

**Trip Report – India – Jan 16 to Feb 12, 2008****Ken Sayre****Feb 13, 2008**

The main purpose of this trip to India was to visit as many field sites and meet as many current site RWC/CIMMYT cooperators as possible in northeastern India (eastern UP, Bihar, Jharkhand, and West Bengal) where CIMMYT has been actively involved with local agencies and farmers in the development, characterization, testing/validation and transfer to farmers of Conservation Agriculture (CA)-based resource conserving technologies (RCTs). These activities that have characterized CIMMYT's effort within the RWC have mainly focused on activities associated with facilitating farmer adoption of zero-till wheat planting technologies. In addition, however, it has also included some simple, observatory activities and demonstrations, mainly in farmer fields, to test other CA-based RCTs including direct seeded rice (with minimum tillage or with zero tillage), application of zero till planting to other crops like maize (kharif and rabi), lentil, mustard, faba bean and chickpea, laser leveling, intercropping (potato and maize, pigeon pea and maize among others) and some limited activities with bed planting (wheat, pigeon pea, maize).

There has also been some applied research (on station as well as in farmer fields) to clarify some associated crop management issues especially related to weed control in zero till planting systems (principally as part of an on-going ACIAR project managed by Dr. Ravi Gopal Singh in Begusari and Pusa, Bihar), to study the comparative potential of available hybrid rice cultivars and to test different reduced/zero till seeders, including controlled traffic seeders particularly for use in continuous zero till planting systems and small scale seeders (hand jab planters and punch planters).

Since this trip occurred over four weeks, I will not follow the usual daily narrative style that I normally use for trip reports but will try to briefly summarize the major observations from each broad region in northeastern India that I visited. I will, therefore, focus more on outlining relevant issues that I believe should be carefully considered as we develop the broad outline of the SACSI project.

**January 16 to 18, 2008 – Karnal, Haryana**

I had two available days (while I waited for my visa for Bangladesh) to make a trip to Karnal, Haryana to visit some of Dr. Samar Singh and his colleagues field activities around Karnal and also to visit the long term CA-based trials at the Salinity Institute near Karnal. This visit included the following:

- We visited some farmers who follow the irrigated rice-wheat system with very sodic soils and continue to puddle transplant rice on the flat. They have found major advantages for growing wheat on fresh beds (they till after rice, seed wheat on the flat and then use furrow openers (forming a bed between furrows) to use for irrigation (see photo below). The costs involved in making the beds for wheat

following rice and then knocking them down after wheat harvest to puddle/transplant rice are well compensated by the much higher wheat yields on the raised beds and, in fact, farmers indicated that it was easier to prepare the fields for rice puddling/transplanting on the flat after bed planted wheat compared to wheat planted on the flat.

### **Bed planted wheat on sodic soils near Karnal, Haryana**



- We then briefly visited the Haryana University Rice Experiment station and met Dr. Ratan Singh, rice breeder, who indicated that he would be very interested in testing a number of rice cultivars under both puddle/transplanting and dry seeding. This needs to be followed up.
- We also visited some farmer fields and the University of Haryana Sugarcane Branch Station near Karnal, where Dr. Samar Singh is posted, to see his use of bed planting as a method to allow intercropping during the period of slow sugarcane establishment when the canes are placed in furrows between the beds. If the sugarcane is planted in the (fall Oct to early Nov), crops like wheat, chickpea, onions mustard etc can be seeded (see photos directly above) or, if the sugarcane is established in the spring, it can be intercropped with mungbean, maize for green cob/fodder or some spring/summer vegetables.
- We finished our field tour with a visit to the Salinity Institute to the long term trial plots – one trial focuses on rice-wheat crop establishment technologies for both rice and wheat in an irrigated rice-wheat system and the other compares the performance of several different crops seeded with tillage and with zero till, all in large plots that are perfect to compare and verify technologies in a realistic, scientific manner as well at a scale that allows farmers to pragmatically judge the value of contrasting technologies

