Agricultural Innovation Program for Pakistan

Semi-annual report: April 01–September 30, 2013

Submitted to USAID on November 01, 2013

CIMMYT
International Maize and Wheat Improvement Center

UCDAVIS
UNIVERSITY OF CALIFORNIA

ILRI
INTERNATIONAL LIVESTOCK RESEARCH INSTITUTE

AVRDC
The World Vegetable Center

IRRI

PARC

ABBREVIATIONS

AIP	Agricultural Innovation Program
AR4D	Agricultural Research for Development
AVRDC	The World Vegetable Center
BGRI	Borlaug Global Rust Initiative
CA	Conservation agriculture
CIMMYT	International Maize and Wheat Improvement Center
CSISA	Cereal Systems Initiative for South Asia
FMI	Farm Machinery Institute
IARCS	International Agricultural Research Centers
ICARDA	International Center for Agricultural Research in the Dry Areas
IEE	Initial Environmental Examination
ILRI	International Livestock Research Institute
IRRI	International Rice Research Institute
IRS	Internationally recruited staff
NARC	National Agricultural Research Centre
PARC	Pakistan Agricultural Research Council
RWC	Rice-Wheat Consortium
SACAN	South Asian Conservation Agriculture Network
UAF	University of Agriculture, Faisalabad
USDA	United States Department of Agriculture

CONTENTS

SUMMARY

In this reporting period, AIP transitioned from a concept into an on-the-ground reality, with resolution of details of the life-of-project calendar, establishment of funding levels for the first two "project years" (through September 30, 2014), and extensive consultations between CIMMYT, PARC, and the other primary partners with ever-widening stakeholder communities. The majority of Internationally Recruited Staff positions for the international partners were filled and substantial progress was made in completing sub-grants between CIMMYT and the primary partners. Major activities were identified, and the formats and details of the first program-level work plan were developed in consultations involving CIMMYT, the primary partners, stakeholders, and USAID-Islamabad.

BACKGROUND

The **Agricultural Innovation Program** (AIP) works to increase agricultural productivity and incomes in the agricultural sector through the promotion and dissemination of modern practices in the following sectors: cereals (wheat, maize, and rice), small and large livestock, and horticulture (both fruit and vegetables). Project management is vested in a unique consortium of CGIAR Centers and the Pakistan Agricultural Research Council (PARC), led by the International Maize and Wheat Improvement Center (CIMMYT). AIP aims to foster emergence of a dynamic, responsive, and competitive system of science and innovation that is Pakistan-owned and will catalyze equitable growth in agricultural production, productivity, and value. AIP is rooted in the principles of *Agricultural Research for Development* (AR4D), with particular emphasis on building partnerships between public research and those it serves, including farmers and the private sector; increasing investments; generating, sharing, and making use of agricultural knowledge for development; and demonstrating and building awareness of the development impacts and returns from agricultural innovation.

AIP operates through three Activity Windows, namely: commissioned projects, a competitive grants system, and human resource development. Work within these activity windows addresses complex agricultural systems but is divided into four 'Science Windows' – cereals and cereal systems, livestock, vegetables, and perennial horticulture. The key indicator of AIP's success will be the number of small farmers who adopt or benefit from productivity or value-enhancing technologies.

CIMMYT is the primary implementing partner and prime grantee; managing and taking overall responsibility for AIP and providing direct oversight of the agronomy, wheat, and maize commissioned projects within the cereals and cereal systems science window. Four international partners (the International Livestock Research Institute, ILRI; University of California, Davis; The World Vegetable Center, AVRDC; and the International Rice Research Institute, IRRI) lead on commissioned projects in livestock, tree fruits, vegetables, and rice, respectively, while PARC serves as both the hosting partner and the lead on a province-inclusive competitive grants system. Combined, those organizations are CIMMYT's "primary partners".

MANAGEMENT AND BUDGET

Project approval and funding

CIMMYT was notified in a voice conference call in December of 2012 that USAID-Islamabad agreed to fund the project described in the revised proposal submitted September 26, 2012. In October 2012, before the endorsement of the proposal, initial funding of US $500,000 was obligated by USAID through Window 3 of the CGIAR fund. No written guidance was provided on use of those funds, but discussions with USAID-Islamabad and Washington D.C. led CIMMYT to limit spending to support communications and project development. During the December call, USAID indicated that the next allotment of funds would be four to five million dollars, and later discussions pointed to a mid-April disbursement. The amount of the obligation intended for April was increased to US $10.9 million in email communication from USAID-Islamabad on April 07, 2013. USAID-DC finalized the obligation of funds on June 20 and CIMMYT was notified of this on June 27, 2013. This notification of fund obligation enabled CIMMYT to establish internal accounts for spending against the combined amount of US $11.4 million (inclusive of the CGIAR fund charge).

Drafting of sub-grants with the primary partners was initiated in late 2012 but the final structure of those instruments was not agreed until August 2013. This delay reflects the changing amount of funding (affecting the initial sub-grant period), finalization of the life of project calendar, and the lag between verbal and formal obligation of the funds. These factors were compounded by limits on the ability of all partners to hire staff until funds were formally obligated to CIMMYT. At the writing of this report, sub-grants were executed between CIMMYT and all primary partners except PARC.

Project Announcement and Inception Meetings

CIMMYT and PARC organized an AIP announcement meeting March 8, 2013 in Islamabad. This was followed by a CIMMYT-organized, two-day AIP inception meeting in May (Appendix A), which brought together international research centers, NGOs, universities, and stakeholders from all provinces. CIMMYT's Country Liaison Officer for Pakistan, Dr. Md. Imtiaz, and R. Ward also helped facilitate the visit of AVRDC staff to Pakistan.

Staffing

In April, CIMMYT organized an Economist online advertisement (see Appendix A) that enabled CIMMYT, IRRI, ILRI, and AVRDC to jointly advertise for internationally recruited AIP staff. Positions were also advertised on the respective partner websites and other relevant outlets (such as SciDev Net). Almost all of these positions have now been filled. CIMMYT initially sought to hire a Chief of Party as the senior representative of AIP but salary and benefits packages for USAID Chief of Parties were unexpectedly high and CIMMYT is now advertising for a Senior Project Leader instead.

Workplan

The initial workplan and budget were submitted to USAID on October 15, 2013.

TECHNICAL AND WORKPLAN UPDATE: APRIL 01– SEPTEMBER 30, 2013

Cereals and cereal systems

The AIP inception meeting during 27-28 May provided an opportunity for discussions between IRRI, CIMMYT, PARC, provincial government, and private sector entities with interest in the cereals and cereal systems component of AIP (see Appendix C). The workplan submitted to USAID on October 15, 2013 reflects these priorities and future reports will align with the logframe.

Drs. Imtiaz and Ward also attended the BGRI meetings in Delhi with a Pakistani delegation that included the Government of Pakistan's Additional Secretary and Member(Plant Sciences), Director General of Punjab Agricultural Research, and the Director of Cereal Crops at Quetta (Balochistan).

Md. Imtiaz is leading negotiations to import appropriate conservation agriculture (CA) machinery that will help in disseminating CA practices, reduce farmers' costs, and enhance soil health. The nine machines comprise: raised bed planter (2), zero till Happy Seeder (4), and small plot seeder (3). Agronomy elements of AIP were significantly augmented by the visited of CA-specialist, Dr. Ken Sayre (former CIMMYT scientist) to Pakistan during August-September. Findings and outcomes of his trip are documented in Appendix L; this report will provide useful guidance and ideas for ensuring the significant positive impact that AIP aims to have in developing and disseminating a CA-based cropping systems approach to crop management. Md. Imtiaz is working closely with PARC's national wheat coordinator on both wheat variety and cereal agronomy priorities.

Stakeholders in the cereals and cereal systems science window met again during 29-30 August, at a meeting organized by CIMMYT and PARC at the National Agricultural Research Center (NARC; see Appendix J). The 48 participants included representatives from the national agricultural research system, universities, USDA, international research centers (CIMMYT, ICARDA), and private companies. The following priority areas were identified, and were detailed in the workplan submitted to USAID on October, 15 2013.

Wheat:

- Rapid diffusion of high-yielding rust resistance wheat;
- Climate resilient wheat varieties for adaptation to warmer conditions;
- Introduction of fungicides to wheat management;
- Generation of a durum wheat value chain for Pakistan;
- Product-based wheat breeding for improved end use quality.

Maize:

- Climate resilient maize hybrids for enhanced productivity in Punjab and Khyber Pakhtoonkhwa (KP) provinces;
- Development and deployment of biofortified maize with improved quality for both human and animal consumption;
- Development of cultivars with increased resistance to biotic stresses;
- Strengthening of Pakistan's maize seed sector.

Rice:

- Breeding program for improved Indica and Basmati rice;
- Improved crop management;
- Improved postharvest and quality control;
- Capacity building for rice researchers and extension officers.

Agronomy:

- Identification and testing of CA-based technology such as: laser leveling, dry seeding of rice, raised bed planting systems, and upscaling in target areas on a village basis in farmers' fields;
- Pilot testing and refinement of crop management technologies and CA-based implements on the basis of field experiences in farmer fields, in close collaboration with relevant machinery manufacturers;
- Evaluation of CA-based crop management technologies and conventional methods in different cropping systems;
- Nutrient management.

During 17-30 August, IRRI rice breeder (and AIP team member) Dr. Surapong Sarkarung visited Pakistan in order to evaluate current rice research and development in Pakistan and therefore further develop proposed AIP activities, particularly in the areas of rice breeding and seed systems. He visited PARC/NARC, other federal and provincial rice research institutes, rice processing mills, and farmers' fields in Punjab and Sindh provinces. Sarkarung reported that the national institutes and private sector have made significant progress on rice research, particularly on incorporating bacterial leaf blight resistance and drought quantitative trait loci into the Basmati background. He suggested that IRRI can play important role in facilitating the national institutes and private sector to work as a collective AIP team to address varietal improvement issues such as biotic and abiotic stresses, advanced breeding lines, emerging molecular techniques and training for young scientists under AIP. The workplan was augmented according to his findings. Some breeding materials are already being evaluated at IRRI headquarters (Philippines) for performance under stagnant flooding, salinity, disease resistance, etc. and we believe the findings will be useful for application in the rice areas of Punjab and Sindh.

Livestock

In order to create awareness and share the objectives of the AIP-Livestock program, Dr. Nils Teufel and Prof. Ibrahim Muhammad made an extensive one-week tour in April, visiting various stakeholders in the province of Punjab, and met with government officials, academia (University of Veterinary and Animal Sciences, Lahore**;** University of Agriculture, Faisalabad; University of Arid Agriculture, Rawalpindi), donor funded projects (USAID-DRDF dairy project; AUSAID ASLP project), and private companies (ENGRO). They also visited KP province and met with the Vice Chancellor, Deans and academics of University of Agriculture, Peshawar, official of the Livestock department, KP, dairy farmers, traders, processors, and exporters. The team also had discussions with FAO officers in Islamabad on possible collaboration with their animal health programs.

Many of the stakeholders consulted during the April visit participated in the ILRI-Livestock science window workshop organized during the inception meeting in May. Four mini-workshops were

conducted on the three major livestock research areas (dairy value chains, small ruminant value chains, and feed, fodder and rangeland), and on site selection (see Appendix D). The workplan was refined according to the outcomes of these meetings.

In June, Ibrahim Muhammad visited three districts in Punjab (Sahiwal – USAID Dairy project site; Okara – AUSAID Dairy project site; and Chakwal – former operational site of ICARDA and CRP1.1 site). He interacted with farmers and farmer groups involved with these projects, and availed the opportunity to review some of their training sessions in progress. Site selection was subsequently discussed with Dr. Fatah Ullah (focal person, small ruminants) and Dr. A. Majid (ICARDA); the criteria for site selection were further refined and potential initial sites analyzed (see Appendix E).

It was agreed that the AIP livestock office will be housed in the Animal Science Institute of NARC. ILRI does not have a host country agreement with Pakistan, so a host agreement between CIMMYT and ILRI is in the process of being drafted. An account has been opened in the ILRI finance system for AIP-Livestock expenses. A separate research collaborative agreement will be signed between ILRI and ICARDA to cover joint ILRI-ICARDA activities on small ruminants and feed/fodder/rangeland.

Vegetables

Drs. Nair and Easdown were unable to acquire Pakistani visas in time to attend the AIP inception meetings in May in Islamabad. Instead they participated in several sessions via skype, including a vegetable group planning meeting with 18 Pakistani participants. A full summary of the vegetable session is presented in Appendix F. Stakeholders agreed on the importance of increasing incomes and employment, as well as the need to link to existing USAID projects. In accordance with the submitted workplan, the AIP vegetable science window will focus on covered production systems, improved mungbean production, and enhanced value chains.

In August, Drs. Nair and Easdown travelled to Pakistan to meet with potential public and private partners to prioritize activities in the three focus areas. In depth discussions were held with PARC horticulture staff from around the country during a workshop to detail current initiatives in covered production and to list a range of activities that AIP could develop. The AVRDC team also met with Dr. Ali Asghar and the PARC legume team and came up with a plan of activities for the mungbean work.

Discussions were also held with a private seed company and Muhammed Ashraf, Deputy Secretary, Ministry of Commerce representatives, who outlined many of the needs to improve vegetable value chains. The government perspective on the project was provided in discussions with Dr. Muhammed Azeem Khan, NARC Director General. Feedback from these discussions highlighted the need to consider the necessary improvements in vegetable seed supplies to Pakistan, as these can currently account for up to a quarter of production costs (e.g. in the case of tomato). This will be included as a component of the value chain sub-project.

The AVRDC team also met with USAID's Michael Wyzan and Nazim Ali and had very productive discussions on the overall AIP project and expectations of the vegetable component.

Prior to the Pakistan trip, W. Easdown also held discussions with R. Ward and other CIMMYT staff on 16 August, during the Borlaug PACT 50 conference in Delhi, and met with CIMMYT staff involved in the CSISA project. They found several areas of common interest in developing mungbean in cereal rotations, and the subsequent visit to Pakistan confirmed these synergies. Some technologies that are being developed in Pakistan could have wide application in improving the profitability of mungbean in cereal rotations.

In September, work focused on developing the workplans and budget for years 1 and 2. Drs. Easdown and Nair conducted discussions with Dr. Mansab Ali and Dr. Asghar Ali (National coordinator, pulses) and sought input from senior AVRDC scientists.

Perennial horticulture

- Drs. Mark Bell and Jim Hill participated in multiple preparatory discussions with Rick Ward. Dr. Hill gave presentations at the inception meeting and at University of Agriculture Faisalabad (UAF), and then also held discussions at Arid University. They conducted a double workshop in Islamabad to identify a starter list of key limitations to perennial fruit tree production and postharvest management, and UAF indicated willingness to make space available and host a UC Davis representative. In September UC Davis drafted terms of reference for the in-country staff position, which are currently being evaluated by in-country partners.
- A detailed description of the inception meeting tree fruit session is given in Appendix G. Participants focused on identifying: activities that would lead to significant change for 10,000 farmers; themes applicable to a wide range of crops; existing activities and how to leverage these; and initial activities for the AIP tree crops group. These activities will fall in the two main focus areas of more efficient perennial horticulture production systems and improved postharvest systems.

A visit by the Vice Chancellor of UAF, Dr. Iqrar Khan, to UC Davis In August provided an excellent opportunity for discussing priorities and potential research activities in the area of perennial tree crops.

Human resource development

Dr. Jim Hill gave presentations on both the graduate study opportunities and the vocational training plans at the inception meeting and at UAF and then held discussions at Arid University.

