

# Enhancing chickpea production in Rainfed Rice Fallow Lands (RRFL) of Chhattisgarh and Madhya Pradesh states of India following Improved Pulse Production and Protection Technologies (IPPPT)

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**NFSM**

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**International Crops Research Institute  
for the Semi-Arid Tropics**

***NFSM-Progress Report 2008-09  
(Restricted Circulation)***

**Enhancing chickpea production in Rainfed Rice Fallow Lands (RRFL) of Chhattisgarh and Madhya Pradesh states of India following Improved Pulse Production and Protection Technologies (IPPPT)**

**Submitted by:**

International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), Indira Gandhi Krishi Vishwavidyalaya (IGKV), Raipur, CG and Jawharlal Nehru Krishi Vishwa Vidyalaya (JNKVV), Jabalpur, MP, collaborative work on “Enhancing chickpea production in rainfed rice fallow lands (RRFL) of Chhattisgarh and Madhya Pradesh states of India following Improved Pulse Production and Protection Technologies (IPPPT)”.



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## **Annual Progress Report (2008- 2009)**

**Title: Enhancing chickpea production in rainfed rice fallow lands (RRFL) of Chhattisgarh and Madhya Pradesh states of India following improved pulse production and protection technologies (IPPPT)**

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**Executive Agency:** International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), Patancheru – 502324, Andhra Pradesh

**Operational Area:** Chhattisgarh and Madhya Pradesh

**Target districts:** Chhattisgarh - Raipur, Durg, Rajnandgaon, Kabirdham  
Madhya Pradesh - Jabalpur, Damoh, Rewa, Satna

**Implementing Agency:** ICRISAT, Patancheru, AP

**Collaborating Agency:**

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## 1. Executive summary

### Summary – Activities 2008-09

- Harnessing Improved Pulse Production and Protection Technology (IPPT) in the Rainfed Rice Fallow Lands (RRFL) of Chhattisgarh (CG) and Madhya Pradesh (MP) is the overall objective of the project. In earlier investigations **Chickpea** was identified as the most suitable pulse that can successfully be grown in the RRFL, hence chosen as a candidate crop to be promoted in selected districts and villages of RRFL of CG and MP using IPPT. The time line followed for carrying out the activities of the project during 2008-09 is given in (Table 1).
- The RRFL of CG and MP consists of a range of soil types such as shallow-sandy loam (Entisols, locally known as *Mattassi* in CG), and deep vertisols (heavy soil texture, locally known as *Kanhar-Dorsa* in CG or *Kali Matti* in MP).
- Deep vertisols (*Kanhar-Dorsa*) RRFL are more suitable to increase the production and productivity of **Chickpea** as a second crop. Therefore selection of sites and farmers were mostly restricted to *Kanhar-Dorsa* soils.
- Rainfed *Mattassi* and other shallow types of soils may not be promoted under double cropping with chickpea or any other crop without substantial irrigation backup.
- Villages and farmers in each of the four target districts in CG (Raipur, Durg, Kabirdham and Rajnandgaon) and MP (Jabalpur, Rewa, Damoh and Satna) were selected randomly following informal participatory rural appraisals (PRAs). Attempts were made to establish on-farm activities in a cluster by forming groups of farmers in each village in a district.
- To achieve the milestones under each objective, three farmers' participatory activities: 1) Farmers participatory variety selection (**PVS**), 2) IPPT demonstration, and 3) Village level seed system (**VLSS**), were conducted in the targeted villages. Additionally, a 4<sup>th</sup> activity on on-station evaluation of newly developed improved varieties along with established varieties of chickpea was conducted at university farms of IGKV, Raipur, CG and JNKVV, Jabalpur, MP.
- Site specific components of IPPT such as seeds of improved chickpea cultivars, seed treatment with fungicides (Thiram, Bavistin) and Rhizobium,

fertilizer application, line sowing following locally available seed cum fertilizer drill and or local adopted methods for chickpea were used in establishing the trials (Table 2).

### **PVS & IPPPT**

- In the **PVS trials**, the chickpea variety JG 74 recorded highest grain yield both in CG (2.38 t ha<sup>-1</sup>, district-Kabirdham) and MP (2.02 t ha<sup>-1</sup>, district-Jabalpur). The chickpea variety JG 74 was preferred not only because of its high yield, but also because of its desirable grain size. The other preferred variety at both the states across locations was JG 315 (Table 3).
- A total **592 farmers'** participatory **IPPPT demonstrations (CG =192 and MP = 400)** were conducted with a success rate of 90 % in CG and 100% in MP during 2008-09 crop season. In CG, 19 trials failed because of late sowing and poor crop stand hence data were collected from 173 trials (Table 4).
- In general the IPPPT demonstration with irrigation at crop establishment and flowering (wherever possible) were impressive. Out of **400 IPPPT** demonstrations conducted in farmer's fields in MP, JG 74 recorded highest yield (1.73 t ha<sup>-1</sup>). Similarly, out of 173 IPPPT demonstrations harvested in CG, chickpea variety JG 11 gave highest yield 1.29 t ha<sup>-1</sup> (Table 5).
- Based on the data collected from 50 farmers to compare the advantage of IPPPT over local farmer practices of chickpea production in the RRFL of CG and MP, IPPPT gave 34 to 60 % yield advantage across locations and farmers in each target district of the state (Table 6).

### **Seed System:**

- Seed produced in **VLSS** was 15.23 t from 13.38 ha (9.06 t from 7.28 ha in CG, 6.17 t from 6.10 ha in MP), including all varieties across locations in CG and MP (Table 7). This seed will be sufficient to cover 203.06 ha of additional area during 2009-10 crop season.
- Approximately 20 % of the total chickpea grain production in **IPPPT** demonstrations was kept as seed (CG = 22.83 t, MP = 20.93 t) by the participating farmers at individual house-hold level (Table 8). Hence, total

seed produced and stored from VLSS and IPPPT at village and district level is 31.89 t in CG and 27.10 t in MP is sufficient to cover 425.2 ha in CG and 361.33 ha in MP during 2009-10 crop season (Table 9).

- IPPPT package was highly profitable and cost effective. Net return by using IPPPT was 110% in CG and 131% in MP higher than local farmer practices (Table 10).
- In **on-station evaluation**, out of nine-improved chickpea varieties, the performance of JG 11 was superior ( $1.85 \text{ t ha}^{-1}$ ) than other tested genotypes at IGKV, Raipur, CG, and among the 4 improved chickpea varieties evaluated at JNKVV, Jabalpur, MP, JG 315 was the highest yielder ( $1.57 \text{ t ha}^{-1}$ ) than other tested varieties (Table 11).

### **Capacity building**

- IPPPT orientation training was conducted in five villages of CG and MP each during 2008-09 crop season to educate farmers on major production constraints and their management practices. Total 398 farmers (CG = 129, MP = 269) participated training in target villages (Table 12).

## 2. Introduction

Chickpea is one of the most suitable crops that can be grown profitably on residual moisture in heavy soils (*Kanhar-Dorsa*) in RRFL with minimum irrigation (one irrigation either at crop establishment and or at flowering). Selection of RRFL *Kanhar-Dorsa* with minimum irrigation is on lines with central and state govt. supported initiatives to bring RRFL into double cropping by cultivating chickpea as a profitable second crop. There is a scope for expanding chickpea production in >500,000 ha with limited irrigation in rainfed rice fallow lands: (*Kanhar-Dorsa*) soils in the states of Chhattisgarh and Madhya Pradesh.

However farmers having *Kanhar-Dorsa* soils in the states of Chhattisgarh and Madhya Pradesh have limited access to the improved high yielding varieties and improved management practices for Chickpea. These farmers have shown interest in cultivation of improved high yielding chickpea varieties with Improved Pulse Production and Protection Technologies (IPPPT). Minimal irrigation is a pre-requisite to recharge rice fallows (with adequate residual moisture) and utilize it to support the second crop of Chickpea, as it is more adaptable and profitable (more remunerative price) in comparison to other crops. The proposal intends to promote high yielding wilt resistant/tolerant chickpea varieties developed by ICRISAT, JNKVV and IGKV in partnership with ICAR, SAUs in *Kanhar-Dorsa* soils using IPPPT.

Sowing of chickpea and crop establishment in RRFL- *Kanhar-Dorsa* depends upon the termination of monsoons. Normally rains continue up to the end of September and chickpea can be sown as follows:

- **Unirrigated early sown: Third week of September to Second week of October**
- **Unirrigated/partially irrigated timely sown: Last week of October- Second week of November**
- **Irrigated late sown: First week of December**

There is ample scope for the expansion of high yielding short –medium duration chickpea varieties through IPPPT in the RRFL to make chickpea production more

economical and sustainable. The project intends to promote high yielding wilt resistant/tolerant chickpea varieties developed by ICRISAT, IGKV, Raipur and JNKVV, Jabalpur in RRFL of CG and MP using IPPPT.

**Goal:**

The goal of this project is “self sufficiency in pulse production through increased productivity by expanding improved pulse production and protection technologies (IPPPT), and establishing village level seed system in the rainfed rice fallow lands (RRFL) in India”.

**3. Objectives**

- 1 To empower farmers in improved pulses (chickpea) - production and protection technologies (IPPPT).
- 2 To introduce conservation agriculture technologies (seed and fertilizer drills) for crop establishment in RRFL.
- 3 To empower the farmers and participating local institutions, to establish village-level seed system (VLLS) of improved varieties of pulses (chickpea).
- 5 Research backstopping for traits and IPPPT components identified by the farmers and researchers in the target area.

**4. Activities: 2008-2009**

The time-line followed to achieve the activities under each objective in 2008-09 is given in Table 1 and the detail of each activity is as follows.

**4.1 Selection of sites:** Based on the remote sense data and identified rainy season fallows, 4 districts each in the state of CG (Raipur, Durg, Rajnandgaon, Kabirdham) and MP (Jabalpur, Damoh, Rewa, Satna) were selected as pilot districts for IPPPT interventions.

**4.2. Selection of soil types:** The RRFL of CG and MP consists of a range of soil types such as shallow sandy-loam (Entisols, locally known as *Mattassi* in CG), and deep vertisols, heavy soil texture (locally known as *Kanhar-Dorsa* in CG and *Kali Matti* in MP). Deep vertisols (*Kanhar-Dorsa*) soil types are more suitable for profitable

chickpea cultivation in RRFL. In these soils chickpea establishment using tractor drawn / bullock drawn seed drills and one irrigation at flowering-podding stage is more suitable to increase the production and productivity of chickpea as a second crop. In Entisols (*Mattassi*), chickpea or any other pulse cultivation is difficult with limited irrigation. Therefore, at the targeted district / village, farmers having *Kanhar-Dorsa* soil types were selected.

**4.3 Selection of villages/farmers:** Villages and farmers in each of the four target districts in CG (Raipur, Durg, Rajnandgaon, Kabirdham) and MP (Jabalpur, Damoh, Rewa, Satna) were selected randomly following informal participatory rural appraisals (PRAs). The objectives, methodology, and advantages of IPPPT were explained, and farmers' perception and preference of chickpea production were discussed. Twenty villages from four districts in MP (400 farmers) and six villages (192 farmers) from four districts in CG were selected for on-farm demonstrations of IPPPT and other activities during 2008-09 post-rainy seasons.

**4.4 IPPPT interventions:** To achieve the milestones under each objective, following on-farm and on-station farmers' participatory activities were conducted

- Farmer participatory variety selection (**PVS**)
- On-farm IPPPT demonstration
- Village level seed system (**VLSS**)
- On-station evaluation of improved chickpea varieties

**4.5. IPPPT components:** Site specific components of IPPPT: seeds of improved chickpea cultivars, seed treatment with fungicides (Thiram, Bavistin) and Rhizobium, fertilizer application, line sowing following locally available seed cum fertilizer drill and or locally adopted methods for growing chickpea were used in establishing the trials (Table 2).

## **5. Progress: 2008-2009**

**5.1 Participatory varietal selection (PVS):** The PVS trials were conducted in two locations in each district in CG and MP. Seven Chickpea varieties (JG 315, Vaibhav, Vijay, Digvijay, DCP 92-3, HC 5 and JG 74) in CG (50m<sup>2</sup> plot size) and six varieties (JG 11, JG 16, JG 315, JG 130, JAKI 9218 and JG 74) in MP (60 m<sup>2</sup> plot size) were evaluated in farmer's field (Table 3).

Variety JG 74 performed better in PVS trials in both the states. Highest grain yield of JG 74 was recorded in Kabirdham district (2.38 t ha<sup>-1</sup>) in CG and Jabalpur district (2.02 t ha<sup>-1</sup>) in MP. Farmers preferred JG 74 more because of its higher yield and desirable grain size. The other preferred variety at both the states across locations was JG 315. The overall performance of varieties across the districts is given in Table 3.

**5.2 IPPPT demonstration:** A total 592 farmer's participatory IPPPT demonstrations were conducted during 2008-09 crop season. IPPPT demonstrations were conducted in 192 farmer's field in six villages covering 119.01 ha (1-1.50 acre farmer<sup>-1</sup>) in four districts of CG and 400 farmers' field covering a total area of 80 ha (0.50 acre farmer<sup>-1</sup>) in 20 villages in MP. Success rate of IPPPT demonstrations was 90% in CG and 100% in MP (Table 4). In CG, 19 trials failed because of late sowing and poor plant stand, hence data was collected only from 173 trials.

