

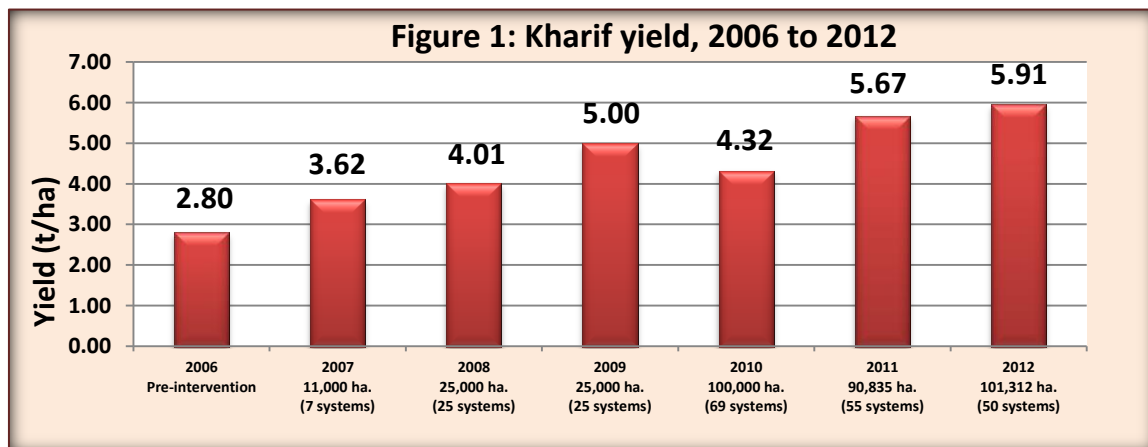
## UN-NOTICED GREEN REVOLUTION IN CHHATTISGARH

### Doubling Farmers' Crop Output and Returns through Collective Action

The **Chhattisgarh Irrigation Development Project (CIDP)** supported by Asian Development Bank (ADB) has organized about 100 Water Users Associations (WUAs) through its **Intensive Intervention Programme (IIP)** to adopt a novel strategy, i.e., managing the Kharif (wet season) in ways that improve its production and also production in the following Rabi (dry season). CIDP's IIP is carried out through WUA-managed collective action that includes collective planning and input and output marketing. Farmers have doubled their Kharif crop yield and have enhanced their Rabi cash crop cultivation. Agricultural incomes from 100,000 ha for over 130,000 families have been more than doubled (Figures 1 and 2). The IIP strategy combines a technical package of practises for enhancing water and land productivity to achieve better year-round management of water, with the use of a social mobilization/intervention methodology.

Consultants of ADB's Technical Assistance (TA) Programme who designed and implemented this model adopted a **Participatory Mode of Management**. The team of ADB-TA consultants functioned as implementers/demonstrators of what they were advising, not simply as conventional "advisers". They guided a cadre of Community Organizers (COs) and Senior COs, selected on a competitive basis and supported by specialists from selected NGOs (AAKRUTHI, CARD and SAMARTHAN). This Team continuously refined the technical package with emphasis on time- and water-saving, high-yielding methods like SRI and on intervention methods that followed a "Learning Process" approach. Hence, a more refined and well-tested model is now available for wider application. Of special significance, the full cost of the project investment, including the cost of infrastructure rehabilitation and up-grading (R&U), was recovered already in just one cropping season. This is an achievement not been recorded in any similar project in India.

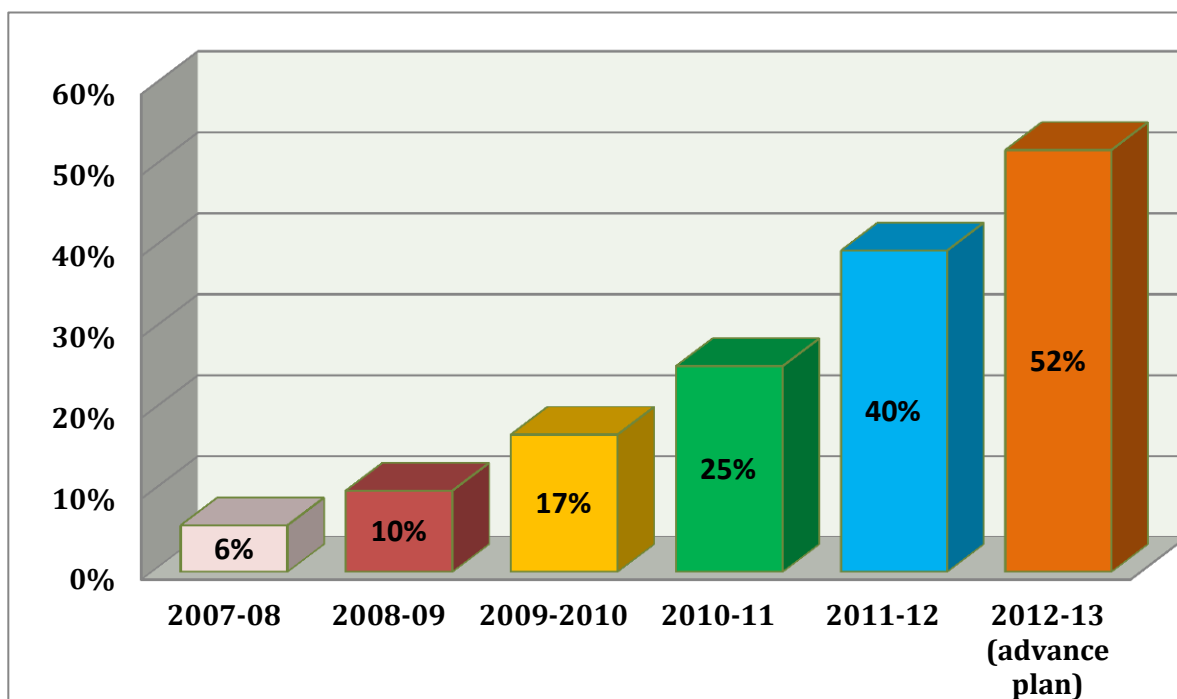
In addition, the team helped all the WUAs in Chhattisgarh (1,324) to federate at district, regional and state levels. The WUA Federation has demanded state-wide extension of the model, and the State Government agreed to continue the programme in the same area (100,000 ha covering 100 WUAs). However, ADB assistance ended on 31 March 2013, and the Water Resources Department has not yet developed the capacity to handle a multidisciplinary project of this nature. If the model is properly extended state-wide, it could be an "eye-opener" to policy-makers throughout India. The state-wide WUA Network could be strengthened further to extend benefits of collective action such as input-output services and value-addition to non-irrigated areas so that rural poverty could be eradicated.