Graduate studies:

Representatives from UC Davis, Pakistani Universities, PARC, and IARC held discussions to finalize the program, selection criteria, and potential selection committee membership of AIP's HRD element (see Appendix H).

The selection committee for scholarship identification and selection has been identified. It will be chaired by Dr. Tom Rost (UC Davis) and includes representatives from the four major universities, plus HEC, PARC, and the AIP primary partners. The selection committee held their first meeting in August, for which the agenda is shown in Appendix I. The committee will meet again in October; Dr. Mark Bell will

be leading the vocational training initiative while Dr. Tom Rost will chair the graduate study committee and lead that initiative.

Vocational training:

Two young scientists – Muhammad Rizwan (Assistant Research Officer, Rice Research Institute, Kala Shah Kaku District, Sheikhupura) and Kashaf Ali Shah (Assistant Plant Breeder, Emkay Seeds Ltd., Lahore) – completed two weeks training on 'Molecular Breeding' from during 02-13 September at IRRI, Los Banos, Philippines. The techniques learnt from this training course should also benefit other scientists in their breeding programs under AIP in enhancing Pakistan's production of rice with good grain quality.

Another participant (Mr. Mohsin, Rice Research Institute, Kala Shah Kaku District, Sheikhupura) has been selected to attend a short-term training course on 'Rice: Post-production to market', also at IRRI, Los Banos, Philippines.

e-Pak Ag:

- Dr. Mark Bell gave presentations on e-Pak Ag at the inception meeting and at UAF. Based on these discussions, it became clear that there are many initiatives. UC Davis is therefore currently reviewing information access and ICT in Ag initiatives. These reviews, combined with carefully planned and selected village level studies, will help to identify how the results of AIP can better reach farmers - with special consideration on the use of ICT. In this respect, contact has been established with both UAF and the Arid University to investigate information access at the village level.
- UC Davis is working with Dr. Babar Shabaz (UAF) and a Masters student to investigate more effective ways to reach farmers through enhancing existing channels. It seems that considerable information already exists online, and it is hoped that UAF can analyze this resource using simple factsheets already made available by related UC Davis activities. Contact has also been made with the Arid University, with the intent that parallel studies can be established with that institution for a different agro-ecological environment.
- A workshop has been planned for December at UAF. An e-Pak Ag online resource has also been drafted and will form the basis for future capture of project extension materials.

PERSONNEL/MANAGEMENT UPDATE

Cereals and cereal systems

Dr. Md. Imtiaz remains leader of the component, but will also take over Interim Project Leader duties from Dr. Rick Ward in October. This allows CIMMYT to have project-level executive authority present in Pakistan for administrative and management decisions, key discussions with stakeholders, primary partners, the governments of Pakistan, and USAID. Imtiaz will hand over to the new Senior Project Lead as soon as s/he is appointed.

Dr. Abdul Rehman was appointed as Rice Improvement Specialist (Senior Scientist I), from August 01, 2013. As the country representative for IRRI-Pakistan, Dr. Rehman is responsible for in-country coordination of all rice-related activities and will liaise with a range of national and international partners. He will also oversee a small team of technical and administrative support staff.

Dr. Akhter Ali joined as AIP socio-economist on 01 September. He will coordinate M&E and impacts work for AIP. Dr. Abdu Rahman Beshir will begin as AIP maize improvement and seed system specialist in October. Both scientists are based in Islamabad. Dr. Krishna Joshi was appointed as wheat improvement specialist and will join the team in mid-November. The system agronomist position has been finalized and we expect the selected candidate to join in December 2013.

Livestock

After reviewing applications, ILRI decided to appoint Muhammad Ibrahim as the project manager for the livestock science window. Ibrahim's existing contract with ILRI was amended to accommodate his AIP responsibilities; he is waiting for the host agreement to be finalized before he can be based in Islamabad permanently.

ILRI worked with ICARDA to conduct interviews for the rangeland and small ruminant position in Amman, Jordon, during September. Dr. M. Islam was selected and will commence duties on 01 November. ILRI has shortlisted three candidates for the livestock value chain economist and interviews are to be conducted at ILRI headquarters (Nairobi, Kenya) in October. The livestock team will be based at the Animal Sciences Institute on the NARC campus.

Vegetables

Following interviews in August, Dr. Mansab Ali was selected as leader of the vegetable science window. He leaves his existing role as Director of the Horticultural Research Institute in Pakistan to commence AIP duties on 01 October. Dr. Ali is currently investigating the possibility to house vegetable component staff on the NARC campus, close to the existing CIMMYT team.

Human resource development

Dr. Jim Hill took over as interim chair of the selection committee while Dr. Tom Rost was unable to travel. Dr. Rost has now resumed his duties.

LESSONS LEARNED

All partners (including CIMMYT) were affected by the delays in fund allocation and finalization of sub-grants, as detailed in '*Project approval and funding'*, above. Partners did as much as they could, under the circumstances, and now that workplans have been finalized, any future problems in terms of timing should be circumvented.

Cereals and cereal systems

A series of discussions were held in order to initiate the rust resistant seed dissemination component of AIP; including with telecommunications companies regarding data collection. However, by the time the partners in all four provinces had established seed distribution mechanisms, the wheat sowing season had already started. This delay led us to reduce targets for 2013/14, but efforts will be scaled-up over the next years by finalizing data collection mechanisms well in advance of the sowing season.

Similarly for the rice component, notification of funds came after the start of the rice season in Pakistan. It was therefore too late to move germplasm from IRRI-Philippines for this season and instead work focused on developing workplans and budgets, and identifying new sources of germplasm for bacterial leaf blight resistance at IRRI-Philippines. Despite a lack of funds, IRRI ran its committed short-term AIP trainings using its own funds.

Vegetables

AVRDC staff (Dr. Warwick Easdown and Dr. Ram Nair) faced major challenges in obtaining visas to visit Pakistan, which prevented them from attending the AIP inception meetings in May, and also cut short their visit in August. They did however manage to participate in the inception meetings via skype and were represented in Islamabad by Dr. Ali. The issue of delayed payments was resolved in September with the cooperation of CIMMYT-Pakistan, and an organizational bank account for AVRDC is now being opened in Pakistan. Neither of these factors affected the milestones.

All other components

Nothing specific to report.

EXTERNAL FACTORS

Cereals and cereal systems

An importation of CA-machinery for crop management was scheduled to arrive in Pakistan in time for this cropping system. Due to changes in government procurement procedures and the introduction of an online system, the import may be delayed. CIMMYT has initiated negotiations with PARC for the online registration process.

Vegetables

An administrative decision was made in AVRDC headquarters to manage the AIP project from the South Asian regional office rather than to appoint a senior scientist from headquarters to supervise the project. While this complicates some visa issues in traveling between India and Pakistan, it also makes it easier to integrate the AIP project work with complementary work being done in other countries across South Asia.

All other components

Nothing to report.

RISKS

Describe current or anticipated risks and the action being taken to mitigate them.

Cereals and cereal systems

Security issues mean that is it difficult to reach out to farmers in Balochistan and the tribal areas. We hope to address this challenge by building and strengthening partnerships with various agencies in those regions.

Timely release of funds is vital if activities are to be carried out as planned.

Vegetables

Delays in opening of an organizational bank account and recruiting technical staff may affect activities. Both issues are being managed with high priority at AVRDC headquarters, the South Asia regional office, and by the AVRDC-AIP Pakistan Office. We expect to have an operational bank account by the end of October and to start advertising for new positions in November.

All other components

Nothing to report

CONTRIBUTIONS TO USAID GENDER OBJECTIVES

Cereals and cereal systems

CIMMYT has undertaken efforts to involve more women at the project planning stage. Several women were invited to contribute to the workplan meeting and thus ensure their participation in project implementation. Further progress on the practical involvement of women will be reported as the project progresses.

Vegetables

Vegetable production – particularly processing and marketing – is dominated by women, and actively involving them to run sections of the vegetables component (particularly the value chain sub-project) will be vital for success. These areas will actively target inclusion of women. Dr. Mansab Ali will participate in a gender workshop with Dr. Nair and other AVRDC staff at its headquarters in Taiwan in November and this will help to focus attentions on increasing the involvement of women in the project.

Human resource development

Women are being strongly encouraged to apply for opportunities in the human resource development component. If the pool of qualified students is sufficient, we are aiming for close to half of the students to be female.

ENVIRONMENTAL COMPLIANCE

No activities were undertaken that would warrant attention under the IEE at this stage.

COMMUNICATIONS

CIMMYT staff worked with USAID to produce a press release around the May inception meetings (Appendix A). A story was also produced in the CIMMYT *Informa* newsletter and blog and the event received coverage in the *Daily Pakistan Observer, Daily Times, Daily The Nation, National Herald Tribune, The Patriot, Daily Business Recorder, Daily Ausuf, Daily Express, Daily Ash Sharq, Daily Al Akhbar, Daily Voice of Pakistan, Daily Subah, Daily Taqat, Daily Dehat,* and *Daily Khabrian*. Several key speakers and partners were also featured on a Pakistani radio show.

The cereals and cereal systems stakeholder meeting in August also received coverage in the CIMMYT *Informa* and blog (Appendix K) and the project has been mentioned many times in Pakistan national press. Now that personnel have been hired and more activities are commencing, CIMMYT communications will work with USAID and the primary partners to ensure that press releases are produced at least every quarter.

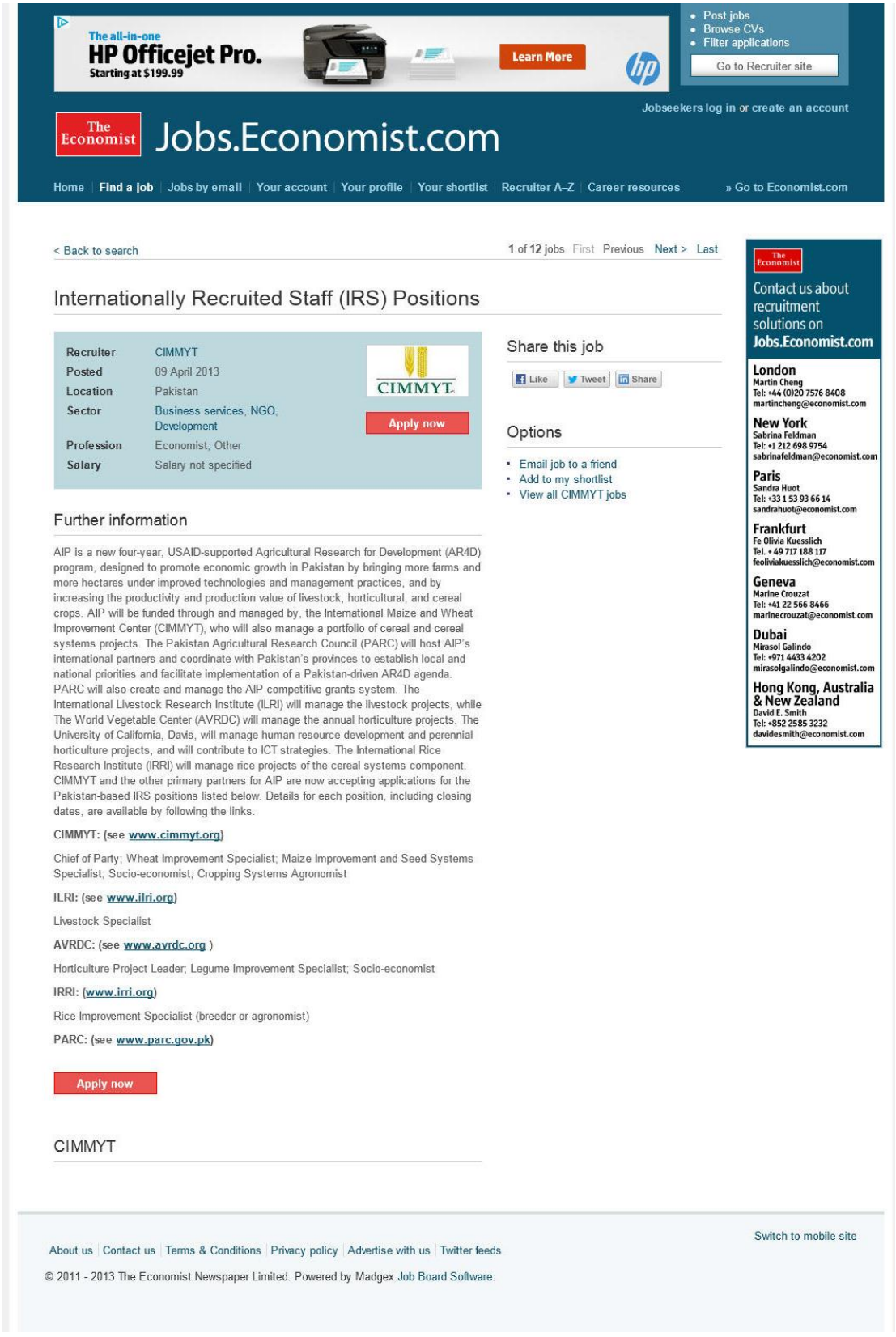
Branding and marking strategies were prepared by CIMMYT and approved by USAID. These have been disseminated to all primary partners and are being actively consulted. At ILRI's request, social media guidelines are also in the process of being prepared by CIMMYT.

OTHER

USAID- Islamabad requested that CIMMYT-Pakistan organize a stakeholder meeting and present the draft workplan before it is approved by USAID. The CIMMYT office is currently working to plan this meeting for November.

Following feedback received from USAID on 26 October, future reports will also include a full calendar of events held and events planned for the next reporting period; documentation of international travel supported by AIP funds; meeting agendas; and a list of sub-grants under commissioned projects or the competitive grants system (i.e., not primary partner sub-grants).

Appendix A: AIP IRS job announcement for *The Economist* – April 09, 2013



Internationally Recruited Staff (IRS) Positions

Recruiter	CIMMYT
Posted	09 April 2013
Location	Pakistan
Sector	Business services, NGO, Development
Profession	Economist, Other
Salary	Salary not specified

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Further information

AIP is a new four-year, USAID-supported Agricultural Research for Development (AR4D) program, designed to promote economic growth in Pakistan by bringing more farms and more hectares under improved technologies and management practices, and by increasing the productivity and production value of livestock, horticultural, and cereal crops. AIP will be funded through and managed by, the International Maize and Wheat Improvement Center (CIMMYT), who will also manage a portfolio of cereal and cereal systems projects. The Pakistan Agricultural Research Council (PARC) will host AIP's international partners and coordinate with Pakistan's provinces to establish local and national priorities and facilitate implementation of a Pakistan-driven AR4D agenda. PARC will also create and manage the AIP competitive grants system. The International Livestock Research Institute (ILRI) will manage the livestock projects, while The World Vegetable Center (AVRDC) will manage the annual horticulture projects. The University of California, Davis, will manage human resource development and perennial horticulture projects, and will contribute to ICT strategies. The International Rice Research Institute (IRRI) will manage rice projects of the cereal systems component. CIMMYT and the other primary partners for AIP are now accepting applications for the Pakistan-based IRS positions listed below. Details for each position, including closing dates, are available by following the links.

CIMMYT: (see www.cimmyt.org)

Chief of Party; Wheat Improvement Specialist; Maize Improvement and Seed Systems Specialist; Socio-economist; Cropping Systems Agronomist

ILRI: (see www.ilri.org)

Livestock Specialist

AVRDC: (see www.avrdc.org)

Horticulture Project Leader; Legume Improvement Specialist; Socio-economist

IRRI: (www.irri.org)

Rice Improvement Specialist (breeder or agronomist)

PARC: (see www.parc.gov.pk)

Apply now

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Appendix B: Summary of AIP Inception Meetings – May 27-28, 2013

During 27-28 May, all the primary partners met with more than 130 stakeholders to discuss the AR4D Boards, HRD elements of AIP, and overall goals, as well as to identify key focus areas for commissioned projects.

