



# 2015

## AIP-Maize Semi-Annual Report (April - September, 2015)



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	<b>Page</b>
<b>1. Technical and work plan update</b>	<b>3</b>
<b>2. Personnel and management update</b>	<b>49</b>
<b>3. Lessons learned</b>	<b>50</b>
<b>4. External factors</b>	<b>50</b>
<b>5. Risks</b>	<b>50</b>
<b>6. Contributions to USAID gender objectives</b>	<b>50</b>
<b>7. Environmental compliance</b>	<b>50</b>
<b>8. Communications</b>	<b>51</b>
<b>9. Annex</b>	<b>52</b>

## **Agricultural Innovation Program (AIP) for Pakistan Semi-annual Report for the AIP-maize component**

### **1. Technical and work plan update**

#### **1.1. Introduction**

Maize is Pakistan's third most important cereal crop covering an annual area of 1.17 million hectares. Maize in Pakistan is showing an increasing trend both in area and productivity. In 2013/14, maize showed a 45% production increase from its levels during 2005-06 (PBS, 2014). Although the demand for feed is the main reason behind the upsurge of maize production, however, population increase and price hikes for other crops makes maize as a preferred food by many rural communities, particularly those living in the Khyber PakhtunKhwa (KPK) province and mountainous areas of Pakistan. Despite its positive trend, maize faces many challenges including but not limited to lack of suitable varieties particularly climate resilient varieties, pests and diseases, lack of good agronomic practices, high maize seed price and absence of a functional and vibrant seed system, among others.

Pakistan imports more than 85 % of hybrid maize seed annually which makes the unit price of seed very much costly for the smallholder. As a result of this and other factors, more than 50% of Pakistan's maize area is planted with local or low yielding maize varieties. Interventions in increasing local capacity in maize varieties development and deployment will not only help to further boost maize production and productivity but also saves the much needed foreign currency for the country. To meet these challenges AIP-maize program developed achievable targets to fast track maize variety development and marketing in Pakistan with the involvement of public and private institutions. This report aims to highlight achievements, lessons learnt and future directions of the AIP-maize activities in the mentioned reporting period.

## **1.2. Commissioned projects of AIP-maize**

The four commissioned projects of AIP-maize are:

- Develop/Introduce climate resilient maize
- Develop/introduce bio fortified maize
- Develop/introduce maize tolerant to biotic stress and
- Enhancing the maize seed sector

## **1.3. Major activities/events in relation to commissioned projects**

### **1.3.1. Development or introduction of climate resilient maize:**

Agricultural production and productivity are being challenged by climate change globally. Its effect is more pronounced in developing countries where farmers have limited resources to adapt. The diverse nature of climate change ranging from extreme temperatures, erratic rainfall, heavy floods and scarcity of ground water among others poses a threat to global food security. Developing and deploying crop varieties that show resilience to climate change are among the strategies where farmers can mitigate its impact.

CIMMYT's maize breeding program developed germplasm with improved tolerance to drought and water stress and several maize varieties are available that can withstand high temperatures (>45<sup>0</sup>c) at critical growth stage of the crop. The AIP maize component is introducing such materials to Pakistan where maize growing farmers faces problem of acute water shortage and thermal heat in the pick months of May-July. The availability of such climate smart varieties both hybrids and OPVs will enhance maize productivity and improve livelihood of resource poor farmers.

During the reporting period the evaluation of the following climate resilient variety/hybrid trials were completed:

- Evaluation of 396 white maize climate resilient hybrids sourced from CIMMYT's Latin America and Southern Africa regional offices (Mexico and Zimbabwe).
- Evaluation of 30 white maize climate resilient open pollinated varieties (OPVs) sourced from CIMMYT's Southern Africa regional office (Zimbabwe).
- Evaluation of 49 yellow maize climate resilient hybrids sourced from CIMMYT's Latin America regional offices (Mexico and Colombia).

- Seed micro increase of 137 elite parental inbreds introduced from CIMMYT regional offices (Mexico, Colombia and Zimbabwe).

The above list of spring trials were grouped under 50 sets and evaluated in KPK, Punjab and Sindh provinces. The following table shows the description of the trials evaluated during spring season:

**Table 1: List of climate resilient maize trials evaluated during spring 2015**

No	Type of trial	Trial code	No of sets	No of entries	Kernel color	Germplasm source
1	Early maturing hybrid	EHYB14	5	45	White	Zimbabwe
2	Early maturing open pollinated varieties	EPOP14	5	30	“	“
3	New sets of intermediate maturing hybrids	PAKINT15	5	72	“	“
4	New sets of late maturing hybrids	PAKLATE15	5	100	“	“
5	Intermediate maturing hybrids	IHYB14	2	60	“	“
6	Late maturing hybrids	LHYB14	4	40	“	“
7	Tropical early to intermediate maturing hybrids	TTWCWL	5	15	“	Mexico
8	Lowland tropics maize hybrids	TTWCWN	4	24	“	“
9	New set of tropical maize hybrids	TLXTRACTWN	2	40	“	“
10	Tropical/subtropical yellow maize hybrids	ASA18HY	5	16	Yellow	Colombia
11	Tropical/subtropical yellow maize hybrids	TTWCYN	3	21	Yellow	Mexico
12	Yellow maize hybrids for lowland tropics	TTWCYL	5	12	Yellow	Mexico
<b>Total</b>			<b>50</b>	<b>475</b>		

The data from these trails will be analyzed and interpreted to help identify best performing entries and suitable seasons for future commercial production. In addition, the performance data from the trails will be combined and analyzed with previous season data to further check entries continued performance across seasons and years in comparison with local checks.



**Figure 1: Women planting AIP maize spring trials at Ali Akbar Seeds farm, Bhawana**



**Figure 2: Women planting AIP maize spring trials at Jullundur Pvt farm, Arifwala**

#### **1.3.1.1. Maize travelling seminar (spring 2015)**

The AIP maize program in collaboration with Pakistan Agricultural Research Council (PARC) organized a maize travelling seminar for the first time after it was discontinued for more than 10 years for lack of funds and other reasons. The objectives of the travelling seminar were among others:

- To create synergies among the AIP maize partners in maize evaluation and deployment
- To share experiences and lessons in field trial management and data recording
- To identify and justify best performing entries across the different sites

The evaluation which mainly focused on spring maize in the Punjab province was conducted from 15-17 June 2015 and experts comprised from twelve public and private institutions including seed companies, agricultural universities and public research institutions evaluated the performance of the AIP maize spring trials across the different sites in the Punjab province.

Apart from the evaluation, the event created a good opportunity for stakeholders to share experience in trial management and field data recording. Participants appreciated CIMMYT and PARC for creating such a unique platform where stakeholders open their gate for visitors to show case their activities and discuss and share information how AIP maize germplasm perform across the different sites. When CIMMYT first introduced the range of maize hybrids and OPVs in the beggung of 2014 it was not sure how the performance would be particularly in harsh environments where temperatures often exceed 40<sup>0</sup>C and at an elevation about 100 meters above sea level. However, this travelling seminar proved that the AIP maize program has much to offer to the needs of Pakistani partners not only in their effort to produce hybrid seed locally for seed self-sufficiency but also to enhance local maize breeding program by enriching their maize genetic pools. The travelling seminar also helped partners to identify and select good performing entries which will be allocated to them by CIMMYT after evaluation of company's performance. Participants also requested the continuation of the activity in other provinces and in the Kahrif season as well. Below are the summary of the recommendations or suggestions by the participants from the travelling seminar:

### Recommendations/Suggestions:

- To incorporate temperate maize germplasm for spring season trails
- To plant trials in their ideal sites based on their days of maturity
- To give more attention in promoting and testing white maize varieties in KPK and other hilly areas of Pakistan
- Evaluation and deployment of competent yellow maize varieties suitable for spring season planting in Punjab province to provide farmers with alternatives
- Promotion of white biofortified maize varieties in KPK and hilly areas of
- In future to include the visit of seed processing facilities and the wet milling industry
- Travelling seminar to be organized in Kharif season including visits in KPK provinces

The following trials were evaluated by the participants during the travelling seminar:

- Early/extra early white maize hybrids
- Advanced white maize QPM hybrids
- Yellow kernel QPM hybrids
- Tropical yellow maize hybrids
- Tropical/subtropical three way cross yellow/white maize hybrids



Figure 3: partial view of maize travelling seminar participants

Table two shows the list of participants and their respective institutions and table three the program schedule for the travelling seminar:

**Table 2: List of AIP maize partners participated in the maize travelling seminar**

No	Institution name	Province	Ownership	No of participants
1	National Agricultural Research Institute	Islamabad	Public	2
2	Cereal Crops Research Institute	KPK	“	1
3	Maize and Millet Research Institute	Punjab	“	2
4	Four Brothers Group	“	Private	1
5	Zamindara Seed Company	“	“	1
6	Jullundur Private Ltd	“	“	1
7	ICI Pakistan limited	“	“	1
8	Tara Crop Sciences	“	“	1
9	Ali Akbar Seeds	“	“	1
10	University of Agriculture Peshawar	KPK	Public	1
11	University of Agriculture Faisalabad	Punjab	“	1
12	CIMMYT-Pakistan	Islamabad	CG center	2



