



Photo: ICRISAT

A farmer applies micronutrients to the soil in Nabarangpur district, Odisha.

This story first appeared in [The Pioneer](#)

Partnering with **Odisha Government** for effective **agri strategy** in times of **COVID-19**

Working closely with the Government of Odisha, ICRISAT through IDC has helped develop a mitigation strategy for agriculture for COVID-19-related challenges. It involves safeguarding harvest-ready crops, arranging for distribution of perishables and preparing for the next crop season.

COVID-19 could not have caught India at a more vulnerable moment. Starting April, Indian farms go into mission mode to be able to feed a billion plus people within and millions more outside for the rest of the year. That COVID-19 may compromise the mission warrants strategies extraordinaire.

Odisha's response plan is to meet the virus head-on despite being spared of its wrath; it had reported just 160 positive cases and one death at the time of writing this. That, however, has not left it complacent. For, Odisha, an agrarian state that witnessed impressive growth in crop productivity and farm income in recent years while being disproportionately affected by extreme weather, disparity in farm incomes and high dependence on labor intensive crop production, has much at stake. Agriculture engages nearly two-thirds of the state's workforce and is worth ₹ 75,800 crore annually.

Inside

3 A solution for migrants...

Migration is making a U-turn out of Bundelkhand region in India where a project is underway to double farmers' incomes...



4 Calves hold out hope...

Female calves birthed in Bundelkhand, following sexed sorted insemination, could herald the end of rampant...



5 Revive havelis, India's...

Have you ever heard of a dual-purpose farm that is a reservoir in the monsoon and a fertile farm in the next season?...



6 How over 500 women...

Farm-dependent households in Ukkali now have an added source of income, thanks to the village's enterprising women...



8 Most prestigious CSR...

The President of India recognized the Power Grid Corporation of India...



Given the stakes, ICRISAT, which is working with Odisha Government to help farmers recover from the cyclone Fani, and boost crop productivity as well as farm incomes by improving the state's soils, developed a COVID-19 response strategy. The strategy is going into action in parts of Odisha and may have lessons for the rest of India.

To outline it, the strategy aims to secure Odisha's Rabi crop, help perishable produce continuously find takers and ensure Kharif preparation progresses unhindered.

Securing the standing crop

As COVID-19 reduced workforce availability and mandates physical distancing to lower risk of spread, machines had to be efficiently pressed into service. With efficient deployment of machines and where available, human workforce, harvesting of Rabi crop has been near complete.

After harvesting and primary processing at the farm gate, procurement of the produce is to begin with the state's efforts, mainly in transportation to secondary processing units. It was suggested that railway wagons be converted into mobile procurement centers and run through major railway stations at district and block levels to augment road transport. It was estimated that 450 trains of 30 wagons each would be needed to procure 7.5 lakh tons of paddy from just 38 critical blocks of the 295 paddy-producing blocks.

These blocks were mapped with Odisha's railway network to plan procurement routes. The critical blocks were further classified as high, medium and low criticality depending on their produce estimates. Further mapping revealed that these critical blocks clustered around districts like Bargarh, Subarnapur, Baleswar, Kalahandi and Koraput. Criticality was attributed to these blocks as it was estimated that they can produce a surplus of 90% over local consumption, which, if not procured on priority basis, can lead to distress sale.

If enough railway wagons can't be arranged in time, the state could consider procuring the marketable surplus at doorsteps of farmers or call them to designated procurement centers (say, through SMS alerts) to avoid crowding. Decentralized procurement beyond mandis may require suitable amendments to the Odisha Agricultural Produce Marketing Act. Returnee migrants as well as local agricultural labourers could assist in these operations while following COVID-19 risk management guidelines.

Vitality, the Government has to permit functioning of processing units with distancing and sanitization measures, besides providing health insurance cover to those involved in the operations at this time.

Maintaining supply chains for perishable commodities

Bottlenecks in supply are severely affecting producers even as consumers are distressed by having to pay more and make do with reduced availability of fruit and vegetable. Perishable commodities will have to be aggregated at the village level or by FPOs (and by large number of self-help groups, promoted under the Mission Shakti in Odisha) with a view to target local promotion of 50% of the produce.

