

Tribal Sub-Plan Report

2012 - 15

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अखिल भारतीय समन्वित बारानी कृषि अनुसंधान परियोजना
All India Coordinated Research Project for Dryland Agriculture
ICAR-Central Research Institute for Dryland Agriculture
Hyderabad, India

Glimpses

AICRPDA - Tribal Sub-Plan Review Workshop at AICRPDA Centre, 3-4 February 2014, IGAU, Jagdalpur, Chattisgarh



Release of publications by Sri Dinesh Kashyap, Hon'ble Member of Parliament, Bastar, Chattisgarh.



Field visit to TSP adopted village Tahkapal, Bastar district, AICRPDA centre, Jagdalpur

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All India Coordinated Research Project for Dryland Agriculture

ICAR– Central Research Institute for Dryland Agriculture

Santoshnagar, Hyderabad –50009, India

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Preface

The All India Coordinated Research Project for Dryland Agriculture (AICRPDA), since its inception in 1972, had been conducting prioritized location-specific research in diverse rainfed agro-ecologies. The project developed doable rainfed technologies in the thematic areas of rainwater management, suitable varieties to cope with deficit rainfall, resilient intercropping systems, highly productive double cropping systems, better nutrient management practices, alternate land use systems, integrated farming systems and energy efficient farm mechanization. The upscaling of doable technologies in the domain districts of the network Centres is one of the unique feature of AICRPDA project.

The Tribal sub-plan (TSP) is being implemented since 2011 by AICRPDA network centres and presently by 7 centres in 20 tribal dominated villages across 8 districts in Rajasthan, Gujarat, Chattisgarh, Odisha, Madhya Pradesh, Assam and Jharkhand. The main objective of this programme is to directly benefit either individuals or community of tribal farmers/people through demonstration of improved practices/livelihood interventions for higher productivity, income and employment, creation of physical assets such as water harvesting, implements/animal sheds etc. and capacity building, particularly tribal women leading to enhanced livelihood of tribal people. During 2012-15, AICRPDA-TSP programme could reach tribal people and demonstrate higher productivity by 45%, income by 60 % and generation of employment through various NRM and animal based livelihood interventions.

I compliment Dr. G. Ravindra Chary, Project Coordinator (Dryland Research), AICRPDA for coordinating and monitoring the programme at 7 centres and also bringing out this timely document with the support of Dr. K.A. Gopinath and Er. B. Narsimlu, scientists in PC Unit, AICRPDA. I also congratulate the chief scientists, scientists and staff at 7 AICRPDA centres viz. Arjia, Biswanath Chariali, Chianki, Indore, Jagdalpur, Phulbani and SK Nagar. On behalf of AICRPDA and on behalf of CRIDA, I profusely thank the participating tribal farmers and women from 20 TSP villages for successful implementation of this programme. I also thank Dr. A.K. Sikka, DDG (NRM) and scientists at NRM Division, ICAR for their kind support and guidance. I am sure and hope that this document would help all the relevant stakeholders engaged in service of tribal farmers.

Date: 25 February 2016


(Ch. Srinivasa Rao)

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Executive Summary

The Tribal Sub-Plan (TSP) program with the financial support of Indian Council of Agricultural Research (ICAR) and Govt. of India, initially started in 2011 at 9 centres of All India Coordinated Research Project for Dryland Agriculture (AICRPDA) centres viz. Arjia, Biswanath Chariali, Chianki, Indore, Jagdalpur, Phulbani, Rewa, SK Nagar and Solapur. The programme at two centres viz. Rewa and Solapur was discontinued in 2013. However, the program continued at other 7 centres in 20 tribal dominated villages across 8 districts in Rajasthan, Gujarat, Chattisgarh, Odisha, Madhya Pradesh, Assam and Jharkhand. The main objective of the program is to directly benefit either individuals or community of tribal farmers through demonstration of improved natural resource management, crop based and livelihood interventions for higher productivity, income and employment generation, creation of physical assets and capacity building. The project was initiated in selected TSP villages with a series of consultations/meetings through participatory rural appraisal, focused group discussions etc leading to identification of major constraints, and site-specific need based interventions for enhancing the overall livelihoods of the tribal people.

The major interventions in AICRPDA- TSP villages were i) Natural resource management (NRM) based ii) Crop based iii) Creation of physical assets iv) Livelihood based, and v) Capacity building. For this, the doable rainfed technologies/practices/expertise at AICRPDA centres and respective SAUs were demonstrated/utilized in TSP villages. More than 20,000 families across different TSP villages were benefitted through various interventions including capacity building.

Natural resource management

The NRM based interventions focused on demonstration of improved practices of soil, moisture conservation, rainwater and nutrient (soil fertility) management. Rainwater management viz. efficient rainwater management (both *in-situ* and *ex-situ*) gave significant outputs in terms of higher crop yields and profitability, crop diversification to high value vegetables, and bringing more area under protective irrigation. For example, *in-situ* moisture conservation through ridges & furrow method or compartmental bunding in maize increased yields by 19-33% with additional income of Rs. 5331-7200/ha compared to farmers' practice in different TSP villages of Bhiwara district. Supplemental irrigation from harvested rainwater improved crop yields by 22-35% in different TSP villages and farmers realized additional income up to Rs 15000/ha. Nutrient management in various crops such as integrated nutrient management, vermicomposting, composting, incorporation of crop residue in soil were also promoted on about 400 farmers' fields which contributed significantly in enhancing crop productivity ranging from 23% to over 65% in various crops.

Crop production

Crop productivity and profitability was improved in TSP villages through promotion of improved crop varieties, diversified cropping systems, and better nutrient and pest management. Farmers were able to realize a very significant increase in crop productivity owing to combination of different interventions such as superior crop varieties, nutrient management, supplemental irrigation and plant protection. On an average, the crop productivity was improved by about 40% compared to farmers'/local varieties in different TSP villages. Similarly, different intercropping systems gave 10-45% higher yields compared to sole cropping.

Livelihood interventions

Livestock acts as the shock absorber for the families at times of distress. Animal component also complements crop productivity by providing draft and manure to the farmer. Improved breeds of poultry, duck, goat and pig were provided to selected farmers in different villages, for further upgradation of local breeds. More than 1000 families were benefitted from livestock interventions which provided additional income along with employment generation. The tribal women highly benefited through provision of eri spinning machines, sewing machines, apiary, mushroom production units etc.

Creation of physical assets

In TSP villages, the major physical assets created were water harvesting structures, repair of water harvesting structures, recharging of open/tube wells, animal sheds, and improved implements for various agricultural operations. The physical assets created for natural resource management include construction of more than 60 water harvesting structures, recharging of 25 open/tube wells, renovation of about 45 water harvesting structures and construction of 70 vermicomposting units. Small farm mechanization was promoted by making available different farm implements such as irrigation equipments, tillage and interculture implements, harvesters, winnowers, sprayers for plant protection etc. More than 450 farm implements were made available to tribal farmers in different TSP villages. Need based infrastructure facilities viz. cattle shed, implement shed, training halls, biogas plants etc were also created in different villages for the benefit of individuals and community..

Capacity building

The capacity building focused on skill development, enhancing knowledge and livelihoods of both tribal men and women through activities such as trainings, exposure visits, scientist-farmer interaction, meetings/field days etc. During 2012-15, 120 training programs were organized benefitting more than 9000 people in different TSP villages. Similarly, about 2000 farmers were benefitted from 38 exposure visits/field days organized during the period.

Overall Impact

The combined impact of implementation of TSP programme in 20 tribal villages with the participation of more than 20000 tribal farmers/women either resulted in improved seed replacement in large areas, creation of water assets for efficient utilization and crop diversification, sensitization and adoption of integrated crop management practices in field and vegetable crops, awareness and operationalization of improved farm implements for small farm mechanization, promotion of integrated farming systems viz. crop-animal-other livelihood activities, improved animal health, creation of infrastructure facilities, enhanced skills and knowledge, environmental benefits through resource conservation etc. leading to higher productivity, profitability, employment generation and, ultimately the enhanced livelihoods of tribal families.

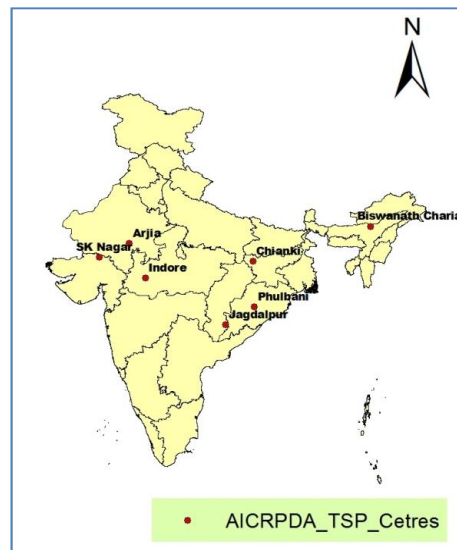
Table1. Agro-ecological Setting of AICRPDA Network Centres

AICRPDA Centre	Universities/Institutes(Hqrs)	Agro-Climatic Zone / Agro-ecological Sub Region (AESR)	Climate	Mean Alluvial soils Annual Rainfall(mm)	Dominant Soil Type	Major Rainfed Production System
Agra (SC)	RBSC, Agra	South-western semiarid zone in Uttar Pradesh (4.1)	Semiarid (Hot dry)	665	Alluvial soils	Pearlmillet
Akola (MC)	PDKV, Akola	Western Vidarbha Zone in Maharashtra (6.3)	Semiarid (Hot moist)	824	Black soils	Cotton
Anantapur (MC & ORP)	ANGRAU, Hyderabad	Scarce rainfall zone (Rayalaseema) in Andhra Pradesh (3.0)	Arid (Hot)	544	Red soils	Groundnut
Arja (MC & ORP)	MPUAT, Udaipur	Southern zone in Rajasthan(4.2)	Semiarid (Hot dry)	656	Black soils	Maize
Ballowal Saunkhri (MC & ORP)	PAU, Ludhiana	Kandi region in Punjab (9.1)	Subhumid (Hot dry)	1011	Alluvial soils	Maize
Bangalore (MC & ORP)	UAS_B, Bangalore	Central, eastern and southern dry zone in Karnataka (8.2)	Semiarid (Hot moist)	926	Red soils	Fingermillet
Bellary (VC)	CSWCRTI, Dehradun	Northern dry zone in Karnataka (3.0)	Arid (Hot)	502	Black soils	Rabi Sorghum
Bijapur (MC)	UAS_D, Dharwad	Northern dry zone in Karnataka (6.1)	Semiarid (Hot dry)	595	Black soils	Rabi Sorghum
Biswanath Chariali (MC)	AAU, Jorhat	North Bank plain zone in Assam (15.2)	Humid (Hot)	1990	Alluvial soils	Rice
Chianki (MC & ORP)	BAU, Ranchi	Western plateau zone of Jharkhand (11.0)	Subhumid (Hot moist)	1179	Alluvial soils	Rice
Faizabad (SC)	NDUAT, Faizabad	Eastern plain zone in Uttar Pradesh (9.2)	Subhumid (Hot dry)	1051	Alluvial soils	Rice
Hisar (MC & ORP)	CCSHAU, Hisar	South-western dry zone in Haryana (2.3)	Arid (Hyper)	412	Alluvial/sandy soils	Pearlmillet
Indore (MC & ORP)	RVSQVV, Gwalior	Malwa plateau in Madhya Pradesh (5.2)	Semiarid (Hot moist)	958	Black soils	Soybean
Jagdalpur (MC)	IGAU, Raipur	Basthar Plateau zone in Chattisgarh (12.1)	Subhumid (Hot moist)	1297	Black/Red soils	Rice
Jhansi (VC)	IGFRI, Jhansi	Bundhelkhand zone in Uttar Pradesh (4.4)	Semiarid (Hot moist)	870	Alluvial soils	kharif/Sorghum
Jodhpur (VC)	CAZRI, Jodhpur	Arid Western zone of Rajasthan (2.1)	Arid (Hyper)	331	Sandy soils	Pearlmillet
Kovilpatti (MC)	TNAU, Coimbatore	Southern zone of Tamil Nadu (8.1)	Semiarid (Hot dry)	723	Black soils	Cotton
Parbhani (MC)	MAU, Parbhani	Central Maharastra Plateau Zone in Maharashtra (6.2)	Semiarid (Hot moist)	901	Black soils	Cotton
Phulbani (MC)	OUAT, Bhubaneswar	Eastern Ghat Zone in Orissa (12.1)	Subhumid (Hot moist)	1580	Red soils	Rice
Rajkot (MC)	JAU, Junagarh	North Saurashtra zones in Gujarat (5.1)	Semiarid (Hot dry)	590	Black soils	Groundnut
Rakh Dhiansar (SC)	SKUAS_T, Jammu	Low altitude subtropical zone in Jammu and Kashmir (14.2)	Semiarid (Moist dry)	860	Black soils	Maize
Rewa (MC)	JNKVV, Jabalpur	Keymore plateau and Satpura Hill zone in Madhya Pradesh (10.3)	Subhumid (Hot dry)	1088	Black soils	Soybean
S.K. Nagar (MC)	SDAU, Dantewada	Northern Gujarat in Gujarat (2.3)	Arid (Hot dry)	670	Sandy soils	Pearlmillet
Solapur (MC & ORP)	MPKV, Rahuri	Scarcity zone in Maharashtra (6.1)	Semiarid (Hot dry)	732	Black soils	Rabi Sorghum
Varanasi (MC)	BHU, Varanasi	Eastern Plain and Vindhyan Zone in Uttar Pradesh (9.2)	Subhumid (Hot dry)	1049	Alluvial soils	Rice

