Agricultural Innovation Program for Pakistan (AIP)

Semi-Annual Report

October 2017- March 2018

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1 Disclaimer

The authors' views expressed in this publication do not necessarily reflect the views of the United States Agency for International Development or the United States Government.

2 Acronyms

AIP	Agricultural Innovation Program
AJ&K	Azad Jammu And Kashmir
AR	Adaptive Research
AR4D	Agricilture Research for Development
ARI	Agriculture Research Institute
ARS	Agriculture Research station
AZRI	Arid Zone Research Institute
BARDC	Baluchistan Agriculture Research Development Center
BARI	Barani Agricultural Research Institute
BISA	Borloug Inistiture for Sout Asia
BRSP	Balochistan Rural Support Program
CA	Conservation Agriculture
CCRI	Cereal Crops Research Institute
CDRI	Crop Disease Research Institute
CDRI	Crop Disease Research Institute
CGIAR	Cumulative Group of International Agricultural Research
CIIT	COMSATS Institute of Information Technology
CGS	Competitive Grants System
CIIT	COMSATS Institute of Information Technology
CIMMYT	International Maize and Wheat Improvement Center
CSD	Canteen Stores Department (Pak Army)
D.I.Khan	Dera Ismail Khan
DAR	Directorate of Agriculture
DG	Director General
DH	Doubled Haploid
DSR	Direct Seeding of Rice
DVC	Dairy Value Chain
FATA	Federally Administrated Tribal Region
FQ&SRI	Food quality & Safety Research Institute
FR	Frontier Region
FSD	Faisalabad
GB	Gilgit Baltistan
GOP	Government of Pakistan
Ha	Hector
HRD	Human Resourses Development
HTMA	Heat Stress Tolerance Maize for Asia
HYT	Heat Yield Trials
HQ	Head Quaerter
HEC	Higher Education Commission
ICARDA	International Center for Agricultural Research in the Dry Areas
ICI	Imperial Chemical Industries
ICT	Informational Communication Technology
IITA	International Institute of Tropical Agriculture
ILRI	The International Livestock Research Institute
IPMP	Insect Pest Management Program

IRRI	International Rice Research Institute
IRS	Internationally Recruited Staff
JPL	Jullundur Pvt. Ltd
Kg	Kilogram
KP	Khyber Pakhtunkhwa
KPWYT	Khyber Pakhtoonkhaw Wheat Yield Trial
KSK	Kala Shah Kaku
KWC	Khawateen Welfare Council
L&DDD	Livestock & Dairy Development Department
LCC	Leaf Color Chart
LDRC	Livestock Development Research Centre
LR	Leaf Rust
MC	Multi-Crop
MFSC	Model Farm Services Center
MMRI	Maize And Millet Research Institute
MNFSR	Ministry of National food & Security
MSF	Mission Strategic Framework
NARC	National Agriculture Research Center
NARS	National Agricultural Research Scientist
NDVI	Normalized Difference Vegetative Index
NE	Nutrient Expert
NGO	Non-Government Organization
NIA	Nuclear Institute of of Agriculture
NIBGE	National Institute for Biotechnology and Genetic Engineering
NIFA	Nuclear Institue for Food & Agriculture
NRS	National Recruited Staff
NRSP	National Rural Support Program
NSTHRI	National Sugar and Tropical Horticulture Research Institute
NUYT	National Uniformity Yield Trial
P.D. Khan	Pind Dadan Khan
PARC	Pakistan Agricultural Research Council
PARP	A medium in NIAB Gohar/Johar Section) ???
PASSCO	Pakistan Agricultursl Storaage & Services Cooperation
pH	Present Hydrogen
PLD	Punjab Livestock Department
PPP	Public Private Partnership
PPR	Peste des Petits Ruminants
PSC	Punjab Seed Cooperation
PUWYT	Punjab Uniformity Wheat Yield Trial
PVA	Pro-Vitaman A
PVS	Participatory Variety Selection
QAARI	Quaid-E-Awam Agriculture Research Institute
QPM	Quality Protien Maize
R&D	Research and Development
RA	Research Associate
RARI	Regional Agriculture Research Center
RMP	Rafhan Maize Products

RPL	Rice Partners Limited
RRI	Rice & Research Institute
RSP	Rural Support Program
RA	Reaserch Associate
SABWGPYT	South Asian Bread Wheat Genomic Predeiction Yield Trials
SEP	Socio-Economic Program
SPU	Semen Production Unit
SSNM	Sight Specific Nutrient Management
t/Ha	Tons per Hector
TASP	Tropical Animal Science and Production
TCS	Tara Crop Sciences
UAF	University Of Agriculture, Faisalabad
UAP	University of Agriculture Peshawar
UC	Union Council
UC Davis	University of California, Davis
UOS	University of Swabi
USAID	U.S. Agency for International Development
UVAS	University of Veterinary & Animal Sciences
VRI	Vegetable Research Institute
WRI	Wheat Research Institute
YR	Yellow Rust
ZT	Zero Tillage
ZTHS	Zero Tillage Happy Seeder

3 Summary

Agricultural Innovation Program for Pakistan (AIP) accomplished the set targets for the reporting period. The project has focused on the innovations in the agriculture sector through new seed varieties, new technologies (mechanization, irrigation systems), and value chain development (durum wheat, rice, and livestock).

AIP continued and strengthened its partnerships with PARC and partners in public, private sectors, farmer associations, Nongovernmental Organizations (NGOs), research institutes, and other stakeholders to effectively achieve its goals. AIP Wheat benefitted 2431 small holder farmers with quality wheat seeds of new wheat varieties. A total of 18 new rust resistant and high yielding varieties were disseminated to maximize wheat diversity and choices for the farmers. Of the total seed beneficiaries 21 percent were women farmers benefitted from new wheat varieties and production technology. Under public private partnership and village based seed production 318 ha was planted with disease resistant and high yielding wheat varieties in all provinces, which can produce enough seed to cover about 8586 ha seed neglected areas in the coming wheat season. To introduce quality concept in the wheat production, 25 commercially grown wheat varieties were analyzed for protein content, dough attributes, and baking properties which providing opportunity to categorize wheats into different market classes. AIP-Wheat conducted 18 capacity building events all over Pakistan in which 880 farmers participated. These farmers were trained on modern wheat production technologies and management practices.

The multi-location evaluations of diverse maize products including 222 white kernel maize hybrids were conducted at various AIP partners' sites and the data from 19 locations (sets) were collected. The University of Agriculture, Faisalabad (UAF) was engaged in the seed multiplication of three provitamin A enriched hybrids. The university was able to produce more than 250 kg of seeds of parental lines and hybrids that will help to distribute the hybrids to farmers and to provide enough seed for variety evaluation and registration. In addition, eight AIP public and private partners including UAF were able to produce 3.1 tons of various parental lines and breeder seeds of maize products allocated under AIP previously. The project also supported three public sector partners to produce 27 tons of maize seeds of locally developed hybrids and OPVs. AIP also conducted its annual maize working group meeting and discussed the major challenges and opportunities in relation to Pakistan's maize sector. Furthermore, AIP supported three Pakistani scientists to participate in the international cereal conference held in Mexico and engaged 173 participants in farmers' field days.

AIP agronomy component partnership continued with 23 national partners in the agriculture research, extension and private sector. This partnership helped to reach 4078 farmers through assisted application of improved techniques on 747 sites, provision of 11 Zero till Happy seeders, training of 377 stakeholders and dissemination of improved techniques through field days to 2943 farmers in the project area. More than 489 farmers were supported for zero tillage wheat, Ridge planting of wheat and LASER land levelling on their farms that helped in saving irrigation water, reducing cultivation cost and improving 10-15% yield. Sharif Engineering Pvt. provided 11 ZTHS to farmers on cost sharing basis that were used for planting of wheat in heavy rice residue. National partners assisted farmers on use of ZTHS and bed planter on 133 farms. Zero till happy seeder helped farmers in planting wheat in combine harvested rice residue without burning of residue and get 0.2 t/ha better wheat grain yield in comparison with farmer practice of broadcasting after residue burning and heavy tillage. AIP also facilitated 125 farmers on precision N management in wheat with green seeker and results showed that farmer saved 34 Kg N/ ha without yield reduction in comparison with farmer practice.

AIP Rice conducted demonstrations on Resource Conservation Techniques (RCTs) like alternate wetting & drying, optimum plant population (200 acre), dry-seeded rice (DSR) with drill, and drum seeder. The

average data of 50 supervised sites/ plots were harvested and result showed that new varieties and RCTs had yield increment of 25-30% over conventional varieties and technologies. Only DSR planted plots showed 10-12% yield increase over conventional planting and on an average PKR. 15,000 to 20,000 per ha monitory benefit was gained with DSR systems of rice establishment.

AIP, Socioeconomics component completed studied on the economic effect of maize germplasm investment in Pakistan; findings showed that maize seed prices are expected to decrease by 2-3 US$ per kg due to local hybrid seed production, saving the foreign exchange and leading to wider adaptability of maize hybrids especially by small farmers. The component also studied wheat value chain in Pakistan with the objective to identify incentives, bottlenecks, constraints and key roles of all actors involved in wheat value chain. It was found that various stakeholders are not properly linked in the bread wheat value chain in Pakistan.

AIP, Livestock monitored the performance of the genetically proven breeding bucks provided in May 2017 to 30 small ruminant herders belonging to the Khawateen Welfare Council Bahawalpur. On an average, each buck has served 72 does, and the highest number of does served by one of the buck was 220. The spin off from providing 30 bucks was that 675 goat rearing farmers from 88 villages have benefited from the distributed bucks. AIP Livestock trained 255 women on animal health and disease prevention in three tehsils of Bahawalpur district. AIP-livestock has conducted a series of farmer awareness and training program on balanced animal feeding through user friendly feeding charts in collaboration with FATA L&DD Secretariat. In addition specialized food grade water troughs and milk-in cans were also distributed among 392 farmers from Bajawar, Mohmand, Khyber and FR agencies to ensure hygienic milk production.

Under the AIP-PARC competitive grant, based on provincial agriculture research priorities 40 grants were awarded to researchers/scientists in the provinces to address productivity constraints in the key sector i.e. livestock, fruits, vegetables, and cereals. This report captured the progress made so far since the award of these grants in October 2017.

AIP-M&E collected data on MSF outcome indicators on quarterly basis and reported to USAID on PakInfo. AIP actively worked in a collaborative manner and reached 10,650 farmers including 852 women farmers during the reporting period.

4 Background

The 'Agricultural Innovation Program for Pakistan' (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), livestock and horticulture (fruits 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 the emergence of a dynamic, responsive and competitive system of science and innovation that is 'owned' by Pakistan and will catalyze equitable growth in agricultural production, productivity and value. AIP is rooted in the principles of 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: commissioned projects, a competitive grants system and human resource development (HRD). Work within these activity windows addresses complex agricultural systems which 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 smallholder 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. International partners (the International Livestock Research Institute, or ILRI and the International Rice Research Institute, or IRRI) lead on commissioned projects in livestock, 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."

5 Maize

5.1 Major activities/events in relation to commissioned projects

5.1.1 Development/ introduction of climate resilient maize

During the reporting period the following climate resilient maize trials were conducted and data were collected from the testing sites:

- A total of **222 white kernel** climate resilient maize hybrids sourced from CIMMYT Mexico and Zimbabwe were introduced and evaluated in the country.
- In Kharif 2017, trials were grouped into late maturing, intermediate maturing and extra early maturing white hybrids under 19 sets which were evaluated and harvested in the different trial sites located in all provinces and territories of Pakistan (see below table 1).

Table 1: Summary of climate resilient maize trials conducted during Kharif 2017

No	Trials Name/Code	Trials Description	No. of entries	No. of reps	No. of Sets	Remarks/Seed source
1	16TTWCWN	Tropical Three Way Cross white kernel hybrids	36	3	2	CIMMYT-Mexico
2	16TLXTWN	Tropical single Cross white kernel hybrids	36	3	2	CIMMYT-Mexico
3	LHYB17	Late maturing white hybrids.	50	3	6	CIMMYT-Zimbabwe
4	IHYB17	Intermediate maturing white hybrids.	50	3	5	CIMMYT-Zimbabwe
5	EHYB17	Early/extra early maturing white hybrids	50	3	4	CIMMYT-Zimbabwe

5.1.2 Development or introduction of biofortified maize Pro-vitamin A enriched hybrid maize in Pakistan

To combat vitamin A deficiency, AIP introduced provitamin A biofortified maize genotypes in Pakistan. AIP seed company partners evaluated and identified high yielding and well adapted maize hybrids for bulk seed production. AIP allocated **three** (HP1097-2, HP1097-11, HP1097-18) promising provitamin A biofortified maize hybrids to University of Agriculture Faisalabad (UAF). Pakistan is first country in South Asia to receive these provitamin A biofortified maize hybrids. These allocated biofortified maize hybrids are not only enriched in provitamin A contents but these are capable of yielding up to 12 t ha^{-1} as these were evaluated across diversified locations in Pakistan. UAF has increased more than 250 kg of parental seed and hybrid seed of these allocated products which is further subjected to multi-location evaluation across different locations and national uniformity maize yield trials to fulfill the prerequisites for approval and registration of these hybrids in the country.

PVA hybrid seed increasing field at UAF

5.1.3 Annual Maize Working Group Meeting

AIP-Maize component organized its annual maize working group meeting on February, 27 -28, 2018 in Islamabad. A total of 42 participants from public and private maize stakeholders and value chain actors attended the meeting. While opening the meeting, Dr. Yusuf Zafar, Chairman-Pakistan Agricultural Research Council (PARC), appreciated the maize innovations and interventions under AIP and urged the stakeholders to get maximum benefits from the program. He emphasized the importance of availability, affordability and accessibility of high yielding and improved seed to maize farmers to increase productivity, which is currently around six million tons. He thanked USAID for the financial support and appreciated CIMMYT for catalyzing maize products testing and deployment drive in Pakistan. During the meeting AIP partners shared their progress and discussed constraints and opportunities across the maize seed value chain.

Participants of AIP annual maize working meeting

5.2 Introduction of Doubled Haploid Technology in Pakistan

Double haploid seed handed over to UAF

AIP assists the partners to accelerate the maize breeding through induction of Double Haploid (DH) technology, which is the first ever coordinated initiative in Pakistan. MMRI-Yousafwala and UAF received seeds of CIMMYT's developed tropically adapted second generation **haploid inducer lines**, which is useful for the development of large number of maize inbred lines in very short breeding cycle. Conventional methods require 6-8 generations (years), while the DH technique significantly shortens this period to 2-3 generations (years). DH technology also saves millions of Rupees that would have spent in developing maize products by national programs. In July 2017, AIP supported five Pakistani scientists (also including from UAF and MMRI) to participate in a **two weeks international** training program aimed to effectively utilize the DH innovation in Pakistan.

5.3 Development or introduction of biotic stress tolerant maize

5.3.1 Status of maize stem borer mass rearing and screening facility

CIMMYT under AIP supported the establishment of national maize stem borer screening facility at

NARC. The objective of the facility is to help identify maize germplasm tolerant to stem borer attack. The lab is currently screening maize germplasms sourced from IITA and national uniformity yield trials (NUYT) with 120 entries sourced from cereal coordinator at PARC. The lab is currently in leading role to identify stem borer resistant germplasm from NUYT trials. NARC requested the allocation of stem borer resistant germplasm (Ama TZBR-Y, TZBR Com 1- YC2 and TZBR Com 2-WC1) based on the field evaluation of germplasm sourced from IITA, sister CG center of CIMMYT.

5.3.2 Promotion of hermetic storage technologies (metal silo) to reduce post-harvest losses, to avoid aflatoxin contamination and to retain the quality of provitamin A biofortified maize

Traditional storage practices in developing countries cannot guarantee protection against major storage pests of staple food crops like maize, leading to 20-30 percent grain losses, particularly due to post-harvest insect pests and grain pathogens. Apart from causing quantitative losses, pests in stored grain are also linked to aflatoxin contamination and poisoning. Mycotoxin contamination (especially aflatoxin and fumonisin) makes grain unsafe for food and animal feed, thus adversely impacting food and feed safety. Consumption of high doses of aflatoxin leads to aflatoxicosis that can result in acute illness and death. To address this problem, a metal silo was developed as a valid option and proven effective in protecting stored grains from attack by storage insect pests. CIMMYT and its partners have been promoting this technology particularly in Africa and recently introduced in Pakistan under AIP.

Training participants on metal silos at IPMP-NARC


Training on metal silos at NARC

In Pakistan aflatoxin contamination of maize is very common mainly due to poor drying and storage condition of maize. Farmers and consumers have little or no prior information about hermetic storage techniques. Hence, AIP is promoting the hermetic storage techniques in collaboration with NARC-Insect Pest Management Program (IPMP) through training of farmers on proper use of metal silos. National Rural Support Program (NRSP) showed interest in mass scale of metal silos and join the project under public private partnership. One day customized workshop was organized by AIP in collaboration with IPMP for nominated 15 farmers of NRSP from Punjab at NARC-Islamabad. Farmers were briefed in detail regarding the efficient use of metal bins and standard storage techniques. Similar trainings will also be organized during May and June 2018 for the local manufacturers to improve their skills for local manufacturing of these metal silos.

5.4 Enhancing the Maize Seed Sector

5.4.1 Seed micro increase for the newly introduced maize varieties

One of the major activities conducted was the start of seed micro increase of the parental lines/breeder seeds of the new maize hybrids and OPVs distributed to partners under AIP. A total of eight public and private AIP maize partners (ICI, TCS, JPL, NARC, MMRI, CCRI, UAF, ARI-AJK) have produced the below list of pre basic and parental seeds. (See table 2)

Table 2: Breeder seed and inbred lines produced under the AIP maize during Kharif 2017

OPV/Hybrid/Parent seeds	Amount of seed produced (Kg)
TP1219	100
TP1217	200
ZM 309	450
ZM401	100
CZP132011	200
CZP132001	600
TP1221	175
QPHM200	200
HP1097-2	87
HP1097-11	64
HP1097-18	49
Various parental seeds	950
Total seed produced	3175

These seeds will be utilized for demonstration, further seed multiplication and hybrid formation. In addition, AIP, Maize also assisted in demonstration and popularization of locally produced certified seed varieties to the farmers. AIP supported three public sector institutions viz NARC, MMRI and CCRI for the production of 26.6 tones seed of locally produced certified seed (Table 3).