**Left – Sugarcane in furrow  
Intercropped with onion;**



**Right – Sugarcane in furrow  
intercropped with wheat**



**Top left- zero till wheat with removal of rice straw; Top right- zero till wheat + straw  
Bottom left – wheat planted on new beds; Bottom right- Wheat planted on permanent beds**



- As for my previous visit to Haryana and the Punjab (the northwest IGP in general) in Oct/Nov 2007, I am repeatedly surprised by the amount of wheat area that is not

being managed under CA-based RCTs, especially where earlier maturing, combine harvested rice has been produced and harvested in late Sept to late Oct reducing the potential importance of rapid turn-around-time between rice harvest and wheat seeding. It is clear that great deal more farmer participatory adaptive research and technology validation and transfer is needed given the importance for farmers to have viable options to seed wheat (and rice and other crops needed for diversification) with reduced/zero till systems which can reduce rice straw burning as well as diesel fuel use, both highly associated with CO2 emissions, and especially to reduce irrigation water use (especially for rice production) to replace the currently common, heavy tillage based systems used by farmers in this rather fragile (falling water tables in some areas, increasing salinity in others) yet crucially important area needed to insure food security.

Although current ill-conceived irrigation water pricing policies do not encourage farmers to seek more efficient ways to use irrigation water, we should be doing the needed research to demonstrate to farmers and especially policy makers that high yielding, water saving technologies are feasible for farmers to use which will encourage farmers to be more willing to accept more realistic water pricing policies.

### **January 19 to 26, 2008 – Eastern UP**

In the morning of January 19 in Lucknow, I met Dr. Ravi Gopal Singh, CIMMYT agronomist managing field cooperative activities with several partners in eastern UP, Bihar, Jharkhand and West Bengal as well as running his own program at Begusarai and Pusa, Bihar focused on weed control for direct seeded rice (supported by an ACIAR project) and farmer testing and technology transfer CA-based RCT in the surrounding areas. Ravi accompanied me during my travels across the eastern IGP. We initiated our visit to the eastern IGP by visiting several cooperators in eastern UP from Jan 19 to 26 (see the itinerary below in Appendix I).

The main RWC cooperators throughout the eastern IGP are associated with KVKs (farmer technology transfer organizations at the district level with funding and program direction from the central government which may be managed by state agricultural universities (Faizabad University in the case of eastern UP) or NGOs. Many of the cooperating KVKs have received or continue to receive some funding through the RWC or have linkages through personal interaction with Ravi Gopal. In addition in eastern UP, the RWC has had linkages with and continues to provide support to Dr. U P Singh, agronomist and professor at Benares Agricultural University at Varanasi.

### **Observations from eastern UP:**

- The principal interaction between the RWC and cooperating KVKs in eastern UP has involved the provision of CA-based RCT implements, mainly normal 9 or 11 tyne zero till drills, some control traffic drills, some bed planters., mainly for wheat crop establishment. In addition some laser levelers have been provided..

- There has been some training, especially for implement operators, provided by the RWC combined with some ongoing interaction with RWC/CIMMYT staff - before Raj Gupta but now mainly via sporadic visits by Ravi Gopal from Bihar or by Mr. Tripathi from the Delhi office as time permits.
- The caliber performance by the KVK cooperators has in general been better for the NGO-managed KVKs than for the university managed KVKs but there are exceptions.
- We saw many examples of farmers in eastern UP who have tested zero till seeing of wheat, usually into only standing rice stubble following hand harvesting or burning of rice straw if combine harvested. (see photos below) and many zero till planters are in farmer hands, including private service providers and there is demand for additional zero till seeders.

**Left – Zero till wheat without residue.**



**Right- zero till wheat in standing stubble**



- One major issue that will need rectification for any new project efforts that up to now, the main focus with most cooperators has mainly been the provision of the zero till seeders with some training in their use for wheat, with very little attention being paid to managing other crop management issues like weed control, nutrient management and irrigation timing that may arise when wheat (and other crops) is seeded with zero tillage (see photos with weed problems below).