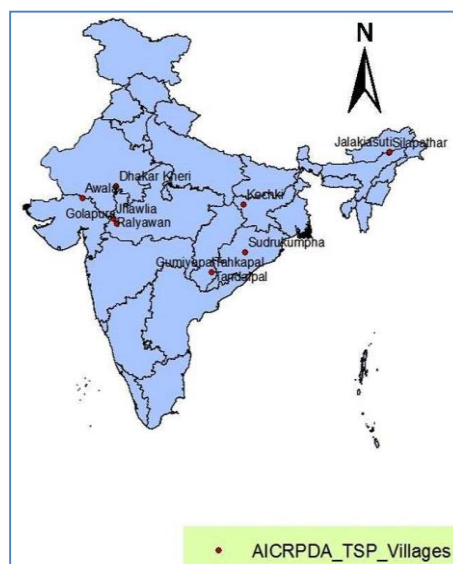
MC- Main Centre; SC - Sub Centre; VC - Voluntary Centre; ORP - Operational Research Project

AICRPDA- Tribal Sub-Plan (TSP) Programme

The Tribal Sub-Plan (TSP) program with the financial support of Indian Council of Agricultural Research (ICAR) and Govt. of India started in 2011 at 9 AICRPDA centres viz. Arjia, Biswanath Chariali, Chianki, Indore, Jagdalpur, Phulbani, Rewa, SKNagar and Solapur. The programme at two centres viz. Rewa and Solapur discontinued in 2013. However, the programme continued at remaining 7 centres and implemented in **20 villages** 8 districts viz Bhilwara, Rajasthan; Latehar, Jharkahnd; Jhabua and Dhar in Madhya Pradesh; Kandhamal, Odisha; Dhenaji, Assam Bastar, Chattisgarh and Narmada, Gujarat (Table.2.).



Location Map of AICRPDA-TSP centres



Location Map of AICRPDA-TSP Villages

Table 2. Details of AICRPDA-TSP adopted villages

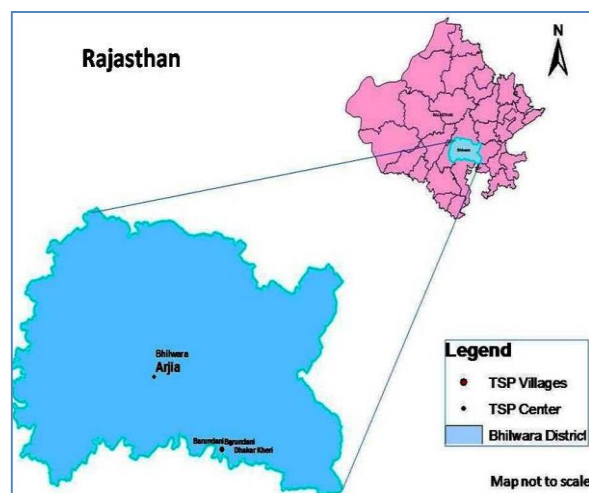
AICRPDA Centre	Implementation Year(s)	TSP villages	Block/ District/ State
Arjia	2012-13	Jallam ke Jhopdiya, Footwall, Patiyal and Mal ka Kuwa and , Annando ka khera, Dol ji Khera, Himmatpura, Fathepura, Bheru ka Rada, Gadiya, Magdeh	Mandalgarh & Mohanpura blocks, Bhilwara, Rajasthan
	2013-15 to till date	Dhakar Kheri, Barundani (Nalaka kuva & Nayaka)	Syampura Mohanpura blocks, Bhilwara, Rajasthan
	2012-13	Rawatkhera, Ramgarh, Tarniya khera, Chhabdia, Jalampura and & Kuradiya, Dhandhola, Chhajlo ka khera, Mata ji ka khera	Jhajpur Kuradiya & Rawatkhera blocks, , Bhilwara, Rajasthan
	2013-15 to till date	Beeramata & Malhi Jhodia, Gutata rani & Nalaka Jhoda	
Chianki	2012-15 to till date	Kechki	Barwadih, Latehar, Jharkhand
Indore	2012-15 to till date	Ralyawan	Petlawad, Jhabua, Madhya Pradesh
		Jhawlia, Golpura	Sardapur, Dhar, Madhya Pradesh
Phulbani	2012-15 to till date	Dadaki, Sudrukumpha, Kumbhariguda	Phulbani, Kandhamal, Odisha
Biswanath Chariali	2012-15 to till date	Jalakiasuti	Sissibor-gaon, Dhemaji, Assam
Jagdalpur	2012-15 to till date	Tahkapal, Tandapal and Gumiyaal,	Tokapal Bastar, Chattisgarh
SK Nagar	2012-13	Wadi, Zariya,	Nandod, Narmada, Gujarat
	2013-15 to till date	Juni Sarotri, Awala and Arnivala	Amirgadh Banaskantha, Gujarat

2. AICRPDA- TSP Villages

The Tribal Sub-Plan (TSP) program, initially started in 2011 at 9 centres of All India Coordinated Research Project for Dryland Agriculture (AICRPDA) centres viz. Arjia, Biswanath Chariali, Chianki, Indore, Jagdalpur, Phulbani, Rewa, SK Nagar and Solapur with the funding from Indian Council of Agricultural Research (ICAR) and Govt. of India. However, the programme at two centres viz. Rewa and Solapur was discontinued in 2013. Presently, program is being continued at other 7 centres viz., Arjia, Biswanath Chariali, Chianki, Jagdalpur, Indore, Phulbani and SK Nagar located in Rajasthan, Assam, Jharghan, Chattisgarh, Madhya Pradesh, Odisha and Gujarat, respectively and being implemented in 20 tribal dominated villages across 8 districts in Rajasthan, Gujarat, Chattisgarh, Odisha, Madhya Pradesh, Assam and Jharkhand. Before implementing the programme, a baseline survey was conducted in adopted tribal villages to capture the biophysical and socioeconomic settings, constraints in agriculture production etc. The brief details of the TSP adopted villages by 7 centres is given below:

2.1. Arjia

The TSP programme by AICRPDA centre, Arjia is implemented presently in two villages viz. Barundani, Mandalgarh tehsil and Dhakar Kheri, Jahajpur tehsil in Bhilwara district, Rajasthan. The total number of farm holdings in the two villages is 589 out of which 263 were marginal, 215 small, 78 medium and 33 are large farmers. The annual average rainfall of the region is 787 mm. The major crops cultivated during *kharif* are maize, blackgram, groundnut and sesame and during *rabi* are wheat, barley, mustard, taramira and chickpea. The dominant animal population is cows, bullocks, buffaloes, goats and sheep. The major livelihood of the tribals is through agriculture, rearing animals, collection and selling of non-farm produce.

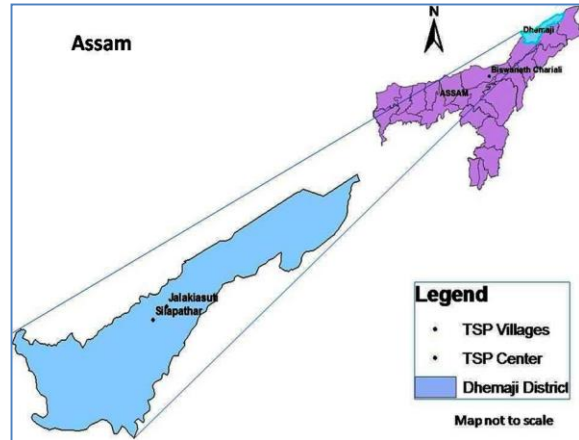


Location map of TSP villages

2.2. Biswanath Chariali

The TSP programme by AICRPDA centre, Biswanath Chariali is implemented in one village, i.e. Jalakiasuti, Sissiborgaon block, Dhemaji district, Assam. The village has 160 households out of which 47 are marginal, 57 are small, 28 are medium, 8 are large and 20 belong to landless. The total cultivated area is 175.4 ha out of which 96.8% is rainfed with 120% cropping intensity.

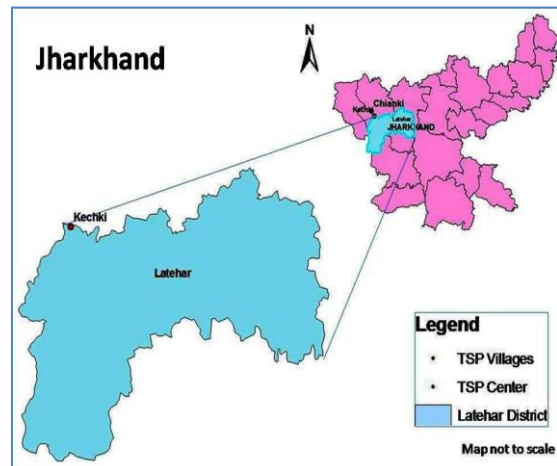
The major crops cultivated during *kharifare* *Sali* rice, maize, blackgram and greengram and during *rabi* is mustard and under irrigated condition is *baou* paddy. The major soil type is sandy loam. The major source of irrigation is bore wells. The homestead gardens comprise of Assam lemon, arecanut, coconut, banana, jackfruit, mango, turmeric, ginger, bettlevine, bamboo and vegetables. Indigenous cattle pig, goat, backyard poultry and duckery comprise of major animal population



Location map of TSP villages

2.3 Chianki

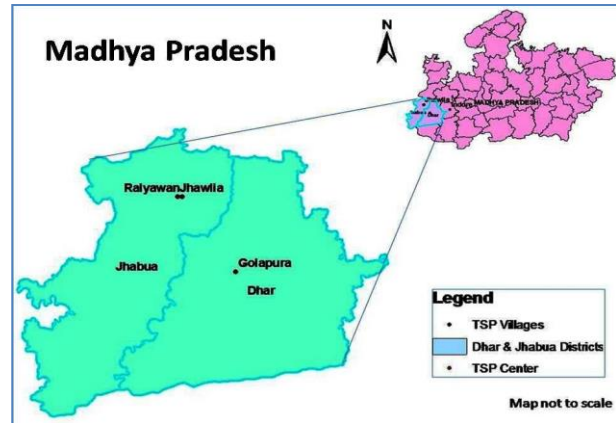
The TSP programme by AICRPDA centre, Chianki is implemented in one village i.e. Kechki (latitude: 23°55'49.92"N; longitude:84° 9'28.69"E), Barwadih block, Latehar district, Jharkhand state. The village has 84% of scheduled tribe population. The total population in the village is 2661 and total land holdings in the village is 545 out of which 92% is small, 5% is medium and 3% is large. The total cultivated area is 254.8 ha out of which 161 ha is rainfed and irrigated is 93.2 ha. The bunded uplands comprise of 43.2 ha, unbunded uplands 56.8 ha, medium land 89.6 ha and low land 64.8 ha. The major soil types are sandy loam to clay loam. The major crops cultivated during *kharifare* rice, pigeonpea, maize, sesame, blackgram and during *rabi* are lentil, barley, niger, horsegram (*kulthi*), wheat, barley, mustard and vegetables. The major animal population is cows, cattle, buffaloes and goats. Backyard poultry is common. The source of irrigation open wells (106) and ahar/dams (8). The major livelihood of the tribals is agriculture, backyard poultry and other off-farm activities.