Table 3: Summary of total maize seed produced & distributed by AIP partners during the reporting period

Partner name	Variety name	Amount of seed (Kg)	
		Produced	Distributed*
NARC	HN-Gold	12000	500
	Fakhar-e-NARC	2000	--
MMRI	YH1898	4050	4050
CCRI	Iqbal	850	--
	Azam	970	--
	Jalal	1940	--
	Pahari	1860	--
	Baber	3000	--
Total		**26670**	**9050**

*The distributed amount will increase

5.5 Requests for allocation of diversified maize germplasm

Recently AIP's public and private partners have submitted their requests after evaluation and identification of germplasm, for allocation of more than 80 maize genotypes genetically improved for provitamin A contents, Zinc level, essential amino acids (QPM), abiotic stress tolerance, disease and insect resistance. After verification on the performance data of the requested maize germplasm, AIP maize will forward the requests to CIMMT's Global Maize Program for product allocation.

Several other public and private partners other than UAF have also shown keen interest in the commercialization of provitamin A and Zinc enhanced maize products. The partners identified and requested the allocation of 20 biofortified maize products including two Kernel Zinc enriched, 12 PVA and six QPM hybrids. The seed production of the two QPM hybrids which were released earlier last year by NARC also continued during the reporting period. During the reporting period NARC was multiplying

the parental seeds as well as the hybrids and the amount of seed will be shared in the next semiannual report.

5.6 Capacity Building

5.6.1 Farmer Field Days in Gilgit Baltistan

The involvment of private seed companies in maize seed production and distribution is very low in Gilgit Baltistan. The problem with infrastructure and less use of hybrid seeds by farmers are among the major reasons for private sector not to invest in GB. However, Agricultural Extension Department is taking the charge of capacity building of the maize farmers as well as transfer of tools and technologies. Directorate of Agricultural Research, GB in collaboration with CIMMYT organized two farmer field days in district Gilgit and Chilas at harvesting of the CIMMYT derived genetically improved maize varieties.

Maize field day at GB

The farmer's field days were aimed to improve the crop management and harvesting skills and to minimize the post-harvest loss through proper drying and storage. The farmers were also briefed about the potential and advantages of genetically improved OPVs over the local maize varieties. More than 80 participants including farmers and field staff particiapted in these field days.

5.6.2 Seminar

A comprehensive seminar was delivered to 93 undergraduate students (32 females & 61 males) from University of Agriculture Faisalabad (UAF). The orientation was held at MMRI and students were briefed about the activities of AIP and technical areas and latest advances on maize were discussed with the students.

5.6.3 Capacity building of scientific community

Three Pakistani scientists from MMRI, NARC and CIMMYT-Sahiwal, participated in International Conference "4th Latin American Cereals Conference" in Mexico. The conference was held from 11-15 March 2017 and the participants were given a chance to visit the world class maize nutrition lab at CIMMYT HQ in El-Batan, Mexico; it was a good chance to make networking among the partners. World renowned scientists shared advances and scientific findings on cereal technology and how the

Orientation about AIP to UAF undergraduate students at MMRI

biofortification of staple crops can improve nutrition. The participants shared the activities of AIP during oral and poster presentations to the larger audience.

5.7 Public private partnership under AIP Maize

Currently AIP maize has 22 partners consisting of 12 private and 10 public institutions working on maize research for development in Pakistan. All these partners actively participated under the AIP's maize variety evaluation and validation network which includes sharing of performance data of different trials. In addition five private seed companies and two public research institutions extended their services to AJ&K, GB and Balochistan provinces as well as to the tribal areas through the partnership and linkages created under AIP.

6 Wheat

6.1 Increasing Wheat Production through Rapid Diffusion of new High Yielding and Rust Resistant Wheat Varieties

6.1.1 Validating performance of newly released wheat varieties through Farmers' own perspectives

The Participatory Varietal Selection (PVS) provides an initial test to determine if a crop variety is worth investing resources in before popularizing it and engaging in large-scale seed production. AIP-Wheat works through a network of public and private partners to ensure fast and free availability of newly released varieties to farmers.

During 2017-18 a total of 115 PVS trials were conducted involving 18 new high yielding, disease resistant wheat varieties in KP, Punjab, Sindh, Baluchistan and AJK provinces to validate their performances and farmers' preference locally. A total of 18 districts were covered with this intervention. Out of these 115 beneficiaries, three were females, two in Sindh and one in AJ&K (see Table 4).

Table 4. Detail of wheat varieties included in PVS trials and locations of trials

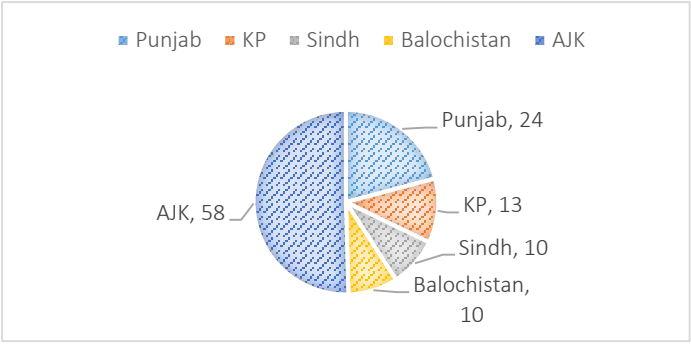
S.No	Variety	Developed by	Provinces of evaluation				
			KP	Punjab	Sindh	Baluchistan	AJ&K
1	Khaista-17	CCRI, KP	√				
2	Wadan-17	CCRI, KP	√				
3	Pasina-17	CCRI, KP	√				
4	Pakhtunkhwa-15	CCRI, KP	√				
5	Pirsabak-15	CCRI, KP	√				
6	NIFA-Aman	NIFA, KP	√				
7	NIFA Lalma	NIFA, KP				√	
8	Kohat-17	BARS, KP	√				
9	Zincol-16	NARC, Islamabad	√	√			√
10	Pakistan-13	NARC, Islamabad		√			√
11	Ujala-16	WRI, Faisalabad		√		√	
12	Gold-16	RARI, Bahawalpur		√			
13	Ehsan-16	BARI, Chakwal		√			√
14	Dharabi-11	BARI, Chakwal		√			√
15	Umeed-16	ARI, Quetta				√	

16	Benazir-13	WRI, Sakarand			√	√	
17	NIA Sarang	NIA, Tandojam			√		
18	Sindho	WRI, Sakarand			√		

PVS trial in Baluchistan in collaboration with ARI, Quetta

PVS trial in Chakwal in collaboration with NRSP

These varieties were also used in other AIP-Wheat interventions like demo plots and seed production. It is interesting to mention that varietal diversity in AJ&K is less and in the same way the average yield which is 1.7 tons per ha. Through these PVS trials farmers will have more options to select better varieties according to their preferences. These new wheat varieties would prove instrumental in increasing wheat productivity and thus providing financial benefits to the farmers.



Number of PVS trials in each province

6.1.2 Rapid deployment of new genetic gains to farmers fields through Demo plots

In Pakistan a wheat variety usually perishes soon before it reaches to maximum farmers, due to farmers' unawareness and weak agricultural extension services. On the other hand farmers stick to plant old varieties over the years. A continuous flow of improved and competitive crop varieties produced by breeding programs is a prerequisite for the replacement of old and obsolete varieties to ultimately improve crop productivity and address the overall challenge of food security and climate change. AIP-Wheat aimed to address both issues through demo plots through a network of public and private partners

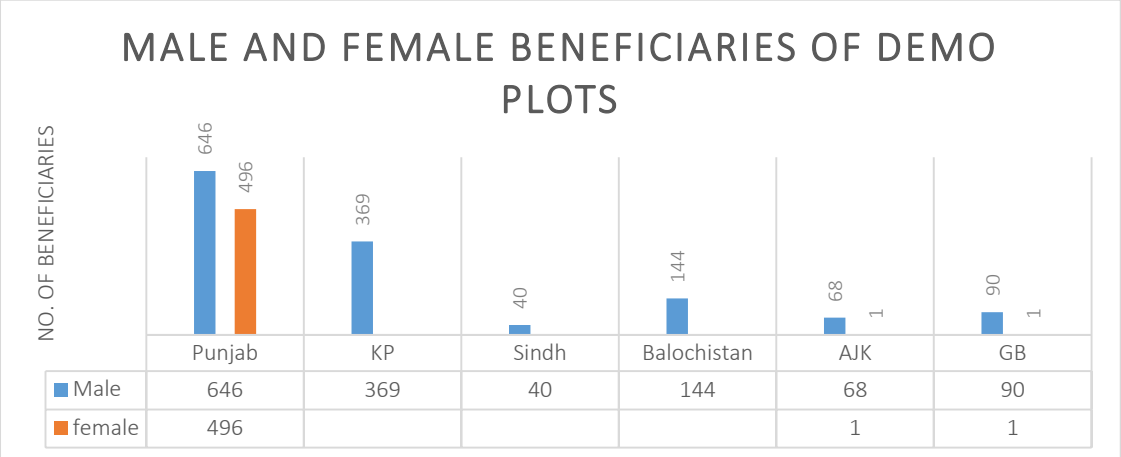
AIP Wheat distributed 21.3 tons quality wheat seed of new disease resistant and high yielding varieties among 1855 farmers including 496 (26.7%) female of 42 districts in all provinces. This can cover 2130 ha area, and considering 2.7 t/ha average wheat yield of Pakistan, it would produce about 5751 tons seed for the coming season.

At the harvest in the coming months May-June, yield data will be collected from these plots, which will further demonstrate the percent yield advantage of these new varieties over local ones.

6.1.3 Provision and Production of seeds of recently released wheat varieties

In many areas of Pakistan farmers especially small holders don't have easy and maximum access to quality wheat seeds, is one of the reasons for the yield gap. Increasing access to seeds of new wheat varieties through village based growers/system and private seed companies are the major objectives of AIP for enhancing average yield of small holders. From November 2017 to January, 2018, 450 seed growers including 11 women, planted seed of new high yielding, rust resistant wheat varieties covering about 49 districts all over Pakistan. A total of 20.5 tons quality wheat seed was distributed in these

village based seed production interventions, which covered about 205.5 ha area. The expectation is that, this could produce about 550 tons seed, which would be enough to plant 5000 ha in the neighborhood areas during coming wheat season. A total of 321 seed growers are the part of seed groups that were established under AIP for village based seed production and marketing. Majority of these activities were focused in far-flung areas such as P.D Khan, Bannu, Chitral, Shangla, remote areas of Balochistan that is Pashin, Lorali, Umerkot in Sindh Province. The concept of decentralized seed production means farmers have easy and nearer access to seeds locally because seeds are produced in every village and marketed in the same village.



AIP has also strengthened wheat seed supply - seed production and marketing as it helped the Private seed companies to have access to tons of seed produced at the public institutes which was not the case before AIP intervention. This enabled private sector companies to produce and market 50 percent more seed.

Miankhail Seed Company from KP province and Kashmala Seed Company from Baluchistan province were major beneficiaries of Public Private Partnership (PPP) intervention. This year from November to January a total of 11.3 tons seed was planted under PPP, which will produce quality seed for coming season.

Village based seed production of Dharabi-11 in P.D khan


Seed production plot of Pirsabk-15 in Lakki Marwat

Table 5: Summary of provinces covered in seed production during 2017-18

Province	No. districts covered	Seed distributed (tons)	Male beneficiaries	Female beneficiaries	area under seed production (ha)
Punjab	17	8.35	128	6	83.5
KP	1	0.5	10	0	5
Sindh	13	4.99	96	5	50
Baluchistan	15	4.95	99	0	49.4
AJK	3	1.76	84	0	17.6
Total	**49**	**20.55**	**450**	**11**	**205.5**

6.1.4 Effective Fungicides Introduced, Evaluated and Registered for Controlling Wheat Rusts

6.1.5 Yield loss Assessment of wheat due to rust disease using fungicides

From November 2017 to January 2018, a total of 15 fungicides demonstration trials were conducted, five in KP and 10 in Punjab for yellow and Leaf rust diseases respectively. Two most efficacious fungicides Nativo and Tilt were used in these demo plots. One acre plot of the farmers, five farmers from KP and 10 farmers from Punjab province were divided into three equal portions and two of which were sprayed with Nativo and Tilt while third plot was maintained as unsprayed control. For stem rust a replicated triall was also repeated in Sindh province. Results of these demonstrations is being finalize to indicate the efficacy of these fungicide against each rust and followed by subsequent recommendations for the farmers in case of any epidemic.

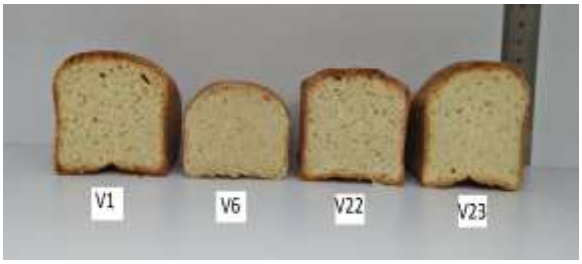
6.2 Development of durum wheat value chain

6.2.1 Durum Wheat National Uniform Yield Trial (DWNUYT) and New Durum Elite lines from CIMMYT

Twenty new durum wheat lines were introduced to broaden genetic diversity of current Durum wheat germplasm in the country. These lines were planted at research farms of CCRI-KP, NARC-Islamabad, NIFA-KP, WRI-Faisalabad, WRI-Sakrand, BARI-Chakwal, NIA-Tandojam, ARI-Quetta and BARDC-Quetta. This year CCRI and WRI-FSD have submitted proposals for release of their durum wheat upcoming varieties. The release of these varieties will contribute to the production component in the durum value chain and can be promoted for making quality Pasta products

6.3 Classification of Pakistani wheat varieties for value added food products

The rapid shift in eating habits of the consumers, give about 20% rise in the fast food business, however there is huge gape of the suitability of Pakistan wheat for these products. Therefore, AIP-Wheat in collaboration with Food Quality & Safety Research Institute (FQ&SRI), Karachi and WRI-Faisalabad analyzed 25 wheat varieties for their quality characteristics (including physicochemical properties, dough attributes and baking properties) and also categorized them into different classes. The purposes of this was initiate efforts for the identification of suitable Pakistani wheat for different foods products.



Different products from selected varieties were cooked in the lab and their physiochemical properties and taste was tested. Although the sample varieties had a narrow range of gluten contents, most of them were found suitable for traditional flat breads (like Chapatti, roti, tandoori naan), pizza base, and cookies (detailed report available). AIP is planning to organize national level workshop in September 2018 where key stallholder from food industry and wheat research will participate. This event aimed to bring researches and industry personnel together and design Industry driven breeding strategies for wheat grain quality and other value chain development aspects.

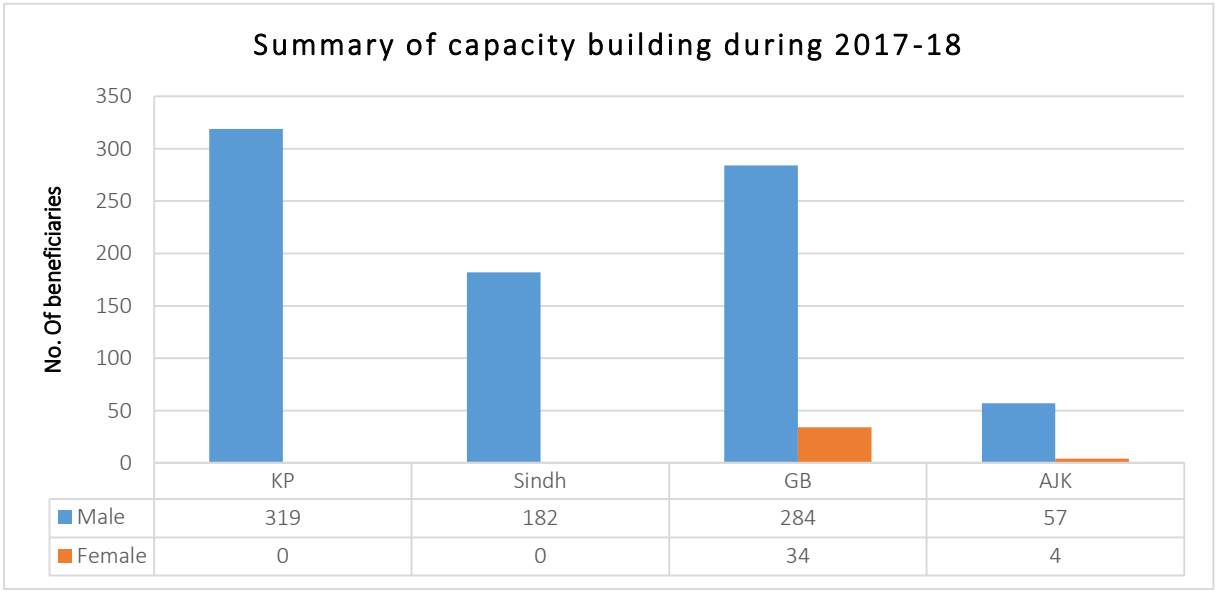
6.4 Capacity building Training

A total of 18 events including training and field days were conducted during 2017-18 in 15 districts across four provinces (KP, Sindh, GB and AJ&K). A total of 880 participants, including 38 women, from different domains attended these events. Participants included farmers, wheat breeders, Agricultural extension staff, NGO staff were trained on various on-farm research, demonstrations and wheat production technologies. During the field visits farmers acknowledged the better and disease free crop

Farmers' field day in Sindh in collaboration with AZRI-Umarkot

Training of Seed Producers in Gilgit in coordination with AKRSP

stand of AIP promoted wheat varieties over old and local varieties. These events were helpful for farmers in understating selection of suitable varieties, related agronomic practices and steps for quality seed production. At least 10 more events will be organized in parts of Punjab and Baluchistan provinces accordingly.