Air-conditioned railway coaches/refrigerated transport can be used to ferry remaining produce to distant markets, besides activating local cold storage units for temporary storage. It was shown that one AC train with 14 coaches would be required to lift around 177 tonnes of vegetables and 457 tons of mango every day from Koraput, which is one of the major producers in the state. Permitting secondary food processing units can further help the produce find takers.

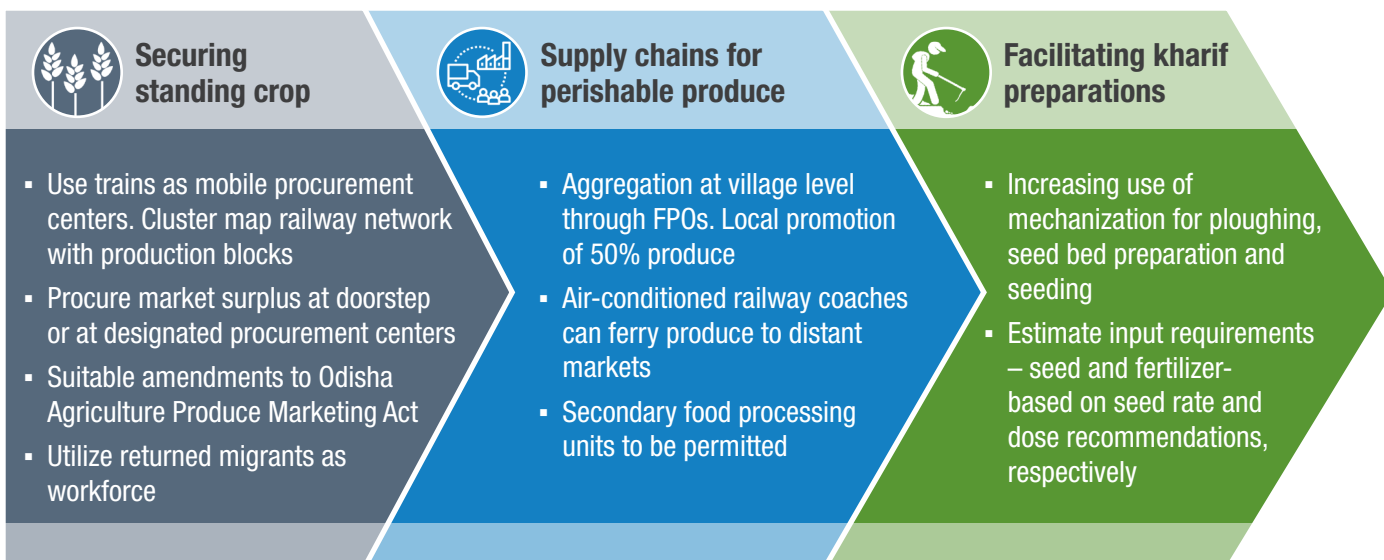
Facilitating Kharif preparations

Like in Rabi, there is a heightened need for mechanization to complete ploughing, seed bed preparation and seeding or transplantation for Kharif. An inventory of machinery at the block level based on the requirement was suggested. Estimates were drawn up for Cuttack to show that 5,350 tractor equivalents for ploughing and 5,618 for puddling were required for a total of 2.2 lakh hectares in the district. Similarly, 3,219 and 3,380 tractor equivalents for ploughing and puddling respectively would be required in Bargarh.

Estimates for requirement of high-yielding varieties of seeds of paddy, groundnut, green gram, black gram and pigeonpea were also provided for Bargarh. For paddy alone, based on recommended seed rate and area sown during Kharif 2019, 14,045 tons would be required. Similar recommendations were made for paddy and chillies in Cuttack.

The two districts were also used as examples to demonstrate fertilizer requirement based on area sown during last Kharif and recommended doses for nitrogen, phosphorus, potash, boron, zinc and sulphur. ICRISAT was able to make dose recommendations as it had analyzed around 40,000 soil samples in the state over the last two years.