**Figure 4 : Field evaluation at Zamindara Seeds Pvt (L) and at 4B group farm (R)**

***In their words: from maize travelling seminar participants***



*"It was a wonderful and helpful opportunity facilitated by AIP to have a broader view on maize and learn new ideas and practices. It was my first time to visit some of the testing stations and found it a good way to learn and share knowledge in a practical manner"*

***Prof. Hidayat ur Rehman : University of Agriculture Peshawar***



*" Comparing AIP maize trails across the different locations was very important to select good performing entries for our future planning"*

***Dr. Saleem Shaheen: Ali Akbar Seeds Pvt.***



*" Travelling with senior scientists and learn from their expertise was among the valuable opportunities from the seminar and it should be a continuous tradition as it will help to groom young researchers"*

***Asrar Hussain: Maize and Millet Research Institute***

**Table 3: CIMMYT/PARC spring maize travelling seminar in Punjab (15-17 June 2015)**

**Program Schedule**

<b>Time</b>	<b>Program</b>	<b>Responsible /organizer</b>	<b>Facilitator</b>
<b>Day One- Monday, 15<sup>th</sup> June</b>			
8:00-10:00	Departure from Hotel and travel to Ali Akbar Seed Farms	Ali Akbar Seeds	Ali Akbar Seeds
10:00-10:30	Recitation of the Holy Quran, Welcome note and program brief	PARC/CIMMYT	CIMMYT/Ali Akbar
10:30-12:00	AIP maize evaluation at Ali Akbar Seeds PLC (Chiniot)	Dr. S. Shaheen	Ali Akbar seeds/CIMMYT
13:00-14:00	Lunch and Namaz break at Chiniot city	CIMMYT	CIMMYT
14:30-16:30	Travel to 4B farm at Lahore	CIMMYT	CIMMYT/4B
16:30: 17:30	Four Brother farm visit	Mr. Umar Sardar	“
17:40-19:40	Travel to Usmania Hotel for overnight stay (Sahiwal)	CIMMYT/PARC	CIMMYT/PARC
<b>Day Two- Tuesday, 16<sup>th</sup> June</b>			
08:00:12:00	Travel and visit at Zamindara Seeds Plc	Dr. Obeid ur Rahman	CIMMYT/PARC
13:00-14:30	Lunch and Namaz at Sahiwal	Participants	Participants
14:30-16:00	Visit to MMRI	Mian Shafique/M. Arshad	CIMMYT/MMRI
16:30-17:30	Visit to Tara Crop Sciences	Mr. M. Shahbaz	CIMMYT/TCS
17:45-18:00	Travel to Hotel Usmania	Participants	Participants
<b>Day Three- Wednesday, 17<sup>th</sup> June</b>			
07:15-09:00	Travel to Jullundur Seed Plc	Mr. Faisal Hayat	CIMMYT/JPL
09:00-11:00	Visit at JPL	“	“
11:00-13:00	Back to Sahiwal	CIMMYT/PARC	CIMMYT/PARC
13:00-14:30	Wrap up, Lunch and fare well at Usmania	CIMMYT/PARC	CIMMYT/PARC

### 1.3.1.2. Selection of climate resilient maize varieties for registration

After testing the introduced maize varieties for the last three consecutive seasons, AIP maize partners shortlisted best performing entries based on field performance and analyzed data. The shortlisted varieties showed a 20-50% yield advantage over the local check varieties. The AIP maize partners requested CIMMYT for the allocation of the selected varieties for further testing and registration process. The following table shows the number of AIP maize varieties selected by partners until spring 2015.

**Table 4: No of selected maize varieties by AIP maize partners (spring 2015)**

No	AIP maize Partner institution	Ownership	No. of selected hybrids	No. of selected OPVs	Total no. of selected entries
1	National Agricultural Research Center	Public	3	2	5
2	Cereal Crops Research institute	Public	6	6	12
3	Tara Crop Sciences	Private	3	-	3
4	Four brothers group	Private	6	1	7
5	Jullundur Private Limited	Private	8	-	8
6	Imperial Chemical industry (ICI)	Private/MNCs	15	-	15
7	Ali Akbar Seeds PLC	Private	4	-	4
8	Petal Seeds Plc	Private	-	3	3
9	Agricultural research Institute (Gilgit B)	Public	-	2	2
<b>Total</b>			<b>39</b>	<b>14</b>	<b>53</b>

The above table shows that both public and private institutions are interested to take further the maize germplasm from the AIP program. Some of the varieties (hybrids/OPVs) were selected by more than one partner, which requires proper procedure for allocation. CIMMYT's maize program has set criteria to streamline a fair and equitable product allocation to partners. The following are among the guiding principles for product allocation to partners:

- Investment made so far by the applicant in hybrid testing, and potential investment in hybrid seed production and commercialization
- Likelihood that seed will become widely available to smallholder farmers
- Likelihood that seed will become widely available as soon as possible
- Relative importance of a variety in the variety portfolio of the applicant

Based on these and others criteria the seed of the allocated hybrid is provided to the partner for testing to meet regulatory requirements and to enable the institute to begin seed scale-up. The process of product allotment is underway and will be completed before the end of the year for the above requested varieties.



Figure 5: Good germination and seed bed establishment of AIP maize spring trails at ICI Pakistan (top) and at Tara Crop sciences (bottom), private seed company trial stations in Sahiwal, Punjab.

**Table 4: AIP-maize partners participated in the evaluation of spring maize trial (2015)**

<b>No</b>	<b>Partner name</b>	<b>Province</b>	<b>Ownership</b>	<b>No. of trials</b>	<b>Status</b>
1	Jullundur Private Limited	Punjab	Private	5	Completed
2	4B group	Punjab	Private	4	Completed
3	Ali Akbar Pvt	“	Private	4	Completed
4	ICI-Pakistan	“	Private	7	Completed
5	Tara Crop Sciences Pvt	“	Private	2	Completed
6	Kanzo Quality Seeds Pvt	“	Private	3	Completed
7	Tassko Seeds Pvt	Sindh	Private	2	Completed
8	Maize and Millet Research Institute (MMRI)	Punjab	Public	6	Completed
9	Cereal Crops Research Institute (CCRI)	KPK	Public	9	Completed
10	National Agricultural Research Institute (NARC)	ICT	Public	8	Completed
11	Agriculture research Institute Balochistan	Balochistan	Public	2	Completed
12	Agriculture research Institute Sindh	Sindh	Public	1	Completed
13	Zamindara Seed Corporation	Punjab	private	3	Completed
14	Petal Seeds Corporation	KPK	Private	3	Completed

### **1.3.1.3. Introduction of low soil nitrogen stress tolerant maize varieties**

Small holder farmers do not have enough resources to apply chemical fertilizers for crop production. Low soil nitrogen is one of the limiting production factors for yield reduction in maize under small holders farming condition. Varieties that can perform well in the limited/scarce condition of soil nitrogen will help farmers to get reasonable harvest from their farm as well as reduce inorganic inputs to soil environment. Reduced use of inorganic fertilizer has positive impact on the environment and enhances quality of agriculture.

Under the AIP maize program CIMMYT introduced low nitrogen (low N) stress tolerant open pollinated maize varieties from the International Institute of Tropical Agriculture (IITA) for evaluation in Pakistan. A total of ten low N stress tolerant maize varieties are being evaluated in Kharif 2015 season along with two local check varieties. Three public research institutes (CCRI, MMRI and NARC) are hosting the trials. The trials are managed by not applying nitrogen fertilizer (UREA) and data of relevant traits will be recorded. As it is the first time to evaluate such trials, partners' needs to have proper low N stress screening sites and skills to gather relevant information for selection of varieties. Based on the data from the current trials, development of ideal low-N sites and appropriate management practices will be facilitated under the capacity program of AIP maize in the upcoming seasons. Further trails will be included in next seasons to compare different nitrogen fertilizer regimes against low N trials. The list of the low-N stress tolerant maize varieties are presented under Table 5.

**Table 5: List of low soil nitrogen stress tolerant maize varieties**

<b>No</b>	<b>Name</b>	<b>Grain color</b>
1	LNTP-Y C7	Yellow
2	LNTP-W C4	White
3	TZPB Prol C4	White
4	BR 9928-DMRSR LN C1	Yellow
5	TZL COMP 1 C6 LN C1	White
6	LA POSTA SEQUIA C6	White
7	Sint Marzoca Larga	White
8	BR 99 TZL Comp 4 DMSRSR	White
9	Acr 97 TZL Comp 1-W LN C1	White
10	Acr 9931 DMRSR LN Syn F2	Yellow
11	Local Check 1	Yellow
12	Local Check 2	Yellow

Further to the evaluation process of these varieties, partners will get benefit by enriching their maize gene pool by using the seeds from these entries.