**Note 1:** In 2010, extra 75,000 ha were added, expanding from a pilot area of 25,000 ha to 90,835 ha. Average yield dropped as the average yield of newly-added systems was 4.11 t/ha, compared to 5.01 t/ha in the previous pilot area.

**Note 2:** Legal framework for empowering WUAs: In 2006, ADB-TA consultants assisted the State Government in developing a New Participatory Irrigation Management (IPIM) Act with its own rules, by-laws and regulations through a participatory consultative process involving a cross-section of stakeholders ranging from farmers and WUAs up to senior policy makers. The Act included: a) management of minor irrigation systems and lower parts of medium and major systems by WUAs, b) water fee collection by WUAs and sharing with Government, c) nested and federated WUAs, d) extending WUA membership to spouses to ensure nearly 50% women representation in WUA, e) representation of head, middle and tail of irrigation systems, and f) reserved seats for women and underprivileged (ST, SC and OBC). First WUA election under the new Act was held 06 February, 2007. With a special grant provided by ADB, consultants conducted a state-wide awareness campaign to educate farmers on the rights and responsibilities of WUAs and to motivate them to identify and elect good leaders.

**Figure 2: Year-wise cultivated *Rabi* area (as a percentage of total command area)**



### The strategy that has doubled crop yields and incomes in the IIP Area<sup>1</sup>

The strategy devised aimed at improving irrigation system-wide water use efficiency through “managing Kharif for Rabi” through WUA-managed collective action (see next section). Available water was managed for maximum benefit across the two seasons. The project provided WUA-organized (complementary) input services<sup>2</sup> and output marketing as well.

<sup>1</sup> ADB-TA commenced in December 2005, and the new Chhattisgarh PIM act, rules etc. were completed in 2006. The recruitment of NGOs was delayed, so the ADB-TA team with grant funding from ADB organized a small intervention programme in 2007 guided by 7 Community Organizers and focusing on a few collective actions. During the period 2007-10, this small pilot programme was expanded to cover 25,000 ha. For Kharif 2010, CIDP recruited NGOs with nearly 85 COs and a few specialists to expand the pilot intervention programme to over 100,000 ha. This launched a new strategy as selection of the NGOs and their facilitating staff was done jointly by TA consultants and the Water Resources Department. This programme is considered as the “Intensive Intervention Programme” (IIP) of the CIDP.

Within the IIP’s 100,000 ha area, within 3 years Kharif paddy yield was doubled, reaching 5.9 t/ha, and Rabi cropping intensity reached 53% (Note: since CIDP’s rehabilitation and upgrading [R&U] work was in progress, Rabi irrigation within the project area has been limited). CIDP’s target was to increase Kharif paddy yields to 3.3 t/ha after R&U. However, this was exceeded in the IIP area before end-of-project. Kharif yield increased steadily (see Figure 1), and already in 2011 Kharif season, nearly 2.5 lakhs tons of extra paddy were produced in the IIP area of 100,000 ha. **The added-value in this one season exceeded the total cost of the project, including the cost of R&U. Added-value was even more in Kharif 2012 when average yield was 5.9 t/ha.** The strategy tested in the pilot areas (2007-09) took only two crop seasons (2010 and 2011) to exceed 5 tons/ha in Kharif.

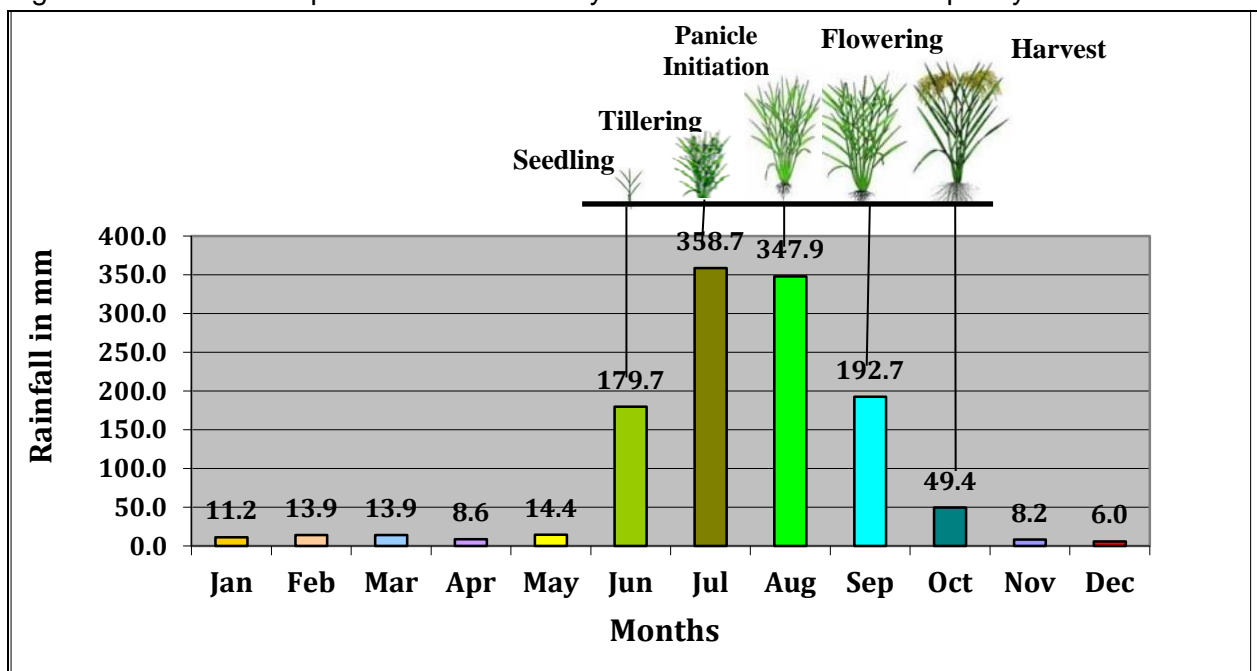
<sup>2</sup> Irrigation systems are agricultural production systems, and the overall performance of these systems depends on a large number of non-water factors as well. There are on-farm and above-farm levels of activity that cross-cut water and non-water factors. For example, at farm level the combined effects of water, high-yielding varieties, fertilizer and other inputs influence crop yields. There exist complementary relationships between these inputs in terms of their effects on crop yield. For instance, improved water availability to crops through more efficient irrigation may result in an upward shift in the fertilizer production function, and vice versa. In other words, returns to fertilizer (or water) are more when it is properly combined with adequate levels of water (or fertilizer). Also, improved water availability and

