Central Water Commission

FARMERS PARTICIPATOY ACTION RESEARCH PROGRAMMES (FPARP)-2nd Phase

COMPLETION REPORT

Submitted to

Ministry of Water Resources
Government of India

ICRISAT
Science with a human face

International Crops Research Institute for the Semi-Arid Tropics
Patancheru 502 324, Andhra Pradesh, India

Central Water Commission

FARMERS PARTICIPATOY ACTION RESEARCH PROGRAMMES (FPARP)-2nd Phase

COMPLETION REPORT

Submitted to

Ministry of Water Resources
Government of India

ICRISAT
Science with a human face

International Crops Research Institute for the Semi-Arid Tropics
Patancheru 502 324, Andhra Pradesh, India

Contents

MINISTRY OF WATER RESOURCES
Central Water Commission

COMPLETION REPORT
"FARMERS PARTICIPATOY ACTION RESEARCH PROGRAMMES"
(FPARP)-2nd Phase

(A) General

1. **Name of University/Institute** : International Crops Research Institute for the Semi Arid Tropics, Patancheru 502 324, Andhra Pradesh, India

2. **Name of the Programme coordinator:** Dr S P Wani

3. **Address and Email ID** : International Crops Research Institute for the Semi Arid Tropics, Patancheru 502 324, Andhra Pradesh, India
   Phone : 91 040 30713466
   Fax : 91 040 30713074
   E-mail : s.wani@cgiar.org

4. Experience in water related works:

ICRISAT with its headquarters at Patancheru, Andhra Pradesh, India has operations across 55 countries in the World. ICRISAT is one of the 15 international centers and is working from 1976 in the area of watershed management with the objective of developing sustainable land and water management practices and enhancing agricultural productivity. ICRISAT has undertaken strategic research in the area of soil, water, nutrient and crop management with the sole aim of enhancing the objective of rainwater use efficiency through rainwater conservation and harvesting which can be used as supplementary irrigation during the dry spells. ICRISAT has developed consortium approach for managing community watersheds and have developed good agricultural practices for sustaining the development in the rainfed areas. Icrisat has long experience in conducting on-farm participatory trials in number of their benchmark watersheds in different states of India and Asia.

Our Research Program, Resilient Dryland Systems (RDS) works with an aim to improve rural livelihoods and increase food security through sustainable integrated natural resource management. Water is always in short supply in the dry tropics, so we place special importance on watershed management (including water harvesting techniques in the SAT. During last 36 years, institute has worked on various technologies for improving water use efficiency.

5. Nature of works done by the Institutes/University during last 5 years:

ICRISAT is the leader in crop improvement of its mandate crops (sorghum, pearl millet, groundnut, chickpea and pigeon pea). It uses high science tools to breed improved varieties of these crops which have been widely adopted in India and other SAT countries. ICRISAT is also the leader in agro-ecosystems research encompassing farmer's participatory integrated watershed management to enhance sustainable agricultural production while reducing land degradation and protecting the environment by adopting practices that enhance efficient use of natural resources. ICRISAT also does research in the area of institutions, market linkages and analysis of research impacts leading to the development of policies that enhance the adoption of new research outputs for enhanced productivity and greater welfare of the farming communities.

Some of the salient works done by our institute in the concerned area are:

- ICRISAT has demonstrated technologies for efficient use of water in the states of Madhya Pradesh, Rajasthan, Jharkhand and Chhattisgarh by conducting farmers' participatory action research trials supported by the Water Resources Ministry, Government of India.

- ICRISAT initiated productivity enhancement initiative at 10 nucleus watersheds of Kolar, Tumkur, Chitradurga, Haveri and Dharwad districts in Karnataka state under Sujala-ICRISAT program. Since last three years, productivity enhancement initiative "Bhoochetana" is technically supported for Department of Agriculture, Government of Karnataka. Farmers' yields increased by 21 to 66% over farmers' practice over 3 million ha.

- ICRISAT demonstrated on productivity enhancement technologies across five counties in Asia including China, India, Philippines, Thailand and Vietnam with the support of (ADB). Government of Andhra Pradesh had supported for up scaling the watershed technologies for improved Livelihood opportunities in five districts of the state through Andhra Pradesh Rural Livelihood Program (APRLP)

- ICRISAT developed Model cum learning watershed at Kothapally in Andhra Pradesh through Asian Development Bank (ADB) supported project which is covered in World Development Report 2008 and is also one of the seven best case studies for Integrated Natural Resource Management in the Consultative Group on International Agricultural Research (CGIAR).

- ICRISAT's Consortium approach for community watershed management is recommended by the Farmers Commission. Innovative water use efficiency enhancement options such as soil test based micronutrient amendments for increasing yields; in-situ generation of organic matter; availability of improved seeds through village based seed banks are few reflected in the farmers' commission report.

- ICRISAT has thirty five plus- years of research and development experience on integrated watershed management. Heritage watersheds at ICRISAT campus revealed that improved management practices could enhance crop yields to 5.2 t ha^{-1} y^{-1} in thirty five years whereas traditional systems have attained only 1.1 t ha^{-1} y^{-1} by doubling the rainwater use efficiency.

- ICRISAT-led consortium undertook comprehensive assessment (CA) of impacts of watershed programs in India for Ministry of Rural Development and Ministry of Agriculture, Government of India. The CA revealed that watershed can be growth engine for development of drylands in India and productivity and rural incomes could be doubled through enhanced water use efficiency.

- For the Comprehensive Assessment of water for food and water for life, ICRISAT-RDS team coordinated global assessment of rainfed agriculture and demonstrated through upgrading rainfed agriculture, water use efficiency could be enhanced and current farmers' field yields can be doubled.

- Sir Dorabji Tata Trust (SDTT) and Sir Ratan Tata Trust (SRTT) supported ICRISAT for combating Land degradation and increasing Productivity in watershed across 20 district watersheds in Madhya Pradesh Rajasthan and Jharkand states.

6. Description of technology (ies) demonstrated:

(i) Chickpea in Rice Fallows (Chattisgarh)

In this project, we primarily demonstrated role of growing chickpea in rice fallows with seed priming technology to enhance its productivity and cropping intensity for enhancing water use efficiency. Balanced nutrition to both rice and chickpea crops with application of secondary and micronutrients increased productivity and water use efficiency of the systems.

The technology comprised of rapid tillage after rice harvest without much loss of soil moisture, growing of improved chickpea varieties, seed priming and seed treatment. The following were the technology components:

a. Seed priming with sodium molybdate followed by treatment with *Rhizobium* and fungicide Captan.
b. High yielding, short-duration improved chickpea varieties such as ICCV 2, JG11 and ICCV 10.
c. Sowing of seeds in furrows through ploughs and planking.
d. Basal dressing of single super phosphate and micronutrients based on soil analysis results

Improved management comprised of

- Growing chickpea with seed priming in the rice fields after its harvest.
- Improved rice cultivar, balanced nutrition of paddy that included application of zinc sulfate @ 50 kg ha^{-1}, Agribor @ 2.5 kg ha^{-1} and single super phosphate @ 200 kg ha^{-1} in addition to the farmers' traditional practice of applying nutrients.

(ii) Chickpea in Rice Fallows (Jharkhand)

In this project, we primarily demonstrated role of growing chickpea in rice fallows with seed priming technology to enhance its productivity and cropping intensity. Balanced nutrition to both rice and chickpea crops with application of secondary and micronutrients increased productivity and water use efficiency of the systems.

The technology comprised of

- Rapid tillage after rice harvest without much loss of soil moisture
- Growing of improved chickpea varieties, seed priming and seed treatment. The following were the technology components:

    a. Seed priming with sodium molybdate followed by treatment with *Rhizobium* and fungicide Captan.
    b. High yielding, short-duration improved chickpea varieties such as KAK 2, ICCV 2 and JG 11.
    c. Sowing of seeds in furrows through ploughs and planking.

Improved management comprised of balanced nutrition of paddy that included application of zinc sulfate @ 50 kg ha^{-1} and Agribor @ 2.5 kg ha^{-1} in addition to the farmers' traditional practice of applying nutrients. The farmers grew chickpea in the same rice fields after its harvest.

iii) Rainy season fallows management with improved Vertisols management technology in Madhya Pradesh

The components of improved Vertisols management technology implemented in Madhya Pradesh to manage rainy season fallows included:

- Broadbed and Furrow System (BBF) land form for effective soil and water conservation and controlling water logging
- Two crops during a year through rainy season fallow management
- Integrated nutrient management including micronutrients applications
- Improved crop varieties for sequential cropping
- Improved implement viz. tractor mounted BBF maker cum seed drill
- Dry season tillage

iv) Rainwater conservation and productivity enhancement for increased water use efficiency in Rajasthan

In this project, we demonstrated

- The role of landform management (Conservation furrows, broad bed and furrow i.e. BBF)
- Micro irrigation (Drip), furrow irrigation
- Soil test-based balanced nutrition to enhance crop and water productivity.

The use of conservation furrows or BBF is very useful particularly during rainy seasons in a way that it provides a safe channel for excess water to run off without distorting soil structure and ultimately affecting yields. The intact soil structure with proper landform also leads to more of infiltration of water into soil to enhance water table which maintains proper water regime during crop growth and leaves more residual moisture for next post-rainy crop and thus ultimately increases rainwater use efficiency. The benefits of drip irrigation are well documented for controlled irrigation to maintain proper moisture regime during crop growth and water saving also. Along with water related issues, the soils of target regions have multinutrient deficiencies mainly sulphur, boron and zinc along with nitrogen and phosphorus which are one of the main reasons leading to inefficient use of available

water resources and resulting into low water use efficiency. The technology of soil test based balanced nutrition included in addition to nitrogen (N) and phosphorus (P), the application of deficient sulphur (S) through gypsum (200 kg ha^{-1}), zinc (Zn) through zinc sulfate (50 kg ha^{-1}), and boron (B) through agribor (2.5 kg ha^{-1}). In block level recommendations, full dose of a nutrient was applied when >50% farmers' fields tested low, while half the dose was added when <50% fields tested low in the nutrient concerned.

7. Total Nos. of demonstrations to be conducted as per approved by MOWR.

	State	**No. of demonstrations**
Rice Fallows	Chhattisgarh	100
Rice Fallows	Jharkhand	100
Rainy Season Fallows	Madhya Pradesh	100
Rainwater Conservation & Productivity Enhancement for increased WUE	Rajasthan	100

8. Total no of demonstrations conducted/completed in the whole program

	State	**No. of demonstrations**
Rice Fallows	Chhattisgarh	179 + 93
Rice Fallows	Jharkhand	330
Rainy Season Fallows	Madhya Pradesh	107 + 235
Rainwater Conservation & Productivity Enhanc. for increased WUE	Rajasthan	139

9. No of demonstrations completed against each tehnology/ies

	State	**No. of demonstrations**
Rice Fallows	Chhattisgarh	179 paddy trials + 93 chickpea with seed priming technique on residual moisture
Rice Fallows	Jharkhand	187 paddy trials + 143 chickpea with seed priming technique on residual moisture.
Rainy Season Fallows	Madhya Pradesh	107 + 235
Rainwater Conservation & Productivity Enhanc. for increased WUE	Rajasthan	Conservation furrow + balanced nutrition = 107 Furrow irrigation + balanced nutrition = 28 Broad bed and furrow (BBF) + micro irrigation = 4

10. Places where the technology (ies) had already been in use:

	State	No. of demonstrations
Rice Fallows	Chhattisgarh	The technology was demonstrated in two districts of Chattisgarh (Bastar and Kanker), where the farmers keep their lands fallow after rice and do not grow any crop after rice to harness the potential of residual resources left in rice fallows.
Rice Fallows	Jharkhand	In Gumla and Saraikela districts where lands are left fallow after rice
Rainy Season Fallows	Madhya Pradesh	Vidisha, Sehore, Raisen and Guna districts of Madhya Pradesh
Rainwater Conservation & Productivity Enhanc. for increased WUE	Rajasthan	The technology was demonstrated in the districts of Bundi, Tonk, Sawai Madhopur in Rajasthan

(B) Physical as given in proposal Actual

11. Cost/hectare (in Rs):

199000/400= 497.5

12. Crops/farming system for which suited:

	State	Crops/farming system for which suited
Rice Fallows (Rice + Chickpea)	Chhattisgarh	The technology is suited for the rice-fallow system which is currently wide-spread in the north-eastern parts of the country (states of Chhattisgarh, Jharkhand and Orissa)
Rice Fallows (Rice + Chickpea)	Jharkhand	The technology is suited for the rice-fallow system which is currently wide-spread in the north-eastern parts of the country (states of Chhattisgarh, Jharkhand and Orissa)
Rainy Season Fallows (Soybean + Chickpea)	Madhya Pradesh	The major crops taken in the trials were soybean in kharif and chickpea and wheat in rabi season. There is one of the major cropping systems in the region.
Rainwater Conservation & Productivity Enhanc. for (all rainfed crops) increased WUE	Rajasthan	Maize, blackgram, pearl millet, groundnut, wheat, chickpea, mustard

13. Water use efficiency/water conserved:

i) Chickpea in Rice Fallows (Chattisgarh)

During the 2011-12 Rabi seasons, the farmers sold 50% their chickpea as green vegetable and 50% harvested for dry grain and yields were recorded and estimated Kg ha^{-1} yield. The total rainfall, irrigation applied and soil moisture data and WUE was calculated and presented below. Water use efficiency (WUE) was ranging from 8.17 to 9.13 kg ha^{-1} mm^{-1} of residual moisture and amount of irrigation given or water applied. During 2011 rainy season rice crop, WUE was ranging from 6.98 to 7.01 kg ha^{-1} mm^{-1} in traditional and 8.52-8.74 kg ha^{-1} mm^{-1} for improved management in 2 districts. However, WUE for Kanker was higher in the improved management than in traditional management. Due to low rainfall during the year irrigation was necessary for rice and Desi chickpea varieties like JG 11 and ICCV 10 in Bastar district.