A summary of the meetings was reported in the CIMMYT *Informa,* and this article was also reproduced on aidnews.org and humanitariannews.org.

CIMMYT
International Maize and Wheat Improvement Center

informa
No. 1844 • 24-31 May 2013

A new era for Agricultural Innovation in Pakistan

On 27-28 May, representatives from CIMMYT, USAID, the Pakistan Agricultural Research Council (PARC), ILRI, IRRI, AVRDC, and UC Davis met with colleagues from several Pakistan universities, agricultural secretaries of the provinces, development sector organizations, private sector representatives, and farmer organizations, to discuss and plan the next stage of the USAID-supported Agricultural Innovation Program for Pakistan (AIP).

ASIA

In his opening address, Randy Chester, USAID's Deputy Office Chief for Agriculture, stated that "AIP represents a unique and unprecedented collaboration, in that it will bring together the expertise and resources of all of these organizations, including USAID, to increase the income of farmers across Pakistan." By using the Global Conference on Agricultural Research for Development (GCARD) approach of agricultural research for development (AR4D), AIP "will foster a demand-driven, results-oriented, science research community, and enhance linkages between Pakistan's agricultural research and innovation communities, the wider global community of agricultural scientists, and the private and civil society sectors," he concluded.

AIP is a unique program for CIMMYT, aiming to address not only cereals and cereal systems, but also livestock, vegetables, and fruit trees, through a combination of commissioned projects, a competitive grants system, and human resource development. The program will draw on the expertise and resources of the five international partners, but many other Pakistan partners will be brought on as the program develops. PARC Chairman, Iftikhar Ahmad, highlighted the role that Pakistan organizations have to play: "We need a new kind of collaboration," he said. "It must be a two-way process in that Pakistan must also contribute to international science. Pakistani scientists must play a crucial role in paying back what we get from the outside. Other economies can benefit from Pakistani science as well," he added.

It would not be the first time that Pakistan has positively impacted worldwide agricultural development. Its national agricultural research system was instrumental in identifying two high-yielding wheat mega-varieties, 'Mexi-Pak' and 'Pak81', also known as 'Siete Cerros' and 'Seri', respectively, recalled Hans Braun, Director of CIMMYT's Global Wheat Program.

During spirited working groups, participants put forward their suggestions for project priorities that will enable AIP to increase the incomes of tens of thousands of farmers, through increased agricultural productivity, in the shortest time frame possible. There will be a strong focus on adapting ▸

Also in this issue

CIMMYT 2 Informa

and up-scaling existing technologies present elsewhere in the region, such as Greenseeker sensors for improved nutrient management.

Closing the meetings, Jonathon Conly, USAID Mission Director, Pakistan, praised the group in their collaboration to revolutionize Pakistan's agricultural sector. "If we care about driving economic growth, it has to be done by increasing farm productivity, by increasing adoption of technologies, and human capacity," he said; concluding: "I believe that AIP will lead to the desperately-needed increases in agricultural productivity in this country."

CIMMYT and USAID also worked together to produce a press release:

U.S. launches 'Agricultural Innovation Program'

ISLAMABAD, 27 May, 2013— The U.S. Agency for International Development (USAID), the International Maize and Wheat Improvement Center (CIMMYT) and the Pakistan Agricultural Research Council (PARC) have launched the Agricultural Innovation Program to expand the use of modern technologies in Pakistan's agriculture sector.

"Boosting Pakistan's economy is one of our top assistance priorities. Getting new and improved technologies and practices into farmers' hands in the next few years will play a major role in helping Pakistan address agriculture needs that will enhance economic development in the country," said USAID Country Director Jonathan M. Conly. USAID's Agriculture Innovation Program aims to increase agricultural productivity and quality that will improve the quality for consumers and help create more jobs on farms throughout Pakistan.

Currently, Pakistan's agricultural sector is a key part of Pakistan's economy but is not growing at a pace that meets its potential. "Pakistan's agricultural productivity has fallen behind comparable countries with similar agro-ecologies," said Thomas Lumpkin, Director General of CIMMYT. "There is a tremendous potential for growth, but we must act now."

Dr. Shahid Masood, Member (Plant Sciences), PARC, said, "The project will develop a science-driven model to improve the livelihoods of Pakistan's agricultural producers, and enable economic growth. The international and Pakistani partners involved in this effort are dedicated to the research, collaboration, and investments that will ensure success."

Through this new four-year, $30 million project, USAID will sponsor research to encourage adoption of new technologies in agriculture. To date, 800,000 rural families have increased yields and started earning better incomes through USAID programs. The goal of U.S. assistance in agriculture is to increase employment and incomes for 1.1 million rural families (representing approximately 7.5 million Pakistanis) by 2018 by irrigating one million acres of land, improving agricultural processes, and connecting small farmers to major agribusinesses.

For more information on USAID Pakistan, please visit http://transition.usaid.gov/pk/

Appendix C: AIP Inception Meeting, Cereals / Cereal Systems Group Summary – May 27-28, 2013

Participants

Muhammad Shafique, Agronomist, Dept. of Agriculture, AJK
Saijad S. Malik, Director, Emkay Seeds Ltd.
Dr. Abdul Rehman, Coordinator (rice), NARC
Dr. G.M. Avesi, Chief (R&D), Guard Agriculture
Ruslam Khan, Manager (Supply chains), PHDEC
Dr. Muhammad Arshad, Maize botanist, MMRI, Yusafwolo, Sahiwal
Mian Muhammad Shafique, Director, MMRI, Yusafwolo, Sahiwal
Muhammad Rafique, Maize botanist, MRS, AARI, Faisalabad
Zahid Mahmood, Scientific Officer, WWCP, NARC, Islamabad
Dr. Muhammad Ashraf, National Coordinator (maize, sorghum, and millet), NARC, Islamabad
M.S. Shaheen, Manager (R&D), Ali Akbar Group, Lahore
Noel Magor, Head of training, IRRI
Bert Collard, Breeder, IRRI
Zahoor A. Swati, Dean (FCPS), Agricultural University, Peshawar
Muhammad Zakria, Director (Agriculture), Agricultural Extension, Punjab
Dr. Nadeem Amjad, Member (NRD), PARC
Dr. Karim Bux Laghari, Director, WRI, Sindh, Sakrand
Asif Alishah, Country Manager, Dupont Pioneer
Imtiaz Hussein, Wheat Coordinator, NARC
Prof. Dr. Safdar Ali, Dean (FCFS), Arid University
Dr. Manzoor Hussein, Assistant botanist, RARI
Dr. Qadir Baloch, Country Manager, Harvest Plus
Waheeda Kausar, Director, PARC
Dr. Gulzar Ahmad, PRO (wheat), CCRI, Pirsabak, KP
Dr. Naeem Ahmad, PRO (cereals), ARI, Mingore
Dr. Muhammad Iqbal, Maize breeder, CCRI, Pirsabak, KP
Dr. Abdul Bari, Director, CCRI, Pirsabak, KP
Yahya Rauf, Research Assistant, CIMMYT
Makhdoom Hussain, Director (wheat), AARI Faisalabad
Rana Iftikhar Muhammad, Secretary General, Anjum Kashitkram, Punjab
Dr. Asmat Ullah, Director (cereals), ARI, Quetta
Hulshum Laload, Rice botanist, RRI, Dokri
Dr. Muhammad Aktar, Director (rice), RRI, KSA
Athaj-Ur-Rehman, ARO (wheat), BARI, Chakmal
Dr. Parvez Khalis, Director (PRMC), NARC
Dr. Akbar Shah Mohmand, Sr. Director (CSI), NARC

Discussion

1. Agronomy

It was decided that cropping systems for rice-wheat systems will be led by CIMMYT, with support from IRRI.

Main issues:

- Burning of crop residues; most is burnt but it should be saved and used in the system.
- Happy Seeder – this plants well in rice residue, therefore can it be promoted in rice-wheat areas of Pakistan?
- Ridge planting – can we move towards bed planting instead?
- Fertilizer – use in Pakistan fluctuates due to prices, subsidies, and availability. There is a need to improve efficiency of fertilizer use through LCC/NUE and technologies such as the GreenSeeker, nutrient efficient germplasm, and nutrient management. Solutions need to be locally-focused.
- Rainfed-specific problems – fertilizer is not commonly used for rainfed crops so the focus should be on better agronomy, production technologies, and inputs. The current zero-tillage machinery is not good for rainfed systems, so machinery needs to be adapted, as zero-tillage followed by bed planting is the ideal system for rainfed agriculture.
- Laser levelling – this is essential for better bed and ridge planting and improved nutrient management.
- ICT – using appropriate tools would help improve farmers' incomes and assist in establishing strong links with regional programs like CSISA.

2. Maize

Main issues:

- Spring planting – this is successful in Punjab and is being adopted by medium- and large-farmers. High prices deter small farmers from using commercial hybrids; therefore we need to supply hybrid seeds at affordable prices. Water availability during April-May puts a huge stress on the crop and is also something that needs to be addressed. Autumn planting still occupies a major area in KP.
- Heat and drought tolerance – this causes large and region-specific problems for maize growers in Pakistan. If CIMMYT can supply material from DTMA, it could be incorporated into Pakistan's local material.
- Other problems: Little irrigated maize; poor quality seed; poor agronomic practices; drought.

Solutions: Ensure availability of improved maize seed and stress tolerance

3. Wheat

Main issues:

- Rust resistance – rust resistant wheats need to be rapidly diffused in Pakistan.
- Fungicides – these need to be introduced to the wheat management system and disseminated country-wide.
- Grain quality – only 25-28% of purchased seed is certified and farmers reuse it for 3-5 years. Even certified seed can be poor quality (especially when demand is high).
- Durum – there is a need to generate a durum wheat value chain for Pakistan as this could be a potential export crop if the industry develops, particularly in Quetta.
- Rice-wheat systems – we need to verify whether the productivity of rice-wheat systems decrease over time. Wheat is considered an "orphan crop" when planted after rice, therefore the wheat and rice breeders need to work together to develop varieties (e.g. early rice varieties) that fit in the system.
- Agronomy – a lot of wheat is seeded via broadcasting, using a high quantity of seed and a high fertilizer rate. There is a need for improved methods to increase NUE, WUE, etc.

4. Rice

Main issues:

- Enhanced access to new germplasm sources for rice breeding in the public and private sectors
    - New sources for critical traits: BLB (Xa23, others), submergence, salinity, drought, heat, cold (Swat valley – japonica)
    - Other specialized genetic stocks, MAGIC populations, etc.
    - Hybrid parental lines improvement: new CMS lines, WBPH introgression
    - Mechanisms include: Demand-driven germplasm sharing, Hybrid Rice Development Consortium (HRDC; public and private), Temperate Rice Research Consortium (TRRC, japonica)
- Enhanced evaluation and release of advanced breeding lines/new varieties for key current and future cropping systems
    - Emphasis on cropping systems solutions (duration, suitability to direct seeding, CA, water management, etc.)
    - Systematic testing of new materials for suitability to specific cropping system and market requirements in Pakistan
    - Advance variety release and early stages of seed production
    - Seed production improvement (selected regions, e.g. Swat)
    - Mechanisms include:
        - Key agronomy sites in the major rice-growing areas, linked to public and private sector breeding sites and systems agronomy hubs
        - Regular selection of materials to evaluate from breeding programs in Pakistan and IRRI (annual breeders visit)
        - Seed purification/production/training
- Research on emerging issues
    - New diseases – brown leaf spot, grain discoloration, false smut, kernel smut

    - Insect resistance genes (WBPH)
    - Grain quality traits, etc.
    - Mechanisms:
        - Sandwich PhD scholars: course work in Pakistan – research at IRRI
        - Visiting Research Fellows (shuttle research between Pakistan and IRRI)
        - Competitive grants proposals
- Postharvest and grain quality
    - Increasing requirements of export and local markets, more opportunities for contract farming
    - Value losses due to poor postharvest technologies
    - Mycotoxins, other contaminations
    - Grain quality analysis – methods, standards
    - Mechanisms include: Collaboration with private sector, training and introduction of postharvest technologies, and lab training
- Crop management tools for extension workers and farmers
    - CropCheck agronomy module for rice in Pakistan
    - Crop Manager for rice-wheat system (web, mobile app)
    - Extension training (public and private sector)
    - Mechanisms:
        - IRRI: content and tool development with partners in Pakistan
        - Extension in Pakistan through AIP cereal systems component as a whole

Next steps:

- 2013 rice season has started already – too late to move germplasm
- Develop detailed work plans and budgets; visit of Pakistan group to IRRI in August to get a complete update on ongoing work and develop detailed work plan for breeding/seed activities
- Start training schedule with first programs in 2013
- Start work on crop management modules and tools for rice
- Start first sandwich PhD/VRF research activities
- ADB project: technical consulting services for rice improvement, agronomy & value chain improvement in Punjab (basmati value chains); with public and private sector

5. Capacity Building

- Extension component – vocational training/ manufactures and service providers
- Send young Pakistani scientists/students to CG/other places/ worldwide centers
- Opportunities for short-term training courses depending on the need
- Indigenous university training working on aspects of commissioned projects etc.
- Training courses in Pakistan for young scientists, technicians, trainers
    - Modular (multiple crops combined)
    - Breeding, agronomy, ICT for extension, postharvest, seed production
    - Leadership, gender, and diversity

Appendix D: AIP Inception Meeting, Livestock Group Summary – May 27-28, 2013

Participants

Dairy Value Chains working group
Iain Wright, Director/PLE, ILRI (Chair)
Mr. Muqarrab Ali Khan, Director Breed Improvement and Farms, Government of KP
Mr. Jack Moser, USAID Lahore
Dr. Aman-Ullah Cheema, NARC, AIP Focal Person
Dr. Hassnain Shah, SSRI, PARC
Dr. M. Afzal, FAO
Dr. Abedullah, UAF
Dr. Subair Ahmed, DRDF (USAID Dairy Project)
Prof. M.S. Qureshi, Dean, Animal Husbandry, UAP
Ahsan Ullah Awan, Arysta Life Science
Dr. R.H. Usmani , Member Animal Science - PARC
Dr. Abdul Rauf, Director/L&DDD, Punjab
Dr. M. Fiaz, Arid University Rawalpindi
Dr. T.N. Pasha, VC/UVAS

Small Ruminant Working group
Dr. Barbara Rischkowsky, ICARDA
Dr. M. Sajjad, Animal Genetics & Breeding, UAF
Nadhem, Economist/ILRI
Dr. M. Fatah Ullah Khan, NARC, AIP Focal Person
Dr. Sohail Ahmad, University Agric., Peshawar
Dr. Muhammad Abdullah, UVAS
Dr. Shahzad Kauser, UAF

Feed, Fodder & Rangeland working group
Dr. Mounir Louhaichi, ICARDA
Dr. Muhammad Islam, NARC, range-land specialist
Dr Sarfraz Ahmad, range expert of PARC
Dr. Shahid Rafique, PARC, AIP Focal Person - FFR
Dr. Shaukat Ali Bhatti, ass. prof. nutritionist, UAF
Prof. M. Sarwar, Dean/UAF (Nutritionist)
Dr. Qamar Shakil, Fodder Research Station, Faisalabad
Dr. H. Khan, Agric. University Peshawar

Site Selection
Dr. Nils Teufel, Economist/ILRI
Dr. M. Azeem Khan, DG/SSRI (NARC)

Dr. Abdul Majid, ICARDA
M. Ibrahim, ILRI

Discussion

Around 30 stakeholders from the different provinces representing (non)government livestock officers, NGOs, donor funded project staff, and academia attended this session. After self-introduction of participants, the outputs, intended outcomes, and milestones for each major research topics under AIP-Livestock were discussed: (a) Dairy Value Chain, (b) Small Ruminant Value Chain, and (c) Feed, Fodder & Rangeland.