Location map of TSP villages

2.4. Indore

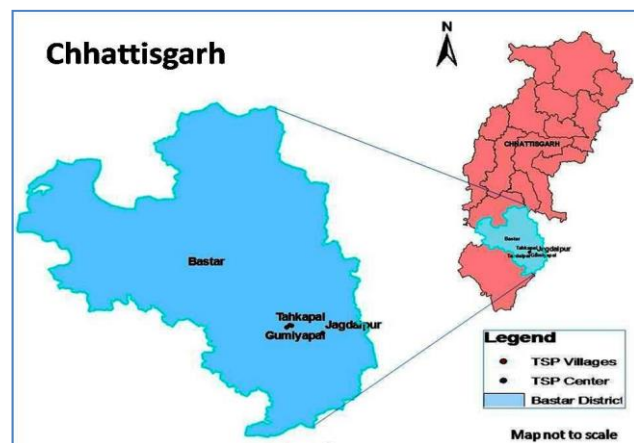
The TSP programme by AICRPDA centre, Indore is implemented in three villages i.e. one village in Jhabua district viz. Ralyawan, Petlawad block and two villages in Dhar district viz. Jhawlia and Golpura, Sardarpur tehsil in Madhya Pradesh. The total population in Ralyawan, Jhawlia and Golpura villages are 803, 1304 and 626 with households of 177, 239 and 76, respectively. The major soil types in these villages are deep medium black soils. The major crops cultivated during *kbharif* are soybean, maize, cotton, blackgram, and groundnut and during *rabi* are wheat and chickpea. Vegetables are also cultivated. The major animal population is cows, buffaloes, goats and backyard poultry is also common in this tribal area.



Location map of TSP villages

2.5. Jagdalpur

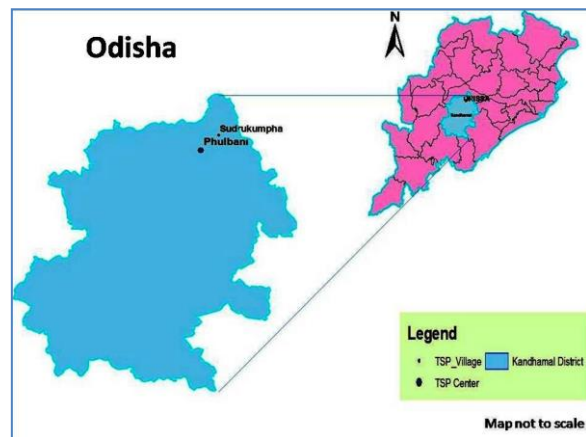
The TSP programme by AICRPDA centre, Jagdalpur is implemented in three villages viz. Tahkapal, Tandapal and Gumiyapal, Tokapal block, Bastar district, Chhattisgarh. The major farming situations in these villages are Badi, *Marban*, *Tikra*, *Mal* and *Gabbar*. The *badi* (10.7%) comprises of upland settlement, *marban* (40.5%) is the unbunded upland, *tikra* (17%) is the banded upland, *mal* (16.1%) involves the midland situation and *gabbar* (15.7%). The soils are sandy loam to clayey. The major crops cultivated during *kbharif* are maize, fingermillet, kodomillet, pigeonpea horsegram and during *rabi* on residual moisture with or without tillage are chickpea, Niger, linseed, pea. The cropping intensity is 128%. The dominant animal population is cows, bullock, buffaloes, goats and pigs. The major livelihood of the tribals is through agriculture, collection and selling of non-farm produce and other off-farm activities. The limited water resources are dug wells (30-50 feet) and farm ponds (2000-5000 m²).



Location map of TSP villages

2.6. Phulbani

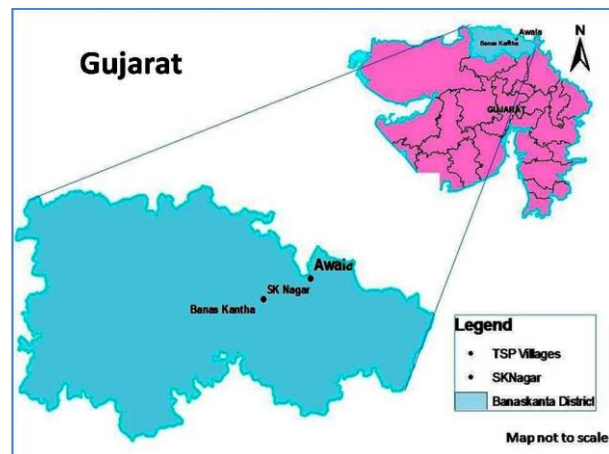
The TSP programme by AICRPDA centre, Phulbani is presently implemented in three villages viz. Dadaki, Sudrukumpha, Kumbhariguda, Phulbani block, Kandhamal district, Odisha. Over 90% of the population depend on agriculture. The major soil type is red laterite soils. The major crops during *kharif* are rice, vegetables, pulses, maize and during *rabi* are mustard, pulses, vegetables. The dominant livestock is bullocks and goats.



Location map of TSP villages

2.7. S. K. Nagar

The TSP programme by AICRPDA centre, SK Nagar is presently in Juni Sarotri cluster villages Amirgadh block, Banaskantha district, Gujarat. The total number of farmers is 478. The marginal farmers are 355, small farmers 8, medium 2 and large 1. The area under cultivation 193 ha. The major soil types are sandy, loamy sand and sandy loam. The major cropping pattern is maize, castor, millets, pulses and oilseeds.



Location map of TSP villages

3. Major Interventions

The major interventions in TSP villages were focused on i) Natural resource management (NRM) based ii) Crop based iii) Creation of physical assets iv) Livelihood based, and v) Capacity building. For this, the doable rainfed technologies/practices/expertise at AICRPDA centres and respective SAUs are demonstrated/ utilized in TSP villages.

i). NRM based interventions: The NRM based interventions focus on demonstration of improved practices of soil, moisture [*in situ* moisture conservation, water (rainwater harvesting in farm ponds etc. and efficient utilization] and nutrient (soil fertility) management.

ii). Crop based interventions: The crop based interventions focus on demonstration of improved/drought tolerant varieties of rainfed crops, cropping systems, plant protection and other crop management practices.

iii). Creation of physical assets: In TSP villages, efforts are being made to create physical assets such as water harvesting structures (farm ponds etc.), repair of water harvesting structures (fish gate in the fisheries cum water harvesting structure etc.), animal sheds, and improved implements for various agricultural operations.

iv). Livelihood based interventions: The livelihood based interventions include pisciculture, improved breeds of goater, piggery, poultry, duckery, betel nut, vermicomposting, apiculture, *Azolla* units, sewing machines, spinning machines etc for improving the livelihood of farmers particularly farm women.

v). Capacity building: The capacity building focus on skill development, enhancing knowledge and livelihoods etc. both for tribal men and women and include activities such as trainings, exposure visits, scientist-farmer interaction meetings/field days etc.

The highlights of the major interventions centre-wise, implemented during 2012-15 in the TSP villages are given below.

3.1. Arjia

During the period, the major interventions implemented in TSP villages of Shyampur, Sarsiya, Rawatkhara, Barundni, Ganoli & Amargarh blocks of Bhilwara district are demonstration of *in situ* moisture conservation practices, nutrient management, improved varieties of major crops, livelihood activities and capacity building.

Interventions

a. NRM based

In situ moisture conservation practices like ridge and furrow system and compartmental bunding in maize were demonstrated in 20 farmers' fields in an area of 4 ha which gave an increased mean yield in maize up to 33% and additional net returns upto Rs. 7042/ha compared to farmers' practice (Table.3.).



Maize with compartmental bunding

Table 3. In situ moisture conservation in maize

Intervention	Yield(kg/ha)		Income* from IP(Rs/ha)	Additional income* over FP (Rs/ha)
	IP*	FP*		
Ridge & furrow system	2042	1635	26345	6265
Compartmental bunding	2092	1630	27077	7042

IP: Improved practice; FP: Farmers' practice *Mean

The demonstration on supplemental irrigation in maize, groundnut and wheat benefitted more than 100 farmers in realizing higher maize, wheat and groundnut yield and farmers realized additional net returns up to Rs. 17000/ha (Table.4.)

Table 4. Supplemental irrigation in rainfed crops

Crop	Yield (kg/ha)		Income from IP (Rs/ha)	Additional income over FP (Rs/ha)
	With supplemental irrigation (IP)	Without supplemental irrigation(FP)		
Maize	2419	1825	31411	8640
Groundnut	1520	1250	68400	12150
Wheat	3460	2612	44255	17047

b. Nutrient management

The demonstration of recommended dose of fertilizers in blackgram, sesame, groundnut, sorghum (fodder), sorghum (dual purpose) in 60 farmers' fields in an area of 11.4 ha gave increased yield up to 45% with income benefit to the farmers upto Rs. 9450/ha (Table.5).

Table5. Nutrient management

Crop	Intervention	Yield (kg/ha)		Income from IP (Rs/ha)	Additional income over FP (Rs/ha)
		IP	FP		
Maize	50:30 (N:P kg/ha)+PSB+ <i>Azotobactor</i>	2240	1680	25730	9134
Blackgram	50:30 (N:P kg/ha)+PSB+ <i>Rhizobium</i>	431	340	9031	4749
Sesame	25:30 (N:P)	445	355	6839	3861
Groundnut	20:30 (N:P)+PSB+ <i>Rhizobium</i>	197	136	7168	6473
Sorghum (fodder)	50:30 (N:P kg/ha)	12000	9500	17945	5625
Sorghum (Dual purpose)	50:30 (N:P kg/ha)+PSB+ <i>Azotobactor</i>	1355	715	20818	7943

Blackgram	Recommended dose of NP	362	276	38010	9030
Groundnut	Recommended dose of NP	1420	1210	63900	9450
Soybean	Recommended dose of NP	415	335	16600	3200
Sesame	Recommended dose of NP	160	105	19200	6600

c. Crop based

The demonstration of improved varieties/hybrids of maize (Bioseed-9881, Hybrid -9637, PM-3), blackgram (T-9, TAU-1, PU-31), clusterbean (RGC-936, RGC 936, RGC-1003), sesame (RT-46, RT-46), groundnut (TAG-24, TG37 A), soybean (JS-335), horsegram (AK-42), sorghum (SPV-15), fodder sorghum (MP Chari), dual purpose sorghum (CSV-15), barley (RD -2035), mustard (Laxmi), chickpea (RSG-888) and taramira (RTM-314) was conducted in different TSP villages of Bhilawara district. Improved varieties of different *kharif* crops gave 16-39% higher yield with additional net returns of Rs. 3037-8685/ha compared to local varieties in different TSP villages of Bhilawara district. Similarly, the increase in yield with use of improved varieties of *rabicrops* was 16-30%.



Blackgram cv. PU-31

Introduction of maize + blackgram (2:2), groundnut + sesame (6:2) and pigeonpea + radish intercropping systems in 90 farmers' fields benefitted the farmers with additional income up to Rs. 10050/ha (Table.6).



Maize + blackgram (2:2)



Groundnut + sesame (2:2)

Table6. Maize and groundnut based intercropping systems

Intervention	Yield(kg/ha)		% increase in yield over FP	Income from IP(Rs/ha)	Additional income over FP (Rs/ha)
	IP	FP			
Maize + blackgram (2:2)	2430	1944	25	28128	9317
	1650	1470	12	32100	10050
Groundnut + sesame (6:2)	1755	1520	15	46184	8121
	1290	1225	5	62850	7725

2.2. Biswanath Chariali

During the period, the major interventions implemented in TSP village Jalakiasuti are demonstration of *in situ* moisture conservation practices, nutrient management, improved varieties of major crops, plant protection, livelihood activities, and capacity building.

Interventions:

a. NRM based:

Mulching with plastic/paddy straw in capsicum and ginger was demonstrated in 21 farmers' fields. The ginger yield increased by 60% (16000 kg/ha) and gave additional income of Rs. 60,000/ha compared to farmers' practice (no mulching).



Plastic mulching in capsicum

Demonstration of seed coating was done with bio-fertilizers *Rhizobium* and PSB each @ 1.5 kg/ha along with basal application of 50% recommended N (7.5 kg N) and P (17.5 kg P) and full dose of K (10.0 kg K) for blackgram was done on 60 farmers' fields (10 ha) and resulted in an improvement of yield by 1000 kg/ha against farmers' practice (600 kg/ha). Similarly, seed coating with biofertilizers (*Azotobacter* and PSB @ 40 g each/kg of seed) along with 75% recommended dose of inorganic fertilizers NP and full K (RDF 40:35:15 N: P₂O₅: K₂O/ha) for toria was demonstrated in 33 farmers' fields in an area of 20 ha.