WUE of rice during the 2011 rainy season.

District	Rainfall (mm)	Irrigation (mm)	Soil moisture Extraction	WUE (kg ha^{-1} mm^{-1})	
				Trad.	Imp.
Rice 2011 (Kharif season)					
Kanker	798	0	-	7.01	8.74
Bastar	361	100	-	6.98	8.52
Rice+ Chickpea(2011-12 season)					
Kanker	798	50	88	-	9.13
Bastar	361	200	35	-	8.17

ii) Chickpea in Rice Fallows (Jharkhand)

During the 2011-12 Rabi seasons, the farmers sold 50% of their chickpea as green vegetable and 50% harvested for dry grain and yields were recorded and estimated Kg ha^{-1} yield. The total rainfall, irrigation and soil moisture extracted data and WUE was calculated and presented below. Water use efficiency (WUE) was ranging from 5.05 to 6.40 kg ha^{-1} mm^{-1} of for rice + chickpea improved technology. During 2011 rainy season rice crop, WUE was ranging from 3.8 to 5.63 kg ha^{-1} mm^{-1} in traditional and 4.6 to 6.4 kg ha^{-1} mm^{-1} for improved management in 2 districts. However, WUE for Gumla was higher in the improved management than in traditional management.

WUE of rice during the 2011 rainy season.					
District	Rainfall (mm)	Irrigation (mm)	Soil moisture Extraction	WUE (kg ha^{-1} mm^{-1})	
				Trad.	Imp.
Rice 2012 (Kharif season)					
Sariekela-Kharsawan	1075	0	0	3.8	4.6
Gumla	1085	0	0	5.63	6.63
Rice+ Chickpea(2011-12 season					
Sariekela-Kharsawan	1207	0	132	-	5.05
Gumla	1221	0	126	-	6.40

iii) Rainy season fallows management with improved Vertisols management technology

Water use efficiency of soybean in different districts of Madhya Pradesh during 2011.			
District	WUE (kg mm^{-1}ha^{-1})		Increase in WUE (%)
	Conventional farmers practices*	Improved practices*	
Sagar	0	0.94	In comparison with 0 WUE in rainy season substantial productivity was recorded.
Raisen	0	0.68	
Mandla	0	1.22	

* *Lands kept fallow during rainy season*

Water use efficiency of Chickpea in different districts of Madhya Pradesh during Rabi 2011-2012.			
District	WUE (mm^{-1}ha^{-1})*		Increase in WUE (%)
	Conventional farmers practices	Improved practices	
Sagar	3.9	4.2 + 0.94	7.7
Raisen	4.5	4.8 + 0.68	8.6
Shajapur	2.3	2.9	26.6
Mandla	1.2	1.3 + 1.22	2.5

**Average yield*

Water use efficiency of Wheat in different districts of Madhya Pradesh during Rabi 2011-2012.			
District	WUE (mm^{-1}ha^{-1})*		Increase in WUE (%)
	Conventional farmers practices	Improved practices	
Sagar	6.7	7.2	7.0
Raisen	7.8	8.4	6.7
Shajapur	9.3	9.9	9.8

**Average yield of WUE trials*

iv) Rainwater conservation and productivity enhancement for increased water use efficiency

10 to 50%

Effects of conservation furrow plus soil test based balanced fertilization on rainwater use efficiency in Rajasthan, 2010 rainy season					
District	No. of trials	Crop	WUE (kg mm-1 ha-1)		% inc.
			FP	BN	
Tonk	5	Black gram	0.43	0.53	24
	18	Maize	2.56	3.84	50
	8	Pearl millet	1.78	2.21	24
	15	Groundnut	1.13	1.38	22
S. Madhopur	8	Maize	2.87	3.17	10

Effects of conservation furrow plus soil test based balanced fertilization on rainwater use efficiency in Rajasthan, 2011 rainy season					
District	No. of Trials	Crop	WUE (kg mm-1 ha^{-1})		% inc.
			FP	BN	
Bundi	12	Maize	4.00	4.61	15
Tonk	3	Maize	2.79	3.41	22
	6	Pearl millet	1.83	2.20	20
	9	Groundnut	1.54	1.79	17
S. Madhopur	2	Maize	3.56	3.99	12
	16	Pearl millet	1.69	1.90	13
	5	Blackgram	1.02	1.18	16

14. Benefit – Cost Ratio:

	State	Benefit – Cost Ratio
Rice Fallows	Chhattisgarh	During the year 2011 season, cost-benefit ratios for rice ranged from 1: 4.1 to 7.5 across districts for traditional management. With improved management (Paddy +Chickpea), the B:C ratios were 1: 4.1 to 8.5 high enough for the farmers to adopt the technology. The net income increase for improved system compared to traditional system ranged between 39 and 43% across 2 districts (Figure 3).
Rice Fallows	Jharkhand	Cost of production varied with district and season both for traditional and improved management. During the year 2011 season, cost-benefit ratios for rice ranged from 1: 6.89 to 11.76 across districts for traditional management. With improved management (Paddy +Chickpea), the B:C ratios were 1: 7.03 to 9.74 high enough for the farmers to adopt the technology. The net income increase for improved system compared to traditional system ranged between 53% and 91% across 2 districts (Figure 4).

Rainwater Conservation & Productivity Enhanc. for increased WUE	Rajasthan	0.92 to 14.9
Rainy Season Fallows	Madhya Pradesh	See Table and graph below

Fallow management trial

District	Rainy season fallow	Improved management (Double cropping)	Percentage Increase (%)
Sagar	2.66	3.93	48
Raisen	2.53	3.55	40
Mandla	2.30	4.58	99
Shajapur	2.70	2.79	3
Mean	**2.55**	**3.71 (48% increase)**	

WUE Trial

District	Rainy season fallow	Improved management INM+BBF
Sagar	1.72	**2.50**
Raisen	0.73	**1.85**
Mandla	0.62	**1.47**
Shajapur	0.73	**1.16**

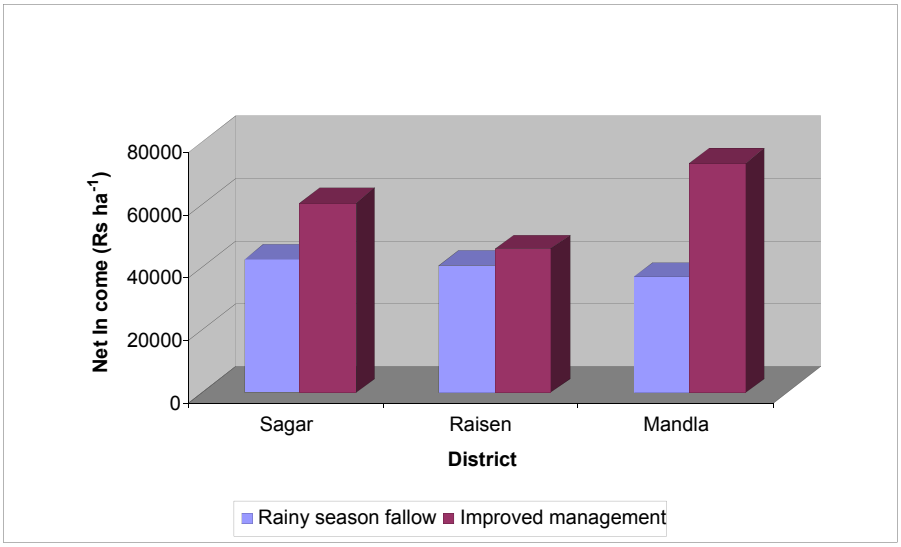

Figure 1. Net income from Traditional (rainy season fallow) and improved (rainy+post rainy season) mangement in Madhya Pradesh, 2011-12

C: B ratio							
	Farmers Practice			Improved Practice			
	Kharif	Rabi	Total	Kharif	Rabi	Total	% increase
Sagar	0.00	2.66	2.66	0.17	3.76	3.93	48
Raisen	0.00	2.53	2.53	0.05	3.50	3.55	40
Mandla	0.00	2.30	2.30	0.68	3.90	4.58	99
Mean	0.00	2.50	2.50	0.30	3.72	4.02	62.4

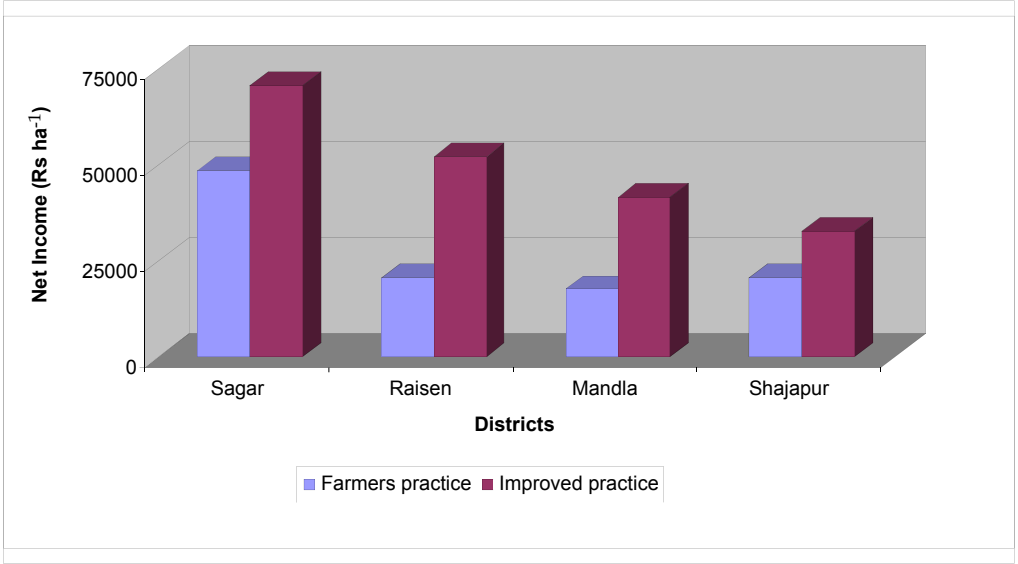

Figure 2. Net income in water use efficiency trials in Madhya Pradesh, 2011-12

C: B ratio							
	Farmers Practice			Improved Practice			
	Kharif	Rabi	Total	Kharif	Rabi	Total	% increase
Sagar	0.00	1.72	1.72	0.17	2.33	2.50	**45**
Raisen	0.00	0.73	0.73	0.02	1.82	1.85	**154**
Mandla	0.00	0.62	0.62	0.38	1.09	1.47	**137**
Shajapur	0.00	0.73	0.73	0.09	1.07	1.16	**59**

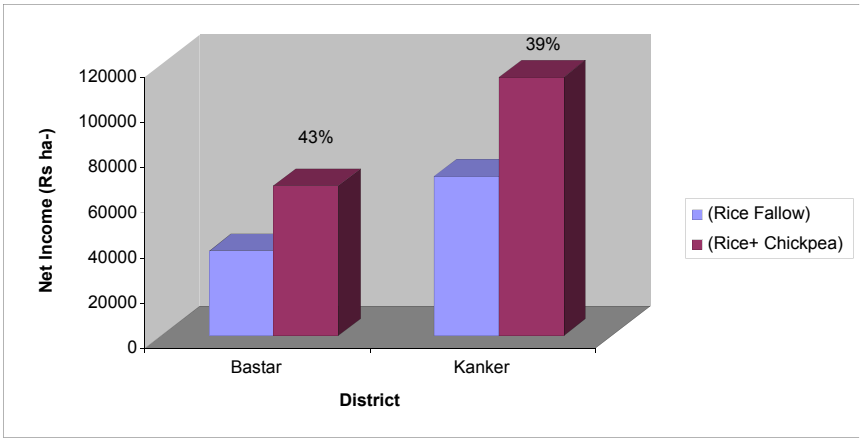

Figure 3. Net income (Rs ha^{-1}) of traditional (Rice+ fallow) and improved (Rice+ Chickpea) crop practices for 2 district of Chhattisgarh, rainy season 2011.

