Final | 09 February 2022

Final Project Report

Pathways to Strengthening Capabilities for Climate Smart Agriculture in Pakistan

1- Project Profile

Project Title	**Pathways to Strengthening Capabilities for Climate Smart Agriculture in Pakistan**
Donor	**Asia-Pacific Network for Global Change Research (APN)**
Solicitation No.	**CBA2019-07SY-Khan**
Implementing Organization	PATCO - PARC
Project Leader	Dr. Bashir Ahmad
Key Stakeholders	APN, Pakistan Agriculture Research Council (PARC), University of Agriculture Peshawar, Provincial Departments of Agriculture, Provincial Agriculture Training Institutes, Provincial Governments, District Governments in Khyber Pakhtunkhwa and Baluchistan Provinces.
Key Objectives	• Enhancing the Capabilities of Provincial Agriculture Service Delivery Organizations (ASDOs) for Climate Smart Agriculture (CSA) • Embedding CSA capability development in the mandate of Provincial Agriculture Departments
Key Deliverables	• Development of CSA Resource Kit • 02 Trainings of District Agriculture Extension Officers • Review of Curricula of 2 Provincial Agriculture Training Institute (ATIs) • 1 National Consultation Workshop on CSA Capacity Building
Geographical Coverage	National, Baluchistan Province, Khyber Pakhtunkhwa Province
Beneficiaries	Agriculture Extension Officers, Farming Communities in Target Provinces

1- Summary

Pakistan's economy depends on the performance and growth of its agriculture sector. At present, the agricultural productivity is lower than most countries in the region and way below the global averages. Existing archaic practices limit the potential of agriculture growth. This can be linked to lack of access to information on climate smart agriculture (CSA). In this context, PATCO-PARC jointly implemented the project in partnership with Asia-Pacific Network for Global Change Research (APN), The Agriculture University Peshawar, Khyber Pakhtunkhwa, and Directorate of Agriculture Extension Balochistan on building capacities around Climate Smart Agriculture.

Climate smart agriculture (CSA) can substantially reduce climate change impacts. However, limited capacity of agriculture extension departments in Pakistan is one of the major inhibiting factors in mainstreaming CSA in Pakistan. Thus, PATCO-PARC aimed at improving capabilities of provincial Agriculture Service Delivery Organizations (ASDOs) by delivering a professional learning program on CSA, in Peshawar - Khyber Pakhtunkhwa, and Quetta - Baluchistan. PATCO-PARC has developed a specialized resource kit on CSA practices and technologies. It further aims to bring these resources into use to develop the capabilities of provincial agriculture extension officers and share these resources with Agriculture Training Institutes (ATIs) at provincial level.

2- List of Completed Activities / Deliverables

The project, originally, was designed and implemented by the LEAD Pakistan that commenced and completed its first phase by engaging local collaborator. Later, due to closure of the LEAD Pakistan and the global pandemic, the project was taken over by the PATCO-PARC with prior approval from the APN. Though project was delayed significantly, PATCO-PARC took the lead role and completed all agreed tasks. As a part of the project, major activities / deliverables has been completed:

Sr.	Activity/Deliverable	Status	Dated
1	Inception (Phase – I)	Completed	5th March 2020
2	Development of CSA Resource Kit (Phase –II)	Completed	July 2021
3	Training of District Agriculture Extension Officers 02 Batches	Completed	Peshawar: 14th – 16th September 2021 Quetta: 05th - 07th October, 2021
4	Review of Curricula for ATI	Completed	18th August 2021
5	National Consultation Workshop on CSA Capacity Building	Completed	2nd December 2022

3- Project Background

Pakistan is an agro-based economy that significantly depends on the agricultural performance. However, the national GDP is shrinking over time where lower agricultural productivity remains a leading cause. Agriculture sector, being an open industry, is the first and foremost witness of climatic variations and climate change that leads to decline and in some cases unpredictable losses.

Our current crop and animal production practices and technologies such as mono-cropping, excessive tillage, intensive cultivation, poor on-farm water management, misuse of fertilizers and pesticides, outdated cropping patterns, poor quality seeds and planting materials and poor crop and animal husbandry practices are vulnerable to climate change. There is a crucial need for attuning the country's agriculture sector under the framework of climate compatible development (CCD).

Transformation to Climate Smart Agriculture (CSA) can substantially reduce climate change impacts. CSA technologies and practices like crop and enterprise diversification, low delta crops, stress tolerant crop varieties and animal breeds, conservation agriculture, organic kitchen gardening, integrated pest management, sustainable intensification of agriculture, solar powered irrigation systems, laser land leveling, climate information services etc. not only help in better utilization of resources but also promote climate resilience in agriculture.

3.1 Description

The major inhibiting factors in mainstreaming Climate Smart Agriculture (CSA) in Pakistan are the limited capacities of agriculture departments for CSA advisory, resource material for farmers which is either complex or doesn't meet current environmental challenges, lack of proper integration and coordination in academia, research, extension and policy making institutions. To address the challenges in milieu of climate change, a project titled 'Pathways to Strengthening Capabilities for Climate Smart Agriculture in Pakistan – Khyber Pakhtunkhwa and Balochistan' was designed for capacity building of agriculture extension departments of Khyber Pakhtunkhwa (KP) and Balochistan.