#### **1.3.1.4. Evaluation of drought tolerant maize inbred lines**

Pakistan is among the water scarce countries of the world and farm production is heavily dependent on the availability of enough surface water during the important growing stages of a crop. Maize is generally considered as water intensive plant; however, maize scientists have developed germplasms that can withstand water scarcity and perform well in the arid and semi-arid ecologies like Pakistan. Introduction and evaluation of such water efficient maize germplasms in Pakistan not only promotes climate resilience farming systems but also increase the competitiveness/profitability of the maize commodity by reducing water and energy which in turn contributes in many ways to the national economy.

Under the AIP maize program, CIMMYT introduced 31 maize inbred lines developed for drought (water stress) tolerance from IITA for evaluation in Kharif 2015. The inbred lines are white grain and help to develop varieties widely acceptable in KPK and hilly areas of Pakistan where farmers use maize as food crop. The technical evaluation of the inbred lines which are planted at CCRI, MMRI and NARC includes withholding of water (irrigation) two weeks before flowering which is a critical water stress growing stage for maize. Inbred lines that showed good adaptability at this stress condition will be selected for further testing and formation of new varieties locally. Based on the data of this season further trials will be arranged particularly in spring season to avoid unwanted rain during flowering. Table six shows the list of drought tolerant inbreds introduced to Pakistan:

**Table 6: Drought tolerant maize inbred lines introduced under the AIP maize program**

No	Name	No	Name	No	Name
1	TZMI761	12	TZMI754	23	TZMI1162
2	TZMI745	13	TZMI755	24	TZMI1163
3	TZMI751	14	TZMI878	25	TZMI1164
4	TZMI899	15	TZMI882	26	TZMI1165
5	TZMI757	16	TZMI886	27	TZMI1167
6	TZMI763	17	TZMI889	28	TZMI1169
7	TZMI764	18	TZMI903	29	TZMI407
8	TZMI765	19	TZMI909	30	TZMI102
9	TZMI747	20	TZMI1159	31	TZMI407-Short
10	TZMI748	21	TZMI1160	32	Check
11	TZMI753	22	TZMI1161		

#### **1.3.1.5. AIP maize candidate varieties under National Uniformity Yield Trial (NUYT)**

In the current season of Kharif 2015, 46 candidate maize varieties have been included for the first to be tested under the national uniformity yield trial (NUYT) in Pakistan. The NUYT is a coordinated activity run by Pakistan Agricultural Research Council (PARC) and is part of variety registration process to get nationwide release/production of maize varieties. Under NUYT candidate varieties are tested in 10-15 locations across the country and the data will validate the stability and repeatability in performance of the candidate varieties. The data from NUYT together with previous three season's data will give clear indications on the varieties performance across sites and seasons. The NUYT data is solely compiled by PARC's cereal systems coordination office and trails are coded before dispatch to different testing stations to avoid bias or errors in data recording. Some of the entries included under NUYT are also being evaluated on farmers plot as demonstration and the detail is presented under the seed sector activities of this report. Shortlisting good performing varieties and including them under NUYT in just less than two years can be considered as one of the achievements of the AIP program, otherwise this practice would have taken more than four years in a normal course of action.

The following tables (7 and 8) show summary and list of the maize varieties included under NUYT during Kharif 2015.

**Table 7: summary of maize varieties included under NUYT (Kharif 2015)**

No	Type of maize under NUYT	Total number	CIMMYT germplasm source
1	White kernel OPVs	13	Zimbabwe
2	White Kernel Hybrids	20	Zimbabwe
3	White Kernel Hybrids	5	Mexico
4	Yellow kernel Hybrids	5	Mexico
5	Yellow kernel Hybrids	3	Colombia
Total		46	

**Table 8: Partial list of AIP maize candidate varieties included under NUYT (Kharif 2015)**

**A. Open pollinated varieties (white kernel)**

No	Name	NUYT Code	Maturity	Remark
1	CZP132001	WVAR-1	Early	NUYT+ On farm demo
2	CZP132002	WVAR-2	Early	NUYT only
3	CZP132006	WVAR-3	Early	NUYT+ On farm demo
4	CZP132011	WVAR-4	Early	NUYT
5	CZP132012	WVAR-5	Early	NUYT
6	TP1217	WVAR-6	Early	NUYT+ On farm demo
7	TP1219	WVAR-7	Early	NUYT+ On farm demo
8	TP1220	WVAR-8	Early	NUYT+ On farm demo
9	TP1221	WVAR-9	Early	NUYT
10	TP1222	WVAR-10	Early	NUYT
11	ZM309	WVAR-11	Early	NUYT+ On farm demo
12	ZM401	WVAR-12	Early	NUYT
13	ZM521	WVAR-13	Early	NUYT+ On farm demo

## B. White kernel hybrid maize varieties

No	Name	NUYT Code	Maturity
1	CZH1247	WHYB-1	Early
2	CZH1248	WHYB-2	Early
3	CZH1258	WHYB-3	Early
4	CZH132134	WHYB-4	Early
5	CZH132140	WHYB-5	Early
6	CZH132150	WHYB-6	Early
7	CZH132151	WHYB-7	Early
8	CZH132163	WHYB-8	Early
9	CZH132164	WHYB-9	Early
10	CZH131007	WHYB-10	Late
11	CZH131008	WHYB-11	Late
12	CZH132067	WHYB-12	Late
13	CZH132070	WHYB-13	Late
14	CZH1218	WHYB-14	Intermediate
15	CZH1221	WHYB-15	Intermediate
16	CZH131010	WHYB-16	Intermediate
17	CZH131011	WHYB-17	Intermediate
18	CZH132043	WHYB-18	Intermediate
19	CZH132045	WHYB-19	Intermediate
20	CZH132055	WHYB-20	Intermediate

**Table 9: List of climate resilient maize trials being evaluated during Kharif 2015**

<b>No</b>	<b>Type of trial</b>	<b>Trial code</b>	<b>No of sets</b>	<b>No of entries</b>	<b>Kernel color</b>	<b>Germplasm source</b>
1	Early maturing hybrid	EHYB14	4	55	White	Zimbabwe
2	Early maturing open pollinated varieties	EPOP14	7	30	“	“
3	Intermediate maturing hybrids	IHYB14	3	60	“	“
4	Late maturing hybrids	LHYB14	2	42	“	“
5	Tropical early to intermediate maturing hybrids	TTWCWL	7	15	“	Mexico
6	Yellow maize hybrids for lowland tropics	TTWCYL	3	12	Yellow	Mexico
7	Early maturing variety trial-streak resistant	EVT-LSR	3	16	White	IITA
8	Early maturing variety trial	EMVT	3	21	White	“
9	Extra early maturing variety trial	EEMVT	3	21	White	“
10	IITA white hybrids	IITA white	5	20	White	“
11	IITA yellow hybrids	IITA yellow	3	30	Yellow	“
12	Drought Tolerant inbred lines	DT lines	3	32	white	“
13	Low N tolerant OPV	Low-N	3	12	White / yellow	“
<b>Total</b>			<b>52</b>	<b>381</b>		

**Table 10: AIP maize trail distributions and partners for Kharif 2015**

No	Partner name	Trial code	No. of entries	Type of Trial	Crop Stage
1	JPL Pvt. Ltd (Arifwala)	EHYB15129	55	On going	R3 (milk stage)
		15CHTPROA4	24	New Trial	“
		14TTWCYL48	12	On going	“
		14TTWCWL34	15	On going	“
2	4B group (Lahore)	IHYB1579	60	On going	R3 (milk stage)
		EHYB15131	55	On going	“
		15CHTPROA5	24	New Trial	“
		LHYB1574	42	On going	“
		ADVQPM1556	60	Ongoing	“
3	Ali Akbar Pvt (Chiniot)	IITA Yellow hybrids (33)	30	NEW	R3 (milk stage)
4	ICI-Pakistan (Sahiwal)	14TTWCYL49	12	On going	R3 (milk stage)
		EHYB15132	55	Ongoing	“
		14TTWCWL35	15	On going	“
		IITA white hybrid	20	New trial	“
		POP Corn (OPVs)	1	New trial	VT (flowering)
		Sweet Corn	2	New trial	“
5	Tara Crop Sciences (Sahiwal)	IITA yellow hybrid	30	New Trial	R3 (milk stage)
		14TTWCWL36	15	On going	“
6	Kanzo Pvt (Sheikupura)	IITA white hybrids	20	New trial	R4 (dough stage)
		14TTWCYL50	12	On going	“
7	Petal seeds Co (Mardan)	02-14TTWCWN	24	New Trail	Harvested
		EPOP1590	30	On going	“
		IHYB1573	60	New Trail	“