Improving agricultural input services and matching water use with complementary inputs contributed to improved water and land productivity. The strategy served to treat irrigation systems as business entities and to make them profitable for farmers as stakeholders.

The Team's strategy of adopting an integrated strategy for organizing WUA-managed collective action and adjusting agricultural practices and services for better irrigation system operation provided a good learning opportunity to irrigation system managers as well. There is scope for further improvements in the strategy itself. For example, there is potential for improvements in such areas as: a) completing the WUA-managed command area development process to avoid field-to-field irrigation for improving water control; b) facilitating WUAs to organize land leveling; and c) advancing on-farm water management.

**Managing Kharif (wet season) for better Rabi (dry season):** To enhance year-round water management efficiency and for greater total (annual) productivity of Chhattisgarh irrigation systems, the major challenge is to match use of rainfall with cropping patterns. As most of the region's rain falls within the *Kharif* season, managing this wet-season water supply for use in the dry season is the key. Long-term (50-year) rainfall data show that 4 to 4.5-month paddy varieties nicely match with the rainfall pattern (Figure 3).

Figure 3: *Kharif* rainfall pattern matches nicely the needs 4 to 4.5-month paddy varieties.



If all the farmers in the irrigation system plant 4 to 4.5-month high-yielding varieties (HYVs) by mid-June, or at least by the end of June (except in poorly-drained areas where a 5-month variety would be more suitable), and if WUAs organize inputs and manage water judiciously (including on-farm water management, OFWM), then staggered cultivation can be minimized

more reliable distribution may lead to increased application of fertilizer by farmers. Thus, *the influence of irrigation management on the application of other complementary inputs is not merely technical, but also behavioural* (Wijayaratna, "Assessing Irrigation System Performance: A Methodological Study," Ph.D. thesis, Department of Agricultural Economics, Cornell University, USA, 1986).

and the utilization of rainfall can be maximized<sup>3</sup>. Reservoir water will then be saved for use in Rabi<sup>4</sup>. This requires **collective action**, however, organizing the right kind of seeds and other input and output services in a timely manner, managing water at the source and throughout the distribution system, developing novel partnerships (WUA-irrigation agency, WUA-private sector, etc.). The ADB-TA team considered WUA-managed collective action to be the core of the WUA capacity-building strategy. Consequently, the WUAs "learned by doing" and the facilitators and specialists assisted them in this.

In summary, the main features of the model were:

- **Adjust Kharif season cultivation to maximize the use of rain** between mid-June and mid-September (Figure 3).
- **Harvest early**, ideally by the end of October, and then **cultivate Rabi cash crops**, promoting diversified cropping using residual soil moisture and the saved water in reservoirs. All of the Irrigation systems within the 100,000-ha intervention area are reservoir-based. However, even in the areas served by diversion systems, this strategy can be followed to save water and time and to increase cropping intensity.
- **Promote water-saving, time-saving and cost-saving production methods like the System of Rice Intensification (SRI)** for the *Kharif* season. Note that SRI methods reduce the crop cycle, as harvesting SRI paddy can be done at least 7-8 days sooner.
- **Organizing input-output marketing to match water supply with complementary inputs** to improve water productivity and incomes. In both *Kharif* and *Rabi* seasons, WUAs were assisted in organizing farmers in the adoption of improved packages of practices (POPs) through WUA-managed collective action (discussed next).

## WUA-managed Collective Action

The Team facilitated WUAs to organize and manage collective action aiming at year-round management of water and at irrigation system-wide impacts. The major collective actions organized / managed by WUAs were:

- **WUAs collectively develop their own Annual Plans** for crops, cropping pattern, and water use, to match water demand with the supply in reservoir, rainfall and all other sources.
- **WUAs manage O&M** as elaborated below, and **WUAs and the Water Resource Department (WRD) share responsibilities in systems management**.
- **Input supply and output marketing have been developed**, making seeds, fertilizer, pests/diseases/weed control chemicals as well as equipment such as seeders, weeders and tillers/ploughs available, and improving output marketing opportunities, working out mutually-beneficial WUA-private sector partnerships.
- **Soil testing** with the support of the Department of Agriculture (DA).
- **Seed production** by WUAs registered with the DA to assure quality supply. The 100,000 ha intensive programme area achieved self-sufficiency in quality seeds in 2012. Many WUAs organized their own selection, testing and treating of seeds.
- **Integrated Pest Management (IPM) and Integrated Nutrient Management (INM)**.