In general, IPPPT demonstrations with one irrigation at crop establishment and flowering (wherever possible) were impressive. Out of 400 IPPPT demonstrations conducted in farmer's fields in MP, highest yield was recorded in JG 74 (1.73 t ha<sup>-1</sup>) in Jabalpur district (Table 5). Other varieties JG 130 and JG 16 also performed well in Rewa and Satna districts in MP. Out of 173 IPPPT demonstrations in CG, highest yield was recorded in JG 11 (1.29 t ha<sup>-1</sup>) in Rajnandgaon district. Performance of JG 11 was also good in Durg district in CG. The overall performance of IPPPT demonstrations is given in Table 5.

**5.2.1. IPPPT vs. local farmer practices:** To compare the advantage of IPPPT over local farmer practices in RRFL of CG and MP, data on local chickpea varieties yield using local farmer practices was collected from 50 farmers in each district. Gain in chickpea production using IPPPT over local farmer variety and practices were between 34-60% across the locations and farmers in target districts in CG and MP (Table 6). In

CG, maximum (60%) yield advantage using IPPPT was recorded in district Raipur; and maximum (56%) yield advantage was recorded in district Satna in MP.

### **5.3. Village Level Seed system (VLSS):**

**5.3.1. Seed production and storage:** Along with adoption of IPPPT practices, chickpea farmers in CG and MP were imparted training in seed production and storage for the next crop season. In VLSS, five improved varieties of chickpea; Vijay in CG, and JG 74, JG-315, JG-130 and JG-16 in MP were multiplied in farmer's field. Fifteen farmers in CG (2-5 farmer district<sup>-1</sup>) and 13 farmers in MP (3-4 farmer district<sup>-1</sup>) were selected for VLSS.

Total seed produced in VLSS was 15.23 t from 13.38 ha including all varieties across locations in CG and MP (Table 7). In CG, total seed production of improved variety Vijay was 9.06 t from 7.28 ha and in MP, total seed production of improved varieties was 6.17 t from 6.10ha - JG 315 (0.63 t), JG 130 (2.42 t), JG 16 (2.56 t) and JG 74 (0.56 t) (Table 7). Total seed produced 15.23 t in VLSS during 2008-09 season will be sufficient to cover an additional area of 203.06ha during 2009-10 crop season.

**5.3.2. Seed production and storage from IPPPT:** In addition to the seed produced in VLSS, approximately 20% of the total chickpea production in IPPPT demonstrations was kept as seed by the participating farmers at individual house hold level. Total grain yield from 573 IPPPT demonstrations during 2008-09 seasons was 218.77 t (114.14 t in CG and 104.63 t in MP) from 199.01 ha (119.01ha in CG and 80 ha in MP). Chickpea grain stored as seed (20%) at individual household level by participatory farmers is 43.76 t (CG- 22.83 t and MP- 20.93 t) and is sufficient to cover 583.47 ha during 2009-10 crop season (Table 8).

**5.3.3. Seed storage from VLSS and IPPPT:** Total seed stored from VLSS (100%) and IPPPT (20 % from total production of IPPPT) at village and district level is 58.99 t (31.89 t in CG and 27.10 t in MP). The seed stored will be sufficient to cover 786.53 ha of additional area [425.2 ha in CG and 361.33 ha in MP] during 2009-10 crop season (Table 9).

**5.4. Economics of IPPPT:** The recommended IPPPT package to grow chickpea in RRFL in CG and MP was highly profitable and cost-effective. On the basis of

information gathered from 573 participating farmers from the CG and MP, the cost of IPPPT package in chickpea production was 23% higher than the local farmer practices. However, net returns using IPPPT was 110% in CG and 131% in MP more than local farmer practices (Table 10). The benefit- cost ratio of chickpea production using IPPPT was estimated to be 4.87 in CG and 3.5 in MP (Table 10).

**5.5. On –station evaluation of improved chickpea varieties:** In on-station evaluation, nine chickpea varieties (JG -315, JG -11, BGD- 72, JG- 16, JG-130, JG 74 ICC-37, Vaibhav and Vijay) at IGKV, Raipur and four (JG 74, JG 130, JG 315 and JG 16) at JNKVV, Jabalpur research farms were evaluated for their performance under RRFL. Each variety was evaluated in non-replicated plots (12m<sup>2</sup> plot sizes in CG and 40 m<sup>2</sup> in MP). Out of nine varieties evaluated at IGKV research farm, Raipur, JG 11 recorded highest yield (1.85 t ha<sup>-1</sup>). Days of maturity ranged from 102-106 across the varieties. At JNKVV research farm, JG 315 was the highest yielder (1.57 t ha<sup>-1</sup>) followed by JG-16 (1.47 t ha<sup>-1</sup>). Maturity days ranged from 100 to 104 days across the varieties (Table 11).

**5.6. Capacity building:** The IPPPT orientation [including integrated nutrient management (INM), integrated pest management (IPM), and integrated disease management (IDM)] programs were conducted in five villages of CG and MP each during 2008-09 crop seasons to train farmers on major production constraints and their management. The IPPPT orientation programs were conducted three times during the crop season; before sowing, at flowering and pod formation stages to increase awareness among the participating farmers on biotic and abiotic constraints and their timely management. Total 398 farmers (CG-129, MP-269) attended training in target villages (Table 12). Further, hands–on training was also given to farmers during trial monitoring and their visits to the research institutions. Approximately 40 farmers participated in *Krishak Sammelan* held at IGKV, Raipur in February, 2009. Additionally, DoA and NFSM state initiatives also conducted *Kisan- melas* and seminars.

**5.7. Research backstopping:** During monitoring of the IPPPT demonstrations, biotic constraints such as soil borne diseases - collar rot (*Sclerotium rolfsii*) and dry root rot (*Rizoctonia bataticola*) were identified as constraints to chickpea crop in RRFL. The

incidence of these two diseases in chickpea sown in RRFL ranged from 5 to 10% irrespective of location and cultivar. Collar rot was recorded in early stages of chickpea when there was moisture in the field, and dry root rot was prevalent during the moisture stress and recorded at the maturity stage. Incidence of these diseases was more in non-participating farmers' fields (20-30%) as compared to participating farmer's fields in the targeted districts. R&D on the etiology and epidemiology of these diseases has been initiated at ICRISAT. Studies on standardization of resistance screening technique for the identification of resistant sources against these diseases have also been initiated.

## **6. Farmers' perceptions & expectations**

Approximately 400 farmers from CG and MP were exposed to the use of IPPPT to obtain higher grain yield in chickpea in RRFL. Interaction with the farmers at the time of data collection and also during NFSM-ICRISAT chickpea farmer's field days in the selected villages indicated that almost all the participated and neighbouring farmers were impressed and convinced with the advantage of the IPPPT and expressed their willingness to adopt these technologies in the coming crop season. Some of the farmers also stored their seeds (as given in Table 8) for the next season to adopt IPPPT. The farmer's are confident that they can grow chickpea and obtain higher yields by adopting IPPPT package in their rice fallows. They are convinced that chickpea has provided them proteinaceous grains, increased income and increased production of rice by improving soil fertility.

## 7. Salient findings

The salient findings in the year 2008-09 crop season are detailed below.

- 1 Work plan activities executed reasonably well in farmers' fields both in CG and MP although the project started late.
- 2 Medium-deep vertisols (*Kanhar-Dorsa*) were selected, as they are potential and suitable for profitable chickpea cultivation with minimum irrigation as a second crop.
- 3 Introduction of Zero-till seed and fertilizer drills, Roto-till seed cum fertilizers and Strip-till seed cum fertilizer drills helped in better crop establishment and fully utilizing the soil moisture left by the rainfed rice crop.
- 4 In Participatory varietal selection (PVS) trials, the chickpea variety JG 74 recorded highest grain yield and performed better both in CG and MP. Farmers' preferred JG 74 because of its higher yield and desirable grain size.
- 5 IPPPT demonstrations with irrigation support at crop establishment and flowering were impressive.
- 6 Success rate of IPPPT demonstrations was 100% in MP and 90% in CG. Among varieties evaluated in IPPPT demonstrations, JG 74 and JG 11 recorded higher yield in MP and CG, respectively.
- 7 IPPPT gave 34-60% yield advantage over local farmer practices in each target district of CG and MP.
- 8 Total seed produced and stored from VLSS is 15.23 t (CG- 9.06 t, MP- 6.17 t) including all varieties.
- 9 Total seed stored from VLSS (100%) and IPPPT (20 %) is 58.99 t and is sufficient to cover an additional RRFL area of 786.53 ha during 2009-10 season.
10. IPPPT package was highly profitable and cost effective for chickpea production as net return was 110% in CG and 131% in MP as compared to local farmers' practices.

## **8. Farmers' awareness activities in print and media**

Attempts were made to involve media right from the inception of the project, launching, and during monitoring and farmers orientation meetings. In these meetings, planners, policy makers, scientists from JNKVV, Jabalpur and IGKV, Raipur participated and emphasized the need of increasing pulse production in India and in this context the importance and suitability of RRFL for the profitable cultivation of chickpea and other water-use efficient pulses (Figure 1). During monitoring tours farmers were provided hands-on training on the biotic and abiotic constraints faced by them specifically on the identification of diseases and pests (Figure 2-3). This also provided an opportunity for scientists for collecting information on existing diseases and pests of chickpea and other pulses (e.g. lentil) for back up research (Figure 4). Total of 398 farmers participated in on-farm training in CG and MP. Pictorial evidences of work are given in the Figure 1 – 5.

### **Literature under preparation (Hindi and English)**

1. Farmers' friendly manual on improved chickpea production technologies in RRFL– under revision
2. Manual on village level seed system – under preparation
3. Frequently asked questions – under preparation

**Table 1. Planned time line for different activities conducted during I<sup>st</sup> year (2008-09) and II<sup>nd</sup> Year (2009-10)**

<b>Objective and Activity</b>	<b>I<sup>st</sup> Year (2008-09)</b>	<b>II<sup>nd</sup> Year (2009-10)</b>
Project submission	22 Aug 2008	-
Project sanction	1 Oct 2008	-
Fund release	18 Nov 2008	-
Project launch	CG: 11 – 12 Nov 2008 MP: 31 Oct – 1 Nov 2008	-
<b>Action plan</b>		
Participatory Rural Appraisals for <ul style="list-style-type: none"> <li>• Selection of villages</li> <li>• Selection of farmers</li> <li>• Base line data collection on constraints and opportunities</li> <li>• Soil sampling and analysis for micronutrient deficiency</li> <li>• Identification of seed cum fertilizer drill, tillage machineries</li> <li>• Purchase seed cum fertilizer drill, tillage machineries</li> <li>• Deploying tillage machineries to targeted village in each district</li> </ul>	Oct – Nov 2008 Oct – Nov 2008 To be done 2009-10 To be done 2009-10 Jan – 2009 In –process In –process	- - - - - - -
Appointment of staff <ul style="list-style-type: none"> <li>• Research Associates</li> <li>• Visiting Scientist</li> </ul>	MP: Feb 2009	CG: July 2009 ICRISAT: May 2009
<b>Execution: On-farm and on- station IPPPT components</b>		
<ul style="list-style-type: none"> <li>• Farmer's orientation</li> <li>• IPPPT components distribution in target villages</li> <li>• Crop establishment</li> </ul>	Oct – Nov 2008 Oct – Nov 2008 Oct – Nov 2008	- - -
<b>Monitoring</b>		
Crop monitoring <ul style="list-style-type: none"> <li>• Vegetative stage</li> <li>• Flowering stage</li> <li>• Maturity stage</li> </ul>	Jan 2009 (NFSM & Project team) Feb 2009 (NFSM & Project team) Mar 2009 (Project team)	- - -
<b>Data collection and harvesting</b>	March and April 2009	
<b>Capacity building</b>		
Farmers' participation <ul style="list-style-type: none"> <li>• Kisan Mela at village and University level</li> <li>• Farmers' visit and training on IPPPT</li> <li>• Training on seed storage at village level</li> </ul>	Feb 2009 Dec, Jan & Feb 2009 -	- - Apr 2009
<b>Feedback and correction</b>		
<ul style="list-style-type: none"> <li>• Data compilation and analysis</li> <li>• Report writing</li> <li>• Tentative work plan for 2009-2010</li> </ul>	- - -	June – July 2009 July – Aug 2009 Aug – 2009

**Table 2. Constraints and interventions/ solutions deployed in IPPPT – on farm chickpea demonstrations in the target districts of RRFL of Chhattisgarh and Madhya Pradesh, 2008-09 crop season**

Constraints	IPPPT – Interventions/ Solutions	
	Chhattisgarh	Madhya Pradesh
Seed	Improved varieties –JG 315, Vaibhav, Vijay, Digvijay DCP 92-3, HC-5 and JG 74	Improved varieties – JG 11, JG 16, JG 315, JG 130 JG 74 and JAKI 9218
Soil & seed borne diseases/pests	Seed treatment (g kg <sup>-1</sup> ) Bavistin 2.5	Seed treatment (g kg <sup>-1</sup> ) Thiomethoxin 3, Bavistin 2 and Vitavax 2
Crop establishment	Seed –cum fertilizer drills/ local methods	Seed –cum fertilizer drills/local methods
Diseases (wilt/root rot)	Resistance cultivar against wilt and root rot	Resistance cultivar against wilt and root rot
Insect –pest <i>Helicoverpa</i> Pod borer	Pheromone traps @ 4 acre <sup>-1</sup> Monocrotophos 2.0 ml liter <sup>-1</sup> of water during flowering and podding stage	Pheromone traps@ 4 acre <sup>-1</sup> Monocrotophos 2.0 ml liter <sup>-1</sup> of water during flowering and podding stage
Fertilizer NPK – (kg/ha)	20: 50: 20	20: 60: 25
Micronutrient	ZN, B & MB- Not used	ZN, B & MB- Not used
Bio-fertilizer	<i>Rhizobium melyorizha</i>	<i>Rhizobium melyorizha</i>
Weed control	Pendimethalin & hand weeding	Pendimethalin & hand weeding
Capacity building / training	Hands on training on project objective and IPPPT	Hands on training on project objective and IPPPT
Monitoring	Periodical: 3-4 times	Periodical: 3-4 times

**Table 3. Performance of chickpea varieties (Yield t ha<sup>-1</sup>) in the farmers' participatory varietal selection (PVS\*) trials conducted in farmers' field in the targeted districts of Chhattisgarh and Madhya Pradesh, 2008-09 crop season**

Variety	District/ Yield (t ha <sup>-1</sup> )				Mean
	Raipur	Durg	Rajnandgaon	Kabirdham	
<b>Chhattisgarh</b>					
JG 315	1.06	1.56	1.00	2.28	1.48
Vaibhav	1.02	1.61	1.40	2.33	1.59
Vijay	0.94	1.42	1.40	2.06	1.46
Digvijay	0.80	-	-	-	
DCP92-3	-	1.52	-	-	
HC-5	-	-	1.00	-	
JG 74	-	-	-	2.38	
<b>Madhya Pradesh</b>					
	Jabalpur	Rewa	Satna	Damoh	
JG 11	1.80	1.21	1.00	0.65	1.17
JG 16	1.99	1.37	1.45	0.85	1.42
JG 315	1.89	1.42	1.33	1.00	1.41
JG 130	1.83	1.45	1.41	1.15	1.46
JG 74	2.02	1.50	1.48	1.30	1.58
JAKI 9218	1.60	1.23	1.35	1.00	1.30

\* PVS trials with 6-7 improved chickpea varieties were conducted in plot 50-60m<sup>2</sup> to each variety in 1-4 farmers' field in targeted village.