**Left – Zero till wheat field with broad**



**Right – Heavy infestation of *Phalaris minor***



- These issues/problems can be properly addressed in the future by insuring that the collaborative efforts with partners take advantage of the ongoing activities in farmer fields to compare, side-by-side, management alternatives within the CA-based crop establishment practices and by perhaps establishing relevant trials on station (as is being done at the Salinity Institute as described above) to compare alternative CA-based activities on a system basis (meaning including other crops like rice, maize, pulse and oil seed crops in a manner to gain needed trial management control in order to provide needed information to farmers (See examples in photos below).

**Left- New trial with seeding and residue managements at the Pratapgarh KVK**      **Right – Zero tilled mustard in farmer field**



- The collaborative activities between Dr, U P Singh (Benares Agriculture University) and the RWC have been ongoing for a longer time with better RWC resource supply over time. Dr, Singh has been able to test different CA-based RCTs for contrasting cropping systems and land types. He has been able to work for several years now with bed planting for rice-wheat with farmers near Ballia (see photos below).

**Left – Permanent bed planted wheat;**      **Right – Permanent bed planted wheat**



- Given the current level of farmer interest on CA-based RCTs and the extent of farmer adoption of zero till wheat seeding, eastern UP should receive high priority for continued efforts to develop and extend the technologies for farmers. Furthermore, there have been farmers who have been trying to grow rice with either direct dry seeding (with or without tillage) and on beds with varying degrees of success. Therefore, these efforts need to be continued to further improve these new rice establishment efforts.

### **January 27 to February 7, 2008 – Bihar and Jharkhand**

As for eastern UP, several of the cooperators that we visited in Bihar and Jharkhand were KVKs (either associated with the Rajendra Agricultural University (RAU) in Pusa or with NGOs). Collaborative efforts in Bihar (including Jharkhand) were initiated later than in the northwest IGP (somewhat similar to eastern UP), mainly starting around 2002 with the ICAR Research Complex for Eastern Region, in Patna.

Initial efforts at Patna were started with Dr. S. S. Singh who also developed some of the initial collaborative efforts in Bihar as well as West Bengal. The efforts at Patna are now managed by Dr. A.R. Khan, principal investigator, with continued support from Dr. Singh. In 2005, Ravi Gopal joined CIMMYT to manage the portion in Bihar of the ACIAR project that focuses mainly on weed control for direct seeded rice and is initiated at RAU but now also with activities at the Directorate of Maize Research (DMR) complex at Begusarai, Bihar where Ravi is based. In addition, the CIMMYT maize QPM effort for eastern IGP, under the supervision of Dr. Gaurav Yadav, also operates at the DMR complex in Begusarai.

Even though the CA-based RCT efforts were initiated later in Bihar than in the northwest IGP, the efforts are quite dynamic since Dr. S. S. Singh and Dr. A. R. Khan are still actively cooperating with the RWC around Patna and especially since Ravi Gopal joined CIMMYT to manage the ACIAR project in Bihar. In addition to his ACIAR project activities, however, Ravi Gopal has become heavily involved in coordinating in field activities with RWC cooperators in eastern UP, Bihar, Jharkhand and West Bengal. These added activities, which Ravi Gopal is conducting in a superlative manner, represent a huge effort on his part and the balance of his ACIAR project responsibilities and his general coordination of CIMMYT and RWC field activities in the eastern IGP does require better clarification and technical support. .

From Feb. 4 to 8, Ravi Gopal and I were joined by John Dixon, Olaf Erenstein, P.H. Zaidi and Jagadish Timsina in our field visits.