Graph Summary of capacity building activities during October to March 2018

6.5 Developing heat resilient wheat Lines/Varieties

As part of AIP efforts to combine heat stress with rust resistance, and identify desirable entries for heat stress, the South Asian Bread Wheat Genomic Prediction Yield Trials (SABWGPYT, 10 trials with 60 entries/trial) planted at Wheat Research Institute Faisalabad during 2017-18 under normal and late planting conditions. Normal sowing was done in last week of November 2017 while late sowing was done in 1st week of January 2018. Data on germination, rust (LR and YR), NDVI, CT and lodging were completed and yield data and final selection of desirable entries will be done in next quarter after completion of yield data analyses. Along this, the previously selected 63 lines (from SABWGPYT 2016-17) as HYT-65 and 27 lines (from HYT-55 being selected from SABWGPYT 2015-16) as HYT-30 were also planted under normal and late sowings. The HYT-65 is planted at Faisalabad and seven other partner institutes (CCRI-KP, Uni. of Swabi-KP, BARI-CWL, BARDC-Q, ARI-Tarnab, ARI-Swabi, RRI-KSK) for further evaluation and selection under heat stress (late planting). The HYT-30 (including 27 lines and 3 checks) were planted at the following partner institutes; Uni. Of Swabi KP, BARDC-Q, ARI-Tarnab KP, ARS-Swabi, NIA-TJ and WRI- FSD. Other partners also did selection based on their specific objective and environment from heat trials being shared previously. For instance selection from HYT-55 for 2017-18 season by partners include; CCRI-KP (n=34), AZRI-Bhakkar (n=15), BARI-CWL (n=6) and RRI-KSK (n=8). Currently we advance 5 lines to NUWYT and 10 lines to provincial yield trials for evaluation across the country and release as new variety. Complete list of advanced lines in provincial and national level yield trials 2017-18 is provided in **Annex 21.1**

6.6 Competitive Grant System Wheat:

6.6.1 Competitive Grant project on Natural Variation for Grain Nutrient Concentration, Proteins and Dietary Fiber of Different Wheat Varieties under Different Agro-Ecological Regions of Sindh implemented by Sindh Agriculture University Tandojam.

Appropriate mineral availability is essential for all biological system like: plants, animals and human beings to complete their biochemical, physiological and development. Cereals are an important source of micronutrient minerals for animal and humans, it is estimated that over one billion people are suffering from micronutrient malnutrition worldwide especially children and women. Among developing countries; Pakistan has one of the highest levels of malnutrition, reports say malnutrition leaves children more vulnerable to disease, stunts their mental and physical development.

Through this project wide genetic diversity will be find out among wheat varieties for all grain nutrients. Along with, multi-location and multi-year evaluation of wheat varieties will help to identify superior and stable variety. The results open the possibility of designing a specific breeding program for improving the nutritional value of wheat through the identification of parental lines with high minerals concentration in whole grains.

Under the project different areas of Sindh province were visited to select the suitable location for conducting experiment. The selection was done on the basis of geographical, climatically, soil and infrastructure conditions. The Experimental Farm of Agronomy Department of Sindh Agriculture University, Tandojam, Thatta and Sakrand was selected for conducting research experiment. For conducting research experiment, in the month of November 2017, seed of 57 wheat varieties were collected from different research

Wheat varietal fields

institutes of Pakistan including National Agriculture Research Center (NARC), Islamabad, Nuclear Institute of Agriculture (NIA), Tandojam, Wheat Research Institute (WRI), Sakrand and local progressive growers. Collected Seed from different research institutes will provides wide variation for nutrients availability and seed will be multiplied for sowing in a coming season. Fifteen peoples along with students participated in the activities.

7 Rice

Under AIP project, IRRI in collaboration with national partners have undertaken the following project activities:

7.1 Breeding Program for Improved *Indica* and Basmati Rice

7.1.1 New Generation of High-Yielding, Stress-Tolerant, High-Quality Basmati Varieties activities at IRRI Head Quarter, Philippines

7.1.2 Assessment of resistance response pattern of 25 BLB resistant Basmati advanced lines against diagnostic strains of *Xanthomonas oryzae* pv. *oryzae* (*Xoo*)

The backcrossing work mentioned in the previous semiannual was continued by NIBGE at IRRI to introgress *xa13* and natural SWEET gene mutations into Super Basmati, IRBB60, Bina Dhan10 and Samba Mahsuri, also aimed at rapid improvement of recurrent parent genome. The F1 plants were grown at IRRI and after foreground survey, plants were selected for developing BC1F1 population to improve genome of recurrent parents. For second backcrossing (BC2F1), the crosses with background of Super Basmati and Bina Dhan10 were selected. Crosses were made during DS2018 at flowering stage, and BC1F1 plants were used as pollen source for development of BC2F1 population.

7.1.3 New Generation of High-Yielding, Stress-Tolerant, High-Quality Basmati Varieties activities at AIP partners' Institutions in Pakistan

Breeding Program for Improved *Indica* and Basmati Rice at Rice Research Institute (RRI), Kala Shah Kaku

A total of 187 lines were selected out of 824 IRRI lines evaluated at Rice Research Institute (RRI), Kala Shah Kaku against biotic bacterial leaf blight (BLB) and abiotic (flood/submergence, drought, salinity and heat) stresses tolerance, yield potential and grain quality. Of the selected lines, 101 were high yielding elite, **53** were Super Basmati bacterial leaf blight (**BLB**) resistant, **23** were tolerant to **drought** and **salinity**, and 10 lines were of IR-6 Sub1 for **submergence tolerance**. These lines were used to develop 42 new fresh crosses during 2016 for BLB resistance and submergence and salinity tolerance, and high yield at RRI-KSK.

IRRI germplasm planted at RRI, Kala Shah Kaku, Lahore, Punjab

Breeding Program for Improved *Indica* and Basmati Rice at Emkay Seeds (Pvt) Ltd Sheikhupura

AIP introduced germplasm from IRRI was also planted at Emkay Seeds Pvt. Ltd, Farooqabad for evaluation, variety selection and using in developing new varieties. **Zinc-enriched** variety was also identified by Engro Fertilizer.

No seed setting occurred in Zinc fortified crosses while seed setting in rest of 23 crosses was good. F1 plants of 23 single crosses were grown in the growth chamber and planted in the field at the end of July, which were back crossed with good Basmati varieties/ lines. F0 seed of 36 three-way crosses have been harvested to grow F1 plants during winter season 2017-2018. Zinc fortified line was again crossed with Basmati varieties and following three crosses were made:

i. Zinc fortified X P.Basmati.34
ii. Zinc fortified X MB.878
iii. Zinc fortified X Pussa.1509

Breeding Program for Improved *Indica* and Basmati Rice at Screening of Bacterial Leaf Blight Resistant Material at Engro farm

Seed Research and Development Farm of Engro Fertilizer, Sheikhupura evaluated AIP provided 164 lines having BB Resistant and Zinc Fortified lines with some other varieties/lines like Indian varieties (**Sharbatti, Pussa Sogandha, Duplicate Basmati, Pussa 1509 & Pussa 1401**), NIBGE (BR 1, BR 18 & BR 23), GSR 1 & GSR 2), NIAB (like Noor Basmati, & old one IR – 9), Rice Research Institute, Kala Shah Kaku (PS – 2, Basmati.515, Punjab Basmati, Chenab Basmati & Kissan Basmati, PK – 386, IR-6, KS – 282, KSK – 133, KSK – 434 with Basmati Super as a local check) varieties under natural conditions of BB hot spot at Seed Research and Development Farm.

Screening of AIP IRRI lines at Research and Development Farm of Engro Fertilizer Pvt

7.2 Up-scaling of High-Yielding New Rice Varieties

Comparison of new Basmati variety (Basmati 515) with Old Basmati Variety (Basmati Super) was demonstrated at farmers' field in different Basmati areas of Punjab (Sheikhupura, Sialkot, Mandi Bahaudin, Kasur, Narowal and Gujranwala Districts) to see the yield difference. Result showed that basmati 515 had yield increment of 25 percent over superbasmati.

7.3 Demonstration on Optimum Plant Population Management (OPPM)

Less number of plants/ha was identified as a major constraint in yield potential of Basmati varieties under conventional transplanted rice system. AIP has conducted surveys in Rice Core Area like Sheikhupura, Gujranwala, Mandi Bahaudin & Sialkot to actualize the plant population/ha. Data revealed that average number of plants/meter square was only from 12 to 14 plants instead of 20 plants per m^2. The Optimum Plant Population Management (OPPM) was included in AIP Project to enhance the Basmati yield. For this purpose, farmers were trained on OPPM and provided them Nylon ropes having marks at nine inch to ensure P X P & R X R distance nine inch.

Demonstration on Alternate Wetting & Drying (AWD)

Water is a vital input of agriculture. For this purpose, farmers were trained on AWD Pipes installation, water measurement through the use of Flume, water level measurement in AWD Tube, and water application methodology, along with the provision of AWD water tubes and Basmati seeds. As the application of Alternate Wetting and Drying (AWD) technology reduces water use, water measuring pipes were manufactured locally and used in farmers' fields to irrigate the rice field by monitoring water

levels inside the pipe and irrigations were applied when water level inside the pipe reach to the depth of six inches below the soil surface. Alternate Wetting & Drying (AWD), a resource conservation technology in rice, was demonstrated at 100 demonstration plots of AWD on an area of 900 acres (700 acres in Nankana Sahib and 200 acres in Sheikhupura) which were established at farmers' fields in Punjab during the year 2017. Data depicted that a maximum of 36 percent water saving was recorded on AWD with an average 20 to 25 percent water reduction. As AWD crop did not lodge, AWD fields have 5 to 10 percent higher yield as compared to conventional irrigated fields and practices.

Demonstrations of AWD at farmers' fields

7.3.1 Extension of Drum-seeder demonstrations at farmers' fields

Mehcnization through Drum-seeder demonstrations were conducted in Punjab and KP provinces during 2017. Result depicted that Drum-seeder provided 15-20% higher yield than the conventional method of rice transplanting with 20% saving of labor.

Demonstrations of DSR and Drum-seeder at public institutes and at farmers' field

7.3.2 Extension of dry-seeded rice (DSR) at farmer's field

Demonstration on Dry-Seeded Rice (DSR) in Punjab

Direct Seeded Rice (DSR) was an important & most prominent activity of AIP. Land leveling is the pre-requisite for dry seeding. Dry-seeding of rice (DSR) technology was demonstrated on 5000 acres in different rice ecologies (2043 acres in Nankana, 1000 acres in Sheikhupura, Sialkot, Narowal, Hafizabad districts of Punjab province, 130 acres in Thatta, Larkana districts of Sindh and 50 acres in Swat, Dir, and Malakun districts of KP province with the help of public and private sectors. Field results have shown good rice crop establishments planting at the rate of 30-40 kg/ha giving 50,000-200,000 fertile seedlings per ha. In DSR, 10-20 percent yield increase was obtained over conventional puddled transplanted rice (PTR) with 25-30 percent water saving. Crop also matured 10-15 days earlier than conventional PTR.

Agronomic data on yield and yield components were also taken from 10 demonstration sites of all plots (DSR Drill, Multi planter, and Broadcast & Farmer practice/Conventional plots). About 10 to 12 percent yield increase was obtained over conventional planting and on an average Rs. 15,000 to 20,000 per ha monitory benefit was gained with DSR.

Dry-Seeded Rice (DSR) in KP Province

In KP, 81% of the rice acreage lies in high altitude, cold and mountainous areas where cold damage to rice crop is a problem to growers. These conditions dictate the development of cold tolerant rice with appropriate production technologies for these cooler hilly areas. Mostly coarse varieties (Fakhre Malakand and Swatai 2014) are grown in the cold climates. The farmers in these areas normally use transplanting as method of cultivation in rice. DSR is not only cost effective but also less time consuming

method, thus giving enough time to sowing of subsequent wheat. Also 75 percent less labor is consumed in DSR over transplanting and most importantly water which is getting a scarce commodity in these areas is saved. From the economic point of view, farmers can save up to PKR. 15,000 per acre in DSR over transplanting with comparatively less or no reduction in overall production. In KP province the demonstrations of DSR was conducted at farmers' field, with Fakharay Malakand and Swatai 2014, in the rice growing belt of Malakand Agency and Swat district. For adoption of DSR, inputs were also distributed.

One farmer from upper Swat, Mr. Amir Hatam Khan used to get four to five bags of paddy seed from 0.05 ha (500m^2) area transplanted with old variety. But with DSR and new rice variety Swatai 2014, he got seven bags of paddy seed from the same area. The farmers are convinced that through DSR they are able to save up to 30,000 PKR per acre piece of land. The field days and trainings have created great deal of awareness among farming community of rice belt.

7.3.3 Dry-Seeded Rice (DSR) in Sindh Province

In Thatta (Lower Sindh) area, on an average 5.5 t/ha paddy yield of Shandar was obtained with DSR as compared to 4.5 t/ha with conventional planting, achieving an extra PKR 20000/ha with DSR. In lower Sindh, farmers normally keep standing water in conventional method of broadcasting till seed germination and establishment of seedlings. Since rice seed drilling was used in dry soil and no standing water for long time was maintained in demo plots. Therefore, approximately 25 to 30 percent of irrigation water was saved as compared to the conventional method of broadcasting and flooding.

7.3.4 Training of Rice Researchers from public and private institutions and companies on Hybrid Rice Technology in Pakistan

Training of rice researchers from public and private institutions and companies on Hybrid Rice Technology in Pakistan entitled "2017 Training Course on Hybrid Rice Technology In Pakistan" from September 12 to October 11, 2017 at NARC, Islamabad Pakistan was organized by Pakistan Agriculture Research Council (PARC), Islamabad, Yuan Longping Hi-Tech Agriculture Company Ltd., China, with support from both AIP and Chinese counterpart.

The eminent scientists, officials and representatives of public and private sectors were:

- Dr. Muhammad Yousaf Zafar, Chairman, PARC
- Dr Muhammad Anjum Ali, Member, Plant Sciences PARC
- Mr. Shahzad Malik, CEO, Guard Agri Services private Ltd.
- Dr. Wang Xiusong
- Ms. Zhou Dan, Vice President, LPHT

Among the total 30 participants from four provinces of Pakistan, 13 scientists from Public institutions and, 17 persons from private institutions and companies such as Guard Rice, Patron seed Co., Tara Crop Science, Engro, have attended this training course.

Mr. Wang Xiusong delivered a lecture on hybrid rice genetics and breeding. In his presentation, he elaborated the basic concepts and terminology used in hybrid rice. He highlighted the procedures and practices for three-line and two-line hybrid systems. A detailed discussion on male sterile line (CMS and PTGMS) characters was done. The pros and cons of both systems were discussed for exploitation of the most suitable system in different ecological zones. Question/answer session was carried out for further understanding of the technology.

Farmers' field visit: In order to explore the typical Basmati rice area, participants visited rice farmers of different villages of Tehsil Muridke, district Sheikhupura and exchanged rice farming experiences. One of the farmers, Ch. Zulfiqar Sehol, expressed that the role of Rice Research by KSK is not only in variety development but also technology transfer. He showed the participants his rice field area comprising of 300 acres planted with dry-seeded rice.

Meeting with extension workers: A meeting was arranged at In-service Agricultural Training Institute, Rahim Yar Khan. The person-in-charge explained the institute's training activities. About 30 extension workers were present in the meeting. Most of the extension workers highlighted the issues of poor adoption of rice hybrids in the area. Sterility due to heat, poor quality, and low market price were pointed out as the major discouraging factors. They were of view that rice hybrids can be adopted by the rice growers of the region if the above mentioned problems were solved.

Participants Visiting Guard Agriculture Services Private, Ltd.

7.3.5 Develop a cadre of young, well trained scientists and extension officers

AIP rice component organized specialized training courses with the collaboration of partners for researchers, extension officers, and progressive growers about resource saving (DSR, AWD, Drum-seeder) rice production technologies in Punjab and KP provinces. Two hundred (200) researchers, scientists and extension officers have been trained about resource saving rice production technologies along with disease and insect management, harvest and post-harvest management issues (100 at Soil Salinity Research Institute, Pindi Bhattian and 100 at Agriculture Research Institute, Mingora Swat).

7.4 Improved Post Harvest & Quality Control

7.4.1 Workshop on harvest, post-harvest operations and quality paddy production

AIP-Rice Organized Farmers' Training and Field days entitled "Role of Quality Paddy Combine Harvester and Postharvest Processes in Minimizing the Grain Losses, Aflatoxin Contamination, and Enhancing Quality Basmati Export" on November 24, 2017 at Daharanwala Farm, Tehsil Muridkey, District Sheikhupura. The participants were farmers, Combine harvester owners, Rice millers, exporters, middle men, and extension workers. The training /field day program was organized in collaboration with seed research and development unit of Engro Fertilizer Pvt Ltd. A total of 120 rice stakeholders participated in this training /field day program. After a brief introduction about AIP, training was imparted to the participants about the proper stage of rice crop harvesting and selection of appropriate combine harvester for harvesting the crop at appropriate paddy moisture percentage. Furthermore it was discussed that what should be the speed of combine especially threshing drum, how to reduce the grain losses, proper drying and storage techniques to reduce the chances of stored insect-pest attack, and aflatoxin contamination. Marketing strategies to get higher price of paddy were also discussed with farmers. Practical demonstrations of combine harvesters were shown to the participants to enable them to see the results of proper rice combine harvester (no fallen grains on the ground, no broken rice, and green straw debris in the paddy) compared to the wheat combine harvester adapted for rice harvesting and threshing instead of wheat crop. At the end, participants thanked USAID for introducing these new technologies to farmers in remote areas.

Comparison of paddy grain harvested by two different combines (Kubota and wheat combine).

It has been evaluated that around 20 to 24 percent paddy grain is generally lost during the process of harvesting in Pakistan. The bifurcation of this loss is 12 to 14 percent grain loss in the field and remaining 10-12 percentage is breakage of grain within the machine.

AIP-Rice has trained machine owners, drivers, mechanics and helpers on optimum operation of machine for not only improving yield by reducing the grain dropage and grain breakage but also improved fuel consumption and maintenance of combines.

Awareness was also raised among farmers on how to select a quality machine for getting quality grain through properly maintained harvesters and engage experienced operators. A 50 percent of grain loss and breakage can be avoided via existing harvesters with trained operators and properly maintained machines with standard quality rice threshing kits.

- Average rice paddy quantity per acre: Average yield 40 monds/acre x 40 kg = 1,600 kg
- Current grain loss (20 percent): 1,600 x 20 percent = 320 kg
- Grain loss with improved machines (10 percent): 1600 x 10 percent = 160 kg
- Price of rice paddy per 40 kg: PKR. 1,800 (Average of year 2017 crop season)
- Rice paddy saved by improved machines: 160 kg
- Cost saving via improved machines: (160/40) * 1800 = PKR. 7,200

Total monetary benefit to the farmers by training and adapting new improved resource saving rice production technologies because of AIP project is (a+b+c+d) = PKR. 33,000/ acre.