**Table 4. Success (%) of IPPPT demonstrations conducted in farmers' field in the targeted districts of Chhattisgarh and Madhya Pradesh, 2008-09 crop season**

State/ District	IPPPT demonstrations (No)*		Success (%)
	Sown	Harvested	
<b>Chhattisgarh</b>			
Raipur	54	50	92.59
Durg	46	45	97.82
Rajnandgaon	32	26	81.25
Kabirdham	60	52	86.66
<b>CG Total</b>	<b>192</b>	<b>173</b>	<b>90</b>
<b>Madhya Pradesh</b>			
Jabalpur	100	100	100
Rewa	100	100	100
Damoh	100	100	100
Satna	100	100	100
<b>MP Total</b>	<b>400</b>	<b>400</b>	<b>100</b>
<b>Grand Total</b>	<b>592</b>	<b>573</b>	<b>97</b>

\*Each IPPPT demonstration was conducted in 0.1 - 2.5 ha in Chhattisgarh and 0.08 to 0.20 ha in Madhya Pradesh.

**Table 5. Performance (Yield t ha<sup>-1</sup>) of IPPPT demonstrations conducted in farmers' field in the targeted districts of Chhattisgarh and Madhya Pradesh, 2008-09 crop season**

State / District	Variety	Farmer (No)	Village	Area sown (ha)	Total yield (t)	Yield (t ha <sup>-1</sup> )
<b>Chhattisgarh</b>						
Raipur	Vaibhav	50	Kalai, Farhada, Khutgaon	20.24	13.95	0.69
Durg	JG 11	45	Jatadah	24.19	26.79	1.11
Rajnandgaon	JG 11	26	Jangalpur	25.19	32.44	1.29
Kabirdham	Vaibhav	52	Dharampura	49.39	40.96	0.83
<b>CG Total</b>	<b>2</b>	<b>173</b>	<b>6</b>	<b>119.01</b>	<b>114.14</b>	
<b>Madhya Pradesh</b>						
Jabalpur	JG 74	100	Paroda, Ched, Gwari, Keolari/Pata, Urdua	20	34.68	1.73
Rewa	JG 130	100	Bidwa, Khokham, Jhiriva, Ghuraihata, Hardua Tonga	20	27.37	1.37
Damoh	JAKI 9218	100	Bimori, Halgaj, Mudari, Riyana, Hinota	20	14.53	0.73
Satna	JG 16	100	Katahaha, Gora, Magraj, Bachhra, Parsiya	20	28.05	1.40
<b>MP Total</b>	<b>4</b>	<b>400</b>	<b>20</b>	<b>80</b>	<b>104.63</b>	
<b>Grand Total</b>	<b>6</b>	<b>573</b>	<b>26</b>	<b>199.01</b>	<b>218.77</b>	

**Table 6. Gain (%) of IPPPT demonstrations over local farmers' practices conducted in farmers' field in the targeted districts of Chhattisgarh and Madhya Pradesh, 2008-09 crop season**

State / District	Yield (t ha <sup>-1</sup> )		Gain (%)
	IPPPT	Local farmer practices*	
<b>Chhattisgarh</b>			
Raipur	0.69	0.43	60
Durg	1.11	0.75	48
Rajnandgaon	1.29	0.96	34
Kabirdham	0.83	0.60	38
<b>Madhya Pradesh</b>			
Jabalpur	1.73	1.20	44
Satna	1.40	0.90	56
Rewa	1.37	0.95	44
Damoh	0.73	0.54	35

\* Local farmer practices based on data collected from 50 farmers in each district.

**Table 7. Seed production (t) in VLSS trials conducted in farmers' field in the targeted districts of Chhattisgarh and Madhya Pradesh, 2008-09 crop season**

State / District	Villages (No)	Farmer (No)	Variety	Area (ha)	Seed sown (kg)	Seed production (t)
<b>Chhattisgarh</b>						
Raipur	1	4	Vijay	1.62	160	0.99
Durg	1	2	Vijay	2.02	160	3.43
Rajnandgaon	1	4	Vijay	1.62	160	2.34
Kabirdham	1	5	Vijay	2.02	200	2.30
<b>CG Total</b>	<b>4</b>	<b>15</b>	<b>1</b>	<b>7.28</b>	<b>680</b>	<b>9.06</b>
<b>Madhya Pradesh</b>						
Jabalpur	4	4	JG 315	0.51	30	0.63
			JG 130	0.51	30	0.76
			JG 16	0.51	30	0.83
Satna	3	3	JG 130	0.51	30	0.44
			JG 16	1.01	60	0.92
Rewa	3	3	JG 130	1.01	60	0.82
			JG 16	0.51	30	0.35
Damoh	2	3	JG 130	0.51	30	0.40
			JG 16	0.51	30	0.46
			JG 74	0.51	30	0.56
<b>MP Total</b>	<b>12</b>	<b>13</b>	<b>4</b>	<b>6.10</b>	<b>360</b>	<b>6.17</b>
<b>Grand Total</b>	<b>16</b>	<b>28</b>	<b>5</b>	<b>13.38</b>	<b>1040</b>	<b>15.23</b>

-Total seed production of improved varieties: Vijay - 9.06 t in CG; JG 315 - 0.63 t, JG 130 - 2.42 t, JG 16 - 2.56 t and JG 74 - 0.56 t in MP.

-Total seed produced 15.23 t in VLSS during 2008-09 season will be sufficient to cover an additional area of 203.06ha, during 2009-10 crop season.

**Table 8. Chickpea grain production (t) and storage (20% at individual house-hold level) from the IPPPT trials conducted in farmers' field in the targeted districts of Chhattisgarh and Madhya Pradesh, 2008-09 crop season**

State / District	Village (No)	Farmer (No)	Variety	Area (ha)	Production* (t)	Seed** (t)
<b>Chhattisgarh</b>						
Raipur	3	50	Vaibhav	20.24	13.95	2.79
Drug	1	45	JG 11	24.19	26.79	5.36
Rajnandgaon	1	26	JG 11	25.19	32.44	6.49
Kabirdham	1	52	Vaibhav	49.39	40.96	8.19
<b>CG Total</b>	<b>6</b>	<b>173</b>	<b>2</b>	<b>119.01</b>	<b>114.14</b>	<b>22.83</b>
<b>Madhya Pradesh</b>						
Jabalpur	5	100	JG 74	20	34.68	6.94
Satna	5	100	JG 16	20	28.05	5.61
Rewa	5	100	JG 130	20	27.37	5.47
Damoh	5	100	JAKI 9218	20	14.53	2.91
<b>MP Total</b>	<b>20</b>	<b>400</b>	<b>4</b>	<b>80</b>	<b>104.63</b>	<b>20.93</b>
<b>Grand Total</b>	<b>26</b>	<b>573</b>	<b>6</b>	<b>199.01</b>	<b>218.77</b>	<b>43.76</b>

\*Total chickpea grain production from IPPPT trials.

\*\*20% of the chickpea grain production in IPPPT trials stored as seed at individual house -hold level by the participating farmers.

**Note:** A total of 43.76 t production stored as seed is sufficient to cover 583.47ha during 2009-10 crop season.

**Table 9. Seed storage (t) from VLSS and IPPPT trials conducted in farmers' field in the targeted districts of Chhattisgarh and Madhya Pradesh, 2008-09 crop season**

State/District	Village (No)	Farmer (No)	Variety	Seed stored (t)		
				VLSS*	IPPPT**	VLSS+IPPPT
<b>Chhattisgarh</b>						
Raipur	3	50	Vaibahv	-	2.79	2.79
	1	4	Vijay	0.99	-	0.99
Durg	1	45	JG 11	-	5.36	5.36
	1	2	Vijay	3.43	-	3.43
Rajnandgaon	1	26	JG 11	-	6.49	6.49
	1	4	Vijay	2.34	-	2.34
Kabirdham	1	52	Vaibahv	-	8.19	8.19
	1	5	Vijay	2.30	-	2.30
<b>CG Total</b>	<b>10</b>	<b>188</b>	<b>3</b>	<b>9.06</b>	<b>22.83</b>	<b>31.89</b>
<b>Madhya Pradesh</b>						
Jabalpur	5	100	JG 74	-	6.94	6.94
	4	4	JG 315	0.63	-	0.63
			JG 130	0.76	-	0.76
			JG 16	0.83	-	0.83
Satna	5	100	JG 16	-	5.61	5.61
	3	3	JG 130	0.44	-	0.44
			JG 16	0.92	-	0.92
Rewa	5	100	JG 130	-	5.47	5.47
	3	3	JG 130	0.82	-	0.82
			JG 16	0.35	-	0.35
Damoh	5	100	JAKI 9218	-	2.91	2.91
	2	3	JG 130	0.40	-	0.40
			JG 16	0.46	-	0.46
			JG 74	0.56	-	0.56
<b>MP Total</b>	<b>32</b>	<b>413</b>	<b>5</b>	<b>6.17</b>	<b>20.93</b>	<b>27.10</b>
<b>Grand Total</b>	<b>42</b>	<b>601</b>	<b>8</b>	<b>15.23</b>	<b>43.76</b>	<b>58.99</b>

\* VLSS: 100% of total production

\*\* IPPPT: 20% of total production at individual house-hold level

**Note:** Seed stored from VLSS (100%) and IPPPT trials (20% from total production of IPPPT trials) will be sufficient to cover 786.53ha of additional areas during 2009-10 crop season

**Table 10. Net return (%) and benefit cost ratio gains from IPPPT trials conducted in farmers' field in the targeted districts of Chhattisgarh and Madhya Pradesh, 2008-09 crop season**

<b>Particulars</b>	<b>IPPPT</b>	<b>Local farmer practices</b>	<b>% gain of IPPPT over local farmer practices</b>
<b>Chhattisgarh</b>			
Input cost Rs./ha	6990	5700	-23
Yield kg/ha	1704	931	83
Gross return Rs./ha	34085	14865	129
Net return Rs./ha	27095	12900	110
BC ratio	4.87	2.60	
<b>Madhya Pradesh</b>			
Input cost Rs./ha	11350	9990	-14
Yield kg/ha	1544	864	79
Gross return Rs./ha	40138	23221	73
Net return Rs./ha	28788	12481	131
BC ratio	3.5	2.32	

**Table 11. Varietal performance (Yield t ha<sup>-1</sup>) of on-station trials conducted in institutional farm of the IGKV, Raipur and JNKVV, Jabalpur, 2008-09 crop season**

<b>Varieties</b>	<b>Days to maturity</b>	<b>Yield (t ha<sup>-1</sup>)</b>
<b>Chhattisgarh</b>		
JG 11	103	1.85
BGD 72	106	1.65
JG-130	102	1.44
JG 74	100	1.44
JG 315	104	1.44
ICCC-37	103	1.40
Vaibhav	103	1.24
JG 16	104	1.24
Vijay	102	1.03
<b>Total</b>		<b>12.73</b>
<b>Madhya Pradesh</b>		
JG-130	102	1.08
JG 74	100	1.40
JG 315	104	1.57
JG 16	104	1.47
<b>Total</b>		<b>5.52</b>
<b>Grand Total</b>		<b>18.25</b>

**Table 12. Capacity building activities conducted in the targeted districts of Chhattisgarh and Madhya Pradesh**

<b>Title of training</b>	<b>Village</b>	<b>Farmer (No)</b>	<b>Duration (days)</b>
<b>Chhattisgarh</b>			
IPPPT–orientation	Kalai	23	1
INM	Khutgaon	18	1
IPM: Pod borer	Jangalpur	25	1
IPM: Storage pests	Jatadah	28	1
Seed production technology	Dharampura	35	1
<b>CG Total</b>	<b>5</b>	<b>129</b>	<b>5</b>
<b>Madhya Pradesh</b>			
IPPPT –Orientation	Paroda	50	1
INM	Gidhora	45	1
IPM: Pod borer	Gora	50	1
IPM: Storage pests	Bamori	60	1
Seed production technology	Patan	64	1
<b>MP Total</b>	<b>5</b>	<b>269</b>	<b>5</b>
<b>Grand Total</b>	<b>10</b>	<b>398</b>	<b>10</b>

**Note:** Non–structured hands –on training were given during trial monitoring and farmers’ visits to research institutes.