#### **Observations from Bihar and Jharkhand:**

- After visiting with numerous farmers, service providers and NARS/NGO RWC cooperators in different districts/KVKs/other partners (see itinerary below) who have been exposed to different CA-based RCTs and have gained experience in the use of CA-based RCTs, it is clear that these CA technologies can provide major benefits to farmers in this region. The most widely tested technology has been zero till planting of wheat which will likely be adopted at a faster rate in eastern

India (especially in eastern UP and Bihar and likely in West Bengal) than has occurred in northwest and north central India. Since most of the rice in the east in the rice-wheat system is planted later and usually with later maturing cultivars, harvest normally occurs in mid-Nov to early Dec. Therefore the benefits of the rapid turn around time after rice harvest gained by zero till wheat seeding is more obvious and widespread than in the northwest India (especially the Punjab where perhaps 60-70% area is planted to rice cultivars harvested before mid-Oct. In addition, most rice is still hand harvested in the east and the straw removed, facilitating zero till seeding with rather inexpensive and more readily available zero till seeders using tyne openers.

In the east, rice straw is more preferred for animal fodder than wheat straw in most cases, but it was of interest to observe that in the few fields of rice in eastern UP and Bihar that had been combined harvested, the rice straw had not been collected but had been burned.

There are a number of CA-based RCTs that are being tested for different crops in Bihar and Jharkhand and a few are illustrated below in photos:

**Zero till wheat after rice with most of the residue removed**



**Zero till lentil after rice with most of the residue removed**



**Intercrop of mechanically seeded potatoes with Maize**



**Zero till rabi maize after rice**





**Controlled traffic, zero till planted Kharif rice**



**Controlled traffic, zero till planted rabi wheat planted in the same field**



**Wheat planted on raised beds**



**Linseed planted with zero till after rice**



**Laser-leveling in Bihar**



**CA Farmer field day in Jharkhand**



As mentioned above, the main CA-based RCT that farmers have seen or used in Bihar and Jharkhand has been zero till, tyne drills manufactured mainly in the Punjab. The zero till drills that have been brought to Bihar/Jharkhand have mainly been used to seed wheat although some are have multi-crop seed delivery systems and other rabi crops like lentil, mustard and chickpea, rabi and kharif maize and kharif rice have also be seeded with zero till. Bed planters have also be tested but need to be further improved in order to manage permanent beds

The main problem that was observed is that the training/supervision provided by most partners, especially KVKs, to farmers focuses only on the seeder itself. Very little effort/training/follow-up concerning is provided to farmers concerning other crop management aspects like weed co fertilizer management, irrigation timing that may require some specific modifications related to zero till seeding wheat and other crops as compared to conventional till seeded crops.

It was quiet clear, for example, that there appears to be some shift in broad leaf weed populations in zero till seeded wheat fields leading to more 2,4-D tolerant weeds like wild *Laytharus* sp indicating the need to use other, available more appropriated herbicides. Similar situations are likely to be the case for other management issues illustrating the need to provide farmers with a more integrated set of recommendations and training than simply providing the zero till seeder

There is a significant farmer demand for more zero till drills in Bihar. In addition farmers in Bihar who have seen laser-leveled fields and the resulting vast improvement in irrigation water management are keen to have access to laser leveling services. Therefore it is clear that in addition to providing farmers with more integrated crop management information and training in CA-based RCTs, there needs to be more ready access for farmers to buy zero till drills and other appropriate RCT implements (more dealers or even local manufacturers), access to spare parts/repair services and to reliable service providers.

### **February 8 to February 11, 2008 – Stops in Bihar and tavel to northern West Bengal and tp Calcutta**

On the way to West Bengal we visited several different sites/collaborators and farmer fields in Bihar. One of the area includes are areas with early planted rabi maize in the up lands as well as later planted rabi maize after rice some planted with zero till (see photo below). We also saw some excellent ravi sunflower next to zero tilled wheat (see photo below).