This project was a collaborative effort, initially designed by LEAD Pakistan and funded by the Asia Pacific Network for Global Change Research. Pakistan Agricultural Research Council (PARC) joined as a national partner alongside provincial partners - the University of Agriculture, Peshawar, Khyber Pakhtunkhwa, and Balochistan Agriculture Extension Department. However, due to an internal decision, the LEAD Pakistan stepped back whereas PATCO – PARC took the lead role for the execution of the project with technical support from PARC – its parent organization – and provincial partners including Agriculture Extensions Departments of Khyber Pakhtunkhwa and Balochistan, and The Agriculture University, Peshawar.

The project objective was to develop, and provide access to Climate Smart Agriculture resources that address the challenges of climate change in agriculture, further improve coordination among stakeholders for learning and adoption of CSA practices and technologies. The provincial extension departments were taken on board to deliver two batches of training. Further, a national level consultation workshop was organized that brought the key stakeholders at one platform to share project experience, sensitize on the issue, and provide access to provincial institutes and other organizations working on the agricultural advancement.

4- Project Inception

‘The project inception meeting for Asia Pacific Network for Global Change Research (APN) funded project “Pathways to Strengthening Capabilities for Climate Smart Agriculture in Pakistan – Khyber Pakhtunkhwa and Balochistan (CBA2019- 07SY-Khan)” took place on Thursday, 5th of March 2020. This meeting was the first phase of the project, in which members of all partner institutes, LEAD Pakistan, Pakistan Agriculture and Research Council (PARC), Department of Agriculture Balochistan and the University of Agriculture Peshawar, met to discuss the opportunities and challenges around the successful delivery of the project. Following the inception meeting, an event brief was drafted and submitted to the Asia Pacific Network for Global Change Research (APN) alongside the biannual project reporting.

5- Development of CSA Resource Kit

‘Developing economies such as Pakistan have over-dependency on the agriculture sector. Constrained financial resources coupled with knowledge gaps leads insufficient adaptation capacity that make agrarian economies vulnerable to climate change impacts.

This project was designed to enhance the capacities of Agriculture Extension Officers/district agricultural officers (DAO's) and bridge knowledge gaps on CSA. PATCO-PARC, jointly with collaborators, developed a CSA Resource Kit on climate smart agriculture in local context. This newly developed Resource Kit was utilized to deliver two capacity-building workshops in Baluchistan and Khyber Pakhtunkhwa. Further, these knowledge resources have already been circulated, also readily available in physical as well as in soft form at PATCO-PARC.

This Resource Kit comprise the following:

5.1 CSA Knowledge Products

Climate Smart Agriculture (CSA) aimed to address three main areas: sustainably increase agricultural production, adaption/resilience to climate change, and reduction of greenhouse gas emissions. CSA can be applied through various strategies, hoping to fulfil global food demands and ensure food security all whilst implementing sustainable practices in the agriculture sector’.

For the adoption of Climate Smart Agriculture practices by local farmers, the CSA Resource Kit include 5 knowledge products in local languages for farmers that consists information and guidance on CSA practices and technology implementation. The knowledge products provide the adoption techniques/information on following topics:

5.1.1 **High Efficiency Irrigation Systems (HEIS):** The high efficiency irrigation systems, such as sprinkler irrigation, drip or trickle irrigation (surface and sub-surface), bubbler irrigation, rain guns, and center pivot irrigation system are valuable adaptation measure, not only save considerable amount of water but also are suited for most landscapes, non-leveled surfaces and soil types.

5.1.2 **Integrated Pest Management (IPM):** Integrated pest management (IPM) is a sustainable approach to control pests by a combination of biological, cultural, physical, and chemical measures in a way that minimizes economic, health, and environmental risks. The aim of IPM programs is to strive for keeping pest problems below the level of economic damages while maintaining profits and reducing environmental damages.

5.1.3 **Stress Tolerant Crops:** Stress tolerant crops and varieties have great potential for improving productivity and saving resources. Farmers can cultivate these stress tolerant crops and varieties to optimize their production in changing climate and extreme weather events.

5.1.4 **Crop Rotation:** Crop rotation is an important tool to tackle climate change at farm level and this will have positive impacts on the ecosystem, water use efficiency, as well as higher yields.

5.1.5 **Crop Diversification:** Crop diversification refers to growing mix of crops on a particular farm or piece of land at the same time. These crops could be any such as cereals, oilseeds, pulses, fodders, fiber crops, sugar crops, vegetables, fruits etc. depending on needs of farmers, market situation or national preferences.

5.2 CSA Training Module

For the purpose of capacity building, as well as building a knowledge repository, Climate Smart Agriculture Training Module is also part of CSA Resource Kit that consists detailed and updated information on climate change, climate smart technologies, climate smart practices, policy advancement, and adoption of Climate Smart Agriculture. This module was utilized for Climate Smart Agriculture training workshop sessions in Quetta and Peshawar.