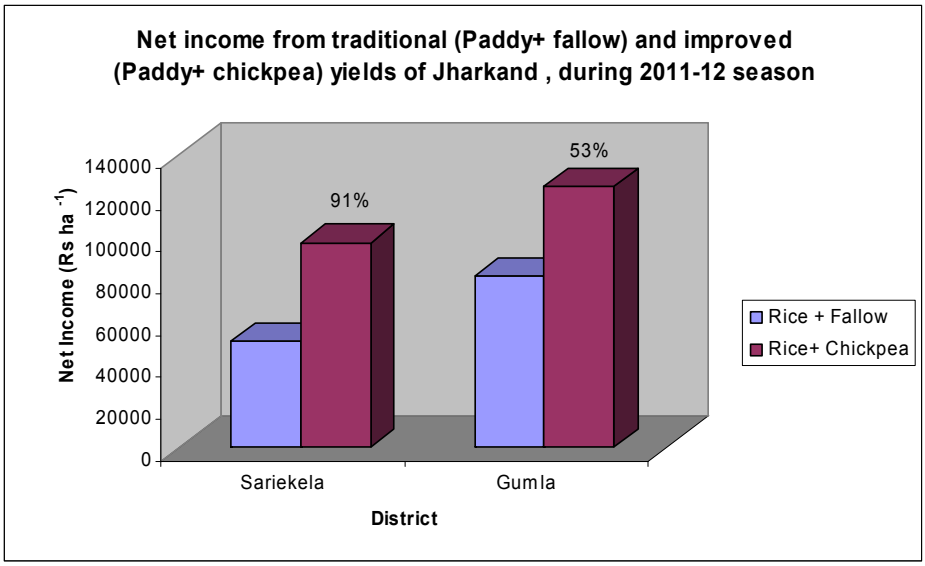

Figure 4. Net Profit from traditional and improved systems during 2011-12 seasons

15. Increase in agricultural yield and other benefits in livestock and fisheries etc.:

i) Chickpea in Rice Fallows (Chattisgarh)

Application of balanced nutrition to rice increased both the biomass and grain yield of rice. Percent gain in grain yield with balanced nutrition was 22.5% to 25.6% across the two districts. From the grain yields of chickpea crop it is evident that residual effect of applied micronutrients to rice crop on chickpea crop gave additional benefit to farmers. The crops yields of paddy during rainy season were ranging from 3220 to 3930 kg ha^{-1} in traditional and 5600 to 6970 kg ha^{-1} in improved management in 2 districts. The chickpea yields in improved management during rabi season were ranging from 675 to 820 kg ha^{-1} in two

districts. The combine yields of improved management rice + chickpea system were ranging from 4610 to 7730 kg ha^{-1} in two districts. The cost of cultivation, gross returns, net income and Benefit cost ratio for rice crop, chickpea crop and rice + chickpea crop for two districts during 2011-12 season data are calculated and presented below.

Gain in rice yields with improved management, 2011 season.							
	No. of farmers	**Area sown**	**Biomass yield (kg ha^{-1})**		**Grain yield (kg ha^{-1})**		**% gain in grain yield**
District	**participated**	**(ha)**	**Trad**	**Imp**	**Trad**	**Imp**	
Rice 2011 (Kharif season)							
Kanker	113	45	7980	9740	5600	6970	25.6
Bastar	66	40	4470	5460	3220	3930	22.5
Chickpea 2011-12 (Rabi season)							
Kankar	63	12.0	-	1600	-	820	-
Bastar	30	7.4	-	1490	-	670	-
Rice+ Chickpea (2011-12 season)							
Kankar	176	57.0	-	10250	-	7730	-
Bastar	96	47.4	-	6960	-	4610	-

Trad = Rice-fallow with traditional management; Imp = Rice-Chickpea with balanced nutrition of rice

Net income and cost: benefit ratios for rice and chickpea, 2011-12 seasons.								
	Total cost (Rs ha^{-1})		**Gross return (Rs ha^{-1})**		**Net income (Rs ha^{-1})**		**B:C ratio**	
District	**Trad**	**Imp**	**Trad**	**Imp**	**Trad**	**Imp**	**Trad**	**Imp**
Rice 2011 (Kharif season)								
Kanker	9476	10476	80020	98971	70444	88495	7.48	8.52
Bastar	9075	10944	45567	55641	36493	44698	4.07	4.12
Chickpea 2011-12 (Rabi season)								
Kanker	-	6020	-	32961	-	26941	-	4.56
Bastar	-	7442	-	27009	-	19567	-	2.65
Rice+ Chickpea (2011-12 season)								
Kanker	-	16480	-	131040	-	114560	-	6.99
Bastar	-	18418	-	80685	-	65882	-	3.58

Farmers don't grow chickpea

ii) Chickpea in Rice Fallows (Jharkhand)

Application of balanced nutrition to rice increased both the biomass and grain yield of rice. Percent gain in grain yield with balanced nutrition was 11% to 17% across the two districts. From the grain yields of chickpea crop it is evident that residual effect of applied micronutrients to rice crop on chickpea crop given additional benefit to farmers. The crops yields of paddy during rainy season were ranging from 4208-6108 kgha^{-1} in traditional and

5094-6869 kg ha^{-1} in improved management in 2 districts. The chickpea yields in improved management during rabi season were ranging from 950 to 1000 kg ha^{-1} in 2 districts. The combine yields of improved management rice + chickpea system were ranging from 6094 to 7819 kg ha^{-1} in 2 districts.

Gain in rice yields with improved management, 2012 season.							
District	**No. of farmers participated**	**Area sown (ha)**	**Biomass yield (kg ha^{-1})**		**Grain yield (kg ha^{-1})**		**% gain in grain yield**
			Trad	**Imp**	**Trad**	**Imp**	
Rice 2012 (Kharif season)							
Sariekela-karshaw	70	27	5550	7060	4210	5094	17
Gumla	117	53	7600	8690	6110	6870	11
Chickpea 2011-12 (Rabi season)							
Sariekela-karshaw	50	10	-	1960	-	999	-
Gumla	93	17	-	1860	-	950	-
Rice+ Chickpea (2011-12 season)							
Sariekela-karshaw	120	37	-	9020	-	6094	-
Gumla	210	70	-	10550	-	7819	-

Trad = Rice-fallow with traditional management; Imp = Rice-Chickpea with balanced nutrition of rice

Net income and cost: benefit ratios for rice 2011 rainy season.								
District	**Total cost (Rs ha^{-1})**		**Gross return (Rs ha^{-1})**		**Net income (Rs ha^{-1})**		**B:C ratio**	
	Trad	**Imp**	**Trad**	**Imp**	**Trad**	**Imp**	**Trad**	**Imp**
Rice 2012 (Kharif season)								
Sariekela-karshaw	7486	8805	58733	72125	51247	63320	6.89	7.21
Gumla	6964	7824	88762	100259	81798	92435	11.76	11.84
Chickpea 2011-12 (Rabi season)								
Sariekela-karshaw	-	5165	-	39967	-	34802	-	6.73
Gumla	-	5053	-	37993	-	32940	-	6.51
Rice+ Chickpea (2011-12 season)								
Sariekela-karshaw	-	13970	-	112092	-	98122	-	7.03
Gumla	-	12877	-	138252	-	125375	-	9.74

iii) Rainy season fallows management with improved Vertisols management technology

Soybean crop yield in improved management (IM) and farmers' management (FM) in water use efficiency trials, 2011.

District	Villages	Crop	Grain yield (kg/ha)		Bio mass yield (kg/ha)		Gain in grain yield (%)
			FM	IM	FM	IM	
Sagar	Karaiya	Soy bean	860 (±28.3)*	940 (±24.3)	650 (±44.6)	690 (±43.6)	8.7
	Shobhapur		870 (±22.4)	940 (±91.9)	630 (±62.2)	680 (±66.6)	6.9
	District average		870 (±18.2)	930 (±15.5)	630 (±12.5)	680 (±10.5)	7.6
Raisen	Siyalwada	Soy bean	190 (±2.9)	220 (±4.5)	310 (±3.3)	340 (±3.3)	16.6
	Pehariya		610 (±32.9)	680 (±31.3)	610 (±25.8)	730 (±40.9)	12.4
	District average		300 (±46.9)	340 (±51.6)	380 (±33.8)	440 (±44.1)	14.5
Mandla	Katangsavini	Soy bean	1180 (±36.0)	1220 (±49.5)	2800 (±124.4)	2970 (±140.4)	3.4

* values in parentheses are SE values

Crop yield in improved management (IM) and farmers' management (FM) in monsoon fallow management field trials during 2011.

District	Crop	Grain yield in IM (kg/ha)	Bio mass yield in IM (kg/ha)
Sagar	Soybean	840 (±26.2)	550 (±15.5)
Raisen	Soybean	240 (±20.7)	320 (±23.1)

* values in parentheses are SE values

During 2011 the crop yields during monsoon season were very low both in Sagar and Raisen district due to continuous rainfall which did not allow any weeding and fertilizer application and fields were waterlogged.

Chickpea crop yield in improved management (IM) and farmers' management (FM) in water use efficiency trials, Rabi 2011-2012

District	Villages	Crop	Grain yield* (kg/ha)		Straw yield* (kg/ha)		Gain in grain yield (%)
			FM	IM	FM	IM	
Sagar	Karaiya	Chickpea	2100	2250	1470	1570	7.3
	Shobhapur		2050	2220	1440	1550	8.0
	District average		2070	2230	1450	1560	7.7
Raisen	Siyalwada	Chickpea	2070	2250	1450	1570	8.6
	District average		2070	2250	1450	1570	8.6

Shajapur	Khanota	Chickpea	1150	1450			26.1
	Mahudiya		1130	1440			27.1
	Ralayti		1020	1410			37.8
	Barkheda		1170	1470			24.8
	Salari		1120	1400			24.4
	Baigaon		1190	1420			20.0
	District average		1130	1440			26.6
Mandla	Katangsavini	Chickpea	1100	1120			1.8
	Padarpani		970	990			2.2
	Mawai Maal		960	1020			5.7
	Mawai Rayat		930	930			0.0
	District average		1030	1060			2.5

* Average yield

Wheat crop yield in improved management (IM) and farmers' management (FM) in water use efficiency trials, Rabi 2011-2012

District	Villages	Crop	Grain yield* (kg/ha)		Straw yield* (kg/ha)		Gain in grain yield (%)
			FM	IM	FM	IM	
Sagar	Karaiya	Wheat	3800	4070	2990	3170	7.2
	Shobhapur		3240	3520	2570	2790	8.5
	Narayanpur		3760	3980	3050	3130	5.7
	District average		3630	3880	2890	3050	7.0
Raisen	Siyalwada	Wheat	3950	4190	3160	3270	5.9
	Pehariya		3590	3860	2880	3040	7.5
	Gaganwada		2800	3000	2210	2390	7.0
	District average		3640	3880	2910	3050	6.7
Shajapur	Mahudiya	Wheat	4500	4740			5.4
	Barkheda		4670	5040			7.9
	Chappriya		4550	4850			6.7
	Khannota		4460	4820			8.0
	District average		4550	4860			6.8

* Average yield

Crop yield in improved management (IM) and farmers' management (FM) in fallow management field trials during Rabi 2011-2012

District	Crop	Grain yield (kg/ha)*		Straw yield (kg/ha) *	
		FM	IM	FM	IM
Sagar	Chickpea	1950	2290	1350	1590
Raisen	Chickpea	1880	2240	1310	1560
Shajapur	Chickpea	1440	1720		

* Average yield

iv) Rainwater conservation and productivity enhancement for increased WUE

10 to 64%; other benefit was similar increase in the stover yield which is important fodder for cattle and thereby a boost to livestock based livelihoods

16. Villages/Blocks/Districts where the technology was demonstrated with data on rainfall and soil as also current land and water use pattern:

i) Chickpea in Rice Fallows (Chattisgarh)

The table below gives the list of districts and villages where technology was demonstrated and the number of farmers participated in the demonstrations. Number of farmers participating in growing of chickpea and the area under the crop slightly reduced.

During rainy season 2011, Bastar district received only 361mm rainfall and Kanker district received 798 mm. Soils in the Kanker and Bastar districts are heavy in texture.

Villages, Blocks and Districts where the technology was demonstrated with information on rainfall and soil.

District	Block	Village	No. of farmers participated	Area sown (ha)	Seasonal rainfall (mm)	Soil type
2011 rainy season - Rice						
Kanker	Kanker	Siltera, Markatola, and Dhanelnkher	113	45	798	Black and Red soils
Bastar	Bakawand	Milbeda, Sawra	66	40	361	Black clay
2011 Rabi-Chickpea						
Kanker	Kanker	Siltera, Markatola, and Dhanelnkher	63	12	-	Black and Red soils
Bastar	Bakawand	Milbeda, Sawra	30	7.4	-	Black clay

Monthly rainfall received at Bastar and Kanker district during the year 2011 for Chhattisgarh state

Rainfall (mm) for Chattissgarh January to December 2011

	Bastar	Kanker
January	0.0	0.0
February	0.0	0.0
March	0.0	0.0
April	0.0	0.0
May	0.0	0.0
June	0.00	73.50
July	63.75	276.35
August	191.25	258.50
September	106.00	188.75
October	0	0
November	0	0
December	0	0
Total	**361**	**797**

ii) Chickpea in Rice Fallows (Jharkhand)

The table below gives the list of districts and villages where technology was demonstrated and the number of farmers participated in the demonstrations. Number of farmers participating in growing of chickpea and the area under the crop more or less remained the same. The 2011 season rainfall ranged from 1207 mm to 1221 mm. Soils in the Sariekela-karshaw and Gumla districts are yellowish in color and heavy in texture.

