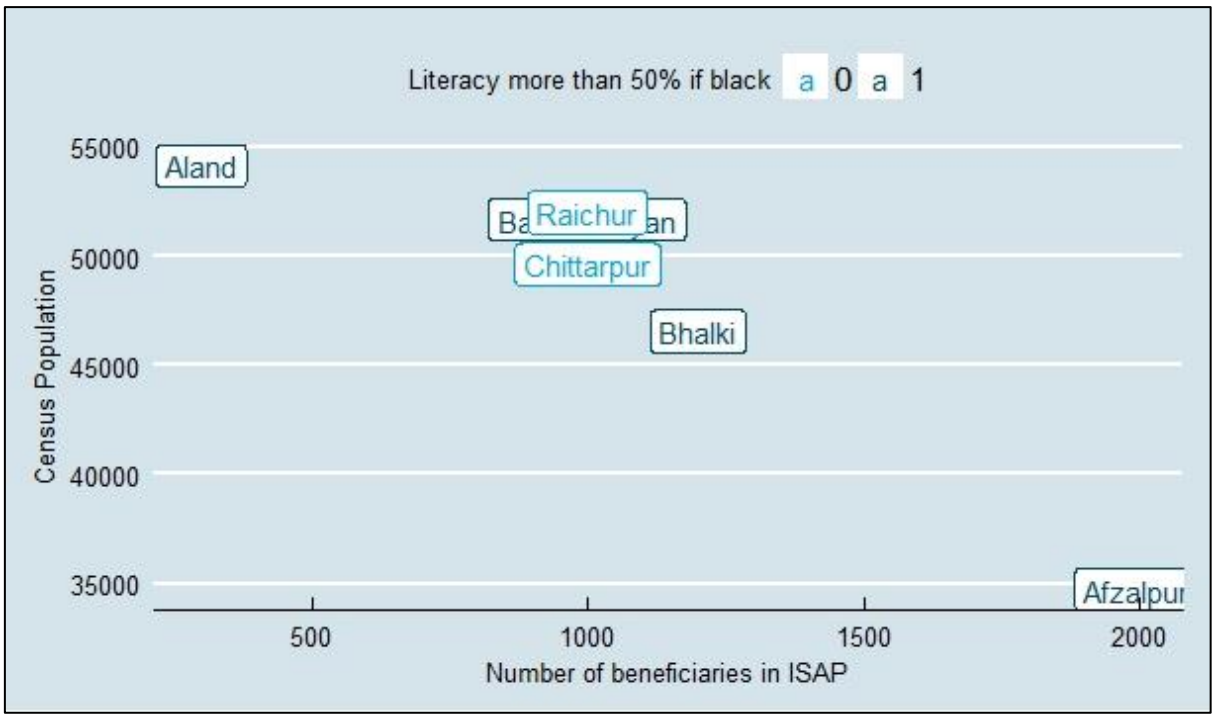


Figure 3: Literacy levels of the communities in the three project areas

The six blocks of intervention in the ISAP program can be compared with respect to the outreach of the program, in the graph above we locate the districts using three parameters – census level of population, block level number of beneficiaries and blocks with literacy rates more than 50%. As we can see there is considerable amount of variation among the blocks when ranked by these three parameters. For example Afzalpur has a high number of beneficiaries and low census population, while Aland has a high census population but low number of beneficiaries, this indicates that the coverage of the program is much higher in Afzalpur compared to Aland, or in other terms there is scope for expansion in Aland. Raichur and Chiitarpur have less than 50% literacy rates, high census population and the number of beneficiaries is close to 1000- they present potential cases of expansion of the program through targeted awareness.

Socio-economically, the villages corresponding to Aland, Chitapur and Bhalki have more than 25% scheduled caste population. The proportion of SC and ST population and distribution of total workers in theproject talukas is provided in table below:

Social and worker categories- all figures in percentage to total population

Block Name	Chitapur	Afzalpur	Aland	Raichur	Basavakalyan	Bhalki
Scheduled Caste	30.7	19.9	26.6	22.0	24.2	25.1
Schedule Tribe	1.9	1.0	2.2	21.3	21.5	11.4
Literacy rate	45.0	50.7	53.6	43.9	58.1	61.4
Literacy rate female	36.6	40.9	44.0	33.8	49.1	52.7
Working	45.2	44.3	48.3	51.7	45.2	45.6
Working Females	37.0	35.6	41.6	47.2	35.7	36.1
Main Worker	34.1	33.1	36.2	40.1	35.0	35.2
Main Worker Female	24.2	22.2	26.0	32.7	24.0	24.5
Main Worker-Cultivator	10.8	11.6	11.6	14.3	11.7	11.2
Main Worker -Cultivator-Female	16.6	19.3	19.1	19.9	17.8	16.9
Main Worker- Agricultural laborer	12.9	14.8	17.1	18.0	14.5	15.9
Main Worker-Agricultural Laborer female	13.1	14.9	17.2	19.5	14.3	15.0
Marginal worker	11.1	11.3	12.1	11.7	10.2	10.4
Marginal worker female	12.8	13.4	15.6	14.5	11.7	11.6
Marginal worker Cultivator	0.6	0.6	0.6	0.9	0.9	1.2
Marginal Work Agricultural laborer	6.2	8.0	9.0	7.7	6.6	6.5
No Work	54.8	55.7	51.7	48.3	54.8	54.4

Source: Census of India, 2011, CD block primary census abstract

Figure 4: Worker categories in the six blocks of the Gulbarga, Bidar and Raichur

The land holding pattern of the project targeted districts indicates a high proportion of small and marginal farmers primarily dryland-rain-fed system of farming

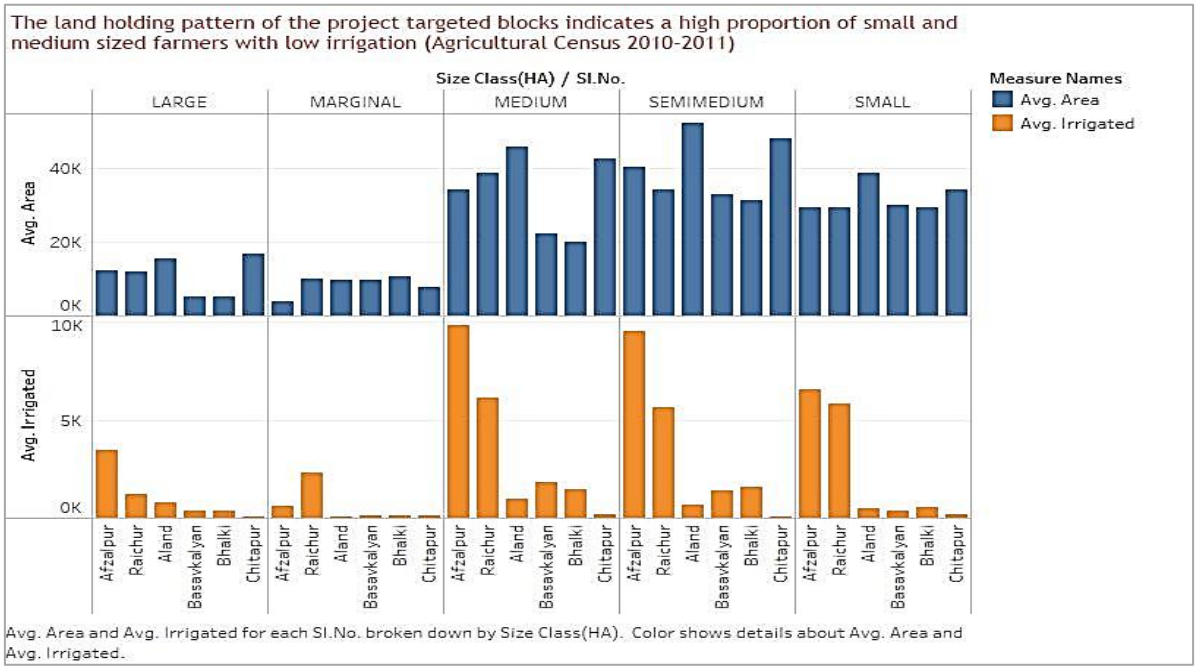


Figure 5: Landholding patterns of farmers in the three project areas

The land holding pattern patterns by the project area farmers indicates that most redgram grower were among small and semi-medium farmers

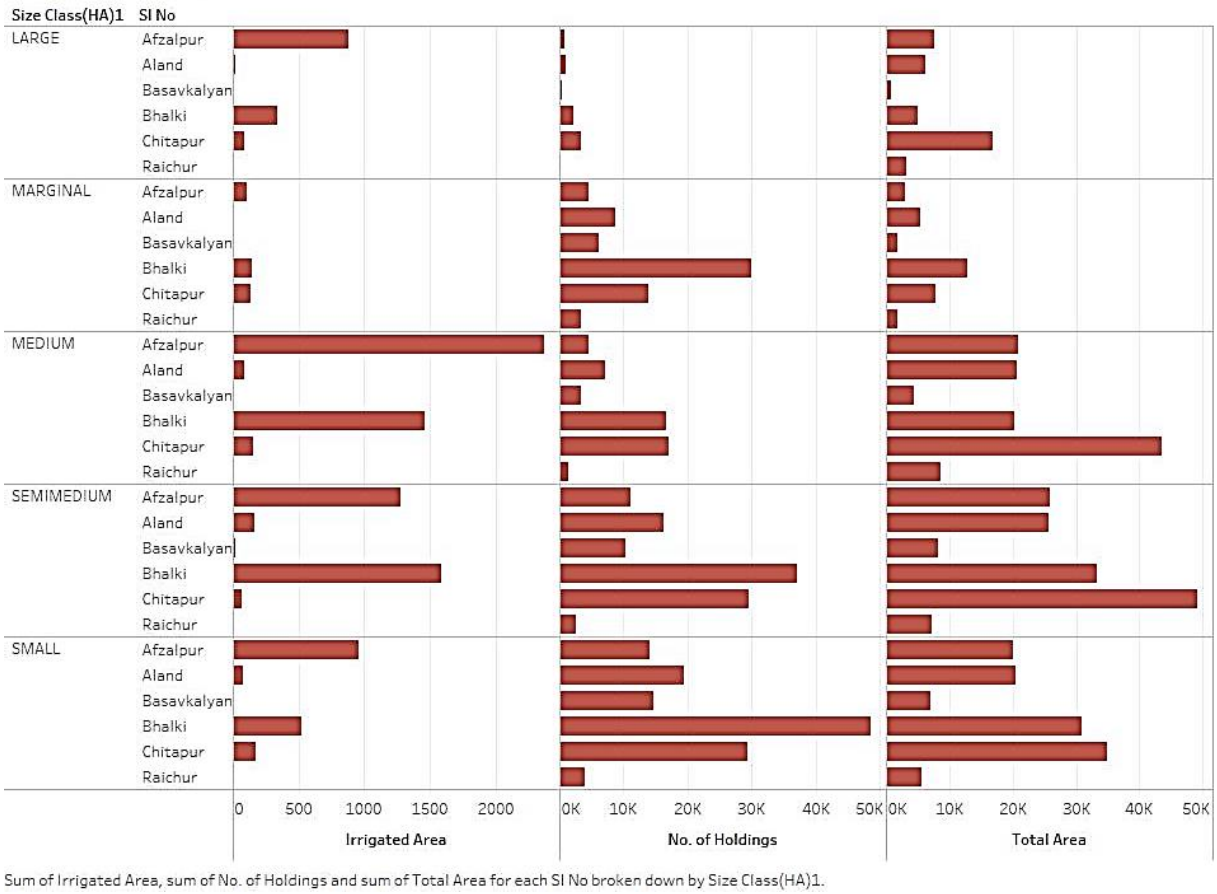


Figure 6: Irrigated area as per the size of the landholdings in the six project blocks