The module comprises Climate Smart Agriculture (CSA) practices, adoption techniques, and detailed technical information on the topics provided below:

Module 1: This module comprises basic knowledge and key concepts of the climate science, such as atmosphere, weather, climate, climate variability and climate change, global warming, greenhouse gases and natural and anthropogenic drivers of climate change causes and impacts.

Module 2: This module elaborates the overall impacts of climate change on agriculture and food security with special focus on impacts on agronomic crops, horticultural crops, livestock, fisheries, forestry, soil and water resources in global as well Pakistan's perspective.

Module 3: This module covers Climate Smart Agriculture (CSA) concept and its relation to adaptation, mitigation and ensuring food security. It also discusses the concept of landscape approach, and its importance for global agricultural transformation, including salient practices of climate smart agriculture that are relevant to local agricultural conditions.

Module 4: It covers the concept of climate and gender inclusion, institutional capacity building, policies advancement relevant to Climate Smart Agriculture, and barriers and opportunities for CSA in Pakistan.

6- Capacity Development Programs

- **Baluchistan and Khyber Pakhtunkhwa**

The project has delivered two Climate Smart Agriculture (CSA) capacity-building workshops, in Baluchistan and Khyber Pakhtunkhwa. The first CSA training for the agriculture extension officers of the Khyber Pakhtunkhwa Agriculture Extension Department was organized at the Fort-Continental Hotel, Peshawar from 14th to 16th of September 2021, whereas the second training was organized in Quetta, Baluchistan on 5th to 7th October 2021.

The project aimed at build capacities of the agriculture extension officers in Climate Smart Agriculture (CSA) through these capacity-building programs. Trainees from diverse agro-ecologies, of the Baluchistan and Khyber Pakhtunkhwa, were selected through proper channel. The attendees of the training were agriculturists with professional degrees in Agronomy, Horticulture, Plant Breeding and Genetics, Soil and Environmental Sciences, Plant Pathology and Agricultural Entomology, additional working within public sector, responsible for day to day field visits and advisory support to local farmers. The resource persons, who joined various training sessions in both trainings, were esteemed professionals and top national level experts in their respective fields such as agronomy, horticulture, plant-protection, water resources and environmental sciences.

5.3 CSA Workshops – Inception

The project team, alongside collaborators and partners, put their best efforts to make the project and these training events a success. The attitude of trainees was positive and highly engaging which is evident through the evaluation report. Trainees participated coherently in all training sessions and showed maximum participation through discussion sessions to understand Climate Smart Agriculture principles, practices, and technologies, which can be adopted in their respective agro-ecologies. The participants took keen interest in the capacity-building program since they had first-hand experience of the field and have witnessed climate change in different agro-ecologies and are always making efforts to do some remedial measures to help local farmers in Baluchistan and Khyber Pakhtunkhwa.

The opening sessions were chaired by Dr. Naveed, who represented the Agriculture Extension Department, spoke on how potentially the capacity building can change the fate of local farmers and can contribute in the agricultural and economic development of the country. Smaller projects often deliver exceptional results, prove sustainable and leave lasting impacts for local people. His knowledge, experience, and lecture delivery on the subject was remarkable.

5.4 Climate Smart Agriculture: Day 01

The Climate Smart Agriculture training was commenced with project brief, delivered by the Mr. Saqib Sultan, who shared detailed project background, ambitions, and rationales. The participants had opportunity to speak and share their experience from fields and expectations from these CSA training and how potentially this can be helpful for attendees, for the agriculture extension departments as well as farmers in long run.

The day 01 covered Module 1, Climate Change and its Causes, and Module 2, Vulnerabilities of Agriculture Sector to Climate Change. Sessions were commenced and moderated by Mr. Saqib Sultan; whereas, the resource persons, Dr. Asif Khan, Dr. Haroon Khan and Dr. Bashir Ahmed, led the technical sessions.

Session 1: The first session, comprised concepts of climate change, causes and sectoral contributions, delivered by Dr. Asif Khan. Since the foundation is always important, the concepts of atmosphere, weather, climate change, climate variations, greenhouse gasses effect and global warming were discussed in depth; also natural and anthropogenic drivers of climate change were discussed.

The contributions of agriculture sub-sectors, crops and livestock, in climate change were discussed, particularly, how agriculture sector contributes in climate change. There was interactive discussions on climate change related phenomenon such as heat waves, change in rainfall patterns, hailstorms, flash floods, droughts, increased desertification, habitat loss, biodiversity loss, sea level rise, seawater intrusion, depletion of fresh water resources.

Session 2: This session highlighted the key challenges of the agriculture and food security sector in Pakistan, was delivered by Dr. Bashir Ahmed. The session covered limited cultivable land with declining soil fertility, climate change, seed – quality, purity, vigor & prices – high postharvest losses, and stagnant crops productivity. The session also discussed livestock issues, such as widening of demand & production gap, animal diseases & mortality, small size of holding, further outdated agro ecological zoning, improper land use, widening water demand and supply gap, haphazard urbanization and lack of integration among agricultural research, education & extension.