Villages, Blocks and Districts where the technology was demonstrated with information on rainfall and soil.						
District	**Block**	**Village**	**No. of farmers participated**	**Area sown (ha)**	**Rainfall (mm)**	**Soil type**
2011 kharif season - Rice						
Sariekela -karshaw	Karshaw	Kanchanpur,Begnadhi, Lakhodhi and Rakakocha	70	27	1207	Yellow clay soils
Gumla	Raidey	Shahitoli, Sipringa, Pogra, parkartoli and Teleya	117	53	1226	Yellow clay soils
2011 Rabi-Chickpea						
Sariekela -karshaw	Karshaw	Kanchanpur,Begnadhi, Lakhodhi and Rakakocha	50	10	-	Yellow clay soils
Gumla	Raidey	Shahitoli, Sipringa, Pogra, parkartoli and Teleya	93	17	-	Yellow clay soils

Monthly rainfall received at Gumla and Sariekela- Karshaw district during the year 2011 for Jharkhand state		
Month	**Gumla (mm)**	**Saraikela-Kharsaw (mm)**
	2011	**2011**
Jan	0	0
Feb	0	0
March	8	0
April	0	20
May	65	33
June	65	384
July	150	162
August	536	334
September	515	295
October	20	32
November	18	0
December	0	0
Total	1377	1260

iii) Rainy season fallows management with improved Vertisols management technology

Monthly rainfall (mm) in four target districts Madhya Pradesh during 2011.				
Month	Sagar	Raisen	Shajapur	Mandla
Jan	29.60	0	0.00	0
Feb	12.80	0	0.00	0
Mar	9.60	0	0.00	12.50
Apr	4.20	0	0.00	0
May	8.30	17.5	7.00	0
Jun	145.40	138.4	241.00	257.00
Jul	264.60	311.0	416.74	615.50
Aug	418.50	348.5	264.00	519.00
Sep	228.10	217.1	162.60	595.00
Oct	43.00	0	0.00	0
Nov	24.00	0	0.00	0
Dec	6.90	0	0.00	0
Total	**1195.00**	**1032.40**	**1091.34**	**1999.00**

Soils:

The soils in all the three target districts are mostly deep black soils (Vertisols and associated soils). These soils are self-mulching and exhibits cracking and becomes hard when dry and sticky when wet. Because of prevailing 2:1 clay type and the relatively high clay contents, the soils are usually imperfectly drained during the wet periods in the rainy season and have a very low saturated hydraulic conductivity. Most of the soils are deep and rich in swelling clay and their water storage capacity are high. Cultivation practices in these soils are particularly affected by the sticky nature, poor infiltration and impeded internal drainage of the soils while wet, as well excessive hardness and difficult workability while dry. Some of the key chemical characteristics of these soils are shown in below Table. The soils are generally deficient in phosphorus, sulphur, zinc and boron.

Soil chemical properties in three target districts of Madhya Pradesh.											
Average of three districts	**pH**	**EC (dS/m)**	**OC (%)**	**Ols-P (ppm)**	**Exch. K (ppm)**	**Avail. S (ppm)**	**Avail. B (ppm)**	**Avail. Zn (ppm)**	**Avail. Fe (ppm)**	**Avail. Mn (ppm)**	**Avail. Mg (ppm)**
Mean	8.0	0.25	1.02	2.22*	261.3	5.83*	0.58*	0.69*	9.5	10.4	536

** Deficient*

Number of participants to whom technologies were demonstrated in water use efficiency trials, 2011.		
District	**Villages**	**No. of farmers participated**
Sagar	2	15
Raisen	2	16
Mandla	1	20
Total	5	51

Villages, blocks and district where technology was demonstrated on monsoon fallow management trials (Nucleus), 2011.		
District	**Villages**	**No. of farmers participated**
Sagar	3	11
Raisen	6	25
Total	9	36

Villages, blocks and district where technology was demonstrated in fallow management trials (Satellite), 2011.		
District	**Villages**	**No. of farmers participated***
Sagar	4	13
Raisen	3	18
Total	7	31

Number of participants to whom technologies were demonstrated in water use efficiency trials during rabi 2011-2012		
District	**Villages**	**No. of farmers participated**
Sagar	3	25
Raisen	3	20
Shajapur	7	33
Mandla	4	15
Total	17	93

Villages, blocks and district where technology was demonstrated in fallow management trial (Nucleus) during rabi 2011-2012		
District	**Villages**	**No. of farmers participated**
Sagar	3	15
Raisen	3	15
Shajapur	3	3
Total	9	33

Villages, blocks and district where technology was demonstrated in fallow management trials (Satellite) during rabi 2011-2012		
District	**Villages**	**No. of farmers participated**
Sagar	4	46
Raisen	4	50
Shajapur	6	13
Total	14	109

iv) Rainwater conservation and productivity enhancement for increased water use efficiency

District	Block	Village	No. of farmers	Area sown (ha)	Rainfall (mm)		Soil type
					2010 (Jun-Dec)	2011 kharif season	
Bundi	Hindoli	Gokulpura, Vijaygarh	12	4.8		792	Black and Red
Tonk	Deoli	Dharola, Rampura, Khwaspura	63+18	7.5+7.2	768	786	Black and Red
Sawai Madhopur	Khandhar	Juwar, Mui, Kushtla	23+23	2.3+9.2	782	747	Black and Red

17. Payback period i.e. when the benefits will start accruing:

	State	Payback period i.e. when the benefits will start accruing:
Rice Fallows	Chhattisgarh	With this technology the benefits start accruing immediately as not very heavy investments are made. The farmers usually use traditional machinery for plowing, sowing and harvesting of crops. However, there is need to introduce no-till machines for sowing of chickpea in rice fallows for greater coverage of the areas without loosing much soil moisture for crop establishments. These costs are not known as yet.
Rice Fallows	Jharkhand	All the trials (100ha) were conducted as per agreement in micronutrient in paddy for rainy season and within post rainy season chickpea crop in residual nutrient and moisture trials were conducted in 2 districts of Jharkand during the year 2011-12.
Rainy Season Fallows	Madhya Pradesh	Major benefits of improved technologies are in terms of increased crop yields and income as well as reduced runoff and land degradation. The benefits start from the first cropping season. In case of most of the improved technologies the payback period is less than one year except for the improved machinery where the payback period could be 2-3 years.
Rainwater Conservation & Productivity Enhanc. for increased WUE	Rajasthan	With these technologies the benefits start accruing immediately during the same season through improved crop productivity and so better returns. Moreover, the investments are not heavy which farmers can easily afford. In addition to immediate returns which make the technology acceptable, it has built in long term benefits in ensuring soil health, sustainability and resilience of the farm production systems.

18. Participants to whom the technology demonstrated i.e. group of farmers, WUAs, Panchayats and NGOs etc. and the number of participants.

i) Chickpea in Rice Fallows (Chattisgarh)

The technology was primarily demonstrated to the farmers as listed below. However, the participating NGOs and the village Panchayat members also got the benefit. Several farmers days were also organized to showcase the benefits of the new technology to the farmers from the nearby villages as listed out below.

During 2011-12, eight training programs in the form of field days, awareness building and maintenance of seed storage were conducted during February-March 2012 in the two districts. A total of 410 farmers in Bastar district and 590 in Kanker district participated in these programs.

Training programs and number of participants in the districts.

District	Village	Training program	Date	No. of participating farmers
Bastar	Mibeda and Sawra	Green manuring, vermi-composting, seed priming and improved chickpea varieties, nutrient management	7-9 June 2011	200
Kanker	Markatola, Siltera and Danelknher	Green manuring, vermi-composting, seed priming and improved chickpea varieties, nutrient management	10-12 June 2011	300
Kanker	Markatola, Siltera and Danelknher	seed priming and improved chickpea varieties, nutrient management	15-16 Oct 2011	150
Bastar	Mibeda and Sawra	seed priming and improved chickpea varieties, nutrient management	19-20 Oct 2011	100
Bastar	Milbeda	Field day	10 Oct 2011	60
Kanker	Markatola	Field day	25 Oct 2011	75
Bastar	Milbeda	Seed storage training	18 Feb 2012	50
Kanker	Markatola	Seed storage training	1 Mar 2012	65

ii) Chickpea in Rice Fallows (Jharkhand)

The technology was primarily demonstrated to the farmers as listed below. However, the participating NGOs and the village Panchayat members also got the benefit. Several farmers' days were also organized to showcase the benefits of the new technology to the farmers from the nearby villages as listed out below.

During 2011-12, eight training programs in the form of field days, awareness building and maintenance of seed storage were conducted during February-March 2012 in the two districts. A total of 610 farmers in Sariekela-Karshaw district and 770 in Gumla district participated in these programs.

Training programs and number of participants in the districts				
District	Village	Training program	Date	No. of participating farmers
Sariekela-Karshaw	Kanchanpur, Begnadhi, Lakhodhi and Rakakocha	Improved cropping, Glyricidia nursery growing hedge for green manuring, vermi-composting, seed priming and improved chickpea varieties, nutrient management	5-10 June 2011	160
Gumla	Shahitoli, Sipringa, Pogra, parkartoli and Teleya	Improved cropping, legume crop cultivation, Glyricidia nursery and growing hedge for green manuring, vermi-composting, seed priming and improved chickpea varieties, nutrient management in rice crop	11-15 June 2011	250
Sariekela-Karshaw	Kanchanpur, Begnadhi, Lakhodhi and Rakakocha	seed priming chickpea with Rhizobium culture and sodium molybdate and improved chickpea varieties, nutrient management.	15-16 Oct 2011	150
Gumla	Shahitoli, Sipringa, Pogra, parkartoli and Teleya	seed priming chickpea with Rhizobium culture and sodium molybdate and availability on improved chickpea varieties, nutrient management	19-20 Oct 2011	120
Sariekela-Karshaw	Lakhodhi and Kanchanpur	Field day for rice crop	21-22 Nov 2011	200
Gumla	Sipringa and Teleya	Field day for rice crop	24-25 Nov 2011	250
Sariekela-Karshaw	Kanchanpur, Begnadhi, Lakhodhi and Rakakocha	Chickpea and paddy Seed storage training	22Feb 2012	100
Gumla	Shahitoli, Sipringa, Pogra, parkartoli and Teleya	Chickpea and paddy Seed storage training	4 Mar 2012	150

iii) Rainwater conservation and productivity enhancement for increased water use efficiency

139 farmers/trials

19. Information on training/educational programme to promote technology (ies) also indicate the number of farmers

i) Chickpea in Rice Fallows (Chattisgarh)

In collaboration with the NGO (Bastar Sevak Mandal, BSM) of the Catholic Relief Services (CRS) and NABARD a training program was conducted to 200 farmers and extension workers at Milbeda and Sawra villages from 7-9 June, 2011 on vermi-composting and green manuring with *Glyricidia* to be grown on field bunds. Agricultural extension workers and farmers were trained in seed priming practice of chickpea. Training was also provided to about 300 farmers from 10-12, June 2011 villages Siltera, Markatola, and Danelknher in seed priming, soil sampling, availability of improved chickpea varieties and the importance of nutrient management, particularly micronutrients deficiencies, in increasing crop productivity. A Training program was repeated on 15-20 of October 2011 for the benefit of agricultural extension workers and farmers of both district villages. ICRISAT also participated in the 4 training programs conducted by BSM along with NABARD on the above subject areas**.**

ii) Chickpea in Rice Fallows (Jharkhand)

In collaboration with the NGO (Tata steel Rural Development Society (TSRDS) a training program was conducted to 160 farmers and extension workers at Kanchanpur,Begnadhi, Lakhodhi and Rakakocha villages from 5-10 June, 2011 on Improved cropping system, Glyricidia nursery and growing hedge for green manuring, vermi-composting, seed riming and availability on improved chickpea varieties, nutrient management in rice crop extension workers and farmers were trained in seed priming practice of chickpea. Training was also provided in collaboration with NGO (Professional Assistance for Development Action (PRADAN)) to about 250 farmers from 11-15, June 2011 villages Shahitoli, Sipringa, Pogra, parkartoli and Teleya in seed priming, soil sampling, availability of improved chickpea varieties and the importance of nutrient management, particularly micronutrients deficiencies, in increasing crop productivity. A Training program was repeated on 15-20 of October 2011 for the benefit of agricultural extension workers and farmers of both district villages. ICRISAT also participated in the 6 training programs conducted by TSRDS and PRADAN along with ICRISAT on various aspects.

iii) Rainy season fallows management with improved Vertisols management technology

Trainings conducted:

NGOs, districts, number of farmers participated and number of villages				
S. No.	**NGOs**	**Districts**	**Number of farmers participated**	**Number of villages**
1.	BYPASS	Raisen	45	13
2.	BYPASS	Sagar	15	5

NGOs, districts, number of farmers training, number of villages and total number of farmers participated in the farmers training					
S. No.	**NGOs**	**Districts**	**Number of Farmers training**	**Number of Villages**	**Total number of farmers participated in farmers training**
1.	BYPASS	Raisen	36	12	883
2.	BYPASS	Sagar	14	6	356

NGOs, number of vermicompost existed					
S. No.	**NGOs**	**Districts**	**No. of villages**	**Number of vermicompost Existed**	**Vermicompost Produced (qt)**
1.	BYPASS	Raisen	12	48 (E)	480
2.	FES	Mandla	3	24 (C)	-

E: Existed; C: Constructed

NGOs, districts, number of *Gliricidia* seedlings distributed, number of *Gliricidia* seedlings distributed to number of farmers and *Gliricidia* seedlings distributed in number of villages					
S. No.	**NGOs**	**Districts**	**Number of *Gliricidia* seedlings distributed**	***Gliricidia* seedlings distributed to number of farmers**	***Gliricidia* seedlings distributed in number of villages**
1.	BYPASS	Raisen	1,170	11	4
2.	BYPASS	Sagar	2,900	16	3

(b) Trainings conducted during rabi season:

NGOs, districts, number of farmers trainings, number of farmers participated and number of villages					
S. No.	**NGOs**	**Districts**	**Number of farmers trainings**	**Number of farmers participated**	**Number of villages**
1.	BYPASS	Raisen	14	285	06
2.	BYPASS	Sagar	16	402	05
3.	CARD	Shajapur	02	80	02

(c) Field days conducted in 4 target districts of Madhya Pradesh during 2011-12.