The COVID-19 strategy made use of cloud-based applications to draw up farm-level inventories for equipment, labor requirement, seed and fertilizer requirement aggregation as well as output aggregation with market linkages. Its success hinges on the government's ability to coordinate the response bottom-up from village to the state-level.



From Bundelkhand

Water harvesting brings home migrant farmers

Migration is making a U-turn out of Bundelkhand region in India where a project is underway to double farmers' incomes. Water harvesting efforts initiated earlier this year have helped families in a remote village return to their homes and farms after decades of migration.

As a part of the Doubling Farmers Income Project in Poora Birdha village, an 800-meter long channel and havelis (tanks) were built to tap rains.

Subsequently, farmers, who earlier had abandoned agriculture for want of water, returned to till their lands this kharif season (monsoon June–September). Encouraged by increased water availability, farmers like Yajuthi cultivated groundnut, sesame, lemon and rice on small land patches for the first time.

“I returned to farming after migrating for work many years ago. I have been able to live with my family since my return and resume farming my land with the water made available,” the farmer told a team of ICRISAT scientists and officials visiting the region. The visit was organized by ICRISAT Development Center (IDC), which is partnering with the government of Uttar Pradesh State, ICAR-Central Agroforestry Research Institute (CAFRI) and non-governmental organizations to execute the project.

Inadequate rainfall in drought years, compounded by water runoff and flooding of fields during other years, deterred farmers from agriculture during kharif in Bundelkhand. After the harvesting structures were



Photo: Shishuvendra K, ICRISAT
A woman collects water from a well that was recharged due to water harvesting in Lalitpur district of Bundelkhand.

made, water is being drained away from the uplands and made available for irrigation and groundwater recharge in the valleys. Agroforestry initiatives, alongside promoting improved crop varieties and agronomy, are helping the region's farmers vest faith in rainfed farming.

“I used to work for other farmers far away from home but decided to return to my farm when I saw water available. My family is happy that we are farming our land, which was left fallow until monsoon this year,” another Birdha farmer Nannu said.

Farmer Bahadur narrates a similar story. After nearly a decade of leaving his land fallow and settling for work with inadequate pay, he returned to farming on the heels of the project. He has harvested 1,200 kilos of groundnut, and over 100 kilos of a mix of crops including black gram, mung bean and sesame from this year's kharif cultivation. Assured of water availability, Bahadur's land is being readied for the second crop season.

Revive havelis, India's ancient rain harvesting farms, to save big on money and resources



Photos: Dr Ramesh Singh, ICAR-CAFRI

Haveli with harvested rainwater (R) Wheat is grown in the drained haveli, post-monsoon.

Have you ever heard of a dual-purpose farm that is a reservoir in the monsoon and a fertile farm in the next season? If you did, it might have been about the ancient Indian haveli system – a 200-300-year-old rainwater harvesting system that once greened the Bundelkhand region, one of the most drought-prone areas in India. Compared to check dams, havelis come with numerous benefits. Renovating a haveli is 10 times cheaper, the water storage capacity is on an average 20 times more and the productivity of crops grown on the silt-rich soil of the drained reservoir during the postrainy (rabi) season is higher. These observations are from a study on the haveli in one of our Corporate Social Responsibility watershed projects in Parasai village, Jhansi.

The haveli utilized 8 ha under submergence out of 400 ha (i.e. 2%) over which the village is spread. Thousands of such havelis are lying defunct in the region and their renovation can lead to better water conservation and improved crop productivity in a cost-effective way.

How it works: The havelis built centuries ago were designed in topographical sequence such that the runoff generated is harvested in a cascading manner from upstream to downstream (Prakash et al., 1998; Shah et al., 2003). The haveli acted as a reservoir during monsoon and as cultivable land post-monsoon. Provision was made to drain out impounded water during September / October to help farmers start preparing their land for rabi cultivation.

Productivity of the haveli fields is relatively higher as it holds more residual moisture, humus and nutrients as it

also harvests silt and organic matter from the upstream fields. It also acts as a carbon sink (Sahu et al., 2015).