This was my first visit to West Bengal (outside of the Calcutta airport). We first went to the northern part of the state where we visited collaborators working on potato+maize intercrops and zero till cropping, especially for wheat using zero till drills for four wheel tractors (included the smaller, controlled traffic, multi-crop drill as well as the larger 9/11 tyne zero till drills. Some work is also ongoing with animal traction, zero till planting

**Left – early and late planted rabi maize**      **Right - Rabi sunflower and zero till wheat**



We also met up with our collaborators from the university UVKB located in northeast West Bengal at Kochbazar, including Prof. A.K.Singha Roy, Department of Agronomy, Dr. Pijush Kanti Mukherjee, Department of Agronomy, Dr. Prateek Madhab Bhattacharya, Department of Plant Pathology and Dr. Apurba Kumar Chowdhury, Department of Plant Pathology - Principal Investigator. This group is very impressive and are doing a lot of research with CA-based RCTs including zero till rabi maize planting (see photo below), rabi potato+maize intercrops (see photo below) and zero till kharif rice planting in different land types (see table below). As can be observed in the table below

**Left – Zero Till Maize after Rice**



**Right – Intercropped Potato and Maize**



provided by this group, rice yields were higher for two of the three varieties with direct seeding (showing the expected tillage by genotype interaction) and the Benefit – Cost Ratio was considerably higher for direct seeding for all three varieties.

**Comparison of the yields and Benefit – Cost Ratio for three rice varieties using conventional puddled, transplanting versus direct seeding (data provided by Dr. Apurba Kumar Chowdhury, Department of Plant Pathology – UVKB)**

Variety	<u>YIELD (t/ha)</u>			<u>Benefit-Cost ratio</u>	
	<u>Transplanted Rice</u>	<u>Direct Seeded Rice</u>	<u>Mean</u>	<u>Transplanted Rice</u>	<u>Direct Seeded Rice</u>
<u>ARIZE 6444</u>	<u>4.99 BC</u>	<u>5.48 B</u>	<u>5.24</u>	<u>1.44</u>	<u>1.77</u>
<u>NK SAHADRI</u>	<u>5.06 BC</u>	<u>6.25 A</u>	<u>5.65</u>	<u>1.55</u>	<u>2.33</u>
<u>PHB 71</u>	<u>5.29 B</u>	<u>5.48 B</u>	<u>5.38</u>	<u>2.19</u>	<u>2.46</u>
<u>MTU 1001</u>	<u>4.44 C</u>	<u>3.89 D</u>	<u>4.16</u>	<u>1.53</u>	<u>1.77</u>
<u>Mean</u>	<u>4.95</u>	<u>5.27</u>			
	<u>Tillage</u>	<u>Variety</u>	<u>Interaction</u>		
<u>LSD 0.05</u>	<u>0.10</u>	<u>0.51</u>	<u>0.72</u>		
<u>SEm ±</u>	<u>0.03</u>	<u>0.16</u>	<u>0.23</u>		
<u>CV %</u>		<u>7.9</u>			

In addition, they are working in selected sites in farmer fields in northern, west Bengal testing CA-based RCTs. This is clearly a group with whom we should continue to closely cooperate.

We during the 3 days that we were in West Bengal, we visited other RWC cooperators as we traveled south towards Calcutta. We visited one group of farmers who have been working with the local agriculture officials to multiply seed of QPM maize hybrids in cooperation with the DMR and CIMMYT group working at Begusari in Bihar. Up to now, these farmers had provided all the hybrid seed that they have produced to the involved government agencies who then distributed this seed to farmers in West Bengal. This year, however, in addition to providing seed for the government distribution program, the farmers will be able to also sell some of their hybrid seed commercially to other farmers, This provided an excellent example of how CIMMYT and DWR are providing entrepreneurial opportunities for small farmers (see photo below of QPM hybrid maize seed production in farmer fields). We also observed some traditional CA practices that farmers are using such as zero tilled cucurbits after rice (see photo below).