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<sup>3</sup> Usually, Kharif cultivation stretches over a period of 6-7 months (June-January) and reservoir water is heavily used for supplementary irrigation. Project strategy aimed at changing this practice and "shortening Kharif".

<sup>4</sup> This model is beneficial to diversion systems as well. For example, irrigation planning would be easier and economical. "Time-saving" can increase overall cropping intensity.

- **Spread of the System of Rice Intensification (SRI)**<sup>5</sup>. The team assisted farmers to adopt SRI as a priority activity according to soil conditions, water availability, labour availability, etc.
- **WUA collectively-managed command area development work**, especially on field channels, and on-farm water management (OFWM). Note: mainly due to procedural delays, the progress of WUA-managed field channel construction was slow. The Team has taken up OFWM in 2013 but the project ended in March 2013.
- **Experience-based group extension methods** involving all the farmers in the *Chak*: Farmer Field Schools were the major method of extension organized by the WUAs with SCOs' and COs' assistance and with technical advice from the NGO extension specialists and TA consultants (no classroom-type training);
- **Formation and strengthening of WUA sub-committees** for finance, works, and social audit

## The Intervention Method

This intervention methodology was not new. Philippine's National Irrigation Administration (NIA) used Community Mobilizers (COs) to form and strengthen WUAs in small communal systems in the mid-70s. A pioneering experiment to establish participatory irrigation management through farmer organizations in the Gal Oya major irrigation project, Sri Lanka (1980-85), benefitted from the Philippines experience. Change agents called Institutional Organizers (IOs) were introduced to initiate a PIM process, encompassing a range of options applicable to different locations and situations. During this process, IOs, farmers and field-level officials developed sustainable participatory organizations, still functioning 30 years later. IOs were expected to respect farmers, their ideas, values and beliefs. IOs were neither instructors nor educators in the classic sense. Instead, IOs functioned as facilitators. They promoted interaction among villagers, and between the villagers and the government officials, and helped irrigation groups and the government agencies to cooperate with each other based on mutual respect.

The IOs' aim was to make villagers self-reliant. The Gal Oya experience led to the government's developing a National Institutional Framework for PIM in Sri Lanka<sup>6</sup>. Other

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<sup>5</sup> **System of Rice Intensification:** The advantage with SRI is not only higher yields, but a significant saving of irrigation water and time. It fits ideally to IIP strategy of 'Managing Kharif for Rabi'. Seed rate in SRI is very low, and many farmers are ready to invest on high-price hybrids as they have seen hybrids thrive well under SRI. The Team promoted SRI as a priority effort. They organized "exposure visits" for non-adopters and encouraged them to come to an agreement and arrange seeds, etc and prepare for next Kharif SRI. When HYV seeds were given through the "WUA minimum 30%: CIDP maximum 70% scheme", preference was given to SRI farmers. SRI adoption was nearly zero in 2010, but in Kharif 2012, out of 133,717 farmers cultivating 101,312 ha, 5,378 farmers were cultivating 4,285 ha under SRI, over 4% of the total area, with more than satisfactory results.

<sup>6</sup>Wijay contributed to the policy changes referred to here. He was the initial team leader of the pioneering Participatory Irrigation Management (PIM) effort in the Gal Oya irrigation scheme in Sri Lanka. Wijay as well as the Gal Oya project funded by USAID benefitted immensely from the frequent visits and continuous guidance of Prof. Norman Uphoff, who was the "Chief Mentor" for PIM introduction, a role similar to that which he has played for the introduction of SRI in many countries. Wijay was fortunate to learn from Prof Norman Uphoff's rich experience over many years. Wijay has co-authored several publications with Prof. Uphoff, including "Demonstrated benefits from social capital: The productivity of farmer organizations in Gal Oya, Sri Lanka," *World Development*, Vol. 28, No.11, November 2000.

countries too, have benefitted from Philippines and Gal Oya experience. In CIDP too, the facilitating staff were guided to make sure that the interventions emerged from a process of participatory planning and the development of a shared WUA vision. WUAs were supported to take the lead and responsibility for participatory planning, implementation and follow-up of each and every step/activity of the plan. This methodology helped farmers and their organizations to own the process.

## **Program Management - Consultants as Implementers**

As the WRD didn't have adequate experience in handling a multidisciplinary programme that integrated technical and social science interventions, ADB-TA managed the implementation. This mode of programme management helped achieve quick results. TA team designed the IIP, managed the entire programme and provided technical guidance. TA consultants of CIDP undertook the responsibility for demonstrating what they advised and advocated. The COs and Senior COs, recruited and selected competitively from the open market, were trained through continuous interactions and by demonstrating how to function as capacity builders/trainers. The method of selection of facilitators and the mode of management of IIP (by the ADB-TA) contributed to the success. Transparency and objectivity have been maintained throughout the process, also supporting programme success. Politicians and government officials did not interfere with the project's selection of implementing staff.

ADB-TA consultants guided the field team and continuously refined the technical package, integrating water-agricultural practices and WUA strengthening. Participatory reviews and target setting was the major tool for sharing experience and improving performance. This is a powerful tool because it can even exert peer pressure and remove those who did not perform, irrespective of their position and possible links.

Despite the active role of the consultants, this was performed in a way that farmers have come to regard the WUAs as their own and to take ownership of the organizations and the process. Most WUAs can continue to organize and manage collective action without further guidance. The four Farmers Companies, however, are still in early stage and need more advice, training and support, especially to develop strong partnerships with private sector.

In the intervention process many WRD staff, especially those in the field who had seen the progress with their own eyes, have changed and have started supporting the WUAs and IIP. Quick results in IIP and the sharing of IIP experience with non-IIP areas, coupled with federating WUAs state-wide, has sensitized senior politicians to the merits of such collective action. It is apparent that many farmers in the IIP area would continue to use improved practices like SRI, and their WUAs will continue to organize and manage collective action. However, as the intervention period has been short (less than three years), marginal returns from further investments in strengthening WUAs and Farmers' Companies would be positive. Expansion of these capabilities to non-CIDP areas will depend on external support.