Date	District	Location	No. of villages farmers	No. of farmers, government officials and other participants
07/01/2012	Sagar	Karaiya,	4	100
30/01/2012	Raisen	Siyalwada	5	185
10/01/2012	Shajapur	Barkheda	3	95
11/1/2012	Mandla	Katangsivni	6	180

(d) Exposure Visit:

An exposure visit was organized for farmers from Sagar, Raisen and Mandla districts to ICRISAT Hyderabad during 14-16 Nov 2011.

iv) Rainwater conservation and productivity enhancement for increased water use efficiency

District	Block	Village	No. of farmers	Area sown (ha)	Rainfall (mm)		Soil type
					2010 (June-Dec)	2011 kharif season	
Bundi	Hindoli	Gokulpura, Vijaygarh	12	4.8		792	Black and Red
Tonk	Deoli	Dharola, Rampura, Khwaspura	81	32.4	768	786	Black and Red
Sawai Madhopur	Khandhar	Juwar, Mui, Kushtla	46	19.2	782	747	Black and Red

Farmers' days during 2010-11

Two farmers' days (FD's) were organized during the 2010 rainy season as per detail given below. Good interactive sessions were held between the experts and farmers as to how we can increase crop and water productivity. The farmers who had earlier used improved crop technologies like balanced plant nutrition shared the benefits they got in productivity and their residual effects in the next season. After interactive sessions farmers also visited the demonstration plots to see them the benefits of improved management.

S. No.	Date/s	Location	District	Farmers participated
1.	23.9.2010	Dharola	Tonk	142
2.	11.10.2010	Gokulpura	Bundi	135

Similarly two FD's as per detail below were organized during 2010-11 post-rainy season to disseminate the technologies in the neighboring areas.

S. No.	Date/s	Location	District	Farmers participated
1.	28.2.2011	Dharola	Tonk	161
2.	10.3.2011	Deviji Ka Thana	Bundi	163

Farmer trainings during 2010-11

District	Date of Training	Number of participants
	5/01/2011	35
Bundi	24/02/2011	35
	26/02/2011	50
	15/01/2011	10
Tonk	16/01/2011	28
	23/03/2011	27
S. Madhopur	6/02/2011	29
	16/03/2011	26

Farmers' days during rainy season 2011

One farmers' day was organized at Devaji Ka Thana in bundi to disseminate the technologies to maximum farmers in the adjoining fields and villages. A total 88 men and 7 women farmers participated in it.

Farmer trainings during rainy season 2011

During April to September, 2011, one farmer training was conducted on 21st September, 2011 in Devaji Ka Thana village in Bundi district. Around 30 men and women farmers attended it. The farmers were particularly trained in application of balanced nutrition to their crops and recycling of farm wastes for compost preparation. Good interactions were held over demonstration trials and boosting animal based livelihoods thru improved fodder availability.

20. Total cost of the program together with information on the other water related program's in progress in the area:

State	Total cost of the program together
Chhattisgarh	Additional cost of the technology is balanced nutrition of rice (application of P, Zn, B and S) to the rice crop during the rainy season. The cost of fertilizers and its application is Rs 3300 per ha. Cost of improved variety of chickpea (80 kg ha^{-1} & Rs 40 kg^{-1}) seed is Rs 3200 ha^{-1} and seed priming is Rs. 230 ha^{-1}. Thus the total additional cost of the improved technology is Rs. 6730 per ha. Total cost of crop production varied with the seasons, crop and the district

Jharkhand	Additional cost of the technology is balanced nutrition of rice (application of Zn, B) to the rice crop during the rainy season. The cost of fertilizers and its application is Rs 1800 per ha. Cost of improved variety of chickpea (80 kg ha^{-1} & Rs 40 kg^{-1}) seed is Rs 3200 ha^{-1} and seed priming is Rs. 230 ha^{-1}. Thus the total additional cost of the improved technology is Rs. 5230 per ha. Total cost of crop production varied with the seasons, crop and the district
Madhya Pradesh	Rs. 0.49 crores
Rajasthan	In water use efficiency enhancement program, the technology of BBF + micro irrigation involves a cost of ~ 80000/- per ha. But keeping in mind the long life, the cost per season comes at around Rs. 4000/ per ha. In interventions like conservation furrow + balanced nutrition, and furrow irrigation + balanced nutrition, the landform component does not bring much cost as furrows are prepare easily by attaching furrow openers in the cultivator at the time of land preparation. Additional cost of balanced nutrition component is in addition of deficient S (thru 200 kg ha^{-1} gypsm), B (thru 2.5 kg ha^{-1} agribor), and Zn (thru 50 kg ha^{-1} zinc sulphate). Therefore, the additional cost of fertilizers (50% recommended where deficiency is on <50% fields; 100% recommended where >50% fields are deficient) ranges between Rs. 1195/- to Rs 2390/- per ha, which are applied once in 2 to 3 years.

21. Strategy for sustainability of this programme:

State	Strategy for sustainability of this programme
Chhattisgarh	Further awareness and capacity-building of the farmers will help in sustaining and scaling-up of the technology. Timely availability of inputs such as fertilizers and seed are the major constraints. The group of farmers needs to be encouraged for establishing their own seed banks and collective actions for obtaining inputs, pests and disease control and marketing of the produce. Block planting of chickpea rather scattered planting would help the farmers save their crop from grazing by wandering animals. Introduction of no-till machines for reducing costs and covering large areas under the crop and supplemental irrigation equipments would help the farmers for sustaining adoption of this technology.
Jharkhand	Further awareness and capacity-building of the farmers will help in sustaining and scaling-up of the technology. Timely availability of inputs such as fertilizers and seed are the major constraints. The group of farmers needs to be encouraged for establishing their own seed banks and collective actions for obtaining inputs, pests and disease control and marketing of the produce. Block planting of chickpea rather scattered planting would help the farmers save their crop from grazing by wandering animals. Introduction of no-till machines for reducing costs and covering large areas under the crop and supplemental irrigation equipments would help the farmers for sustaining adoption of this technology.

Madhya Pradesh	• Ensure the availability of improved implements for making BBF system • Ensure the availability of credit for purchasing the implements and other inputs • More farmers' awareness and capacity building is required to take full advantage of promising technologies (improved seeds, balanced nutrition of crops, BBF system, water use efficient technologies, farm machinery etc.) • Timely availability of information and agricultural inputs are essential to support productivity enhancement. Local production of improved seeds, seeds and fertilizer banks needs to be encouraged. • Farmers need to be provided with timely soil testing support for better fertilization of their crops. • Community participation, collective actions and social responsibility of communities for the protection, use and sharing of natural resources is essential for sustainable productivity enhancement. Efforts should be made to improve the situation. • The results and lessons learnt need to be documented thru reports, flyers, pamphlets and videos in local languages for sharing with others and for better assimilation by the rural communities.
Rajasthan	Awareness and capacity-building of the farmers is targeted to make the program self-sustaining for scaling-up of the technology. Timely availability of inputs such as fertilizers and seed are the major constraints. The groups of farmers are being encouraged for establishing their own seed banks and collective actions for obtaining inputs and marketing of the produce. To manage bulky fertilizers like gypsum, the consortium has entered into partnership with private sector to develop low volume fertilizer mixture containing S, B and Zn, so as to make transport, storage and application easy.

22. Benefits in monetary and ecological terms:

State	**Benefits in monetary and ecological terms**
Chhattisgarh	It has been demonstrated that the new technology gives additional income to the farmers. The other ecological benefits are that the residual soil moisture and nutrients are used up by the chickpea crop which otherwise are liable to be lost from the soil system to pollute the groundwater or lost to the atmosphere. Legumes add N-rich organic matter to the soil, thus improving soil fertility. Cropped lands would also have to be less weedy and save the costs.
Jharkhand	It has been demonstrated that the new technology gives additional income to the farmers. The other ecological benefits are that the residual

<table>
<tr><td></td><td>soil moisture and nutrients are used up by the chickpea crop which otherwise are liable to be lost from the soil system to pollute the groundwater or lost to the atmosphere. Legumes add N-rich organic matter to the soil, thus improving soil fertility. Cropped lands would also have to be less weedy and save the costs.</td></tr>
<tr><td>Madhya Pradesh</td><td>
<table>
<tr><th>District</th><th>Additional monitory benefit due to improved technology</th><th>Ecological benefits</th></tr>
<tr><td>Sagar</td><td>Rs. 6435 ha^{-1}</td><td rowspan="3">Taking two crops both in the rainy and postrainy seasons has greatly help in the conservation of soil and water resources. Reducing monsoon fallow areas in this region will have significant effect in reducing land degradation.</td></tr>
<tr><td>Raisen</td><td>-</td></tr>
<tr><td>Mandla</td><td>Rs. 12420 ha^{-1}</td></tr>
</table>
</td></tr>
<tr><td>Rajasthan</td><td>It has been demonstrated that the new technologies give additional income to the farmers. The other ecological benefits are that the residual soil moisture and nutrients are used up efficiently by the crop which otherwise are liable to be lost from the soil system to pollute the groundwater or lost to the atmosphere.</td></tr>
</table>

23. Timeframe for implementation of the Action Research Programme as approved by PIT

June 2011 to May 2012

24. Funds with date(s) received from MoWR:

Date of Funds received: Rs.1.99 crores received on 10-3-2011

Expenditure: Rs.2,07,38,056 (including interest of Rs.8,38,056)

25. Date of commencement & completion of the programme:

Date of commencement : June, 2011

Date of completion : May, 2012

26. Brief note on the feedback about the programme from the farmers:

(Giving relevant information e.g. number of farmers trained/participated/ willing to adopt the technology etc. on the basis of feedback received from the farmers)

State	Brief note on the feedback about the programme from the farmers
Chhattisgarh	Over the project period, 1000 farmers have been exposed to various aspects of the improved technology to enhance productivity and water

	use efficiency of the rice-chickpea cropping system in the three districts of Chhattisgarh. Large number of farmers, especially in the Kanker district is willing to adopt this technology. As the technology was implemented in the tribal areas of Chhattisgarh, where the infrastructure development is meager and the farmers are very poor, the adoption, sustainability and further scaling up of the technology would depend upon the availability of the essential inputs (micronutrients, improved seeds, Rhizobium culture and pesticides) for crop production and credit availability. The farmers in groups need to be linked to markets for purchase of inputs and selling of outputs. As the groundwater availability in most districts is enough, the farmers also seek government support for irrigation equipments for providing supplemental irrigation.
Jharkhand	Over the project period, 1380 farmers have been exposed to various aspects of the improved technology to enhance productivity and water use efficiency of the rice-chickpea cropping system in the three districts of Jharkhand. Large number of farmers from Gumla and Sarielkela district is willing to adopt this technology. As the technology was implemented in the tribal areas of Jharkhand, where the infrastructure development is meager and the farmers are very poor, the adoption, sustainability and further scaling up of the technology would depend upon the availability of the essential inputs (micronutrients, improved seeds, Rhizobium culture) for crop production and credit availability. The farmers in groups need to be linked to markets for purchase of inputs and selling of outputs. As the groundwater availability in most districts is enough, the farmers also seek government support for irrigation equipments for providing supplemental irrigation.
Madhya Pradesh	a. Farmers expressed that the improved Vertisol management technologies is highly beneficial in increasing crop yield, mainly due to application of micronutrients and improved land and water management system i.e. BBF system. However, for better adoptability of BBF system, farmers need BBF maker cum planter and hands-on training on use of the equipment. Some credit also may be needed to buy the new implements. b. Farmers could see the advantage of BBF land form system during continuous rainfall situation to overcome the water logging problem, which is quite common in this region and also, addition moisture conservation in BBF for subsequent rabi crop.

	 **BBF formation, sowing, and good soybean crop in improved management system at Madhya Pradesh, 2011.** c. Farmers are quite happy with new simple low cost BBF maker. Most of the small and medium farmers feel good scope for adoption of this low-cost implement. d. Farmers observed that about 30-40% irrigation water can be saved and more area can be covered in BBF system compared to conventional flooding in flat system. e. Availability of micronutrients is one of the major problems for increased adoption f.
Rajasthan	During the rainy and post rainy seasons 2010-11, a total of 86 and during the rainy season 2011, a total of 53 farmer participatory research trials / demonstrations were successfully conducted to improve crop and water productivity. To disseminate the technology and to show farmers the impact of technology in their own fields, the farmer days/trainings were conducted in addition to day to informal trainings, in which around 1000 farmers participated. A positive feedback is recorded from the farmers who have used improved crop technologies. Once having seen the benefits on their or neighboring farmers' fields, they are willing to adopt the improved management to rest of their farm bearing full cost of the same. In general the farmers are happy to learn the current technology, and a timely availability of the inputs is only what farmers' demand now.