No	Partner name	Trial code	No. of entries	Type of Trial	Crop stage
8	Sohni Dharti (Sahiwal)	14TTWCWL37	15	New Trail	R4 (dough)
9	NARC (ICT)	EVT-LSR (White)	16	NEW	R3 (dough stage)
		EMVT (90-95 days)	21	NEW	"
		EEVT (80-85 days)	20	NEW	"
		IITA White hybrids	20	NEW	R3 (milk stage)
		IITA Yellow hybrids	30	NEW	"
		Stem borer tolerant	15	NEW	"
		Low N tolerant OPVs	12	NEW	R3 (milk stage)
		Mid altitude DT lines	32	NEW	"
		15CHTPROA6	24	On going	"
		14TTWCWL38	15	Ongoing	"
		POP and Sweet Corn	3	NEW	VT (flowering)
		On-station demos	46	NEW	R2 (kernel setting)
10	CCRI (Pirsabak)	LHYB1575	42	On going	VT (flowering)
		EVT-LSR (White)	16	NEW	"
		IITA White hybrids	20	NEW	"
		14TTWCWL39	15	NEW	R1 (silking)
		15CHTPROA7	24	NEW	"
		Stem borer tolerant	15	NEW	"
		Low N tolerant OPVs	12	NEW	"
		Mid altitude DT lines	32	NEW	"
		On farm demo plots	4	NEW	R3 (milk stage)
		POP Corn (OPV)	1	NEW	VT (flowering)
		Sweet Corn (White)	1	NEW	"
		Sweet Corn (Yellow)	1	NEW	"

No	Partner name	Trial code	No. of entries	Type of Trial	Crop stage
11	MMRI (Yousafwala)	EVT-LSR (White)	16	NEW	R3 (milk stage)
		EMVT (90-95 days)	21	NEW	"
		15CHTPROA8	24	New	"
		Stem borer tolerant	15	NEW	"
		Low N tolerant OPVs	12	NEW	"
		Mid altitude DT lines	32	NEW	"
12	UAF (Faisalabad)	15CHTPROA9	24	New	R3 (Milk stage)
		ADVQPM1558	60	On going	"
13	UAP (Peshawar)	EMVT (90-95 days)	21	NEW	R3 (milk stage)
14	ARI-Sindh (Tandojam)	EEVT (80-85 days)	20	NEW	VT (flowering)
15	ARI Gilgit (Diامر, Skurdu, Gilgit)	EPOP1584	30	On going	R4 (dough stage)
		EPOP1585	30	On going	"
		EEVT (80-85 days)	20	New	"
16	AJK (Muzafarabad)	EPOP1586	30	New	Harvested
		EPOP1587	30	New	"
17	ARI (Balochistan)	EPO1588	30	Ongoing	Harvested
		EPOP1589	30	"	"
18	Tassko (Tando Alayar)	IITA white hybrid	20	New	R3 (milk stage)
19	Zamindara Seeds (Dipalpur)	EHYB15130	55	Ongoing	R3 (milk stage)
		IHYB15 80	60	On going	"
		ADVQPM1557	60	Ongoing	"
		14TTWCWL40	15	NEW	"



Figure 6 Farmers orientation on maize farming practices in Balochistan

### 1.3.1.6. Creating synergies with other USAID climate resilient maize project

Heat Tolerant Maize for Asia (HTMA) is another project funded by USAID's Feed the Future (FTF) program. It is a public-private CIMMYT led alliance consisting of Purdue University, Pioneer Hi-Bred, seed companies, and South Asian public sector maize programs. It is implemented in four south Asian countries viz Bangladesh, India, Nepal and Pakistan. In Pakistan the maize and millet research institute (MMRI) is an implementing partner.

The MMRI in collaboration with CIMMYT Pakistan office organized HTMA field day on 04 June 2015. More than 35 participants from public and private research and development institutions and seed companies attended the field day that included HTMA hybrids visit at MMRI Yusafwala and at Zamindara Seeds Plc. at Dipalpur. Selection of good performing heat stress tolerant maize hybrids was among the objectives this field day and the AIP maize project will help in facilitating the delivery of the selected hybrids to partners based on hybrid allocation criteria and promote the deployment process in Pakistan.



Figure 7 Partial view of the participants of HTMA (USADI's FTF project) field day at MMRI Yusafwala



Figure 8 Participants visiting HTMA hybrids at Zamindara seeds PLC in Dipalpur



Figure 9 Photo showing tassel burning due to extreme heat and heat tolerant maize line from HTMA program  
(Photo Courtesy: P.H. Zaidi)

### **1.3.2. Development or introduction of biofortified maize**

Biofortification or the breeding of staple food crops to increase their micronutrient density is widely viewed as a valuable strategy for sustainably improving the nutritional status of some malnourished populations. Successful biofortified varieties must be agronomically competitive with the best available local varieties, acceptable to consumers for all intended uses, including home consumption and marketing, and must be able to improve nutritional status of the target consumer (K. Pixely et al., 2013, Biofortification of maize with provitamin A carotenoids).

According to the global hunger index of 2013 developed by the International Food Policy Research Institute (IFPRI), Pakistan is among the countries where food and nutritional security is at a serious level. The rate of stunting among children under the age of five is about 43% in Pakistan which is one of the highest in the world. Attaining food and nutritional security is one of the main targets of AIP in general and that of the maize component in particular. CIMMYT germplasms that have proven quality of protein and enriched with provitamin A (beta-carotene) are being evaluated in Pakistan to reduce the widely prevalent undernourishment and related health complications.

#### **1.3.2.1. Evaluation of biofortified maize during spring and kharif seasons**

The AIP maize program is evaluating protein enriched maize varieties particularly those with enhanced level of Lysine and Tryptophan, which are among the essential amino acids where humans have to get them from external food sources (like eggs, meat, milk and milk products...). However, animal derived protein sources are not easily affordable by resource poor farmers and children and women are the most vulnerable.

A total of 60 white and yellow kernel quality protein maize (QPM) varieties were evaluated during the spring and 24 vitamin A enriched hybrids and 60 white kernel QPM hybrids are being tested during Kharif season. Out of the total tested biofortified hybrids two QPM hybrids were included under the NUYT during spring season. These two hybrids have completed the wide adaptability test and expected to be official released in 2016 for large scale commercial production. The QPM hybrids are being evaluated and multiplied by National Agricultural Research Center (NARC) and the varieties will be the first released maize varieties from the AIP

program and they will be the first QPM hybrids in Pakistan. Table 10 shows the list of biofortified maize varieties evaluated in Pakistan

**Table 11: list of biofortified maize varieties evaluated in Pakistan (spring and Kharif, 2015)**

No	Trial Name/code	Trial description	No of entries	No. of sets	Trial status	Crop stage
1	15CHTPROA	ProA (entries enriched with VitA) of subtropical materials	24	6	Ongoing trials from CIMMYT Mexico	R1 (silking stage)
2	ADVQPM	Advanced white kernel QPM hybrids	50	5	Ongoing trials from CIMMYT Zimbabwe	Harvested
3	PK14A/13BEARHQ PMY	Yellow kernel QPM hybrids	10	5	CIMMYT Colombia	Harvested
4	ADVQPM	Advanced white kernel QPM hybrids	60	4	Ongoing trials from CIMMYT Zimbabwe	R3 (milk stage)



Figure 10 A child carrying yellow maize at Chichawatni from his father's demo plot in Punjab (Photo: M. Waheed Anwar)

### **1.3.2.2. Prerelease demonstration and seed production of QPM hybrids**

Prerelease on-farm demonstration of the two QPM hybrids has begun during the spring season. The pipeline hybrids were planted in Kaghan in KPK; Rawlakot and Danna Kacheely areas of AJK provinces. The selection of the sites was based on the food habit of the community where maize is the staple food and in many cases the principal source of protein for the resource poor farmers. The farmers demo were planted in 100m<sup>2</sup> area along with local check variety so that the yield and advantaged can be compared. The demo at Rawlakot is harvested and at Kaghan the crop is approaching maturity.

To ensure the seed production capacity of the parental lines of the QPM hybrids locally, the seed multiplication of the two QPM hybrids is in progress in two isolated fields at NARC in a total of 0.63 acre. The seed micro increase will help to identify proper row orientation and planting pattern of the inbred lines which is one of the important aspects of hybrid seed production. Detasseling (removing the tassel of the seed parent) and removing off type plants from the seed field are being conducted to maintain the quality of the seed. As hybrid seed production requires proper follow up and capacity to meet seed quality standards, NARC needs capacity enhancement in proper seed multiplication planning, seed processing and conditioning, seed delivery and marketing and on other technical skills in the seed value chain. Furthermore, the nutritional quality of biofortified varieties will be lost if proper protection measures are not set in place. Hence, CIMMYT is planning to give practical training in November 2015 on monitoring and maintaining the grain nutritional quality of QPM and Vitamin A maize varieties.