### **WUA Federations and Producers Companies to Extend CIDP Model State-wide**

CIDP's exceptional achievements attracted visitors from other areas of Chhattisgarh and from other states. Farmers in non-CIDP area have shown interest in benefiting from the strategy. CIDP has organized experience-sharing opportunities. In addition, District WUA

Federations were formed, and all the Managing Committees (MCs) of the District Federations joined together to form a State Federation. Later, Regional Federations were established. The irrigated area is about one-third of the total cultivated area in Chhattisgarh, and many farmers in irrigation systems are cultivating in rainfed areas as well. Therefore, already well over half of the farmers in Chhattisgarh (over half the population) are formed into Federated Farmers' Organizations at district (27) and state levels.

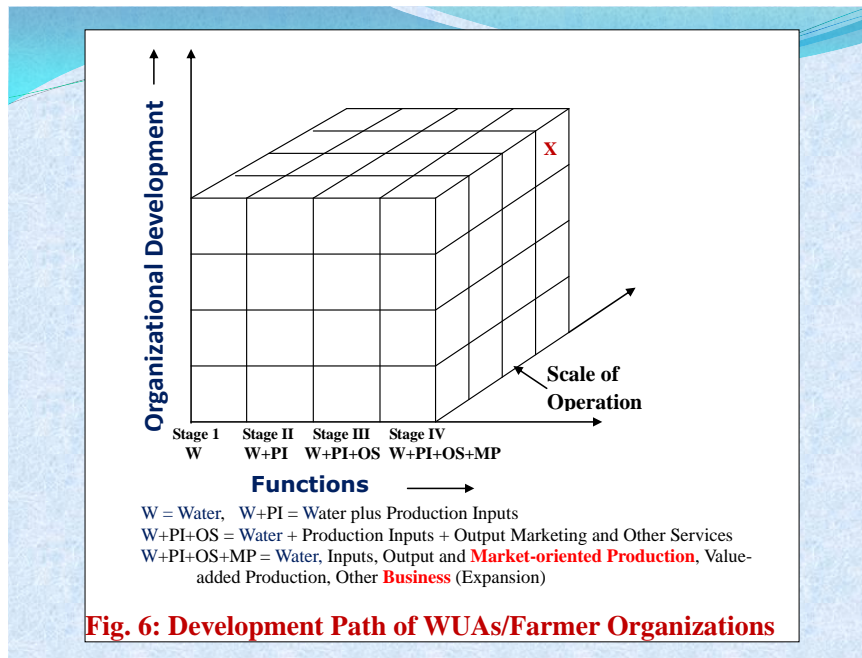


Figure 4: The Chief Minister addressing the WUA State Federation and District Federation Representatives (29th Aug 2012).says that he wants the strategy to be extended state-wide



Figure 5: Example that “Water has no colour”. In one medium-scale irrigation system, the four WUA presidents belong to the two leading political parties, but they are nevertheless united for farmers' collective action.

**WUA Development Path and Farmers' Producer Companies:** Development of WUAs or Farmers' Organizations is an evolutionary and dynamic process. Different stages of this process are illustrated in the figure below. For a typical WUA, the target would be to reach a position like “X”. The Team interacted with WUAs and persuaded them on this path of development. All the WUAs in the Intensive Intervention area handle input services, and many of them are involved in output marketing and have already developed business linkages and partnerships with the private sector. A few WUAs have begun marketing their produce outside Chhattisgarh.



In addition, the CIDP, with the help of the Rural Management and National Livelihood Resource Institute, assisted WUAs to establish four farmers' producer companies (under the Farmers' Producer Companies Act). Farmer companies, cooperatives or other forms of federated farmer organizations would be the most appropriate organizations for small farmers to reach economies of scale and enhance the bargaining power of member-producers. They can develop stronger partnerships with the private sector and sustain themselves as strong and viable production and marketing organizations which will be responsible, not only for irrigation management, but also for input-output marketing, collection, storage, quality-control, value-added production, and marketing (see illustration below). It is expected that a CIDP expansion project will help to strengthen these farmers' (producer) companies.