Publicity (a paper cutting):

पत्रिका

आगर-मा

उज्जैन

जाएगा। स्वास्थ्य में ताजगी रहेगी। अनुकूल अंक व रंग-1, श्वेत।

कारोबारी काम में कम लाभ मिल पाएगा। तालमेल का अभाव रहेगा। परस्पर तनाव बढ़ेगा। अनुकूल अंक व रंग-7, बादामी।

समय तनावभरा रहेगा। मांगने पर सहयोग अभाव रहेगा। शांतिपूर्वक नित्य काम कीजिए। अनुकूल अंक व रंग-6, हरा।

विवादित मामला निपटेगा। संसाधन का विस्तार होगा। आय का नवीन स्रोत बनेगा। अनुकूल अंक व रंग-3, गुलाबी।

सेवा संबंधी लाभ मिल जाएगा। संतान चिंता निवारण होगा। निजी हित साध लेंगे। अनुकूल अंक व रंग-2, पीला।

सेवा संबंधी लाभ मिल जाएगा। पदोन्नति बाधा निकल जाएगी। उच्चस्थ अधिकारी से निकटता रहेगी। अनुकूल अंक व रंग-6 हरा।

कलह-विवाद का डर रहेगा। परिवारजन उपेक्षित रहेंगे। आर्थिक मंदी परेशानी बढ़ाएगी। अनुकूल अंक व रंग-7, बादामी।

परिश्रम प्रयास का यथेष्ट लाभ मिलेगा। पुरानी योजना विस्तार होगा। स्वास्थ्य सुधार होगा। अनुकूल अंक व रंग-1, श्वेत।

रुका काम बना लेंगे। तालमेल से काम बना लेंगे। आय बढ़ सकती है।

उन्नत कृषि के तरीके सिखाए

किसानों को जानकारी देते विशेषज्ञ।

आगर-मालवा. जिले में संचालित सेंटर फॉर एडवांस रिसर्च एवं डेवलपमेंट कार्ड संस्था के तत्वावधान में गत दिवस बैजनाथ महादेव मंदिर परिसर में आगर, सुसनेर, बड़ोद एवं नलखेड़ा विकासखंड के किसानों का प्रशिक्षण कार्यक्रम का आयोजन कर किसानों को खेती के उन्नत तरीके सिखाए। प्रशिक्षण में कृषि विशेषज्ञ डा. एमआर रघुवंशी, एन सिंह खेडे ने किसानों को गेहूं एवं चना फसलों की सम्पूर्ण जानकारी दी। प्रसाद कामडी ने सोयाबीन व चना फसलों में अपनाई जाने वाली बीबीएफ तकनीक को बताया। इस अवसर पर कार्ड संस्था के प्रोजेक्ट कोर्डिनेटर अमोल गवांडे, निरंजन गौड उपस्थित थे।

प्रोजेक्टर के माध्यम से दी जानकारी

सुगंध दशमी पर अनुष्ठान

जैन मंदिर में आराधना करते समाजजन।

पत्रिका प्रतिनिधि @ आगर-मालवा

दिगंबर जैन समाज द्वारा पर्युषण पर्व के तहत बुधवार को सुगंध दशमी धूमधाम के साथ मनाई गई। इस अवसर पर समाजजनों द्वारा उपवास रखते हुए तप-आराधना की गई।

प्रातःकाल से ही छावनी एवं नगर स्थित जैन मंदिर में पूजा-अर्चना का दौर शुरू हुआ। दोपहर 3 बजे समाजजनों ने छावनी मंदिर में धूप खेने की क्रिया की। इसी प्रकार शाम 5 बजे धोबी गली स्थित दिगंबर जैन मंदिर में धूप खेने का कार्यक्रम हुआ। रात में आरती एवं प्रवचन कार्यक्रम आयोजित हुए। पं. अभयकुमार जैन द्वारा प्रवचन देते हुए सुगंध दशमी के संदर्भ में समाजजनों को विस्तार से जानकारी दी।

अहंकार नष्ट कर देता है

गुना गुरूवार 2 फरवरी 2012 सांध्य दैनिक चंचल एक्सप्रेस

किसान दिवस का हुआ आयोजन

बीनागंज। ग्राम बरखेड़ा खुर्द में 31 जनवरी को बायफ डेव्लपमेंट रिसर्च फाउण्डेशन गुना द्वारा इक्रिसेट परियोजना के माध्यम से किसान दिवस का आयोजन किया गया। आयोजन का शुभारंभ कार्यक्रम के मुख्य अतिथि मदन सिंह मीना भूतपूर्व जनपद अध्यक्ष द्वारा दीप प्रज्जवलित कर किया गया एवं अपने उद्‌भोदन में कार्यक्रम में पधारे सभी वरिष्ट अधिकारियों एवं उपस्थित सभी किसान भाईयों का आभार व्यक्त किया। बायफ डेव्लपमेंट रिसर्च फाउण्डेशन गुना के परियोजना अधिकारी डी.एस. रघुवंशी द्वारा क्षेत्र में परियोजना के माध्यम से चलाई जा रही गतिविधियां एवं माइल वाटरशेड के अंतर्गत किए गए निर्माण कार्यों की जानकारी दी गई एवं परियोजना के उद्देश्यों से किसानों को अवगत कराया गया। इसके बाद इक्रिसेट हैदराबाद से पधारे वैज्ञानिक श्री प्रसाद द्वारा परियोजना क्षेत्र की मिट्टी परीक्षण अनुसार फसलों में सूक्ष्म तत्वों की आवश्कता एवं मात्रा के बारे में जानकारी दी गई। इसके बाद इक्रिसेट हैदराबाद से पधारे कृषि वैज्ञानिक डॉ. गिरीश चन्दर द्वारा सूक्ष्म तत्व प्रबंधक के माध्यम से अंतर्वर्ती फसल एवं रोग प्रतिरोधी फसलों के बारे में जानकारी दी गई। इसके बाद बायफ भोपाल से पधारे जे.पी.डी. डॉ. जे.डी. अम्बेडकर द्वारा क्षेत्र में किसान भाईयों से कृषि के साथ उन्नत नस्ल के पशु रखने के बारे में जानकारी दी गई एवं इससे होने वाले लाभों के बारे में जानकारी दी गई। इसके बाद कृषि विभाग से पधारे ग्रा.क.वि.अ. एम.आर. द्वारा क्षेत्र में कृषि विभाग द्वारा चलाई जा रही योजनाओं की जानकारी दी गई। इसके बाद कार्यक्रम में पधारे एबीके आरोन के प्रभारी डॉ. जी.एस. द्वारा कार्यक्रम में उपस्थित किसानों को उन्नत फसल तकनीक अपनाने, उन्नत किस्मों का चयन करने एवं फसलों में होने वाले रोगों एवं कीट व्याधि तथा उसके निदान के बारे में जानकारी दी गई।

Farmers Day news published in local news paper, Madhya Pradesh.

S.P. Wani

Signature of the authorized signatory with date

International Crops Research Institute for the Semi-Arid Tropics (ICRISAT)

Email ID: s.wani@cgiar.org

Telephone: 040 – 30713466

LEAFLET PERFORMA (FPARP - 2nd phase)

Introduction of chickpea in rice fallows of Chhatisgarh with low input system

1. **Name of Institute**: International Crops Research Institute for the Semi-Arid Tropics, Patancheru 502 324, Andhra Pradesh, India

2. **Date of commencement of Program**: June 2011

3. **Date of Completion of program**: May 2012

4. **No. of demonstrations to be conducted: 100 (100 ha)**
As the farm holdings in tribal areas are small, more number of trials conducted to cover 100 ha.

S. No.	Name of location	Number of demonstrations
1	Bastar district	40
2	Kanker district	60

5. **No. of demonstrations completed:** During the project year 2011-12 total 272 demonstrations on rice in rainy and chickpea in post-rainy season were conducted in Kanker and Bastar district of Chhatisgarh. Total area covered under demonstrations was 104 ha.

6. **No. of demonstrations under progress:** All the planned demonstration completed as per plan and in Bastar district due to low rainfall some of the chickpea trials were not conducted.

7. **Districts and villages covered under the program:** The demonstrations were conducted in the Kanker and Bastar district of Chhatisgarh in the following villages.

S. No.	District	Village	Rice crop		Chickpea crop		Total area (ha)
			No of Farmers	Area (ha)	No of Farmers	Area (ha)	
1	Kanker	Siltera	38	15.2	26	4.8	20.0
2	Kanker	Markatola	51	20.4	27	6.0	26.4
3	Kanker	Dienalkher	24	9.6	10	1.2	10.8
4	Bastar	Milbeda	32	16.8	13	3.6	20.4
5	Bastar	Sawra	34	23.2	17	3.2	26.4
		Total	**179**	**85.2**	**93**	**18.8**	**104.0**

8. **Number of farmers participating in the program:** Total 272 farmers, covering an area of 104 ha, participated in the program.

9. **Technology demonstrated:** The technology comprised of rapid tillage after rice harvest without much loss of soil moisture, growing of improved chickpea varieties, **seed priming and seed treatment**. The following were the technology components.
    a. High yielding, short duration improved chickpea varieties such as ICCV 2, JG 11 and ICCV10.
    b. Seed priming with sodium molybdate followed by treatment with *Rhizobium* and fungicide Captan.
    c. Sowing of seeds in furrows through ploughs and planting (needs to be further promoted)
    d. Basal dressing of single super phosphate, Zinc Sulphate and Agribor for Rice crop along with NPK balance nutrition based on soil test results.

10. **Impact of each or combination of technologies:** Economic benefits like total cost, gross return and net income and Benefit cost ratio of growing chickpea after rice were estimated for each farmer. Extractable water capacity of the soil was considered to be 100 mm.

District	Total cost (Rs ha^{-1})		Gross return (Rs ha^{-1})		Net income (Rs ha^{-1})		B:C ratio	
	Trad	Imp	Trad	Imp	Trad	Imp	Trad	Imp
Rice 2011 (Kharif season)								
Kanker	9476	10476	80020	98971	70444	88495	7.48	8.52
Bastar	9075	10944	45567	55641	36493	44698	4.07	4.12
	Chickpea 2011-12 (Rabi season)							
Kanker	-	6020	-	32961	-	26941	-	4.56
Bastar	-	7442	-	27009	-	19567	-	2.65
	Rice+ Chickpea (2011-12 season)							
Kanker	-	16480	-	131040	-	114560	-	6.99
Bastar	-	18418	-	80685	-	65882	-	3.58

11. **Cost of each technology:** Total cost of seed priming and seed treatment with sodium molybdate, *Rhizobium* and fungicide is only rupees 230 per ha. Costs of improved chickpea seed, land preparation, weeding and harvesting is rupees 5000 per ha. Total cost of production of chickpea is estimated to be rupees 5230 per ha.

12. **Response of farmers about adaptability of the technology:** The farmers are convinced about the benefits of the new technology. They are very keen to expand chickpea production in the region. Major problems in the adoption of technology faced by the farmers are their ignorance about the new technology and availability of improved seeds and fertilizers especially the micro-nutrients.

13. Photographs exhibiting relevant information:

Training program conducted for farmers for technology dissemination and sign board in the field indicating details of field trials in village.

Rice crop demonstration with balance nutrition with micronutrients and chickpea field on residual moisture. with seed priming technique.

Field day celebration farmers visiting rice crop from different villages.

14. Efforts made to promote the technology:

- The farmers and the NGOs are trained in the new technology.
- The SHGs are encouraged to have seed banks in the villages to have timely availability of quality seeds.
- NGOs are linking farmers with the market for supply of inputs and marketing of their produce.
- Block planting is being encouraged to protect the crops from free-animal grazing.
- Field days and training programs were conducted for 1000 farmers to share the results of improved technologies on the following topics.

    - Soil nutrient Management
    - Improved cultivars
    - Water use efficiency
    - Crop diversification
    - IPM
    - Seed priming and seed treatment

International Crops Research Institute for the Semi-Arid Tropics (ICRISAT)

Email ID: s.wani@cgiar.org

Telephone: 040 – 30713466

LEAFLET PERFORMA (FPARP - 2nd phase)

Introduction of chickpea in rice fallows of Jharkand with low input system

1. **Name of Institute**: International Crops Research Institute for the Semi Arid Tropics, Patancheru 502 324, Andhra Pradesh, India

2. **Date of commencement of Program**: June 2011

3. **Date of Completion of program**: May 2012

4. **No. of demonstrations to be conducted: 100 (100 ha)** As the farm holdings in tribal areas are small, more number of trials conducted to cover 100 ha.

S. No.	Name of location	Number of demonstrations
1	Sariekela- Kharsawan district	30
2	Gumla district	70

5. **No. of demonstrations completed:** During the project year 2011-12 total 330 demonstrations on rice in rainy and chickpea in post-rainy season were conducted in Sariekela-Kharsawan district of Chhatisgarh. Total area covered under demonstrations was 105.3ha.

6. **No. of demonstrations under progress:** All the planned demonstration completed as per plan and results are obtained.

7. **Districts and villages covered under the program:** The demonstrations were conducted in the Sariekela-Kharsawan district of Jharkand in the following villages.