Furthermore, Dr. Bashir Ahmed, presented interventions made by PARC to address climate change in various agro-ecologies of Pakistan, and elaborated the need for public investment in agriculture sector for improved resilience and agricultural productivity.

Session 3: The importance of agriculture sector in a developing agro-based economy and its contribution in creating employment opportunities, rural development and sustaining food security is evident. Dr. Haroon Khan discussed the significant contribution in the national economy as well as challenges faced by agriculture sector. He further explained yield gaps of major crops, impacts of climate change on agronomic crops, horticultural crops, livestock, fisheries and forestry, which remained very interactive session.

He further explored impacts of climate change on various crops observed in different regions. Trainees from Swat valley shared experiencing frequent hailstorms that is playing havoc with major fruit crops of the valley such as apricot, plum and peach. They also mentioned that changing weather pattern and winds causes loss of premature fruits – apricot and plum – that results in huge loss to growers and economy as well.

Session 4: The climate impacts are largely depended on the land use. Better use of land and resources can lead to minimizing climate impacts and growing yields from agriculture. Dr. Zakir Hussain Dahri delivered a session on recent trends of land use and climate impacts, and future projections in Pakistan and future projections. He covered the impacts of climate change with particular focus on impacts on water and land resources.

5.5 Climate Smart Agriculture: Day 02

Session 1: Mr. Saqib Sultan commenced the first session, with a recap and discussion on the previous – take away from the last day sessions – that remained very much interactive session. Mr. Saqib Sultan moderated the training sessions, whereas Mr. Muneeb Ahmed Khan, Dr. Haroon Khan and Dr. Bashir Ahmed joined various sessions as resource persons following the participatory approach.

Session 2: This session, delivered by Mr. Muneeb Ahmed Khan, covered the following topics:

- Climate change and increasing population; challenges to agriculture and food security
- climate smart agriculture (CSA) concept, history and its relation to adaptation, mitigation and food security
- the three pillars of CSA and role of local CSA practices in meeting global sustainability agendas
- Sustainable vs. unsustainable practices in agriculture; what to follow
- The landscape approach and its relevance to CSA

The session had pre-recorded videos on CSA practices and success stories collected from global sources. The landscape approach was particularly pointed out by participants as something entirely new to learn. This session had a brainstorming activity. The attendees were given various topics, to discuss mutually and speak based on their experience / thoughts on the topics. This remained quite useful.

Session 3: Third session, delivered by Mr. Muneeb Ahmed Khan, covered CSA practices and technologies that are relevant to Pakistan's context such as;

- Crop diversification
- Crop rotation
- Stress tolerant crop varieties
- Low delta crops
- Residue management and conservation tillage
- Organic kitchen gardening

This session was quite a productive session and highly relevant in local context. Prior to this, the attendees had idea of the conservation tillage and low delta crops concept which was

covered thoroughly and examples of low delta crops from field and horticultural crops were shared. Trainees from southern districts of Khyber Pakhtunkhwa showed keen interest in potential low delta crops for their semiarid agro-ecologies. Trainees also identified several stress tolerant crop varieties in their respective agro-ecologies.

Session 4: The session, delivered by Muneeb Ahmed Khan, covered promising CSA practices and technologies that have high relevance to Pakistan's agriculture, such as:

- Integrated pest management
- Stress tolerant animal breeds
- Manure management
- Enterprise diversification
- Sustainable intensification
- Agricultural production on sloppy and /barren lands

This session was supported by videos that helped learning agricultural production on sloppy and barren lands. Local success stories, Izhar Farms Chakwal, of managing barren slopes, hills and undulated terrains with efficient farm and water management technologies were shared which is an exceptionally presentable case on Climate Smart Agriculture.

Session 5: The session, delivered by Dr. Bashir Ahmed, discussed core practices and technologies that are really helping farmers in adapting to the climate challenge throughout Pakistan and the whole world, such as;

- High efficiency irrigation systems
- Alternate energy
- Climate information services

The participants took keen interest learning portable and movable solar water pumping systems, a novel design of PARC scientists. The Agriculture Extension Departments were invited to join PARC for field visits at their convenience.

Session 06: Dr. Haroon Khan delivered the final session that focused on Climate Smart Agriculture global experiences. He presented key CSA practices that are widely adopted in various countries. He also presented the characteristics of a CSA model village and gave example of the Chitral district where HELVETAS Swiss Inter-cooperation developed the complete adaptation plan.

5.6 Climate Smart Agriculture: Day 03

Dr. Haroon Khan delivered the final session that focused on policy interventions and institutional capacity building. The session covered:

- Enabling Environments and Policy Interventions for CSA
- Gender and Social Inclusion
- Institutional Engagement and Policy Making
- Institutional Capacity Building
- Barriers and Opportunities for CSA

The session was concluded with an activity to highlight social and policy gaps for Climate Smart Agriculture. Most trainees highlighted social inclusion and a comprehensive CSA policy that focuses on agricultural development and covers socio-economic impacts of a positive agricultural transformation.