1. *Dairy Value Chain*

Intended outcome: Small-holder farmers in disadvantaged areas gain access to products and services; inclusion in the value chain allows them to increase their market knowledge and farm smarter.

Constraints:

(a) Marketing

- Lack of market access (lack of collection centers)
- Informal markets
- Price fluctuation (price control, need to reduce production costs)
- Milk quality (Adulteration, Aflotoxins)

Research Opportunities in Milk Marketing

Develop innovative models of cooperation and marketing

- Formal and informal sectors
- Market differentiation

(b) Breeding

- Good genetics available in Pakistan (e.g. Sahiwal), but semen is imported from Australia/Sweden
- No recording system
- Summer shortage of milk
- National Breeding Policy?

Opportunities in Breeding Research

- Develop appropriate breeding programs (Community based, Control diseases)
- Synchronization of breeding in June/July to supply summer milk

(c) Animal Health

- FMD
- Brucellosis
- Mastitis
- Theleriosis

- 50% calf mortality

Opportunities in Animal Health Research

- Assess prevalence of disease using epidemiological surveys and molecular tools
- Assess economic and public health costs of disease to assist in targeting R&D

(d) Animal Feeding

- In most systems the basal diet are crop residues, and some characteristics/constraints associated are; nutrient density, lack of storage, spoilage, price competition, fodder markets, burning and chopping
- Supplements (lack quality control)

Research Opportunities in Feeds

- Improvement of straw quality
- Feed storage (silage technology)
- Fodder seed systems

(e) Other Topics

- Cattle management
- Input supply
- Gender

2. Small Ruminant Value Chain

After careful consideration of the intended outcome, outputs, and target indicators, the group identified constraints and opportunities for the SR value chain system. The group proposed a list of research activities which will be needed to address the above constraints.

Intended outcome: Overall productivity of small ruminant value chains increased.

Outputs: Higher animal productivity, increased incomes through more SR sold, farmers enabled to target new, more profitable markets.

Target Indicators

- 500 households in 20-25 target communities involved in project activities
- Off-take rate from small ruminant flocks increased by 30% (2015)
- Incomes raised by 40% (2016)

Constraints and opportunities in Sheep and goat VC

- Limited access of smallholders to vaccines for PPR, Enterotoxaemia and CCPP
  - More community animal health workers and private services required
- Best male animals are sacrificed for Eid
  - Breeding program initiated for Beetal – Makhicheni; AI to be tested as potential means to use best males more efficiently
- Feeding options required for high input dairy goat systems

- Such as lucerne (alfalfa) hay , Berseem, Acacia pods and concentrate mix
- Each market channel requires different animal size and weight , e.g. retailers versus Eid
  - Access to market information and economic assessment

Activities

- Training of researchers in VCA
- Assessment of selected sheep and goat value chains to identify limiting factors and opportunities;
- Increase farmers' access to:
  - feeds for higher input systems
  - animal health services, in particular vaccines
  - breeding animals with higher genetic potential
- Develop more effective marketing models through:
  - sales of sheep and goats with appropriate weight and size according to market demand
  - increased access to market information
  - Organizing farmers

3. Rangeland, Forages, Feeding Systems

After reviewing the intended outcomes, the group formulated a set of research questions and proposed a set of activities for forages, feeding systems, and rangeland.

Intended outcomes:

- Increased profitability of livestock production through higher rangeland and fodder productivity
  - Farmers spend less (reduced feeding cost) on livestock feeding
- Improved feed availability and better feed utilization
- Rangeland condition in selected sites mapped and assessed
- Innovative approaches are sustainable and environment friendly

Research Questions:

- Which knowledge partners can efficiently support increased productivity and quality of range, fodder, and feed in rainfed and irrigated systems?
- What technology is readily available for adoption and out-scaling after fine-tuning?
- How to enhance the adoption of improved feeding practices?
- How to better utilize the available feed resources?
- How to alleviate feed scarcity during lean periods (November-January and May-June)?
- How degraded are rangeland sites in each target province?

Activities

Forages:

- Combine improved fodder and forage varieties with high yield potential with appropriate agronomic practices
- Select grain crop varieties for increased nutritional value of residues(dual purposes)

- Investigate role of Lucerne for high input dairy goats
- Forage conservation to alleviate gap in feed resources during lean periods
- Enhance/establish forage seed production enterprises (state, private, village-based/community)

Feeding systems:

- Balance feed rations for flushing, late gestation, milk production, and fattening
- Utilize cereal-legume mixes (link with cereals group)

Rangelands:

- Characterize sites and communities in terms of biophysical and socio-economic variables, in particular:
    - Document existing setup (grazing arrangements, community organization, user groups, etc.) for using common resources
    - Assess condition of rangeland resources at selected sites
- Strengthen availability of native and well adapted introduced range seed and seedlings enterprises (establishment of mother plants, seed production and multiplication)
- Rehabilitate degraded rangelands (water harvesting techniques, reseeding, shrub plantations, etc.)
- Enhance/establish community-based rational grazing management with full involvement of local community

Cross-cutting:

- Enhance capacity development of all stakeholders (farmers, local institutions, etc.)
- Gender balance

Milestones

- Interventions will target at least 250 households per selected site
- Fresh fodder biomass production increased by 30-50%
- Milk and meat production from ruminants increased by 20-30%
- Rangeland productivity increased by 50 -100% for 10 pilot communities (each with 50-100 households)

4. *Working Group on Site selection*

The group proposed a set of criteria for selection of sites; these are listed below. The group also stressed the need for provincial representation.

Criteria for site selection:

1. Accessibility:
   - remoteness; distance/time to market
   - security; local experts and USAID

2. Development institutions (government, NGOs, private companies, community):
   - quality, diversity, expert opinion
   - large development interventions for scaling-out (e.g. provincial government initiatives)

3. Research organisations:
   - level of involvement, distance of organisation

4. Representativeness of district for farming/livestock systems:
   - number of households in system (combination of population and farming system; livestock only, mixed-rainfed, mixed irrigated)

5. Poverty:
   - data (poverty score cards – Benazir Income Support Programme, NRSP, Islamabad; Rural Support Network , RSPN)
   - Arif Bhat, Pakistan Institute of Development Economics (PIDE)

6. Contribution of livestock (livestock/household, livestock/land)

7. Food security:
   - Data from Sustainable Policy Development Institute (SDPI, Islamabad)

8. Market quality (mainly milk, also SR):
   - exclude subsistence-dominated areas
   - data on formal marketing institutions (dairy collection centres/plants), SR trade?

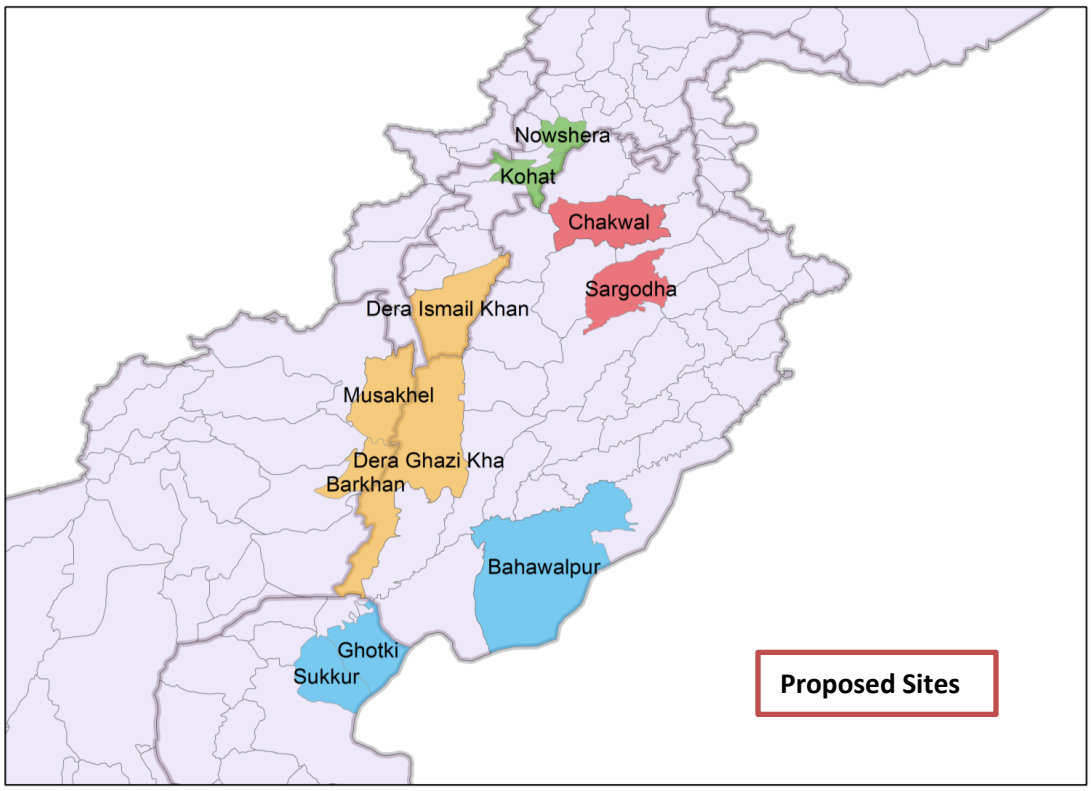
Provincial representation:

- For Balochistan and Sindh: Target districts in southern Punjab that can link to neighbouring districts in Balochistan and Sindh
- Rainfed: Punjab (DG Khan), adjoining with Balochistan (Musakhel, Barkhan)
- Irrigated: Punjab (Bahawalpur), adjoining (nearly) with Ghotki (Sindh, could be a bit risky); Sukkur and Khairpur are much better, but there is no research setup. Bahawalpur has similar systems to Tharpakka desert (Mithi and Umarkot districts in Sindh)
- For Balochistan perhaps only specific issues: range-lands/ diseases (FMD/PPR)

Proposed sites:

It was agreed that the number of sites to be limited to 3-4 (proposed sites are listed below and also shown in the map)

- Sargodha/Chakwal
- Bahawalpur/Cholistan (links to Sindh)
- DG Khan could be another option with links to Balochistan (Musakhel/Barkhan) and Sindh (Sibi)
- DI Khan (linked to Zhob/Musakhel, Balochistan, but link goes through FATA therefore difficult for foreigners)
- Nowshera/Kohat


Nowshera
Kohat
Chakwal
Sargodha
Dera Ismail Khan
Musakhel
Dera Ghazi Kha
Barkhan
Bahawalpur
Ghotki
Sukkur
Proposed Sites

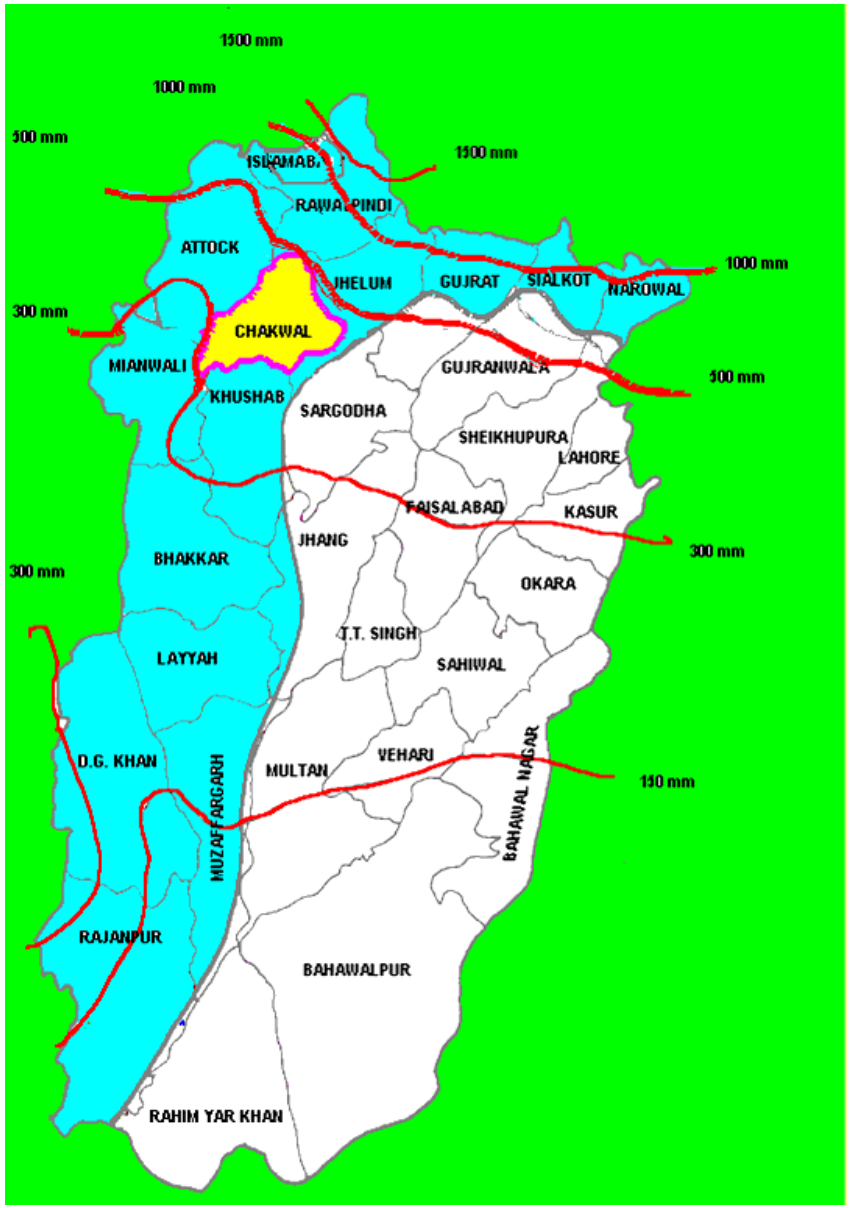
Appendix E: Initial site selection for the AIP livestock component (proposed during AIP inception meetings, May 27-28, 2013)

Site	1. Accessibility/Security	2. Research and Development institutions (gov, ngo, priv, community)	3. Representativeness of district for number of hh in system	4. Poverty data	5. Contribution of livestock (livestock/hh, livestock/land)	6. Food security	7. Market access and efficiency
Chakwal	Good/good	BARI for fodder		yes (collate data)	predorminantly goats:most HH has goats and some HH shave heep, cattle + Buffaloe	Poor due low rainfall	Structure is there, but efficiency ??
		NARC all					
		NRSP					
		Line depts					
		CRP1.1					
		KHERIMurath (LS barani research institute)					
Bhawalpur	Good/good	LD		MIX of both (L-Med)	Details are availble in GEF PDF B report	Good - Poor (Cholistan)	Reasonable to good
Irrigated		SR Directorate, line dept					
		Arid zone research Institute					
		NRSP (NGO)					
		Any university/Vet Fac with LS??					
Rainfed (Cholistan)		Cho Dev Authority					

Sargodha	Exe	Sargodha fodder res institute		Mix good to poor	Dairy contribution is high	medium	good
		Sarghoda University??					
		LD are there					
		Dairy people at NARC?					
Nowshera	Travel is OK	LD, Livestock		Average	Dairy contribution is high	good	good
(mainly dairy)	Security?	Peshawar University					
		FRI has Range institutions					
		Rural support program?					
Kohat (rainfed)	some difficulty/ security questionable	L Line Depts are present		more poor	Distribution ??		
		Research Institutions do not know					
		NGO ?					
		Rural support program?					
Okara	AUSAID project site?						
Chichawaatni	USAID funded Dairy Project						
Hyderbad	Dairy						