S. No.	District	Village	Rice crop		Chickpea crop		Total area (ha)
			No of Farmers	Area (ha)	No of Farmers	Area (ha)	
1	Sariekela- Kharswan	Kanchanpur	23	7.2	16	2.6	9.8
2	Sariekela- Kharswan	Begnadhi	15	8.0	11	2.8	10.8
3	Sariekela- Kharswan	Lakhodhi	20	4.0	15	1.9	5.9
4	Sariekela- Kharswan	Rakakocha	12	7.2	8	2.6	9.8
5	Gumla	Shahitoli	17	10.0	9	1.6	11.6
6	Gumla	Sipringa	19	8.6	16	2.4	11.0
7	Gumla	Pogra	36	15.0	31	5.5	20.5
8	Gumla	Parkartoli	28	12.0	23	4.7	16.7
9	Gumla	Teleya	17	6.6	14	2.6	9.2
		Total	**187**	**78.6**	**143**	**26.7**	**105.3**

8. **Number of farmers participating in the program:** Total 330 farmers, covering an area of 105.3 ha, participated in the program

9. **Technology demonstrated:** The technology comprised of rapid tillage after rice harvest without much loss of soil moisture, growing of improved chickpea varieties, **seed priming and seed treatment**. The following were the technology components.

    a. High yielding, short duration improved chickpea varieties such as ICCV 2, JG 11 and KAK2.
    b. Seed priming with sodium molybdate followed by treatment with *Rhizobium* and fungicide Captan.
    c. Sowing of seeds in furrows through ploughs and planting (needs to be further promoted)
    d. Basal dressing of single super phosphate, Zinc Sulphate and Agribor for Rice crop along with NPK balance nutrition based on soil test results.

10. **Impact of each or combination of technologies:** Economic benefits like total cost, gross return and net income and Benefit cost ratio of growing chickpea after rice were estimated for each farmer. Extractable water capacity of the soil was considered to be 130 mm.

District	Total cost (Rs ha^{-1})		Gross return (Rs ha^{-1})		Net income (Rs ha^{-1})		B:C ratio	
	Trad	Imp	Trad	Imp	Trad	Imp	Trad	Imp
Rice 2011 (Kharif season)								
Kanker Sariekela-Kharswan	7486	8805	58733	72125	51247	63320	6.89	7.21
Gumla	6964	7824	88762	100259	81798	92435	11.76	11.84
	Chickpea 2011-12 (Rabi season)							
Sariekela-Kharswan	-	5165	-	39967	-	34802	-	6.73
Gumla	-	5053	-	37993	-	32940	-	6.51
	Rice+ Chickpea (2011-12 season)							
Sariekela-Kharswan	-	13970	-	112092	-	98122	-	7.03
Gumla	-	12877	-	138252	-	125375	-	9.74

11. **Cost of each technology:** Total cost of seed priming and seed treatment with sodium molybdate, *Rhizobium* and fungicide is only rupees 230 per ha. Costs of improved chickpea seed, land preparation, weeding and harvesting is rupees 5000 per ha. Total cost of production of chickpea is estimated to be rupees 5230 per ha.

12. **Response of farmers about adaptability of the technology:** The farmers are convinced about the benefits of the new technology. They are very keen to expand chickpea production in the region. Major problems in the adoption of technology faced by the farmers are their ignorance about the new technology and availability of improved seeds and fertilizers especially the micro-nutrients.

13. **Photographs exhibiting relevant information:**

Training program conducted for farmers for technology dissemination here seed priming for chickpea is demonstrated in Kanchanpur village Sariekela Kharsawan.

Field day celebration in Teleya village Gumla, farmers visiting chickpea crop from different villages.

15. **Efforts made to promote the technology:**

- The farmers and the NGOs are trained in the new technology.
- The SHGs are encouraged to have seed banks in the villages to have timely availability of quality seeds.
- NGOs are linking farmers with the market for supply of inputs and marketing of their produce.
- Block planting is being encouraged to protect the crops from free-animal grazing.
- Field days and training programs were conducted for 1380 farmers
- to share the results of improved technologies on the following topics.
    - Soil nutrient Management
    - Improved cultivars
    - Water use efficiency
    - Crop diversification
    - IPM
    - Seed priming and seed treatment

International Crops Research Institute for the Semi-Arid Tropics (ICRISAT)

Email ID: s.wani@cgiar.org

Telephone: 040 – 30713466

LEAFLET PERFORMA (FPARP - 2nd phase)

1. **Name of Institute**: International Crops Research Institute for the Semi Arid Tropics, Patancheru 502 324, Andhra Pradesh, India

2. **Date of commencement of Program**: June 2011

3. **Date of Completion of program**: May 2012

4. **Total nos. of demonstrations to be conducted as approved by MoWR**: 100

5. **Total nos. of demonstrations conducted/ completed:** 343

(a) Demonstrations completed during kharif season 2011-12

The project was implemented in three districts of Madhya Pradesh viz. Sagar, Raisen and Mandla, which have large percent of area under rainy season fallow that comes under the agro-climatic zone of Malwa platue and Narmada valley, hot dry sub-humid ESR with medium and deep clayey black soils (Vertisols and associated soils) high available water holding capacity with medium to high annual rainfall (800-1250 mm).

Details of field trials during kharif season 2011-12 in three districts of Madhya Pradesh:

Villages, blocks and district where technologies were demonstrated in water use efficiency field trials, 2011.

District	Block	Village	No. of farmers	Area (ha)
Sagar (15)	Sagar	Karaiya	10	4.0
	JC nagar	Shobhapur	5	2.0
Raisen (16)	Silwani	Siyalwada	12	4.8
		Pehariya	4	1.6
Mandla (20)	Niwas	Katangsavini	20	8.0
Total			51	20.4

Villages, blocks and district where technologies were demonstrated on monsoon fallow management (Nucleus), 2011.

District	Block	Village	No. of farmers	Area (ha)
Sagar (10)	Sagar	Karaiya	3	3
	JC nagar	Shobhapur	4	4
		Hanota	3	3
Raisen (15)	Silwani	Siyalwada	6	6
		Pehariya	1	1
		Gagnewada	3	3
		Paradiya	2	2
		Khamariya	2	2
		Bamori	1	1
Total			26	26

Villages, blocks and district where technology was demonstrated on monsoon fallow management (Satellite), 2011.

District	Block	Village	No. of farmers	Area (ha)
Sagar (13)	Sagar	Karaiya	4	4
		Taalguhari	1	1
	JC nagar	Shobhapur	4	4
		Hanota	4	4
Raisen (18)	Silwani	Siyalwada	9	9
		Dungariya	5	5
		Rampura	4	4
Total			31	31

(b) Demonstrations completed during Rabi season 2011-12

Villages, blocks and district where technologies were demonstrated in water use efficiency field trials of Chickpea during Rabi 2011-2012

District	Block	Villages	No. of farmers	Area (ha)
Sagar (11)	Sagar	Karaiya	4	1.60
	Jasinagar	Shobhapur	7	2.80
Raisen (7)	Silwani	Siyalwada	7	2.80
Shajapur (13)	Agar	Mahudiya	4	1.60
	Barod	Barkheda	3	1.20
	Barod	Ralayti	2	0.80
	Nalkheda	Baigaon	2	0.80
	Agar	Salari	1	0.40
	Susner	Khanota	1	0.40
Mandla (15)	Niwas	Katangsivni	8	3.20
	Niwas	Mawai Maal	3	1.20
	Niwas	Padarpani	3	1.20
	Niwas	Mawai Rayat	1	0.40
Total			46	18.40

Villages, blocks and district where technologies were demonstrated in water use efficiency field trials of Wheat during Rabi 2011-2012

District	Block	Villages	No. of farmers	Area (ha)
Sagar (14)	Sagar	Karaiya	5	2.00
	Jasinagar	Shobhapur	4	1.60
	Sagar	Narayanpur	5	2.00
Raisen (13)	Silwani	Siyalwada	6	2.40
		Pehariya	5	2.00
		Gaganwada	2	0.8
Shajapur (20)	Agar	Mahudiya	5	2.00
	Barod	Barkheda	4	1.60
	Susner	Chappriya	8	3.20
	Susner	Khanota	3	1.20
Total			47	18.80

Villages, blocks and district where technologies were demonstrated in fallow management (Nucleus) of Chickpea during rabi 2011-2012

District	Block	Villages	No. of farmers	Area (ha)
Sagar (15)	Sagar	Karaiya	7	2.80
	Jasinagar	Shobhapur	5	2.00
		Hanota	3	1.20
Raisen (15)	Silwani	Siyalwada	7	2.80
		Gaganwada	5	2.00
		Rampura	3	1.20
Shajapur (3)	Barod	Barkheda	1	0.40
	Nalkheda	Lasudiya Gopal	1	0.40
	Agar	Raipuriya	1	0.40
Total			33	13.20

Villages, blocks and district where technology was demonstrated in fallow management (Satellite) of Chickpea during rabi 2011-2012

District	Block	Villages	No. of farmers	Area (ha)
Sagar (46)	Sagar	Karaiya	20	8.00
		Narayanpur	7	2.80
		Talguari	7	2.80
	Jasinagar	Shobhapur	12	4.80
Raisen (50)	Silwani	Siyalwada	21	8.40
		Gaganwada	14	5.60
		Chorpipariya	7	2.80
		Dunagriya	8	3.20
Shajapur (13)	Agar	Mahudiya	4	1.60
	Barod	Barkheda	3	1.20
	Barod	Ralayti	2	0.80
	Nalkheda	Baigaon	2	0.80
	Agar	Salari	1	0.40
	Susner	Khanota	1	0.40
Total			109	43.60

6. No. of demonstrations under progress if any

- Nil –

7. Villages/districts covered under the whole programme:

S. No.	Agroclimatic Zone (Name)	States (Name)	Districts (Serial wise name of all)	Villages (District wise name of all)
	Malwa platue and Narmada valley, hot dry sub-humid ESR with medium and deep clayey black soils (Vertisols and associated soils) high available water holding capacity with medium to high annual rainfall (800-1250 mm)	Madhya Pradesh	1. Sagar	Karaiya Shobhapur Hanota Taalguhari
			2. Raisen	Siyalwada Pehariya Gangnewada Paradiya Kamariya Bamori Dungariya Rampura
			3. Mandla	Katangsavini
			4. Shajapur	Mahudiya Barkheda Chappriya Khannota

8. Technologies demonstrated:

S.No.	Description of Technologies	No. of Demonstrations	No. of farmers benefited in the programme
1.	The components of improved Vertisols management technology implemented in Madhya Pradesh included: ▪ Two crops during a year through rainy season fallow management ▪ Broadbed and Furrow System (BBF) land form for effective soil and water	108 During kharif season 235 During rabi season	108 During kharif season 235 During rabi season

	conservation and controlling water logging ▪ Integrated nutrient management including micronutrients applications ▪ Improved crop varieties ▪ Improved implement viz. tractor mounted BBF maker cum seed drill ▪ Dry season tillage		

9. Impact of Technology (Crop wise)

(a) ***Name of Technology*** : Monsoon fallow management through improved Vertisol management technology

(b) ***Name of crop*****:** Soybean

S.No	Items (with units)	Conventional Method	Using Technologies	Saving/Benefit in quantity	Saving/ Benefit in %age
1.	Water use efficiency (kg mm^{-1} ha^{-1})	0.85	0.96	0.11	12.9
2.	Yield				
	(a) Main product (kg/ha)	697	784	87	12.4
	(b) Bio-mass (kg/ha)	858	939	81	9.4
3.	Input (kg/ha)				
	(a) Seed	92	80	12	13
	(b) Fertiliser				
	(c) Pesticide	-	-	-	-
	(d) Others	-	-	-	-
4.	Increase in income/ (benefit cost ratio)	-	1.8	-	-
5.	Others benefits if any	-	Less soil loss	-	-

(c) ***Name of crop*****:** Chickpea

S.No	Items (with units)	Conventional Method	Using Technologies	Saving/Benefit in quantity	Saving/ Benefit in %age
1.	Water use efficiency (kg mm^{-1} ha^{-1})	2.98	3.4	0.42	14.1
2.	Yield				
	(a) Main product (kg/ha)	1757	2085	328	18.7
	(b) Bio-mass (kg/ha)	1331	1596	265	19.8
3.	Input (kg/ha)				
	(c)Seed	85	70	15	17.6
	(d) Others	-	-	-	-
4.	Increase in income/ (benefit cost ratio)	-	1.78	-	-
5.	Others benefits if any	-	Improved soil health	-	-

10. Cost of each technology (Rs/ha):

The details of fixed and variable costs of the technologies are given below:

Fixed cost:

Modular type BBF maker cum planter equipment cost: Rs 30000. (one time investment to replace the existing cultivator and seed drill. This is expected to last for minimum of 10 years.

Variable cost:

Broadbed and furrow making - Rs 200 ha^{-1}

Micronutrients:

For Boron and Gypsum - Rs 1500 ha^{-1}

For Boron Gypsum and Zinc sulphate - Rs 2500 ha^{-1}

Improved seed:

Soybean - Rs 2100 ha^{-1}

11. Response of farmers about adaptability of technologies:

a) Farmers expressed that the improved Vertisol management technologies is highly beneficial in increasing crop yield, mainly due to application of micronutrients and improved land and water management system i.e. BBF system. However, for better adoptability of BBF system, farmers need BBF maker cum planter and hands-on training on use of the equipment. Some credit also may be needed to buy the new implements.

b) Farmers could see the advantage of BBF land form system during continuous rainfall situation to overcome the water logging problem, which is quite common in this region and also, addition moisture conservation in BBF for subsequent rabi crop.

c) Farmers are quite happy with new simple low cost BBF maker. Most of the small and medium farmers feel good scope for adoption of this low-cost implement.

d) Farmers observed that about 30-40% irrigation water can be saved and more area can be covered in BBF system compared to conventional flooding in flat system.

e) Availability of micronutrients is one of the major problems for increased adoption.