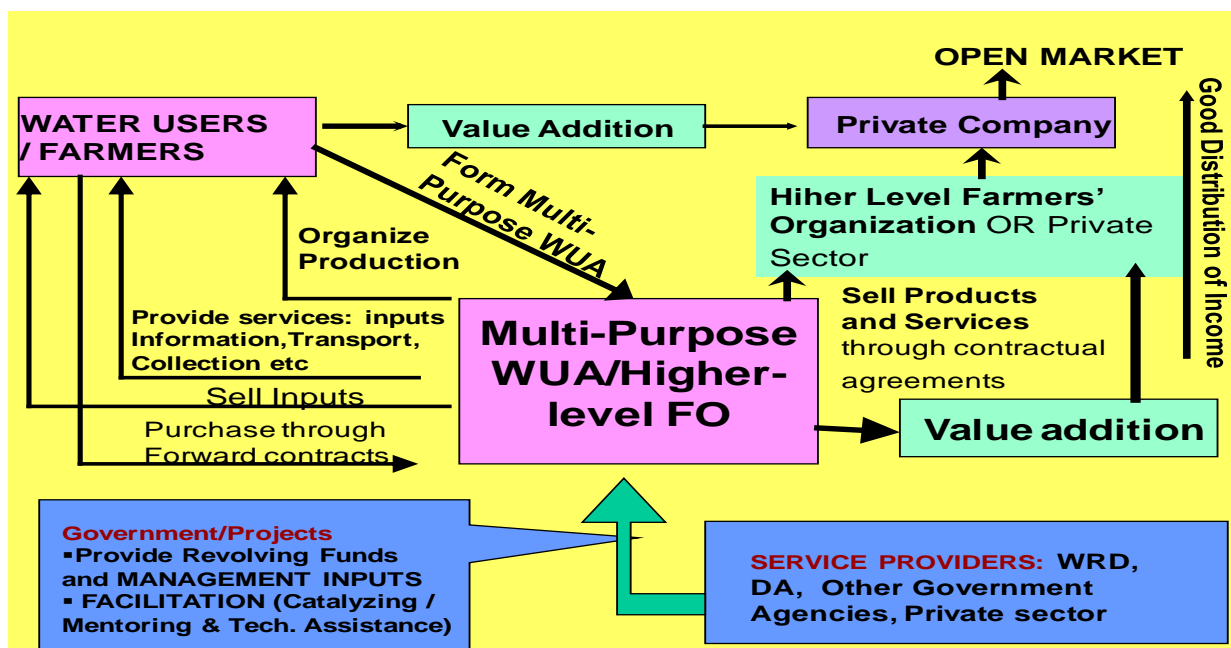


Figure 7: WUA/Federated WUAs as Multi-Functional Business Organizations



## CIDP's UNIQUE ACHIEVEMENTS

1. **Kharif paddy yield has been doubled**, from 2.8 t/ha in 2007 to 5.9 t/ha in 2012. Yield was estimated by over 1,000 crop-cuttings certified by field staff of the Departments of Agriculture and Water Resources. Water saved by shortening the Kharif season, adopting short-age paddy varieties, advanced nurseries and other methods to match the crop requirements with rainfall saves reservoir water for us in Rabi season. Irrigated Kharif cropping intensity (CI) has reached 100% in 100,000 ha (Figure 1).
2. **Rabi cropping intensity has exceeded project targets**; already it is 53% (Figure 2). Crop diversification and new crops (sunflower, maize, groundnut, etc.) have been introduced.
3. **WUAs are managing water in many minor systems**, under sluices also, and are sharing management with WRD in medium-sized systems.
4. **WUAs manage farmers' input provision and output marketing** and also organize the adoption of better practices to improve water and land productivity, including water-saving higher-yielding methods like System of Rice Intensification (SRI -- see box). WUA-private sector partnerships including "forward contracting" have been established.
5. **WUAs have organized themselves state-wide**: All 1,324 WUAs are organized into district, regional and state-level federations.
6. **The full cost of the project has been recovered**, including infrastructure rehabilitation and up-grading (R&U), before the end of project; in fact, in just one season.
7. **Construction of WUA-managed field channels has proceeded**, although progress on this is slow due to a late start.
8. Assuming CIDP extension, **four large Farmers' Companies have been formed** in different regions of Chhattisgarh. However, CIDP has ended, so they need a little more support.

## MAJOR REASONS FOR SUCCESS

- The strategy that combined: a) **technical aspects**, related to year-round water management mainly by "managing Kharif for Rabi" and "maximizing the utilization of rainfall while saving reservoir water, and water- and time-saving methods like SRI, and b) the **social mobilization** method of intervention, focusing on WUA-managed collective action.
- **Active program management by ADB-TA Team**: ADB consultants, with inputs from specialists and facilitators recruited by NGOs, did not act as "advisors" but instead demonstrated "how to do". Also, **staff members were selected competitively** from the open market, avoiding external influences as much as possible. The method of staff selection and the mode of management were major contributors to success. Transparency and objectivity have been maintained. Participatory target-setting and performance assessment created healthy competition among field facilitators.
- **Farmers' collective action**, involving over 135,000 farm families. When most farmers are operate small holdings (less than 1 ha), their activities need to be coordinated. Without this, it is difficult to improve irrigation system-wide water and raise land productivity. Many farmers and their WUAs understood that "an Australian farmer having 1000 ha can adopt the same best package of practices all over her/his farm; so over 1000 of us operating on 1000 ha must adopt collective action to approach that efficiency". Hence, WUA-managed collective action for planning, water management and input-output services was the key.
- **WUA partnerships with the Agriculture and Water Resources Departments and the private sector**. It is seen that DA field staff now collaborate and work closely with WUAs.
- **Constant support from ADB**, both financial and technical: ADB's "**finance plus**" concept.



Figure 8: WUA president for the Markatola minor irrigation system, showing a sunflower crop in Southern Chhattisgarh.