5.2 Profile of surveyed beneficiaries

The impact assessment survey was adminstered to a total of 170 beneficiaries. The project beneficiaries surveued for the impact assessment consists a mix of FPO members (65%) and non members (35%). 95% of the surveyed respondents were hindus while remaining 5% were muslims. Distribution of survey respondents by project talukas is as follows:

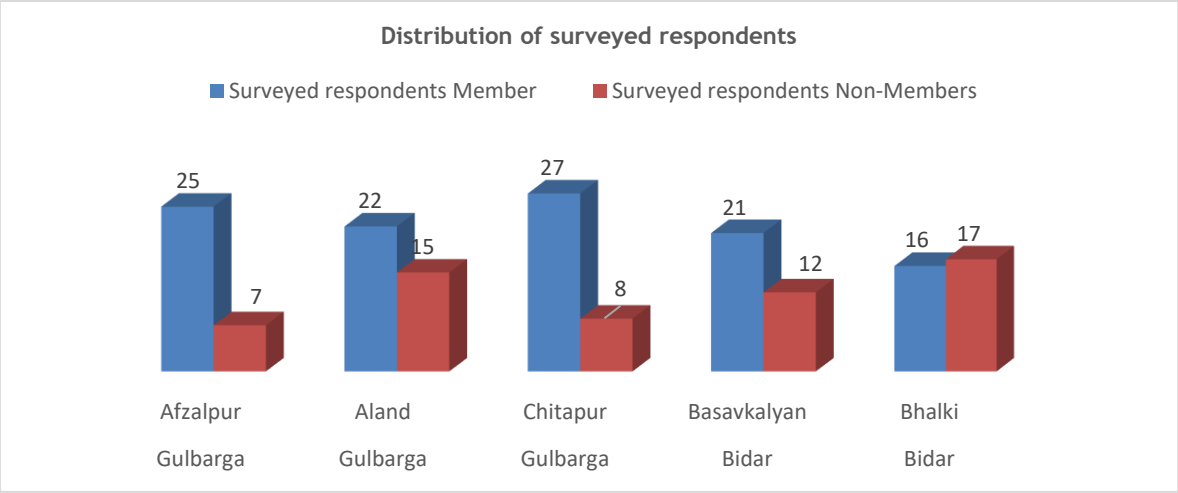
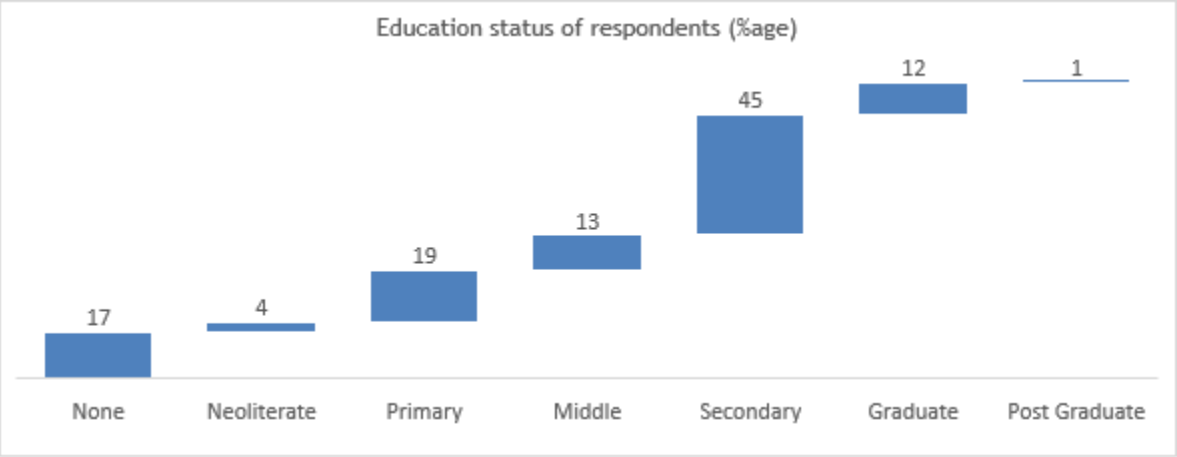


Figure 7: Distribution of the farmers interviewed in the survey conducted

In terms of education, 16% of the respondents were illiterates while only 10% were graduates or post graduates. Majority had completed either primary or secondary schooling.



Out of the total members (N=111), 50 received support through field demonstration intervention. None of the non members (N=59) were beneficiaries of farm demo. Pulse procurement had the highest number of direct beneficiary (117) followed by Dal mill and custom hiring centres.

Intervention area	Total	Members	Non-Members	Total %	Members %	Non-members %
Field Demonstrations	50	50	0	29	29	0
Integrated Farming System	36	33	3	21	19	2
Pulse Procurement	142	95	47	84	56	28
Dal Mill	82	58	24	48	34	14
CHSC	73	49	24	43	29	14

Table 9: The distribution of the surveyed farmers across the different intervention areas

More than two-third of the beneficiaries surveyed were small or marginal farmers. Only 73 number of farmers had irrigated land. Out of total area of 992 acres, irrigated area was only 309 acres.

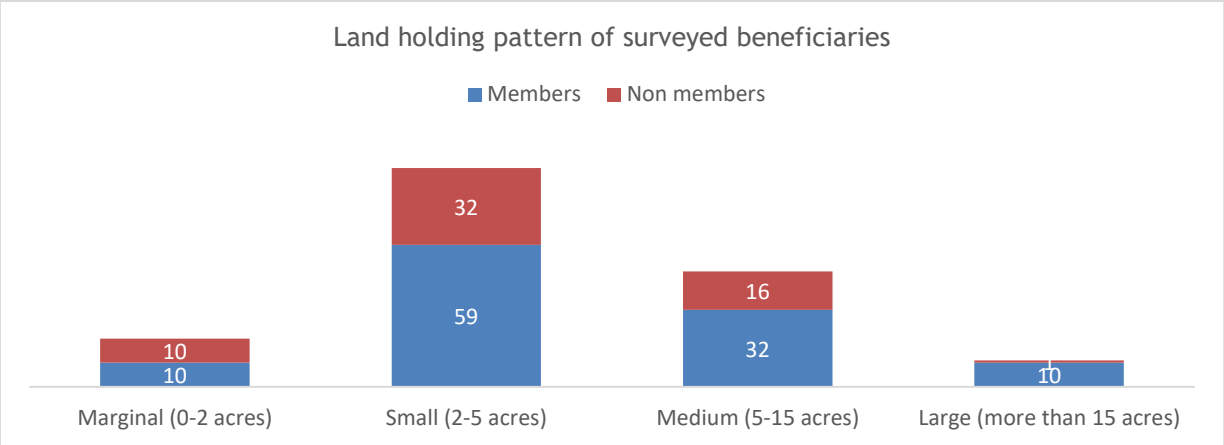


Figure 8: Landholding patterns of the farmers that were surveyed

Khariff crops are undertaken on approximately 80% of the total available agriculture land by the survey respondents. Redgram is the primary crop undertaken by the farmers with 96% of the respondents growing pigeon pea during khariff. In addition to redgram, Soyabean and Sugar

cane (irrigated land only)were the other two crops grown by project farmers in Khariff. Around 50% of the respondents reported practicing intercropping with redgram. The crops used as inter-crop are black gram, green gram and soyabean.

In Rabi, the cropped area is just 18%. Important crops undertaken during the season are Jowar (43%), Bengal gram (31%) and Wheat (21%). Chick pea was reported being grown on 6% of total cropped area. Cropped area in summer is just 1% of total agricultural land. Only farmers with assured irrigation go for summer crops.