Cost benefits: The unit cost of rainwater harvesting through the haveli system is much cheaper than other measures such as check dams or farm ponds. The cost of haveli renovation in Parasai village was ₹ 800,000 (~US\$ 13,000) with a storage capacity of 73,000 m³. Whereas average investment made for a check dam was ₹ 350,000 (~US\$ 5,800) for a storage capacity of 3000 m³. The unit cost of creating storage capacity by renovating haveli and check dam is ₹ 11 /m³ and ₹ 117 /m³, respectively.

Creating awareness: It is important to note that check dams are built across village streams belonging to public/government land. Since havelis are generally located on land owned by farmers/community, their rejuvenation/repair will need community agreement. The community is aware about defunct havelis, their history and potential benefits. Incentivizing the communities to arrive at a consensus, sensitizing policy makers, identifying suitable technical expertise and capacity building are necessary to scale up haveli renovation/repair on a large scale.

The zone of influence of havelis from groundwater recharge can be much larger compared to check dams making them a preferred option of rainwater harvesting. There is a strong need to articulate the cost and benefit aspects of haveli structures in a simple and effective way in order to help policy makers make a right choice when it comes to large-scale investments in drought-proofing measures.

Calves hold out hope for Bundelkhand's cattle

Female calves birthed in Bundelkhand, following sexed sorted insemination, could herald the end of rampant abandoning of livestock in the region, thereby increasing farmers' returns.

The first calf, born in Nathupura village of Mahoba district in the Bundelkhand region of Uttar Pradesh state, is a result of insemination with sexed sorted semen which has a probability of yielding 90% female births.

Extended droughts, fodder and water shortage force farmers in Bundelkhand to abstain from rainfed agriculture and let livestock loose to freely graze in summer. The practice is called 'annapratha'. The grazing continues well into kharif (monsoon) season and is blamed for extensive crop damage. According to various estimates, the area under kharif cultivation is just half of that during rabi. Nearly a quarter of the crop produced during kharif is damaged by the straying cattle.

The state government and its research partners have realized the need for creating more value in livestock to tackle annapratha and reduce the liability of animals to farmers. Consequently, increasing the number of high quality female cattle is being seen as a good solution to provide farmers with livelihood options by way of sale of milk produced by the cows.

In January, BAIF Institute for Sustainable Livelihoods and Development (BISLD) and ICRISAT introduced sexed sorted insemination in Bundelkhand. Sexed semen is produced by sorting male and female chromosomes in the semen. Further, farmers are also being provided with rapid pregnancy diagnosis facilities, which makes pregnancy detection possible in 18-20 days as compared to three or four months it normally takes.

The Nathupura calf is a buffalo of Murrah breed which was birthed by a 9-year-old female. Ms Malti Pateria, the farmer who owns the animals, said that the calf has caught the attention of the village. Ms Pateria's family earns its livelihood by selling the nine liters of milk that its two buffalos produce every day. Since the birth of the Nathupura calf, seven more female calves were born across the region.



A biogas plant being demonstrated in Chitrakoot district.

“A farmer has more reasons to rear livestock if sexed sorted insemination services are provided. This technology can produce breeds of choice for the farming community. Around 310 inseminations were carried out by September in Mahoba and Chitrakoot districts of Bundelkhand. Similar interventions have been initiated in all the seven districts of the region under the Doubling Farmers' Income project from October,” said Dr Prakash Rathod, Visiting Scientist, ICRISAT.

To further increase the value of cattle and buffaloes for farmers, around 20 easy-to-install, portable and compact biogas units are being set up across the region after five such plants installed earlier in Mahoba and Chitrakoot districts provided multiple benefits. These include free cooking fuel, freeing women from drudgery of collecting firewood, and preventing exposure of a family, primarily that of women, to hazards of firewood pollution. The slurry left behind after digestion of dung in the unit can be used as manure, Dr Rathod added.

Doubling farmers' income in Bundelkhand

Partners:

- Government of Uttar Pradesh

Project objectives:

- Enhancing water availability across seven districts
- Introduction of new varieties of wheat, chickpea and mustard
- New agronomic techniques like laser land levelling and zero till method of sowing to be introduced.

POWERGRID makes a difference

How over 500 women in south India built sustainable livelihoods in face of drought



Photo: S Arun, ICRISAT

Women who have been empowered gather for a meeting in Ukkali village.