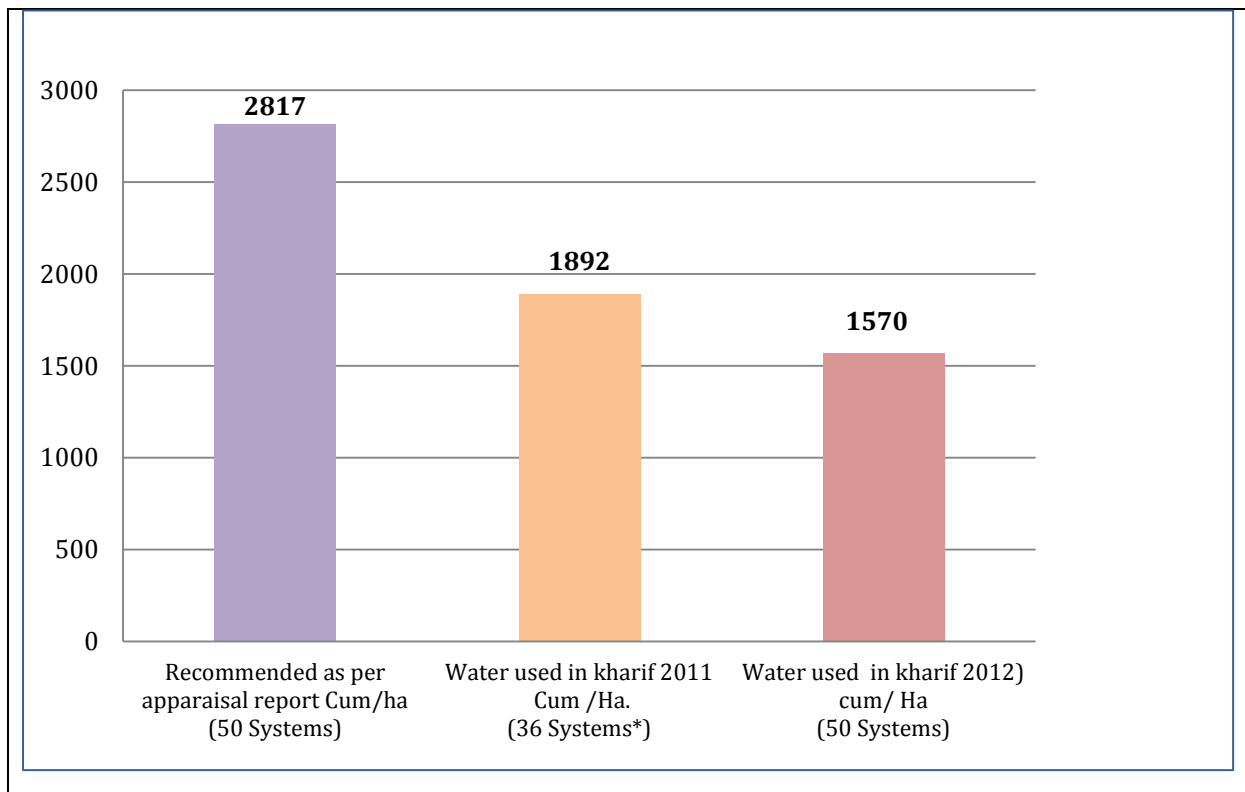


Figure 9: Water use efficiency in *Kharif* 2012 with better water management

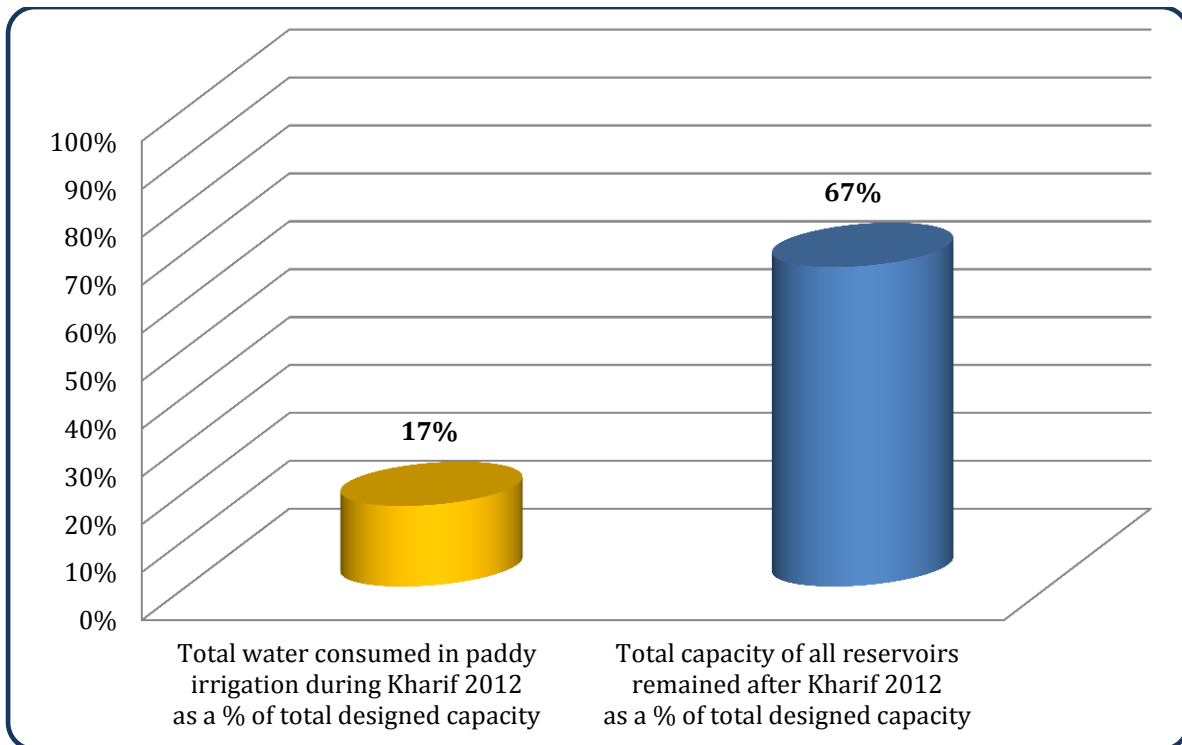


Figure 10: Water consumed during *Kharif* season and the capacity remaining at the end of *Kharif* season in 2012 at reservoirs of IIP irrigation systems



Figure 11: Project’s successes include large-scale row transplanting, together with failures such as inadequate on-farm water management (OFWM), with difficulty in maintaining shallow water depth throughout the field due to the large size of the plots. Construction of several earthen cross-bunds would be helpful.

**System of Rice Intensification (SRI) has been a major Intervention of CIDP-IIP as it is high-yield at the same time that it saves farmers water, time and cost**



Fig. 12: In the past two Kharif seasons, highest yield in Chhatisgarh (over 11 t/ha) has been reported by CIDP-IIP farmer Mr. Shayam Kumar Patel, Raigarh. This won him an award.

Nearly 5% of the area was under SRI in 2012. 10-15-day old seedlings are planted with wide spacing (25cm x 25 cm). Soil is kept moist, but well-drained. Organic matter is added by many farmers; others apply chemical fertilizer or a mix to maintain good fertility. Minimum water is applied during vegetative growth stage, with a thin layer of water during flowering and grain-filling (or intermittent wetting and drying). Weeds are managed using rotary weeders as this improves root growth.

SRI is strongly promoted, depending on field and soil conditions, water availability, labour availability, etc. SRI gives not only higher yields, but also significant savings of irrigation water and time. Harvesting can usually be done 7-8 days sooner than usual. This supports the IIP strategy to create more productivity in the Rabi season. SRI fits ideally with the IIP strategy of “managing Kharif for Rabi” and it has accordingly been given highest priority. Department of Agricultural Extension staff have given good support to this effort.