Figure 11: Showing female (detasseled) and male rows from the QPM hybrid seed production field at NARC



Figure 12 Removing off type (doubtful) plants from hybrid seed production field at NARC

### **1.3.2.3. Introduction of specialty maize**

Maize is one of the extensively utilized cereal crops of the world. One the reason for its wider adoption is the availability of maize variants for food, feed and industrial use. Baby corn, sweet corn, popcorn, Purple (blue) corn, waxy corn...etc are among the different types of maize known for their culinary, dye and health benefits. Among these specialty maize sweet corn and popcorn varieties have been introduced by the AIP maize program for planting during the kharif season.

Two sweet corn open pollinated varieties (yellow and white kernel) and one popcorn variety known for its popping quality were introduced from IITA. These specialty maize varieties are being tested for their adaptation at CCRI, NARC and ICI-Pakistan Ltd. Once their adaptation is confirmed the seed multiplication will continue to avail the products particularly for urbanites where the potential demand for such maize is high. In addition, the germplasm can be used to extract valuable inbred lines for possible formation of the hybrid version in the future.

### **1.3.2.4. Aflatoxin in the spotlight**

Food quality and safety issues resulting from aflatoxin contamination present a serious obstacle to programs designed to improve nutrition and agricultural production that link farmers to markets. Aflatoxins are highly toxic, cancer-causing fungal chemicals that suppress the immune system, retard growth, and cause liver disease and death in both humans and domestic animals. Aflatoxin exposure thus provides a challenge in efforts to improve people's health, especially women and children ([www.iita.org](http://www.iita.org)). Aflatoxin is a poison produced by a fungus, *Aspergillus flavus*, residing in soil and dead/decaying matter in the field and attacks grains of maize, ground nut, rice and root crops like yam and cassava among others.

Although the problem of aflatoxins is known in Pakistan, there is no a coordinated effort in protecting maize or other crops from its serious consequences. The AIP maize program in collaboration with relevant stakeholders including the industry initiated a project discussion to develop safe and effective ways (including biological method) of controlling maize aflatoxins in Pakistan. During its first meeting ,07 April 2015, experts addressed issues on best ways of controlling aflatoxin primarily in maize and further identify the role of stakeholders in the value

chain. During the consultation process stakeholders raised the following issues/suggestions/recommendations:

- The level of aflatoxins in the food/animal products is found above the standards of foreign countries particularly in EU which prohibited export of commodities
- Farmers' wider practices of drying maize cobs on the open field/soil found to be the major source of aflatoxin contaminations in maize
- To initiate biological control of aflatoxin by introducing naturally safe fungal types into the soil. To learn from aflatoxin mitigation projects in Africa which are also funded by USAID and USDA among others donors
- To establish aflatoxin controlling and testing lab facilities under the Borlaug Innovation Platform, a process under discussion between CIMMYT-Pakistan and USAID mission in Islamabad
- To further explore potential stakeholders (local and international) and to engage the private sector in owning the project though co-funding and other support

Based on these and other recommendations, a concept note will be developed to outline implementation framework and funding strategies. It is planned to hold a national aflatoxin workshop in consultation with USAID and other stakeholders to enable the kickoff this project in Pakistan.



Figure 13 Consultative meeting on maize aflatoxins 7th April 2015



Figure 14: Stakeholders' discussions on aflatoxins



Figure 15: drying of maize cobs on soil is one of the causes of aflatoxin contaminations in maize

### 1.3.3. Development or introduction of biotic stress tolerant maize

Pests and diseases cause major loss on maize productivity. In some cases maize stalk borer only can cause a 40% yield loss and such loss will not only reduce total maize production and quality but also affects the livelihood of small holder farmers.

During the current Kharif season, AIP-maize is evaluating 13 stem borer tolerant open pollinated maize varieties against two local checks. The OPVs are developed through conventional method by the International Institute of Tropical Agriculture (IITA). The varieties are planted at CCRI, MMRI and NARC and currently at milk stage. These trials are managed by not applying pesticides on the trials and relevant data are recorded to identify the most tolerant entries at natural condition. In subsequent seasons the trials will be compared with under protected condition by releasing stem borers to the trials.

Best varieties from these trials will help farmers to save their produce from pest attack and reduce production cost by avoiding chemical spray. Avoidance or reduction of chemical spray to control maize stem borer will have positive environmental impact. A customized training on mass rearing of maize stem borer and related techniques is planned for December 2015. Maize entomologists will have a chance to gain knowledge from subject matter specialists who will be invited from CIMMYT regional offices in China and Kenya. The introduced varieties will also serve as source population to enhance local gene pools and for the development of hybrid maize varieties in future.

**Table 12: Status of stem borer tolerant maize varieties planted during Kharif 2015**

No	Partner name	Trial	No. of entries	Type of Trial	Crop Stage
1	CCRI	Stem borer tolerant OPV	15	New	R1 (Silking)
2	MMRI	"	"	New	R3 (milk stage)
3	NARC	"	"	NEW	R2 (grain filling)



Figure 16: larva of maize stem borer on leaf and inside stem (most damaging stage)

#### 1.3.4. Enhancing the Maize Seed Sector

Access and availability of quality seed is the most important factor to enhance agricultural productivity. In this regard, the Pakistan maize seed industry is not robust enough to mitigate the high demand of maize seeds. More than 85% of the hybrid seed is imported annually which makes the unit price of the hybrid very expensive to the smallholder farmers. As a result farmers are forced either to recycle or to use substandard seeds available in the market. Resolving the maize seed issue related to price and quality through the participation of public and private institutions will help to unlock the potential of maize productivity in Pakistan. AIP maize is a public-private alliance to enhance local capacity in the provision of affordable quality maize seeds in Pakistan.

Currently, ten private and nine public institutions are directly involved under the AIP maize activities and part of AIP maize working group team. Three multinational companies also occasionally share their experiences under the AIP maize network (Table 13). It is one of the AIP maize successes to manage such multi stakeholder platforms. Members of the AIP-MWG meet at least once in a year to plan upcoming activities, update progress, share experiences and discuss way forward.