5.7 Concluding Session

The chief guest, Dr. Naveed, highlighted the importance of this training for the Agriculture Extension Departments in meeting their capacity building needs. He highlighted how agricultural extension system is being transformed to a target based and result oriented system. He motivated extension officers to find solution to the climate threats in their respective agro-ecologies to agricultural production through issue based research and give positive output to justify the existence of agricultural extension department in today is challenging environment. He specifically highlighted the achievements of agricultural extension department in locust control in southern districts of Khyber Pakhtunkhwa where with meager resource the department saved crops worth an estimated Rs. 52 billion from locust attack, which is indeed an achievement and result of teamwork. Such enthusiasm and teamwork is needed in learning, teaching and adoption of Climate Smart Agriculture at local level that would be a game change for the sector as well as for the economy.

7- Training Evaluation

7.1 Khyber Pakhtunkhwa

September, 2021					**Total Participants = 14**	
Feedback	**5**	**4**	**3**	**2**	**1**	**Average Score**
1. The objectives of the meeting were clearly defined	9	4	1			4.6
2. Participation and interaction was encouraged	6	8				4.4
3. The topics covered were relevant to me	7	7				4.5
4. The content was organized and easy to follow	5	9				4.4
5. The materials distributed were helpful	6	8				4.4
6. This meeting will be useful in my future work	9	5				4.6
7. The speakers were knowledgeable about the topic	10	4				4.7
8. The speakers were well prepared	8	5	1			4.5
9. The meeting objectives were met	5	9				4.4
10. The time allocated for the sessions was sufficient	3	7	4			3.9
11. The meeting room and facilities were adequate and comfortable	5	4	5			4.0
					Overall Course Ranking	**4.4**

This evaluation is compilation of the written feedback provided by 14 participants – district level agriculture officers – who joined the Climate Smart Agriculture (CSA) training in Peshawar, Khyber Pakhtunkhwa. This report indicates the training score provided by beneficiaries who joined this 3 days CSA capacity-building workshop. The highest score awarded was 4.7 that denotes the knowledgeability and preparation of speakers, and second highest score remained usefulness of the training and well objectives of the training by securing 4.6 score. The lowest secure was marked 3.9 out of 5 against the time allocated for each session and duration of the training that hints the interest and will of participants to explore further the subject. Most participants has recommended the CSA workshops for their colleagues as well as the resources should be taken to other provinces.

7.2 Baluchistan: Training Evaluation

October, 2021					**Total Participants = 17**	
Feedback	**5**	**4**	**3**	**2**	**1**	**Average Score**
1. The objectives of the meeting were clearly defined	10	7				4.6
2. Participation and interaction was encouraged	13	4				4.8
3. The topics covered were relevant to me	7	9	1			4.4
4. The content was organized and easy to follow	5	11		1		4.2
5. The materials distributed were helpful	8	9				4.5
6. This meeting will be useful in my future work	15	2				4.9
7. The speakers were knowledgeable about the topic	15	2				4.9
8. The speakers were well prepared	12	5				4.7
9. The meeting objectives were met	6	11				4.4
10. The time allocated for the sessions was sufficient	6	8	2	1		4.1
11. The meeting room and facilities were adequate and comfortable	7	7	3			4.2
				Overall Course Rank		**4.5**

This evaluation is compilation of the written feedback provided by 17 participants – district level agriculture officers – who joined the course at Quetta, Baluchistan. This indicates the training score provided by beneficiaries who joined this 3 days Climate Smart Agriculture capacity-building workshop. The highest score award was 4.9 out of 5, which denotes the knowledgeability of speakers, and course usefulness for their day-to-day job. Preparation regarding course/session remind second highest score at 4.7. The lowest secure was marked 4.1 against the time allocated for each session and duration of the training that hints the interest in the subject by participants. The overall course was ranked at 4.5 out of 5, which is excellent and slightly higher than first training.

7.3 Evaluation: Training Beneficiaries Response

This section is compilation of written feedback collected during the post evolution of training programs that were organized in Baluchistan and Khyber Pakhtunkhwa. Training participants have provided generous feedback on the usability of this course. Further, they have suggested what aspects or topics should be included or given more time allocation for improvement.

The most useful sessions: The training beneficiaries from Baluchistan and Khyber Pakhtunkhwa have provided in written about the topics they considered most useful among all. They particularly have mentioned that the focus on the Climate Smart Agriculture, learnings how the climate change is affecting agriculture locally and further learning from global and national experience were commendable. Further, the participants have pointed out that the sessions on various irrigation systems/methods, climate adaptation technologies, climate impacts on horticulture crops, high efficiency irrigation systems (HEIS), and methods ensuring food security were indeed useful and directly related to their job. Each session was precise, informative and well delivered by experts through participatory approaches. Furthermore, videos, documentaries and demonstrations have helped largely. Participants have marked the Climate Smart Agriculture training as comprehensive and exceptionally up to date.

Aspects of the training should be improved: Despite overall strong positive feedback, the participants have suggested extended duration for the training since Climate Smart Agriculture is quite a broad topic that requires more time to cover all aspects. The beneficiaries have suggested that more local success stories should be included and participants should be given opportunity to have exposure of such projects. To enhance learning, participants should be given regional specific case studies such as olive and pistachio farming in Baluchistan, scope of biotechnology for addressing climate issue, droughts, and policy aspects such as subsidies on solar and fertilizers, etc. More time should be allocated for interactive sessions.