5.3 Project impact

Before moving on with assessment of impact of project interventions, it is important to highlight certain externalities that any Agriculture Development project is bound to encounter. Some of these may be managed but usually these factors are beyond any direct control of project interventions. Some of these factors include:

- **Rainfall**: The project area is affected by recurrent drought. Off the three intervention years, the first two were draught years. The project area received good rainfall in its last year of intervention. In absence of adequate rainfall and lack of sufficient irrigation facilities, there were instances of crop failure even on field demonstration plots that was reported under the project.
- **Beneficiary response**: The success of a low on inputs- high on a advisory and facilitation project requires an intense rapport with the project beneficiaries. The response of the beneficiaries towards the project interventions, their ability to internalise information & knowledge and their participation is critical in determining the success and the achievement of the project and its objectives. If the response rates are high, the same is reflected in the positive changes in the external environment of the communities. However, low response rates usually indicate that the project may not be received very well by the communities and may thus require sustained efforts over time;
- **Linkages and networks**:Another critical success factor to have concerted impact, is to engage with all stakeholders in the value chain. Particularly for agricultural projects, creating public private partnerships with the government and private stakeholders becomes important for increased market access, increased access to finance etc. The project has demonstrated some such initiatives where it collaborated with state agricultural food cooperatives as well as NAFED.
- **Policy framework**: Conducive Government policies provides a boost to project interventions playing a major facilitative role. Policies related to pulses are under a lot of debate these days. The discussion includes aspects of subsidies, rate fixations, crop insurance etc. Not only is it important for farmers to avail such benefits but it is also critical that farmers are aware of the available schemes

Figure 4 below provides a schematic representation of the impact trail. It indicates causality between various interventions and its impact. The project has led to intermidiate and long term outcomes leading to long term impact. While assessing the impact, the assessment team interacted with project members (FPO members) as well as non members. It may be noted that most of the interventions supported by the project has reached to non FPO members either indirectly (training, extension services, input supply) or directly (access to CHSCs and pulse procurement). The assessment of the interventions alongside the intermediate output, long term output, intermediate outcome and the long term outcomes has been depicted below:

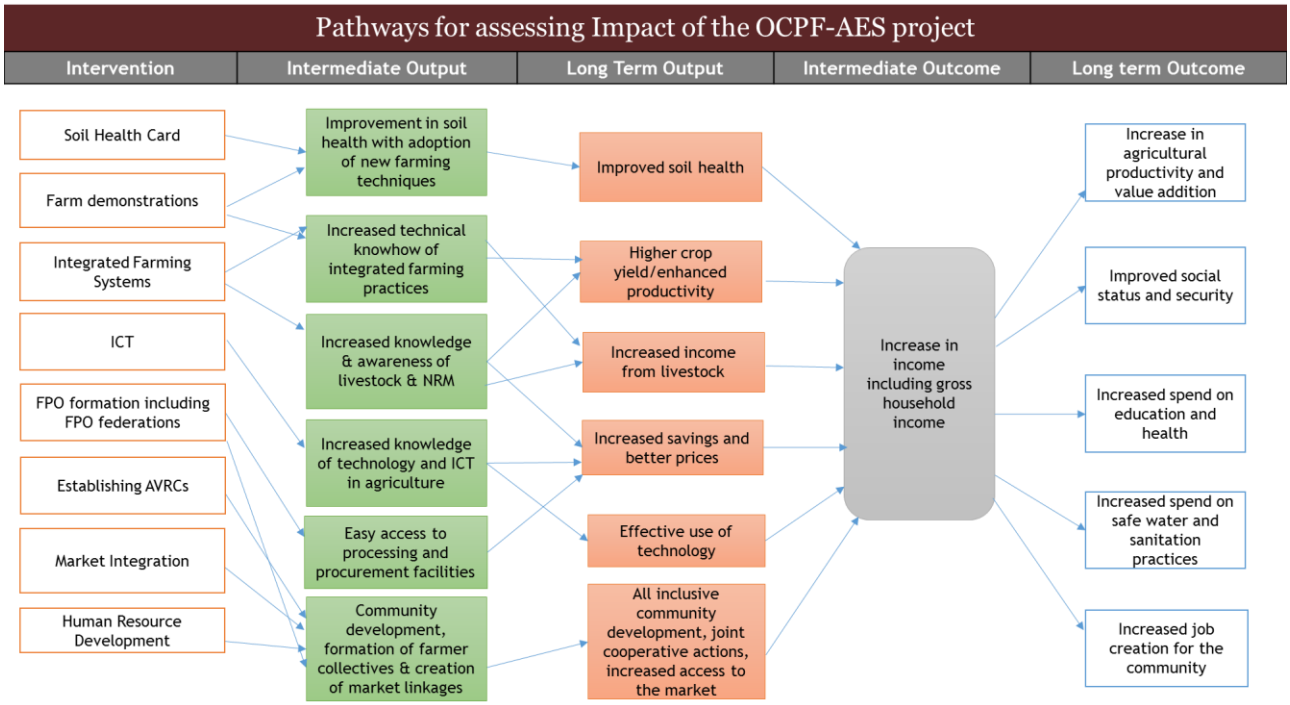
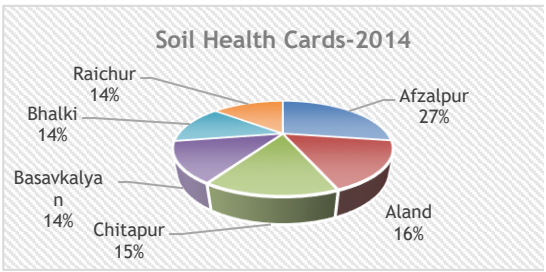


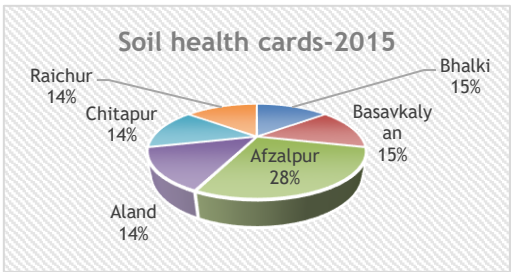
Figure 10: Impact map

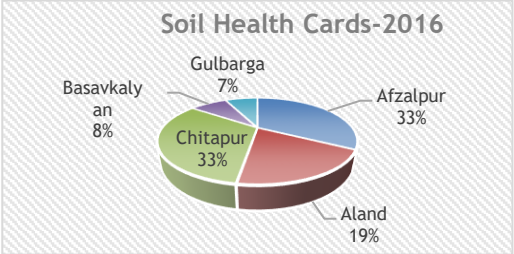
Improved soil health

The targeted beneficiaries- both the members and the non members attribute better awareness and understanding on soil types, application of micro-nutrients and fertilizers as an outcome of project interventions by the project beneficiaries. During the baseline survey (2009-10), 95% of the farmers were found to be unaware about any soil testing facility in the surroundings of the project area. Similarly, only 6% of the total respondents had either visited the soil testing facility or someone from the soil testing laboratory had visited their field. Only 3% of respondents had got their soil tested and only 1% of total respondents had soil health cards. Not a single farmer was aware about the benefits of the soil health card issued to them. The impact study carried out at the end of first phase of intervention indicated that 99 percent of the surveyed respondents were aware of soil testing.

During the second phase of intervention soil samples were collected from the plots of 467 farmers every year covering 92, 69 and 32 villages in 2014, 2015 and 2016 respectively.







- The concentration of soil testing interventions have been more in Gulbarga district with Afzalpur sharing the larger portion of the pie in the intervention years
- In 2016, soil testing was not undertaken in Bhalki; Beneficiaries from Chitapur taluka almost doubled

Figure 11: Soil health card distribution across the project blocks in Phase II

Off the 170 farmers interviewed during the assessment, 80 (47%) reported having received a soil health card. Out of those who received soil health cards under the project, 25% were from Afzalpur followed by Chitapur (24%), Aland (20%), Basavkalyan (20%) and Bhalki (11%). Out of 111 FPO members, 74 (67%) reported receiving soil health cards. The benefits of soil testing was however not confined to members only. Around 10% of non members also reported getting soil health cards. While It is not very clear whether these farmers received soil health cards through the project or other relevant schemes, there is certainly a greater degree of awareness about getting the soil tested. When asked if they received specific advisory on soil management including micro-nutrients and fertilizer application, 95% of the farmers who had reccieved the soil heath card responded in the affirmative.

While conducting FGDs with farmer groups, increased knowledge on soil nutrients and recommnded doses of fertilisers and pesticides emerged as one of the easily recalled impacts of the project. The farmers reported that over time, there has been a behavioural change in terms of acceptance and the demand for getting soil tested and on applying the recommended nutrients as advised by agricultural scientists on fields to get further inputs. The farmers further reported that while earlier the Government used to have soil testing facilities, the same were not used by the farmers. With improved knowledge, some of the farmers have started availing these Government schemes as well.

Adoption of improved variety of seeds

At the time of initiating the first phase of the project, varieties of pigeon pea (Local, Asha, Maruti, TS3R, BSMR 736, and others) were being recommended, of which the seed was seldom available to the farmers. The baseline study carried out in 2009 reported that more than 99% of the area under pigeon pea was covered by local varieties such as Maruti (60%), Jawari (6%), Asha (2%), Gulyal (1%) and other local varieties covering 19% area. Most of these local varieties were long duration crops and hence farmers undertaking these varieties were left with no other choice but to do monocropping. The traditional varieties were also prone to drought becouse of longer-duration crop (180-200 days), wilt and pests.

The OCPF-AES project during its first phase worked towards narrowing down the choice of varieties to the farmers to just two- TS3R and BSMR-376-new high yielding varieties of seeds that was developed by the Agricultural Scientists in Gulbarga. The project also contributed to the availability of the seeds of these varieties. TS3R (early maturity- drought and wilt resistant) and BSMR 736 (late duration- sterility mosaic, wilt and powdery mildew diseases) varieties respectively for low rainfall (Raichur and Gulbarga) and normal rainfall areas (Bidar) were provided for project farmers. A pink variety was also adopted by 11% farmers, which is a high yielding variety but was not provided by ISAP-AES.

As reported by various stakeholders during the course of assessment, despite the potential benefits of using the new and improved seed varieties, its adoption rate was very limited for a few years after its launch. Based on the principal that technology diffusion (awareness) is an

important precondition for adoption to occur, the project through its extension services including field demonstrations, created huge awareness around the potential benefits of using these varieties and also in clarifying the attached myths. The results were visible towards the end of phase I where almost 99% of the project area reported shifting to TS3R and BSMR-736 varieties.

As per the findings of the survey, 95% of the farmers in Gulbarga reported cultivating TS-3R variety of redgram. 5% of the respondents from Gulbarga district reported cultivating the traditional varieties. In Bidar, the survey results indicates a 100% adoption to high yielding varieties. Except one, all the farmers reported cultivating BSMR-376 variety while one of the farmers reported cultivating TS-3R variety. The adoption was uniform across members and non members. Amongst the farmers that are still using traditional seeds, 2 were members while the remaining 3 were non members.

Change in seed rate and improved plant geometry

Ensuring proper soil treatment and preparing the land for cultivation is critical for the survival, growth and productivity of redgram. Before the initiation of the project, the farmers in the project area were not aware about the appropriate methods of land preparation, seed treatment, sowing techniques, spacing and seeding rate. The project through its extension activities, field demonstrations and capacity development interventions created a lot of awareness on these aspects. One of the questions asked by the assessment team was related to the seeding rate. The baseline study undertaken in 2009 indicated an average seeding rate of 4.2 kg per acre. The farmers during focus group discussions reported that earlier on they would broadcast the seeds and believed the greater number of seeds would result in greater levels of prductivity. Now, through awareness created by the project, farmers have learnt to prepare the land and treat the seeds before sowing them. The seeds are now sown using the dibbling technique in rows and recommended spacing is being maintained.