Savings of machine owners per acre by adapting the improved protocol developed by AIP for machines owners and operators:

- Breakdown maintenance: reduced by 70 percent
- Planned maintenance: time increased by 40 percent
- Machine utility in the field: increased by 30 percent
- Machine availability to farmers: increased by 20 percent
- Fuel Consumption per acre for harvesting: 5.5 liters (average of season)
- Cost of fuel per liter: PKR. 80
- Fuel cost per Acer: PKR. 440
- Fuel saving by trained drivers: 1.5 Liters per acre

8 Agronomy/Crop Management

8.1 Dissemination of Conservation Agriculture Technologies

AIP agronomy facilitated demonstration of zero till wheat planting, ridge planting of wheat and LASER land leveling on 489 farms and trained 263 stakeholders including farmers and technical staff. A total of 36 farmer's field days were organized for 2943 farmers in 21 districts of Punjab, Balochistan and KP provinces. Field days provided an opportunity to farmers to observe better yield with improved agronomic practices and other benefits such as; water saving with LASER land leveling and ridge planting; reduction in cost of cultivation in Zero tillage; saving in cost and time of planting with direct seeding of rice and saving in fertilizer with use of LCC in rice on their farms or fellow farmer fields.

8.1.1 Partnership for out scaling CA technologies:

AIP agronomy collaborated with 23 national partners that included 16 public sector agricultural research and extension organizations, four private sector seed and fertilizer companies; Engro Fertilizers, Miankhel Seed Corporation, Petal Seeds and Rice partners Limited (RPL), two machinery manufacturers; Greenland Engineers and Sharif Engineering and one NGO; National Rural Support Program (NRSP). National partners were instrumental in dissemination of ridge planting of wheat, ZT planting of wheat

and LASER land levelling, provision of locally produced Zero till Happy Seeders (ZTHS) on cost sharing basis and efficient fertilizer management techniques for wheat in the country.

8.1.2 Demonstration of CA technologies:

National partner's namely AZRI Bhakkar, ARS Bahawalpur, NRSP, BARI Chakwal, Adaptive Research Punjab, Wheat Program NARC, WRI Faisalabad in Punjab province; ARI DI Khan, CCRI Nowshera, Miankhel Seeds and MFSC – KP province; Department of Balochistan Agriculture Research, ARI – PARC Jaffarabad in Balochistan province, WRIS – Sakrand, AZRI Umerkot and NSTHRI Thatta in Sindh province assisted 489 farmers in application of ZT wheat planting , Ridge planting of wheat, LASER land levelling and rain fed wheat planting after mung crop in the project area.

Zero till wheat planting in district Jaffarabad

National partners provided technical support like ZT drill for use and training to farmers in adopting wheat planting with zero tillage drill after rice crop on 254 farms in the districts of Jhal Magsi and Jaffarbad in Balochistan province, Thatta, Sujawal and Jacobabad in Sindh province, DI Khan district in KP province and Faisalabad, Nankana Sahib, Sheikhupura and Kasur district in Punjab province. Furthermore, 36 farmers planted wheat with ZT drill after mung or Guar in Bhakkar and Chakwal districts in Punjab province and DI Khan district in KP province. Discussion with national partners indicated that ZT drill adoption for wheat planting after rice in Balochistan province is gaining momentum and around 12000 – 13000 acres were planted with ZT after rice in 2017-18. During 2017 wheat season, increase in number of the service providers resulted in reduction of rate from PKR. 1100 to PKR. 900 per acre for ZT wheat planting in Jaffarabad region. ZT wheat planting technology after rice / legume crop helped farmers saving PKR. 7500/ha in cost of land preparation and get 0.2 t/ha additional wheat grain in comparison with farmer practice of land preparation followed by broadcasting of wheat seed and fertilizer.

Zero tillage wheat planting after mung bean in Bhakkar

A) AIP provided technical assistance and seed to 164 farmers who were instrumental in demonstration of ridge planting of wheat on 34 farms in 10 districts of Sindh province, 33 farms in eight districts of KP province, 95 farms in 14 districts of Punjab province and two farms in one district of Balochistan province (detail given in Table 6). Data collected from farmer field trials and demonstrations showed that 10-15 percent higher number of tillers contributed towards 12 percent higher wheat grain yield with ridge planting in comparison with the farmer practice of broadcasting of seed followed by shallow cultivation. Ridge and furrow planting of wheat also showed saving of 30-40 perecnt water in comparison with farmer practice. Furrow irrigated ridge planting technique also helped in reducing lodging of crop during grain filling stage. Those

Figure 3. Ridge planting of wheat in Jaffarabad, Balochistan

Farmers adopted ridge planting technique had more profit of PKR 10767 per hectare than those farmer have not adopted the techniques.

Table 6: Ridge planting of wheat in various districts of Pakistan		
Province	Districts	Demonstration (No)
Sindh	Badin, Tando Allahyar, Mirpur Khas, Mitiari, Shaheed Benazir Abad, Noshero Feroz, Sanghar, Sajawal, Umerkot and Thatta	34
Khyber Pakhtunkhwa	Banuu, Mansehra, Kohat, Buner, Nowshera, Swabi, DI Khan and Lakki Marwat	33
Punjab	Jhelum, Bhakkar, Khushab, Bahawalpur, Mianwali, Lodhran, Hafizabad, Vehari, Sheikhupura, Gujrat, Narrowal and Pakpattan, sahiwal, Gujranwala,	95
Balochistan	Jaffarabad	02

B) A local partner, that is MFSC, in KP province, provided service to 30 farmers in the districts of DI Khan, Kohat and Tank on LASER land leveling on more than 87 hectares. LASER land leveling adopters obtained 15 percent higher grain yield and 29 percent in water saving in comparison with non-adopters. In addition, Wheat Program NARC and CCRI Nowshera facilitated planting of mung bean with Zero till and conventional practice on five farmer fields of one acre in Nowshera of KP province while in Rawalpindi of Punjab province.

8.1.3 Training of stakeholders on CA techniques

National partners AZRI Bhakkar, NRSP, MFSC-KP, Miankhel Seeds and WRIS Sakrand collaborated with AIP in organizing eight trainings on November 03, 07, 08, 11, 13, 14 and 20, 2017 in the districts of Bhakkar, Hafizabad, Mianwali, Islamabad, DI Khan, Swabi, Nowshera, Hyderabad and Shaheed Benazir Abad. More than 263 farmers, staff belonging to NRSP and MFSC attended these trainings. The trainings focused were on Zero till wheat planting, ridge planting of wheat, wheat production technology and nutrient management in wheat. The trainings improved the understanding of staff and farmers regarding adoption of improved techniques at farms.

8.1.4 Dissemination and promotion of technologies through field days

National partners organized a total of 36 field days including eight in Balochistan, four in Sindh, five in the KP and 19 in Punjab provinces. The objectives of the these field days were dissemination of information to farmers on improved practices such as; LASER land leveling, ZT Happy seeder planted wheat, ZT wheat planting after rice / mung, Ridge planting of wheat, Bed planting of wheat and maize, maize planting with push row planter, mung cultivation in rain fed area, precision nitrogen management

Field day on ridge planting of wheat in KP province

Field day on ZTHS wheat planting at Saranwala, Sheikhupura

in wheat and direct seeding of rice through DSR planter. A total of 2943 farmers and agriculture professionals attended these field days in the districts of Jaffarabad in Balochistan province, Bannu, DI Khan, Kohat, Nowshera and Swabi in KP province, Bhakkar, Bahawalpur, Chiniot, Gujrat, Mandi Bahauddin, Rawalpindi, Sheikhupura, Vehari, Sahiwal, Nankana Sahib and Gujranwala in Punjab

province and Sanghar, Shaheed Benazir Abad and Umerkot in Sindh province. Farmers visited fields under improved practices, and adopters shared experiences with their fellow farmers and agriculture professionals.

8.2 Pilot Testing and Refinement of New CA-Based Implements and Technologies

A local partner, Sharif Engineering manufactured and sold 11 ZTHS to farmers on cost sharing basis in Punjab province. In addition, 133 farmers use ZTHS and bed planter for wheat planting in Punjab, KP and Sindh provinces. Around 88 operators, farmers and agriculture staff were trained on use of ZTHS for what planting and troubleshooting and maintenance in Punjab province.

8.2.1 Local manufacturing of new CA planters and evaluation

A) A total of 11 Zero till Happy seeders (ZTHS) manufactured by Sharif Engineering during October – December 2017 and sold to farmers @ PKR. 160,000 per seeder on cost sharing basis in districts Hafizabad, Gujranwala, Nankana Sahib, Lahore, Sialkot, Narowal, Sheikhupura, Sargodha, Khanewal and Kasur of rice-wheat area of the Punjab province. AIP have shared 48 percent cost of new ZTHS with farmers during wheat planting season 2017 and farmer paid 52 percent of the cost. These modified ZTHS have depth wheel that are used for transportation of the ZTHS from one field to other and maintenance of planting depth during planting of wheat. Since start of the project, AIP has provided a total of 32 ZTHS in rice – wheat area of the Punjab province that included 23 ZTHS provided to farmers / service providers on cost sharing basis during 2016-17 and 09 ZTHS to national partners free of cost as part of strengthening their capacity.

ZTHS planted wheat at Farooq Abad, Sheikhupura

ZTHS with wheels manufactured by Sharif Engineering, Faisalabad

B) AIP imported Multicrop planter and supported Greenland Engineers that is a local partner in development of inclined seeding plate's planter enabled Greenland PVT. Engineers manufacture 187 "Green Multicrop DSR planter" during 2016 & 2017 rice season. These DSR planters have inclined plate seeding system and can drill both seed and fertilizer simultaneously, and maintain an appropriate plant to plant distance without breaking the seeds. A representative of Greenland Engineers, informed that company will be manufacturing more than 200 DSR planters in 2018 rice season for rice farmers in Pakistan. Adoption of DSR would help farmers in saving water and labor, improve 10 percent plant population and rice productivity in comparison with transplanting of rice.

8.2.2 Demonstration of New CA planter at farmer fields

A) National partners ARS Bahawalpur, CCRI Nowshera and WRIS Sakrand demonstrated wheat bed planting with MC bed planter on 16 sites in districts of Shaheed Benazir Abad in Sindh province, Bahawalpur district in Punjab province and Nowshera in KP province. AIP partner WRI

established demonstration of **lentil** intercropping in **sugarcane** crop in Faisalabad district of Punjab province.

B) During 2017-18 wheat season, AIP in collaboration with partners AR Farms Gujranwala and Sheikhupura, RRI – KSK, Engro Fertilizers, RPL and WRI – Faisalabad facilitated use of ZTHS for wheat planting in combine harvested rice fields. Data from partners showed that ZTHS was used by 117 farmers on 1050 acres in district of Chiniot, Faisalabad, Gujranwala, Hafizabad, Jhang, Kasur, Lahore, Mandi Bahaudin, Nankana Sahib, Narrowal, Sheikhupura and Sialkot in Punjab province. A farmer from village Herdo Sehol in district Sheikhupura, planted wheat with ZTHS on 50 acres and invited 64 farmers to visit ZTHS planted wheat on March 29, 2018. A farmer from Sialkot, planted wheat with ZTHS on his farm and saved PKR. 7200 per acre in cost of cultivation, sowing and fertilizer application. Farmers adopting Zero till Happy seeder technology for wheat planting saved PKR. 12500 / ha in land cultivation and planting cost and obtained 0.2 – 04 t / ha additional wheat grain yield in comparison with farmer practice of burning residue and heavy tillage. Farmers and service providers saved 14 liter diesel per acre with ZTHS technology in comparison with farmer practice.

ZTHS planted wheat at Engro Farm, Sheikhupura

C) During 2017 rice season, around 180 MC DSR planters were available in field by farmers and service providers for DSR in rice growing area of the Punjab province in particular and Pakistan in general. National partners, Engro Fertilizers, RRI, AR Farms Sheikhupura and Gujranwala, helped farmers to use Multicrop DSR planter for direct seeding of rice on 46 sites in districts of Gujranwala, Mandi Bahaudin, Gujrat, Sheikhupura, and Sialkot in Punjab province. A farmer from village Herdo Sehol in district Sheikhupura, planted direct seeded rice through MC DSR planter on **146 acres in ten days**. He obtained average paddy yield of 4.3 t/ha that was 0.75 t/ha higher in comparison with transplanted rice. By adopting DSR for the last two year on his farm, he saved PKR. 5000 per acre in planting cost with 20 percent improvement in paddy yield.

8.2.3 Training of Stakeholders on New Seeders

AIP in collaboration with Sharif Engineering trained 50 tractor operators and farmers in November, 2017 in Lahore, Chiniot, Kasur, Hafizabad, Jhang Gujranwala, Sheikhupura, Nankana Sahib, Narowal and Sialkot districts of Punjab province. In these on farm training, technical staff from AIP, CIMMYT and

ZTHS Manual

manufacturer trained operator on ZTHS use for wheat planting, calibration of seed and fertilizer, troubleshooting and maintenance of seeders. NRSP also organized awareness workshop for its farmers in Hafizabad where 48 farmers observed wheat planting with ZTHS in heavy rice residue. AIP also developed manual on operation and maintenance of ZTHS and copies were provided to trainees and farmers.

8.3 Evaluation of Conservation Agriculture-Based Crop Management Techniques Methods in Different Cropping Systems:

8.3.1 Field trials in wheat based cropping systems in Pakistan

Field trials conducted during 2015 – 2017 in rice-wheat, maize-wheat, cotton-wheat and rain fed wheat cropping systems in partnership with national partners namely ARS Bahawalpur, BARI Chakwal, RRI Kala Shah Kaku, and CCRI Nowshera. These trials validated new techniques, improved understanding of planting techniques effects in a particular cropping system perspective. After three years, finding from these trials are summarized as under:

1. **Evaluation of Different Planting Methods/Techniques in Cotton-Wheat System at ARS Bahawalpur, Punjab:** In this study, different planting techniques for cotton and wheat were evaluated in Bahawalpur. Three years results showed that average cotton yield of 2.55 t/ha was obtained with multicrop bed planter that was at par in comparison with 2.60 with manual planting on wide beds. In wheat planted after cotton, Zero till relay planted wheat in standing cotton on beds or flat surface had average grain yield of 5.14 t/ha in comparison with 4.29 t/ha with farmer practice of wheat planting on prepared land after cotton harvesting. Maximum system productivity of 7.72 t/ha was obtained with bed planting of cotton and relay planting of wheat in standing cotton crop.


Operator training on ZTHS in Hafiz Abad

2. **Effect of Planting Techniques on the Productivity of Different Rain-Fed Cropping Systems at BARI Chakwal, Punjab:** Zero tillage and conventional tillage were evaluated under mung – wheat, soybean – wheat, green manure –wheat and fallow – wheat cropping system in Chakwal. Results from the study showed that higher system productivity was 3.2 t/ha with mung bean – wheat and 3.0 t/ha with soybean – wheat cropping system under zero tillage and conventional tillage techniques in comparison. Wheat productivity of 2.9 t/ha was achieved when green manure crop of guar was incorporated in soil that was followed by 2.5 t/ha of wheat grain yield with fallow-wheat system under conventional tillage. Mung-bean – wheat system had lower risk of crop failure as this system had consistent production of 0.9 t/ha mung bean during summer season in comparison with fallow.
3. **Evaluation Of Different Residue Management and Planting Techniques Under Heavy Residue Environment Of Rice-Wheat Cropping System at RRI KSK, Sheikhupura, Punjab:** Three year (2015-2017) field study on planting techniques and residue management at Kala Shah Kaku in rice-wheat cropping system showed that direct seeding of rice (DSR) with tillage followed by ZTHS planted wheat in full residue and DSR under ZT condition followed by ZTHS planting of wheat had system productivity of 7.8 and 7.1 t/ha, respectively. Rice-wheat system productivity of 6.3 – 6.4 t/ha under farmer practice of transplanted rice and broadcasted wheat after residue burning and heavy tillage was achieved that was lower than DSR followed by ZTHS wheat. Basmati paddy yields with transplanted rice and direct seeder rice were at par, however, average wheat

grain yield planted with ZTHS in residue were 4.0 t/ha in comparison with 3.0 t /ha with conventional planting after residue burning.

4. Effect of Planting Techniques such as ZT, Bed Planting and Farmers' Practice on The Productivity of Irrigated Maize-Wheat Cropping System in Nowshera District of KP Province: In this study, Zero drill planted wheat after maize crop had higher grain yield in comparison with mechanized bed planting and farmer practice of broadcasting. Because of higher maize grain yield, maize–wheat system productivity was significantly higher with bed planting and farmer practice in comparison with Zero tillage. There was 16-22 percent water saving with bed planting in comparison with ZT and farmer practice. The study showed that farmer practice of manual planting of maize and broadcasting of wheat can be replaced with bed planting of maize and zero till drill planting of wheat, respectively to save water, labor and improve maize-wheat system productivity and water use efficiency.

8.4 Nutrient Management

During wheat season 2017-18, national partners facilitated 125 farmers in demonstration of nutrient management in wheat in the districts of Punjab, Balochistan, KP, and Sindh provinces. A total of 26 national partner's staff were trained on sensor based nitrogen management in wheat crop. Green Seeker assisted N management would help in promotion of balanced and site specific fertilizer management among farming community and improve wheat productivity.

8.4.1 Evaluation and demonstration of SSNM in collaboration with national partners

A. Green seeker use for N management in wheat: AIP Agronomy evaluated crop sensor use for N (nitrogen) management in wheat during 2014-15, 2015-16 and 2016-17 in collaboration with national partners in Pakistan. Results from 136 farmer fields during three wheat seasons showed that 34 kg of nitrogen per hectare could be saved without any loss in wheat grain yield. This saving would be 74 Kg of urea fertilizer per hectare and farmer can save PKR. 3000 / ha in fertilizer cost without reduction in yield. AIP, CIMMYT in collaboration with 17 national partners demonstrated precision N management on 125 sites in 18 districts of Punjab, Sindh, KP and Balochistan provinces in 2017-18 wheat season.