Topics need more discussion: The participants were asked about further topics and a general area that should be improved to make these trainings more useful in future. The participants have pointed out the topics that should be included or expanded further and given more time in future: Climate impacts, measures, mitigation and adaptation, food security, High Efficiency Irrigation Systems (HEIS), cropping pattern and water scarcity. Further, challenges for small-scale farmers and CSA practices in the context of small-scale farming should be given more time and discussion. A participant have suggested a public awareness is important and advocacy on Climate would leave a real impact. CSA is indeed much important, and the course is useful for field workers as well as fresh graduated. Beside the ATIs, the universities should be given access to these newly developed resources.

8- Review of the ATI's Curricula

Today the climate change science is a highly specialized area with broad-spectrum knowledge base involving many fields. The current project aims to strengthen the capabilities of ASDOs (Agriculture Services Delivery Organizations) in Climate Smart Agriculture (CSA) from Khyber Pakhtunkhwa and Baluchistan. The Agriculture Extension Officers, mostly, enter into the service directly after completing B.Sc. (Hons.) or M.Sc. (Hons.). They at-least get some knowledge of soil sciences, agronomy, horticulture, plant pathology, agricultural entomology, plant breeding and genetics, agricultural biotechnology, rural sociology, agriculture extension education, environmental science etc. in the universities during their course of study. Agriculture Research and Extension Officers usually directly join the service after passing competitive examinations and therefore need refresher/training courses in Climate Smart Agriculture (CSA) to cater the needs of farmers in the field. There is also need for a comprehensive course on Climate Change and Climate Smart Agriculture.

Keeping in view all these factors, review of curriculum of ATIs was conducted and recommendations were made so the audience of these curricula should be better prepared before taking the full time job. It was observed that the existing curricula was not sufficient in order to meet growing challenges of climate. Under the curricula review, recommendations were made to prepare ASDOs to at-least assess the situation in field and can propose practices – adaptation / mitigation. Detailed recommendations as well as knowledge Resource Kit are extended to fill these gaps at ATIs and ASDOs.

9- National Consultation Workshop: Islamabad

Pakistan's economy depends on the performance and growth of its agriculture sector. The agriculture sector, being an open industry, is the first and foremost witness of climatic variations and climate change. There is a crucial need for attuning the country's agriculture sector under the framework of climate compatible development (CCD). Transformation to Climate Smart Agriculture (CSA) can substantially reduce climate change impacts. CSA technologies and practices not only help in better utilization of resources but also promote climate resilience in agriculture.

The Pakistan Agricultural Research Council (PARC) and Asia-Pacific Network for Global Change Research (APN), jointly with The Agriculture University Peshawar, have delivered the project that has extensively benefited the provincial agriculture extension departments through building capacities of front-line officers i.e. District Agriculture Officers in the Baluchistan and Khyber Pakhtunkhwa provinces. To carry forward the message, and share experience of the project, a national level consultation was organized in Islamabad. It has provided an opportunity to key stakeholders to join hands on highlighting the issue of climate change and sensitize the leaders, mobilize resources to reach other provinces and agricultural communities in need of Climate Smart Agriculture (CSA) practices and technologies.

The Chairman PARC, Dr. Ghulam Muhammad Ali, who joined as a chief guest, spoke about the climate change that put the country among the most vulnerable nations. The challenge of rapid population growth, coupled with climate change is stressing the economy and food security, has created an alarming situation for the country. Self-sufficiency, he said, must be taken as a goal in order to meet challenges posed by climate change and food insecurity in the country. Dependency and rising imports of the country are huge burden on the economy and unsustainable for economic growth in long run. A developing country like Pakistan must adopt Climate Smart Agriculture (CSA) to fight climate change, improve agriculture productivity and meet the regional economic productivity level, which is indeed possible. As a chair, he appreciated the efforts of APC for joining hands with PARC and for the promotion of Climate Smart Agriculture (CSA) and developing knowledge resources in Pakistan.

Agriculture is affecting and being impacted by the climate change. Dr. Qamar Zaman, chaired the session, provided a recap of global efforts on climate change. He spoke on the developments COP-26 that held in UK, Glasgow in 2021. Climate is indeed among the leading issues of the 21st century that posed an existential threat and affected the global economies. Over the past decade, COP21 in Paris was a milestone achieved towards fight against climate change, where countries have voluntarily pledged on reducing CO2 emission. Scientists through IPCC reports have declared climate as an existential threat, and provided policy support through technical knowledge advancing for tackling the issue. Pakistan, country itself vulnerable to climate, has pledged under NDC to reduce its 15% emission by 2030, which is quite an ambitious plan.