INM in toria

b. Crop based:

Improved varieties of *sali* rice, maize, blackgram, toria, sesame, turmeric, ginger, tomato, potato and cabbage were introduced in the village for improving crop productivity and profitability. All the improved varieties performed better than farmers'/local varieties and the farmers realized additional income ranging from Rs. 15000/ha in toria (TS-36, TS-38) to Rs. 60000/ha in tomato (Rocky) and ginger (Nadia) (Table.7).

Table 7. Improved varieties of field and vegetable crops

Crop	Improved Variety	Yield (kg/ha)		Income from Improved variety (Rs/ha)	Additional income over farmer's variety(Rs/ha)
		Improved variety	Farmer's variety		
Sali Rice	Ranjit	6000	3600 (Bihari)	37214	23364
	Gitesh	5850		35414	21564
Maize	HQPM	4860	2500	36679	16000
Blackgram	KU- 301	1300	600 (local)	39591	30916
Toria	TS- 36	1200	725 (M- 27)	34098	15000
	TS- 38	1000		24098	
Turmeric	Megha Turmeric- 1	18000	12000 (local)	116000	32000
Ginger	Nadia	16000	10000 (local)	160000	60000
Tomato	Avinash-II	18500	10000	150000	40000
Tomato	Rocky	18300	10500	200000	60000
Potato	Pokhraj	21000	18000(Phulaloo)	220000	40000

c. Plant protection measures

IPM packages were demonstrated with the concept of popularizing integrated pest management in the village for tomato, brinjal, betelvine, and potato, and the number of farmers who adopted the IPM were 10, 15, 163, and 52, respectively. Preparation and application of Bordeaux mixture was demonstrated to betelvine farmers to protect the crop from diseases like Phytophthora foot rot and Anthracnose. Further, spray schedule against late blight in tomato and potato has been adopted by 215 farmers.

d. Livelihood based

- Mushroom cultivation was adopted by 80 farmers and generated an income of Rs.6500.
- Sericulture is being practiced by 26 farmers and the produce is being used for traditional handlooms.
- Apiary was adopted by 5 beneficiaries and could be able to generate an income of Rs.6700 per year.



Apiary



Mushroom cultivation



Rearing of silkworms

2.3. Chianki

During the period, the major interventions implemented in TSP village Kechki, Barwadihblock, Latehar district, Jharkhand were cleaning of open wells, demonstration of improved varieties of major crops, livelihood activities and capacity building.

Interventions

a. Crop based:

The demonstrations of improved varieties of rice, maize, pigeonpea, wheat, chickpea, lentil and toria were conducted in 670, 282, 122, 324, 396, 353 and 260 farmers' fields. Improved varieties of different crops gave 9-92% higher yields with additional net returns ranging from Rs 4686/ha to Rs 23132/ha compared to local varieties (Table.8).

Table 8. Improved varieties of *kharif* and *rabi* crops

Crop	Improved Variety	Yield (kg/ha)		Income from Improved variety (Rs./ha)	Additional income over farmer's variety (Rs./ha)
		Improved variety	Farmer's variety		
Rice	Naveen	3249	2525	21914	8614
	Sahbhagi	3307	2500	22584	9284
	Vandana	2520	1310	17967	13867
	Arize-6444	5008	4600	40586	4686
Maize	Rassi -4212 (hybrid)	4419	2300	37532	23132
Pigeonpea	Bahar	1474	860	39192	21592
	Narendra Arhar-1	819	680	23130	6050
Wheat	K-9107	2999	2000	29985	16285
	HUW-234	2480	1700	21380	12480
Chickpea	KPG-59	1000	650	26909	13959
Lentil	K-75	847	450	15304	12704
Toria	Shivani	75	410	9217	8147



Rice cv. Sahabhagi



Wheat cv. K 9107

b. Livelihood interventions

The livelihood interventions including vermin-compost units, pisci-culture, lac production, mushroom cultivation and tailoring (sewing machine) were introduced among the women farmers in the village and about 50 tribal women have benefited from these interventions. Each basket produced 2.0 - 2.5 kg mushroom and the farmers benefitted with net returns of Rs. 190-225/basket.



Mushroom cultivation

2.4. Indore

During the period, the major interventions implemented in TSP villages viz. Ralyawan, Jabhua district and Jhawlia and Golpura villages in Dhar districts, Madhya Pradesh were in *situ* moisture conservation practices, nutrient management, improved varieties of major crops, plant protection, livelihood activities and capacity building.

Interventions

a. NRM based:

Sulphur application along with recommended dose of NPK in soybean was demonstrated in 70 farmers' fields. The increase in yield was 300 to 600 kg/ha as compared to no sulphur application (1000 kg/ha) with net returns up to Rs. 16,000/ha. Seed treatment with Mo @1-2 g/kg seed in chickpea increased yield upto 300 kg/ha as compared to no seed treatment (1500 kg/ha) with net returns of Rs. 10,400/ha.



Chickpea crop seed treated with Mo

b. Crop based

The improved varieties of soybean, wheat and chickpea were introduced for improving crop productivity and profitability. Among different soybean varieties, JS-335 gave higher additional income of Rs. 11710/ha compared to local variety. Cultivation of wheat variety HI 1418 gave additional income of Rs. 14966/ha compared to local variety (Lok-1). JAKI-9218 variety of chickpea gave additional income of Rs. 18777/ha compared to local variety (Table.9)

Table 9. Improved varieties of crops

Crop	Variety	Yield (kg/ha)		Income from improved practice (Rs/ha)	Additional income over farmer's practice (Rs/ha)
		Improved Variety	Farmer's practice		
Soybean	JS-335	1487	1096(Local)	44600	11710
	JS93-05	1295		38860	5970
	JS95-60	1420		41760	8870
	RVS 2001-4	1209		3412	6574
Wheat	HI 8498	3483	2840 (Lok1)	52252	11819
	HI 1418	3693		55399	14966
	HI 1479	3248		48725	8292
	GW366	2563		38445	5445
Chickpea	JAKI-9218	1583	1061	55392	18777
	JG-302	1251	902	43800	12236

The intercropping system of soybean+maize (1:1) was demonstrated during 2012-13 and 2013-15 in 138 farmers' fields in an area of 34.5 ha. The intercropping system gave a soybean equivalent yield of 2788 kg/ha with additional benefit of Rs. 10209/ha over sole soybean (1650 kg/ha) (Table.10).

Table 10. Soybean+maize intercropping system

Soybean equivalent yield *(kg/ha)		Income from improved practice (Rs/ha)	Additional income over farmer's practice (Rs/ha)
Soybean+maize intercropping system(1:1)	Sole soybean		
2788	1650	40410	10209

*Mean of two years

During 2013-14 and 2014-15,maize +cottonintercropping system was demonstrated 23.75 ha in 103 farmers' fieldswhich gave additional maize equivalent yield of 925 kg/ha compared to sole maize (2060 kg/ha) with additional income of Rs. 12149/ha.



Maize +cotton

c. Livelihood based

Improved poultry birds (chicks) were provided to 7 individual tribal farmers which can provide additional income and 665 man-days of employment per year.

2.5. Jagdalpur

During the period, the major interventions implemented in TSP villages Tahkapal, Todapal and Gumiypal are NRM, crop and livelihood based and capacity building.

Interventions

a. NRM based

In onion, bunding as *in situ* moisture conservation practice, was demonstrated in 12 farmers' fields covering 9.56 ha area. This benefitted farmers in realizing an additional onion yield of 3038 kg/ha.



Bunding for irrigation in onion

The higher yield and income was realized with two supplemental irrigations in onion on 15 farmers' fields covering 8.7 ha. The farmers earned additional income of more than Rs. 75000/ha.



Rice under supplemental irrigation



Rice without supplemental irrigation

Nutrient management in rice(cv.MTU1010)with application of N:P:K; 60:30:20 kg/ha was demonstrated in 17 farmers' fields which gave an additional grain yield of 679 kg/ha and additional income of Rs. 8274/ha.

b. Crop based

The improved variety of rice cv. MTU1010 was demonstrated in 23 farmers' fields covering an area of 17.32 ha. The farmers obtained an increased yield of 773 kg/ha (mean) with improved variety over local variety (2227 kg/ha). Niger crop was introduced as an intercrop in mango plantation of 7 farmers due to which the farmers benefitted with an additional income of Rs. 10500/ha. Hand weeding at 35 days after sowing in groundnut was demonstrated in 8 farmers' fields benefitting with an increased yield of 766 kg/ha.



Weed management in groundnut

c) Livelihood based

Improved breeds of goats, cows and pigs, besides chicks of poultry birds were given for enhancing the livelihoods of the tribal farmers which resulted in higher income (upto Rs. 23,000) and employment generation of 844 days in the village (Table.11).

Table 11. Animal based livelihood interventions

Livelihood activity	No. of beneficiaries	Income generation (Rs.)	Employment generation (days)
Goatery	04	17000	154
Dairy	12	23000	310
Piggery	02	40000	220
Poultry	05	7000	160



Goatry



Piggery

2.6 Phulbani

During the period, the major interventions in the TSP villages Dadaki, Phulbani block and Kumbhariguda village, Phiringia block in Kandhamal district, Odisha are NRM, crop, livelihood based and capacity building.

Interventions

a. NRM based:

The two interventions of increase in bund height and summer ploughing in two rice varieties viz. Lalat (2013) and Sahabhagi (2014 and 2015) in 15 farmers' fields in 7.5 ha, helped the farmers realize an additional yield of 600 kg/ha(mean) with an additional income of Rs. 6000/ha(mean) compared to farmers' practice.



Performance of rice with improved practice



Performance of rice with farmer's practice

Recommended dose of fertilizer (NPK) in rainfed crops viz. paddy (Lalat&Sahabhagi), cowpea, yambean, greengram and groundnut in 104 farmers' fields in 15.5 ha and in mustard, garden pea, cauliflower, cabbage, tomato, brinjal and onion was demonstrated in 180 farmers' fields in 11.5 ha. This resulted in higher yields of various crops and farmers benefitted with additional income up to Rs. 40,000/ha (Table.12).

Table 12. Nutrient management in field and vegetable crops

Crop	Yield (kg/ha)		Income from improved practice(Rs/ha)	Additional income over farmer's practice (Rs/ha)
	Recommended dose of fertilizer	Farmer's practice		
Rice	2700	1900 (Jhalka/ Punia)	10500	6160
Maize	3000	2100	11000	9000
Cowpea	5350	3150	39000	24000
Greengram	550	400	13000	6000
Groundnut	1200	900	17000	5000
Tomato	20000	15000	120000	40000
Brinjal	15000	12500	110000	25000

a. Crop based:

The improved varieties / hybrids of *kharif* crops viz., rice (Lalat, Sahabhagi), maize (Nirmal-51, NMH-51), greengram (TARM-1), blackgram (Pant U-30), groundnut (Kadiri, GPBD) and *rabi* crops viz., mustard (M-27) were demonstrated in 193 farmers' fields in 24 ha. The farmers benefited with an additional income of Rs. 2000 to Rs. 11000/ha in various crops. The improved varieties of various vegetable crops such as tomato, cabbage, garden pea, potato, cowpea, yambean, brinjal, and onion were also demonstrated which gave higher yield and income to the tribal farmers (Table.13)

Table 13. Improved varieties of rainfed crops

Crop	Improved Variety/Hybrid	Yield (kg/ha)		Income from Improved variety (Rs./ha)	Additional income over farmer's variety (Rs/ha)
		Improved variety	Farmer's variety		
Rice	Lalat	2800	2100	13000	7300
	Sahabhagi	2500	1900	10000	6000
Maize	Nirmal-51	3100	2000	11500	9500
	NMH -51	3300	2100	14000	11000
Greengram	TARM -1	425	300	9000	4000
Blackgram	Pant U-30	300	210	6000	2000
Mustard	M-27	360	235	3500	2000
Groundnut	Kadiri	1200	900	17000	5000
	GPBD	1000		11000	1000



Rice cv. Sahabhagi



Rice cv. Lalat



Groundnut cv. Kadiri-6



Green gram cv. TARM-1

The intercropping systems of maize + cowpea and pigeonpea + radish were demonstrated in 25 and 10 farmers' fields, respectively. These systems gave an additional income of Rs. 19000 to Rs. 20000/ha compared to farmers' practice of sole cropping (Table.14).