   In this technique, an application of Nitrogen at planting and first irrigation remains same. At second irrigation, crop is sensed through AIP introduced Green Seeker and nitrogen fertilizer dose is calculated according to crop response by using NDVI and android application. In this process, a Green Seeker handheld crop sensor quickly assesses crop vigor and provides NDVI readings that are used by the urea calculator to furnish an optimal recommendation on the amount of nitrogen fertilizer needed for the wheat crop. This android application developed by CIMMYT-India and the Borlaug Institute for South Asia (BISA) for cell phones and is being introduced in AIP.

B. LCC use for N management in rice: During autumn 2017, a total of 50 on farm demonstration established in Gujranwala, Sialkot, Sheikhupura, Faisalabad districts in Punjab province and Jaffarabad district in Balochistan province. Results from on farm user of LCC in rice crop showed that farmers saved 38 Kg N per hectare without any yield loss that was equivalent to 82 Kg of Urea per ha (33 Kg of Urea per acre) in LCC managed rice plot in comparison with farmer practice of general recommendation.

8.4.2 Training on sensor based Nitrogen management in wheat

AIP-CIMMYT in collaboration with national partners RRI – Kala Shah Kaku and WRIS Sakrand organized trainings on precision nutrient management in wheat at RRI-KSK and WRI Sakrand on January 11 and 18, 2018. In these training a total of 26 agriculture professionals from national partners were trained on use of green seeker for NDVI recording and use of android application urea calculator for calculation of nitrogen fertilizer dose. These trainings and new partnerships helped national partners to demonstrate and disseminate precision N management technique to wheat farmers across Pakistan which will enable farmers to apply nitrogen according to crop need contributing to reduction in input cost (see Table 7).

Training on Green Seeker use in WRIS, Sakrand, Sindh

Table 7: National partner's collaboration on Green Seeker use for N management in wheat in Pakistan

Province	Partners	District
Punjab	ARS – Bahawalpur, AZRI- Bhakkar, RRI – Kala Shah Kaku, NRSP, Wheat - NARC, Adaptive Farms Punjab; Engro Fertilizers and WRI – Faisalabad	Nankana sahib; Sheikhupura; Gujranwala; Mandi Bahauddin; Faisalabad; Chiniot; Vehari; Sahiwal; Jhelum; Hafiz Abad; Bhakkar;
KP	ARI – DI Khan; CCRI – Pirsabak; Miankhel Seed – DI Khan, MFSC – KP	Nowshera, Swabi and DI Khan
Sindh	AZRI – Umerkot; NTSHRI – Thatta; WRIS – Sakrand	Umerkot, Shaheed Benazir Abad, Thatta
Balochistan	DAR – Balochistan; ARI – BARDC	Jaffarabad

8.5 Competitive Grant System Agronomy

8.5.1 Competitive Grant: a Project on Efficient use of water and crop production through Laser land leveling Technology is implemented by Agriculture Research, Farm Machinery & Implements, ARI Sariab Quetta

The objective of the project was to use laser land leveling as an effective water saving tool for surface irrigation system in context of optimizing water use efficiency, improve crop establishment, reduce the irrigation time and effort required to manage crop.

A total of 26 different farmers' fields were selected across tehsil Quetta and number of acres for laser land leveling as per land holding size of farmers were recorded. The selected sites were first ploughed before laser land leveling. Most of lands were found in 2-4 inch gradient across surface and so there was no need for conducting topographic survey.

- Total number of acres leveled through laser land leveler = 213
- Total number of beneficiaries (farmers) = 26

The set target for number of acres leveled through laser land leveler was 200 acres but we did 213 acres due to farmer's interest in this technology.

9 PARC- AIP: Competitive Grants System – Horticulture

9.1 Fruits

1. Boosting irrigation system efficiency of apple orchards in district Ziarat, Balochistan:

Under the AIP, PARC, Competitive Grant a project on Boosting irrigation system efficiency of apple orchards in district Ziarat is implemented by the Directorate of Water Management, ARI, Sariab Quetta. Commonly more water is being applied in apple orchard than needed.

The project is addressing the optimal use of water by boosting application efficiency for proper irrigation scheduling.


The following activities were conducted during the reporting period.

1. Farmer's involvement & Agreement

- The suitable site was selected for trial and farmers were taken into confidence. A written agreement was signed with farmers with defined roles and responsibilities.

2. Calibration and Equipment Installation

It involve the process of irrigation scheduling, determine bulk density of soil and to know the effective root zone of the trees. Mapping of the trail area on scale and developing a graph about time of irrigation in a field is done. Equipment in field was installed and continuous sampling for 15-20 days was carried out.

3. Determination of soil texture.

- Collected sample were analyzed to determine the texture and bulk density.
- Sample was also sent to other laboratories for cross check.

4. Effective Root Zone Determination

- It is important to ensure feeding or effective root zone to schedule the required depth per irrigation. The field condition was assessed and hard pan was checked, the depth of infiltration was measured and a six inches diameter hole was prepared by using torch rooting zone.
- The experiments were conducted at Kawas, Zandra and Pechi sites.

5. Discharge

- The graph was drawn which will be used in the field at the time of irrigation while deciding the duration of irrigation for each sub plot of the trail.

6. Mapping of the trail area.

- Field was measured, map was prepared to determine the area of each tree according to its canopy.

7. Water Holding Capacity (WHC)

- After texture determination WHC was determined from Tables developed by FAO for different soil types. And also cross checked by special equipment in field and Lab. This will provide guidance while deciding the depth of irrigation for a single turn.

8. Bulk Density

- Bulk density of the selected fields was determined in field by bulk density apparatus, and also confirmed in lab.

All these above activities completed and further progress on this will be presented in the next report.

9.1.1 A project on Integrated Nutrient Management for improving production and quality of Strawberry in Sindh implemented by Quaid-e- Awam Agriculture Research Institute (QAARI) Larkana.

This project is aimed to evaluate the optimum dose of nutrient application for strawberry and to investigate the response of integrated use of organic and inorganic nutrients in improving the yield and quality of strawberry. Benefit of farming community is considered through transfer of technology for obtaining maximum economic yield of strawberry through integrated plant nutrition management. This project has close collaboration with farmer communities.

The analysis of soil and plant nutrient status of strawberry under various organic and inorganic nutrients is part of this project. Study is being carried out to assess the cost benefit ratio of strawberry cultivation under various plant nutrition strategies, i.e. organic, inorganic and integrated.

Soil samples associated with strawberry plantations were taken for analysis to know the nutritional status for formulating the balanced fertilization program. Seed beds were prepared according to the layout. The activity continued for one week at the katcha area of Taluka Pano Akil district Sukkur.

The experimental plots were sown and fertilizer was applied according to the research plan with objective that the required target may be achieved. The sowing was started on October 15, 2017 at village named Panhwari, Taluka Pano Akil.

A seminar entitled “Integrated Nutrient Management for improving production and quality of Strawberry in Sindh” was conducted to make awareness and spread knowledge among the stakeholders for use right fertilizer at right time with right dose and by right method to increase quantity and quality of strawberry without permanent injury to soil atmosphere and fertility. It was organized on March 26, 2018 at villages named Pahwari Taluka Pano Akil Distt Sukkur, Sindh province. A total of 129 beneficiaries attended the seminar.

9.1.2 Competitive Grant a project on "Research and development of Pome Fruits Rootstock Production in the Agro-climatic Zones of Hazara Division" is implemented by Agricultural Research Station Baffa, Mansehra

Agricultural Research Station Baffa, Mansehra initiated its activities on Pome Fruits Rootstock Production in the Agro-climatic Zones of Hazara Division. Three sites were selected with an area measuring one Kanal with its agro-climatic importance.

1. Pir Bai Bala, Chattar Plain.
2. Andrasi, Siran Valley.
3. ARS Baffa Mansehra.

A total of 110 beneficiaries benefited directly/indirectly, Project established stool bed for rootstock production in these localities. In long term an orchard establishment will take place in these localities.

Planation of wild pear and apple rootstock at Siran, Andrasi

Competitive Grant a project on establishment of High Value Fruit and Vegetable Nurseries in Sindh province is implemented by Arid Zone Research Institute, (PARC) Umerkot

The project focus is on arid horticultural plants and chili to reduce the Aflatoxin issue of the semi-arid and arid areas of district Umerkot, Sindh. The farmers of district Umerkot are facing water shortage issues and contamination of Aflatoxin in their main economic crop chilies.

9.2 Different treatments of fertilizer as basal dose for nursery

Under the project activities, the chili (Dandicut) nurseries were established at Arid Zone Research Institute, Umerkot and at farmer's field. More than 17 farmers were trained on application of fertilizer as basal dose and briefed them that seed must be treated with systemic fungicides and insecticides to

Chili nursery in trays peat mass

Chili transplanting at farmers field.

Nursery on raised beds at farmers' field.

prevent from diseases and insects infestation and transplant healthy sapling in the field. A total 15000 rootstocks of ber planted in February 2018 and scion will be placed during the June, 2018.The grafted ber plants will be available during the second week of July, 2018. The coordination of Public Private Partnership developed with the Muhammad Hanif Nursery at Mirpurkhas. The seeds of the ber provided by institute and seedlings developed by the private nursery. The scion of the Dehli Gola variety will be provided by the institute during the month of June, 2018 for the grafting of saplings.

9.3 Dates

Meeting was conducted with the farmers of the Khairpur districts during the month of March, 2018 regarding the suckers of the 'Aseel' variety in collaboration of Dates Palm Research Institute (DPRI) and Shah Abdul Latif University Khairpur. Farmers were agreed to provide the suckers of the 'Aseel' variety during the month of June-July, 2018 for transplanting, as that is the best period for suckers cutting and planting in the field.

Date palm orchard of Aseel variety at Khairpur

2. **Under AIP PARC Competitive Grant a project on "Develop tomato varieties resilient to blight and viruses over a range of environments" is implemented by NIAB**

Susceptibility of tomato to fungal and viral diseases is one of the major limitations of low tomato productivity in Pakistan. To develop tomato varieties resilient to blight and viruses over a range of environments, the evaluation of such material is essential following disease screening techniques and adaptability trials over the years. The current project addresses these problems. This exercise may culminate to release other blight and virus tolerant tomato varieties with wider range of adaptability. By developing local tomato cultivars/hybrids tolerant to diseases, cheaper seed will be available to the farmers thereby reducing input cost incurred on chemical control. After approval of hybrid varieties, it may be commercialize through open bidding to seed company(s) and ensure supervision of inbred lines to maintain the purity of inbred genetic stocks.

Punjab Seed Council, Lahore approved two AIP introduced determinate tomato hybrid varieties viz. NIAB GOHAR and NIAB JAUHAR for general cultivation. Nutritive quality data on matured fruits of each approved hybrid variety will be collected soon to submit to PSC, Lahore as per their comments. Hybrids contributed in multi-location yield trials are going well. An application for the registration of one of the hybrids (NBH-149) has been submitted to FSC & RD, Islamabad for execution of DUS study. Of 47 hybrids, 5 hybrids and their inbred were elucidated as highly tolerant, 5 hybrids resistant and 13 hybrids

NIAB "Gohar" & NIAB "Johar" Tomato Varieties Trial

with their inbred parents were identified as tolerant to ToMV. Culture of A. Solani was multiplied on V8 media. Forty-seven hybrids and their inbreds were inoculated to screen them against EB.
Both approved varieties were grown in field conditions at NIAB. Fruiting were started since the end of February, 2018 and expected to be mature by the fortnight of April, 2018. Ripened fruits will be evaluated for lycopene content, Beta carotene (Vitamin A), Vitamin C, sugar content, calcium, phosphorus, iron, zinc period in collaboration of PHRC, AARI Faisalabad and will be submitted to PSC for further extension of approval.
Two high yielding hybrids were contributed in competitive adaptability yield trials at Faisalabad, Multan and Sheikhupura during 2017-18 in collaboration with provincial vegetable institute (Vegetable Research Institute, VRI, and Faisalabad) in order to check stability and adaptability across the environments eventually leading to selection of better ones. Both hybrids are growing in good conditions at respective locations. Data on yield and yield components will be recorded during April-June, 2018.
Culture of Phytopthora infestans (causing late blight) was multiplied on PARP medium. After 10 to 14 days, sporangia were harvested by applying sterilized deionize distilled water and gently scraping agar surface with microscopic glass slide or paint brush. The sporangia suspension was filtered and sprayed on to the nursery seedlings of 47 elite advance lines and hybrids grown in low tunnel. Unfortunately, due to unfavorable conditions no disease developed on the treated unit.

9.4 Vegetables

9.4.1 Under AIP, PARC Competitive Grant a project on Vegetable Nursery Production and Supply System for Kitchen Gardening is implemented by Muhammad Nawaz Shareef University of Agriculture Multan (MNSUAM)


Irrigation of vegetable plant nursery

The project, in collaboration with private nursery farms, was started in November 2017. The objectives is to promote kitchen gardening by establishing a system for provision of healthy nursery for economical and clean (pesticide free) vegetable production by overcoming the germination and season related problem, and to build capacity of the agriculture graduates for entrepreneurship.

A walk in tunnel (130x15 ft.2) was constructed for raising nursery of Tomato, Chili, Pepper, Brinjal and Cucurbits (gourds and cucumber etc.). Different potting media (Peat moss, Perlite, Silt and compost) are being evaluated for nursery raising. Both male and female students are involved in various activities of the project to promote their capacity building in nursery media preparation, multipot tray filling, sowing and further nursery management. Portal for Online sale of vegetable nursery has been launched on website at mnsuam.edu.pk/Nursery/. Programs for awareness of society for healthy foods and promotion of kitchen gardening for self-sufficiency in vegetables were conducted at three schools/ colleges. Market linkage were developed with different Departmental Stores, Food Festival, CSD shop etc. to provide space for display of nursery for sale at their stores. So far nursery, 6480 plants of tomato, 6420 plants of chilies, 5700 plants of sweet pepper, 660 plants of bringle, 3300 plants of cucumber and 600 plants of bitter gourd 1020 plants of pumpkin, 780 plants of vegetable marrow,120 plants of luffa, 300 plants of melons are raised in multipot trays. Marketing of vegetable nursery is started on Febrauary 25, 2018 and up till now 2097 plants


Tomato sowing and further nursery management


Filling of Multipot Trays with peat moss

of Chillies, 2131 plants of tomato, 1774 plants of sweet pepper, 630 plants of bringle, 692 plants of pumpkin, 1127 plants of cucumber 629 plants of vegetable marrow 105 plants of luffa and 150 plants of melon are sold.

9.4.2 Competitive Grant on Molecular based genetic divergence in indigenous common bean of Himalaya Pakistan is implemented by NIGAB

Himalaya region of Pakistan is rich in legume production. Common bean has a diverse genetic base. Indigenous germplasm contain high variation for morphological traits and are usually sown in mixtures at high elevations, so we do not know exactly the performance of individual genotypes. In order to separate the various genotypes it need to be characterized into different groups according to their seed morphological traits. It assist in further evaluation of the collected germplasm.

Molecular markers represent a potential tool for effective characterization of genetic diversity and to aid in the management of plant resources. Molecular based characterization of indigenous germplasm is helpful in identifying the promising material to be used in further breeding programs for variety development with superior attributes.

Under the project more than 200 accessions of common were collected from different locations of district Swat, Gilgit, Shangla, Neelum valley AJ&K, Nagar, Diamer, Kel, Kumrat, Dir, Ghizer, Ishkoman, Batagram, Mansehra, Astore, Parachinar and Kurram Agency. Collected germplasm based on seed coat color, pattern and seed shape are groped. A tentative sowing plan for proposed locations is prepared. Morphological characterization of the collected germplasm is in progress at two locations i.e at NIGAB, NARC Islamabad and at IBGE, University of Agriculture Peshawar. About 96 accessions were planted in glasshouse of IBGE and University of Agriculture Peshawar. Crop is performing better at greenhouse conditions.

At NIGAB, 98 accessions was planted on February 19, 2018 under screen house conditions. Accessions were planted in randomized complete block design with two replications. Out of these 98 accessions, 77 accessions showed overall better germination whereas 23 accessions showed vigorous growth at second week of germination with larger stems and broader leaves as compared to other accessions. Variation was observed for leaf color i.e dark green, green and light green.

Germinating stage at screen or green house of NIGAB

DNA Extraction

Variation was also observed for leaf shape i.e broadly ovate leaflets with cordate or deltoid primary leaves. Variation is observed for flower color i.e lavender, white, cream, lilac, purple, white with lilac shade, lilac with dark purple stripes at outer side of standard petal. Plant growth habit varies from indeterminate bushy or prostate vine to indeterminate erect vine. Aphid attack was observed at initial vegetative stage in 48 accessions in which five were severely affected while 49 accessions showed resistance. However, detergent wash and insecticidal spray at proper time had reduced the pest attack.

10 Livestock

10.1 Dairy Value Chain

10.1.1 Exploration of Mastitis prevalence using Electronic Mastitis Detector in hilly areas of Pakistan

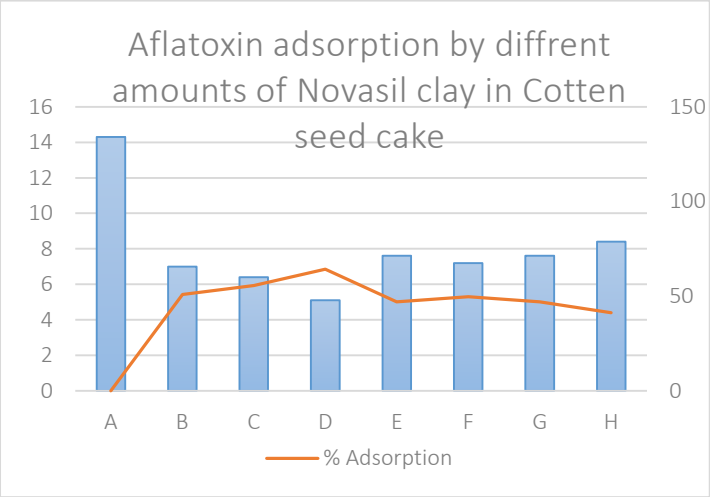
AIP-ILRI conducted a survey during Sep-Oct 2017 on the ''Prevalence of mastitis by Dramiński electronic mastitis detector" at tehsil Barikot and Khwazakhela district, Swat. Mastitis is the most dreadful disease confronting dairy industry throughout the world particularly Pakistan due to sub-clinical cases. During the survey, the detector was used to determine mastitis rate by taking few streaks of milk in the cups of detector. A total of 82 farms having 72 buffalos, 22 cattle and 42 cross breeds were checked. Among 136 animals, 114 were healthy while 22 were mastitis affected and accurately detected by the device. Samples from infected and normal teats were analyzed completely for percent compositional values of protein, fat, lactose and pH through Lactoscan Milk Analyzer from VRDI Swat. The farmers will benefit from clearly identifying clinical mastitic status (acute, sub-acute and chronic), and take necessary precautions.