The survey findings indicated an average seed rate of 3.14Kg per acre indicating a drop in seed rate by atleast 1 kg per acre from 2009. The seed rate adopted by members was 3.04 kg per acre compared to a slightly higher seed rate amongst non members (3.20 kg per acre).

		Average Seed rate kg/acre	
District	Taluka	Member	Non-Members
Gulbarga	Afzalpur	3.08	3
Gulbarga	Aland	3.06	3.4
Gulbarga	Chitapur	3.06	3.14
Bidar	Basavkalyan	2.92	3
Bidar	Bhalki	3.09	3.5
		3.04	3.20

Table 10: Average seed rates per acre being used after project interventions

Better awareness/knowledge on appropriate package of practices

One of the major challenges faced by farmers is the lack of access to sector specific information. With increased globalization and the porosity of borders, information and knowledge have become tools that are considerably easier to access. However, this does not resonate in the case of agriculture. Farmers across the country continue to remain unexposed to advancements in technology and are often remain confined to traditional systems and practices.

An important area of focus under the project has been on capacitating farmers to adopt modern and improved methods of cultivation- pre as well as post harvest.

Survey finidings indicate that farmers do attribute improved knowledge and awareness levels to the support provided through the project. Only 27% of the respondents reported not receiving any training either directly or through cross learning. In Aland more than 50% of the respondents reported receiving training and also exposure visits.

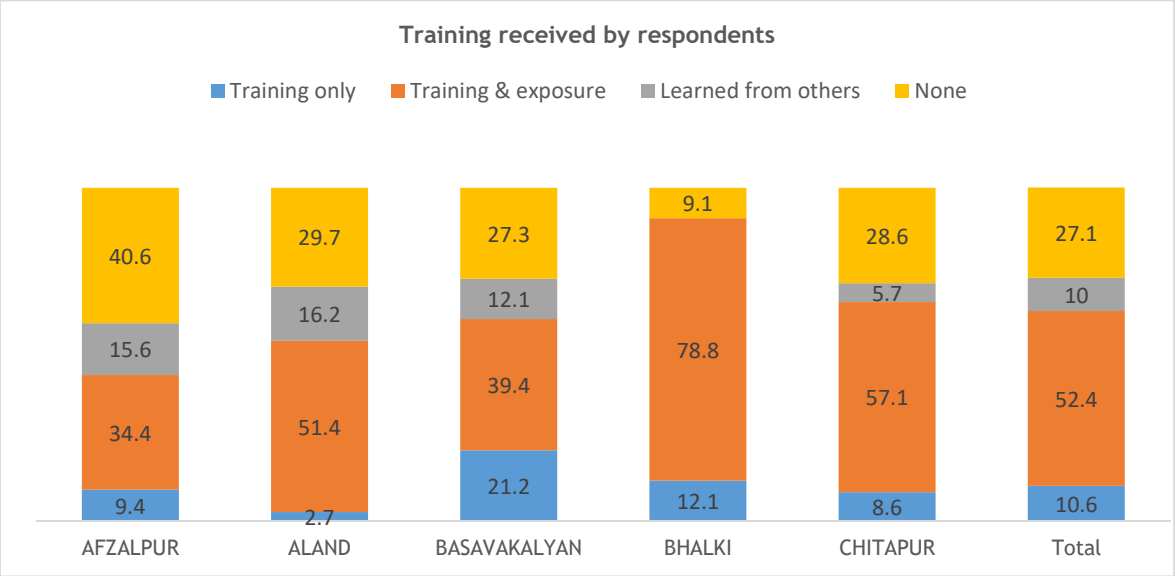


Figure 12: Types of training and knowledge sessions received by the surveyed farmers

117 respondents out of 170 reported their knowledge and awareness about improved agricultural practices have increased in the last 2-3 years. More than 90% amongst them attributed an increase in their knowledge to the project interventions. During interactions with farmers it was reported that they are now aware of the best practices and the complete package of practices that should ideally be implemented in the field and attribute the same to the project as well . This can be seen through the appropriate usage of fertilisers, a drastic reduction in the seed rate per acre that is used.

The impact assessment conducted at the end of phase I, reported close to a 100 percent adoption of the use of organic manures, insecticides and pesticides as compared to the baseline study conducted. At the end of phase II, an analysis of data depicts that farmers applied upto 7 sprays of chemical insecticides-pesticides during the baseline year (2009-10) which declined to 4 sprays in 2013-14. During 2009-10, around 65% farmers were observed to be applying inputs atleast 6 times a day. Due to the OCPF project interventions of organic manures and organic insecticides pesticides, the number of applications were found to have reduced to 17.33% (1 spray), 16.93% (2 sprays), 40.67% (3 sprays) and 25.07% (4 sprays) during 2013-14 thus indicating the changed attitudes of the communities.

Changes in fertiliser application

Soils naturally contain numerous nutrients such as nitrogen, phosphorus, calcium, and potassium which enable crops to grow. When such nutrients are missing or in short supply, crops suffer from nutrient deficiencies which hinders growth and leads to crop failure.

Fertilisers are substances that contain crop nutrients and are applied to agricultural fields to supplement the required elements found naturally in the soil. Fertilisers are expensive and can harm the environment if not used in appropriate quantities. Thus, before adding fertilisers, it

is important that baseline soil testing is done to determine the exact requirements of the nutrients to be added. This is a critical steps since if too little fertiliser is added, the crop will not grow as it should. On the flipside, if too much is added, or at the wrong time, excess nutrients will run off the fields and pollute adjacent streams and ground water.

Our research indicates that the highest consumption of the DAP fertiliser is in Karnataka. It has been found that the ideal ratio of nitrogen (N), phosphorus (P) and potassium (K) at an all India level has been found to be 8:4:1 whereas the consumption in Karnataka alone is 4:2:1. The graph below indicates the consumption of DAP in Karnataka between 2009-2016:

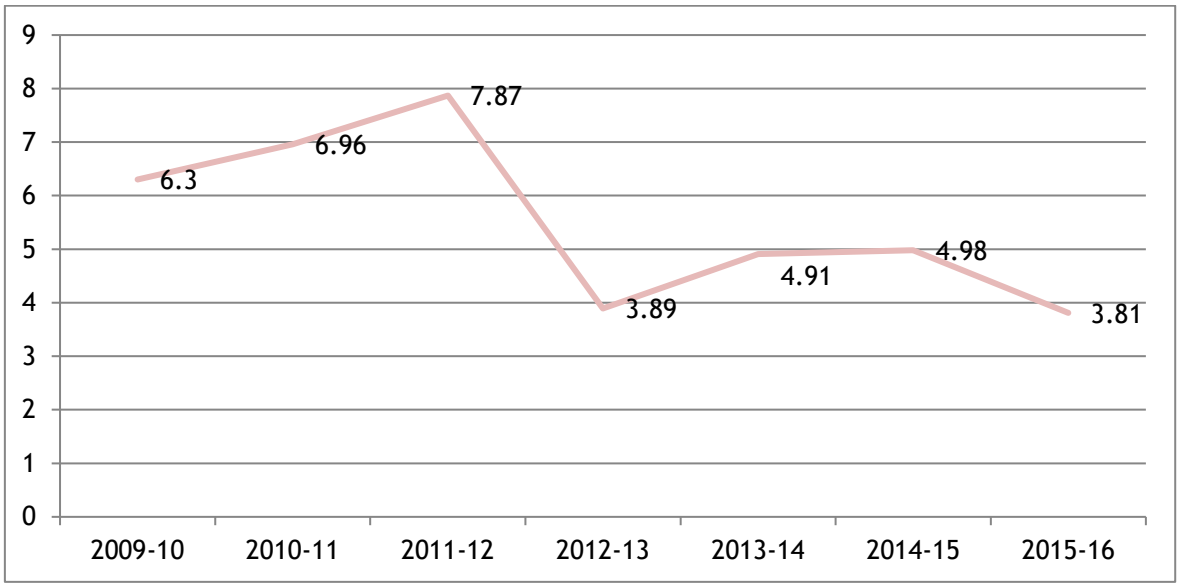


Figure 13: Trend of fertiliser consumption in Karnataka

DAP can be applied for all field crops, grassland and in gardens and orchards. For the best effect DAP should be applied prior to sowing mixed with soil at the depth of ca. 20cm under the ground. It is recommended to use it in early Spring mainly for winter crops.

DAP gives optimal effects when applied with potassium chloride with which it can be mixed at any time. Directly before spreading it can be also blended with urea, ammonium nitrate and CAN. While calculating dosage of the fertilizer one should take into account such factors as current soil analysis, its quality class and agronomical category, average yield per hectare in recent years, forecrop and the use of other nutritional components.

The project promotes the use of DAP amongst its beneficiaries. It has been observed that the consumption of phosphate in Bidar, Gulbarga and Raichur has been steadily increasing over time. However, between 2012-14, the consumption of the same has declined owing to the drought conditions. Post that scenario, the consumption has again increased. It has been noted that Bidar has a higher consumption of phosphate as compared to Gulbarga.

To validate these claims, a primary study was conducted in Gulbarga to capture the change in the trends of phosphorus application from 2010-17. The semi structured interviews were conducted in 4 districts of Gulbarga and included the participation of 18 fertiliser dealers.

The assessemnt indicated that before the project started, farmers used to purchase one bag (50 kg) of DAP for an average of 3 acres of land. However, with awareness regarding the advantages of the application of DAP, farmers are now investing in 50 kgs of DAP for one acre of land. Dealers reported almost a doubled increase in the sale of DAP since the project and its

interventions. They also indicated the dip in sales due to the droughts in Karnataka during 2012-14. Additionally adding to this decline in sales is the increased price of DAP.