-Additionally Seminars and *Kisan–melas* were also provided to the participatory farmers conducted by DoA and NFSM –state initiatives.

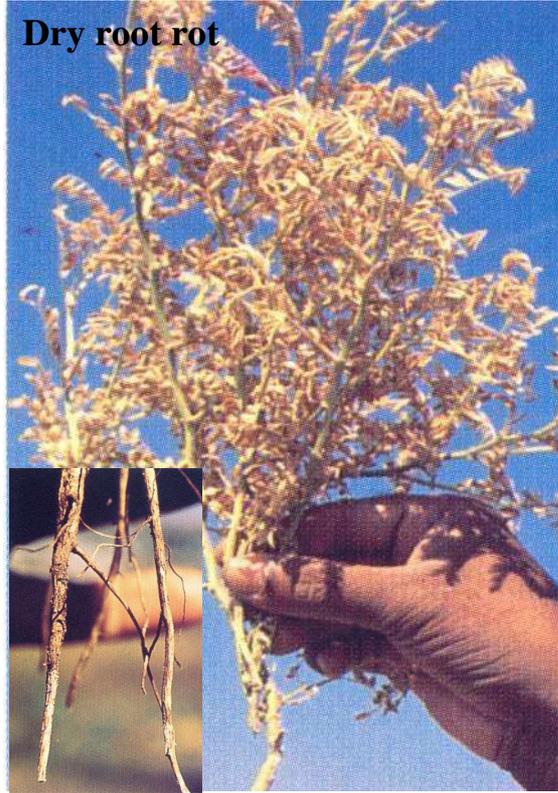
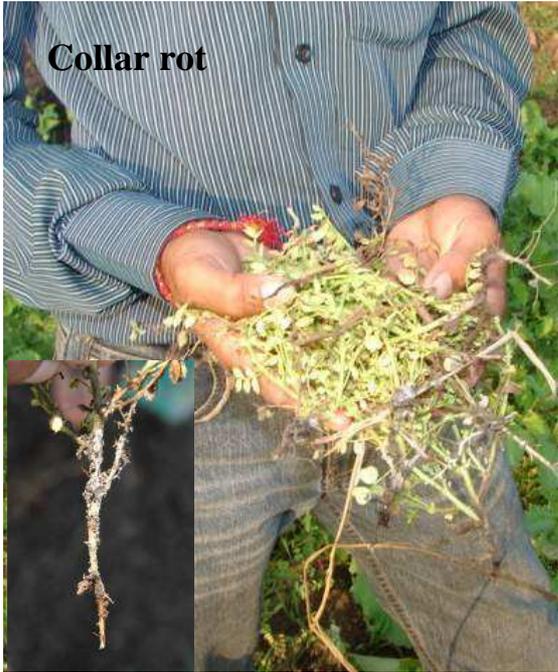




**Figure 2.** IPPPT demonstrations- monitoring and hands on training



**Figure 3.** On-station trials at Jabalpur (MP) and Raipur (CG)



**Figure 4.** Backstop research- collar rot and dry root rot



**Figure 5.** IPPPT components- seed /soil application

## **11. Work-plan 2009-10 (Pre-chickpea)**

### **Initiatives and activities**

#### **11.1. Base line data collection – Parameters**

##### **Village profile**

1. Access to infrastructure, organizations, institutions
2. Distribution of Households
3. Most preferred pulses grown
4. Most preferred pulses consumed
5. Chickpea specific information

##### **Group profile**

1. Group Number
2. Consumption preference for pulses
3. Production preference for pulses
4. Is area of chickpea increasing, decreasing or constant
5. What are the important constraints to growing chickpea (discuss and then rank)

##### **Individual farmer profile (participating and non-participating)**

1. Farmers identity: district, block, village, name of farmer, gender, age, education
2. Family size (Nos)
3. Most important sources of income (Rs. /years) for the household
4. Size of land holding (acres)
5. Cropping Pattern
6. Chickpea Cultivation
7. Willingness to grow chickpea if not growing
8. Resource use Pattern and Crop Yields (Information to be collected / acre)
9. Total Production (Production per acre area under chickpea)
10. Utilization of chickpea (qty in kg)
11. Other technology (Mechanization: Crop establishment using Zero-Till Seed-cum fertilizer seed drills etc.) related constraints.

#### **11.2 Soil sampling details**

1. Collection of five samples from each targeted village
2. Collection of representative soil sample from the participatory farmers
3. Collection of soil from five places in each plot at 0-15 cm depth

#### **11.3 Kharif - Rice trials**

##### **Madhya Pradesh**

No. of project districts	: 4 (Jabalpur, Rewa, Satana, Damoh)
No. of demonstrations	: 1400 (350/district)
Hybrid	: JRH 4
Area	: 0.4ha/demonstration
Method of sowing	: Transplanting

##### **ICRISAT**

Varieties	: RASI, GS -1 (IET - 17430) (early); IR 64 (medium)
Hybrid	: PA-6201
Area	: 0.5ha
Method of sowing	: SRI and Transplanting

## 12. Work-plan 2009-10 (Chickpea)

### Workplan development process:

Objective → Activity → Milestone → Workplan → Progress Report

**Objective 1. To enhance capacity at field level for farmer-participatory research and extension (FPRE) in adoption and expansion of improved chickpea-pulse production and protection technologies (IPPPT) in rainfed rice fallow lands**

*Activity 1.1: Identify improved chickpea cultivars for IPPPT participatory varietal selection*

**Milestone 1.1.1:** 2-3 improved chickpea cultivars identified for each target districts for IPPPT through participatory varietal selection

**Workplan 1.1.1.1:** Evaluate location specific 6-8 improved chickpea cultivars for IPPPT through farmers' participatory varietal selection

**MP:** JG 16, JG 11, JG 130, JG 14, JG 74, JG 63, JAKI 9218, and JGK 2

**CG:** JG 14, JG 16, JG 11, Vaibhav, JG 74, JG 63, JAKI 9218, and JGK 2

**Plot size:** 10 x 8m<sup>2</sup>

**Location:** 2 in each district

**Data record:** To be supplied by ICRISAT (Standard data record sheet and farmer perception proforma)

**Note: Crop establishment with minimum irrigation wherever available is advised**

*Activity 1.2: Enhance farmer-participatory research and extension (FPRE) capacity by providing training in IPPPT components*

**Milestone 1.2.1:** At least 500 farmers provided training in IPPPT

**Workplan 1.2.1.1:** Conduct specialized courses and training on IPPPT components (IPM, IDM and INM) to participating farmers, representatives from NGOs and Research Associates of participating institutions

**CG:** 500 farmers (Men & Women) in each district

**MP:** 500 farmers (Men & Women) in each district

**Workplan 1.2.1.2:** Prepare farmer's friendly training and extension manuals on improved chickpea production technology

**CG/MP:** Oct. 2009 (Hindi)

**Objective 2. To multiply and distribute farmer-preferred chickpea varieties along with IPPPT (including IDM, IPM and INM) for sustainable intensification of rainfed rice fallow cropping systems**

*Activity 2.1: Identify farmers for IPPPT demonstrations in RRFL of target states*

**Milestone 2.1.1:** At least 2000 farmers identified in target states for IPPPT demonstrations

**Workplan 2.1.1.1:** Identify farmers from each target districts for IPPPT demonstrations in RRFL

**CG:** 673 farmers (125 per district (2009-10) + 173 farmers from 2008-09 will be followed up)

**MP:** 1200 farmers (200 per district (2009-10) + 400 farmers from 2008-09 will be followed up)

**Plot size:** 0.2 – 0.6 ha

***Activity 2.2: Multiply and distribute location specific farmer-preferred chickpea varieties for IPPPT demonstrations in RRFL***

**Milestone 2.2.1:** At least seeds of 1-2 improved chickpea varieties distributed to farmers

**Workplan 2.2.1.1:** Distribute seeds of location specific improved chickpea varieties to farmers for IPPPT demonstrations in RRFL

**MP:** Jabalpur (JG 16, JG 74), Damoh (JG 16, JAKI 9218), Satna (JG 16), Rewa (JG 16, JG 130)

**CG:** Kabirdham (Vaibhav), Durg (Vaibhav), Raipur (JG 11), Rajnandgaon (JG 11)

**Milestone 2.2.2:** At least 20% of the grain produced from IPPPT demonstrations stored as seed at individual house- hold level for next crop season

**Workplan 2.2.2.1:** Assure at least storage of 30-40% of seed produced from each IPPPT demonstrations at individual house-hold level for next crop season

***Activity 2.3: Standardize IDM, IPM and INM components of IPPPT***

**Milestone 2.3.1:** Location specific components of IPPPT including IDM, IPM and INM standardized

**Workplan 2.3.1.1:** Standardize components of IPPPT (IDM, IPM and INM) for RRFL in each target states

**IDM:** Wilt resistant varieties and seed treatment

**INM:** Rhizobium, PSB, Zinc sulphate @20kg/ha, Gypsum @200kg/ha

**IPM:** Pheromone traps, HNPV, Need based insecticide

**Note:** *Pheromone traps will be provided from the project*

**Workplan 2.3.1.2:** Impart training to farmer's groups/NGOs/local institutions specifically on crop protection components of IPPPT (IDM/IPM/INM) as master trainers/village scouts

**MP:** 20 farmers (5 per district) at JNKVV

**CG:** 20 farmers (5 per district) at IGKV

**Period of training:** 2 days during crop season

**ICRISAT:** Exposure visit to the farmers -1 day

**ICRISAT:** Training of Project Research Associates

**Period of training:** 5 days during crop season

*Activity 2.4: Introduce location specific mechanization for establishing IPPPT demonstrations*

**Milestone 2.4.1:** At least one Zero till seed-cum fertilizer drill introduced in each target district

**Workplan 2.4.1.1:** Evaluate and identify location specific Zero till seed-cum fertilizer drill for crop establishment  
ICRISAT will procure and provide test seed drills

**Objective 3. Empowerment among farmers and participating local institutions, on FPRE/IPPPT to establish village-based seed system (s) to achieve self-sufficiency in seeds of farmer-preferred, improved varieties of chickpea at the village level**

*Activity 3.1: Identify/develop a functional model of seed system (s) and validate in selected villages in each state*

**Milestone 3.1.1:** Farmers' groups identified to initiate village level seed system in site locations

**Workplan 3.1.1.1:** Initiate seed multiplication in identified farmers' groups in project village / district

- Identify farmers with assured irrigation for foundation seed multiplication program at project village / district level
- **Varieties:**  
**MP:** Jabalpur (JG 16), Damoh (JG 16), Satna (JG 16), Rewa (JG 16)  
**CG:** Kabirdham (Vaibhav), Durg (Vaibhav), Raipur (JG 11), Rajnandgaon (JG 11)
- **Plot size:** 5ha in each district

**Milestone 3.1.2:** Farmers' participatory model seed system developed in selected villages for improved chickpea varieties

**Workplan 3.1.2.1:** Establish functional model seed system in selected villages in each district

- Initiate the process of private public entrepreneurship for foundation seed multiplication, procurement, processing, storage, and marketing

*Activity 3.2: Train farmers and local institutions to produce quality seed*

**Milestone 3.2.1:** Train individual farmer /farmer's groups/ women farmer self help groups on seed production and storage at house-hold level

**Workplan 3.2.1.1:** Impart training to 10 farmers from each project district in quality seed production and storage technology

**Period of training:** 2 days

**Objective 4. Research backstopping for further improvement of chickpea varieties for traits and IPPPT components preferred by the farmers and traders in the target area**

***Activity 4.1: Identify biotic and abiotic constraints to chickpea production in RRFL***

**Milestone 4.1.1:** Biology and epidemiology of the new pathogens associated with chickpea in RRFL determined

**Workplan 4.1.1.1:** Monitoring and identification of new emerging diseases in chickpea in RRFL

**Workplan 4.1.1.2:** Initiate studies on biology and epidemiology of the identified pathogens in RRFL and devise their management strategies

**Milestone 4.1.2:** Additional/unknown location specific abiotic constraints to chickpea production in RRFL identified

**Workplan 4.1.2.1:** Monitoring and identification of location specific abiotic constraints in RRFL and determine their management strategies

- Collect baseline data on bio-physical constraints for expanding chickpea in RRFL.

### **13. Acknowledgements**

I gratefully acknowledge the National Food Security Mission (NFSM), Department of Agriculture & Cooperation (DoA&C), Ministry of Agriculture, Govt. of India for funding this research project. I am grateful to Madhya Pradesh and Chhattisgarh state coordinators and associated staff from JNKVV Jabalpur and IGKV Raipur, KVKs and DoA in target districts for providing active support in implementing and executing the project activities with all limitations at their end.