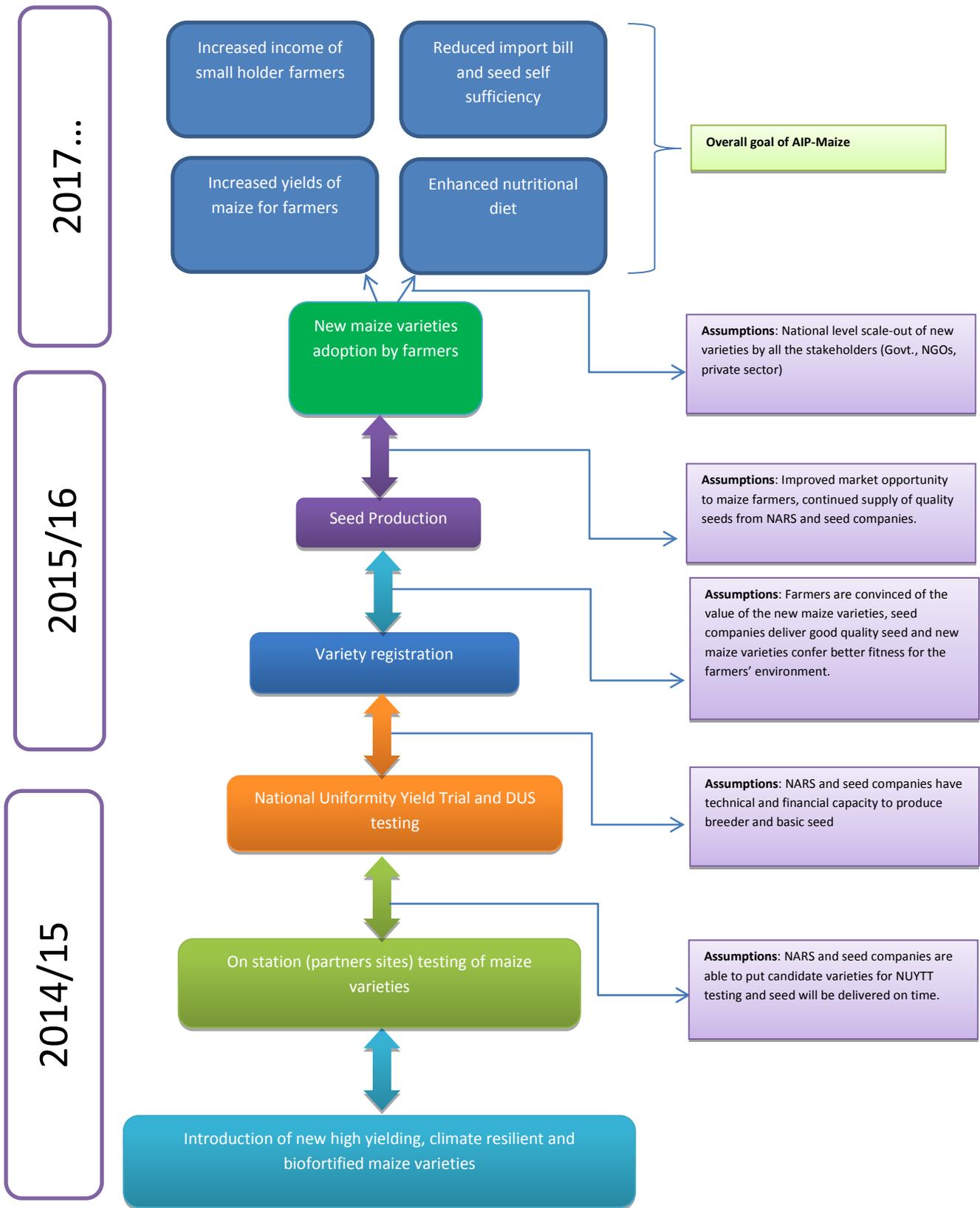


Figure 17 Schematic diagram showing program pathway of AIP-maize

**Table 13: Updated list of Public and private maize R&D institutions working with AIP-maize (As of October, 2015)**

<b>No</b>	<b>Institution</b>	<b>Ownership</b>	<b>Main activity/business</b>	<b>Geographical coverage in Pakistan</b>	<b>Involvement in maize variety development in Pakistan</b>	<b>Maize seed Production and distribution</b>	<b>Type of partnership under AIP maize</b>
1	National Agricultural Research Center	Public	Research and development	Mainly in Islamabad and surrounding areas	Yes	No	Germplasm evaluation and capacity building
2	Cereal Crops Research Institute-Nowshera, KPK	Public	Research and development	KPK province	Yes	Yes	Germplasm evaluation and capacity building
3	Maize and Millet Research Institute-Sahiwal, Punjab	Public	Research and development	Mainly southern Punjab	Yes	Partially	Germplasm evaluation and capacity building
4	Punjab Seed Corporation	Public	Seed business	Punjab province and spill over to KPK and Sindh provinces	No	Yes	Seed production and seed sector enhancement
5	Agr. Research Institute (ARI)-Balochistan	Public	Research and development	Baluchistan province	Mainly variety testing	No	Germplasm evaluation and capacity building
6	Agr. Research Institute (ARI)-Sindh	Public	Research and development	Sindh province	Mainly variety testing	No	Germplasm evaluation and capacity building
7	Agr. Research Institute (ARI)-Gilgit	Public	Research and development	Gilgit Biltistan province	Mainly variety testing	No	Germplasm evaluation and capacity building

**Table 13: Continued**

8	Univ. of Agr. Peshawar	Public	Academics and research	KPK province	Yes	No	Germplasm evaluation and capacity building
9	Univ. of Agr. Faisalabad	Public	Academics and research	Punjab province	Partly	No	Germplasm evaluation and capacity building
10	Department of Agriculture, AJK	Public	Research and development	Azad Jammu and Kashmir	Mainly variety testing	No	Germplasm evaluation and capacity building
11	Imperial Chemical industry	Private	Mixed business	Nation wide	Yes	Yes	Germplasm evaluation
12	4 brothers group	Private	Mixed business	Mainly in Punjab provinces	Mainly testing	Yes	Germplasm evaluation and seed sector enhancement
13	Jullundur Private Limited	Private	Mixed agri. business	Mainly in Punjab and Sindh. Maize OPVs in KPK	Yes	Yes	Germplasm evaluation and seed sector enhancement
14	Petal Seeds Company	Private	Mixed agri. business	Mainly in KPK province	Mainly testing	Yes	Germplasm evaluation and seed sector enhancement
15	Ali Akbar Group	Private	Mixed agri. business	Mainly in Punjab provinces	Yes	Yes	Germplasm evaluation and seed sector enhancement
16	Tara Crop Sciences	Private	Mixed agri. business	Mainly in Punjab provinces	Mainly testing	Yes	Germplasm evaluation and seed sector enhancement
17	Kanzo Seeds Pvt	Private	Mixed agri. business	Mainly in Punjab provinces	Mainly testing	No	Germplasm evaluation and seed sector enhancement
18	Tassko seeds Pvt	Private	Mixed agri. business	Mainly in Sindh provinces	Mainly testing	No	Germplasm evaluation and seed sector enhancement
19	Zamindara Seeds Plc	Private	Mixed agri. business	Mainly in Punjab provinces	Yes	Yes	Germplasm evaluation and seed sector enhancement
19	Monsanto Pakistan	Multinational	Mixed business	Nation wide	Mainly testing for adaptation	Yes	Collaborations on information sharing
20	Syngenta Pakistan	Multinational	Mixed business	Nation wide	Mainly testing for adaptation	Yes	Collaborations on information sharing
21	Pioneer Pakistan	Multinational	Mainly seed business	Nation wide	Mainly testing for adaptation	Yes	Collaborations on information sharing
22	PARC	Public	Coordination and policy	Nation wide	Yes in coordination	No	Primary partner under the project

#### **1.3.4.1. Taking the seeds to the farmers: *on farm demonstration***

For the first time under the AIP maize program farmers start evaluating candidate varieties in their own field. During Kharif 2015 the seeds of 11 maize varieties were distributed for on farm demonstration. Out of the eleven three are hybrids and eight are white grain open pollinated varieties. The main purpose of the on farm demonstration is to popularize the variety at its future potential marketing area and also to gather performance data based on farmers management who are the ultimate user of the candidate varieties. In addition, the AIP maize also supported promotion of locally developed hybrid from MMRI at ten farmers sites to make popular the variety among farmers. The information from farmers will help for future promotion strategies of the candidate varieties. List of the demonstration sites are presented under table 14.



**Figure 17: Detasseling (removal of the female flower) at NARC's hybrid seed production field**

**Table 14 : list of on farm demonstration of AIP maize and other locally developed hybrids**

<b>Name of candidate variety</b>	<b>Hosting institute</b>	<b>Location</b>	<b>Date of sowing</b>	<b>Farmer Name</b>
TP1217	Gilgit	Di Amer ( Near Gonar Farm)	<b>09-07-15</b>	Kareem Khan
TP1220	Gilgit	Agi Extention Farm Chillas	<b>10-07-15</b>	
ZM521	Gilgit	Danyor Gilgit	<b>07-07-15</b>	Subadar Dar Ameen
TP1217	Petal Seeds	Haji Ahsan	<b>27-07-15</b>	Ashraf Ud Din Zarifa Qala
		Petal Seeds/ Mardan	<b>13-07-15</b>	Ashraf Ud Din Zarifa Qala
TP1219	Petal Seeds	Petal Seeds/Mardan	<b>13 -07- 15</b>	Ashraf Ud Din Zarifa Qala
		M.Usman	<b>31-07-15</b>	Muhammad Shah Qala
TP1219	4B	Swabi	<b>31-7-15</b>	Fazla Rahman
		Zozo Banda (Yar Hussain) Swabi	<b>2-08-15</b>	Sajid Khan
TP1219 ZM309	CCRI	Nowshera	<b>27-07-15</b>	
		Nowshera	<b>27-07-15</b>	
ZM309 ZM521	ARI Balochistan	Dhadar (Bolan district)	16-09-15	Muhammad Aslam
CZP132001	NARC	Not identified so far	Not planted	
TP1217	NARC	“	“”	
CZP132006	CCRI	Nowshera	27-07-15	
CZH131007 (hybrid)	CCRI	Nowshera	27-07-15	

**Table 14 : continued...**

<b>Name of candidate variety</b>	<b>Hosted by</b>	<b>Location</b>	<b>Date of sowing</b>	<b>Farmer Name</b>
YH1898	MMRI	Sahiwal	2-Aug-15	Mr. Muhammad Asghar
		Sahiwal	16-Jul-15	Mr. Ahsan-UI-Haq
		Sahiwal	16-Jul-15	Mr. Muhammad Qasim
		Sahiwal	16-Aug-15	Mr. Muhammad Awais
		Toba Tek Singh	14-Aug-15	Mr. Saif-Ur-Rehman
		Chichawatni	7-Jul-15	Mr. Farooq Ahmad
		Sahiwal	7-Jul-15	Mr. Rana Muhammad Abbas
		Sahiwal	11-Jul-15	Mr. Muhammad Rafique
		Sahiwal	12-Aug-15	Mr. Shahid Ramzan
		Noorpur Pakpatan	1-Aug-15	Mr. Haji Muhammad Sadique
QPM hybrids	NARC	Rawala kot (AJK)	08 May 2015	Muhammad Sadeeq Tahir
		Danna Kacheely (AJK)	01 June 2015	Shouqat Hussain
		Kaghan (KPK)	27 May 2015	NARC Kaghan site

### 1.3.4.2. Support to AIP maize partners (Sub grants)

During the reporting period a total of **\$62,066.63** has been granted to 17 AIP maize partners to help execute the different commissioned projects. Until the compilation of this report 16 partners have signed the Sub Grant Agreement (SGA) that will be applicable until March 2016. The public sector received 73% of the sub grant and the private sector 27%. The list of the sub grant distribution is presented under Table 15 and the distribution of funds based on commissioned projects under Table 16