Farm-dependent households in Ukkali now have an added source of income, thanks to the village's enterprising women who availed of the POWER GRID-ICRISAT watershed project.

Underway in the northern Karnataka village, the watershed project 'Improving rural livelihoods through farmer-centric integrated watershed management' has been empowering women through skills-based trainings since 2014. Over 500 women who have never been provided opportunities, are now self-sustainable through tailoring, computer skills and small enterprises.

Over the past many years, crop failures due to perennial drought in Vijayapura district, where the village is located, forced families to migrate for work. However, the POWERGRID-ICRISAT watershed project has helped farmers retain water in water harvesting farm ponds, masonry check dams, well recharge pits and percolation tanks. As these initiatives help agriculture in the village bounce back, empowering women is helping hasten household financial recovery.

"The CSR activities we took up under the guidance of ICRISAT has not only helped farmers but also the women in the village, where skill development, education and

training has accrued benefits to the community," said Mr D R Murty, General Manager (HR), POWERGRID, Southern Region Transmission System-II, Bengaluru.

Entrepreneurship to the rescue

Recognizing the scale of efforts required to empower women, the project is supporting entrepreneurship to amplify livelihood opportunities. A revolving fund provides to enterprising women the necessary seed capital to set up their stores or start a venture from their homes.

Ms Kalavathi, for instance, received a loan of ₹ 30,000 from her SHG group through the watershed program. She set up a bangle store and turned it profitable. Selling bangles alone, she nets a profit of ₹ 6,000 every month. Likewise, Ms Hameeda set up a store to sell snacks and stationery from the ₹ 10,000 she received.

Others like Ms Muktha Bai, who had no source of income until 2018, started making jowar (sorghum) rotis (traditional Indian bread) at home for sale in hotels, weddings and other events. Severe drought in the region forced her to take up this activity as the family was running out of savings. She now sells about 5,000 rotis a month.

“I turned a food entrepreneur while at home with just ₹ 3,000 to start making papad (crispy rice foods) for 4 months in a year. I now sell 1,000 packets per month for a profit of ₹ 5000,” Ms Yamunakka, another beneficiary, said.

A few amplified their farm activities with the financial support they received. Ms Shankaravva Kothanapur took up goat rearing with ₹ 30,000 assistance and manages to turn in a profit of ₹ 25,000 a year selling them.

Investing in the future

Ms Bhagyashree, a computer trainer, has made more than 25 students computer literate. The computer training initiative of the POWERGRID-ICRISAT watershed program aims to impart skills to enhance employability of young women.

“Through the computer training program, I learnt basic computer operations, typing, use of word processing and basic image editing and printing. Now, I want to enroll for an advanced course that will help me secure a well-paying job,” Ms Gangambika, a pre-university student, said.

In some, the computer training program instilled entrepreneurship. Ms Pallavi Hiremath wants to use her

skills in word processing, image editing and printing at her own computer center that provides specialized documentation services and internet access.

Tailor-made initiative

Ms Nagamma Kalmath, the master tailor in the village, has trained 430 women under the program. She has helped the women learn stitching, designing and customizing outfits. One of the beneficiaries, Ms Bharathi, learnt designing ethnic outfits for weddings and established a cloth store that now earns her about ₹ 5,000 per month, covering the education of her children and ensuring savings for the family.

Ms Ashwini, another beneficiary, has gained employment at a local garment center after learning tailoring. Besides a regular income, she also devotes time at home tailoring to augment her income.

“Apart from providing inputs to farmers in Ukkali through water harvesting structures, micronutrients etc., we have strived to benefit families by empowering the women. Trainings in tailoring, computer education and income generating activities like goat rearing and vermicomposting have helped families through the extra income generated by the women,” said Dr Sreenath Dixit, Head, ICRISAT Development Center.



Photo: S Arun, ICRISAT

Muktha Bai sells about 5000 rotis per month and makes a net income of ₹ 10,000 per month.