10.1.2 Aflatoxin total ELISA and Curtailment Potential of Novasil Clay as a Toxin Binder in Cotton Seed Cake

AIP-ILRI conducted a research trial at the Animal Nutrition Lab, NARC Islamabad, in December 2017 by using Aflatoxin total ELISA kit. The fungi, Aspergillus produces Aflatoxin B1, which contaminates the animal feed and its toxic metabolite Aflatoxin M1 excreted in the milk that is carcinogenic for human consumption. The main intend of the study was the effective use of clay in binding toxins present in animal feed. For the effective reduction or prevention of the mycotoxicity in the feed stuff, Novasil clay toxin binder was used as an adsorbent of AFB1. The six groups of cotton seed cake (CSC) having different levels of clay within the range of recommended dosage, along with a blank group named A, were tested. In this study primarily, all the groups were treated with 70 percent methanol solution as per protocol and activated charcoal was taken as control to compare the results of clay binding capabilities.

Front 2 teats are normal; Rear 2 are subclinical

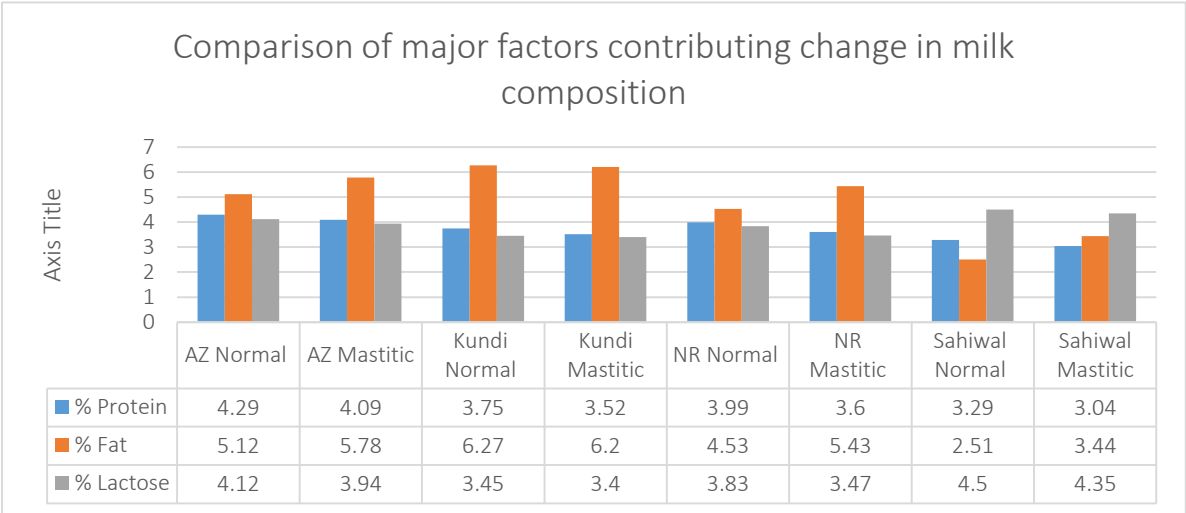
Milk from all 4 teats are normal



Group	Sample
A	CSC
B	CSC +Charcoal
C	CSC+0.1 % NC
D	CSC+0.25 % NC
E	CSC+0.5 % NC
F	CSC+0.2% NC
G	CSC+1% NC
H	CSC+ 2% NC

CSC: cotton seed cake
NC: novasil clay

Charcoal containing group B showed 50 percent adsorption and reduced half of the total amount of Aflatoxin present in the sample. According to analysis results, the adsorption of Novasil clay is vertically higher than the activated charcoal within the given range of recommended level in group C & D. By increasing the amount of clay, AF absorbability decreases peculiarly as shown in group E to G, however, without extracting CSC with methanol solution (group H) clay is still working. This is strengthening the analysis objective of Novasil clay in terms of toxin binder. These results urge the researcher for the earnest analysis and further animal trials. Adaptability of animals with this binder will help in reducing the milk contamination of Aflatoxin transferred from the feed. It is planned to conduct an animal trial with 30 lactating animals to test the efficacy of this binder.



	AZ Normal	AZ Mastitic	Kundi Normal	Kundi Mastitic	NR Normal	NR Mastitic	Sahiwal Normal	Sahiwal Mastitic
% Protein	4.29	4.09	3.75	3.52	3.99	3.6	3.29	3.04
% Fat	5.12	5.78	6.27	6.2	4.53	5.43	2.51	3.44
% Lactose	4.12	3.94	3.45	3.4	3.83	3.47	4.5	4.35

10.1.3 Phenotypic and Molecular characterization of Azikheli Buffalo in Swat valley KP

AIP, ILRI in April 2017, with the collaboration of Livestock Department of KP province conducted first ever Azikheli buffalo beauty and milk competition in Khawazakhela swat. The objective was to create awareness among the researcher regarding this buffalo and to work on it in future. In October 2017

Phenotypic data and hair follicle sample collection for Molecular Characteristics of Azikheli Buffaloes

AIP-ILRI conducted a research study on "Phenotypic and Molecular characterization" of Azikheli Buffalo. Specially designed data recording form was used to obtain phenotypic characteristics of all important parameters, while tail hair samples were collected for molecular characterization. The hair follicle samples were sent to the ILRI lab in Beijing China. A total of 60 Azikheli buffaloes samples were collected along with phenotypic data at a ratio of 1:2 with male and female. Comparison of the phenotypic and molecular data will provide us the gene map of the Azikheli buffaloes.

10.1.4 Setting New Standards for Productivity through Innovation for Widows and Poor Female Livestock Farmers in Disaster Prone Areas of District Bagh, AJ&K

AIP-Livestock on October, 5, 2017, organized a capacity building program for widows and poor female livestock farmers in district Bagh in collaboration with L&DD, AJ&K IRP. More than 400 participants (95 percent female) including several civil society members from NRSP, Save the Future and other reputed organizations attended this event. As a contribution from IRP, in early 2017 they have distributed 70 cows costing PKR 150,000 in this district. AIP-livestock provided the specially designed feeding chart, and distributed food graded water troughs (300) and milk-in cans (200) to 200 livestock farmers belonging to various villages of District Bagh. Distribution of feeding to five dairy farmers is an initiative to encourage other farmers in the community to adopt semi-commercial dairy farming.

10.1.5 Sensitizing Marginalized Dairy Farmers in FATA on Strategic Feeding and Management

AIP-Livestock in collaboration with L&DD, FATA conducted a series of farmer awareness and training programs titled "Maweshi Pal Kisanoo ka Din" in the four different agencies of FATA; namely Bajawar, Mohmand, Khyber and FR Peshawar Agency.

Bajawar Agency

The first farmer day in FATA was conducted in Bajawar khar on October 27, 2017. More than 250 farmers participated in the program, and the Veterinary officers and Additional Director/L&DD FATA also attended the program. The importance of free access to water, balance feeding and performance of Rhode grass in Bajawar was discussed. Feeding charts (200) as a guide for balanced feeding of cattle and buffaloes, water troughs (200) and the especially designed treble purpose milk-in cans (200) were distributed to 200 farmers.

Mohmand Agency

AIP-Livestock conducted a farmer awareness cum training program on November 27, 2017 in Mohmand Agency in collaboration with L&DD/FATA. A total of 37 farmers along with five veterinary doctors, five Veterinary assistants and Assistant Director L&DD of Mohmand Agency FATA attended the program. Previous activities conducted in Swat, KP and Bajawar agency were shared with the participants. Balanced feeding using the feeding charts, importance of free access to water and its effect on milk production of dairy animals were discussed. Feeding charts (37) as a guide for balanced feeding of cattle and buffaloes, water troughs (37) and the especially designed treble purpose milk-in cans (37) were distributed to increase the milk production and produce hygienic milk.

FR Peshawar

The third farmer's day was conducted on November 28 at Peshawar with the collaboration of Livestock Department Peshawar. More than 200 farmers participated in this farmer day, including veterinary doctors, assistants and Assistant Director Livestock. Balanced feeding using the feeding charts in Urdu language was briefly discussed with farmers regarding animal feeding for high production. At the closing session 130 water troughs and 30 hygienic milk-in cans were distributed among the 130 farmers.

Khyber Agency

AIP-Livestock on November 29, conducted the fourth farmer awareness cum training program at Khyber Agency (Agriculture Center, Barra) in the collaboration with the livestock department of Khyber agency. The theme was to share the results of past activities of AIP in other parts of FATA and KP province, and to create awareness on the importance of balance feeding, free access to drinking water for animals in lactation and improved forage varieties in FATA. A total of 46 farmers participated along with veterinary doctors, veterinary assistants, Agriculture Director and Assistant Director of Livestock Khyber Agency. Farmers were made aware on the importance of free access to drinking water on animal milk production and the outcomes of farmer participatory trials conducted by AIP on balanced feeding. Almost 95 percent of the farmers in Khyber agency told that they are giving water in a small bucket once a day (10-20 liters). This was followed by the discussion on the feeding charts on the importance

of balance feeding as well and ways to reduce cost of production of milk. AIP-ILRI distributed the 35 water troughs and 16 milk-in cans to 35 deserving farmers.

10.1.6 Edification of Livestock Farmers concerning Animal Health and Disease Prevention Practices

AIP-ILRI in collaboration with the L&DD, ICT conducted awareness cum training program on animal health and disease prevention practices on 22 February 2018 at Dhok Sheikhan, Islamabad. The program was intended to ascertain dairy farmers about adequate farm hygiene, managemental criteria (clean animal housing, dung disposal, quarantine or isolation of sick animals), and alertness to disease symptoms, biosecurity, vaccination practices and health planning measures. In this program, 25 dairy farmers from the vicinity participated and open-ended questions were answered through mutual discussion. The ultimate output of this effort is better production and reproduction practices of dairy cattle and buffaloes.

10.1.7 Illuminating Animal Health benefits and Disease Prevention Practices for Farmer's amelioration

AIP-ILRI in collaboration with L&DDD, ICT, and Islamabad organized a one-day famer training and awareness program on March 13, 2018 at Golra Sharif, Islamabad. The program is aimed to intricate the effectiveness of general hygienic practices, proper farm management and disease prevention measures. A total of 50 farmers joined the training and were guided through a prepared checklist with non-leading open-ended questions to ensure completeness of purpose.

10.1.8 Farmer's Prudence for Health Gain and Disease Prevention Measures in Livestock

AIP-ILRI in collaboration with the L&DD, ICT on March 14, 2018 arranged awareness cum training program on animal health and disease prevention practices for the livestock at Burma Town Islamabad. The face to face follow-up discussions held with almost 65 farmers about disease outbreaks and vaccination strategies which were interactive and participatory. The farmers learned that how to avoid some management disorders (lack of appetite, nasal discharges) by simple practices and disease diagnosis by different changes in animal behaviors compare to normal routine.

10.2 Small Ruminant Value Chain

10.2.1 Performance and progenies of the Bucks distributed to Women farmers in Bahawalpur

AIP-Livestock conducted monitoring exercise with those farmers who received bucks in May 2017. Of the 30 bucks distributed, 1 had died and 2 others were facing some libido issues, the remaining bucks have gained weight and performing extremely well. On an average, each buck has served 72 does, and

the highest number of does served by one of the buck was 220. The spin off from providing **30 bucks** was that **675 goat** rearing farmers from **88 villages** have benefited from the distributed bucks. Average radius of service provision was 10 kilometers. Conception rate and twining percentage was observed at 98 percent and 50 percent, respectively. Weight of kids from AIP-Bucks at the time of birth was much higher than those from local bucks (**5.9 kg versus 2.9 kg, respectively**), and the economic benefit of using improved buck is estimated at PKR 5,000 at 1-day kid stage (PKR 3,000 vs. 8,000). In 2016, AIP-Livestock arranged a visit for goat rearing farmers to visit goat show organized by AIP which gave them exposure to the other breeds (Beetal Makhi Cheeni).

Bucks provided by AIP-Livestock

Kids born to bucks provided by AIP

10.3 Radiating the Livestock Health Management by Training of Volunteer Female Farmers in Southern Punjab

Cholistan is bestowed with a significant livestock wealth. The outstanding livestock breeds of Cholistan are world renowned and majority (over 90 percent) of livestock rearing is done in villages specially by women, in smallholdings ranging from 1-2 buffaloes/cattle, 4-5 goats and a dozen or so poultry. AIP, ILRI took different initiative to improve the smallholder livestock producers by providing health knowledge about livestock farming. This will make them market oriented by sensitizing mastitis and other disease's sign and symptoms to improve their livelihoods. In view of need assessment of women livestock farmers, a training in livestock was organized on March 27 in Lateef Abad, tehsil Mandi Yazman, Bahawalpur in collaboration with KWC, Bahawalpur. The primary passed

Simple domestic tests to confirm disease

volunteer female farmers having small or large ruminants was selected for discussion facilitation. A total of 45 females actively participated in the discussions and practical demonstrations. The program was intended to sensitize the livestock holders about managemental criteria (clean animal housing, hygienic milk production), preventive measures and disease diagnosis by observing the symptoms which animals shown in a season.

Enhancing Women Small Dairy Holder's Sustainability via Training cum Awareness Program on Animal Health and Disease Prevention Practices

Temperature taken by female farmer in goat

AIP, ILRI, on March, 28 and 29, 2018 conducted training cum awareness programs on animal health and disease prevention practices in collaboration with the Bahawalpur, in Haheji and Moza dita Baloch tehsils. About 140 female farmers from Hatheji and 70 from Moza dita Baloch, participated. These events were aimed at women farmer's sensitization to make changes in their daily routines and animal management for better results. This training improved small dairy holder's understanding, on the need to successfully control targeted disease complexes and to immediately report the diseases occurrence to the nearby veterinarians. Seasonal calendars for vaccination and deworming for identified diseases and parasites were also extensively discussed at the community level.

10.3.1 Feed, Fodder and Rangeland

10.3.2 Evaluation of Rhodes Grass Cultivation in Federally Administrative Tribal Areas (FATA)

In March 2017, AIP-livestock established 19 demonstration plots covering nine acres of cultivated area in three agencies of FATA namely Bajaur, Khyber and Mohmand Agency in collaboration with Livestock Department of FATA Secretariat. In these demonstration trials, Rhodes grass shows exceptionally remarkable results and up to **18 tons** per acre biomass production. The farmers have witnessed the 3.5 times more biomass production with 3-6 cuts annually as compared to other grasses including Shaftal, Oats and Natural grasses. AIP-Livestock joined hands with **Farm Dynamics Pakistan** (FDP) for the promotion of high yielding perennial grasses in various areas of FATA in collaboration with the Livestock Department of FATA Secretariat. The main aim of this trial was to grow quality grass with high nutritional value as well as to get maximum green grasses in the summer season when other fodders are unavailable for animals. A total of nine livestock farmers from three different villages were involved in this evaluation and performance trials (9-acre area under Rhode grass cultivation).

- The maximum level of plant height was recorded 62 (inches) at 4th cut, while average height of plant was 30 inches.
- The result revealed that Rhode grass production is FATA is 16 tons/acre/cut on a fresh basis while on dry matter basis yield is 4.5 tons/acre. Compared to other grasses in FATA, the annual biomass production of Rhode grass is 10 time higher.
- By providing timely irrigation and fertilizer farmers can get 6-7 cuts/season with high nutritive value as compared to natural grasses.

10.3.3 Screening of fodder varieties for economic utilization of saline and sodic soils in Southern Punjab

As a pilot project, AIP-livestock identified the district Bahawalnagar area; important dairy hub as well as famous pocket for Beetal goat breed in Pakistan. These identified lands were saline to saline sodic in nature. Initially in July 2017 saline resistant variety Tolgar (Rhodes Grass) was cultivated to gauge the performance as well as estimation of economic returns from this intervention. The results confirm that Tolgar perform well with 12-17 tons per acre/cut biomass production.

In July 2017 forage evaluation trial was established in saline to sodic soils in Bahawalnagar. The performance/productivity of 11 forages (detail is given in below table 8) was evaluated with and without the application of Gypsum, and all cultural/management practices (irrigation, fertilizer) was according to recommended levels and frequency.

Table 8: The comparative performance of these forage species was evaluated in March 2018.

Plot Number	Forage species	Performance evaluation	
		Non-Gypsum	*With Gypsum*
1	BERMUDA GRASS	NO GROWTH	Better growth
2	MOTT GRASS	BETTER compared to other grasses	Comparatively good
3	RHODES GRASS	Good	Very Good
4	ECHINOCHLOA	NO GROWTH	POOR/NO GROWTH
5	PARA GRASS	Good	Very GOOD
6	SESBANIA	NO GROWTH	Better growth
7	ALFALFA	NO GROWTH	POOR/NO GROWTH
8	BERSEEM	NO GROWTH	POOR/NO GROWTH
9	MAIZE	NO GROWTH	POOR/NO GROWTH
10	KALLAR GRASS	NO GROWTH	BETTER
11	SORGHUM	NO GROWTH	POOR/NO GROWTH

- Growth of all grasses was significantly improved with gypsum application. It was observed that treated plots were in better condition. Treated plots gain better height, as compared to non-treated with more number of tillers.
- In the non-gypsum plots which received the same application of irrigation and other standard cultural practices it was observed that the crop stand was not impressive. It showed the importance of gypsum and its affect when compared to non-treated plots.
- Best producing grass was Para grass followed by Rhode grass, kallar grass, Bermuda grass, mott grass and sesbania, showing their ability to tolerate salinity.
- While on the other hand minimum production/growth was observed with Echinochloa, Maize, Alfalfa, Sorghum and Berseem respectively.
- Less growth of some salt tolerant grasses like kallar grass and sorghum might be due to the water stress.