12. Efforts made to promote the technologies:

- Trainings have been organized in the project districts for NGOs and other partners on improved technologies for managing monsoon fallow in Vertisols
- Efforts are being made to improve the availability of improved implements for making BBF and other inputs viz. micronutrients, improved seeds etc. in six districts of Madhya Pradesh

13. Photographs exhibiting relevant information (attach hard & soft copy)

Tractor drawn BBF maker cum seed and fertilizer drill unit
BBF formation, sowing, and good soybean crop in improved management system at Madhya Pradesh, 2011.

Cultivatin on BBF system and good chickpea crop in improved management system in Madhya Pradesh, 2011-12.


Good chickpea crop in target districts of Madhya Pradesh, 2011-12.

Farmers day at target district, Madhya Pradesh

Publicity (a paper cutting):


पत्रिका

आगर-माल

उन्नत कृषि के तरीके सिखाए

सुगंध दशमी पर अनुष्ठान

प्रोजेक्टर के माध्यम से दी जानकारी

अहंकार नष्ट कर देता है


किसान दिवस का हुआ आयोजन

मीनागंज। ग्राम चरखेड़ा खुर्द में 31 जनवरी को वायफ डेव्लपमेंट रिसर्च फाउण्डेशन गुना द्वारा इक्रिसेट परियोजना के माध्यम से किसान दिवस का आयोजन किया गया। आयोजन का शुभारंभ कार्यक्रम के मुख्य अतिथि मदन सिंह मीना भूतपूर्व जनपद अध्यक्ष द्वारा दीप प्रज्जवलित कर किया गया एवं अपने उद्बोधन में कार्यक्रम में पधारे सभी वरिष्ठ अधिकारियों एवं उपस्थित सभी किसान भाईयों का आभार व्यक्त किया। वायफ डेव्लपमेंट रिसर्च फाउण्डेशन गुना के परियोजना अधिकारी डी.एस. रघुवंशी द्वारा क्षेत्र में परियोजना के माध्यम से चलाई जा रही गतिविधियां एवं माइक्रो वाटरशेड के अंतर्गत किए गए निर्माण कार्यों की जानकारी दी गई एवं परियोजना के उद्देश्यों से किसानों को अवगत कराया गया। इसके बाद इक्रिसेट हैदराबाद से पधारे वैज्ञानिक श्री प्रसाद द्वारा परियोजना क्षेत्र की मिट्टी परीक्षण अनुसार फसलों में सूक्ष्म तत्वों की आवश्कता एवं मात्रा के बारे में जानकारी दी गई। इसके बाद इक्रिसेट हैदराबाद से पधारे कृषि वैज्ञानिक डॉ. गिरीश चन्दर द्वारा सूक्ष्म तत्व प्रबंधक के माध्यम से अलसी फसल एवं रोग प्रतिरोधी फसलों के बारे में जानकारी दी गई। इसके बाद वायफ भोपाल से पधारे जे.पी.डी. डॉ. जे.डी. अम्बेडकर द्वारा क्षेत्र में किसान भाईयों से कृषि के साथ उन्नत नस्ल के पशु रखने के बारे में जानकारी दी गई एवं इससे होने वाले लाभों के बारे में जानकारी दी गई। इसके बाद कृषि विभाग से पधारे ग्रा.क.वि.अ. एम.आर. द्वारा क्षेत्र में कृषि विभाग द्वारा चलाई जा रही योजनाओं की जानकारी दी गई। इसके बाद कार्यक्रम में पधारे एचीवीक आरीन के प्रभारी डॉ. जी.एस. द्वारा कार्यक्रम में उपस्थित किसानों को उन्नत फसल तकनीक अपनाने, उन्नत किस्मों का चयन करने एवं फसलों में होने वाले रोगों एवं कीट व्याधि तथा उसके निदान के बारे में जानकारी दी गई।

Farmers Day news published in local news paper, Madhya Pradesh.

International Crops Research Institute for the Semi-Arid Tropics (ICRISAT)

Email ID: s.wani@cgiar.org

Telephone: 040 – 30713466

LEAFLET PERFORMA (FPARP - 2nd phase)

1. **Name of Institute**: International Crops Research Institute for the Semi Arid Tropics, Patancheru 502 324, Andhra Pradesh, India

2. **Date of commencement of Program**: June 2011

3. **Date of Completion of program**: May 2012

4. Total nos. of demonstrations to be conducted as approved by MoWR: 100

5. Total nos. of demonstrations conducted/ completed: 139

   (a) Demonstrations completed during Rabi season 2010-11: 32

   (b) Demonstrations completed during Kharif season 2010-11: 54

   (c) Demonstrations completed during Kharif season 2011-12: 53

6. No. of demonstrations under progress if any: 65 (Rabi, 2011-12 being processed)

7. Villages/districts covered under the whole programme:

Agroclimatic Zone (Name)	States (Name)	Districts (Serial wise name of all)	Villages (District wise name of all)
Semi-arid tropics	Rajasthan	Bundi	Gokulpura, Vijaygarh, thana, Goverdhanpura, Tahala, Visupura, Salawaliya
		Tonk	Dharola, Rampura, Khwaspura
		Sawai Madhopur	Juwar, Mui, Kushtla

8. Technologies demonstrated:

Description of Technologies	No. of Demonstrations	No. of farmers benefitted in the programme
Conservation furrow + balanced nutrition	107	139 directly, but as such >900 participated in capacity building
Furrow irrigation + balanced nutrition	28	
Broad bed and furrow (BBF) + micro irrigation	4	

Impact of Technology (Crop wise)

(a) Name of Technology: Conservation furrow + balanced nutrition

(b) Name of crop: Maize, blackgram, pearl millet, groundnut

S.No	Items (with units)	Conventional Method	Using Technologies	Saving/Benefit in quantity	Saving/ Benefit in %age
1.	Water use (m^3/ha)	Rainfed	Rainfed	Rainwater efficiency improved by 10-50%	10-50%
2.	Yield				
	a) Main product (kg/ha)	Maize=1730-3170 Blackgram = 290-760 Pearlmillet = 1200-1440 Groundnut = 760-1210	Maize=2140-3650 Blackgram = 360-880 Pearlmillet = 1420-1730 Groundnut = 930-1410	Maize=200-860 Blackgram = 70-120 Pearlmillet = 160-290 Groundnut = 170-200	Maize=10-50 Blackgram = 16-24 Pearlmillet = 13-24 Groundnut = 17-22
	b) By-product (straw)(kg/ha)	Maize=2220-4600 Blackgram = 520-2888 Pearlmillet = 1790-5670 Groundnut = 1020-2750	Maize=2490-5340 Blackgram = 520-3116 Pearlmillet = 2080-6220 Groundnut = 1150-3250	Maize=230-1020 Blackgram = 0-228 Pearlmillet = 290-950 Groundnut = 130-500	Maize=8-46 Blackgram = 0-8 Pearlmillet = 10-24 Groundnut = 13-18
3.	Input (kg/ha)				
	(a) Seed				
	(b) Fertiliser	Flat bed + Nitrogen (N), phosphorus (P)	Conservation furrow +N, P + sulphur + boron + zinc		
	(c) Pesticide				
	(d) Others				

4.	Increase in income/ Monetary benefits from agriculture, fisheries & livestock etc.		Rs. 220 to Rs. Rs. 6210		
5.	Others benefits if any		Better household nutrition and increased fodder availability a boost to livestock based livelihoods		

(a) Name of Technology: Furrow irrigation + balanced nutrition

(b) Name of crop: Chickpea, wheat, mustard

S.No	Items (with units)	Conventional Method	Using Technologies	Saving/ Benefit in quant	Saving/ Benefit in %age
1.	Water use (m^3/ha)			Water use efficiency improved by 10-60%	10-60%
2.	Yield				
	a) Main product (kg/ha)	Chickpea =1650-1850 Wheat = 4080-4420 Mustard = 1650-2860	Chickpea =2710-2730 Wheat = 4860-5360 Mustard = 2550-3720	Chickpea =880-1060 Wheat = 440-1280 Mustard =860-900	Chickpea =48-64 Wheat = 10-31 Mustard =30-55
	b) By-product (straw)(kg/ha)	Chickpea =1830-2210 Wheat = 4860-5420 Mustard = 4160-4420	Chickpea =3500-3710 Wheat = 5550-6960 Mustard =5530-6390	Chickpea =-1500-1670 Wheat = 130-2100 Mustard =1370-1979	Chickpea =68-91 Wheat = 2-43 Mustard =33-45
3.	Input (kg/ha)				
	(a) Seed				
	(b) Fertiliser	Flood irrigation +N, P	Furrow irrigation +N, P + sulphur + boron + zinc		
	(c) Pesticide				
	(d) Others				
4.	Increase in income/ Monetary benefits from agriculture,		Rs. 2890 to Rs. 21755		

	fisheries & livestock etc.				
5.	Others benefits if any		Better household nutrition and increased fodder availability a boost to livestock based livelihoods		

(a) Name of Technology: BBF+micro irrigation
(b) Name of crop: Wheat

o	Items (with units)	Conventional Method	Using Technologies	Saving/Benef it in quantity	Saving/ Benefit in %age
	Water use (m^3/ha)			Water use efficiency improved by 20%	20%
	Yield				
	(a) Main product (kg/ha)	Wheat = 3500	Wheat = 4200	Wheat = 700	Wheat =20
	(b) bBy-product (straw) (kg/ha				
	(c) Input (kg/ha)				
	(d) Seed				
	(e) Fertiliser				
	(f) Pesticide				
	(g) Others	Flat bed sowing, flood irrigation	BBF, drip irrigation		
	Increase in income/ Monetary benefits from agriculture, fisheries & livestock etc.		Rs. 8400		
	Others benefits if any		Better household nutrition and increased fodder availability a boost to livestock based livelihoods		

9. Cost of each technology (Rs/ha): Balanced nutrition = Rs. 1195 – Rs. 2390; and micro irrigation + BBF ~Rs 4000/- per season.

10. Response of farmers about adaptability of technologies:

A positive feedback is recorded from the farmers who have used improved crop technologies like balanced plant nutrition and happily share the benefits they get in productivity and their residual effects in the next season. Once having seen the benefits on their or neighboring farmers' fields, they are willing to adopt the improved management to rest of their farm bearing full cost of the same. In general the farmers are happy to learn the current technology, and a timely availability of the inputs is only what farmers' demand now.

11. Efforts made to promote the technologies:

About 5 big Farmer days and 9 formal farmer trainings were organized in addition to day to day informal training so as to promote the technologies

12. Photographs exhibiting relevant information (attach hard & soft copy)

Fig. Farmers day at Bundi, Oct, 2010

Fig. Farmers' day at Tonk, Sept, 2010

Fig. Farmer day in Bundi, Oct 11

About ICRISAT

ICRISAT
Science with a human face

The International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) is a non-profit, non-political organization that conducts agricultural research for development in Asia and sub-Saharan Africa with a wide array of partners throughout the world. Covering 6.5 million square kilometers of land in 55 countries, the semi-arid tropics have over 2 billion people, and 644 million of these are the poorest of the poor. ICRISAT and its partners help empower these poor people to overcome poverty, hunger, malnutrition and a degraded environment through better and more resilient agriculture.

ICRISAT is headquartered in Hyderabad, Andhra Pradesh, India, with two regional hubs and four country offices in sub-Saharan Africa. It belongs to the Consortium of Centers supported by the Consultative Group on International Agricultural Research (CGIAR).

Contact Information

ICRISAT-Patancheru (Headquarters)
Patancheru 502 324
Andhra Pradesh, India
Tel +91 40 30713071
Fax +91 40 30713074
icrisat@cgiar.org

ICRISAT-Liaison Office
CG Centers Block
NASC Complex
Dev Prakash Shastri Marg
New Delhi 110 012, India
Tel +91 11 32472308 to 08
Fax +91 11 25841294

ICRISAT-Nairobi (Regional hub ESA)
PO Box 39063, Nairobi, Kenya
Tel +254 20 7224550
Fax +254 20 7224001
icrisat-nairobi@cgiar.org

ICRISAT-Niamey (Regional hub WCA)
BP 12404, Niamey, Niger (Via Paris)
Tel +227 20722529, 20722725
Fax +227 20734329
icrisatsc@cgiar.org

ICRISAT-Bamako
BP 320
Bamako, Mali
Tel +223 20 223375
Fax +223 20 228683
icrisat-w-mali@cgiar.org

ICRISAT-Bulawayo
Matopos Research Station
PO Box 776
Bulawayo, Zimbabwe
Tel +263 383 311 to 15
Fax +263 383 307
icrisatzw@cgiar.org

ICRISAT-Lilongwe
Chitedze Agricultural Research Station
PO Box 1096
Lilongwe, Malawi
Tel +265 1 707297/071/067/057
Fax +265 1 707298
icrisat-malawi@cgiar.org

ICRISAT-Maputo
c/o IIAM, Av. das FPLM No 2698
Caixa Postal 1906
Maputo, Mozambique
Tel +258 21 461657
Fax +258 21 461581
icrisatmoz@panintra.com

www.icrisat.org