**Left – QPM maize hybrid seed production in farmer field**



**Right – Zero till cucurbit production after rice**



The amount of land left fallow during the winter season in parts of northern West Bengal surprised me (see photo on the left below), especially when compared to the more southern West Bengal where cropping was very intense during the winter season, including extensive boro rice (see photo below on the right) until it was explained that the groundwater resources in the north are less developed and that some of the land left fallow in winter was soon to be seeded to jute. If appropriate CA technologies could be implemented to reduce/prevent the loss of residual soil moisture after the monsoon combined with some supplemental irrigation, some early maturing crops (mustard, pulses, fodder crops) could be grown after rice and before jute during the rabi season.

**Left – Extensive land left fallow in winter in northern West Bengal**



**Right – Intense cropping in winter in southern West Bengal**



Several other factors were notable to me in West Bengal. One could note considerable numbers of piles of monsoon rice straw still in the fields (see photo on the left below). I was not able to obtain a clear reason for piling the straw in the field (convenience after threshing for eventual use for fodder or other purposes or just not needed or what?). The other observation was that I did not believe that I would ever be able to see was an old friend, the very old variety like Sonalika (released in the late 1960's or early 1970's) seeded with zero till (see photo below on the right). I am not sure if this speaks to the resiliency of this great, old variety, the inability of the wheat breeders to find better varieties for West Bengal, the ineffectiveness of the seed delivery system or a bit of all of the above,

**Left – Kharif rice straw left piled in fields as boro is transplanted**



**Right – Sonalika wheat seeded by zero till**



Finally, after seeing the very small size on most fields in West Bengal (and in parts of Bihar and eastern UP), I am more convinced than ever that we need to rapidly expand the use of 2-wheel tractors with appropriate CA seeding implements as we are doing in Bangladesh. There are Indian made, Korean made and Chinese made two wheel tractors. We now have several attachments for the same two-wheel Chinese tractors for zero till seeding on the flat and for bed planting (both fresh beds and permanent beds including potato planters) which can easily be brought to eastern India to mechanically empower the small farmers (both owners and tenants) to be more efficient and use more sustainable, profitable systems. Obviously there is also scope for the CA implements/seeder already available in India for four-wheel tractors but, I fully agree with the position that Scott Justice continually pushed for eastern India when he was with CIMMYT (and still does from his vantage point in Nepal) that two-wheelers can be of great value with the right CA implements.

**February 12 - traveled from Calcutta to Dhaka in the morning**

## Concluding Observations

- This trip provided opportunities to see abundant and extremely encouraging examples that clearly demonstrate the potential that a comprehensive effort which will focus on the development and deployment of sound, CA-based technologies, can resolve many existing production bottlenecks and inefficiencies in an ecologically sustainable way that can be delivered to not only the more resource endowed farmers but also the resource constrained, small-scale farmers, representing both land owners and tenant farmers.
- It appears obvious that farmers in the eastern IGP and probably in south India, as well, can benefit more readily and more rapidly from the adoption of suitable CA-based RCTs that has occurred in the more resource endowed northwestern IGP because crop intensification and diversification and crop turn-around-time issues, which are associated with appropriate CA technologies, are more prevalent in the east and south of India. **It makes good common sense to bring these CA-based RCTs to farmers initially in tandem with other more traditional yield generating technologies such as new, improved cultivars, more fertilizer use and pest management etc, instead of in two phases, delaying the deployment of sustainable, input-use efficient CA-based technologies**
- In most areas, especially in the northwest IGP (Punjab and Haryana) but beginning in western UP and to some extent in Bihar, where farmers have been using zero till seeding, especially for wheat, for several years, second generation problems (weed control issues, water management issues at seeding wheat especially when rice is harvested before mid-to-late October, rice straw management after combine harvesting etc) are emerging that required applied research efforts (in farmer fields where possible) to resolve.