## 14. Annexures

### Annexure 1. List of participatory farmers: IPPPT demonstration/ PVS/ VLSS- Madhya Pradesh

Districts = 4; Villages = 20; Farmers = 400

S. no.	Districts -Jabalpur	Districts -Satna	Districts -Rewa	Districts -Damoh
	Village - Paroda	Village - Kataha	Village - Bidwa	Village -Bamori
1	Krishna Kumar	Santosh kumar mishra	Triveni Prasad Sharma	Hake singh
2	Arvind kumar Patel	Shyamdhani Kol	Dilip Kumar	Kripal singh
3	Prahalad Patel	Ram Prakash Upadhyaya	Kaptan Singh	Charan singh
4	Nekhnarayan Singh	Shyamlal Upadhyaya	Murli Kushwala	Pritam singh
5	Ghanshyam Patel	Anil Kumar Mishra	Gangadeen Adiwasi	Kashiram
6	Balvir Patel	Kushal Kol	Milan Yadav	Chitar singh
7	Susheel Patel	Nathurah Shukla	Rajkumar Yadav	Mukund
8	Govind Patel	Jagannath Kushwaha	Ram Sunder Yadav	Bhagvandas
9	Munna Singh Gond	Babulal Kushwaha	Daroga Adiwasi	Harpal singh
10	Jagdesb Patel	Samailal Kushwaha	Hinouta Adiwasi	Munna singh
11	Tejilal Patel	Ramsukh Kushwaha	Vanshi Pahalwan	Vijay singh
12	Om Prakash Patel	Rambali Kol	Rohini Singh	Mahendra singh
13	Surendra Singh Thakur	Ramayan Kol	Sita Prasad	Bhupendra singh
14	Vishnu Kumar Patel	Sudhir Singh	Chhotelal Patel	Pratap singh
15	Balmukund Patel	Keshav Pratap Singh	Raghuwansh Bhusan	Komal singh
16	Raja Patel	Sampat Vishwakarama	Indrajeet Singh	Makhan singh
17	Pradeep Patel	Nandkishore Yadav	Ramvishwam Patel	Komal singh
18	Kaluram Gond	Motilal Prajapati	Moti Pandit	Suresh singh
19	Rajendra lal Gond	Ayoudhya Prasad Kushwaha	Shail Sharma	Padam singh
20	Dayaram Dahiya	Badrinarayan Gautam	Pradeep Kumar	Shukhdev singh
21	Nitin Patel	<b>Village - Gora</b>	<b>Village -Khokham</b>	<b>Village Halgaj</b>
22	Bhedilal Patel	Lalgi Soni	Devendra Tripathi	Hakam singh
23	Sukhdev Pd. Patel	Chhotelal Kotwar	Jevendra Kumar	Puran singh
24	Manoj kumar Patel	Ajai Bahadur Singh	RamParas Dwivedi	Ram singh
25	Govind Patel	Pyush Kumar Mishra	Krisnhadeo Mishra	Gulab singh
26	Bhagwat Prasad Patel	Salamat Musalman	Shankarlal Ji	Motilal
27	Santram Patel	Chhotopal	Babulal Singh	Bharat singh
28	Murarilal Patel	Lalji Pandey	Rakesh Singh Tiwari	Ram singh
29	Dhani Bai	Sarjupal Adiwasi	Govind Shukla	Kahar vishvkarma
30	Naveen Patel	Shivprasad Kalar	Sharda Prasad Shukla	Chatur singh
31	Ramnath Patel	Rakesh Singh Pawe	Ambrish Kumar Chaturvedi	Heran singh
32	Prakash Patel	Shrinidhi Mishra	Purshottam Chaturvedi	Ghan singh
	<b>Village Chedi</b>	Roshanlal Namdeo	Pradeep Kumar Pandey	Nanhe singh
33	Rajan Patel	Rajesh Kumar Mishra	Mukesh Chaturvedi	Nanhebbhai
34	Naresh kumar	Doodhmani Mishra	Subhah Kumar Pandey	Gangu
35	Rakesh kumar	Kedar Prasad Dwivedi	Prakash Mishra	Kanchhedi rathore
36	Vineet kumar	Girja Pratap Singh	Gajendra Tripathi	Deshraj singh
37	Kailash Tiwari	Motilal Vishwakarma	Shailendra Tripathi	Nanhebbhai
38	Rudra Pratap Tiwari	Deepak Tiwari	Nagendra Kumar Tripathi	Halke singh
39	Venkat Narayan Awasthi	Dwarika Prasad Namdeo	Laxman Kol	Vishram ahirwar
40	Ram Krihna Soni	Premlal Tripathi	Kaloo Kol	Lakhan rajak
42	Naresh Patel	Achyut Kant Mishra	Chandrabhan Kushwaha	Vikram singh
43	Nirmal Palival	Kashi Prasad Tiwari	Smt. Varsha Singh	Mohanlal
44	Lakhan lal Patel	Ajai Kumar Mishra	Gajanand Kol	Nanhebbhai
45	Nripendra kumar Patel	Ram Naresh Tiwari	Sunil Kol	Gulab singh
46	Ravi Shankar Patel	Ram Prakesh Tiwari	Ramashraya Tiwari	Indra singh
	<b>Village -Gwari</b>	Babulal Tripathi	Soniya Pal	Goli adivasi
47	Shankar Singh	Durga Prasad Tiwari	Shatrughna Prasad Pandey	Mukesh singh
48	Brijmohan Singh	Kmal Kumar Tripathi	Ram Niwas Kori	Halkai singh

49	Rajendra Singh	Lavkush Tiwari	Indrajeet Kori	Jagat singh
50	Mahesh Singh	Mathur Prasad Kushwaha	Kunti Kori	Dharmendra
51	Kunjan Singh	Rampal Tiwari	Sooraj Tiwari	Dhan singh
52	Raj kumar Singh	Ramdeo Tiwari	Ramnaresh Kushwaha	Natthu sahu
53	Vijay Singh	Ramchandra Tripathi	Sandeep Kumar Pandey	Nanhe sahu
54	Narayan Singh	Krishnakant Tripathi	Dilip Paswan	Nannai
55	Sultan Singh	Shyamkali Tripathi	Ram Sajiwan Kori	Komal singh
56	Balvir Singh	Brajendra Mishra	Gendlal Kol	Jhallu singh
57	Ramesh Singh	Somendra Singh	Satish Singh	Narayan singh
58	Jeetendra Singh	Umesh Pandey	Vijay Kumar Pandey	Halkai singh
59	Munshi Singh	Yadunath Tiwari	Salil Singh	Veeran singh
60	Pramodh Singh	Prahlad Kushwaha	Nagendra Pandey	Hemraj singh
61	Bablu Singh	<b>Village -Bachhara</b>	<b>Village -Ghuraihata</b>	<b>Village -Riyana</b>
62	Arvind Singh	Harideen Pal	Triveni Tiwari	Bllu singh
63	Rakesh Singh	Jitendra Singh	Raj Kishore Pandey	Sultan singh
64	Munna Singh	Ram Autar Kushwaha	Arun Kumar Mishra	Rajju singh
65	Brij bhushan Singh	Kaushal Pathak	Subhash Chandra Payasi	Madan singh
66	Surendra Singh	Ramautar Patel	Balgovind Verma	Lachhu singh
	<b>Village -Keolari, Shahpura/Patan</b>	Rajbhan Gupta	Lalji Verma	Pappu singh
67	Narayan Singh	Bharat Pal	Vanshpati Prasad Pandey	Bhagirath
68	Neeraj Shukla	Satyaprakesh Tiwari	Chhotelal Mishra	Guptsingh
69	Vishram Singh	Sanjay Mishra	Ramsiya Mishra	Javendra singh
70	Purva Thakur	Kasi Prasad Kol	Suryamani Dwivedi	Gopal yadav
71	Deepak Jhariya	Ramcharan Pael	Jawaharlal Mishra	Bhujbal yadav
72	Kamal Singh	Ramgopal Gupta	Bhaiyalal Teli	Khilan ahirwar
73	Vijay Singh	Vijiaynath Mishra	Ashutosh Mishra	Halle singh
74	Vivek Thakur	Omprakash Patel	Ashok Kumar Mishra	Sundar singh
75	Ashish Kumar Patel	Surendra Singh Patel	Pannalal Mishra	Ramcharan
76	Amber Patel	Virender Prasad Sondhiya	Pushpendra Kumar Mishra	Basudev
	<b>Village - Urdua/Pipariya/Khili</b>	Sant Kumar Patel	Ramnihore Mishra	Kishor singh
77	Kamal Palival	Nagendra Singh Patel	Anil Mishra	Arvind singh
78	Santram Palival	Baliprasad Kol	Ram Sahodar Tiwari	Govind yadav
79	Shiv Kumar Sharma	Ramsumiran Tiwari	Rajendra Prasad Mishra	Pappu singh
80	Ram naresh Mishra	<b>Village- Parasiya</b>	<b>Village -Hardua Tonga</b>	Makhan singh
81	Shyam lal Kachi	Hanuman Prasad Agnihotri	Shankarshan Prasad Tiwari	Sone singh
82	Ashok Mishra	Arunendra Kumar Pandey	Rajendra Prasad Tiwari	<b>Village -Hinota</b>
83	Neeraj Mishra	Deependra Pandey	J.P. Tiwari	Dhan singh
84	Mahesh Kumar	Chandikeshwar Singh Tiwari	Ram Salone Tiwari	Bhulgu singh
85	Ramlochan Patel	Indrajeet Patel	Shakuntala Devi	Ramji singh
86	Sunita Burman	Santosh Kumar Pandey	Santosh Devi Pandey	Raghuvir singh
87	Vishnu Patel	Chhotelal Mishra	Rajeshwar Prasad Tiwari	Jawahar singh
88	Tulsiram Patel	Sheshmani Mishra	Ramlal Pandey	Narayan
89	Pradeep kumar Patel	Rakesh Pandey	Ramraj Tiwari	Lakkhu sahu
90	Madhav Tiwari	Rudramani Prasad Tiwari	Ramlakhan Pandey	Puran
91	Monu Tiwari	Lalji Pandey	Abhimanuya Tiwari	Teji singh
92	R.K.Yadav	Rakesh Singh Tiwari	Indramani Tiwari	Lattu singh
93	Bharon Prasad Patel	Brajwashi Sen	Yashwant Prasad Tiwari	Jagdish singh
94	Satendra Yadav	Keshav Prasad Mishra	Ramdutta Tiwari	Nanhe
95	Satendra Tiwari	Suryabhan Singh Tiwari	Ramanuj Tiwari	Bhakuri
96	Mohammed Firoz	Laxmi Narayan Pandey	Ramlali	Dhuman
97	Paramlal Yadav	Ramlakhan Pandey	Ramashankar Tiwari	Babu singh
98	B.L. Thakur	Dhan Singh Tiwari	Onkar Prasad Tiwari	Lekan singh
99	Chandramani Patel	Seshmani Mishra	Awadhesh Prasad	Basori varman
100	Devendra Kumar	Lalmani Kol	Kamlesh Tiwari	Rajivmohan pande
<b>Total</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>

**Annexure 2. List of participatory farmers: IPPPT demonstration/ PVS/ VLSS- Chhattisgarh**  
Districts = 4; Villages = 6; Farmers = 173

S. no.	Districts - Raipur	Districts - Durg	Districts - Rajnandgaon	Districts - Kabirdham
	Village - Kalai	Village - Jatadah	Village -Jnagalpur	Village - Dharampura
1	Shri Awadhram/Harram sahu	Shri Ramprasad/ Shri Banshi Ram	Shri Srwan/ tale bhagwati	Shri Netram/ Millu Ram
2	Shri Devcharan / Awadhram	Shri Mulkham Singh/ Shri Mehattar Ram	Shri Krishna/ parashram	Shri Kumar/Sitaram
3	Shri Sarjusahu/ Hariram sahu	Shri Bishal Singh/ Shri Jaipal Singh	Shri Thansingh/ Chatursingh	Geeta Kumar/Sitaram
4	Shri Devcharan sahu/ Pritam sahu	Shri Dalkumar / Shri Majiguru	Shri Gajanand/ bandhu	Ramphal/Rupau
5	Shri Naryan lodhi/ Ramadhar lodhi	Shri Tula Ram/Shri Itwari	Shri Tikaram/ Bala	Manharan/Latel
6	Shri Dinesh lodhi / Naryan lodhi	Shri Ghasiya Ram/ Shri Mansingh	Shri Mahatam/ Dhanau	Kailash/Ghasiram
7	Shri Rajendr alodhi/ Lachhan lodhi	Shri Mandlal/ Shri Manguram	Shri Sahdev/ Dhanau	Prahlad/Bhikhuram
8	Shri Kalikram / Rajaram lodhi	Shri Mehattar Ram/ Shri Ramlal	Shri Rajendra/ Amilal	Motiram/Ratwari
9	Shri Shivkumarlodhi/Naryan lodhi	Shri Omprakash / Shri Ganpat Ram	Shri Pawan/ late.bhagawati	Shtruhan/Sudharam
10	Shri Rakumar Pal/ Manthirpal	Shri Naval Singh/ Shri Ramadhin	Shri Shankar/ Dhunshivhare	Dwarika/Sewaram
11	Shri Ramgopal pal/ Manthir pal	Shri Thakur Ram/ Shri Bhaiya Ram	Shri Atma/ Balaram	Mahendra/Khelanram
12	Shri Ramkhilawan/ Chhotan Kosariya	Shri Lalu Ram / Shri Keshav Ram	Shri Firanta/ Braj	Holi/Adhin
13	Shri Dallu kosaria/ Baukosaria	Shri Bhagwat / Shri Ramlal	Shri Santusingh/ Chatur	Sugriva/ Khelanram
14	Shri Johan kosaria/ Dshrath kosaria	Smt. Bimla Bai/Chhattar Singh	Shri mannu/ Suman	Sushil/Khedu
15	Shri Kushu / Dasrath Kosaria	Shri Lalla / Shri Banshi Ram	Shri Umesh/ Late. Bhagwati	Puran/Jagdish
16	Shri Kumarlodhi/ Ramadhar lodhi	Shri Nandu Ram / Shri Sukhi Ram	Shri Bhuluram/ Laluram	Ramji/Khedan
17	Shri Devsingh / Ramadhar lodhi	Shri Manthir/ Shri Raja Ram	Shri Fatteram/ Suman	Banshi/Sudhen
18	Shri Thakurdevsingh/ Lodhi	Shri Bhart / Shri Manglu	Shri Shrawan/ Latram	Tilko/Dukhuram
19	Shri Amrit / Laxminaryan lodhi	Shri Ganesh Ram	Shri Uttam/ Krishna	Anuj/Rupau
20	Shri Alak Lodhi/ Ramadhin	Shri Gandulal	Shri Bedram/ Laluram	Khelan/Sukhchen
21	Shri Pankaj lodhi/ Gajanand Lodhi	Smt. Ramila Bai	Shri Ramawtar/ Baldev	Sundar/Nohar
22	Shri Bhupendra / Ramanand Lodhi	Shri Bhaiya Ram	Shri Thansingh/ Dwarka	Lekhram/Lalla
23	Shri Sarju Lodhi/ Jhanana Lodhi	Shri Gariba / Shri Itwari	Shri Nemo/ Latmar	Lala/Jagdish
24	Shri Jhaman Lodhi / Anil Lodhi	Shri Hem Bai/ Shri Budhram	Shri Dukhuram/Banttu	Kali/Shyاملal
25	Shri Kishor / Dhanshyam Lodhi	Smt. Kaushilya / Shri Udali	Shri Tetku/ Johida	Sharha/Girdhari
26	Shri Ashok / Radheshyam lodhi	Shri Shobhu Ram/Shri Karwar Singh	Shri Gopi/ banttu	Ramdulari
27	Shri Laxmi Chand / Ganesh	Shri Johrit/Shri Bodhiram		Bhuneswar/Prahlad