As has already been discussed in the report, noted positive behaviourial changes have been attributed to the project especially with regard to the balanced use of fertilisers. The survey conducted on 160 farmers indicates that farmers are adhering to the recommended doses of fertilisers, i.e. Phosphorus at 50 kg/acre as compared to 25 kg/acre in 2009-10, Boron/borex at 2 kg/acre, ferrous sulphate at 5 kg/acre, and, gypsum at 5 kg/acre. The application of zinc at 5 kg/acre has been attributed to the project since before implementation, Zinc was not being applied by the project farmers. 70% of the farmers surveyed have adopted the mulching practice, 88% practice fertiliser management and 78% use organic pesticides. As for the use of insecticides and pesticides, it has been found that 70% of the farmers use the same 2-3 times depending on incidences of infestation, 21.8% use the chemicals only in the wake of severe infestations, and, 8% use it thrice annually depending upon pests. Additionally, 35% of the farmers use gypsum, and 70% reported the use of growth promoters and micronutrients.

Improvement in the yield and productivity of red gram

The OCPF-AES project is primarily aimed at increasing the yield and the productivity of one specific crop, i.e. red gram. This has been selected owing to the fact that almost fifty percent of the cultivation in the three project areas consists of red gram. The area under redgram cultivation in 2009 was estimated to be around 3690 acres and the average yield of red gram was attributed as 3.40 quintals per acre.

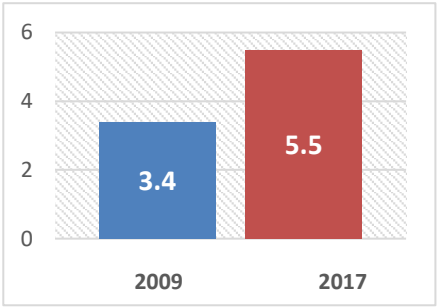


Figure 14: Increase in yield before and after intervention

The increased productivity of red gram may be attributed to be the contribution of a number of factors such as the introduction of the farmers to appropriate methods of land preparation, high yielding seed varieties and its treatment, sowing techniques, spacing and seeding rate. The project through its extension activities, has managed to increase the productivity of the land.

The survey findings indicate that the total land under cultivation for red gram amongst the farmers surveyed is 783.45 acres, which is 74% of the total cultivation area. Moreover, the study indicated that the average productivity of red gram is relatively higher at 5.5 quintals per acre as compared to the 3.40 quintals before the start of the project. The findings of the survey indicate that the average yield for members of FPO is 6 quintals per acre as compared to non FPO members whose yield remain at about 4.6 quintals per acre. (see table 14).

Block	Average yield for red gram (in quintals)	Area under cultivation(acres)
AFZALPUR	5.6	222.5
ALAND	6.4	215
BASAVAKALYAN	4.8	112.2
BHALKI	5.6	118.2
CHITAPUR	5	115.5
Total	5.5	783.4

Table 11: Average yield and area of cultivation across the six project blocks

One can attribute the increase of the productivity to the OCPF-AES project. Discussions with the farmers indicate that through the introduction and the adoption of high yielding varieties of seeds farmers are now able to generate much higher production as compared to when they were using the traditional varieties of seeds. The survey indicates that the average yield of the traditional variety is 4 qtls per acre as compared to TS-3R at 5.7 quintals per acre, BSMR at 5.2 qtls and Pink at 8 qtls per acre which are high yielding. The first two varieties were provided under the project. A new high yield variety pink which was adopted by 11% of the farmers was seen to give 8 qtls per acre. (see figure 15)

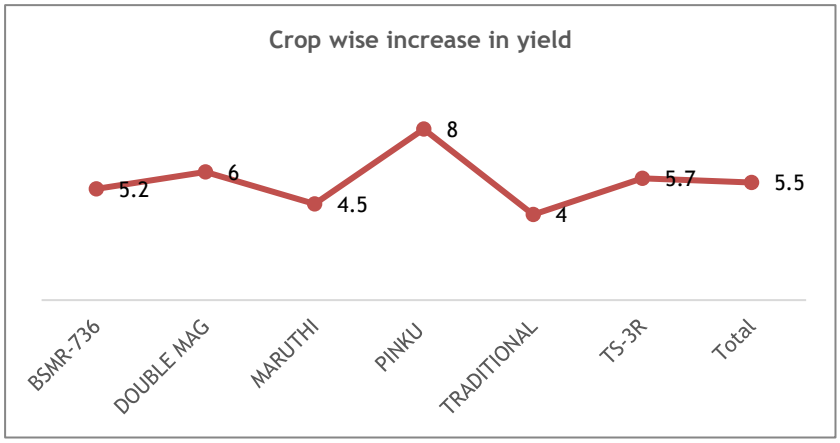


Figure 15: Crop wise increase in yield with the use of recommended varieties viz the traditional varieties

Apart from use of high yielding varieties, farmers attributed the change to more appropriate sowing methods, use of improved technique such as dibbling and pit method (enhanced moisture retention) and increased knowledge about fertilizers, pest and soil/seed management. The pit method has been found to be particularly beneficial since the cost of cultivation is substantially lower once the seeds have been planted and manure has been applied. The dibbling method has been reported as having many associated advantages such as moisture conservation, ability to undertake intercropping, ability for all plants to receive equal quantities of inputs and so on. Alongside this with the introduction of new methods such as seed geoetry and dibbling, farmers are now able to use minimum inputs and receive maximum outputs. Nevertheless, it is important to point out that yield and productivity is subject to the geoclimatic situation and the average rainfall of the area.

Increased income

The project has led to an increase in income for both members and non-members. The increase in ncome is attributed to increase in income from agriculture as well as livestock.

The survey findings indicates an increase in average annual incomes for members as well as non members. As per the survey carried out for 170 farmers, the current average annual household income has been found to be INR 2,35,818 for members and INR 1,60,332 for the non members as compared to the INR 53,365 in 2009-10. The income for members has increased by more than 4 times the income in 2009 (Rs 53,365) while the increase in income of non members is around 3 times the income in 2009.. A block wise analysis of the income breakup has been provided below:

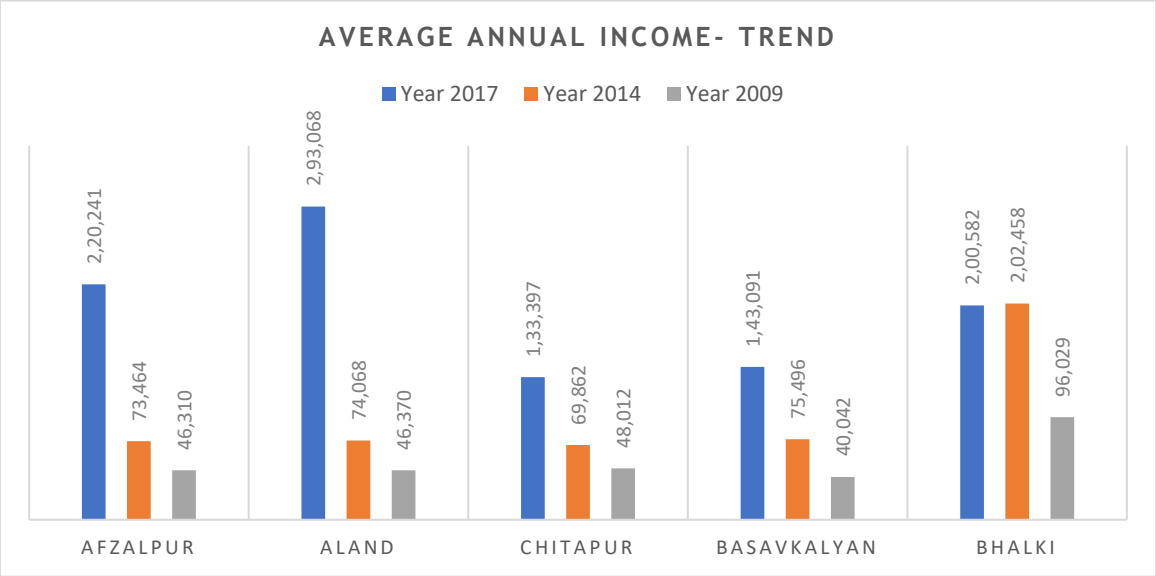


Figure 16: Average Annual Income-Trend

Except for in Bhalki, across all the blocks the income of the members is higher than that of the non members farmers.

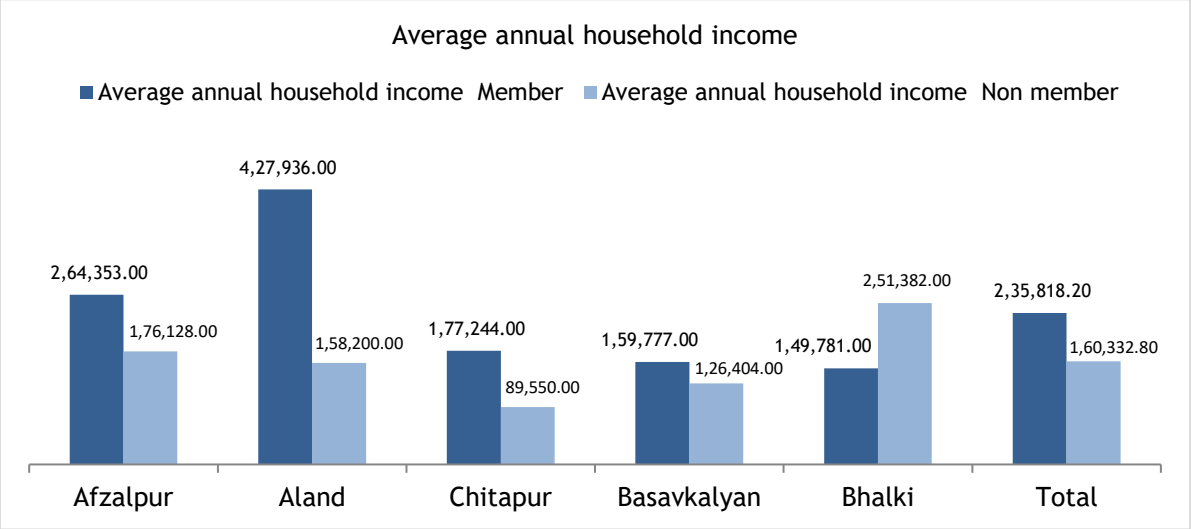


Figure 17: Annual average income of the farmers in the project districts

The increase in the overall household income has been attributed to several factors such as increased productivity, the adoption of IFS activities, better linkages to the market and increased awareness levels. Moreover all the respondents who reported an increase in income attributed it to the project interventions.

Majority of the farmers (69%) fall under the income bracket of 50,000 to 300,000 per annum that shows a substantial increase from 2009 and 2014 levels.