Ali Tauqeer Sheikh, former CEO LEAD Pakistan, chaired the session and spoke on how the climate smart agriculture is important for Pakistan since we are a developing agro-based economy that remained on the list of top-ten highly vulnerable countries. He also moderated the session. Arif Goheer, GCISC, said that APN's role in Pakistan needs special mention, as the organization has sponsored around 15 projects through various organizations and the focus remains on fighting climate change through capacity building. He further stated that climate change reporting is indeed much needed and important area, however, institutes and think tanks working on the issue must know and share the impacts of their reporting. This is notably a takeaway from the event for all stakeholders who are committed to and working on climate change, agriculture development in the country. Dr. Arif Shah Kakar, Baluchistan, and Dr. Haroon Khan, Khyber Pakhtunkhwa, praised the commendable initiative of PARC for bridging the knowledge gap and bringing the resources for front-line workers and farmers in local language. Despite advancement at provincial level, the indigenous knowledge is still missing and that need to be integrated. Such as, experience from the fighting locust attack in Baluchistan, he identified an indigenous plant, *Tecomella Undulata*, which can extensively help fighting locust.

The climate change is a multi-sectoral issue that need to be fought at all fronts whether it is social, economic or environmental. Dr. Basheer Ahmad, Project Director, spoke on the gap of knowledge identified through this project in the curriculum of Agriculture Training Institutes. He further shared about the knowledge Resource Kit on Climate Smart Agriculture (CSA), which is intended to meet these capacity building and knowledge gaps in Climate Smart Agriculture (CSA). He highlighted the aim of the consultation workshop, to bring the stakeholders at one platform to share project experience, engage and sensitize experts on the problems in adoption of Climate Smart Agriculture (CSA) practices and technologies by farmers and exploring research and policy gaps, know capacity building needs of agriculture departments, and seek future coordination to meet the common objectives. He further invited all stakeholder to join the hands and take these resources to communities where they have access and outreach through their organizations. Fortunately, now we have resources and knowledge developed under this project – CSA knowledge Resource Kit. The front-line officers as well as farmers in other provinces must be benefited from these resources.

10- ANNEX

Annex 01: Pictures from Training Event. Peshawar, Khyber Pakhtunkhwa, Pakistan

Annex 02: Pictures from Training Event. Quetta, Baluchistan, Pakistan

Annex 03: Pictures from National Consultation, Islamabad, Pakistan

Annex 04: Attendance Sheet, inception meeting

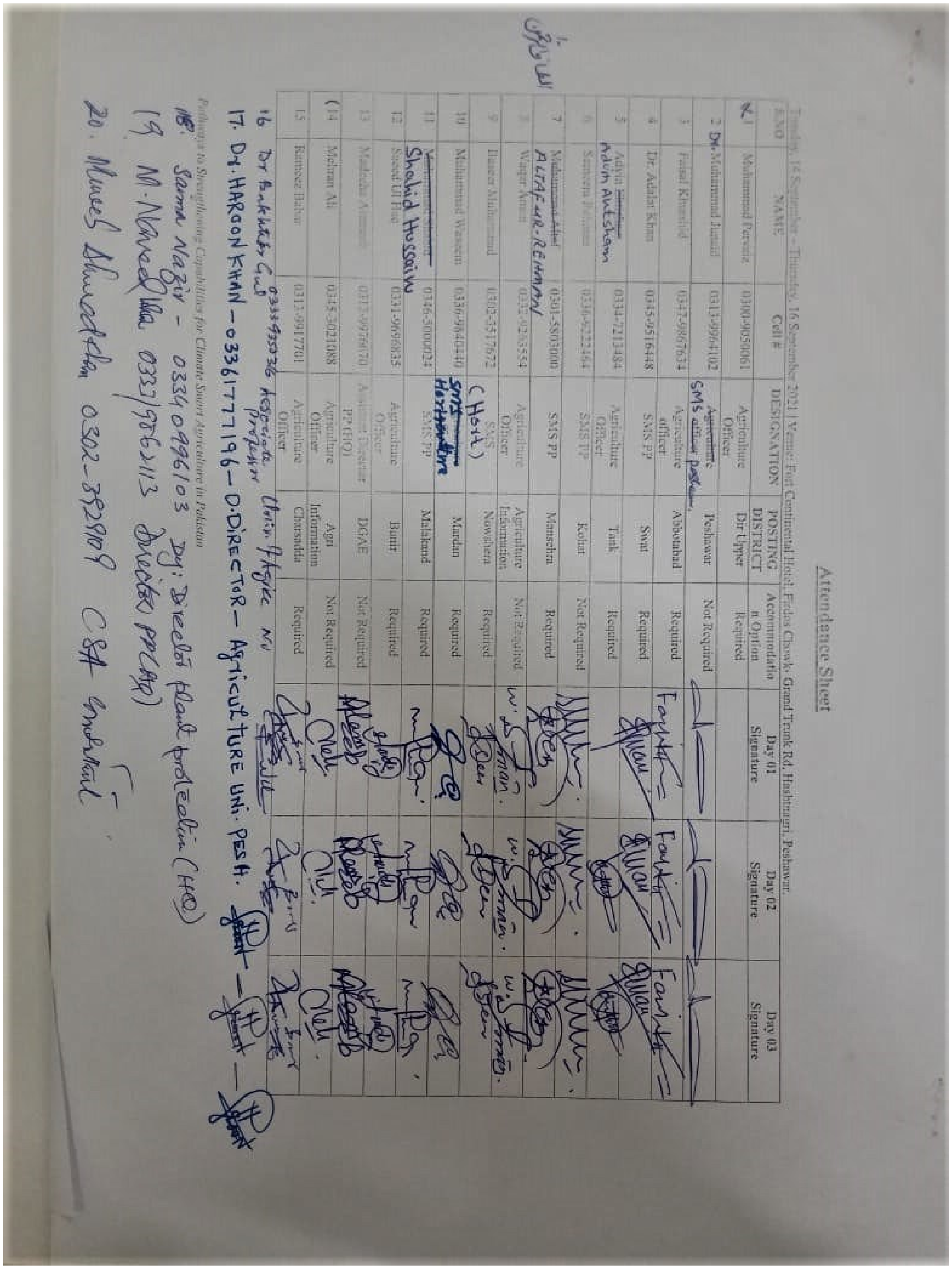
Iception Meeting | Pathways to Strengthening Capabilities for Climate Smart Agriculture in Pakistan