	Lodhi			
28	Shri Johan Lodhi/ Dukalu Lodhi	Shri Budhram/ Shri Bhangi		Uttam/Bhilluram
29	Shri Krishna / Radhey Kosaria	Shri Girwar/Shri Guman		Ramesh/Khelanram
30	Shri Chhotta / Balu Kosaria	Shri Ramhu/Shri Birju		Rika/Keshav
31	Shri Ramlal / Deelip Kosaria	Shri Sugit/Shri Chamra Ram		Mahga/Kodda
32	Shri Chinta Lodhi/ Narad Lodhi	Sri Krishna/Shri Mainu Ram		Lala/Khedu
33	Shri Rewa/ Girdhar Lodhi	Shri Radhe Lal/Shri Ghanwa		Teerath/Hemram
	<b>Village - Khutgaon</b>	Shri Rohit/Shri Piluram		Teku/Teerath
34	Shri Naryan Prasad / Jagmohan	Shri Lokesh/Shri Ghasiya Ram		Balram/Ishwari
35	Shri Dasmit/ Naryan Prasad	Shri Ramnarayan/Shri Ganesh Ram		Kumar/Latel
36	Shri Ranjeet/ Naryan	Shri Barlam/Shri Radhelal		Rajkumar/Latel
37	Shri Arjun/ Paduram	Smt. Rangubai/Shri Keshiya Ram		Batuk/Latel
38	Shri Durbal/ Paduram	Smt. Sawan Bai/Shri Man Singh		Gyansingh/Bahoran
	<b>Village - Farhada</b>	Shri Janendra /Shri Ramhan Singh		Lala/Maniram
39	Shri Kumar/ Shyamlal Chandrakar	Shri Tribhuwan /Shri Amar Singh		Chhotu/Maniram
40	Shri Vinod/ Ramnarayn	Shri Hari Ram/Shri Anjori		Adihar/Maniram
41	Shri Parash /Rramnaryan	Smt. Godawari/ Shri Virendra Kumar		Ghanshyam/Krishna
42	Shri Dharmendra/ Loknath satnami	Shri Chintaram/Shri Mer Singh		Laldhar/Deocharan
43	Shri Tularam/ Setram yadav	Shri Shersingh / Shri Noharu Ram		Lakhan/Hemram
44	Shri Dwarika/ Nathuram dhobi			Heeralal/ Jharau
45	Shri Hemant/ Bisahuram sahu			Heeralal/Shyamratan
46	Shri Firanta/ Bhuluram yadav			Charan/Shyamratan
47	Shri Subhash/ Loknath Chandrakar			Phatte/Bisauha
48	Shri Shivsagar/ Loknath Chandrakar			Laxmikant/Bhagwat
49	Shri Lakhan/ Chaitu chandrkar			Ramawatar/Umend
50	Shri Shyam Lal/ Ramkishan Yadav			Anil/Malik
Total	<b>50</b>	<b>45</b>	<b>26</b>	<b>52</b>

### **Annexure 3: Periodical monitoring reports**

#### **Periodical monitoring: Tour Report Summary- 1**

- |                                       |                       |
|---------------------------------------|-----------------------|
| <b>1. COUNTRY VISITED:</b>            | India                 |
| <b>2. LOCALITIES:</b>                 | Delhi                 |
| <b>3. DATES:</b>                      | 31 July- 2 Aug 2008   |
| <b>4. TRAVELLER(S):</b>               | S Pande               |
| <b>5. PERSON APPROVING THIS TRIP:</b> | CLL Gowda and DDG (R) |
| <b>6. LINKS to OTHER TRIPS:</b>       | None                  |

**7. KEY INSTITUTES & PERSONS VISITED:** Department of Science and Technology (DST): Drs R Saha, Advisor, Vinita Sharma, Director, and SK Agarwal, Scientist. National Food Security Mission (NFSM): Dr. NB Singh (AC), Shankar Lal Advisor (NFSM, Advisor), Mr Mukesh Khullar Joint Sec. Crops and National Director NFSM, MS A Neerja, and Dr GK Choudhary Director NFSM.

#### **8. OBJECTIVE(S) OF THE TOUR:**

- To present project proposal “Enhancing chickpea production in rainfed rice fallow lands (RRFL) of Chhattisgarh and Madhya Pradesh states of India following improved pulse production and protection technology (IPPPT)”.
- To meet DST officials and explore project development for funding

#### **MAIN OBSERVATIONS**

- Presented the project proposal on enhancing chickpea production in rainfed rice fallow lands of Chhattisgarh and Madhya Pradesh as per the terms of reference of NFSM. Project and its presentation was well received and taken up very positively for funding by the NFSM officials. In fact NFSM-Pulses are looking forward for such a proposal.
- Discussed two idea-notes on pulses, constraints and opportunities for their expansion in India with DST officials. Two- hour discussion went on positive assurances and DST officials asked to develop project proposals and submit according to DST-SAS program terms and reference.

**MAIN RECOMMENDATIONS:** Follow up of project proposals for further development with DST (Action Suresh Pande). Follow up of project proposal with NFSM (Action: Prabhat Kumar and Suresh Pande)

**ACKNOWLEDGEMENTS:** The support in covering the various objectives and agenda of this trip by Drs CLL Gowda and Prabhat Kumar is appreciated.

## **Periodical monitoring: Tour Report Summary- 2**

- 1. COUNTRY (IES):** India  
**2. LOCALITIES** Raipur, Jabalpur  
**3. DATES:** 6-8 Oct 2008  
**4. TRAVELLER(S):** Suresh Pande  
**5. PERSON APPROVING THIS TRIP:** CLL Gowda and Dave Hoisington  
**6. LINKS to OTHER TRIPS:** Nil

**7. KEY INSTITUTES & PERSONS VISITED:** Indira Gandhi Agricultural University (IGAU), Raipur (Chhattisgarh CG): Drs CN Hazra (VC), ASRAS Sastri, (Director Research), RL Pandey (Coordinator NFSM-IGAU) and Team IGAU, SR Verma (DoA), SR Kerketta (ADoA), CL Jain (Director NFSM –CG), Jawaharlal Krishi Viswa Vidyalaya JNKVV: Drs SR Rao (Director Farms and coordinator NFSM-MP), SS Tomar (Direct Research) and associate scientists and partners.

### **8. OBJECTIVES:**

To discuss and make arrangements for NFSM-Chickpea project implementation plan.

### **9. MAIN OBSERVATIONS:**

The meetings were convened at IGAU (6 Oct) by Director Research and at JNKVV (7 Oct) by Director Farms and attended by key partners from the respective collaborating institutes. The following action points were agreed and initiated:

1. Selection of villages and farmers in each target district initiated and will be completed by third week of October and before Deepawali following formal and informal participatory rural appraisals (PRAS) and it could be revalidated during the crop season
2. The most needed Improved Pulses Production and Protection Technology IPPPT interventions (seed, seed drills and other inputs for providing conditioned seed to farmers) for chickpea are finalized and their purchase and or procurement have been ensured.
3. System intensification by introducing short duration rice for profitable and effective rotation with chickpea in rainfed rice fallows will be initiated
4. Planning and execution process for all on farm and on station experiments on backup research discussed and agreed upon as the season progresses and will be further discussed during technical program finalization meeting at project launching workshop.
5. Formal project launching workshop to discuss and finalize the technical implementation program for **YEAR 1** will be organized before or by the end of October 2008.

**Note:** *Collaborators have enthusiastically agreed to procure all the inputs and started the process on the assurance that funds will be released and made available to them soon either before the sowing or at sowing. In the meanwhile they will approach their respective university authorities or ICRISAT to partially support them by providing some funds on loan which can be reimbursed once the project money reaches them.*

**10. RECOMMENDATIONS:** Follow up on finalization of site specific technical plan activities/trials during and project launching meeting at ICRISAT by the end of Oct (Action SP).

### **Periodical monitoring: Tour Report Summary- 3**

<b>1. COUNTRY VISITED:</b>	India
<b>2. LOCALITIES:</b>	Jabalpur
<b>3. DATES:</b>	29 Oct-1Nov 2008
<b>4. TRAVELLER(S):</b>	S Pande, PM Gaur
<b>5. PERSON APPROVING THIS TRIP:</b>	CLL Gowda and Dave Hoisington
<b>6. LINKS to OTHER TRIPS:</b>	None

**7. KEY INSTITUTES & PERSONS VISITED:** National Food Security Mission (NFSM) Govt. of India: Mr. Mukesh Khullar, Joint Sec. Crops and National Director NFSM, Ms A Neerja, Director (Crops and NFSM), Jawaharlal Nehru Krishi Vishva Vidyalaya (JNKVV): Drs Gautam Kalloo VC, SS Tomar, Director Research. Participants from Department of Agriculture MP, KVKs, and farmers from project target districts and villages

#### **8. OBJECTIVE(S) OF THE TOUR:**

- To launch NFSM funded project “Enhancing chickpea production in rainfed rice fallow lands (RRFL) of Chhattisgarh and Madhya Pradesh states of India following improved pulse production and protection technology (IPPPT)”.

#### **MAIN OBSERVATIONS**

- The project launching workshop was inaugurated by Dr Gautam Kalloo, VC JNKVV, and attended by > 75 participants representing partners from JNKVV, DoA MP, Farmers and KVKs. In his inaugural address Dr Kalloo expressed his appreciation for the timely and long awaited initiative of introducing legumes in general and chickpea in particular in the rainfed rice fallows of Chhattisgarh and Madhya Pradesh. He was optimistic on the scope and opportunities of greater inclusion of legumes following improved production technologies. Further he emphasized to follow the system approach where we need to include early duration rice varieties in the rainfed eco system followed by chickpea.
- Mr Mukesh Khullar, Joint Sec. Crops and National Director NFSM, appreciated the initiative and said that NFSM was looking for such an initiative and were impressed by the project proposal and the enthusiasm and commitment of the project partners. He also suggested to factor mechanization into this project for crop establishment and the success of this pilot project will pave way for its further expansion to other rainfed rice fallows of India and NFSM will be willing to support such initiatives in near future.
- Dr Prabhat Kumar read the message by William D Dar, Director General, ICRISAT, on “Exploiting Rainfed Rice Fallows for Greater Chickpea Production”. The Salient features of his message are summarized as: Large areas lying fallow for a considerable part of the year are cause for concern in South Asia for two main reasons. Firstly, the large and growing population of the region requires ever-increasing quantities of locally available food grains; hence these fallow lands reflect an underutilization of agricultural land resources. Secondly, continuous cereal cropping is unsustainable over time; crop rotation or diversification is desirable for the sustainability of the agricultural production system. Hence increasing the cultivation of legumes, which are already being cultivated after rice in South Asia, in these rice fallows is a solution that addresses the growing shortage of legume grains in the region

and also has ameliorative effects in cereal-based cropping systems, thus contributing to their long-term sustainability. A review of the constraints and opportunities for legume cultivation in subtropical South Asia, reveal that the availability of improved technologies and appropriate cultivars make increased legume cultivation after rice more feasible. The application of technologies to promote chickpea cultivation after rainfed rice in India, Bangladesh and Nepal are available.

- I gave the overview of the project on “enhancing chickpea production in rainfed rice fallow lands of Chhattisgarh and Madhya Pradesh as per the terms of reference of NFSM. Also I detailed the project related NFSM-norms, reporting requirements, and working arrangements etc. Project and its presentation was well received and taken up appreciatively by NFSM officials.
- Dr Pooran Gaur gave a presentation on chickpea improvement for rainfed cropping systems emphasizing the availability of ICRISAT bred chickpea varieties in collaboration with JNKVV and IGAU and other SAUs those are suitable for rainfed rice fallows. It was well received.
- Dr SK Rao, Co-PI of the project from JNKVV gave the details of the targeting and adoption of chickpea technologies for rainfed rice fallows of MP that formed the basis for full fledged location/district work plan development for year-1. The work plan for MP for year-1 was finalized for immediate implementation.
- Partners from IGAU Raipur Chhattisgarh could not attend the meeting because of the restrictions: “Code of Conduct imposed by State Government on Travel due to elections”. However targeting and adoption of the project was briefly discussed with out finalizing the workplan for year-1 for Chhattisgarh. In this context it was decided that a project coordinator along with a project scientists from ICRISAT will organize a 2-day meeting at Raipur by 10 Nov.
- Additionally I gave an invited seminar on “Food legumes in Cropping Systems and Farmers Participatory Approaches” to the Faculty and students of JNKV. It was chaired by VC and was well received.