Criteria for site selection:

1. Accessibility
2. Research and Development institutions (gov, ngo, priv, community)
3. Representativeness of district for number of hh in system
4. Poverty data
5. Contribution of livestock (livestock/hh, livestock/land)
6. Food security
7. Market access and efficiency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SARGODHA
SHEIKHUPURA
LAHORE
FAISALABAD
KASUR
JHANG
BHAKKAR
OKARA
T.T. SINGH
LAYYAH
SAHIWAL
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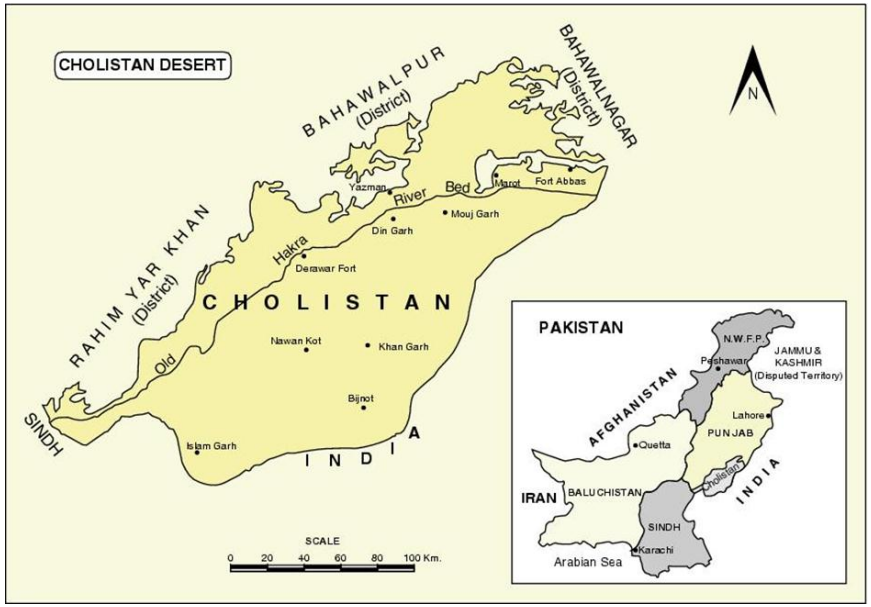
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BAHAWALPUR (District)
BAHAWALNAGAR (District)
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Nawan Kot
Khan Garh
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Bijnot
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SINDH
INDIA
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N.W.F.P.
Peshawar
JAMMU & KASHMIR (Disputed Territory)
AFGHANISTAN
Lahore
PUNJAB
Quetta
Cholistan
IRAN
BALUCHISTAN
INDIA
SINDH
Karachi
Arabian Sea

Appendix F: AIP Inception Meeting, Vegetable Group Summary – May 27-28, 2013

Participants

Dr. Mansab Ali, Director, Horticultural Research Institute, NARC, Islamabad (Chair)
Dr Mubarik Ali, CEO, PARD, Islamabad
Dr. Fazal ur Rehman, Director, Agriculture, Gilgit-Baltistan
Mr. M. Shafique, Agronomist, Dept. of Agriculture, Shaukat Lane, Muzaffarabad, Azad Kashmir
Mr. Matloob Hussain, F&V Specialist, Department of Agriculture, Gojra, Muzaffarabad, Azad Kashmir
Mr. Sajjad S. Malik, Director, Emkey Seeds, Lahore, Punjab
Dr. Muhammad Shafiq, Assistant Botanist, Pulses Research Institute, AARI, Faisalabad, Punjab
Mr. Muhammad Saleem Shaheem, Manager R& D (Seeds), ALI AKBAR GROUP, Lahore
Dr. Muhammad Ashraf, Deputy Chief, Pioneer Seeds, Lahore, Punjab
M. Maaz Ullah Khan, Horticulturist, Agricultural Research Institute, Mingora, Swat, Khyber Pakhtunkhwa (KP)
Dr. Ghulam Jeelani, PSO, Vegetables, Horticultural Research Institute, NARC, Islamabad
Dr. Asghar Ali, Coordinator, Pulses, Crop Sciences Institute, NARC, Islamabad
Dr. Ashfaq, University of Arid Agriculture, Rawalpindi, Punjab
Dr. Sial, University of Arid Agriculture, Rawalpindi, Punjab
Dr. Shahid Niaz, Director, Vegetable Research Institute, Ayub Agricultural Research Institute, Faisalabad, Punjab
Mr. Sahoo, Vegetable Specialist, Vegetable Research Station, Sindh Horticultural Research Institute, Mirpurkhas, Sindh
Dr. Mansoor, PSO, Pulses, Arid Zone Research Institute, DI Khan, Khyber Pakhtunkhwa
Mr. Nizammani, Botanist, Pulses, Rice Research Institute, Dhokri, Larkana, Sindh
Dr. Warwick Easdown, Regional Director South Asia, AVRDC-The World Vegetable Center (via teleconference)
Dr. Ramakrishnan Nair, Legume Breeder, AVRDC-The World Vegetable Center (via teleconference)

Discussions

Three proposed sub-projects (covered production systems, improved mungbean production, and enhanced value chains) were confirmed as important for the whole group, and three additional foci were also emphasized for inclusion. Increasing national vegetable seed production is important as almost all vegetable seed is imported. Introducing more heat and cold tolerant varieties of vegetables is important to extend open field production seasons, and there is a need to develop nurseries for virus-free seedling production. The main focus needs to be on increased income and employment and linking to existing USAID projects

Covered production systems

There are a few very large farmers growing vegetables under protected cultivation and many smallholder farmers. The project will focus primarily on smallholder farmers. Protected cultivation is well-established in Pakistan, but the main focus has been on walk-in tunnels and low tunnels for cultivation of a range of off-season crops between December and February. There is a need to strengthen such systems and to improve efficiency.

There is no need to focus on protected cultivation for very cold areas and such systems are not used at other times of the year, such as during the kharif season to protect crops from rain. Protected cultivation is only used from October to February. Plastic covers are removed from March onwards as temperatures rise. It is difficult to grow vegetables in June and July as it is too hot and humid, and strong winds can be a problem. At these times there is more vegetable production in the hills than on the plains.

Walk-in tunnels and low plastic tunnels are being used in all four provinces, but they need more promotion in KP for early cucurbits in the foothill areas. Other crops under low tunnels have not been well researched and may also be as equally profitable as cucurbits. There is a need to extend the seasons for a number of crops through such innovations. There is also a need to expand the types of covered production used beyond low and high tunnels.

Crops are sprayed every 2-3 days for diseases, and more research on pesticide use under covered production is needed to minimize misuse. There is need for a fully-fledged integrated pest management (IPM) program to manage production in low plastic tunnels more effectively. A university-developed hydroponics system could also be further tested to improve watering options within covered production systems, and more work is needed on herbicides and biological control methods.

There is not much current need for R&D work on soil health as most of the covered production systems used are not permanent. Most systems used by smallholders are portable. However, there is a need for better quality plastics that will allow in more light and that can be manufactured locally.

Improved mungbean production

Mungbean fits into the irrigated rice-wheat and wheat/wheat rotations as a cash crop, and the main production area is in Punjab. Mungbean is overwhelmingly used as a grain crop in Pakistan, and only about 1% is used as a vegetable.

There is a need for short duration varieties like as NM92 that can be harvested in 55-60 days. Pakistan has some short duration lines but the yields are very low. Preferred yields need to be >1.5 t/ha. Crops are normally sown from April to June. Early crops tend to have more flower drop due to high temperatures. Current varieties usually have three flushes of pod production, with about half the production in the first flush. More synchronous varieties are needed as well as the development of a certified seed system.

Mungbean crops are at risk from sucking pests, and are regularly sprayed at flowering. Sucking bugs can do a lot of damage during pod formation and are particularly bad in southern Punjab in wheat/wheat

and cotton/wheat rotations. There is a need for IPM in mungbean. Some insect- or bruchid-resistant lines have been developed but they need to be tested further.

A prototype harvesting and threshing machine for mungbean has been tried and more work is needed on mechanical harvesting.

Enhanced value chains

The most important crops to focus on are: tomato, onion, cucumber, sweet pepper, and spinach. Other crops of secondary interest are: chili, brinjal, okra, cauliflower, and cabbage. It will be important to first survey value chains across different provinces and to evaluate postharvest practices and the impacts of storage life on farmers and consumers.

Other issues of importance

1. Off-season open field production: There is a need for vegetables that are more resistant to cold and heat and can extend growing seasons and the use of production technologies (like onion sets) to promote more off-season production. Pakistan has good heat tolerant tomatoes, but there is a need for more cold tolerant lines. It would be useful to be able to access more successful central Asian vegetable lines suitable for very hot or cold conditions.

2. Disease-free seedlings: What options are there to expand seedling production in polypots for early production? There is a need for virus-free nursery production, as there is a particular lack of high quality germplasm in the more remote provinces.

3. Improving national vegetable seed production: Almost all vegetable seed used in Pakistan is imported. With the exception of some work on peas and okra, no national seed production is being done. Selection work is being done, but there is very little breeding and no local seed production of tomato, spinach, or cucumber. There is a need for capacity building in scientific seed production, breeder training, and more development of seed villages and small-scale seed threshing technologies for vegetables.

A list of mature technologies will be developed for commissioned projects.

Appendix G: AIP Inception Meeting, Tree Fruit Group Summary – May 27-28, 2013

Participants

Dr. Rai Niaz Ahmad, University of Arid Agriculture, Rawalpindi, Punjab
Dr. Nadeem A. Abbasi, University of Arid Agriculture, Rawalpindi, Punjab
Dr. Fazal Rehman, Director of Research, Gilgit Baltistan
Matloob Hussain, Fruit & Vegetable Specialist, AJK
Dr. M. Abdul Rauf, Agricultural Research Institute, Mingora, Swat
Ahmed Ali Zafar
Dr. Ahmad Saleem,
Hassnair Shah, National Agricultural Research Council, Islamabad
Dr. Hafeez ur-Rahman, Coordinator, Fruit crops, National Agricultural Research Council, Islamabad
Dr. Abdul Samad, Agricultural Researcher, KP
Riaz Mahmood, CABI, Rawalpindi
Muhammad Ishfaq, Vegetable Research Institute, Ayub Agricultural Research Institute, Faisalabad, Punjab
Dr. Amir H. Malik, CABI, Rawalpindi
Dr. Muhammad Tariq, BARI, Chakwal
Dr. Mark Bell, UC Davis
Dr. Jim Hill, UC Davis

Discussion

Various challenges quickly emerged: there is a wide variety of crops that are both grown and which are of significant economic importance to Pakistan; secondly, there is a wide range of problems facing the different crops. When asked to identify what they saw are the top five priorities, there were two clearly dominant foci across the group:

1. True-to-type certification (clean)
2. Post-harvest demonstration and training (from harvest to market assessment to cooling and value addition etc.)

Other major draft priorities included:

- Certification considerations
- Extension and orchard demonstration (service providers)
- Establish model nurseries
- Pest management (mealy bug, phytophthora, fruit fly)
- Rootstock and scion – new sources and purity of existing
- Strengthen existing and establish new GPUs (mother blocks)
- Set priorities based on region (tropical, subtropical, or temperate)

Appendix H: Proposed AIP HRD Committee (proposed during AIP inception meetings, May 27-28, 2013)

1. Professor Thomas Rost, Chair — UC Davis
   tlrost@ucdavis.edu
2. Dr. Muhammad Imtiaz — CIMMYT/CG
   M.Imtiaz@cgiar.org
3. Prof. Dr. Sarwat Naz Mirza (Dean) — PMAS Arid Agriculture University
   sarwat_mirza123@yahoo.com
4. Prof. Dr. Safar Mirjat (Dean) — Sindh Agriculture University
   msmirjat@sau.edu.pk
5. Prof. Asif Ali Khan (Director) — University of Agriculture Faisalabad
   asifpbg@uaf.edu.pk
6. Prof. Dr. Farhatulla, (Director) — University of Agriculture Peshawar
   drfarhat@aup.edu.pk
7. Dr. Iftikhar Ahmad (Chairman) — Pakistan Agricultural Research Council
   iftahmad@gmail.com
8. Wasim Hashmi Syed — Higher Education Commission
   wsyed@hec.gov.pk
9. James Hill (Assoc Dean) — UC Davis (*ex officio)*
   jehill@ucdavis.edu

- Responsibilities
- Determine student selection criteria and application process (students should be directly linked to one of the center projects)
- Consult widely with PARC on key research areas
- Select students based on established criteria
- Work with UC Davis to place students at US LGUs
- Offer suggestion on graduate committees
- HR workgroup representation
- UC Davis - professor Tom Rost - Chair
- Pakistan Agricultural Universities
- PARC
- HEC
- Student research and studies program
- Graduate students placed at a USA LGU

- Coursework conducted in the USA
- Major Professor selected from a USA LGU
- Dissertation committee includes Pakistan Agricultural Professor and a Center IRS
- Research conducted on a problem in Pakistan (to the extent possible, could also be at a center)
- Dissertation defense conducted in Pakistan

Appendix I: AIP HRD Selection Committee, Meeting Agenda, August 21-22, 2013

August 21, 2013

12:30 – Welcome and Introductions

13:00 – 14:30 -- Charge to the committee and presentation (Rost):

1. *Identify the selection criteria for PhD and MS Pakistani student candidates in agriculture to be trained at Land Grant Universities (LGU) in the USA.*
2. *Act as the selection committee to identify 5 PhD and 9 MS candidates to be trained in the USA.*
3. *In consultation with the center partners identify the topics for this training that must include the following areas: (Note: Approximately ½ of the selected students should be female.)*
    a. *Livestock*
    b. *Horticulture*
    c. *Wheat / Maize*
    d. *Rice*
    e. *Tree crops (perennial horticulture)*
4. *Assist in the identification of USA Land Grant and Pakistan Universities and Professors to sponsor the selected graduate students.*

14:30 – 15:00 – Tea break

15:00 – 17:00 – Discussion and Planning

1. Identify the selection criteria for PhD and MS Pakistani student candidates in agriculture to be trained at Land Grant Universities (LGU) in the USA. Note that all candidates must meet the LGU admission standards to be admitted. Below is an example of the admission standard at U.C., Davis, and other LGUs will be similar:
    a. GPA – at least B average
    b. BS or MS completed (depends on whether the candidate is nominated for PhD or MS program)
    c. Student statement indicating some relevant experiences, drive and determination
    d. TOEFL score at least 550
    e. GRE score at least in 70% - English and Science
    f. 3 strong letters of support
    g. Other criteria?
2. Selection timing: Suggest selecting all 5 PhD candidates immediately along with 4 MS students; select the remaining 5 MS students the following year.
3. This is intended to be a so called “sandwich” program where PhD students will spend their first two years at the LGU, take their PhD qualifying examination at the LGU, then conduct their research and defend their dissertation at their Pakistan University in one additional year. MS students will spend their first year at a LGU, then conduct their research and write their thesis in

Pakistan. Discuss how to select the co-major professors, and also potential difficulties and issues of this strategy.