10.4 PARC- AIP: Competetive Grants System – Livestock

Under AIP PARC, Competitive Grant a project is implemented by University of Balochistan Quetta. The objective of this project is to **develop an environment friendly biocontrol strategy for the biodegradation of mycotoxin in poultry feed** in order to decrease the chances of mycotoxin

contamination in poultry meat and reduce the death rate of poultry population due to mycotoxin and mycotoxigenic fungi.
The activities were started by sampling collection from two different locations of Balochistan. The poultry samples from poultry farms in Pashin and poultry feed suppliers in Quetta were collected in clean and sterile plastic bags and were brought to laboratory for analysis..

10.5 Under AIP PARC Competetive Grant a project on "Development of rapid and cost effective assays for the diagnosis of prevalent Echinococcal species in Pakistan" is implemented by COMSATS Institute of Information Technology, Islamabad

The objective of this project is figuring out the disease burden of Echinococcosis (Hydatidosis) among the animal species and Human beings, genetic characterization of the prevalent Echinococcal species, designing of assays for strain identification as well as development of serological tools for the detection of the condition in animals or human beings. Activities carried out included sampling from different parts of the Punjab and KP provinces, established collaborations with different universities for carrying out the study by engagement of research students, presented initial disease burden data and importance of Echinococcosis research in Pakistan on various platforms and carried out initial characterization of cysts and Echinococcal species from the animal and human sources.

Sampling activities:

In order to find out the burden of disease in animal species, sampling activities was carried in different parts of KP and Punjab provinces. Different animal species including buffalos, sheep, and goats were sampled for blood and cysts. The cyst samples were collected from various slaughter houses. The targeted districts included, district Swat, Buner, Shangla, Dir, Mardan, Kohat, Lakki Marwat, Rawalpindi, Gujranwala and FATA region.
For estimation of disease burden and cysts collection from the human sources, collected cysts and blood samples from the Thoracic and abdominal surgery units of various healthcare units including PIMS, Lady-Reading Hospital Peshawar, North-west General Hospital Peshawar, Shifa International Hospital Islamabad, Khyber Teaching Hospital Peshawar, Saidu Teaching Hospital Swat and Mardan Medical Complex Mardan.
The blood samples of people belonging to the high risk groups including abattoir workers, veterinary clinicians, animal farm workers, butchers were also collected, which will be further analyzed by serological assays.

Conferences and Workshops:

In order to share data with researchers from different parts of the country and to promote research in zoonotic diseases such as Echinococcosis, activities of the project was presented under the title ' Echninococcosis; Burden and Research in Pakistan' during the two days conference on ' PARASITES: A SERIOUS THREAT TO HUMAN AND LIVESTOCK' on 14th & 15th March 2018. The work was also presented during the First International conference on strategies for therapeutics, control and Prevention of Dengue and other infectious diseases in Pakistan' held on March 1&2 at the University of Swabi, KP province. The conference was jointly organized by HEC, University of Swabi and CIIT Islamabad. During both events, targeted audience was students and researchers numbering up to 1200.
Activities update:

A. Morphological Characterization of Cysts

The collected cysts were morphologically characterized based on their appearance as unilocular, multi-locular, dimensions and appearance. Morphological characterization of cysts is necessary for furthering molecular work. In each case, the source of the cyst, its internal location in different organs was documented.

B. Characterization of the cystic Fluid and its antigenic potential

For characterization of the cystic fluids aspirated from the collected cysts, the standard protocol (Results) was used. Currently, project is purifying different bands from the Poly-acrylamide gels and evaluating their antigenic potential to diagnose the condition in blood samples collected from cyst-positive animals.

C. DNA extraction

Since sampling of the cysts was started from animals and human sources, project is continuously using the hydated cyst fluid (HCF) for extraction of Genomic and Mitochondrial DNA in each case using the commercial column-based DNA extraction Kits as per manufacturer's instructions.

D. PCR for Identifications of species and strains.

In order to identify various Echinococcal species from the cyst contents using the extracted DNA, Type-specific PCR or PCR-RFLP technique are employed. (Ali et al., 2015).

E. Amplification of Mitochondrial genomes

Currently, amplification of the mitochondrial genomes started and designed primers for amplification of various genes and have them synthesized. Project is optimizing conditions for their amplification and sequencing at the moment.

11 Socioeconomics

The socioeconomics component of the agricultural innovation program for Pakistan completed four studies during October 2017-March -2018. The details of the completed studies are as under

- Economic Impact of the Maize Germplasm Investment in Pakistan
- Agronomic Performance of the quality protein maize (QPM) hybrids in Pakistan
- Wheat Value Chain in Pakistan
- Maize Value Chain in Pakistan

Economic Impact of Maize Germplasm Investment in Pakistan

The maize component of the AIP has distributed maize germplasm to 16 public and private partners in Pakistan since the start of AIP project. The main objective of the current study was to estimate the potential economic impact of the maize germplasm investment in Pakistan. The questionnaire was developed included a number of questions regarding the partner's overall profile, seed production, sales information, maize seed prices, number of entries tested (provided by CIMMYT under AIP) as well as business outreach of the company. In total the data was collected from 16 public and private partners as presented in table 9.

Table 9 Selected Interviewed Partners

Public sector Partners	Private sector Partners
Department of Agricultural Research Gilgit	Sohni Dharti International
Agricultural Research Station Dadu	Hi Sell Seed Industry
Maize and Millet Research institute Yusafwala, Sahiwal	Tara Crop Sciences (Pvt) Ltd
CCRI Pirsabak Nowshera KPK	Kanzo Quality Seeds
Department of Agriculture AJK, Muzaffarabad	ICI Pakistan
Directorate of Cereal Crop ARI, Quetta	Petal Seed Company
Muhammad Nawaz Shareef University of Agriculture Multan	Ali Akbar Group
National Agricultural Research Centre, Islamabad	Jullundur Private Limited

The empirical findings indicate that overall maize germplasm investment made by AIP-maize to strengthen public and private partners for local maize seed production will have positive impact that is to strengthen public and private partners for local maize seed production. The germplasm investment will have significant impact in near future on Pakistan maize seed industry. The germplasm introduction to public and private partners have saved approximately 5 years as presented in table 10. The maize companies are also expecting an increase in their business volume and in couple of years the varieties will be ready to release by the partners, and will be available in the local market.

Table 10: Impacts of Germplasm Investment		
AIP Germplasm Impact	Public	Private
Time saved due to AIP germplasm (years)	5.33	4.29
Business volume (seed) increased (tons/year)	5.73	96.67
AIP germplasm varieties ready to release (Months)	24.80	39.00

Key Outcome of Maize Germplasm Investment

- The maize seed prices are expected to decrease by 2-3 US$ per kg due to local seed production
- The local production of the maize hybrids will help to save the foreign exchange current amount to 65 million US$
- The reduction in seed prices will lead to wider adaptability of the maize hybrids especially by small farmers
- The wider adaptability will eventually lead to more production
- Due to availability of the reduced price seed the overall cost of the production will also decrease

12 Agronomic Performance of the Quality Protein Maize in Pakistan

In order to document the agronomic performance of quality protein maize varieties (QPM) in Pakistan the data was collected from 50 farmers who cultivated QPM maize varieties. The details about sample are presented in table 11. A comparison of the QPM maize varieties with traditional varieties was carried out. Information on number of household and farm level characteristics was collected. The sampling frame of the study included Punjab, KP provinces and AJ&K.

QPM Data Collection in Gojra (T.T.Singh)

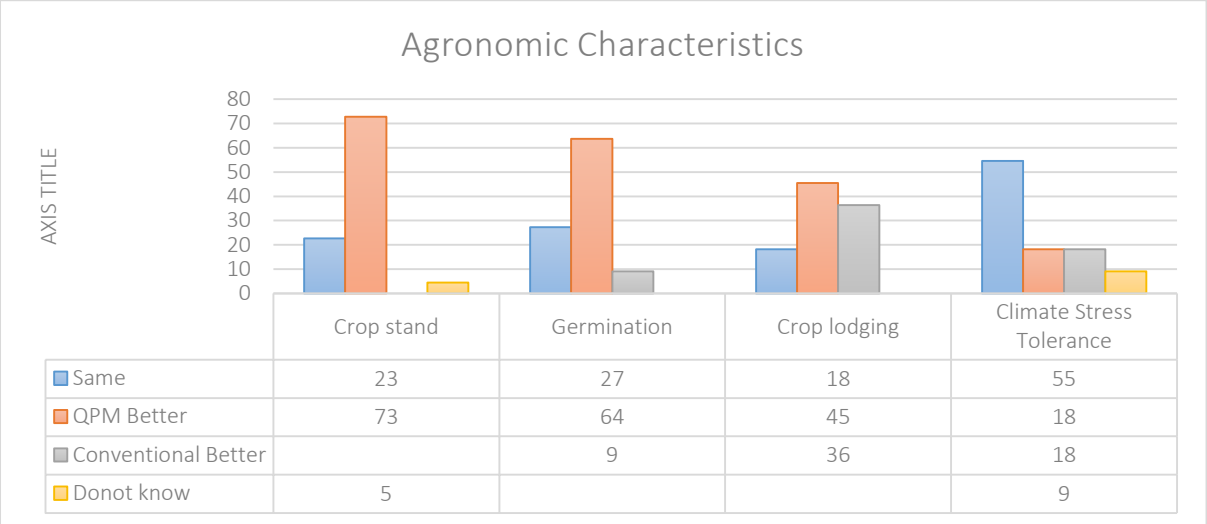
The key findings of the study are as follows;

- Majority of the farmers lack awareness about QPM maize hence they need information and guidance about the production technology. The information can be disseminated through effective extension education as well as through field days, flyers and brusher's etc.
- As this was only second year of QPM introduction in Pakistan, the farmers have allocated very less area to QPM maize i.e. 0.25 to 1 acre. The extension education can help to increase the area under quality protein maize varieties provided the availability of the seed.
- The agronomic performance of the QPM maize indicates that it is very much compatible with the conventional maize and in some aspects even better.
- The germination of QPM maize is higher as compared to conventional maize indicating that QPM can be helpful for getting good yield as it will maintain greater plant population.
- The QPM is good in color and taste and also liked by the livestock as fodder

Table 11: District Wise Distribution of Sample		
Districts	Frequency	Percent
Mansehra	6	12.0
Okara	4	8.0
Pakpatan	9	18.0
Sahiwal	7	14.0
T.T.Singh	7	14.0
Vehari	5	10.0
Qasoor	1	2.0
Rawalpindi	1	2.0
Poonch (AJK)	8	16.0
Bagh (AJK)	2	4.0
Total	50	100.0

- The cob size of QPM is better as compared to conventional maize but the yield of the conventional maize are higher as compared to QPM maize (9 percent) hence more efforts are needed in this direction
- The cost benefit ratio of the QPM maize is 1.043 while that of the conventional maize is 0.702 indicating that QPM maize is quite compatible with the conventional maize.

Below chart presents the comparison of the QPM maize as well as convention maize indicating that QPM is quite compatible with the conventional maize and even better in certain aspects.



	Crop stand	Germination	Crop lodging	Climate Stress Tolerance
Same	23	27	18	55
QPM Better	73	64	45	18
Conventional Better		9	36	18
Donot know	5			9

13 Wheat Value Chain in Pakistan

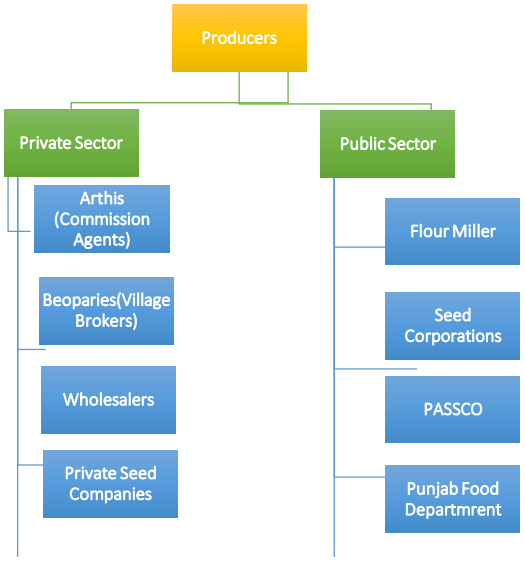
The third study completed was on Wheat value chain. Main objective of the study was to identify incentives, bottlenecks, constraints and key roles of all actors involved in wheat value chain. Pakistan agricultural storage and services corporation (PASSCO) and other provincial food departments are actively involved in wheat value chain activities in Pakistan. Marketing of wheat is done by the provincial departments, these departments set quotas for wheat supply based on milling capacity as well as restricting inter district mobility of wheat to reduce illegal exports, particularly to Iran, India, Afghanistan and other central Asian countries. In Pakistan the import of wheat is mostly done by the trading corporation of Pakistan if needed due to shortage. Value addition in agriculture involves altering a raw agricultural product through different processes including packaging, processing and other activities that differs from commodity to commodity into something new value added product. This value addition process increases economic returns, price and economic value of commodity. Pasta and bakery products are the examples of value addition in wheat. The government of Pakistan is involved in pre-production steps of wheat value chain which mainly comprises the distribution and research. Inputs, production, trade, processing and marketing. The

Data Collection from Mian Channu (Khanewal)

current study is based on comprehensive review and suggest a number of measures which can be adopted to improve the situation.

13.1 Suggestions

- Pakistan could benefit from visionary interventions that build its domestic wheat supply chain.
- Government needs to overcome Pakistan's overdependence on the wheat economy to deal with the issue of food security. The challenge lies in effective intervention in the value chain and by devising new instruments to achieve the goals.
- Structural reforms such as land organization, stable input markets, functional government policy making apparatus, and efficient institutional frameworks to support and implement a new vision for the future are long overdue interventions needed to achieve sustainability of wheat economy.
- Establish a national wheat board that operates at provincial and federal levels, like those in other Asian and Pacific countries (e.g., the Australian Wheat Board). Such a board in Pakistan could be a professionally managed public–private partnership involved in procurement, storage and logistics, or by creating a public listed company/organization.
- Quality assurance and product traceability, facilitated by information technology (IT) across the supply chain, would strengthen and coordinate the supply chain for in time delivery and inventory management
- A modern, comprehensive national agriculture policy is needed that favors the private sector and developed by genuine involvement of stakeholders.

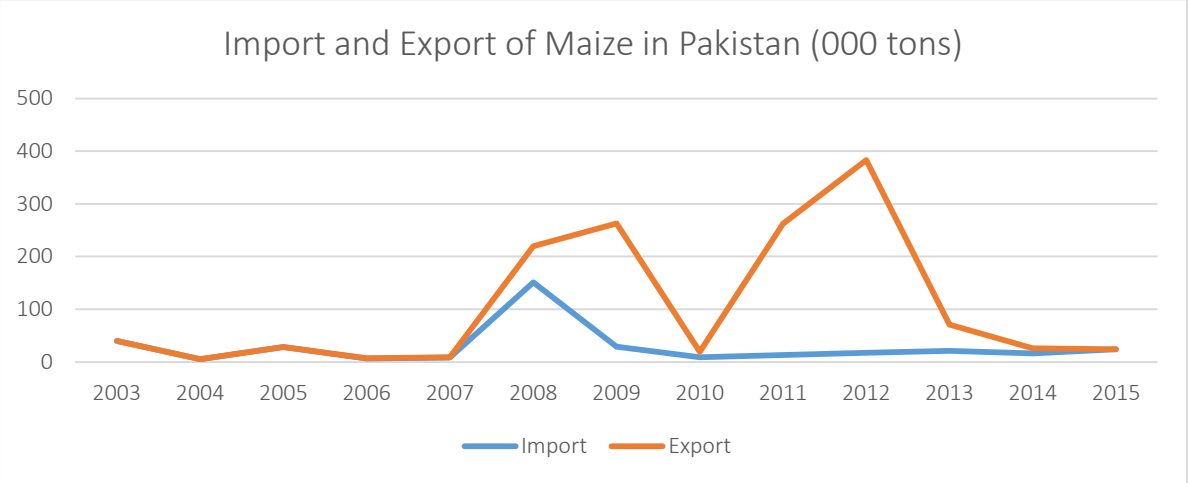


Wheat Value Chain in Pakistan

14 Maize Value Chain in Pakistan

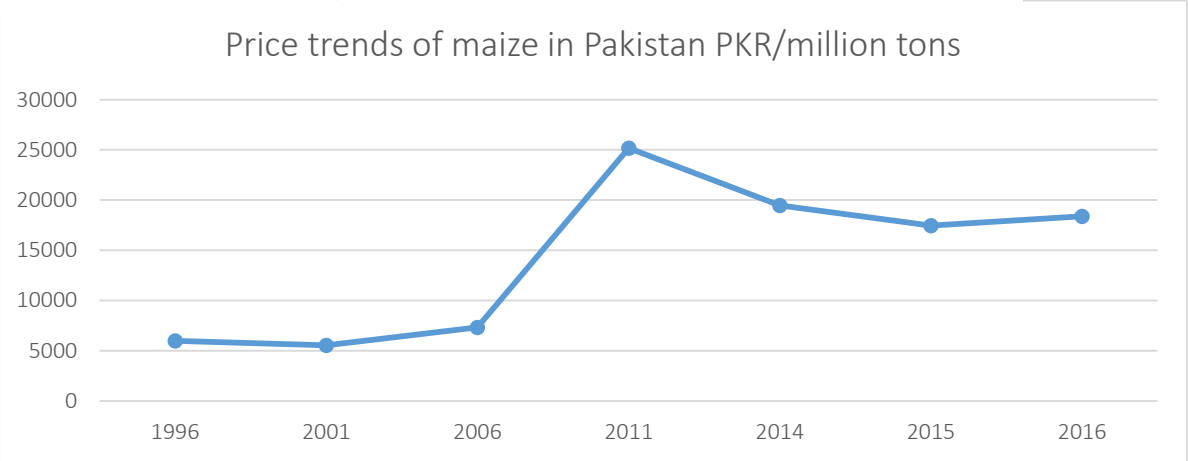
The fourth study completed by SEP component of AIP focused on maize value chain in Pakistan. In fact the maize value chain consists of two sub value chains i.e. maize input value chain and maize output value chain. The actors involved in maize input value chain are maize breeding unit, commercial seed production, seed distribution and sales, farm level maize producers as well as seed and produce marketing unit etc. The actors involved in maize output value chain include processors (producing feed, food and other products), processed product's marketing unit and end consumers. The current study is basically review study and focuses on identifying the gaps and weakness in linking different actors

(Farmers, Breeding Institutes, Seed Companies, Processors etc) playing their respective roles in maize value chain. The study findings suggest that how maize production can be enhanced making value chain more efficient.