**Table 15: Distribution of AIP maize funds to partners for the period April'15 to March'16**

No.	Partner institutions	Sector	Budget assigned
1	NARC	Public	\$ 15,107.90
2	MMRI	"	\$ 7,386.49
3	CCRI	"	\$ 5,076.73
4	ARI-Quetta	"	\$ 4,526.73
5	ARI-Gilgit	"	\$ 4,146.73
6	JPL	Private	\$ 3,455.45
7	4B group	"	\$ 3,290.42
8	Zamindara seeds	"	\$ 2,683.17
9	ARI-Sindh	Public	\$ 3,226.73
10	Ali Akbar seeds	Private	\$ 2,321.78
11	AJK-Muzafarabad	Public	\$ 2,926.73
12	UAP	"	\$ 1,425.00
13	UAF	"	\$ 1,234.00
14	Tara Crop Sciences	Private	\$ 1,794.42
15	Petal seeds co	"	\$ 1,375.25
16	KQS	"	\$ 1,113.86
17	Tassko Seeds plc	"	\$ 975.25
		<b>Total</b>	<b>\$ 62,066.63</b>

**Table 16: Summary of AIP maize funds across commissioned projects**

Commissioned Project	Budget	Percent
Climate resilient and biofortified maize	\$ 22,918.42	37%
Biotic stress tolerant maize	\$ 5,000.00	8%
Enhance the maize seed sector	\$ 11,520.00	19%
Across	\$ 22,628.71	36%
<b>Total</b>	<b>\$ 62,067.13</b>	<b>100%</b>

Part of the AIP maize sub grant is the support of IT equipment for field data recording and compiling activities. The equipment support will help to ensure data precision in field operations which in turn increase expected deliverables from partners. Table 16 shows equipment support given to AIP maize partners.



**Figure 18 Partners using grain moisture meter provided under AIP maize equipment support**

**Table 17: List of equipment distributed to AIP maize partners**

<b>Partner institution</b>	<b>Laptop</b>	<b>Desktop</b>	<b>Printer</b>	<b>Camera</b>	<b>Moisture meter</b>
NARC	2	1	1	1	1
MMRI	1	1	1	1	0
CCRI	1	1	1	1	1
4B group	1	0	0	0	1
JPL	1	0	1	0	0
Petal SC	0	0	0	0	1
UAF	0	0	0	0	1
AAS	1	0	0	1	0
ZS	1	0	0	0	0
KQS	0	0	0	1	1
TS	0	0	0	0	1
TCS	1	0	0	0	1
UAP	0	0	0	0	1
ARI-Sindh	1	1	1	1	1
ARI-Gilgit	1	1	1	1	1
ARI-Quetta	1	1	1	1	1
AJK-MuzafarAbad	1	1	1	1	1
<b>Total</b>	<b>13</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>13</b>

The above equipment were dispatched after the signing of the SGA and partners were requested to send signed acknowledgment/receipt form and government institutions proof that the items are registered in the fixed asset book of the organization.

### **1.3.4.3. AIP maize working group (MWG) meeting**

The meeting was held from 8-9 April 2015 in Islamabad. A total of 47 participants attended this annual event that aims partners to share their annual progress regarding the AIP maize activities, lessons learnt and way forward. Participants diagnosed the major bottlenecks of the maize seed sector based on their working area. Below are the major points identified by stakeholders during the analysis of the maize seed value chain of Pakistan.

#### **Problems/Recommendations indicated by the AIP-MWG Participants**

- Lack of availability of temperate maize germplasm
- Provision of access to the public sector maize germplasm
- Enforcement of Plant Breeders Rights in the country.
- Ensuring plant breeders rights to enhance Research and Development in private sector
- Lack of flow of hybrid cultivars from public sector
- Public sector institutes should work on CIMMYT model of Material Transfer Agreement (MTA) and Standard Material Transfer Agreement (SMTA) to avail their hybrids/varieties to the private sector
- Breeding institutes should give a seed road map of commercialization at the time of variety approval
- The limit of 10kgs seed import for testing purpose should be increased
- Multinational companies should produce seed locally and there should be adequate law enforcement for violators.
- Federal Seed Certification & Registration Dept. needs to be strengthened. High penalties for those involving in the illegal seed business.

#### **In breeding and variety release**

- National Seed Council (NSC) should be activated and decisions should be made at national level for variety approval for different ecologies and provinces
- Variety Evaluation Committee (VEC) and National Seed Council NSC should have representations of private sector companies
- VEC and NSC should have representation from private sector crop experts for spot examination.

## **Suggestions for Establishment of Seed Company**

- At the time of registration the role/activities of seed companies should be identified either breeding or Marketing company or both.
- For companies who breed seed locally minimum one breeder must be necessary for each target crop
- There should be a notified calendar of activities for VEC for each crop
- Fixed schedule for company registration
- Interest free loans for professionals who want to establish a seed company
- Seed importing national and multinational companies should be given a time limit to start local seed production and ultimately stop importing
- Legislation for Interest free loans for development of processing facilities and infrastructure including proper storage and drying facilities.

## **Seed Marketing**

- Blackmailing by the farmers in case of any incidental loss in crop production and compensation should restrict to the price of seed
- Informal seed sector should be discouraged and banned (this is to mention those farmers/others who are selling seed by the cover of informal seed. This doesn't include the age old tradition of seed exchange among farmers)
- Un-registered companies, groups or individuals should be treated as per law on sale of seed

## **Problems identified for under developed areas (AJK, GB, Sindh, Balochistan).**

The under developed areas are characterized by

- Lack of resources (Capital, land and expertise, almost no mechanized farming.)
- Absence of research institution, no laboratories and field equipment
- Poor extension services
- Lack of market system, no intervention from private seed companies in those areas.
- Capacity building is utmost important for improvement in agriculture in these area.
- Adoptability trials should be conducted, area specific varieties should be introduced
- Farmer to farmer exchange of seed /technology should be promoted.

- There should be a sustainable local seed system for seed production, quality maintenance and dissemination of improved seed and production technology.
- Timely availability of seed at affordable prices.
- Promotion of maize production technology, using field days, seminars, print media, demonstration plots etc.



Figure 19 Maize farmer Muhammed Sadeeq Tahir inside AIP's biofortified maize demo plot in Rawala Kot, AJK

(Photo: Muhammad Ashraf, NARC)



Figure 20 AIP maize working group meeting April 8-9 2015, Islamabad



Figure 21 Handing over ceremony of equipment to representative of Gilgit Baltistan

#### 1.3.4.4. Participation in AIP annual conference

During the reporting period AIP-maize component displayed samples of introduced maize varieties to the participants of the AIP annual conference that was held from 24-25 August, 2015. During the maize session, the activities of AIP maize was shared to the more than 300 participants and the global trend on maize was briefed by the director of CIMMYT' global maize program who shared a recorded presentation. During the conference Federal Minister for Food Security and Research, H.E. Sikandar Hayat Khan Bosan, paid a visit to the AIP-maize stall. The minister who was accompanied by the USAID representatives appreciated the work being done by AIP maize.



Figure 22 H.E Mr. Sikandar Hayat Khan Bosan (middle), listening about the AIP-maize activities during the AIP annual conference



Figure 23 Presentation of the AIP maize activities to the audiences of the AIP annual conference

## 2. PERSONNEL/MANAGEMENT UPDATE

During the reporting period the mid-year performance assessment of two research associates was conducted. Annual work plan was reviewed and objectives and activities for the year 2015-16 has been set.

## 3. LESSONS LEARNED

The following are the major lesson learned during the reporting period:

- Slow response in signing the SGA from the public sector sub grantees which requires repeated follow up
- Importance of engaging food laboratories in monitoring the quality of biofortified maize varieties
- The importance of technical trainings on the various aspects of maize value chain

- The importance of seed laws and its enforcement so that partners can be encouraged for maize product development

#### **4. EXTERNAL FACTORS**

Getting visa for resource persons coming from outside of Pakistan becomes difficult which is causing repeated cancellation of scheduled trainings.

#### **5. RISKS**

Security risks particularly in Sindh and Balochistan

#### **6. CONTRIBUTIONS TO USAID GENDER OBJECTIVES**

AIP maize is evaluating Quality Protein Maize (QPM) germplasm and Provitamin A varieties which will help to reduce under five mortality rate and a good source of weaning food. AIP has introduced 24 new protein- and vitamin-enriched maize varieties to Pakistan, which will increase yield by 25 to 30 percent, and provide protein and micronutrients to improve nutrition of women and children to reduce rate of stunting which is among the worst in the world. The production and promotion of QPM in Pakistan will serve as a cheap source of Lysine for the poultry feed which will in turn help to reduce the cost of other sources of protein for the resource poor and disadvantaged communities.