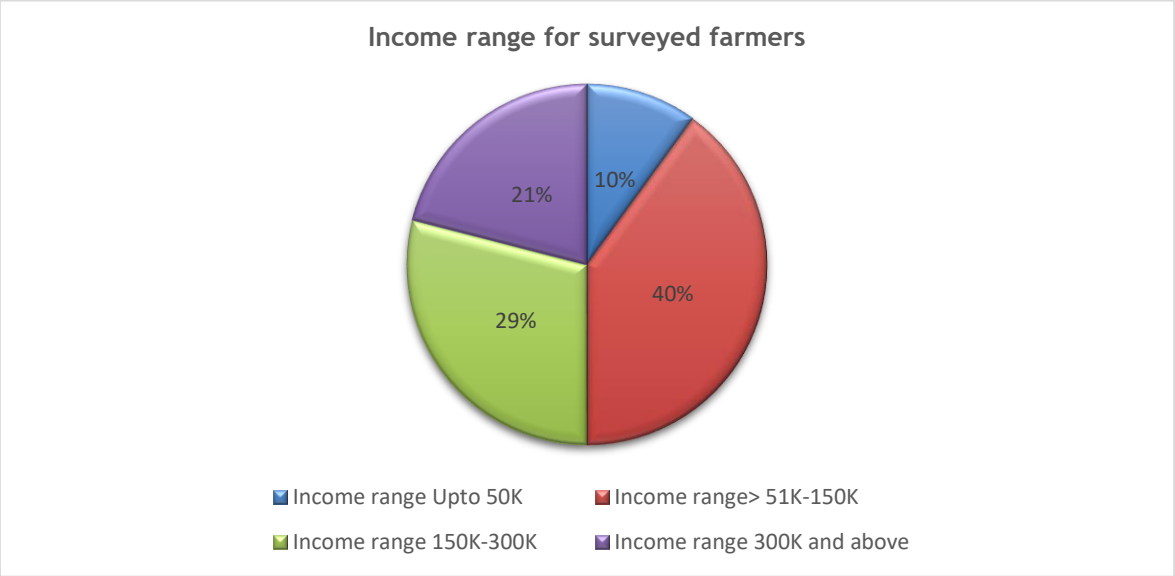


Figure 18: Income range distribution of the farmers based on their average annual income

The increase in annual income is primarily becouse of improved agricultural production, productivity and access to markets. Farmers have adopted various improved practices (PoPs) like intercropping, the pit method, dibbling and other diversified activities like vermicomposting which has led to increased income levels for both members and non-members.

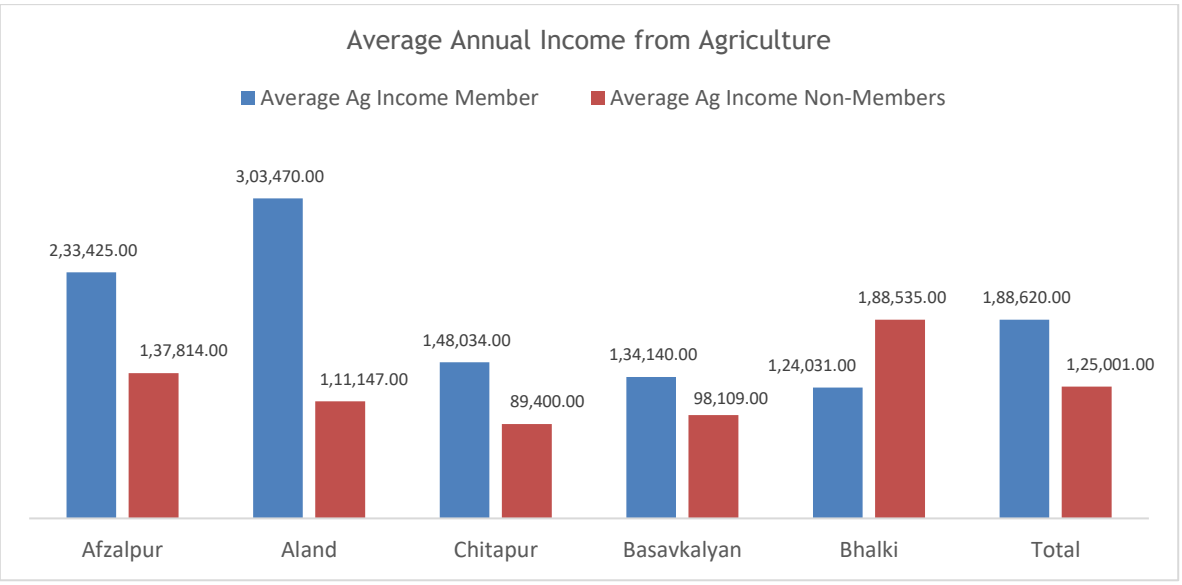


Figure 19: Average annual agricultural income of the farmers in the project areas

The highest average annual agricultural income for the members is in Aland block of Gulbarga district whereas the highest average annual agricultural income for the non members has been found in Bhalki block of Bidar district.

Of the 170 farmers who participated in the survey, attempts were made to link the instances of increased agricultural income to the project interventions. It has been indicated that 82.8% of the members reported an increase in their agricultural income of which 79.2% attributed to the same to the project. Similarly, 40.6% of the non-members indicated an increase in their agricultural income, of which 37.2% attributed this increase to the project interventions again (refer to table 12).

Besides an increase in agricultural income, there has been noted an increase in income owing to livestock as well. One of the major areas of support provided under the integrated farming systems was that of livestock. Under the component of livestock itself, support was being provided to the farmers to create poultry structures. A total of 140 farmers have been provided livestock support under the project in its second phase. As reported by various IFS beneficiaries during the course of the assessment, using the livestock support provided, farmers have engaged in many petty businesses such as the dairy business, the sale of the offsprings of the farm animals and also the sale of fodder for the animals on farms.

The average annual income of the members from livestock has been found to be INR 67,405 through different components such as dairy business, goat rearing etc. An analysis has been done to gauge the linkages of the increased income through livestock to the project support. Of the 170 farmers in the survey study, 47.7% of the members indicated an increase in their income from livestock, of which, all the farmers attributed the increase to project support. 8.4% of the non members in the survey also indicated an increase in their income from livelihood, which again in its entirety was attributed to the project interventions.

The pulse procurement facility has been reported as very beneficial by both project members and non members. Through this tie up with NAFED, farmers are able to sell their produce at the AVRC for INR 5500 which is higher than the market price of INR 4400. Of the total 170 respondents, it has been noted that 64.8% of the project members were procurement beneficaries of which 63.5% attributed their increased income to this facility. Further, 63% of the non members were found to be availing the procurement facilities as well of which 33.8% attributed their increased income to this facility (Refer to table 13).

District	Block	Procurement beneficiaries		Attributed increase to project	
		Member	Non-Members	Member	Non-Members
Gulbarga	Afzalpur	11	2	11	2
Gulbarga	Aland	18	4	18	4
Gulbarga	Chitapur	12	1	11	1
Bidar	Basavkalyan	16	3	16	3
Bidar	Bhalki	15	11	14	10
Total	Total	72	21	70	20

Table 12: Procurement beneficiaries with an increased income attributed to the project interventions

Although the project does not provide for demo plot facilities for the non members, the impact of the farm demonstrations have reached out to the larger community as well. Based on positive experiences of their peers, non members have undertaken suggested practices in their own fields. Of the 170 farmers surveyed, 52.2% of the project members were demo beneficiaries of which 48.6% attributed an increase in income to the same. The proportion of non members to this parameter could not be assessed since the project does not directly work with the non project members on this aspect.

Improved access to markets through AVRCs

An analysis of pigeon pea production and consumption data of surveyed project members reveals a significant rise in the availability of marketable surplus of pigeon pea due to increased productivity and production.

As per the survey conducted with the members and the non members, 84% of the farmers reported selling their produce through the AVRCs and 69% of the beneficiaries felt that selling

at the AVRC was more convenient than other places. Discussions revealed that it was easier to access the AVRC and it spared them the expense of hiring appropriate transport and travelling to far off places to sell their produce. Even when they travelled and went to local wholesale markets and other traders, they often did not get the best prices.

The project facilitated linkages with NAFED and the state government for timely procurement of redgram through the AVRCs. Minimum Support Price (MSP) for procurement of redgram was fixed by NAFED at INR 5050 per quintal which was higher than the rates offered by the local agents and traders. NAFED did the procurement on MSP. The State Government of Karnataka provided additional bonus of INR 450/- per quintal. Initial amount was routed through Karnataka Farmers Maha Society (KFMS), while the bonus was transferred directly to the accounts of the individual farmers by the NAFED.

Moreover, the pulse procurement support was not only limited to FPO members but was extended to the non FPO members also. 83% of the respondents reported using the pulse procurement support out of which 27% were non members. The table below shows the percentage of benefeciaries of the pulse procurement out of 170 respondents surveyed.

Block	Members	Non-member
Afzalpur	88%	100%
Aland	100%	73.30%
Basavkalyan	90.50%	83.30%
Bhalki	93.80%	100%
Chittapur	66.70%	25%

Table 13: Percentage distribution of the surveyed pulse procurement farmers in the different districts

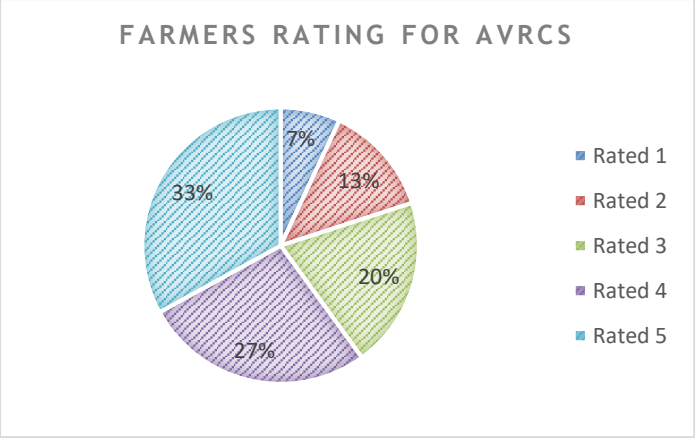


Figure 20: Ratings given to the AVRC by the surveyed farmers basis the available services

Farmers during the focus group discussions reported that a majority who cultivate small holdings were forced to sell their little surplus immediately after the harvest, when the prices are relatively lower. However with the AVRC center, they were able to store their products and sell it at MSP. It was stated that the farmers would not want to sell outside the AVRCs because they get their payments on time and there is no corruption. 80% of the farmers rated the services of the procurement center above 3. on a scale of 5.