August 22, 2013

9:00 – 10:30 – Continue discussion

1. Other details of program:
    a. Continue discussion of issues related to the sandwich program.
    b. Qualifying exams at LGU
    c. Defense of PhD dissertation and MS thesis at Pakistan site
    d. LGU professors have travel money for Pakistan (do we want to allocate travel money for Pakistan professor to US?)
    e. Topics: Need for one PhD student for each center topic – How to do this?
        i. IRRI-rice;
        ii. CIMMYT-wheat, maize;
        iii. AVRDC-veggies;
        iv. ILRI-livestock;
        v. UCD-perennial horticulture

2. This committee will act as the selection committee to identify 5 PhD and 9 MS candidates to be trained in the USA. Discuss the possible the timing.
3. How to advertise and then identify student candidates and process to select students? Should there be in-person interviews? Are students from universities outside the members of this committee also eligible for selection?
4. Which universities in the US? BELOW EXAMPLES ONLY
    a. Texas A&M – livestock
    b. WSU – wheat
    c. U of IL – maize (technical detail)
    d. Iowa State U – maize
    e. U of Neb – maize
    f. UCD – horticulture
    g. UCD – rice

10:30 – 11:00 – Tea Break

5. Continue student committee discussion – what are the criteria to be slected as a co-major professor -- LGU major prof? Pakistan major prof? How to coordinate first two years, research project and thesis writing and approval?
    a. LGU prof
    b. 2 members from LGU for PhD and 1 for MS
    c. Pakistan prof

d. 1 member to represent Center topic
e. 5 members for PhD and 4 for MS

12:30 – 13:30 – Lunch

13:30 – 16:30 – Continue discussion

f. Intro course at UCD?
    i. Content and Duration?
    ii. Who teaches?
g. Student travel to UCD – housing and meals?
h. Student travel to LGU – housing, initiation, coordinate admission, etc.
i. How to follow through and evaluate progress?
j. Staff to coordinate the student program at UCD and Pakistan. NOTE: program budget includes a coordinator at UC Davis and UAL.

Any other discussion items?

Appendix J: Minutes of AIP cereals and cereal systems meeting – August 29-30, 2013

An AIP cereals and cereal systems meeting was organized by CIMMY-Pakistan and PARC at NARC, Islamabad, to discuss the workplan of this Science Window with all stakeholders, including partners from both the public and private sector.

Dr. Rick Ward, AIP interim leader introduced AIP and described the overall AIP goal of more effective science and innovation in Pakistani agriculture systems. In this case,' Innovation' means *"novel business or organizational models, operational or production processes, or products or services that lead to dramatic improvements (not incremental ones) in achieving development outcomes more effectively and cheaply, and that reach more beneficiaries in a shorter period of time."* AIP will achieve this through commissioned projects, a competitive grants system, and human resource development.

Dr. Ken Sayre, CIMMYT consultant on global conservation agriculture, gave a detailed presentation on "Conservation Agriculture-Based Crop Management", which focused on the common problems facing farmers worldwide, such as:

- Ever-increasing production costs;
- Prices insecurity for crops/commodities;
- Constant issues over water usage;
- Increasing levels of soil degradation related to excessive tillage and crop residue removal/burning;
- Potential negative implications of climate change.

Dr. Sayre also described the main motivations to develop conservation agriculture-based crop management technologies and three defined principles of conservation agriculture and their significant results from different countries:

- Develop seeding systems that allow major reductions in tillage;
- Retention of adequate and rational levels of crop residues on the soil surface;
- Use of suitable and profitable diversified crop rotations.

On the first day, crop management (agronomy) issues were discussed across the three major crops of the system, namely wheat, maize, and rice. A draft workplan for agronomy was introduced and discussed. The following day, we formed three working groups to discuss these workplans in detail.

Dr. Imtiaz Muhammad, Country Liaison Officer for CIMMYT-Pakistan, presented the wheat workplan under the cereals and cereal systems Science Window for commissioned projects and opened the forum for discussion. The following three projects were proposed:

1. Rapid diffusion of high yielding, rust resistant wheat;
2. Introduction of fungicides to wheat management;
3. Generating a durum wheat value chain for Pakistan.

Combined discussions were held around the following potential areas/projects:

- Product-based wheat breeding/production and quality analysis assurance;
- Climate resilient wheat (especially for heat and drought);
- Cultivation of Durum in Balochistan (estimated potential to double production). Balochistan has 2 million migrants who prefer pasta products thus there is a good market for durum wheat;
- Introduction and standardization of fungicides to combat yield losses;
- Communication – ICT tools for early warning systems;
- Strengthening of seed systems/production.

Dr. Sadananda, CIMMYT-India, presented the maize workplan based on the following commissioned projects:

1. Climate resilient maize hybrids for enhanced production and productivity in the Punjab and Khyber Pakhtoonkhwa (KP) Provinces of Pakistan
2. Developing and deploying biofortified maize with improved quality traits for human consumption and poultry feed.
3. Developing and deploying cultivars with resistance to major biotic stresses limiting productivity of maize-based systems in Pakistan.
4. Strengthening maize seed sector in Pakistan for improved access of quality seed by the smallholders.

Combined discussions were held around these potential areas/projects:

- Maize yields are much lower in KP, compared to Punjab, due to a lack of technology. AIP should provide a precision planter, harvesters, and laser levelers for maize cultivation in KP.
- Commissioned projects should be sanctioned for maize sowing technologies. In Pakistan maize sowing is 100% manual, which is time-consuming and not cost effective in terms of labor charges.
- We need to identify the maize hybrid market and build-up farmer confidence in the need to purchase hybrid seed for yield improvements.
- Measures to get sustainability in yield in KP.
- Management practices are the major constraint to yield in KP, which currently produces 45% of Pakistan's maize. In Punjab, all maize is cultivated on laser leveled farms but zero hectares are in KP.
- Service providers need a presence in KP to introduce laser levelers, planters, and harvesters etc.
- Maize demand in Pakistan is increasing due to the silage and well established poultry industry, which gives a good market price.

Dr. Abdul Rehman, IRRI-Pakistan presented the work plan for rice projects

Combined discussions were also held on:

- Seed: Public-private partnerships.

- Jalander Seed Corporation is working throughout Pakistan on paddy, maize, wheat, and forage seeds. They have their own farmland and also working on hybrid seed production of maize and sunflower. We think that they can contribute to AIP through public-private partnerships in the seed sector.
- We should make public sector research accessible to the private sector for increased sustainability.
- The seed act should be strictly implemented and the seed association of Pakistan should actively play a role in the seed sector.
- Pre-release potential lines should also be demonstrated in the National Uniform Wheat Yielf Trials during the 2nd year for popularization.
- Certified varieties should be demonstrated within AIP activities.
- Production constraints: Most shopkeepers are selling seed that is actually grain, not seed; newly released varieties occupy less than 10% of the area and old ones are still mega varieties.

Participants also discussed the following cross-cutting issues:

- A need to formalize the relationships and involvement of the private sector in public sector research in order to effectively share material and information, i.e., the development and introduction of public private partnerships through Memoradums of Understanding and standard operating procedures for germplasm exchange with CIMMYT;
- Involvement of private sector in trainings;
- Establishment of seed system sustainability through public-private partnerships;
- Involvement of end users, growers associations, local companies, and NGOs in AIP;
- Public and private sector should have well defined mandates;
- Forums for dialogues and combined evaluation of germplasm by public and private sectors;
- Promotion of indigenous hybrids by public sector.

Attendence Sheet

Annexure-I

	Name	Designation/organization	Tel. number	E.Mail
1	Haider Abbas	SO (NARC) Wheat	0300-5215634	hakazmi79@gmail
2	Dr. Anjum munir	Director CDRI	0300-9801570	anjums41@yahoo.com
3	Dr. M.Sohail	Agronomist, wheat Narc	0343-5709267	sohailkundi@yahoo.com
4	Dr. Atiq _ur_rehman	CDRI (Narc)	0321-5306412	atiqrather@yahoo.com
5	Dr. maqsood qamar	Wheat (NARC)	0346-5939219	maqsoodqamar@gmail.com
6	Riaz_ud_din	wheat (NARC)	0345-786231	riazuddin384@yahoo.com
7	Dr. Glzar ahmad	PRO wheat/CCRI pirsahab	0333-9127652	gulzar_1999_99@yahoo.com
8	Dr. S.A Taran	Director	0300-2411522	satarasri@yahoo.com
9	Dr. mahboob Ali sial	principal scientist	0300-3441956	mahboobali.sial@gmail.com
10	Shafiullah	Director MARC	05811- 400204	shafiullah59@yahoo.com
11	Badaruddin khakher	Agronomist WRI	0301-3647110	badoruddinkhakher@yahoo.com
12	Dr. karim lagari	Director wheat Res : Inst sakrand	0301-3817407	lagariKb@yahoo.com
13	Dr. Javeed Iqbal Mirza	Incharge CDRI : Murree	0321-5666750	mirzajaved2000pk@yahoo.com
14	Dr. Imtiaz Hussain	Cordinator wheat	0333 5171232	izhussain@yahoo.com
15	Ian Wiuborne	USDA	n/a	n/a
16	Kay Simmons	USDA	n/a	n/a
17	Asmat Raza	USDA	0300-5018809	n/a
18	Imtiaz mahmood	CLO/ wheat	0334-5644464	m.imtiaz@gmail.com
19	R.Ward	cimmyt		
20	Dr. abdul Bari	Dirctor,ccri,pirsabak kpk	0346-9409577	bari_655@yahoo.com
21	Dr. shahid masood	Member (PSD) PARC	051-844-2414	shahidmasood61@gmail.com
22	Makhdum Hussain	WRI,FSD	0300-7213713	makhdumhussain@yahoo.com
23	Kh. Shafique Ahmad	Director Research AJK	0300-5503290	khshafiqueahmad@gmail.com
24	Abdul Jabbar khan	Grop leader wheat NIFA	0301-8580083	abduljabbarnifa
25	Dr. Fazal subban	Wheat Breeder NIFA	0300-5956456	subban_162003@yahoo.com
26	Dr.Abdul Majid	Country manager ,ICARDA	0300-8554740	a.majid@cgiar.org
27	Dr shahid Mansoor	Director NIBGE	0300-7944841	shahidmansoor@gmail.com
28	Muhammad shafique	Agronomist AJK	0302-8990526	shafique_esma@hotmail.com
29	Dr. javeed Ahmad	Wheat Botaniest/WRI,Fsd	0321-7662504	javeed1710@yahoo.com
30	Zewdie Bishaw	Head,seed section,CARDA	n/a	z.bishaw@cgiar.org
31	K.D Sayre	consultant_cimmyt	n/a	k.sayre@cgiar.org
32	Dr. Manzoor Hussain	RARI,Bahawalpur	0344-7202573	manzoorhussain.1900@yahoo.com
33	Abdul Hamid	Res.Analyst.cimmyt FSO	0344-7717060	a.hamid@cgiar.org
34	Dr. Farooq e Azam	senior scientist NIFA	0300-9006616	fazam786@yahoo,com
35	M. Ashraf Mian	wheat Breedz	0321-5213736	ashraf9611@hotmail.com
36	Attiq_ur_Rehman	Assistant Research Officer	0333-5723909	attiq_77@yahoo.com
37	Muhammad Noor	Research Associate,cimmyt.pak	0302-5258528	noor_pbg49@yahoo.com
38	Naeela Qureshi	ASSH.PI.Pathologist,BARI	0331-5295422	naeela.qureshi@gmail.com
39	Shoaib Liaqat	Assistant Research Officer	0332-6080543	shoaib87pk@yahoo.com
40	Dr. anjum Ali(on behaf of Dr.Muzammil)	PBAR punjab	0300-7200565	dar@gmail.com
41	Dr. Hafiz M.Nasrullah	Assistant Agronomist BWP	0333 6229318	muhammadnasullah22@yahoo.com
42	Yahya Rauf	RA/CIMMYT	0332 8897233	y.rauf@cgiar.org
43	Dr.Sumera Yasmin	SSO NIBGE Fsd	0300-7610660	
44	Dr. Anjuman Arif	PSO NIBGE Fsd	0313-2658626	
45	Dr. Fathia Mubeen	PSO NIBGE Fsd	0345-7706996	
46	Dr. Umar Masood	QAU. Isb	0336-0506675	
47	Sajid Ali	IBGE, Agric. Uni Peshawar	0345-9106929	
48	Masood Qadir Waqar	Director Agri.(AR) PB	0300-4326239	

Appendix K: Coverage of the cereals and cereal systems meeting – August 29-30, 2013

CIMMYT
International Maize and Wheat Improvement Center

informa
No. 1862 • 27 September-04 October 2013

Pakistan program aims for agricultural innovation

By Imtiaz Muhammad

International and Pakistani scientists are expanding efforts to accelerate access to climate-resilient maize and rust-resistant wheat varieties in Pakistan, as well as to improve farmers' access to quality seeds, as part of the Agricultural Innovation Program (AIP). Project partners discussed these priorities during a cereals and cereal systems meeting at the National Agricultural Research Center (NARC) in Islamabad from 29 to 30 August.

AIP is a U.S. Agency for International Development (USAID)-funded project focusing on cereals, vegetables and livestock in Pakistan, a country challenged by rapid population growth and climate change. CIMMYT is working with the Pakistan Agricultural Research Council (PARC), the International Rice Research Institute (IRRI) and other partners to increase agricultural productivity and the value of agricultural commodities in the country.

The program is supporting Pakistan in agricultural research for development, which includes building partnerships between research and those it serves; increasing investments; generating, sharing and making use of agricultural knowledge for development; and demonstrating and building awareness of the development impact and returns from agricultural innovation.

Farmers throughout the world face similar problems from increasing production costs, fluctuating market prices, water and soil degradation and potential implications of climate change, said Ken Sayre, a CIMMYT consultant on conservation agriculture. Sayre also described the benefits of conservation agriculture crop management technologies and their main principles. These include seeding systems that allow major reductions in tillage, retaining adequate levels of crop residues on the soil surface and using diversified crop rotations.

There are many challenges AIP can address. Maize yields in Khyber Pakhtunkhwa Province are low due to a lack of technology. Most maize farmers in Pakistan use manual sowing, which is not cost or time-effective, and farmers need more confidence in hybrid seeds before they will pay a premium for them.

Meeting participants discussed several options for commissioned projects in wheat, including rapid diffusion of high-yielding, rust-resistant wheat; introducing fungicides for wheat management; and generating a durum wheat value chain in Pakistan. Participants also discussed potential projects and goals related to climate-resilient wheat, the cultivation of durum wheat in Balochistan province, the standardization of fungicides to combat yield losses and strengthening communication.