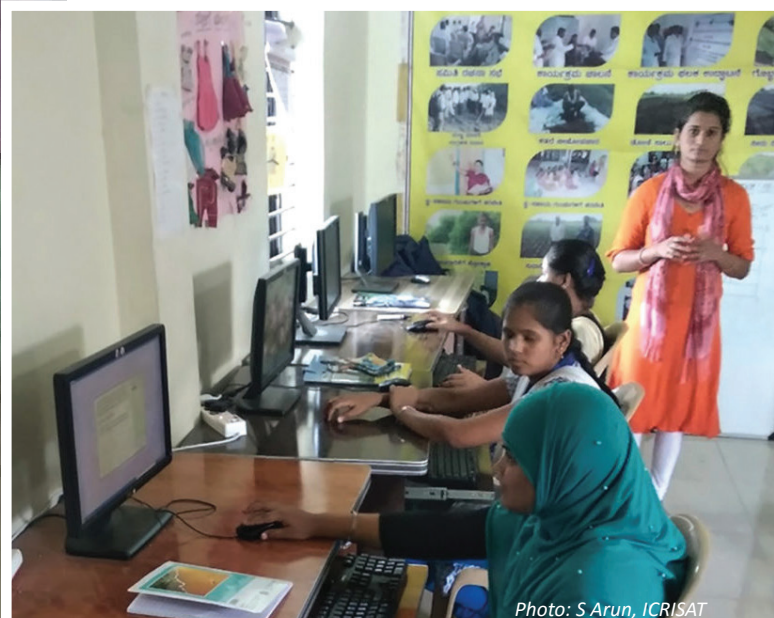


Photo: S Arun, ICRISAT

Bhagyashree has been playing the key role of a computer trainer and has trained two batches of more than 25 students in basic computer skills.

Most prestigious CSR award given for integrated watershed management



A checkdam constructed in Ukkali to harvest water.

The President of India recognized the Power Grid Corporation of India (POWERGRID) with the highest CSR award for bettering the lives of nearly 30,000 farmers through an integrated watershed management project executed in partnership with ICRISAT.

President Mr Ram Nath Kovind and Ms Nirmala Sitharaman, Minister of Finance and Minister of Corporate Affairs, India, presented the National CSR Awards that seek to recognize outstanding CSR efforts that have resulted in positive impact.

POWERGRID and ICRISAT initiated the project 'Improving Rural Livelihoods through Farmer Centric Integrated Watershed Management' in Kurnool district of Andhra Pradesh state and Vijayapura district of Karnataka State in 2014. In Ukkali village of Vijayapura, the watershed program has been focusing on improving water availability to around 10,000 residents in order to help diversify the livelihood systems by adopting an integrated water resource management approach.

"From 2014 onwards, nearly 150,000 m³ Rain Water Harvesting (RWH) capacity has been created with check dams, farm ponds, percolation tanks, gully checks, wastewater treatment plant and borewell recharge pits. Nearly 300,000 m³ runoff water has been harvested, facilitating groundwater recharge," said Dr KH Anantha, Watershed Scientist at ICRISAT and the project's

Principal Investigator in Karnataka. These efforts enabled about 500 ha of additional area to be brought under supplemental irrigation with increased cropping intensity of 30-40%.

Climate resilient crop varieties, balanced nutrient management, crop diversification with high value crops and improved crop management on more than 1,000 ha helped achieve yield increases between 30% and 50%. These efforts increased incomes by ₹ 10,000 (US\$ 140) – ₹ 50,000 (US\$ 704) per year per household. There has also been an increase in income of about ₹ 6,000 (US\$ 84) per family through livelihood opportunities created specifically for women and the landless.

In 10 villages of Kurnool district, where 4,100 farm households were targeted in the watershed area, around 230 soil and water conservation structures were made. These structures have resulted in a net storage capacity of 200,000 m³ with a total conservation capacity of 500,000 m³. Around 20,000 farmers directly benefited from these efforts.

"Through various water structures in Kurnool, the surface and groundwater availability increased significantly as several borewells and open-wells which were dry have become functional. Constructing low-cost farm ponds has proven to be a suitable water storage solution to provide easy water access to smallholders

and help them mitigate drought-related losses up to 30-60%," said Dr Girish Chander, Soil Scientist at ICRISAT and the project's Principal Investigator in Andhra Pradesh.