The pulse procurement proram is steered by Karnataka Farmers Maha Society (KFMS) that acts like a catalyst. The procurement activity has been done in the year 2017 through a hub and spoke model faciliated by the KFMS. The results for the procurement has been phenomenal owing partly to the bumper harvest due to good timely rainfall and enhanced productivity through adoption of project promoted package of practices and partly becouse of the higher than MSP rates faciliated through KFMS from NAFED and State Government of Karnataka. The project has faciliated procurement of approximately 29,000 metric tonnes of redgram this season (28,906.69 MT) with an overall revenue generation of INR 16 crores. The benefits were availaed by more than 10,000 farmers with an average revenue of INR 1.5 laks per farmer.

KFMS (FPO)	OCPF FPO	MSP-NAFED (INR/Q)	Government Bonus (INR/Q)	Quantity Sold (Q)	Total Revenue (INR 'Crore)
Mallapur(FPO)	Sharana Basaveshwara Raichur Farmers Federation, Raichur	5050	450	36152	1.99
Kappagal(FPO)	Sharana Basaveshwara Raichur Farmers Federation, Raichur	5050	450	8151.1	0.45
Gudadnal(FPO)	Sharana Basaveshwara Raichur Farmers Federation, Raichur	5050	450	11567.5	0.64
Nagnur(FPO)	Sharana Basaveshwara Raichur Farmers Federation, Raichur	5050	450	12534.5	0.69
Gonal (FPO)	Sharana Basaveshwara Raichur Farmers Federation, Raichur	5050	450	22334	1.23
Kurudi	Sharana Basaveshwara Raichur Farmers Federation, Raichur	5050	450	20243.5	1.11
Tadkal(FPO)	Negilayogi Aland Farmers Federation, Tadkal, Aland taluk, Gulbarga	5050	450	21858	1.20
Gudur(FPO)	Afzalpur Farmers Federation Gudur, Afzalpur taluk, Gulbarga	5050	450	45000	2.48
Rudrawadi (FPO)	Negilayogi Aland Farmers Federation, Tadkal, Aland taluk, Gulbarga	5050	450	10132	0.56
Choudapur(FPO)	Dr.S.A. Patil Farmers Society, Ankalaga, Afzalpur taluk, Gulbarga	5050	450	41598	2.29
H. Biral (FPO)	Karnataka Farmers Maha Society (KFMS), Gulbarga	5050	450	27835	1.53
Halbarga	Jai Kisan Sourdha Multipurpose Cooperative Society, Halbarga, Bidar	5050	450	10249.5	0.56
Sastapur (FPO)	Sri Basaveshwara Sourdha Multipurpose Cooperative Society, Basavakalyan taluk, Bidar	5050	450	13444	0.74
Hudgi (FPO)	Sri Basaveshwara Sourdha Multipurpose Cooperative Society, Basavakalyan taluk, Bidar	5050	450	7969.5	0.44
Total				**2,89,069**	**16**

Table 14: Revenue generated through pulse procurement

Increased economic capacities to invest in household assets

Increased income leads to increased spending abilities along with value creation and asset generation. Thus, the impact of the project needs to be assessed on the economic and the social goods or assests that are generated by the farmers as a result of the increased income.

The survey tool assessed the spending trends of the farmers with an increased income to identify areas of spending. Of the total farmers surveyed, 79.2% of the members reported an increase in their income as did 37.2% of the non members. The trends emerging from the same in each block have been depicted below. The trends have been depicted seperately for both the project and the non members and include components such expenditure on assets, investments on household goods and spending on developmental indicators such as education and health.

Taluka	Member Count	Construction of new house	Modification of old house	Purchased land
Afzalpur	18	5	4	2
Aland	19	7	7	3
Chitapur	20	9	11	2
Basavkalyan	17	4	3	1
Bhalki	14	1	0	1
Total	88	26	25	9

Table 15: Spending trends of the members on assets

Of the members with a reported increase in income, 29.5% constructed new houses, 28.4% modified/restored their old houses whereas 10.2% spent their increased income on purchasing land (refer to figure 21).

Questions in the survey were also designed to capture the spending of the members with increased incomes on household assets. It has been noted that the maximum spending has been on areas such as education of children (65.9%), improved health facilities (55.6%) sanitation (36.3%), purchase of mobile phones (39.7%), LPG gas facilities (23.86%), and access to safe drinking water (36%).

Taluka	Member count	Education of children	Better health facilities	Sanitation	Mobile phones	LPG gas facilities	Access to safe drinking water
Afzalpur		15	13	8	5	3	5
Aland		14	17	10	10	6	11
Chitapur		16	14	9	13	10	11
Basavakalyan		9	3	2	3	2	11
Bhalki		4	2	3	4	0	3
Total		**58**	**49**	**32**	**35**	**21**	**32**

Table 16: Spending trends of the members on developmental indicators

The spending trends of the non members with increased incomes indicated similar trends. It emerged that 18% of the non members spent their increased income on constructing houses, 9.09% on modifying/restoring their old houses, 4.5% on purchasing land (refer to table17).

Taluka	Total count (non-member)	Construction of new house	Modification of old house	Purchased land
Afzalpur	3	1	1	1
Aland	5	3	1	0
Chitapur	2	0	0	0
Basavkalyan	2	0	0	0
Bhalki	10	0	0	0
Total	**22**	**4**	**2**	**1**

Table 17: pending trends of non members on assets

Increased income at a household level has also been spent on improving the overall quality of life of the non members as well. It emerged that 13.6% of the increased income of the non members was spent on sanitation, 9.09% on improved drinking water facilities, 18% on purchasing mobile phones and 13.6% on buying new agricultural impediments (refer to figure

Taluka	Livestock	Crop/livestock/ agricultural insurance	Education of children	Better health facilities
Afzalpur	0	1	2	3
Aland	1	2	3	3
Chitapur	0	1	0	2
Basavkalyan	0	0	0	0
Bhalki	0	0	0	0
Total	**1**	**4**	**5**	**8**

Table 18: Spending trends of the non members on developmental indicators

It has further been observed that 18% of the increased income was spent on purchasing crop/livestock/agricultural insurance, 22.7% on availing better educational facilities and 36.3% on better health services (refer to table 18).

Strengthened institutional structure due to the formation of the FPOs

Institutionalization is the process of creating consistency and uniformity across any group with respect to the way in which processes are implemented. It helps to establish and lay down similar set of standards that are to be followed by every person in that group itself.
Within the project, the institutionalization of farmers into the Farmer Interest Groups (FIGs) and the groups into Farmer Producer Organizations (FPOs) has worked to the advantage of the farmer communities in question. These groups work collectively towards common interests and are ensuring the sustainability of the project interventions as well as creating market linkages for the farmers. Through these groups, farmers are able to take collective decisions and are able to support each other in negotiating not just within the market but also with state and national representatives. 7 FPOs were set up in Phase I of the project and in Phase II, the focus has been on ensuring that these FPOs are now made sustainable. As part of the project FPOs have been provided support for market integration including both input sourcing and output marketing.

As part of the project, the 7 FPOs were also provided support in setting up Agri Village Resource Centers (AVRCs) in their respective blocks. The AVRC centres were designed in a way so as to be a one stop centre for all agricultural queries. The centre further is designed to deliver all local needs of the farmers and is connected with ISAP Call Center to disseminate required know-how to the farmers including the market information for important mandis and other local areas of supply.

The AVRC centre within itself included an FPO office, an Input Store, a small warehouse (output store), value addition unit (dal mill), custom-hiring center, nursery, vermicompost unit, children's computer centre, women's training centre, children's recreational centre and a primary health unit.

For sustenance of the FPOs, handholding support was provided to enable these groups to start with input businesess before they moved on to output businesses. Three of the FPOs, viz., Afzalpur Farmers' Federation, Negil yogi Aland Farmers' Federation and Jai Kisan Souharda MCS, secured their input licenses. Selected FPOs were provided revolving funds (working capital) to conduct their business at a reasonable scale for profitable results. Two of the FPOs (Jai Kisan Souharda and Negil yogi Aland Farmers Federation) who were facing considerable challenges in getting power connectivity were assisted by ISAP to get the same. Processing units of these FPOs were thus made functional. Assistance was also provided for proper packaging of pulses. Support was also provided to Negil yogi Aland Farmers Federation for setting up of planting material nursery for use by farming community of the area. This nursery started with 10,000 saplings of brinjal, tomato, and chillies and these vegetable saplings were available for everybody.

As per the analysis of farmer's responses on Farmers Group Initiatives during the impact assessment survey (2013-14), almost 100 per cent of the farmers were reported to be holding regular discussions on relevant topics such as, quality use of inputs, seeds and fertilizers, buying inputs on discounts and soil health in project blocks. More than 98% farmers were found to be involved in discussions on good agricultural practices, use of quality seeds &fertilizers and soil health. However, topics such as use of inputs and buying inputs on discounts were not often discussed less in the FIGs.

6. Conclusions

1) The OCPF-AES project has been designed to respond to agricultural issues in Northern Karnataka, i.e. Gulbarga, Bidar & Raichur. The findings of the end term impact assessment indicate that the issues identified by the project are relevant and are contextual to the region. Given that pulses are an intrinsic element in the Indian diet and contribute significantly to the economy, the focus of the project on the increase in the productivity of pigeon pea is not just valid, but is vital as well.

2) The assessment finds a considerable degree of satisfaction amongst the beneficiaries who attribute increased incomes and spending power to the project itself. The assessment findings bring out the key achievements and the project impact, which is visible at both an absolute and a perspective level.

3) The agricultural extension services provided by the project such as soil testing are aimed at increasing soil fertility whereas other components such as the dal mill and procurement facilities seek to increase income. The assessment indicates the selection of all project activities as strategic and a critical aspect of the project design.

4) Under the agri-extension services component, technical and advisory support has been provided and has led to a noted behavioural change in the target beneficiaries. Interactions with farmer groups indicate greater awareness levels and the inclination to move towards more efficient and innovative farming methods. The survey conducted included interactions with both project and non-project farmers to effectively gauge impact on both. It can be concluded that the OCPF-AES project has been designed in a way that non-members too have benefitted from the project interventions. Non-project members here, are those farmers that are not FPO members. It has been noted that even for such farmers, facilities at the agri village resource centres such as the dal mill and procurement facilities are inclusive and open to all farmers.