Table14. Maize and pigeonpea based intercropping systems

Intercropping system	Maize/pigeonpea equivalent yield (kg/ha)		Income from intercropping system(Rs./ha)	Additional income oversole crops (Rs./ha)
	Intercropping systems	Sole maize / pigeonpea		
Maize+ cowpea	5250(MEY)	3500	23000	19000
Pigeonpea+ radish	2250(PEY)	1000(PEY)	30000	22000

MEY - Maize equivalent yield; PEY -Pigeonpea equivalent yield

Timely plant protection measures to control various pests and diseases were demonstrated in paddy, cowpea, greengram, groundnut, mustard and vegetable crops in more than 114 farmers' fields covering an area of 12 ha which resulted in better performance of field and vegetable crops and benefitted the farmers with higher income (Table.15).

Table 15. Plant protection (PP) measures in field and vegetable crops

Plant protection (PP) measure	Crop	Yield (kg/ha)		Income with PP (Rs./ha)	Additional income over no PP (Rs./ha)
		Improved PP measure	Farmer's practice		
BLB – Plantomycin @ 1 g/l Blast – Tricyclazole @ 1 g/l	Paddy	2800	2000	13000	8000
Aphid – Dimethoate @ 2 ml/l	Cowpea	5500	3000	40000	25000
Aphid – Dimethoate @ 2 ml/l	Greengram	550	400	13000	6000
Termites –Chloropyrophos @ 2ml/l	Groundnut	1200	900	17000	5000
Saw fly- Quinalphos @ 2 ml/l	Mustard	320	190	3800	2000
Fruit and shoot borer- Quinalphos @ 2 ml/l; Bacterial wilt- Plantomycin-@ 1g/l	Tomato	20000	15000	120000	40000
Fruit and shoot borer- Quinalphos @ 2 ml/l	Brinjal	15000	12500	110000	25000
Seed treatment-Quavator-1g/l Thrips- – Dimethoate @ 2 ml/l	Onion	16000	10000	110000	40000



Better performance of garden pea and cauliflower with timely plant protection



Sensitizing the tribal women about pest problems in cabbage

c. Livelihood Interventions

The livelihood interventions included introduction of improved chicks of poultry which benefitted 835 farmers with an income generation of Rs. 500/bird and employment generation of 250man-days per year.

2.7. SK Nagar

The TSP programme was implemented for two years (2012 & 2013) in Wadi and Zariya villages in Nandod Taluka, Narmada district, Gujarat. From 2014 onwards, the programme is being implemented in Juni Sarotri village, Amirgadh Taluka, Banaskanth district, Gujarat. The major interventions during the period were NRM and crop based and also capacity building.

Interventions:

a. NRM based:

The drip irrigation system was demonstrated in 4 farmers' fields, which gave 37% and 34% increase in seed cotton and stalk yield compared to without drip irrigation with higher net returns.



Drip irrigation in cotton

The sprinkler irrigation system was demonstrated in 4 farmers' fields, which gave 18% and 17% increase in pod and haulm yield compared to without sprinkler irrigation with higher net returns (Table.16).



Sprinkler irrigation in groundnut

Table 16. Sprinkler irrigation in groundnut

Groundnut yield (kg/ha)				Net returns (Rs/ha)	
Withsprinkler irrigation		Withoutsprinkler irrigation		Withsprinkler irrigation	Withoutsprinkler irrigation
Pod yield	Haulm yield	Pod yield	Haulm yield		
2250	4630	1950	4050	87020	74500
2110	4460	1780	3750	81020	66840
2380	4750	2010	4050	92440	76780
2247	4613	1913	3950	86827	72707

b. Crop based:

The improved hybrids of maize were demonstrated in 26 farmers' fields which gave 33.65% higheryield over local variety and the farmers could realize the net returns upto Rs. 34155/ha.



Maize cv. GM 2

The pigeonpea cv. GT 101 was 13 farmers' fields covering 5.2 ha. The farmers could earn additional income of Rs. 12000/ha (mean) compared to cultivation of local variety.



Pigeonpea cv. GT 101

The fodder sorghum cv. CSV-21 gave 42% higher fodder yield than the local variety (8497 kg/ha) and farmers benefitted with additional net returns of Rs. 14144/ha (mean of 13 farmers).



Fodder sorghum cv. CSV-21

Two improved varieties of clusterbean viz. Juni Sarotri and Avala-Arnivada were demonstrated in 4 farmers' fields which gave additional net returns upto Rs. 13000/ha over local varieties. Introduction of castor hybrid GCH 7 in 40 farmers' fields benefitted increase in yield by 20% with additional net returns upto Rs. 17000/ha (mean) over local variety.



Castor hybrid GCH 7

4. Physical Assets Created

One of the activities under TSP was creation of physical assets in the selected villages under different thematic areas including natural resource management, farm machinery, livestock etc. A summary of major physical assets created in different TSP villages is presented in this section.

4.1. Natural resource management

Under this theme, major emphasis was given for construction of soil and water conservation structures including farm ponds, sunken ponds, zing terraces, CCTs, renovation of existing ponds and tanks, recharging of open/tube wells, and efficient recycling of farm residues through vermicomposting (Table.17).

Table 17. Details of physical assets created for natural resource management

Village/district	Details of the physical asset	Number	Beneficiaries
JallamkeJhopdiya, Bhilwara	Vermicompost units	4	4
Jalakiasuti, Dhemaji	Bore wells	4	4
	Vermicompost units	32	32
	Renovation of community pond	1	All farmers
	Recharging of bore wells	3	3
Nala ka kua	Biogas plant	4	4
Kechki, Latehar	De-silting of repairing of wells	23	23
	Construction of cemented water tanks (3 m x 2 m x 1 m)	11	11
	Vermicompost units (10 ft x 3 ft x 2.5 ft)	23	23
	Repair of hand pumps	19	Entire village
	Repairing the gate of Damdaha Dam	1	150
Ralyawan, Jhabua	Farm pond	1	1
	Pond	1	110
	Recharging of wells	23	23
Tahkapal, Gumiyapal& Tandpal, Bastar	Farm ponds (12 m x 3 m x 3 m)	6	6
	Open ring tubes	6	6
	Contour trenches	360 m	12
	Vermicompost units	7	7
	Stop dam	4	17
	Stone pitched well	1	3
	Zing terraces	2	2
	Gabion structures	15	Entire village
Sunken ponds	16	Entire village	



Farm pond - Tahkapal, Bastar district, Chattisgarh



Repairing the gate of Damdaha Dam - Kechki, Latehar district, Jharkahnd



Vermicomposting unit - Jalakiasuti, Dhemaji district, Assam



Check dam - Tahkapal, Bastar district, Chattisgarh



Biogas plant , Nala ka kua, Bhilwara district, Rajasthan

4.2. Crop based physical assets

Establishment of fruit orchards and agri-horti systems was undertaken in different villages for ensuring nutritional security and stable income during aberrant weather conditions (Table.18). The orchards are in initial establishment stage. About 52 farmers in different villages have benefitted from these interventions.

Table18.Establishment of agri-horti or fruit orchards in different villages

Village/district	Details of the physical asset	Area (ha)	Beneficiaries/remarks
Kechki, Latehar	Establishment of fruit orchards	-	31 farmers, each orchard having 50 plants of guava, mango and orange.
Ralyawan, Jhabua	Establishment of guava orchard (Allahabad safeda)	2.75	11
	Establishment of mango orchard (Allahabad safeda)	2.50	10

4.3 Farm machinery

Agricultural mechanization is an important input to agriculture for performing timely farm operations; reducing the cost of operation; maximizing the utilization efficiency of costly inputs (seeds, fertilizer, plant protection chemicals, water and agricultural machinery); improving the quality of produce; reducing drudgery in farm operations; improving the productivity of land & labour and for improving the dignity of labour. Timeliness of agricultural operations is crucial to cope with climatic variability, especially for sowing and interculture operations as soil moisture status provides a limited window of opportunity. This calls for greater use of appropriate agricultural machinery for performing critical agricultural operations. Small farm mechanization was promoted by making available different farm implements including sprayers, irrigation equipments, tillage and interculture implements, harvesters, winnowers etc. (Table.19).

Table . 19. Details of farm implements provided in different villages

Village/district	Details of the physical asset	Number	Beneficiaries/remarks
Jalakiasuti , Dhemaji	Power tiller	5	All farmers on custom hiring basis
	Pump sets	5	All farmers on custom hiring basis
	Sprinkler system	1	1
	Power sprayer	1	All farmers on custom hiring basis
Kechki, Latehar	Drip systems	6	6
	Diesel pump sets	7	7
	Sprayers	10	All farmers on custom hiring basis
Tahkapal, Gumiyapal&Tandpal, Bastar	Diesel pump sets	10	10
	Power operated chaff cutters	3	All farmers
	Power sprayers	20	All farmers
Wadi&Zariya,	Power operated winnowers	20	All farmers
	Drip systems	4	4

Narmada	Sprinkler systems	3	3
	Sprayers	13	26
	Secators	110	50
	Bund formers	4	40
	Sickles	200	50
	Electric winnowing fans	3	50
	Dusters	9	18



Power sprayer - Jalakiasuti, Dhemaji district, Assam

4.4 Livestock

Introduction of improved breeds was a major emphasis under this theme. Improved breeds of poultry, duck, goat and pig were provided to selected farmers in different villages, for further upgradation of local breeds (Table.20).

Table 20. Details of improved breeds and *azolla* units introduced in different villages

Village/district	Details of the physical asset	Number	Beneficiaries
Jallamkejhopdiya, Bhilwara	<i>Azolla</i> units	8	8
Jalakiasuti, Dhemaji	Introduction of improved poultry breed (Vanaraja)	4800	160
	Introduction of improved duck breed (Khaki Cambell)	324	69
	Introduction of improved pig breed (Hampshire)	10	10
Kechki, Latehar	Introduction of improved fisherlings	25 kg	12
Ralyawan, Jhabua	Introduction of improved poultry breed (Kadknath)	-	5
Tahkapal, Gumiyapal& Tahkapal,Bastar	Introduction of improved poultry breed	150	7
	Introduction of improved goat breed (Jamunapui)	40	3
	Introduction of improved milch animals (Shahiwal)	12	12
	Introduction of improved pig breed (Hampshire)	12	2
Dadaki, Kandhamal	Introduction of improved poultry breed (Vanaraja)	-	835



Introduction of improved fisherlings –
Tahkapal, Bastar district, Chattisgarh



Azolla unit - JallamkeJhopdiya, Bhilwara
district, Rajasthan



Fish gate - Jalakiasuti, Dhemaji district,
Assam



Introduction of improved breed of pigs -
Kechki, Latehar district, Jharkhand

4.5 Infrastructure

Need based infrastructure facilities including cattle sheds, implement shed, training halls, biogas plants etc. were created in different villages (Table.21). In addition, assets were created for additional income generation such as Eri spinning machine, sewing machine, honeybee and mushroom production units.