#### **7. ENVIRONMENTAL COMPLIANCE**

Most of CIMMYT's maize germplasm are climate smart varieties which can best perform under stress environments. CIMMYT's germplasm which are tolerant to heat and water stress will benefit farmers in water scarce environments. In addition, CIMMYT materials which are under evaluation in Pakistan are developed through conventional breeding techniques, hence, they don't need additional inputs or extra environmental/biosafety care as compared to germplasms developed through non-conventional ways. The evaluation of maize tolerant to maize stem borer and low soil nitrogen stress have a positive impact on environment as it will reduce the use of chemical pesticides, nitrogen fertilizers.

## 8. COMMUNICATIONS

Under AIP maize due emphasis has been given to communicate the project activities to local and international stakeholders following the communication guidelines of USAID. The following mediums were utilized to communicate the AIP maize activities:

- AIP-newsletter
- CIMMYT's *Informa* ;1933:
- CIMMYT 's Informa: 1946
- Flickr: to share activities photos
- USAID's weekly News Bulletin (Washington office) (AIP maize news appeared during the week of 28 September 2015 news series)
- Participation in workshops, conferences and meetings

## Annexure -1

### Monthly/ Quarterly/ Semi Annual/ Annual Report

#### 1. Events Calendar for Meeting Held

S. No.	Meeting Name	Date	Purpose	Person Responsible	Venue	Partners	Brief Outcome
1	Maize aflatoxin meeting	07 April 2015	Project possibility discussions to protect the effect of Aflatoxin	Dr. AbduRahman Beshir	NARC/CSI committee room	AIP primary partners and stakeholders of the maize food industry	Agreed to develop concept note and project idea on aflatoxin and to call national workshop
2	AIP maize working group meeting	8-9 April 2015	Progress update on AIP maize activities	Maize improvement and Seed System specialist	Islamabad Hotel/Islamabad	AIP maize partners	Partners shared their progress and suggested recommendations and way forward
3	Meeting on outcome mapping	17 Apr 15	better reporting of project outcomes	Mr. Nazim Ali (USAID)	NARC/CSI committee room	AIP primary partners	Techniques on outcome mapping was shared
4	Meeting on Job grading	21 Apr 15	Discussions on how to standardize job grades	CIMMYT-HR	NARC/Islamabad	AIP cereal and cereal systems component leaders	Component leaders shared their opinion on the level of grades to their respective research associates
5	PARC maize variety evaluation Committee (VEC)meeting	23 April 15	To review variety registration applications	PARC	PARC committee room	VEC members	After the review of the applications, 11 varieties gets the approval of the VEC committee
6	Maize seed training in Kabul	24-27 April 15	To give maize breeding and seed production training	CIMMYT-Afghanistan	Agricultural Research Institute of Afghanistan Kabul	Maize stakeholders of Afghanistan	Training given to more than 54 participants
7	Maize CRP meeting	3-5 May 15	To discuss and develop flagship projects	CIMMYT-Nairobi	CRP maize	Colleagues from GMP and other programs of CIMMYT and IITA	Inputs given for the CRP flagship projects particularly for FP3 and FP4
8	Meeting with CIMMYT HQ team	11 May 15	To update progress on AIP components and meet CIMMYT Pakistan staff	Dr. Hans Braun and Dr. M. Imtiaz	NARC/CSI committee room	CIMMYT Pakistan staff	Project updates and HR and legal issues discussed
9	AIP primary partners meeting with Dr. Hans Braun	16 May 15	Progress update	Dr. Hans Braun	NARC/CSI committee room	AIP primary partners	Discussion on individual AIP components, problems and recommendations

10	CIMMYT Pakistan Management committee meeting	25 May 15	Discussion on management issues of the office	Dr. M. Imtiaz	CIMMYT Pakistan office	CIMMYT Pakistan management committee members	Management related issues and solutions discussed
11	Meeting with Dr. Abid Mehmood (Director General of Punjab Agri. Research)	27 May 15	To discuss maize research activities and SGA signing	Maize improvement and Seed System specialist	DG office of Ayub Agr. research	MMRI representatives	Delegation of directors of research center to sign on SGAs and progress update on AIP and HTMA maize activities
12	Discussion on HTMA field day organization	27 May 15	To finalize HTMA field day preparations	MMRI	Director office MMRI	MMRI representatives	Finalize field day organization of HTMA project
13	Field discussions with AIP maize partners	27-29 May 15	Field evaluation of trails	Maize improvement and Seed System specialist	Various seed company offices and fields around Sahiwal	AIP maize partners (ICI, JPL, MMRI, 4B, Zamindara seeds)	Field evaluation of trails and recommendations for improvement
14	CIMMYT Science week	11-18 June 15	Annual meetings	CIMMYT GMP and HQ	CIMMYT-Mexico	CIMMYT staff	Updates and way forward
15	AIP conference organizers meeting	01 July 15	To discuss how to organize the annual AIP conference	Dr. Imtiaz Muhammad	CIMMYT Pakistan office	Component leads and organizing members	Discussions on the number of pax and other updates
16	Meeting with NARC maize team	11 August 15	Discussion on the demonstration of NARC2703	Maize improvement and Seed System specialist	CIMMYT Pakistan office	NARC maize team (Dr. Muzamil and Dr. Shafique)	To plan demo of NARC2703 more in April 2016
17	AIP conference	13 August 15	To update progress on the AIP annual conference	Dr. M. Imtiaz	NARC/CSI committee room	AIP primary partners	Progress update and activities shared
18	AIP annual conference	24-25 August 15	Annual project review	Dr. M. Imtiaz	Serena Hotel/Islamabad	About 350 national and international stakeholders	Project discussed and reviewed
19	Meeting with Martin Kropff (DG CIMMYT)	28 August 15	General staff meeting	Dr. Martin Kropff	NARC/CSI committee room	CIMMYT HQ delegation and CIMMYT-Pakistan staff	General discussions on technical, non-technical and strategic issues
20	Meeting on Aflatoxin	31 August 15	Discussion to further the idea of aflatoxin mitigation initiatives in Pakistan	Maize improvement and Seed System specialist	CIMMYT-Pakistan	Nazim Ali (USAID) and Dr. M. Imtiaz	To develop a concept note and to held national workshop on the issue
21	Supervisory training	7-8 Sep 2015	How to manage staff working under once supervision	Sergio Ferreira	CIMMYT-Pakistan	Supervisors of CIMMYT-Pakistan office	Training on management skills discussed in depth
22	Meeting with CCRI and ARI Balochistan directors	10 Sep 2015	To discuss AIP maize updates	Maize improvement and Seed System specialist	CIMMYT Pakistan office	Dr. Jan Masood, Director CCRI and Dr. Asmatullah Taran Director ARI-Quetta	Discussion on SGA with CCRI and on demo plots with ARI Quetta

## 2. Meetings Planned for Next month, Semi-Annual Period

S. No	Meeting Name	Date	Purpose	Person Responsible	Venue	Partners	Expected Outcome
1	Training on QPM/biofortified maize	3-5 Nov 2015	Capacity building	AIP maize	Islamabad	AIP maize partners	Capacity of NARS will be developed in relation to maize breeding and seed production
2	Training on breeding program management and analysis	Mid Nov 15	Capacity building	AIP-maize	Islamabad	AIP maize partners	Capacity of NARS will be developed in relation to maize trials management
3	Maize training on biotic stress tolerant	First week of Dec 2015	Capacity building	AIP-maize	Islamabad	AIP maize partners	Capacity of NARS will be enhanced
4	Maize seed business management	End of January 2016	Capacity building	AIP-maize	Islamabad	AIP maize partners	Capacity of NARS and seed companies will be enhanced
5	AIP MWG meeting	First week of Feb 2016	Annual review	AIP maize	Islamabad	AIP maize partners	Progress update

### 3. International Travel

S. No.	Name	Date	Place/destination	Purpose	Brief Outcome
1	Maize seed training	24-27 April 2015	Afghanistan Agricultural Research Institute (Kabul)	To give training	More than 50 participants attended the training
2	CRP meeting	3-5 May 2015	Nairobi-Kenya	Experience sharing and discussion on CRP flagship projects	Develop strategies on CRP special projects on maize
3	Visa travel to Turkey	30 <sup>th</sup> May till 3 <sup>rd</sup> June 2015	Turkey	Visa process for Mexico	Visa granted
4	CIMMYT science week	11-18 June 2015	Mexico	Institutional meeting	Shared objectives and working instructions

### 4. Field days, exhibitions and fairs attended

S. No.	Name	Date	Place	Purpose	Brief Outcome
1	Maize training and field day in Balochistan	18 May 2015	Balochistan Quetta	AIP maize activities brief and training	More than 30 Participants got training
2	PARC/CIMMYT maize travelling seminar	15-17 June 2015	Faisalabad, Chiniot, Lahore, Sahiwal, Dipalpur and Arifwala	Field evaluation of AIP maize trails across Punjab	AIP maize partners able to get firsthand information on the performance of AIP maize varieties and hybrids
3	AIP conference	24-25 August 2015	Islamabad	Display of introduced maize varieties under AIP	Maize stall visited by conference participants and dignitaries