Soil testing in select villages revealed severe deficiency of organic carbon (17-85% deficiency), sulphur (36-100%), zinc (58-100%) and boron. Crop-specific fertilizer recommendations were then made to farmers. Further, around 1,000 demonstration plots were established to demonstrate the benefits of improved cultivars, seed treatment, soil test-based fertilizer application that included micro and secondary nutrient application, and integrated pest management practices.

Consequently, productivity improvement of 10-50% was reported in crops like maize, pigeonpea, groundnut, foxtail millet and paddy. The increase in income was ₹ 4,500 (US\$ 63) per ha to ₹ 8,800 (US\$ 124) in paddy, maize, pigeonpea and groundnut.

To support women farmers, small kitchen gardens or vegetable gardens were promoted. Other income generating activities including vermicomposting, vegetable kits, distribution of horticulture plants to SHG members, besides provision of a revolving fund, have been undertaken.

The team also introduced composting with crop residues of pigeonpea, maize and pearl millet in Kurnool. To increase value in pigeonpea farming, a mini mill was set up which also provides employment. Several capacity building programs and public messaging initiatives were taken up to create awareness about the watershed project. Members of self-help groups that were engaged in goat rearing have reported increased incomes of ₹ 4,000 (US\$ 57) in a year.



Photo: ICRISAT

A low-cost cement-lined farm pond that was constructed in Kurnool.

Improving Rural Livelihoods through Farmer-centric Integrated Watershed Management in Karnataka and Andhra Pradesh

Partners:

- POWERGRID – Power Grid Corporation of India Limited, Government of Karnataka and Government of Andhra Pradesh

Objectives:

- Establish model sites of learning in Karnataka and Andhra Pradesh for harnessing the potential of rainfed areas by adopting the integrated water resource management approach.
- Enhance water availability and its (green and blue water) use efficiency for diversifying the livelihood systems in the target villages by adopting integrated water resource management approach.
- Build capacity of farmers in the region for improving rural livelihoods through knowledge sharing and dissemination strategy.



Mr Ram Nath Kovind, President of India, presents the award to Mr K Sreekant and Mr Ravi P Singh, CMD and Director (Personnel) of POWERGRID, respectively. Ms Nirjala Sitharaman, Minister of Finance and Minister of Corporate Affairs, looks on.

A glance at recent developments at IDC

ICRISAT Development Centre (IDC) works to create impacts. Our work was recognized recently in many ways. We also look forward to working on new initiatives and building partnerships for a better tomorrow in the drylands.

- The Odisha Livelihood Mission (OLM) project was approved with a new donor (Rural Development and Panchayat Raj and Ministry of Water Resources, Odisha).
- MoUs signed with three new CSR projects funded by AB InBev, TRIDENT Sugars Ltd. and POWERGRID project in Kalahandi, Odisha.
- The Institute of Agricultural Sciences, Banaras Hindu University (BHU), as an external agency, evaluated DFI Bundelkhand project progress and

this report summarizes the findings of the project evaluation. Based on the visit to three project sites and interaction with various stakeholders, the team realized that number of interventions undertaken in this project are innovative. It is significant to note that different stakeholders are realizing the impact in a very short period of one and half years of project implementation.

- [Farmers' day under Bhoosamrudhi project in Bidar](#), DG ICRISAT participated.
- ICRISAT's soil laboratory accredited by the FAO Global Soil Laboratory Network (GLOSOLAN), becoming only the second lab in India to achieve this distinction. With the accreditation, the laboratory can serve as a focal point for all soil laboratories in India and help develop a regional laboratory network.

To know more about impactful approaches, see the last issue [here](#)



ICRISAT Development Center works for large-scale uptake of science-backed technologies to achieve major impact in reducing poverty, hunger, malnutrition and environmental degradation across Asia and Africa. About IDC: www.idc.icrisat.org



We believe all **people** have a **right to nutritious food** and a **better livelihood**.

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

We work across the entire value chain from developing new varieties to agribusiness and linking farmers to markets.

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