5) One of the most significant and demonstrated achievements of the project is the increase in income. Based on the survey results, the annual average income of the members has been found to be INR 2,35,818 as compared to the non-members who's annual average income has been found to be INR 1,60,332. Further, in the last year, i.e. 2016-17, Northern Karnataka has received good rainfall, which has provided increased impetus for increased incomes as well.

6) The assessment team finds that the AVRC's at the village level are bustling commercial hubs in which trade is taking place on a regular basis. Besides, as mentioned in the report already, the facilities such as the dal mill and procurement services are open to both project and non-project farmers, thus enabling the larger community to avail equal benefits. Alongside, keeping in line with its focus on human resource development, the different components of the project such as the children's computer centres, women's training centres and primary health care centres are functional across AVRC's, although in varying degrees.

7) The dal mill intervention, which is a value addition component of the project has been found to be functional in some AVRCs. However, the same facility is not being provided/not in use in some of the AVRCs such as Bhalki. In depth interactions with the farmer groups were held to understand the effectiveness of the dal mill on the farmers. These discussions indicated that the dal mill has been very cost effective since farmers are able to process their crops at a nominal price close to the village itself. With its ready availability and easy

accessibility, farmers are now saving on the costs of travelling outside the village area, on hiring vehicles for crop transportation which also leads to more time to engage in other productive activities. Besides, processing in towns and cities is considerably more expensive. Thus, the dal mill has been found to be beneficial for both the project and the non-project members.

8) The Farm mechanization centre designed under the project as a component of AVRC received a big boost due to convergence with State Govt Custom Hiring Service Centre (CHSC) Scheme. Except Raichur, all the AVRCs/FPOs created under the OCPF-AES project benefited from the scheme. However, some of the villages in the remote locations did not get access to this facility due to limited number of tractors/machineries available at the centre. From the discussion with the farmers it was observed that there is a need for effective repair and maintenance services also to be made available at the AVRC. Existing repair and maintenance services are only available at the dealers point in a district place. It is recommended that the repair maintenance support to be made available at each AVRC.

9) The procurement facilities provided under the project as a result of its tie up with NAFED, has proven to be successful and profitable to the farmers. Farmers are now able to sell their produce at very competitive rates as compared to the market prices that are offered for their produce. However, in some of the centres, it has been noted that this facility has been provided but owing to procedural delays, the produce could not be sold timely. Going forward, the project may ensure that the procurement process is carried out uniformly across all the AVRC's. Any structural delays may be dealt with on a case to case basis.

10) An important component of the project has been its focus on introducing ICT in agriculture. Under this component, interventions such as the KCC, KG and the agripole have been popularized. As per data available with ISAP, the KCC has been found to be the most well-known of the three activities. The Krishi Gyan Programme and the agripole were not widely used by the farmers due to limited outreach of smart phones. Going forward, the project can focus on the ICT aspect and use it to further mobilize people and create impact.

11) The assessment findings indicate that the project is inclusive and works to impact all people alike through its interventions such as the demo plot which have influenced even non-project farmers through demonstrated successes. In the case of the FPO's the members indicate a mixed social group. Lead farmers have been selected based on certain indicators such as land size and income. However, this may be attributed to the fact that for the lead farmer to be able to participate in the interventions as a leader/model, a certain foundation becomes critical.

12) The FPOs that have been created are all working together and are aware of market trends, rates and good practices. Regular exposure and interactive visits are organized both within Karnataka and to other states along with international visits as well. Some of the farmers from OCPF-AES Karnataka Project were able to visit Morocco and got international exposure in Agri-exhibition and Food Security conference. They have become leaders in implementing good agricultural practices. One of the farmer from Morocco visitor group devised an innovative nipping machine for pruning red gram plants.

13) Sustainability needs to be a key focus area for the agri extension services for the project going forward. Scaling up of the project can also be done based on demonstrated successes of the interventions alongside further capacity building of the collectives. The FPOs should

further be strengthened to enable them to continue working collectively towards getting the best market prices whilst also adopting modern and healthy techniques and methods.

14) The study also highlights the need to look at better convergence between the project and the government in terms of appropriate usage of the available schemes and benefits. Cases have been noted where individual farmer groups are working on different schemes that are available. The same could be replicated across all the groups in all the three districts. The assessment team duly acknowledges the technical competency and the know-how of ISAP and notes that the organization will greatly benefit from a systemic approach to a development that is aided by standard operating procedures for all the interventions. Systematic documentation will further assist in the replication of similar interventions at a larger scale in other geographies.

15) An important component of sustainable livelihood is the ability to cope with unforeseen risks. The assessment highlights the need to scale up inclusive interventions such as IFS which will ensure that farmers have access to some income even in the face of adversities such as drought. Components such as crop insurance, health insurance and gender mainstreaming may further be focused upon.

16) The assessment team concludes that the achievements of the OCPF-AES project has been significant and has positively impacted the beneficiaries. The increased income of the farmers and their families is seen to have a multiplier effect on the abilities of the beneficiaries to spend more on food security, education, health, sanitation etc. There is a high level of awareness to tackle unforeseen challenges such as drought. Farmer suicides seem to be coming down and youth seem motivated to pursue a career in agriculture itself. While highlighting the achievements and the successes of the project, the assessment also highlights the need to focus more on sustainability, strengthening the existing FPOs & FPO Federation, and facilitating greater convergence at the government and a community level. The recommendations have been discussed more in detail in the next section.

7. Overall Recommendations

It has been noted that the project has demonstrated good outcomes achieved through varied interventions that are distinct but remain interrelated and are all designed to bolster red gram productivity. However, for more pointed impact, a few key considerations need to be made in the following areas:

1) Strengthening the FPOs and the FPO federations

The first important area of consideration for ISAP is the continued strengthening of the FPOs and federation of FPOs. It has been found that the FPOs that have been formed under the project are doing business in large volumes and are generating revenues in the capacity of crores. Most of these transactions are of substantial value and often done online directly to the beneficiary accounts. For the farmers to be able to handle such large amounts of money, it is important that their capacities are duly built. This includes providing trainings such as accounting, book keeping, signing ledger books etc. Equally important to this is that if such practices are maintained then this also leads to greater transparency and accountability. At present, such concerns may not be very evident since ISAP is still working in the project areas and has their staff, who often assist in transactions and provide guidance as required. However, before the exit of the project, such considerations need to be made and the farmers should be oriented and trained to deal with the same efficiently and effectively.

2) Convergence strategies

In both the phases, i.e. Phase I and Phase II, the OCPF-AES project has demonstrated some examples of convergence through its linkages with NAFED, with the Karnataka Agricultural Department for Custom Hiring Service Centres (CHSCs) etc. Although, emphasis is being laid on such convergences, there remains enormous potential for the project to establish and to explore many such schemes and facilities that have been made available for the farmer communities. A convergence strategy could be developed which would guide the identification and the selection of relevant and appropriate schemes for the farmer beneficiaries. The drafting of this strategy would further institutionalize this process of creating convergence and would provide for the easy access to such information for the FPOs who could avail the same in a timely manner.

3) Strengthening the AVRC's

The AVRCs that have been created under the project are flourishing business units that are well known and are often frequented by the nearby village communities. Considering that the AVRC's are well equipped infrastructural centres, ISAP could propose turning the same into multi purpose units which may be flexible and include several other components than what it currently is. At present, besides agricultural activities, the AVRC is also home to a women's training centre, a children's computer centre and a recreational centre that can be used by young children. Going forward, the AVRC's could also be used as multipurpose units that could host youth meetings, may act as small village clubs, could host large scale infotainment programs etc. A strategy for the same needs to be identified so as to ensure that while the FPOs continue to do business in the centres, the same can be used by the larger village for communal advancement.

4) Value chain initiatives

One of the features of phase II of the project has been the introduction of the dal mill facility. The focused group discussions with members of the FPO indicate that the dal mill has been very beneficial in terms of cost effectiveness. However, the output produced in these mills does not qualify to the quality parameters of bulk/potential buyers. These dall mills need to be upgraded so as to produce 'Patka dall', which is the widely acceptable quality in the market. For more farmers to benefit from the dall mill operations and to scale up the marketing of the produce, it is vital that the desired up gradation of existing facilities should be done. Similarly with introduction of IFS in the project area more and more IFS farmers will get involved in production of fruits and vegetables apart from livestock such as Goat and cow. There should be sustained efforts in marketing of IFS produce and building the supply chain through AVRCs and FPOs under the project.

5) ICT interventions

The project recognizes the gravity of the inclusion and the usage of ICT in agriculture. Keeping in line with this focus, three areas of activities have been selected, namely the Kisan Call Centre (KCC), the Krishi Gyan (KG) programme and the agripole. On site visits and in depth discussions with the farmer groups indicate that some of the ICT components in the project are before time interventions. Being a dryland area, very few farmers use smart phones. However, the younger generation is more tech-savvy and have a fair understanding of the usability of interventions like Agri-pole. Unlike the kind of response received by the Krishi Gyan on playstore, agri-pole (through Edison box) is yet to gain traction in the project region. However, investing solely in technology will not ensure successful implementation of ICT applications. It is necessary to invest in a team that can effectively perform M&E tasks as well as to invest in capacity development of the end users who can ensure the sustainability of the project. Thus, it is recommended that going forward, the project takes stock of the users of the designed applications, adequately orients the team members that work with these audience and also takes into account contextual factors such as the lack of adequate resources etc.

6) **Systemic approach for enumerating project reach and beneficiaries**

Like any other development programs, benefit spillover is clearly evident in OCPF-AES Project. This means that number of project beneficiaries stands far higher than the actual target. Interventions carried out through field demonstration, for example, sets a chain reaction amongst the farmers who sees the benefit of adopting these practices. As highlighted earlier, many non FPO members also attributed an increase in income to the project interventions. Moreover, for interventions like pulse procurement and CHSCs, the non-members are direct beneficiaries. Considering the project benefits spill over to members as well as non-members, it is recommended that the project should reconsider their approach towards enumerating and presenting the outreach in terms of project supported farmers by including both FPO members as well as non-members.