Table 21. Infrastructure facilities created in different villages

Village/district	Details of the physical asset	Number	Beneficiaries/remarks
Jalakiasuti, Dhemaji	Pig sheds	10	10
	Low-cost polyhouse	5	5
	Training hall	1	Under construction
	Custom hiring centre	1	For keeping the farm implements; Under construction
	Eri spinning machine	1	For the benefit of entire village
	Sewing machine	3	3
	Honeybee production units	5	5
Kechki, Latehar	Honeybee production units	5	5
	Mushroom production units	15	15
Tahkapal, Gumiyapal&Tandpal, Bastar	Animal sheds	4	4
	Biogas plants	30	30
	Implement shed	1	All farmers



Training hall - Jalakiasuti,
Dhemajidistrict



Pig shed - Tahkapal, Bastar
district



Sewing machines - Kechki,
Latehar district



Apiary unit - Jalakiasuti,
Dhemaji district



Threshing floor – Ralyawan,
Jhabua district



Low-cost polyhouse -
Jalakiasuti, Dhemaji district

5. Capacity Building

5.1. Trainings/Meetings organized

During 2012-15, 120 training programs on improved NRM/crop management practices, livelihood activities, and skill and knowledge enhancement activities were organized in TSP villages directly benefitting more than 9000 tribal farmers/women. Similarly, about 2000 farmers were benefitted from 38 exposure visits/field days organized during the period. The details of various capacity building activities organized by 7 AICRPDA centres either in TSP villages or at centres and other institutes/farmers' fields are presented, centre-wise, below

5.1.1. Arjia

In TSP villages	Date	Name of the trainings programme	No. of participants
Kuradiya	11/09/2012	One day training programme organized under AICRPDA (TSP) in selected tribal support plan area	44
	12/03/2013	In one day training programme on post harvest technology and zaid season improved crop cultivation, farmers/rural youth/working women participated	66
Rawat khera	11/09/2012	One day training programme organized under AICRPDA (TSP) in selected tribal support plan area	79
	03/07/2013	One day training programme organized under AICRPDA (TSP) in selected tribal support plan area	69
Aanando ka khera	03/10/2012	One day training programme organized under AICRPDA (TSP) in selected tribal support plan area	115
Jalam ki Jhopdia	03/10/2012	One day training programme organized under AICRPDA (TSP) in selected tribal support plan area	58
	08/03/2013	In one day training programme on post harvest technology and orchard management, farmers/rural youth/working women participated	78
	01/07/2013	One day training programme organized under AICRPDA (TSP) in selected tribal support plan area	68
	14/03/2014	In one day training programme on post harvest technology and <i>rabi</i> season improved crop cultivation, intensive agriculture, importance of crop rotation, integrated pest management farmers/rural youth/working women participated on dated at village, Panchayat-syampura, Panchayat Samiti-Mandalgarh (Bhilwara)	83
Dol ji ka khera	11/03/2013	In one day training programme on post harvest technology, summer ploughing and orchard management, farmers/rural youth/ working women participated	80

Ramgarh	13/03/2013	In one day training programme on post harvest technology and summer ploughing, farmers/rural youth/working women were participated	71
	13/03/2014	In one day training programme on post harvest technology, summer ploughing, improved varieties of <i>rabi</i> crops, composting, orchard management and poultry farming, farmers/rural youth/ working women participated	81
Sarsiya	11/03/2014	In one day training programme on post harvest technology, <i>rabi</i> seed production technique, integrated pest management and orchard management, farmers/rural youth/working women participated	71
Dhakarkheeri	11/03/2014	Training programme on post harvest technology, <i>rabi</i> seed production technique, integrated pest management and orchard management	71
	13/03/2014	Training programme on post harvest technology, summer ploughing, improved varieties of <i>rabi</i> crops, composting, orchard management and poultry farming	81
	14/03/2014	Training programme on post harvest technology and <i>rabi</i> season improved crop cultivation, intensive agriculture, importance of crop rotation, Integrated pest management	83
Nalakakuva	10/07/2014	Pre seasonal training (<i>Kharif</i>)	79
	11/07/2014	Pre seasonal training (<i>Kharif</i>)	83
	13/07/2014	Pre seasonal training (<i>Kharif</i>)	95
	15/07/2014	Pre seasonal training (<i>Kharif</i>)	75
	11/11/2014	Pre seasonal training (<i>Rabi</i>)	40
	13/11/2014	Pre seasonal training (<i>Rabi</i>)	70
	18/11/2014	Pre seasonal training (<i>Rabi</i>)	110
	20/11/2014	Pre seasonal training (<i>Rabi</i>)	75
Arjia	7/07/2015	One day institutional training programme of TSP farmers and one exposure visit to ORP & NICRA villages)	250
	19/02/2015	Focus group discussion	575



Training on Post Harvest Technology at village Jalam ki Jopadiya



Training on Post Harvest Technology at village Dol ji ka khera





Training on Post Harvest Technology and Zaid season improved crop cultivation at village Kuradia& Ramgarh



Field visits



Field visit



On-station training

5.1.2. Biswanath Chariali

TSP villages	Date	Name of the trainings programme	No. of participants
Jalakiasuti	06/05/2013	Backyard rearing of dual purpose poultry breed "Vanraja"	40
	12/09/2013	Breed up gradation of cattle through artificial insemination (AI)	41
	29/10/2013	Training on managing group dynamics	23
	30/10/2013	Post-harvest management	20
	15/11/2013	Vocational training cum demonstration on broiler farming	25
	20/08/2015	Training on improved cultivation practices of paddy	28
	23/08/2015	Training on improved cultivation of potato	25
	24/08/2015	Training on care and management of pigs	23
	25/08/2015	Training on improved cultivation practices of banana	21

Silapathar	25/01/2014	IPM on <i>salip</i> paddy cultivation	25
	28/01/2014	Fish-livestock-horticulture farming as IFS model	28
	29/01/2014	Year round management of fish pond	25
	24/02/2014	INM in paddy cultivation	33
	27/02/2014	Scientific cultivation of maize	33
	24/04/2014	Natural resource management	35
	26/08/2015	Training on integrated farming system of livestock and fishery	23
	27/08/2015	Training on preservation of seasonal vegetables by pickling	25
	29/08/2015	Training on improved cultivation practices of blackgram	22



Vocational Training cum Demonstration on Broiler Farming



Demonstration of seed treatment



Training on Improved cultivation practices of paddy



Training on preservation of seasonal vegetables by pickling



Training on improved cultivation of potato



Training on improved cultivation practices of blackgram

5.1.3. Chianki

Date	Name of the trainings programme	No. of participants
20/12/2012	Training on mushroom production	20
22/01/2013	Training on preparation of vermicompost	52
19/01/2013	Training on bee keeping	53
19/06/2013	Management of <i>kharif</i> crops	500
26/08/2013	Training on fish production	11
28/10/2013	Training on <i>rabi</i> crop management	500
17/01/2013	Training on sewing entrepreneurship development	28
27/06/2014	Training on <i>kharif</i> crops	500
11/07/2014	Training on improved dryland practices, fertilizer management in <i>kharif</i> crops and commercial cultivation of vegetable crops	230
21/10/2014	Training on <i>rabi</i> crop management	600
04/05/2015	Training on insect and pest management in <i>kharif</i> crops	105
19/10/2015	ZREAC meeting	12
13/11/2015	Training on mushroom production	28
05/12/2015	Training on mushroom production	25
07/11/2015	Training on <i>rabi</i> crop and seed distribution	350
06/09/2012	Preliminary survey	52
04/10/2012	Training on women empowerment	88
30/10/2012	Training on sewing entrepreneurship development	55
31/10/2012	Awareness about vermicompost and farmyard manure	41
01/03/2013	Training on secondary agriculture	50
14/03/2013	Training and vaccination of PPR in goats	250
15/03/2013	Training and vaccination of FMD in large animal	200
23/03/2013	Awareness about secondary agriculture for livelihood for widow and poor woman	80
03/07/2013	Training on horticultural fruit crop	51
18/07/2013	Training on mushroom production	15
27/07/2013	Management of horticultural fruit crops	27
03/08/2013	Training on fertilizer management	50
17/09/2013	Preparation of vermi-compost for improvement of soil health and rural employment	45
01/11/2013	Training on commercial lac cultivation	25
20/12/2013	Training on integrated farming system	60
20/03/2013	Training and vaccination of PPR in goats	250
20/03/2014	Training and vaccination of FMD in large animal	250
25/07/2014	Kum pani mein krishi kaise karenge	60
27/08/2014	Fertilizer management in <i>kharif</i> crops	130
24/09/2014	Training on commercial cultivation of vegetable crop	40
28/11/2014	Training on scientific cultivation of onion	20
20/01/2015	Training on water management in vegetable crops	70
24/01/2015	Training on care and maintenance of diesel engine	50
26/03/2015	Training on post harvest management	114
14/05/2015	Training on water management in cereal crops	50
06/07/2015	Training on <i>kharif</i> crops	70
04/08/2015	Training on orchard management	24
01/10/2015	Training on goatry and piggery	23
08/10/2015	Training on scientific cultivation of vegetables	47

01/11/2015	Training on <i>rabi</i> crops	70
21/11/2015	Training on pig farming distribution	70
24/11/2015	Visit of B.Sc. (Ag) students in TSP village	14
30/11/2015	Kisangoshthi in TSP village organized by B.Sc. (AG) students	110



Training on vermicomposting



Training on tailoring for tribal women



Training on bee keeping



Training on nutrient management



Training on pisciculture



Training on maintenance of diesel engine



Skill development in post harvest of management



Training on water management

5.1.4. Jagdalpur

TSP village	Date	Name of the trainings programme	No. of participants
Tahkapal	05/07/2015	<i>Kharif</i> crop production	34
	15/08/2015	Rainwater utilization for crops	32
	12/09/2015	Water harvesting techniques	45
	12/10/2015	<i>Rabi</i> crop production	43
	15/11/2015	Vegetable production in <i>Badi</i>	23
	11/12/2015	Post harvest technology	46
Gumiyapal	31/08/2015	Integrated pest management	30



Training cum distribution of improved seed



Training on vegetable production

5.1.5. Indore

TSP village	Date	Name of the trainings programme	No. of participants
Relya wan and Jhwalia	07/10/2013	Improvement in skills of farmers	10
	24/10/2013	Improvement in skills of farmers	10
	24/10/2013	Integrated farming system	18
	07/10/2013	Integrated farming system	21
	24/10/2013	Integrated farming system	20
	17 /1/2014	Organic farming	16
	05/ 2/2014	Improved crop production practices	17
	01/4/2014	Sustainable profit in rainfed conditions	22
	23/6/2014	Integrated farming system	14
	1/12/2014	Trainings on improved practices of chickpea, wheat, animal health and fodder cultivation.	25
Golpura	24/10/2013	Conduction of adaptive trials/demonstration	18
	1/8/2014	Run off loss of water	16
	14/8/1014	Climate change and crop	18
	5/12/2015	Farmers sangoshthi	35
	01/1/ 2016	Faring system	42
	19 /1/2016	Training on nutrient management in pulses	30
	07/01/2016	Visit and farmers sangosthi	40

5.1.6. Phulbani

Venue: TSP Village, Dadaki

Date	Name of the trainings programme	No. of participants
05/02/2015	Training on soil testing and soil health management	50
06/02/2015	Training on value addition and post harvest technology of agricultural produce	50



Training on post harvest technology

5.1.7. SK Nagar

TSP Village	Date	Name of the trainings programme	No. of participants
Kotada (Dhunasol)	02/01/2015	Dryland technologies, human nutrition, crops dominantly grown	79
Avala/ Arnivada	20/01/2015	Agricultural inputs, distribution and farmers	125

5.2. Exposure Visits/Field Days etc, organized

5.2.1. Arjia

Title	Date	Venue	Beneficiaries
Exposure visit (Field day)	13/03/2014	Nahari	35
Exposure visit (IMP)		Bhilwara	05
Awareness among the farmers for improved wheat cultivation practices	11/11/2014	Ramgarh	81
Awareness among the farmers for improved barley cultivation practices	11/11/2014	Sarsiya	71
Awareness among the farmers for improved gram cultivation practices	11/11/2014	JalamkiJhopdiya	83

One day exposure visit farmers from village, Redwas and GogasKotdi to participate in district level kisanmela at KVK,	20/11/2014	Bhilwara	41
TSP farmers visit to NICRA village for Bio-gas plant, farm ponds and custom hiring centre for farm mechanization	22/05/2015	NalakaKuva&NayaKua, Dhakarkheri	40
Exposure visit of TSP farmers at ORP & NICRA villages was carried out on	23/05/2015	NalakaKuva&NayaKua, Dhakarkheri	40



Distribution of soil health cards



Field Day / visits



Field Day / visits



Exhibition cum filed day



Best farmer award

5.2.2. Biswanath Chariali

Title	Date	Venue	Beneficiaries
Exposure visit of farmers of TSP village, Jalakiasuti to Bishwanath	12/12/2013	B.Chariali College of Agriculture	30
Exposure visit of farmers of TSP village, Jalakiasuti to NICRA village	18/01/2014	ChamuaGaon, Lakhimpur	28
Exposure visit of farmers of TSP village, Jalakiasuti to Jingia,	27/03/2014	College of Agriculture, Biswanath Chariali and farm of Nilam Dutta	25
Exposure visit cum certificate course to four women farmers to AAU, Jorhat	30/03/2015	AAU, Jorhat	50
Demonstrations of different technologies on rainfed agriculture	01/04/2015	Jalakiasuti	347
Training cum exposure visit on farm machinery	10/4/ 2015	FMTTI, Biswanath Chariali	160
Training programme cum exposure visit to FMTTI	05/05/2015	Biswanath Chariali	9
Training cum exposure visit on “ certificate course in textile, dying and printing	05/05/2015 -	Assam Agricultural University, Jorhat	4
Training cum exposure visit on “ modern agriculture practices at SIRD	05/05/2015	Guwahati	4
Farmers field school at on scientific rearing of broiler farming	05/05/2015	Guwahati	20