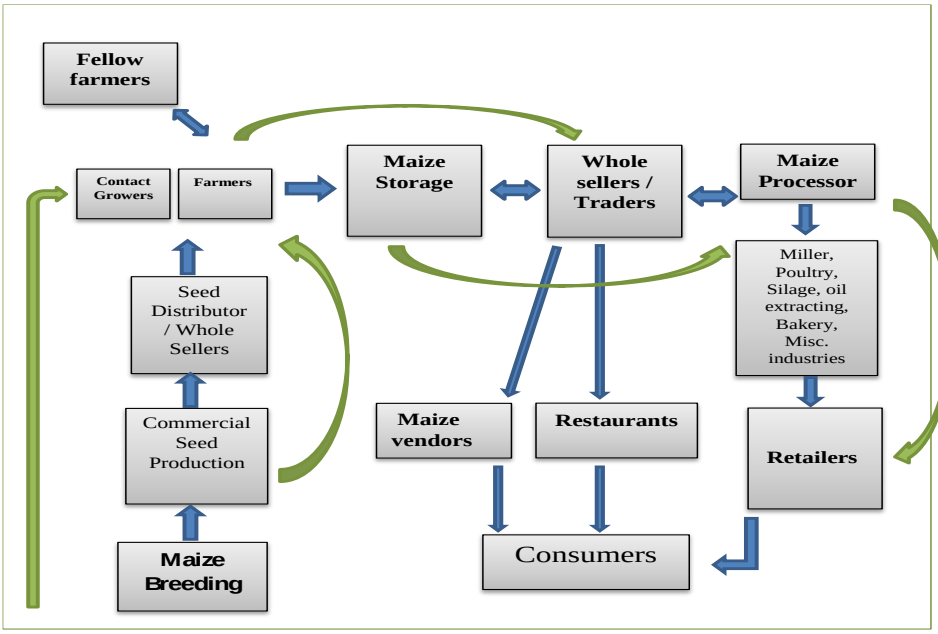


Import and Export of Maize in Pakistan (USDA, 2015)

Similarly over the years the price trends of the maize are presented as follows



Price trends of maize in Pakistan (USDA, 2016)



Over the years the import and export trends of the maize are presented in the below figure. The reduction in the prices of the hybrid maize seed can help to increase the area under maize which in turn can leads to increase in production as well as can reduce the cost of production. The recently practiced contract farming by Rafhan in the Sindh province can also encourage the farmers to allocate more area under maize. As more than 70 percent maize produced in Pakistan is consumed in the poultry sector hence the linkages needs to be strengthened (GoP, 2016)

15 AIP Monitoring and Evaluation Semi Annual Report

AIP M&E is working to improve current and future management of outcomes and impact of all the intervention made by this project. The active functioning of the AIP- M&E will help in improving performance and achieving results by establishing links between the past and future accomplishments. AIP-M&E collected data from all existing partners i.e. Wheat, Maize, Agronomy, IRRI and ILRI including PARC-AIP grants funded during reporting period according to performance indicators on quarterly basis and reported to USAID on Pakinfo.(see attached annex 21.1 for detail)

16 Competitive Grants systems

Under Competitive Grant of AIP, PARC 40 project are in implementat5ion phase and their details are given under relevant section of the report.

17 PERSONNEL/MANAGEMENT UPDATE

Under Wheat Ghulam Ullah, a Research Associate, Wheat transferred to Islamabad office during the reporting period. Under AIP-Livestock five RAs resigned (Dr. Shafqat Rid, Dr. Nadar Khan, Ms. Roheela Amir, Mr. Zeeshan Mustafa and Mr. M. Shakeel Ashraf) to take up longer term positions. To fill in the gap two DVM graduates were appointed in March 2018 as consultants. In December 2018, the two DVM intern students from University of Agriculture Peshawar completed their internship assignments under AIP-Livestock.

17.1 EXTERNAL FACTORS

- Getting visa for resource persons coming from outside of Pakistan remains a hurdle to conduct planned trainings.
- Recently introduced complicated procedures for germplasm import permit issuance are creating hurdles in routine-wise import of germplasm.
  Favorable environment in all provinces to execute livestock activities, except FATA (only minor activities such has forage seed distribution, monitoring, and distribution of water troughs and milk cans.

17.2 Challenges/Risk

- Security risks particularly in Sindh and Balochistan remains a concern.
- Under Wheat in case of fungicide demonstrations if there was no rust attack the purpose of demonstration will not be accomplished. In Sindh inoculation is also not recommended due to spread of stem rust pathogen.
- The pending INGO issues of ILRI and the delay in getting NOC for the Host Country Agreement between GoP and ILRI have created the hindrance in actively working with livestock farmers in FATA. However, AIP-livestock has started their activity through the collaborators and/or aligned departments to reach the small herders in the most difficult of parts of Pakistan.

- Under competitive Grant AIP, PARC the following challenges were documented
- The fear of poultry farmer regarding sampling and other information discloser was also found as a constraint. The supply of chemicals through proper channel made somehow delay in the project activities which was overcome by adopting different strategies.
- Under Agricultural Research Station Baffa, Mansehra project on Pome Fruits Rootstock Production in the Agro-climatic Zones of Hazara Division stated that the farming community is associated with mono cropping and extensive cultivation for decades. Pome fruits' Orchard in Mansehra are negligible, except natural vegetation on the marginal lands. They believe that orchards plantation is a long term investment.

18 CONTRIBUTIONS TO USAID GENDER OBJECTIVES

AIP encourages the participation of women in all possible ways.

- Under wheat during the reporting period 22% women were benefitted with seeds of newly released and high yielding Wheat varieties. Also 4% women participated in various trainings on Wheat production and capacity building activities.
- The availability of inferior breeding bucks and farmers preferences to sacrifice their best animal for Eid after castration of male bucks; further worsen the prevailing conditions. Therefore, AIP-livestock in collaboration with Khawateen Welfare Council distributed 30 superior breeding bucks for community based small ruminant breeding services. In the follow-up monitoring and evaluation activity conducted by AIP-livestock in December 2017 revealed that more than 600 woman livestock holders have benefited from the breeding buck services.
- USAID funded AIP-Livestock in collaboration with Khawateen Welfare Council (KWC) organized a Animal health care, prevention and control awareness cum training program where more than 150 woman were trained on animal health care and prevention practices
- AIP maize is evaluating protein and vitamin A enriched maize varieties in Pakistan. Apart from their grain yield advantage these germplasms will provide protein and other crucial micronutrients with particular importance to women and children to mitigate malnutrition and attendant diseases. Vitamin A deficiency is seriously effecting the health of women and children. In this regard three ProA enriched maize hybrids have been allocated to University of Agriculture Faisalabad for commercial production. These hybrids, once approved by the national system, believed to increase the availability of low cost biofortfied foods in the market which in turn contributes for the nutritional wellbeing of women, children and other deprived communities. The various AIP maize activities also created job opportunities in fields for women during the reporting period.
- Under the project of detection estimation of mycotoxigenic fungi and mycotoxin present in the poultry feed in Balochistan region is implemented by department of Microbiology University of Balochistan Quetta. Two female are doing their MPhil research in this project and are getting skills and experiences form the activities of this project, which they can utilize in future practical life.
- Under project of optimizing water and nitrogen application through hydro priming, moisture stress and nitrogen managements in wheat, a female Principal Investigator (PI) is running a project and involved a female labor on daily wages for different field operations and cultural activities like weeding and harvesting.
- Under the competitive grant, AIP, PARC the project on vegetable, two female students have been enrolled in M.Phil while third female student in Ph.D research work in addition to one male student in M.Phil degree program.

19 ENVIRONMENTAL COMPLIANCE

- Under Wheat in Barani areas drought tolerant varieties distributed which require less water. This practice remains effective with water shortage in the coming scenarios. AIP out scaled newly released, rust resistant and high yielding wheat varieties, this will eventually minimize the use of pesticides, which is both hazardous to environment as well as humans and animals. There will be no adverse environmental impact of growing these wheat varieties in Pakistan.
- 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. AIP partners are able to produce high yield from drought tolerant varieties in less than five irrigations per crop cycle which are commonly 10-12 irrigations per crop cycle.
- 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 germplasm developed through non-conventional ways such as genetically modified organism (GMO).
- In agriculture, nitrous oxide is emitted when people add nitrogen to the soil through the use of synthetic fertilizers and it is volatized into the atmosphere. The impact of one pound of nitrous oxide is 300 times as potent as one pound of carbon dioxide. AIP is evaluating nitrogen efficient maize to reduce the need for fertilizer. The target is to reduce the use of chemical nitrogen fertilizers by 75% and to get a comparable grain yield with well fertilized soils. For instance, if the current nitrogen application is 200 kg per ha, these varieties are expected to perform well with the application of only 40-50 kg per ha. These varieties will not only save farmers money, but could potentially significantly reduce greenhouse gas emissions.
- Extensive use insecticides, pesticides and fertilizers are also huge source of soil and under-ground water pollution. AIP is facilitating the Identification and deployment of insect pest resistant and fertilizer efficient utilizing genotypes which will definitely help to mitigate the environment pollution.
- Similarly, varieties included under the stem borer tolerant trials will have significant environmental impact by avoiding or reducing chemical pesticides. Based on field evaluation partners identified best adapted low nitrogen stress and stem borer tolerant maize varieties.

  Under AIP PARC Competitive Grant a project on Tomato, no pollution / environmental hazards are foreseen. The development of tomato hybrids/cultivars tolerant to disease would reduce number of chemical spray, cost of production eventually generating friendly atmospheres to producers and consumers.
- Under Wheat the project has no detrimental effects on environment rather it would minimize pollutants in atmosphere leading to climate change as well as ground water reservoirs contaminations. As application of reduced fertilizer and quantity of water would minimize risks of unwanted weed species, insects, pests and diseases besides fertilizer depletion and volatilization at large scale.

20 COMMUNICATION

In this reporting period AIPs' communications highlighted the program interventions which included arranging successful events and maintaining media presence. Under AIP, due emphasis has been given to communicate the project activities to national and international stakeholders following the branding

and marking guidelines approved for AIP particularly to 40 newly awarded competitive grants partners. Mediums used to communicate the AIP activities are listed below:

- Electronic & print media (new USAID TV campaign, print media news)
- Publications (calendar 2018, research papers, certificates, , banners, standees, backdrops)
- Social Media (Flicker, Facebook, Twitter)
- Web-media
- Events

Branding material of Maize, Wheat, Agronomy, Rice and Livestock was produced according to USAID approved AIP branding and marking guidelines. These include banners, backdrops and standees for various events under these components. Photographic coverage of all events and official visits was done and uploaded for future reference.

USAID/Pak Economic Growth Team visit to NARC/AIP to Wheat fields, Maize stem borer rearing lab and Gene bank: Photo coverage and news published:
http://www.cimmyt.org/usaid-delegation-visits-cimmyt-pakistan-office/

The link to the tweet about the story, in which #USAID was tagged:
https://twitter.com/CIMMYT/status/968957516192321536

USAID Cook's Challenge – TV Show: This show will highlight USAID/USG interventions in rural areas and will have the implementing partners, beneficiaries and general public of that area as an audience. The idea is that two cooks will be going around Pakistan to various USAID/USG program's locations, cook some regional food for the audience and then talk about USAID transforming lives. The show is in post-production and will be aired in 2nd quarter of year 2018.Cook's challenge wrap-up episode was recorded in NARC premises featuring U.S. Pakistan relations in agriculture sector. Deputy Chief of the U.S. Mission (DCM) in Pakistan, Mission Director of USAID Pakistan and Chairman PARC joined in the cooking show.

Agronomy:

Additionally, AIP interventions were picked up by national media such as an article in leading daily publication Dawn newspaper highlight importance of ZTHS: (Rice-Wheat cultivation area) intervention: E-edition: https://www.dawn.com/news/1374300


DAWN

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'Happy Seeders' to help tackle smog

Amin Ahmed | December 04, 2017

IN 2014, a multicrop zero tillage planter for rice and several zero tillage 'Happy Seeder' machines were imported from India under the Agricultural Innovation Programme (AIP).

Two brochures/manuals related to innervations were published with amendments:

- Zero Tillage Happy Seeder (ZTHS)
- Dry Seeder Rice (DSR)

Maize:

Similarly 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:

- For Annual Maize Working Group Meeting 2018 design program agenda, invitations, visibility material for partners and value chain actors and photographic coverage of the event. https://www.flickr.com/photos/cimmytpakistan/41069809955

- Poster on "Maize Yield and Agronomic performance of QPM hybrids" designed and printed as per USAID guidelines of branding & marking presented in Mexico, LACC
- Photo coverage of Maize Double Haploid seed handing over to MMRI-Yousafwala and University of Agriculture (UAF), Faisalabad.

Livestock:

- 4 news insertions in newspaper
- Media Coverage on Azikheli Buffalo Beauty and Milk Competition is given below:

Wheat:

- USAID media campaign "Cooks Challenge":

AIP Wheat interventions in formation of Farmers Seed Groups, Storage of wheat seed and wheat seed grader provision in Pind Dadan Khan, Punjab province were highlighted related to the component in recording of the TV program series produced by USAID.


- Dr. Hans Braun, Global Wheat Program Director CIMMYT Int. accompanied by Program Leader AIP Dr. Md. Imtiaz visited to the wheat field in Pind Dadan Khan to attend Kissan Day. The event was covered in photographs followed by news. Zincol and other wheat variety were focused in both irrigated and rain-fed areas: https://www.flickr.com/photos/cimmytpakistan/sets/72157665454855297

Vegetable:

AIP Competitive grants partners' MNSUAM have many news appeared in electronic and print media. 17 insertion of news in print media were monitored and 4 on electronic media (both radio & TV) were aired.

20.1 LESSONS LEARNED

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

- Processing import permits to get seeds is getting time consuming, hence needs to plan ahead and try to expedite the process through PARC and government of Pakistan.
- The spring trial in Maize was not achieved due to late arrival of seed
- Farmers are enthusiastic to grow new wheat varieties if out scaled properly.
- Village based seed production plays vital role in strengthening informal seed sector ultimately leading to increased productivity.
- There is a need for increasing genetic diversity for grain yield in durum and farmers benefit oriented policy on marketing aspects.

AIP-PARC Competitive Grant Leeson Learned

- Under the project on bean implemented by NIGAB stated that common bean is a naturally diverse crop and it is a good initiative to collect the germplasm from neglected parts of Himalayan region. This germplasm will be exploited for the existence of genetic diversity and will be conserved for sustainable utilization to assist crop improvement. Molecular characterization is the best tool for identification and removal of duplicates. It will help to identify the existence and distribution of different variants of common bean in diverse localities.
- Under the joint project on tomato implemented by of University of Agriculture Peshawar and Agriculture Extension, Balochistan it is stated that the problem of Orobanche sp. in tomato growing areas of KPK and Balochistan was really a major issue for the farmers and the local farmers were interested to solve the problem. It was realized the involvement of the Kissan councilors in the local government program can effectively communicate the findings of the experiments to the farmers and end users.

21 Annexures

21.1 Annex Details of advanced lines from South Asian trials (Heat trials) in provincial/national level trials, 2017-18.

Line Name	Selection	Partner name	Trial name
15C042	SABWGPYT 2014-15	BARI-CWL	**NUWYT 2017-18**
HYT-60-5	SABWGPYT 2014-15	WRI-FSD	**NUWYT 2017-18**
HYT-60-57	SABWGPYT 2014-15	WRI-FSD	**NUWYT 2017-18**
HYT-27-11	SABWGPYT 2013-14	WRI-FSD	**NUWYT 2017-18**
HYT-80-34	SABWGPYT 2013-14	WRI-FSD	**NUWYT 2017-18**
HYT-20-19	SABWGPYT 2014-15	WRI-FSD	PUWYT 2017-18
HYT-20-6	SABWGPYT 2014-15	WRI-FSD	PUWYT 2017-18
HYT-55-33	SABWGPYT 2015-16	WRI-FSD	PUWYT 2016-17
HYT-55-40	SABWGPYT 2015-16	WRI-FSD	PUWYT 2017-18
HYT-20-12	SABWGPYT 2014-15	UoS-Swabi	KPWYT 2017-18
HYT-20-13	SABWGPYT 2014-15	UoS-Swabi	KPWYT 2017-18
HYT-80-44	SABWGPYT 2013-14	UoS-Swabi	KPWYT 2017-18
HYT-20-14	SABWGPYT 2014-15	UoS-Swabi	KPWYT 2017-18
HYT-27-6	SABWGPYT 2013-14	ARS-Swabi	KPWYT 2017-18
HYT-27-7	SABWGPYT 2013-14	ARS-Swabi	KPWYT 2017-18

21.2 Annex Output indicator: October 17 - March 2018

Indicator	Beneficiaries (No)
Number of farmers linked with/benefiting from agriculture extension services through scaled up extension system	962
Number of improved production and agriculture management technologies/practices transferred/made available to farmers	18
Number of demonstration plots/farms/trials established for farmers' awareness on improved agriculture technology and management practices	2997
Number of farmers received information on improved agricultural management practices through demonstrations/field days/trials	12729
Number of farmers and others getting assistance (sperm,) ruminants up take and , seed villages, seed partners, new seed varieties/cultivars/rootstock of cereal, horticultural and agronomic crops transferred to farmers) supported/established to disseminate seed of improved high yielding varieties.	1654
Number of farmers linked with input/service providers for improved production services/inputs	1586

Number of new breeding lines/cultivars/rootstock of cereal and horticulture crops at development stage	785
Number of partnerships developed with input suppliers/companies for development of production inputs/services (PPR vaccine, Semen, new varieties)	23
Number of training events arranged for interventions under different value chains	16
Number of farmers linked with public/private business development service providers (Input supply facilities, industries) through established partnerships	3539
Number of farmer selling products (cereals, vegetables, fruits, milk and small ruminants) value added , production cost decreased a as a result of Project interventions	1426
Number of workshops carried out to disseminate new and improved agricultural products	5
Number of new/improved products identified and disseminated through value chain interventions	4
Number of training events arranged on concepts of value chain and value chain assessment/analysis	1
Number of entities (including national scientists, academics, value chain actors etc.) received training on concepts of value chain	6
Number of training events arranged in agriculture production and management (livestock, cereals and horticulture) on skill improvement of farmers, NARS scientists, extension workers and others	58