**MAIN RECOMMENDATIONS:** Follow up of the location specific project implementation plans development for Chhattisgarh and monitoring of project implementation in MP (Action SP).

**ACKNOWLEDGEMENTS:** The support in covering the various objectives and agenda of this trip by Drs WD Dar, Dave Hoisington, CLL Gowda and Prabhat Kumar is appreciated.

## Periodical monitoring: Tour Report Summary- 4

<b>1. COUNTRY VISITED:</b>	India
<b>2. LOCALITIES:</b>	Raipur, Chhattisgarh
<b>3. DATES:</b>	10 Nov-12Nov, 2008
<b>4. TRAVELLER(S):</b>	S Pande, Mamta Sharma
<b>5. PERSON APPROVING THIS TRIP:</b>	CLL Gowda and Dave Hoisington
<b>6. LINKS to OTHER TRIPS:</b>	None

**7. KEY INSTITUTES & PERSONS VISITED:** Indira Gandhi Agricultural University (IGAU), Raipur: Mr. Sergius Minj (IAS), VC, Dr ASRAS Sastri, Director Research, Dr RL Pandey, Professor and Head, Plant Breeding, Dr CL Jain, Director (NFSM Pulses-Chattisgarh), Mr. PR Kridutt, Director of Agriculture, Chhattisgarh and Associate Scientists and participants from project target districts and villages.

### **8. OBJECTIVE(S) OF THE TOUR:**

- To launch NFSM funded project “Enhancing chickpea production in rainfed rice fallow lands (RRFL) of Chhattisgarh and Madhya Pradesh states of India following improved pulse production and protection technology (IPPPT)”.

### **MAIN OBSERVATIONS**

- The project launching workshop was inaugurated by Mr. Sergius Minj (IAS), Vice Chancellor, IGAU and attended by > 40 participants representing partners from IGAU, Department of Agriculture (DoA) and KVKs. In his inaugural address Mr. Minj appreciated for the initiative of introducing chickpea in the rainfed rice fallows of Chhattisgarh. He was optimistic on the scope and opportunities of inclusion of chickpea following improved production technologies. He emphasized that the success of this project will pave the way for the expansion of area and production of chickpea in RRFLs of the Chhattisgarh state.
- Mr. PR Kridutt, Director Agriculture, DoA Chhattisgarh appreciated the initiative and said that use of RRFLs have been discussed at many platforms and is a serious issue. He gave the detailed statistics of cultivation in Chhattisgarh state including the area under paddy, wheat, soil types, and irrigation and appreciated the project partners for selecting the appropriate districts for including chickpea in RRFLs in Chhattisgarh through this pilot project.
- Dr Mamta Sharma read the message by William D Dar, Director General, ICRISAT on “Exploiting Rainfed Rice Fallows for Greater Chickpea Production”.
- I gave the overview of the project on “Enhancing chickpea production in rainfed rice fallow lands of Chhattisgarh and Madhya Pradesh as per the terms of reference of NFSM. Also I detailed the project related NFSM-norms, reporting requirements, and working arrangements etc. Project and its presentation were well received.
- Dr ASRAS Sastry, Director Research, IGAU emphasized on the commitment and dedication for the successful implementation of the project.
- Dr CL Jain, Director NFSM-Chattisgarh highlighted the objectives and mission of the NFSM-Pulses and gave emphasis on the linkage of NFSM –Pulses project with this project. He also gave detailed information about the subsidy

- given in different forms.
- Dr RL Pandey, Co-PI of the project and Dr Urkurkar, Associate Scientist from IGAU presented the detailed location/district workplan development for year-1 covering all the objectives of the project. The workplan for Chhattisgarh for year-1 was thoroughly discussed and finalized for immediate implementation.

**MAIN RECOMMENDATIONS:** Monitoring of project implementation in Chhattisgarh and Madhya Pradesh (Action SP).

**ACKNOWLEDGEMENTS:** The support in covering the various objectives and agenda of this trip by Drs WD Dar, Dave Hoisington and CLL Gowda is acknowledged.

## **Periodical monitoring: Tour Report Summary- 5**

- 1. COUNTRY VISITED:** India  
**2. LOCALITIES:** Delhi  
**3. DATES:** 16 Dec –17 Dec 2008  
**4. TRAVELLER(S):** S Pande  
**5. PERSON APPROVING THIS TRIP:** CLL Gowda and Dave Hoisington  
**6. LINKS to OTHER TRIPS:** None

**7. KEY INSTITUTES & PERSONS VISITED:** National Food Security Mission (NFSM): Mr T Nand Kumar Sec Department of Agriculture and Cooperatives (DAC), Mr Mukesh Khullar Joint Sec. (DAC) and National Mission Director, NFSM, MS A Neerja (Director Crops and NFSM), and Dr GK Choudhary (Director NFSM-Wheat) and Shankar Lal Advisor (NFSM Advisor), ICAR: Dr PL Gautam DDG Crops, SN Shukla ADG, Masood Ali Director IIPR

### **8. OBJECTIVE(S) OF THE TOUR:**

- To present progress report of the NFSM-Pulses Project “Enhancing chickpea production in rainfed rice fallow lands (RRFL) of Chhattisgarh and Madhya Pradesh states of India following improved pulse production and protection technology (IPPPT)”.

### **MAIN OBSERVATIONS**

- Two of ICRISAT projects (Pulses in Rainfed Rice Fallows and Hybrid Pigeonpea funded by NFSM) were included in the agenda items of the Second Meeting of the General Council under the Chairmanship of Hon’ble Union Agriculture Minister of GOI.
- I Presented the project progress report (1Oct- 15 Dec 2009) on enhancing chickpea production in rainfed rice fallow lands of Chhattisgarh and Madhya Pradesh as per the terms of reference of NFSM. Project progress presentation was well received and taken up very positively by the NFSM and DDG ICAR. In fact NFSM-Pulses are looking forward for such a project and have shown interest in participating in monitoring the demonstrations during the 2008-09 cropping season. (Action SP and collaborators in MP and CG). Dr KB Saxena presented the progress made in the hybrid seed multiplication and expansion of the ICRISAT Hybrids (more details in KB’s tour report)

**MAIN RECOMMENDATIONS:** Monitoring of on ground progress of project activities in MP and CG (Action Suresh Pande).

**ACKNOWLEDGEMENTS:** The support in covering the objective and agenda of this trip by Drs CLL Gowda and Prabhat Kumar is appreciated.

## Periodical monitoring: Tour Report Summary- 6

<b>Place visited:</b>	Jabalpur (Madhya Pradesh)
<b>Date of Visit:</b>	12-16 Jan 2009
<b>Traveler:</b>	Suresh Pande
<b>Persons approved the trip:</b>	Dr Hoisington, DDG-R, CLL Gowda, GTL-CI
<b>Objective of the trip:</b>	To monitor NFSM-chickpea project on station and on-farm trials at project districts (Jabalpur, Damoh, Rewa and Satana) in MP.

**Institutions visited and persons met:** Jawaharlal Nehru Krishi Vishva Vidyalaya (JNKVV): Drs Gautam Kalloo (VC), S K Rao, (Director Farms), A K Srivastava, Rajesh Devedi, Navin Gupta (NFSM - project team – Damoh); S B Agarwal, R P Joshi, D Sharma (NFSM - project team – Satna and Rewa); R P Singh, Dinkar Sharma, R R Sharma (NFSM- project team – Jabalpur), and >40 participating framers and nonparticipating farmers in each of the 5 villages in each district.

### Main Observations:

- To enhance chickpea production in rainfed rice fallow lands (RRFL) of Madhya Pradesh, the R and D agreed work plan activities are being executed successfully in farmers fields in four districts (Jabalpur, Damoh, Satna and Rewa)
- Baseline the surveys and farmers participatory varietal selection (PVS) trial (2 in each district) including six chickpea varieties (JG 74, JG 130, JG 11, JG 315, JG 16 and JAKI 9218) were impressive and the crop is in the vegetative growth stage
- Four hundred on-farm demonstrations of improved pulse production and protection technology (IPPPT) included fusarium wilt resistant improved chickpea varieties (JG 74, JG 130, JG 16 and JAKI 9218) were sown (0.5 acre each) in RRFL from 14-20 Nov. 2008. Crop stand was adequate and crop was free from any biotic stress.
- Out of 20 on-farm IPPPT-chickpea conducted in each of the 20 villages we visited 5-10 framers fields in the target village of the districts; and held meeting with groups of farmers in villages: Bamori, Halgaj and Mudari (district Damoh), Bidwa, Khokhan, (district Rewa), Bacchra and Parasia (district Satna) and Giduraha and Paroda (district Jabalpur).
- Inspected village level seed multiplication plots of the improved varieties. The purpose of these trials was to establish village level seed systems. These plots were sown with life saving irrigation.
- Collar rot (*Sclerotium rolfsii*) and Dry root rot (*Rhizoctonia bataticola*) are the potentially emerging diseases of chickpea irrespective of location and crop cultivar. The incidence of these two diseases in chickpea sown in RRFL ranged 5-10%.

- In the non-participating farmers' field where chickpea was sown soon after the harvest of soybean, the incidence of collar rot and dry root rot was up to 15% in wilt resistant cultivars such as JG 315.
- Collar rot and dry root rot type of diseases severely affected the lentil (var. Mallika) in the farmers' fields. A similar disease was observed in pea field also.
- Overall, farmers were pleased and enthusiastic with the participatory IPPPT that will at least introduce improved high yielding varieties in the villages and in RRFL specifically.
- Introduction of Zero-till seed and fertilizer drill and or Roto-seed- drill type of machinery is demanded by the farmers for the successful chickpea crop establishment in the RRFL and similar situation even after soybean harvest.

**Recommendations:**

- Follow up of monitoring at crop maturity and farmers' perception on IPPPT
- Follow up on the selection/ procurement of zero-till seed and fertilizer drills suitable for RRFL.
- There is an urgent need to identify and incorporate resistant to dry root rot and collar rot diseases of chickpea.

**Acknowledgements:**

- I sincerely acknowledge the committed hard work of JNKVV team NFSM-Chickpea for successfully establishing IPPPT trials and carrying out other R&D activities in the targeted villages and districts of MP.

## Periodical monitoring: Trip Report Summary- 7

<b>Country:</b>	India
<b>Place visited:</b>	Jabalpur, Delhi
<b>Date of Visit:</b>	22-25 Feb. 2009
<b>Traveler:</b>	Suresh Pande
<b>Persons approved the trip:</b>	CLL Gowda, GTL-CI, Dr Hoisington, DDG-R
<b>Link to other trips:</b>	None

**Institutions visited and persons met:** Jawaharlal Nehru Krishi Vishva Vidyalaya (JNKVV): Drs S K Rao, Om Gupta, and NFSM associated staff of district Jabalpur, Dr Shnkar Lal, NFSM- Consultant (Seeds).

DST: Drs R Saha, Vinita Sharma and panel of DST project experts.

### Objective of the trip:

- To participate in chickpea production training organized for DoA&ES in NFSM funded project
- To accompany NFSM-consultant in monitoring NFSM- Chickpea trials at selected locations in MP.
- To present project proposal to DST on enhancing “Improved Chickpea Production Technology (ICPT) in RRFL of Jharkhand”.

### Main Observations:

#### NFSM- Chickpea Jabalpur:

- Participated in the early rice hybrid production discussion, as it has a relevance to the success of chickpea in the RRFL. Several early maturing (90-100 days) rice hybrids (JRH 4, JRH 5 and JRH 8) are available and are being evaluated at several environments in Madhya Pradesh and Chhattisgarh.
- Discussion on chickpea seed conditioning with vitavax, Bavestin and Thiomethoxan was found to be effective in better crop establishment and it will be incorporated in the 2009-10 action plan for RRFL in Chhattisgarh and MP .
- Accompanying Drs Om Gupta (JNKVV), Mamta Sharma (ICRISAT) visited International wilt and root rot nursery 2008-09 sown at JNKVV farm. Wilt and root rot disease pressure was adequate for effective evaluation of chickpea lines. Chickpea lines ICCV 96818, ICCV 95 and ICC 2072 were found to be asymptomatic in both the replications.
- Collected wilt and root rot samples from farmers’ fields between Nagpur and Jabalpur for *Fusarium oxysporum* spp. *Ciceris*, and *Rhizoctonia bataticola* pathotype characterization.
- Along with NFSM- consultant (Dr Shankar Lal) NFSM-JNKVV site coordinator (BL Agarwal) and Dr Mamta Sharma monitored NFSM- Chickpea demonstrations, seed multiplications and related activities in three villages

(Giduha, Bhikhakhera and Parora). All the trials were sown as per the planned work-plan and the crop was in the podding growth stage and stress free. The expected yields by farmers' are 1.5-2.0 t ha<sup>-1</sup>.

#### **DST – Delhi:**

- Presented the project proposal entitled “Enhancing the income of resource poor farmers through introduction and expansion of improved chickpea production technologies (ICPT) in rainfed rice fallow lands in Jharkhand” to the panel of 15 experts drawn from cropping systems, policy-planners, socio-economics, seed technologists etc. The project proposal was well received and both DST-officials and experts appreciated ICRISAT vision, efforts and components of ICPT and action –research approach in introducing and enhancing chickpea in RRFL.