Until now, in most cases, farmers/service providers have been provided with the zero till planters along with some instructions in their used, but little follow up technology development with corresponding advice to farmers concerning how to manage these other aspects of the CA-based “package”. This is more common in the northwest and has apparently led to some “dis-adoption” of zero till wheat planting. **However, instead of simply stating, as several counterpart institutions commonly do, “well, zero till doesn’t work, so let’s go back to the conventional till systems” effort needs to be made to find solutions to these new farmer concerns and to resolve these second generation problems to insure the continued use of zero till planting systems for wheat at to be extended to other crops.**

- **In may areas in the IGP, immediate attention is needed to develop other ways of growing rice besides puddling and transplanting because of water and labor issues or rice will be forced out of the picture.** This is especially important in the northwest IGP but it should be a potential goal anywhere rice is being grown and the application of sound CA-based technologies provides the

most valid basis for this effort. Obviously the RWC, and additional funding opportunities combined with the efforts of CIMMYT and our sister CG centers in the region must respond to the growing, potential food crisis in south Asia including India and expeditious efforts to address this are needed. But We should not loose site of the fact that developing and deploying new technologies that will address the sustainable use of the productive resource base, the need to increase the efficiency of input use (especially water) and reduce production costs and to reduce agriculture-generated green house gases must be at the foundation of our combined efforts with our national partners and a sound CA focus will insure that these objectives are met.

- One factor related to use of straw for animal feed puzzled me. In the northwest where wheat straw is clearly preferred for animal fodder compared to rice straw, it is very common for farmers to burn the rice straw from combined harvested rice fields and even in many cases the straw from hand-harvested, hand threshed rice (including Basmati rice straw). However as one moves east in the IGP, the straw preference for fodder gradually shifts from wheat to rice straw. However, even in eastern UP and in the areas in Bihar where combine harvesting of rice is being done. Nearly all of the rice straw in the field was observed to have been burned as in the Northwest. I am not sure what the implications are on this since in these areas, if the same rice had been hand harvested/threshed, it would not have been burned. However, as soon as combine harvesting is used, the clear tendency is to burn the rice straw. It may be that the farmers in eastern UP and Bihar that are beginning to combine harvest their rice are larger farmers with plenty of feed for their animals, but given the apparent high demand in these areas for rice straw, this burning seems an anomaly
- More effort is needed to introduce more CA implements for two-wheel tractors, as are being developed and used in Bangladesh, to benefit the farmers with small fields sizes, especially resource constrained farmers in West Bengal in particular but in other areas in India (and Nepal and Pakistan) where small fields predominate.
- There are also a number of activities (hybrid maize seed production as well as seed of other crops, labor generated by service providers etc) that can open up value and job producing opportunities for rural inhabitants, especially small-scale farmers and even landless farmers if this can be tied in with innovative efficient money loaning schemes.

### **Acknowledgements**

I would like to acknowledge all the multitude of cooperators that took the time to show us their research and technology delivery activities to farmers and to all the farmers that showed us their fields where they are testing the different CA-based RCTS and the CIMMYT driver, Sanjay who drove all that distance over four weeks. However, I want to especially thank Dr. Ravi Gopal Singh for taking four weeks away from both his



ongoing., busy work schedule and from his family to accompany me in this incredible learning experience, much of which he has had a great deal of input to deploy the CA-based activities that we saw happening in farmer fields in this region..