Exposure visit of farmers of TSP village, Jalakiasuti to Bishwanath Chariali



Exposure visit to NICRA village Chamua Gaon, Lakhimpur



Exposure visit on “ certificate course in textile, dying and printing

5.2.3. Chianki

Title	Date	Venue	Beneficiaries
Visit to zonal research station	19/01/2013	Chianki	50
Tribal kumbhmela	11/02/2013	Dubyakhar, Palamau	40
Exposure visit to agrotechkisanmela	23/2/ 2013	BAU, Ranchi	10
Visit to Zonal Research Station, - Zonal Research Station, Chianki	26/02/2013 19.01.2013	Chianki	20 50
Tribal kumbhmela	11.02.2013	Dubyakhar, Palamau	40
Visit to zonal research station	1/4/2014	Namkum Ranchi	20
Celebrating field day of wheat at farmers field and Elephant foot yan at TSP village	26/03/2015	Kechki	114
Exposure visit to agrotechkisanmela,	14/4/2015	BAU,Ranchi	10
Field day on wheat crop	23/3/2015	Kanake,	114
Participated agro tech kisanmela	14/3/2015	Kanake,	10



Field day on wheat and elephanta footyam at TSP village Kechk

5.2.4. Jagdalpur

Title	Date	Venue	Beneficiaries
To show technologies in krishimela,	12/12/2012	Raipur	15
World soil health day	15/1/2014	IGKV, Raipur	13



Field visit

5.2.5. Indore

Title	Date	Venue	Beneficiaries
Interaction of NICRA farmers with TSP farmers and visit of Jhabua KVK	14/6/2012	KVK, Jhabua	26
Interaction of progressive farmer and hon' able member board of management	20/6/2013	Sangari, RVSKVV, Gwalior	24
To monitored experiments <i>rabi 2013-14</i> on farmers' field under TSP	01/1/2014	Raliavan and Jhablia	22
to monitored experiments <i>Rabi 2013-14</i> on farmers' field under TSP	14/1/ 2014	Golpura	16
Exhibition cum training programme was arranged, at dean college of agriculture, Indore	20/9/2014	GolpuraDhar	10
Farmers exposure visit cum meeting	5/12/ 2015	Raliavan and Jhablia	48
Exposure visit to chief mister's tirthsthal	12/5/2015	sundarel	15

5.3 Animal health activities

Centre	Title	Date	Venue	Beneficiaries
Biswanath Chariali	Animal health camp, FMD vaccination	25/06/2014	Jalakiasuti	42 (145 farm animals)
	Prophylaxis of livestock and poultry along with liver tonic supplementation	30/07/2014	Jalakiasuti	48 (749 farm animal)
	Vaccination of vanaraja bird	19/10/2014	Jalakiasuti	96
	Vaccination of vanaraja bird	18/11/2014	Jalakiasuti	76
	Vaccination of vanaraja bird	16/12/2014	Jalakiasuti	20
	Vaccination of vanaraja bird	29/01/2015	Jalakiasuti	43



Animal health camps etc in TSP village ChAmua, ASSAM



Animal health camps etc. in TSP village Khurha Chapka, Jharkahnd

6. Impact

The TSP programme is being implemented in different villages since 2011-12. During the last 5 years, the major interventions in these villages were focused on rainwater management, nutrient management & soil health, improved crop production technologies including plant protection. The impacts of different interventions in enhancing crop productivity and profitability in different villages are presented in this section.

6.1. Rainwater management

One of the major emphases during the period was on augmenting rainwater availability through its efficient use by adopting site-specific rainwater harvesting strategies. In different TSP villages of Bhiwara district, *in-situ* moisture conservation through ridges & furrow method or compartmental bunding in maize increased yields by 19-33% with additional income of Rs. 5331-7200/ha compared to farmers' practice. Supplemental irrigation enhanced yield of groundnut by 22% and that of maize by 24-45% compared to no supplemental irrigation. Similarly, supplemental irrigation in wheat gave 29-35% higher grain yield with additional returns of Rs. 14850-18405/ha. Mulching with paddy straw was demonstrated in farmers' fields of Jalakiasuti, Dhemaji district. The ginger yield increased by 60% (16000 kg/ha) and gave additional income of Rs. 60,000/ha compared to farmers' practice (no mulching). In village Tahkaal, Bastar district, bunding for irrigation in onion gave 128% higher yield with additional returns of Rs. 94658/ha. Similarly, two supplemental irrigations in onion resulted additional income of Rs. 101606/ha compared to farmers' practice of without supplemental irrigation. In Dadaki & Kumbhariguda villages of Kandhamal district, summer ploughing followed by increase in bund height for rice cultivation gave 26% higher yield (2700 kg/ha) and additional returns of Rs 5500/ha compared to farmers' practice. In Wadi & Zariya villages (Narmada district), drip irrigation in Bt cotton gave additional returns of Rs. 35420/ha with 37% higher yield compared to farmers' practice. Similarly, in groundnut, the pod yield increased by 17% with supplemental irrigation and gave Rs. 14120/ha higher returns compared to farmers' practice.

Impact of rainwater management interventions

Centre (Village/district)	Crop	Intervention	No. of farmers	Area covered (ha)	Yield (kg/ha)		% increase in yield over FP	Income from IP (Rs/ha)	Additional income over FP (Rs/ha)
					IP	FP			
Arjia									
Shyampura, Sarsiya, Rawatkhera, Barundni, Ganoli & Amargarh, Bhilwara district	Maize	Ridge & furrow	6	1.2	2145	1810	19	23590	5331
			4	0.8	1940	1460	33	29100	7200
		Compartmental bunding	6	1.2	2315	1850	25	26105	7185
			4	0.8	1870	1410	33	28050	6900
		Supplemental irrigation	23	4.6	2648	2140	24	29972	7080
12	2.4	2190	1510	45	32850	10200			

	Groundnut	Supplemental irrigation	03	0.6	1520	1250	22	68400	12150
Mohanpura & Baraundni, Bhilwara district	Wheat	Supplemental irrigation	61	-	3275	2530	29	44005	17035
Shyampura & Ganoli, Bhilwara district	Wheat	Supplemental irrigation	60	-	3310	2475	34	45350	18405
Kuraidya & Sarsiya, Bhilwara district	Wheat	Supplemental irrigation	74	-	3410	2590	32	49970	17900
Rawatkhera & Bilotha, Bhilwara district	Wheat	Supplemental irrigation	76	-	3845	2855	35	37695	14850
Biswanath Chariali									
Jalakiasuti, Dhemaji district	Capsicum	Mulching with black polythene	3	0.04	8000	-	-	240000	-
	Ginger	Mulching with paddy straw	18	0.50	16000	10000	60	160000	60000
Jagdalpur									
Tahkapal, Bastar district	Onion	Bunding for irrigation	12	9.56	5404	2366	128	216174	94658
	Onion	Supplemental irrigation (2 irrigation)	15	8.57	5801	2540	128	232041	101606
Phulbani									
Dadaki & Kumbhariguda, Kandhamal district	Rice	Summer ploughing and increase bund height	10	5	2700	2150	26	12000	5500
SK Nagar									
Wadi & Zariya, Narmada district	Bt cotton	Drip irrigation	-	-	3046	2226	37	117754	35420
	Groundnut	Sprinkler irrigation	-	-	2247	1913	17	86827	14120

IP: Improved practice; FP: Farmers' practice

6.2. Nutrient management

Demonstrations on nutrient management in various crops were conducted on about 400 farmers' fields in different TSP villages. In different TSP villages of Bhiwara district, integrated nutrient management (INM) involving use of recommended fertilizers + seed treatment with biofertilizers in different crops enhanced the crop yields by 27-90% compared to farmers' practice. Similarly, use of recommended fertilizers in different field crops resulted in 17-52% higher yield with additional returns of Rs 3200-9030/ha compared to farmers' practice. At village Jalakiasuti of Dhemaji district, INM in blackgram involving use of biofertilizers and chemical fertilizers enhanced seed yield by 67% and gave additional returns of Rs. 17533/ha. Demonstrations on balanced nutrition in rice at village Tahkapal, Bastar district, resulted in 35% higher yield and additional income of Rs. 23869/ha compared to farmers' practice. Similarly, at Ralyawan, Jhabua district, balanced nutrition in soybean gave 38% higher yield whereas in chickpea, seed treatment with molybdenum @ 1-2

g/kg seed produced 23% higher yield with additional returns of Rs 10128/ha compared to farmers' practice. In Dadaki & Kumbhariguda villages of Kandhamal district, INM involving use of both organic and chemical fertilizers in maize 43% higher yield compared to farmers' practice.

Impact of nutrient management interventions

Centre (Village/ district)	Crop	Intervention	No. of farmers	Area covered (ha)	Yield (kg/ha)		% increase in yield over FP	Income from IP (Rs/ha)	Addition al income over FP (Rs/ha)
					IP	FP			
Arjia									
Mohanpura, Shyampura, Sarsiya, Rawatkhera, Barundni, Ganoli & Amargarh, Bhilwara district	Maize	50:30 (N:P kg/ha) + PSB + <i>Azotobacter</i>	17	3.20	2240	168 0	33	25730	9134
	Blackgram	50:30 (N:P kg/ha) + PSB + <i>Rhizobium</i>	23	4.6	431	340	27	9031	4749
	Sesame	25:30 (N:P)	8	1.60	445	355	25	6839	3861
	Groundnut	20:30 (N:P) + PSB + <i>Rhizobium</i>	6	0.80	197	136	45	7168	6473
	Jowar (fodder)	50:30 (N:P kg/ha)	4	0.80	1200 0	950 0	26	17945	5625
	Jowar (Dual purpose)	50:30 (N:P kg/ha) + PSB + <i>Azotobacter</i>	2	0.40	1355	715	90	20818	7943
	Maize	Recommend ed dose of NP	12	2.40	1755	142 5	23	26325	4950
	Blackgram	Recommend ed dose of NP	02	0.40	362	276	31	38010	9030
	Groundnut	Recommend ed dose of NP	04	0.80	1420	121 0	17	63900	9450
	Soybean	Recommend ed dose of NP	04	0.80	415	335	24	16600	3200
	Sesame	Recommend ed dose of NP	02	0.40	160	105	52	19200	6600
Biswanath Chariali									
Jalakiasuti, Dhemaji district	Blackgram	Seed coating with <i>rhizobium</i> and PSB each @ 1.5 kg/ha along with 50% RD of NP and full K (RDF: 15:35:10 kg NPK/ha)	60	10	1000	600	67	26208	17533
Indore									
Ralyawan, Jhabua district	Soybean	Balanced nutrition (RDF + S)	163	41	1418	102 2	38	39996	11078

	Chickpea	Seed treatment with Mo @ 1-2 g/kg seed	42	11	1825	1488	23	54754	10128
Jagdarpur									
Tahkapal, Bastar district	Rice	Balanced nutrition (60:30:30 kg NPK/ha)	17	15.46	2679	1989	35	32144	23869
Phulbani									
Dadaki & Kumbhariguda, Kandhamal district	Maize	Application of organic and chemical fertilizers	7	2	3000	2100	43	11000	9000

IP: Improved practice; FP: Farmers' practice

6.3. Crop management

Crop productivity and profitability was improved in TSP villages through promotion of new crop varieties, diversified cropping systems, and better nutrient and pest management. In general, all the improved varieties/hybrids gave higher yields and net returns/ha compared to farmers'/local varieties. Improved varieties of different *kharif* crops gave 16-39% higher yield with additional net returns of Rs. 3037-8685/ha compared to local varieties in different TSP villages of Bhilwara district. Similarly, the increase in yield with use of improved varieties of *rabi* crops was 16-30%. In Jalakiasuti of Dhemaji district, the increase in crop yields ranged from 22% in potato (Kufri Pokhraj) to 117% in blackgram (KU-301) compared to local varieties. The additional income obtained with the use of improved varieties ranged from Rs 17500/ha in toria (TS-36) to Rs 72000/ha in turmeric (Megha Turmeric-1). In Kechki village of Latehar district, improved varieties of different crops gave 9-92% higher yields with additional net returns ranging from Rs 4656/ha to Rs 23132/ha compared to local varieties. Similarly, at Ralyawan village of Jhabua district, improved varieties of soybean gave 26-36% higher yield whereas wheat yield increased by 24-32% with improved varieties compared to local varieties. In Dadaki & Kumbhariguda villages of Kandhamal district, improved varieties of different *kharif* crops gave 33-100% higher yields whereas the yield increase was 20-60% with improved varieties of *rabi* crops compared to local varieties. In Wadi & Zariya villages (Narmada district), improved varieties of all crops performed better and gave 20-40% higher yields compared to local varieties.