#### **Recommendations:**

- Follow up of on the feedback on NFSM consultants suggestions on on-farm NFSM-chickpea activities in Madhya Pradesh.
- Follow up of on the feed back on project proposal from DST?

#### **Acknowledgements:**

- The support and efforts of Drs CLL Gowda, Mamta Sharma, Dave Hoisington (ICRISAT), Drs SK Rao, Shankar Lal, Om Gupta (JNKVV), site coordinators of NFSM- Chickpea activities are acknowledged.

## **Periodical monitoring: Tour Report Summary- 8**

<b>Country:</b>	India
<b>Place visited:</b>	Madhya Pradesh (Jabalpur, Damoh, Rewa, Satna, Katni), Delhi
<b>Date of Visit:</b>	22-27 February 2009
<b>Traveler:</b>	Mamta Sharma
<b>Person (s) approving the trip:</b>	Drs S Pande, CLL Gowda and D Hoisington
<b>Link to other trips:</b>	None

### **Key institutions & persons visited:**

**Jawaharlal Nehru Krishi Vishva Vidyalaya (JNKVV):** Dr Shankar Lal, NFSM-Consultant (Seeds), Drs S K Rao (Director (Farms), Om Gupta, Anita Babbar, BL Agarwal, GK Kotu (NFSM Project team Distt. Jabalpur), Dr S Devedi (NFSM Project team Distt. Damoh), Drs RP Singh, RP Joshi (NFSM Project team Distt. Rewa/Satna), Dr HS Rai (Katni) and other associated staff of NFSM project.

**Delhi University:** Dr Rupam Kapoor

### **Objectives of the tour:**

- To monitor International chickpea wilt and root rot nursery at JNKVV
- To participate in chickpea production training organized for Extension officers.
- To monitor NFSM trials in targeted districts of MP with NFSM consultant

### **Main Observations:**

#### **International Chickpea Wilt and Root Rot Nursery:**

- Visited International chickpea wilt and root rot nursery (ICWRRN) 2008-09 at JNKVV farm along with Drs Om Gupta (JNKVV), Suresh Pande (ICRISAT). The nursery was sown on 8<sup>th</sup> November and inoculum levels of wilt and root rot pathogens (dry root rot and collar rot) were adequate for effective evaluation of chickpea lines. Susceptible cultivars showed 100% wilt. Few lines ICCV 96818, ICC 95 and ICC 2072, ICCV 04108, ICCV 05107 were found asymptomatic in both the replications.

#### **Training on Chickpea production:**

- I gave a presentation (coauthored with Dr Suresh Pande) on “**Enhancement of Chickpea Productivity in Rice Based Cropping System (RBCS)**” to the Extension officers and Asst. Directors of Agriculture from three states Madhya Pradesh, Chhattisgarh and Maharashtra. Their were concerns about the emerging diseases of chickpea such as dry root rot and collar rot. The incidence of these two diseases has increased in last two years and needs to be addressed perhaps in the context of climate change?

#### **NFSM Project:**

- Attended the presentation on “Hybrid rice: R & D and seed production technology”. Early maturing (90-100 days) rice hybrids (JRH 4, JRH 5 and JRH 8) are available at JNKVV and will be used in this season for the success of chickpea in rainfed rice fallow lands (RRFL).

- Along with NFSM- consultant (Dr Shankar Lal), NFSM- site coordinator (Drs BL Agarwal, GK Kotu, RP Singh, RP Joshi) monitored NFSM- farmers participatory varietal selection, on-farm IPPPT demonstrations, village level seed system and related activities in farmers fields in four districts (Jabalpur, Damoh, Rewa and Satna) in Madhya Pradesh.
- Farmer's participatory varietal selection trials (2 in each district) include six chickpea varieties (JG 11, JG 16, JG 130, JG 315, JAKI 9218). The crop was in podding stage and free from any biotic stress except at Rewa (village Khokham) where up to 2% incidence of stunt, viral disease was found.
- On-farm IPPPT demonstrations (includes seed priming, treatment with fungicides, insecticides, Rhizobium, PSB, fertilizers, Pheromone traps etc.) are conducted in 20 villages in four districts. Out of 20 farmer's demonstrations in each village, we visited 5-10 farmers fields. IPPPT demonstrations were monitored in three villages in distt. Jabalpur (Giduha, Bhikhakhera and Parora); three villages in Damoh (Bamori, Halgaj, Mudari); two villages in Rewa (Bachara, Parasia) and two villages in Satna (Khiokham, Bidwa). Crop was in podding stage and free from diseases. Incidence of *Helicoverpa armigera* was found in few fields and farmers were recommended to spray Chlorpyrifos.
- Farmers were highly impressed with the IPPPT and there is a heavy demand of this technology by neighboring farmers for its further expansion in the RRFL as through IPPPT we are introducing and expanding the improved high yielding wilt resistant varieties of chickpea.
- Visited KVK (ICAR), Distt. Katni, seed production unit. They have sown JG 16 for seed multiplication and crop was in podding stage. The incidence of dry root rot (*Rhizoctonia bataticola*) was found up to 15%.
- Collected chickpea wilt and root rot samples from both NFSM participating and non-participating farmer's fields from all the districts visited for isolation and race identification studies. The collection of *Fusarium oxysporum* f. sp. *ciceris*, and *Rhizoctonia bataticola* will form the basis for pathotype characterization of Foc and *R. bataticola*.

### **Delhi University**

On return journey (Jabalpur-Delhi-Hyderabad), visited Delhi University and discussed on going project development on characterization of Botrytis gray mold of chickpea with Dr Rupam Kapoor, Deptt. of Botany.

### **Recommendations:**

- Follow up of on the feedback on NFSM consultants suggestions on on-farm NFSM-chickpea demonstrations in Madhya Pradesh.
- The farmers should be provided with insecticides for control of pod borer, as there is possibility of increase in the incidence of pod borer with sudden rise in temperature.

### **Acknowledgements:**

I sincerely acknowledge the guidance and support of Drs S Pande, CLL Gowda, Dave Hoisington (ICRISAT), Drs SK Rao, Om Gupta, GK Kotu (JNKVV), Dr Shankar Lal (NFSM consultant) and site coordinators of NFSM- Chickpea activities.

## **Periodical monitoring: Tour Report Summary-9**

<b>1. Countries:</b>	India
<b>2. Localities:</b>	Bhopal- Jabalpur
<b>3. Dates:</b>	14-17 May 2009
<b>4. Traveler:</b>	Suresh Pande
<b>5. Person approving this trip:</b>	CLL Gowda and Dave Hoisington
<b>6. Links to other trips:</b>	Nil

**7. Key institutes & persons visited: CIAE:** Ers. SD Kulkarni, VV Singh, BK Garg, Anurag K Dubey, SK Rautaray, and Uday Badegamkar

**JNKVV:** Drs Gautam Kaloo, Sk Rao, Om Gupta, Anita Babbar, JP Lakhani, and NFSM district site research associates.

### **8. Objectives of the trip**

- To discuss and collect information on zero-tillage machines suitable for chickpea sowings in rainfed rice fallow lands of Chhattisgarh and Madhya Pradesh
- To review 2008-09 progress and discuss work-plan of NFSM-project 2009-10 kharif and rabi season

### **9. Main observations**

#### **CIAE:**

- Accompanying Dr SK Rao and KB Tewari from JNKVV discussed the mechanization options for sustainable chickpea establishment and production in the RRFL of Chhattisgarh and Madhya Pradesh specifically in the black soils soon after the harvest of paddy. The CIAE has developed either alone or in participation with private manufacturers several prototypes of machines and farm implements and many of them have been commercialized with rate contract with CIAE.
- We examined several versions and designs of Zero-Till-Seed and Fertilizer Drills (ZTSFD), suitable for soil types with varying water holding capacities and agricultural practices. The Roto-Seed cum Fertilizer Drill was found to be most suitable one for establishing chickpea in the RRFL situations of the target villages and states of the NFSM-Project.
- The ZTSFD is being commercially manufactured under the trade name of “SHAKTIMAN ROTARY TILLER” by Tirath Agro Technology Pvt. Ltd. Rajkot, Gujrat and as “NATIONAL ROTO TILL SEED DRILL” by National Agro-Industries Ludhiana, Punjab. The Ludhiana made seed drill is superior in quality, thus contacted the manufacture for more information and performance of the machines. CIAE has already tested this machine and recommended for NFSM-Project.

#### **JNKVV:**

- Under the chairman ship of Dr Gautam Kaloo, VC, JNKVV, the 2008-09 progress report of each of the four districts (Jabalpur, Damoh, Rewa and Satna) was presented by the respective research associates appointed for the project.

- Despite the delayed sanction of the project, the agreed work-plan for 2008-09 was meticulously implemented in all the four districts. The Improved Pulse Production and Protection Technology (IPPPT) for chickpea - on farm activities (capacity building, technology demonstrations, village level seed system from foundation seed, and identifying constraints for backstop research) were conducted in 400 farmers (100/district) in MP. The total area covered was 200 acres @ half acre per farmer. The salient results are:
  1. Chickpea crop stand was better in IPPPT-trials and grain yields ranged between 900-2000 Kg ha<sup>-1</sup> indicating a net two-fold more yield than the farmers' practice.
  2. A total of 200 participating and several non practicing farmers were provided hands on training on IPPPT components and their concerns for betterment of this component is included in the 2009-10 wok-plan. From the farmers' participatory variety trials, JG-16, JG-74 were the most preferred varieties by the farmers.
  3. Village level seed system at each house hold level was established and about 5 tons of seed of these varieties is being multiplied and stored in the project villages and will be used to expand the project activities during 2009-10 season.
  4. Backstop research on soil-borne diseases (collar rot and dry root rot) needs to be accelerated as these two diseases were found to constraint chickpea crop in RRFL.
  5. Site selection for year 2009-10 is in progress to establish the model rain-fed rice-chickpea cropping system. In this context 1000 farmers (@250/district) will grow early duration rice hybrid during rainy season and chickpea will be zero tilled in these rice fields during post rainy season.
  6. Tentative work-plan for each site has been discussed and drafted and will be soon formalized along with the results awaited from Chhattisgarh.

**10. Main recommendations:** Follow up with CIAE, JNKVV, and National Agro industries Ludhiana.

**11. Acknowledgements:** The support and efforts of Drs CLL Gowda, Dave Hoisington (ICRISAT), Drs Gautam Kaloo (VC), SK Rao, Om Gupta (JNKVV), site coordinators of NFSM-chickpea activities,MP are acknowledged.

## Periodical monitoring: Tour Report Summary- 10

- 1. Countries:** India  
**2. Localities:** Raipur  
**3. Dates:** 20-21 May 2009  
**4. Traveler:** Suresh Pande  
**5. Person approving this trip:** CLL Gowda and Dave Hoisington  
**6. Links to other trips:** Nil  
**7. Key institutes & persons visited:** IGAU Drs. MP Pandey VC, LK Pandey Dean and Project Coordinator Chhattisgarh, PL Johanson, and RM Sharma

### 8. Objectives of the trip

- To review the progress of 2008-09 project activities conducted in the four districts of Chhattisgarh
- To discuss tentative work-plan of NFSM-project for 2009-10 kharif and rabi season

### 9. Main observations

- Met Dr MP Pandey, and apprised him with the progress made in carrying out the NFSM- chickpea project activities in each of the four districts (Raipur, Durg, Rajnandgaon and Kawardha) of Chhattisgarh during 2008-09. Dr Pandey has assured that he will provide full support for the successful accomplishment of project objectives on time by IGAU in the target districts.
- Despite the delayed sanction of the project, the agreed work-plan for 2008-09 was meticulously implemented in all the four districts. The Improved Pulse Production and Protection Technology (IPPPT) for chickpea - on farm activities (capacity building, technology demonstrations, village level seed system from foundation seed, and identifying constraints for backstop research) were conducted in 192 farmers (32-60/district) in four districts. The total area covered was 240 acres @ half acre per farmer. Out of 192 participatory farmers, 173 followed the technology with precision hence data was collected from these farmers only. The salient results are:
  - Chickpea crop stand was better in IPPPT-trials and grain yields ranged between 700-1300 Kg ha<sup>-1</sup> indicating a net two-fold more yield than the farmers' practice (450-700 Kg ha<sup>-1</sup>).
  - A total of 194 participating and several non practicing farmers were provided hands on training on IPPPT components and their concerns for betterment of this component is included in the 2009-10 work-plan. Farmers preferred JG 315 and Vaibhav (ICCV 91106 (s)) chickpea varieties for further expansion.
  - Village level seed system at each household level was established and about 5 tons of seed of these varieties is being multiplied and stored in the project villages and will be used to expand the project activities during 2009-10 season.
  - Backstop research on soil-borne diseases (collar rot and dry root rot) needs to be accelerated as these two diseases constraint chickpea establishment in RRFL.
  - Site and farmer selection for year 2009-10 is in progress to establish the model rain-fed rice-chickpea cropping system. In this context out 800 farmers targeted (@200/district) ~ 25 farmers will grow improved early duration rice hybrid/varieties during rainy season and chickpea will be zero tilled in these rice fields during post rainy season.

- Tentative work-plan for each site has been discussed and drafted and will be soon formalized along with the results received from Chhattisgarh and MP.
- Discussed the possibility of Indira-Zero-Till-Seed and Fertilizer Drills (IZTSFD), suitable for Dorsa and Kanhar types of black soils of the project districts. Also the need and scope of Roto-Seed cum Fertilizer Drill in Chhattisgarh was discussed.

**10. Main recommendations:** Nil

**11. Acknowledgements:** The support and efforts of Drs CLL Gowda, Dave Hoisington (ICRISAT), Drs MP Pandey (VC), RL Pandey, PL Johnson and RN Sharma (IGAU), are acknowledged.