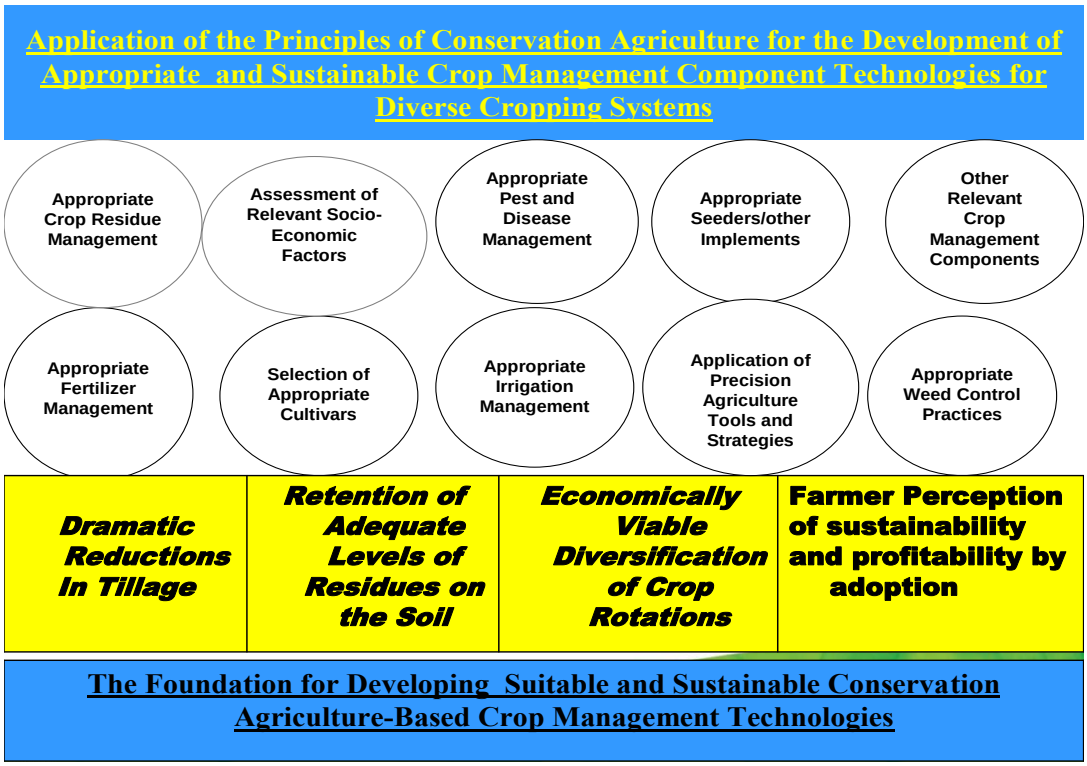
For the rice work plan, top priority areas include developing tolerance to submergence and heat in locally adapted varieties such as super basmati, basmati 515, IR-6 and IR 9, in addition to bacterial leaf blight resistance and superior grain quality. Abdul Rehman and Surapong Sarkarung represented IRRI, where some of the activities have already begun.

Priorities for the maize work plan include introducing climate-resilient maize hybrids, developing biofortified maize, developing cultivars with resistance to biotic stresses and strengthening the maize seed sector. CIMMYT maize expert R. Sadananda and national partners joined to refine the maize work plan. Kay Simmons from the U.S. Department of Agriculture (USDA)-Agricultural Research Service and Ian C. Winborne, plant health advisor for the USDA Animal and Plant Health Inspection Service at the U.S. Embassy in Islamabad, also attended the meeting to discuss wheat productivity enhancement in Pakistan.

Photo: Muhammad Iftikhar/NARC

Appendix L: Consultancy report, Dr. Ken Sayre, August 26–September 07, 2013

I was asked to participate in the AIP planning meeting in Islamabad to provide inputs into the development of the Cropping Systems portion of the AIP work plan. It is understood that although there are various crop management components that will be addressed and delivered to farmers within the AIP project, the foundation of these efforts will be established on the principles of Conservation Agriculture (CA)-based Crop Management Practices as indicated below.



I was also asked to remain a few days after the AIP planning meeting to visit both irrigated (rice-wheat, cotton-wheat and maize-based systems) and rainfed areas (mainly fallow – wheat and summer fodder – fallow but with some summer fodder-wheat systems). Due to time and other constraints, most travel outside of Islamabad was in the Punjab.

On August 30, after the AIP meeting, I traveled to Lahore with Dr. Mushtaq Gil, one of the key people in Pakistan during the Rice-Wheat Consortium RWC) and now Chief Executive of the South Asian Conservation Agriculture Network (SACAN). On August 31 we visited several areas (machinery manufacturers/farmers in the Punjab and on September 1 we were joined by Rick Ward and Imtiaz Hussain, PARC wheat coordinator, for further visits in/around Lahore and then around Faisalabad on September 2 and 3. We returned to Islamabad in the evening of September 3.

In the morning of September 4, Dr. Gil and I visited the Pir Mehr Ali Shah Arid Agriculture University at Rawalpindi and in the afternoon, I had a wrap-up meeting with Rick Ward (he was returning to the US the next day) and Muhammad Imtiaz, CIMMYT WPEP coordinator.

The following day Dr. Gil and I were joined by Muhammad Imtiaz, Imtiaz Hussain, Akhter Ali, the new CIMMYT socio-economist in Pakistan, Dr. Rai Niaz Ahmad, Vice Chancellor of the Arid Agriculture University, and several of his staff to visit several institutions located in the rainfed area of Chakwal.

During all of these visits the focus was to visit various provincial government agencies, including universities and province-level research stations and adaptive research farms were visited as well as private sector agro-business', especially implement manufacturers producing CA-based seeders for zero till and bed planting and other implements, that may be able to play a collaborative role in the AIP project..

Narrative of Activities

August 27 and 28, 2013 - Islamabad

I combined participation in the on-going WPEP project meeting involving USDA staff and the representatives of the stakeholders that are involved with the project with a series of meetings with staff from the rice, maize, and wheat programs as well as with the Farm Machinery Institute (FMI) on the PARC campus. These meetings provided useful background information regarding on-going activities and also gave me an opportunity to better understand machinery development advances from the FMI point of view since my last visit to Pakistan in 2008.

August 29 and 30, 2013- Islamabad

I participated in the 2-day planning meeting for the AIP project including giving a seminar on CA-based Crop Management Technologies. I believe that a very useful basis to help guide the project's crop management activities was developed. I will elaborate on my impressions and suggestions below in this report.

Following the last session of the meeting on the afternoon of August 30, I traveled to Lahore with Dr. Gil.

August 31 and September 1, 2013 – Lahore and Surrounding Areas

On August 31, Dr. Gil and I, together with 2 other SACAN members, visited several ag machinery manufacturers/dealers and then some farmers planting maize or cotton. On September 1, we made further visits to other manufactures and farmers.

The first manufacturer that we visited was Easy Farming where I saw the tractor from Belarus shown in the photo below on the left. Apparently the Belarus tractors are still being imported/assembled in Pakistan.

I am very interested in these tractors since they may offer better potential opportunities to mechanically relay seed wheat into standing cotton since they are very similar to the tractors that are used throughout Central Asia for relay seeding wheat into standing cotton planted on beds. These tractors have adjustable wheel axles that can facilitate bed widths (furrow to furrow) from 60 cm to 180cm. It needs to be determined if these tractors are still commercially available in Pakistan and also if they can

be purchased with high clearance axles and narrow rims/tires needed to allow entrance into standing, moderately tall cotton varieties to relay seed wheat. This needs to be checked out.

Belarus Tractor

Scrapers for laser levelers

Easy farming was the first manufacturer that made laser levelers in Pakistan, largely with the support of Dr. Gil when he was Director of Water Management in the Punjab. The photo on the right above illustrates a large number of scrapers at the factory that will be used as laser levelers.

Ladies assembling electronic components for the laser levelers

Completed controls and cables

Easy Farming is fairly unique in Pakistan since although it does import the laser emitter and receiver for its levelers, all other components for their laser leveler are fabricated in house including all the electronic controls etc (see photos above).

In this two day visit to the Punjab, we visited at least five implement manufacturers that are making laser levelers and/or other farm implements. The value of laser leveling for improving the efficiency of irrigation water use and enhancing crop yields is now well known in the Punjab but laser leveling still has not been widely taken up in other provinces. This can be a point of focus for the AIP project – facilitating the introduction and adoption by farmers of laser levelers in the irrigated production areas in other provinces. In addition there are strong arguments to use leveling (can be laser leveling or more simple

“fine-tune leveling with scrapers) to improve the efficiency of rain water use in larger fields in the rainfed production areas.

Many of the manufacturers that that fabricate laser levels also manufacture other farm implements including zero till seeders and bed planters whereas there are other manufactures that only make other implements including zero till seeders and bed planter as seen in the photos below.

Conventional Till Bed Planter

Zero Till Seeder

The visit to Greenland Engineers in Daska was very informative.

Current version of the Greenland Zero Till Drill

Modified Inverted-T Opener

During the RWC, Greenland was the first manufacturer in Pakistan (and perhaps in South Asia) to fabricate zero till drills with the modified Inverted-T openers as shown in the photos above. When we asked Greenland about current sales of zero till drills, we were told that in Pakistan, more sales are going to the Sind than to the Punjab where zero till seeding on wheat in Pakistan reached a significant area during past 15+ years. When we inquired about the production and sales of bed planters, we were informed that most are being exported, mainly to Africa with press wheels as seen in the photos below (not usual on bed planters used locally). Also zero till drills are being exported to Africa.

Front View of Greenland Bed Planter for Export ***Rear View with Attached Press Wheels***

Earlier both FMI at NARC and at PAU in India developed versions of the Happy Seeder (now called the Turbo-Happy seeder in India and the Rocket Seeder in Pakistan) with support from an ACIAR project also associated with the RWC. This seeder was developed to allow zero till seeding into large amounts of retained crop residues in the field. For reasons that I have still not been able to understand, although there were some prototypes made of the Pakistan version (the Rocket seeder), very little was done with it in Pakistan whereas several manufacturers in India now make Turbo-Happy seeders.

I was not aware that two Turbo-Happy seeders had been imported from India into Pakistan sometime around 2005, I believe, through an ADB supported project administrated by IRRI and associated with the RWC. According to Dr. Gil, these seeders performed well in the field seeding wheat zero till with full retention of combined harvested rice residues but when the ADB project ended, nothing more was done regarding this seeding technology.

A Basically Abandoned Indian Turbo-Happy Seeder Sitting with Greenland Engineers in Daska

In fact, we saw one of the Indian-Turbo Happy seeders that has been essentially sitting abandoned (see photos above) with Greenland Engineers in Daska. Given that the AIP project is importing seeders from

India, including Turbo-Happy seeders, I urge that some investigation be done to better understand what occurred with this situation.

Also we saw other relevant implements that were being made by different manufactures as can be seen below. The implement below on the left is commonly used by farmers to make the conventional tilled wide beds now commonly used in the Punjab to seed cotton and maize. The implement on the right is used for seeing wheat on ridges with furrow irrigation.

Bed Maker for Cotton and Maize Seeding

Ridge and furrower former for wheat on ridges

During these two days we visited several farmer fields seeded and talked with farmers about the different seeding/management practices that they were using. We found that most of the cotton and maize is seeded on wide, tilled beds with furrow irrigation. Below are some photos (some photos were taken during my last visit in June 2008. The first photo below on the left shows how the wide beds for seeding cotton or maize are normally made.

Making Beds for Hand Seeding Cotton/Maize

Making Beds and Band Applying Basal Fertilizer

In this case basal fertilizer was broadcast applied and incorporated by tillage before the beds are made Seeding or cotton or maize is done by hand and any post emerge fertilizer is also usually applied by hand. In the photo above on the right is another wide bed former where basal fertilizer is applied in a

band but seeding is by hand. It would be very easy to modify this bed maker to also band apply post emerge fertilizer.

The photos below show wide bed planted, furrow irrigated cotton and maize at different stages of development as examples of common, current management systems in the areas we visited in the Punjab (again some photos were taken in 2008). Please note the extensive amount of maize residue that must be managed for high-yielding maize.

Furrow Irrigating Cotton on Wide Beds

Early Stage of Cotton Development

Later Stage of Cotton Development

Early Stage of Maize Development

Later Stage of Maize Development

Maize Residues – Used, Burned or Retained

Although we did see some rice fields, most of the areas that we visited during these two days were principally maize and cotton. A lot of the rice we did see, however, had been severely damaged by the floods. The photo below on the left shows an example of puddled transplanted rice used by nearly all farmers. The photo below on the right is a field of unpuddled, transplanted rice on 90 cm raised beds established in a farmer's field by the Water Management Department at Faisalabad University for comparison that I took in 2008. As yet, during all my visits to Pakistan, I have not seen a field of direct seeded rice.

Puddled, Transplanted Rice

Unpuddled, Transplanted Rice on 90cm Beds

Although we obviously did not see any wheat, below are the existing and potential wheat production systems that will need to be considered/compared by the AIP project.

Conventional Till Flat Seeded Wheat – Flood Irrig.

Zero Till Flat Seeded Wheat – Flood Irrig.

Conv. Tilled, Ridge-Sown Wheat- Furrow Irrig. ***Bed Planted Wheat with Furrow Irrig.***

We also made a short stop at the Monsanto facilities in Okara.

September 2 and 3, 2013 – Lahore and Faisalabad (Return to Islamabad)

During these 2 days Muhammad Imtiaz, Rick Ward, Mushtaq Gil and I visited several organizations in and around Lahore and Faisalabad to develop potential links for future collaboration within the AIP project.

On the first day, in Lahore we visited the Director General of Extension for Punjab. It was clear that there is considerable interest in developing collaborative linkages with most of the activities that the AIP project will be implementing in the Punjab. And it would appear that collaboration with the Adaptive Research Farms that are under the Provincial Extension Service and which are located at areas within the important production systems (irrigated and rainfed) could provide the platforms for the testing and fine-tuning of relevant CA-based crop management practices and other component technologies.

We also visited the Director General of On-Farm Water Management for the Punjab. This department was very instrumental in the development and extension of Resource Conserving Technologies) RCTs during the RWC when Dr. Gil was the director but this activity has been dramatically curtailed since them. However, there should be areas of common concern once the AIP project is up and fully operating.

Our last stop in Lahore was a visit to the Four Brothers, a major private sector organization involved in seed and agro-chemical production/sales in Pakistan. We met with the chairman Engr. Jawed Salim Qureshi who described their operations and approach. I believe that there will be good possibilities for future collaboration.

Finally we moved on to Faisalabad to meet up with Dr. Makhdoom Hussain, director of the Wheat Research Institute near Faisalabad. We met at a small machinery manufacturer who is fabricating the plot thresher developed at the institute and then we moved on to the Wheat Research Institute itself and made a visit to the research fields to observe some of the summer crop activities mainly involving different cotton management practices within the irrigated cotton-wheat production system.

Following the field visit we then received a briefing from Dr. Noor-ul-Islam, Director General of the Ayub Agricultural Institute, on the overall activities of the Institute and then a more in-depth description of the Wheat research activities from Dr. Makhdoom Hussain. We then had the opportunity to visit several of the wheat research group's different laboratories.

The next day (September 3) we visited the Water Management Research Center at the University of Faisalabad and were given a briefing by Dr. Allah Bakhsh, Director of the Center. When I visited Pakistan in June 2008 when Dr, Rai Niaz was director of the center, a lot of work was going on with developing and extending raised bed planting systems for wheat, maize, cotton and rice. Some of these efforts are still ongoing but not at the level before. However, I believe that there may be scope for collaborative efforts. We also had a brief meeting with university's Vice Chancellor Iqrar Ahmad Khan.

We then visited one of the sites that SACAN is managing under the ICARDA/USDA project focused on developing and extending CA-based crop management systems to farmers. They have developed several training approaches that can potentially be useful to the AIP project efforts. The training that is being done for service providers involving access and use of CA-based implements can provide a good, potential model for similar AIP project efforts.

In the evening, we returned to Islamabad.

September 4, 2013 – Islamabad

Mushtaq Gil and I were invited by Vice Chancellor Dr. Rai Niaz to visit the Pir Mehr Ali Shah Arid Agriculture University in Rawalpindi. It turned out that we were able to meet with most of the university staff of the Agronomy and Soil Science group. VC Rai Niaz gave an overall briefing on activities at the University, especially focusing on water use issues for rainfed production systems. I then gave a short seminar to the group focusing on our CA-based activities in the rainfed areas in Mexico. We made arrangements to travel together with other CIMMYT/NARC colleagues to visit the Barani Agricultural Research Institute, and Punjab provincial extension program Adaptive Farm and the Arid Agricultural Research Farm in Chakwal.