The Team is confident that it should be possible to cover about 5 to 7% of whole Chhattisgarh irrigated area with SRI. Together with WUA-managed input-output services, this would bring the State’s average irrigated Kharif paddy yield up at least up to 6-7 mt/ha. If CIDP does not continue, however, such additional breakthroughs may not come or will get delayed.

**Figure 13: Progress of SRI: 2010-2012**

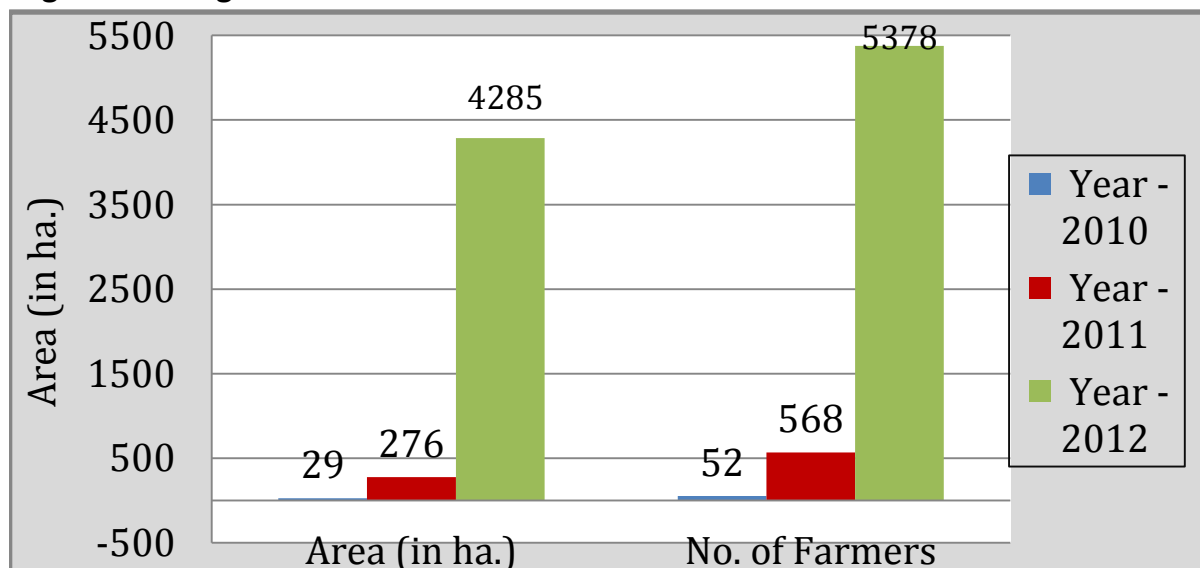




Figure 14: Farmers have adopted SRI quickly

Paddy crop cuts Report - Randomly selected farmers of CDP-IIP irrigation systems - Kharif 2012										
Name of Irrigation System :		Putka I								
Name of Water Resources Division:		Sarangarh, Distt- Raigarh								
Name of District:		Raigarh								
Name of Community Organiser :		Khitawan Kumar Chaudhari								
Name of Senior Community Organiser :		Mr. D. Megh								
Name & Code of Water User Association :		Sarangarh								
S. No.	Name of Farmer	Village	Chak No.	Land Register no. of the paddy field	Location of Chak Head/Middle/Tail	Name of Paddy Variety	Method of Crop Establishment (SRI/Line Transplanting (LTP)/ Normal TP (NTP)/Line Sowing (LS)/ Broadcasting (BC)	Date of crop cut (dd/mm/yy)	Weight of crop cut (5 x 5 m Sample) (in kg.) (after drying)	Signature of Farmer
1	Mahendra Singh Maitri	Amakoni	1	8/3	H	1001	NTP	16-11-12	15.375	मेघ सिंह
2	Laxman Munda	Kawalajhar	2	174/2	H	6444	NTP	21-11-12	16.120	लक्ष्मण
3	Suklal Singh	birshingdhi	2	24	H	1010	BC	07-11-12	15.400	सुकलाल सिंह
4	Jai Gopal	Sarangarh	3	1504	H	HMT	NTP	16-11-12	16.100	जयगोपाल
5	Siv charan Yadav	Chawarpur	2	78/2	M	Swarna	SRI	19-11-12	23.500	शिवचरण
6	Vijay Yadav	Sarangarh	5	384/1	M	MTU-7029	NTP	27-11-12	18.800	विजय
7	Naresh Jaiswal	Chingripali	2	78	M	Swarna	LTP	22-11-12	16.320	नरेश जयसवाल
8	Bharat Lal Maitri	Gadhakhata	2	502	T	Swarna	LS	26-11-12	15.710	भारतलाल
9	Narshing Maitri	Bardahara	L	38	T	1010	BC	10-11-12	15.680	नरसिंह
10	Santosh chandra	Jharadihi	4	118	T	1001	NTP	26-11-12	16.330	संतोष
11										
12										
13										

Name & Seal of Water User Association (WUA):

Name & Seal of Water Resources Department (WRD):

Rural Agriculture Extension Officer

SARANGARH

Name & Seal of Department of Agriculture (DOA):

वरिष्ठ कृषि विकास अधिकारी

सारंगरह, जि. सारंगरह (छ.ग.)

Revenue Inspector

Hardi, Sarangarh,

Senior Agriculture Development Officer

Department Of Agriculture, Sarangarh

Figure 15: Crop Cut Record Sheet – An example from Putka-I medium irrigation system, Sarangarh, Raigarh. This original record sheet was certified by the Department of Agriculture, the Water Resources Department, the Government Revenue Inspector, and the President of the WUA. 1,070 such crop-cuts were done in Kharif 2012, and in Kharif 2011 too, over 1,000 crop-cuts were conducted and recorded.