Impact of improved varieties of rainfed crops

Centre (Village/ district)	Crop	Intervention (Improved varieties)	No. of farmers	Area covered (ha)	Yield (kg/ha)		% increase in yield over FP	Income from IP (Rs/ha)	Additional income over FP (Rs/ha)
					IP	FP			
Arjia (Mohanpura, Shyampura, Sarsiya, Rawatkhera, Barundni, Ganoli, Amargarh, Bhilwara district)									
<i>Kharif</i>	Maize	Bioseed-9881	40	8.00	2176	1756	24	24564	7073
		Hybrid -9637	40	8.00	2219	1745	27	25549	7964
		PM-3	96	19.2	1695	1395	22	25425	4500
	Blackgram	T-9	15	3.00	402	347	16	7578	3037
		TAU-1	15	3.00	437	354	23	8862	3633
		PU-31	06	1.2	245	190	29	25725	5775
	Clusterbean	RGC-936	16	3.20	432	326	33	6173	4555
		RGC 936	13	2.6	362	266	36	20150	4355
		RGC-1003	16	3.20	478	345	39	8325	5586
	Sesame	RT-46	20	4.00	175	128	37	4838	5008
		RT-46	21	4.2	195	148	32	23400	5640
	Groundnut	TAG-24	9	1.8	1612	1384	16	39374	8227
		TG37 A	04	0.8	1218	1025	19	54810	8685
Soybean	JS-335	09	1.8	1838	1450	27	14480	3840	
Horsegram	AK-42	07	1.4	310	243	28	22575	5775	
<i>Rabi</i>	Sorghum	SPV-15	12	2.4	960	765	25	20894	4319
	Jowar (fodder)	MP Chari	16	3.20	3224	2580	25	18845	6075
	Jowar (Dual purpose)	CSV-15	4	0.80	2755	2367	16	19934	6797
	Barley	RD -2035	35	0	2988	2378	26	42463	11750
	Mustard	Laxmi	336	-	1401	1076	31	32215	10173
	Chickpea	RSG-888	17	-	995	790	26	33947	9479
	Taramira	RTM-314	39	0	473	375	26	6333	2751
Biswanath Chariali (Jalakiasuti, Dhemaji district)									
<i>Kharif</i>	Maize	HQPM	10	1.0	4860	-	-	36679	-
	<i>Sali</i> paddy	Ranjit	54	12	6000	3600	67	37214	23364
	Blackgram	KU-301	32	2.4	1300	600	117	39591	30916
	Sesamum	Local	18	4.53	-	400	-	-	-
	Turmeric	Megha Turmeric-1	28	0.87	18000	12000	50	216000	72000
	Ginger	Nadia	18	0.50	16000	10000	60	160000	60000
	Potato	Pokhraj	163	2.5	22000	18000	22	220000	40000
<i>Rabi</i>	Toria	TS-36	94	50	1125	725	56	30348	17500
	Tomato	Avinash -II	5	0.13	18500	-	-	250000	-
		Rocky	52	0.5	18300	-	-	252000	-
	Banana	Borjahaji	17	0.63	18250	13000	40	182500	52500

Chianki (Kechki, Latehar district)									
<i>Kharif</i>	Rice	Arize -6444	40	8	5008	4600	9	40586	4656
	Maize	Rassi – 4212 (Hybrid)	282	3.15	4419	2300	92	37532	23132
	Pigeonpea	Bahar	78	4.10	1474	860	71	39192	21592
<i>Rabi</i>	Wheat	K-9107	304	9.44	2999	2000	50	29985	16285
	Gram	KPG-59	396	7.87	1000	650	54	26909	13959
	Rai	Shivani	260	28.37	750	410	83	9217	8147
	Lentil	K-75	353	21.3	847	450	88	15304	12704
Indore (Ralyawan, Jhabua district)									
<i>Kharif</i>	Soybean	JS-335	120	30	1487	1096	36	44600	11710
		RVS-2001-4	72	18	1257	998	26	34468	7611
<i>Rabi</i>	Wheat	HI-1418	226	56.5	3693	2840	30	55399	14966
		HI-8498	44	11	3788	3052	24	56813	11037
		HI-8683	51	12.75	3936	2747	32	59045	17845
	Chickpea	Janki – 9218	107	1042	1583	1061	49	55392	18777
Jagdalpur (Tandpal, Bastar district)									
<i>Kharif</i>	Rice	MTU-1010	23	17.32	3000	2228	35	36001	10000
Phulbani (Dadaki & Kumbhariguda, Kandhamal district)									
<i>Kharif</i>	Rice	Lalat	37	6	2800	2067	35	13000	7333
	Maize	Nirmal-51	17	3	3100	2000	55	11500	9500
	Groundnut	Kadiri-6	13	1	1200	900	33	17000	5000
	Greengram	TARM-1	20	2	300	200	100	5000	2000
	Blackgram	Pant U-30	20	1	300	210	43	6000	2000
	Cowpea	Gomti	20	2	5450	3050	79	39000	24500
	Yambean	Rajendra	8	1.25	12000	-	-	100000	-
<i>Rabi</i>	Mustard	M-27	55	6	347	220	58	3600	2000
	Tomato	BT-10	2	0.5	22000	16000	37	120000	45000
	Cabbage	Star plus	2	0.5	16000	-	-	100000	-
		Equatoria F1 hybrid	9	0.6	15000	-	-	110000	-
	Cauliflower	Kashmere F1 hybrid	9	1	12000	-	-	80000	-
		Garden pea	Rachana	15	2	5200	-	-	60000
	KSP-110		26	1.25	5500	-	-	62500	-
	G-20		10	1.0	5300	-	-	60000	-
	Potato	Jyoti	20	2	22000	16000	37	120000	60000
	Tomato	New Chiranjeev	21	1	20000	15000	33	120000	40000
	Brinjal	Blue Master	19	0.4	15000	12500	20	110000	25000
	Onion	N-53 Nashik Red	31	0.7	16000	10000	60	110000	40000
KSP 1700		10	1.0	14000	9000	56	100000	37000	

SK Nagar (Wadi & Zariya, Narmada district)									
Kharif	Maize	GM-2	40	10.52	2478	1798	38	32166	11053
	Pigeonpea	GT-101	26	10.52	1498	1207	24	43787	11254
	Clusterbean	GM-2	4	-	1310	1023	23	57912	13504
	Groundnut	GG-2	4	-	2350	1890	20	107570	21644
	Castor	GCH-7	40	-	2875	2380	20	86633	16512
Rabi	Sorghum (fodder)	CSV-21	26	10.52	11575	8253	40	40651	13292

6.4. Cropping systems

In different TSP villages of Bhiwara district, intercropping of maize + blackgram (2:2) gave 12-25% higher yield with additional returns of Rs. 9317-10050/ha compared to farmers' practice of maize cultivation. Similarly, groundnut + sesame intercropping (2:2) produced 5-15% higher yields compared to farmers' practice of groundnut cultivation. Among different intercropping systems demonstrated in Ralyawan village of Jhabua district, maize + cotton intercropping system gave 45% higher yield with additional returns of Rs 12149/ha compared to farmers' practice of sole soybean cultivation. In village Tahkapal of Bastar district, intercropping of niger in mango gave 53% higher yield than farmers' practice of mango plantation alone. In Dadaki & Kumbhariguda villages of Kandhamal district, among different intercropping systems, pigeonpea + radish intercropping gave 125% higher yield with additional income of Rs 22000/ha compared to farmers' practice of sole pigeonpea cultivation.

Impact of cropping system interventions

Centre (Village/district)	Crop	Intervention	No. of farmers	Area covered (ha)	Yield (kg/ha)		% increase in yield over FP	Income from IP (Rs/ha)	Additional income over FP (Rs/ha)
					IP	FP			
Arjia									
Mohanpura, Shyampura, Sarsiya, Rawatkhera, Barundni, Ganoli, Amargarh, Bhilwara district	Maize	Maize + blackgram (2:2)	6	0.80	2430	1944	25	28128	9317
			47	-	1650	1470	12	32100	10050
	Groundnut	Groundnut + sesame (2:2)	4	0.80	1755	1520	15	46184	8121
			33	-	1290	1225	5	62850	7725
Indore									
Ralyawan, Jhabua district	Soybean	Soybean + maize (SEY)	90	22.5	1506	1370	10	45190	4090
	Maize	Maize + cotton (MEY)	103	26	2985	2061	45	76149	12149
Jagdulpur									
Tahkapal, Bastar district	Mango	Mango plantation + niger intercrop	7	3.56	1209	789	53	30201	10507

Phulbani									
Dadaki & Kumbhariguda, Kandhamal district	Maize	Maize + cowpea (MEY)	25	5	5250	3350	57	29500	19000
	Pigeonpea	Pigeonpea + radish	10	2	2250	1000	125	42000	22000

6.5. Plant protection measures

Demonstrations on plant protection measures with optimum dose and time of pesticide application were conducted in different TSP villages. In general, recommended plant protection measures effectively controlled different pests and diseases, and gave higher crop yields compared to farmers' practices). The increase in crop yields ranged from 20% with use of quinalphos @ 2 ml/l for control of fruit and shoot borers in brinjal to 83% in cowpea due to efficient control of aphids in Badaki village of Kandhamal district.

Impact of plant protection measure interventions

Centre (Village/district)	Crop	Intervention (Control measures)	No. of Farmers	Area covered (ha)	Yield (kg/ha)		% increase in yield over FP	Income from IP (Rs/ha)	Additional income over FP (Rs/ha)
					IP	FP			
Biswanth Chariali									
Jalakiasuti, Dhemaji district	Potato	Spraying against late blight	163	2.5	22000	18000	22	220000	40000
	Tomato	Spraying against late blight	52	0.5	18300	-	-	252000	-
Jagdarpur									
Tahkapal, Bastar district	Groundnut	Weed management (One hand weeding at 35 DAS)	8	6.54	2189	1423	53	76627	49807
Phulbani									
Dadaki & Kumbhariguda, Kandhamal district	Paddy	BLB: Plantomycin @ 1 g/l Blast: Tricyclazole @ 1 g/l	14	3	2800	2000	40	13000	8000
	Cowpea	Aphid: Dimethoate @ 2 ml/l	10	1	5500	3000	83	40000	25000
	Greengram	Aphid: Dimethoate @ 2 ml/l	14	1	550	400	38	13000	6000

Groundnut	Termites: Chlorpyriphos @ 2 ml/l	23	2	1200	900	33	17000	5000
Mustard	Saw fly: Quinalphos @ 2 ml/l	20	2	320	190	68	3800	2000
Garden pea	Aphid: Dimethoate @ 2 ml/l	26	1.25	5500	-	-	62500	-
Cauliflower	Leaf eating insects: Quinalphos @ 2 ml/l	9	1	12000	-	-	80000	-
Cabbage	Leaf eating insects: Quinalphos @ 2 ml/l	9	0.6	15000	-	-	110000	-
Tomato	Fruit and shoot borer: Quinalphos @ 2 ml/l Bacterial wilt: Plantomycin @ 1 g/l	21	1	20000	15000	33	120000	40000
Brinjal	Fruit and shoot borer: Quinalphos @ 2 ml/l	19	0.4	15000	12500	20	110000	25000
Onion	Seed treatment with Quavator 1 g/l; Thrips: Dimethoate @ 2 ml/l	31	0.7	16000	10000	60	110000	40000

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Dr. Ch. Srinivasa Rao, Director, CRIDA visits AICRPDA-TSP village, Jalakia Suti Dhemaji district, Assam



Dr. G. Ravindra Chary, Project Coordinator (Dryland Research) in a field visit to AICRPDA- TSP village, Nalaka Kua, Bhilwara district, Rajasthan

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