In the afternoon I returned to the CIMMYT office for a final wrap-up meeting with Rick Ward and other CIMMYT staff prior to Rick's departure for the US the next morning.

September 5, 2013 – Chakwal

In the morning, Muhammad Imtiaz, Imtiaz Hussain, Mushtaq Gil and I traveled together along with VC Rai Niaz and several members of the university staff to Chakwal. This is a major rainfed (Barani) production area in the Punjab and will certainly be a crucial place to focus any rainfed activities within the AIP project, especially activities related to the development of rainfed CA-based crop management. It was very beneficial that the visit that day was to potential, future partners for crop management collaboration with AIP (the Barani Agricultural Research Institute, and Punjab provincial extension program Adaptive Farm and the Arid Agriculture University Research Farm) and included members of

each institution as well as CIMMYT and the PARC wheat program thereby opportunity good for interactions.

We visited the Barani Agricultural Research Institute first and were met by Dr. Muhammad Tariq, Director of the institute. He gave us a briefing of the institute's activities and we then visited some field trials. They involved a similar treatment set that is being conducted by the wheat agronomists on the PARC campus – rainfed fallow-wheat, maize-wheat and mungbean - wheat with conventional till, permanent raised beds and zero till on the flat. It was clear that there were management issues that were likely related to implement problems. The zero till drill and the bed planter that are being used are shown in the photos below. With the addition of press wheels to the zero till planter, I believe its seeding ability can be improved for these rainfed conditions if other management steps are taken (retention of adequate residues on the soil surface and perhaps deep vertical tillage to enhance rain water infiltration and storage). The bed planter which is developed for use under conventional till conditions will need some major modifications (or be replaced by a more appropriate bed planter for operation on permanent raised beds) if use of permanent raised beds can be made feasible for rainfed conditions.

Zero Till Seeder ***Raised Bed Planter***

However, if good CA-based implements can be provided to this station, there should be good opportunities for collaboration on strategic trials to compare and fine tune new CA-based crop management technologies for rainfed production systems.

We then visited the Extension services nearby Adaptive Research Farm. It is clear that these farms can provide the potential place to compare existing farmer practices with new, potentially useful CA-based crop management technologies with active farmer participation and training. This will be of particular value if it is linked closely with on-going research and development activities at the nearby Barani Agricultural Research Institute.

We then visited the Arid Agriculture University Research Farm. This farm is still under development and will involve a wide range of research activities focused on crop and livestock production in rainfed

production situations. A major effort is being made to develop an integrated watershed management system across the farm to demonstrate feasible water harvesting and utilization strategies for farmers.

Some field research has been initiated and we visited an excellent CA-based Ph D student research trial that is focusing on the rainfed fallow-wheat production systems. Treatments included the farmer conventional till practice, zero till with and without residue retention and a very innovative treatment that combines residue treatment, vertical tillage and direct seeding. The latter treatment may be the best way to harvest water *in situ* more effectively with dramatically reduced tillage to improve rainfed wheat production.

Since this university research farm is still under development, Vice Chancellor Rai Niaz has indicated that he wants to put 10 acres of the farm to focus on the development of CA-based rainfed crop production technologies. He has asked me to provide some guidance on this based on our experiences with long term rainfed trials in Mexico. He would like to develop long-term CA-based platform trial and corresponding component technology trials that will provide a basis for development and for conduct of relevant student thesis research. I have agreed to provide this information and to assist in this process. I see this as another highly useful linkage for potential collaboration with the AIP project.

September 6, 2013 – Islamabad

I had some final meetings with the NARC wheat crop management group and other individuals at the CIMMYT office

Summary and Conclusions

I really appreciate the opportunity to participate in the AIP project planning meeting as well as to have the opportunity after the meeting to visit irrigated and rainfed areas in the Punjab and interact with both NARS, private sector and other organizations that will most likely become solid stakeholders and partners in the implementation of the AIP project.

During my years as an agronomist with the CIMMYT Global Wheat Program and the CIMMYT Global Conservation Program prior to my retirement in 2010, I made a number of visits to Pakistan primarily associated with supporting activities of the RWC. During those years, Pakistan was clearly a regional leader and made dramatic advances in the development and extension of important RCTs including implementing laser leveling in farmer fields and developing and extending sound zero till, small grain seeders that allowed a large number of farmers (mainly in the Punjab) to adopt zero till wheat seeding in the irrigated rice-wheat system. Raised bed planting was introduced, initially mainly focused on irrigated wheat but it appears that at present, raised bed planting has been more widely adopted for irrigated maize and cotton seeding than for wheat.

During my last visit to Pakistan in 2008, as the RWC activities in Pakistan were winding down, I continued to see very important advances in crop management including adaptive research activities and on-farm validation and extension efforts at the farmer level that were underway by several organizations, notably the Water Management Research Center at the University of Faisalabad.

However, based on discussions on the current status of crop management efforts during the AIP planning meeting and my observations from my own discussions with people that I was able to interact with and the field visits to the Punjab during this trip, my sense is that during the past 4-5 years, there has been a marked, overall slow down in crop management research activities especially in the development of new technologies that are being adopted by farmers. It would appear that this situation is likely related to the overall limited support and resources that appear to be available for crop management research in general.

In contrast, however, throughout the years when it appears that there has been a "slow down" in crop management advances, there has been a fairly consistent interest in, and support for the development of new, better performing cultivars for the important crops like wheat, cotton, rice and maize. It is clear that the private sector in particular has been able to increasingly provide better cotton and maize cultivars (mainly hybrids), and efforts both public and private, are being focused on rice cultivar improvement (including rice hybrid). Wheat improvement, on the other hand, has mainly been based on support for the NARS wheat breeding efforts combined with a long and productive collaboration with the CIMMYT Global Wheat Program and these efforts have been enhanced in recent years by support associated with the Global Rust Initiative and particularly the ongoing USDA supported Wheat PEP project.

Clearly the AIP project will continue to reinforce and enhance the existing strong wheat breeding efforts and other associated activities and it will also allow the integration of relevant vegetable, livestock and tree crop technologies relevant to farmers following diversified production systems. But I am hopeful that the AIP project can help to overhaul the approach for the development and extension of crop management on a CA-based cropping system approach to "revitalize" these efforts while at the same time insuring the short term extension of relevant technologies that will meet the ambitious farmer adoption targets established for the AIP project.

I have come away from this visit to Pakistan in relation on-going crop management activities with a list of both negative and positive impressions but with the conclusion that the "cup is half full". This means that the AIP project can have a major positive impact, especially given the project structure to devolve opportunities to interact/collaborate/link provincial/local entities in the adaptive development and extension of sound CA-based crop management technologies to farmers with active farmer participation.

The somewhat negative impressions that I came away with were as follows:

- The quality of most crop management research especially that focusing on CA-based efforts (zero till, bed planting etc) that I observed (and admittedly this was pretty limited) was not impressive and in most cases largely related to use of inappropriate implements/seeders.

- Although Pakistan researchers were early leaders in the development of CA-based seeders etc during the RWC, this effort seems to be pretty much at a stand-still (lack of interest and/or support?). It was very discouraging to talk to the FMI engineers about the promise of the Rocket Seeder that they developed to seed into heavy residues that was never really followed-up and then

to see that the two Turbo-happy seeders brought in from India with the ADB project worked well in the field but once the project ended were set aside and apparently never used again.

- It appears that the momentum that was generated during the RWC to bring about the adoption of zero-till seeded wheat in the irrigated rice-wheat system in the Punjab has abated and perhaps has gone backwards with farmer dis-adoption of the technology related to the increases in combine harvested rice with the associated burning of rice straw combined with use of tillage to plant wheat (I hope that there can be a rapid assessment made by the socio-economists to determine the situation for zero till wheat in the Punjab and in the Sind).

- It was of interest to see that there has been a wide adoption in the use of tilled, wide raised beds for irrigated cotton and maize production in the Punjab but it was quite surprising and disappointing to see that almost all farmers hand plant these crops and also hand apply most of the fertilizer.

- I was surprised to see the extensive weed problems in many farmer (and experiment station) maize and cotton fields/trials. And in discussions with the coordinated Rice Program staff at NARC, although they have been working with direct seeded rice in the Sind, weed control is a serious limitation. It appears that there is very little weed control research being done even though there are a number of private sector companies that could facilitate the introduction of potentially useful herbicides.

- Although there appears to be some growing interest, there has been very little done to improve crop production efforts in the rainfed areas in general and in KP and Balochistan in particular

However there were positive impressions as follows:

- I was very impressed to see that there is still a great deal of expertise and capacity within the private sector agricultural implement manufacturers. It was of interest to see that even though there has been little interest from Pakistan researchers and farmers to make innovations for zero till and bed planters used locally, several of the local manufacturers are making seeders for export and in some cases the importers are requesting useful modifications that are not included in the seeders sold locally.

  I believe if new implement innovations that will be introduced that are relevant for farmers in Pakistan can readily be utilized by these manufacturers if the key, initial support is forthcoming. (Examples – potential use of the inclined plate seeding system for machine seeding of maize and cotton on raised beds: modifying existing zero till seeders and bed planters with better tines and press wheels to function better especially under rainfed conditions and in some irrigated situations)

- There appear to be sizable numbers of Chinese two-wheel tractors in Pakistan especially in the KP. A great deal of progress has been made in China and Bangladesh to develop a number of implements including zero till seeding and bed planters that offer excellent mechanization issues for small farmers operating in small fields. Clearly a rapid assessment of the current two-

wheel tractor situation in Pakistan will need to be carried out by the socio-economics group and, depending on the outcome of this assessment, some emphasis on two-wheel tractor mechanization issues may be merited.

- There are many good, sound researchers and other partners in the different public and private sector organizations that are ready, able and willing to focus on the development of improved crop management practices. And these include NARS national (NARC etc) and provincial level organizations (including universities).

  In addition, the provincial extensive services maintain a network of adaptive research farms. The adaptive research farms can provide the needed foundation for testing new crop management technologies, including CA-based crop management efforts with active farmer participation (including farmer and service provider training) as the initial step before initiating extension/demonstration efforts directly in farmer fields activities.

- The innovative structure of the AIP project that emphasizes the devolution of efforts more to the local, provincial level will allow the existing positive aspects to be channeled towards the development of well-defined cross discipline and cross institutional innovative, adaptive research and extension platforms in the key production systems within each province targeted by the project.

Below I offer a couple of diagrams that illustrates a model (but not a recipe) for a structure that may be used as a guide to integrate the needed partners in the key production areas that will be selected for emphasis by the project. The essential partners/cooperators will be using the extension adaptive research farms as the main interactive point to initial test, adapt and verify new crop management technologies with full participation of farmers and service providers. These activities are illustrated within the red circle in the first diagram and are focused within the adaptive research farms.

Diagram 2 illustrates how the activities within the adaptive research farms are linked to farmers and service providers. Initially farmers/service providers who have been participating/observing the activities at the adaptive research farm, agree to establish modules in their field to further test the new technologies side-by-side with their existing practices (and further fine-tune if needed). These farmer modules (once the module farmer is convinced that the new technology is of value) become the focal point to then extend the new technologies to the surrounding neighboring farmers with the assistance of the project staff and extension agents. If the module farmer also is a service provider or potential service provider, there will be a clear incentive for the module farmer to consider the neighboring farmers as potential clients, especially when new CA-based implements may be involved.

Diagram 1.

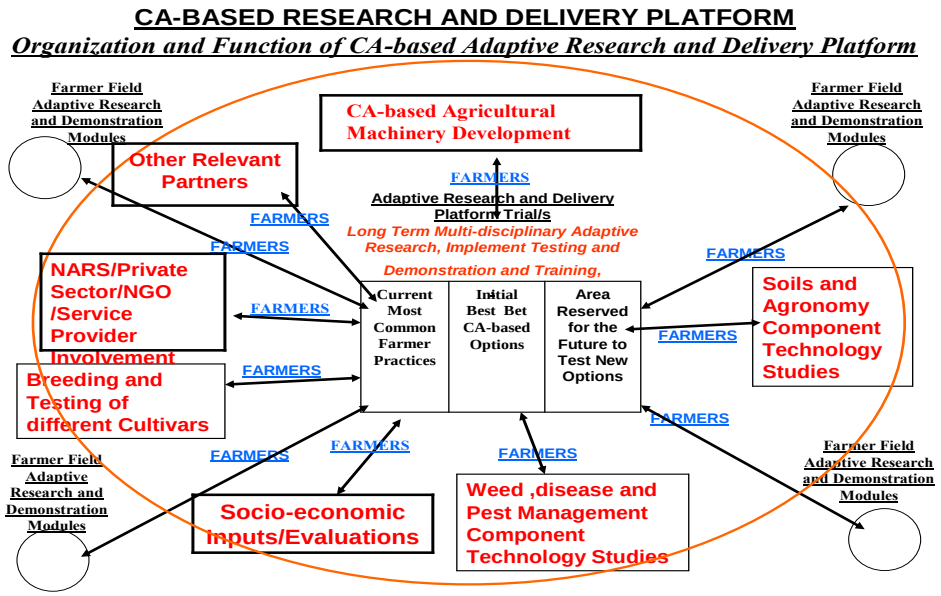
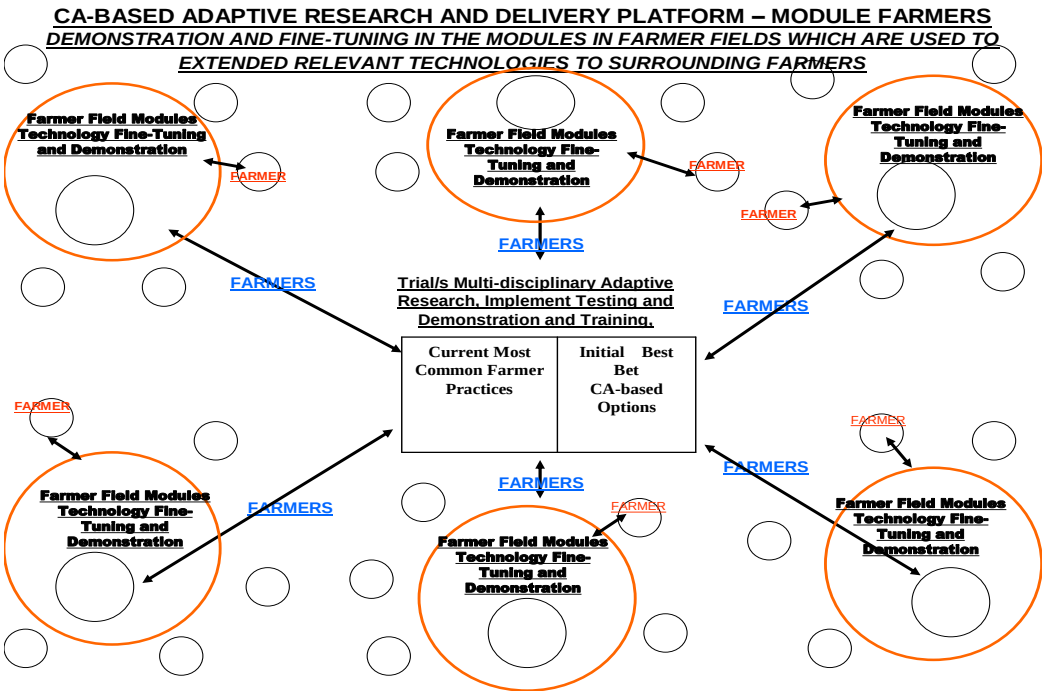


Diagram 2.



I hope that this report will be of use in the implementation of the AIP project and will help focus the positive contributions that will be made by the CIMMYT Global Conservation Program to the project.