**Travel Itinerary for Dr Ken Sayre in India**  
**Jan 19 to Feb 12, 2008**

#	Date	Place	Activity	Key Contacts
1.	Jan 19 <sup>th</sup> SAT	KVK, Kaushambi, U.P	Arrives Lucknow, Visit CA/RCT program around KVK, Kaushambi Night stay- at KVK, PBH	Mr J.B. Singh, Dr Naveen
2.	Jan 20 <sup>th</sup> Sun	KVK, Pratapgarh, U.P	Visit CA/RCT program around KVK, Pratapgarh Night stay- at KVK, PBH	Dr A. K. Srivastava Mr Manoj
3	Jan 21 <sup>st</sup> Mon	N.D. U.A.T., U.P	travels to N.D. U.A.T., meeting with VC and Director of Extension Faizabad, NS at Gorakhpur	Director of Extn and Dr R.P. Shukla, NDUAT
4.	Jan 22 <sup>st</sup> Tue	KVK- Gorakhpur, U.P	Field visit CA/RCT program Night stay at Mau	Dr Asraf, Dr S.K. Tomar
5.	Jan 23 <sup>rd</sup> Wed	KVK Mau, U.P	Field visit CA/RCT program Night stay at Ballia	Dr N.P.Singh
6	Jan 24 <sup>th</sup> Thru	Ballia, U.P	Field visit CA/RCT program Night stay at Varanasi	Dr U.P. Singh
7.	Jan 25 <sup>th</sup> FRI	Chandauli, U.P	Night stop at Benares Agricultural University	Dr U.P. Singh
8	Jan 26 <sup>th</sup> SAT	Chandauli, U.P	Field visit CA/RCT program Night stay at Ara	Dr M.P. Singh
9	Jan 27 <sup>th</sup> SUN	ARA, Bihar	Field visit CA/RCT program Night stay at ARA	Dr Dwedi, Mr Shashi
10	Jan 28 <sup>th</sup> Mon	ARA, Bihar	Field visit CA/RCT program Night stay at Patna	Dr Dwedi, Mr Shashi
11.	Jan 29 <sup>th</sup> Tue	BGS, Bihar	Field visit around Patna, Travel to Begusarai	Rajesh, Ravi
12.	Jan 30 <sup>th</sup> Wed		Stay at BGS – Rest stop/desk work	
13	Jan 31 Thurs	Muzzafarpur, E.champaran	Field visit CA/RCT program Night stay at Muzzaffarpur Night stay at Pusa	Ravi, Mukesh
14	Feb1st Fri	Darbhangha, Bihar	Field visit CA/RCT program Night stay at Darbhanga	Govind, Ravi
15	Feb 2 <sup>nd</sup> Sat	Darbhangha, Bihar	Field visit CA/RCT program Night stay at Begusarai	
16	Feb3rd Sun		Stay at BGS	

17	Feb4th Mon	Nawada, Bihar	Trip with Drs John Dixon, Olaf, Timsina etc, Visit FPTs in Nawada Nstay at koderma	Er. SK. Mishra
18	Feb5th Tue	Koderma, Jharkhand	Visit RCT activities in Koderma NS at Nawada town/ KVK	Dr R.K.Singh/ Dr A.K.Dubey
19	Feb 6 <sup>th</sup> Wed	Jamui, Bihar	Visit CA/RCT program around Jamui NS Begusarai	Ravi
20	Feb 7 <sup>th</sup> Thu	BGS, Bihar	Visit DMR station at BGS, FPT BGS travel to RAU travel to Patna (Dixon, Olaf). Ravi, Ken , Timsina Back to Bgs	Ravi, M.kumar
21	Feb 8 <sup>th</sup> Fri	Uttar Dinazpur, W.B.	Timsina Visits khagaria with Gaurav, Ken &Ravi travels to UttarDinazpur NS Jalpaiguri	Apoorva Chaudry
22	Feb 9 <sup>th</sup> Sat	Jalpaiguri, W.B.	Visit RCT program in Jalpaiguri travels Malda.	Dr Subeer Dutta
23	Feb10th Sun	Nadia, W.B.	Visit FPTs at Nadia, NS at Nadia	Dr Bhattacharya, Dr A.K. Ghosh
24	Feb11th Mon	Burdwan, W.B.	Visit CA/RCT program on the way to Kolkata and spend the night in Kolkata.	Dr Bhattacharrya, Dr Maity
25	Feb12th Tues	Kolkota	Fly from Kolkota to Dhaka	