Attendance Sheet

5-Mar-20 | Venue: Islamabad | LEAD Pakistan

Sr #	Full Name	Organization	Designation	Email	Cell	Signature
1	Zakir Hussain Dahri	PARC	National Coordinator (water)	zakirdahri@yahoo.com	0335 8077828	[signature]
2	Dr. Bashir Ahmad	NARC	Director	dr.bashir70@gmail.com	0333-5487546	[signature]
3	Muneeb Ali Khan	–	CSA Expert	ahmedmuneeb47@gmail.com	0302-3929109	[signature]
4	Dr. HAROON KHAN	CCC–UAP	Dy. DIRECTOR	HAROONKHAN@AUP.EDU.PK	03361777196	[signature]
5	Banaras Khan	FAO	Program Officer	banaras.khan@fao.org	03468544169	[signature]
6	Durreshahwar	—	—	durreshahwar7111@gmail.com		[signature]
7	Syed Ahmad Hassan	LEAD.P.	GM OPS.	shasan@lead.org.pk	0321-4930662	[signature]
8	M. SAQIB SULTAN	LEAD.P.	Coordinator	msultan@lead.org.pk	0341-7272272	[signature]
9	Zeeshan Tanvir	LEAD.P	Focal Person	ztanvir@lead.org.pk	0321-5293938	[signature]
10						
11						
12						

Annex 05: Attendance Sheet, CSA Training 01



Attendance Sheet

Tuesday, 14 September – Thursday, 16 September 2021 | Venue: Fort Continental Hotel, Firdos Chowk, Grand Trunk Rd, Hashtnagri, Peshawar.

S.NO	NAME	Cell #	DESIGNATION	POSTING DISTRICT	Accommodation Option	Day 01 Signature	Day 02 Signature	Day 03 Signature
1	Muhammad Pervaiz	0300-9050061	Agriculture Officer	Dir Upper	Required			
2	Dr. Muhammad Junaid	0313-9964102	~~Agriculture~~ SMS officer pesha.	Peshawar	Not Required	[signature]	[signature]	[signature]
3	Faisal Khurshid	0347-9867634	Agriculture officer	Abbotabad	Required	[signature]	[signature]	[signature]
4	Dr. Adalat Khan	0345-9516448	SMS PP	Swat	Required	[signature]	[signature]	[signature]
5	Adyia ~~[illegible]~~ Adum Autsham	0334-7213484	Agriculture Officer	Tank	Required	[signature]	[signature]	[signature]
6	Sameera [illegible]	0336-9222464	SMS PP	Kohat	Not Required	[signature]	[signature]	[signature]
7	~~Muhammad Altaf~~ ALTAF-UR-REHMAN الطاف الرحمن	0301-5803000	SMS PP	Mansehra	Required	[signature]	[signature]	[signature]
8	Waqar Amin	0332-9263554	Agriculture Officer	Agriculture Information	Not Required	[signature]	[signature]	[signature]
9	Baseer Muhammad	0302-3517672	SMS (Host)	Nowshera	Required	[signature]	[signature]	[signature]
10	Muhammad Waseem	0336-9840440	SMS ~~[illegible]~~ Horticulture	Mardan	Required	[signature]	[signature]	[signature]
11	~~Muhammad Shahid~~ Shahid Hussain	0346-5000024	SMS PP	Malakand	Required	[signature]	[signature]	[signature]
12	Saeed Ul Haq	0331-9696835	Agriculture Officer	Bunir	Required	[signature]	[signature]	[signature]
13	Madeeha A[illegible]	0313-9976670	Assistant Director PP (HQ)	DGAE	Not Required	[signature]	[signature]	[signature]
14	Mehran Ali	0345-3021088	Agriculture Officer	Agri Information	Not Required	[signature]	[signature]	[signature]
15	Rameez Babar	0313-9917701	Agriculture Officer	Charsadda	Required	[signature]	[signature]	[signature]

16 Dr Bakhtiar Gul 03339355336 Associate Professor Univ. of Agric. NU

17. Dr. HAROON KHAN – 03361777196 – D. DIRECTOR – AGRICULTURE UNI. PESH.

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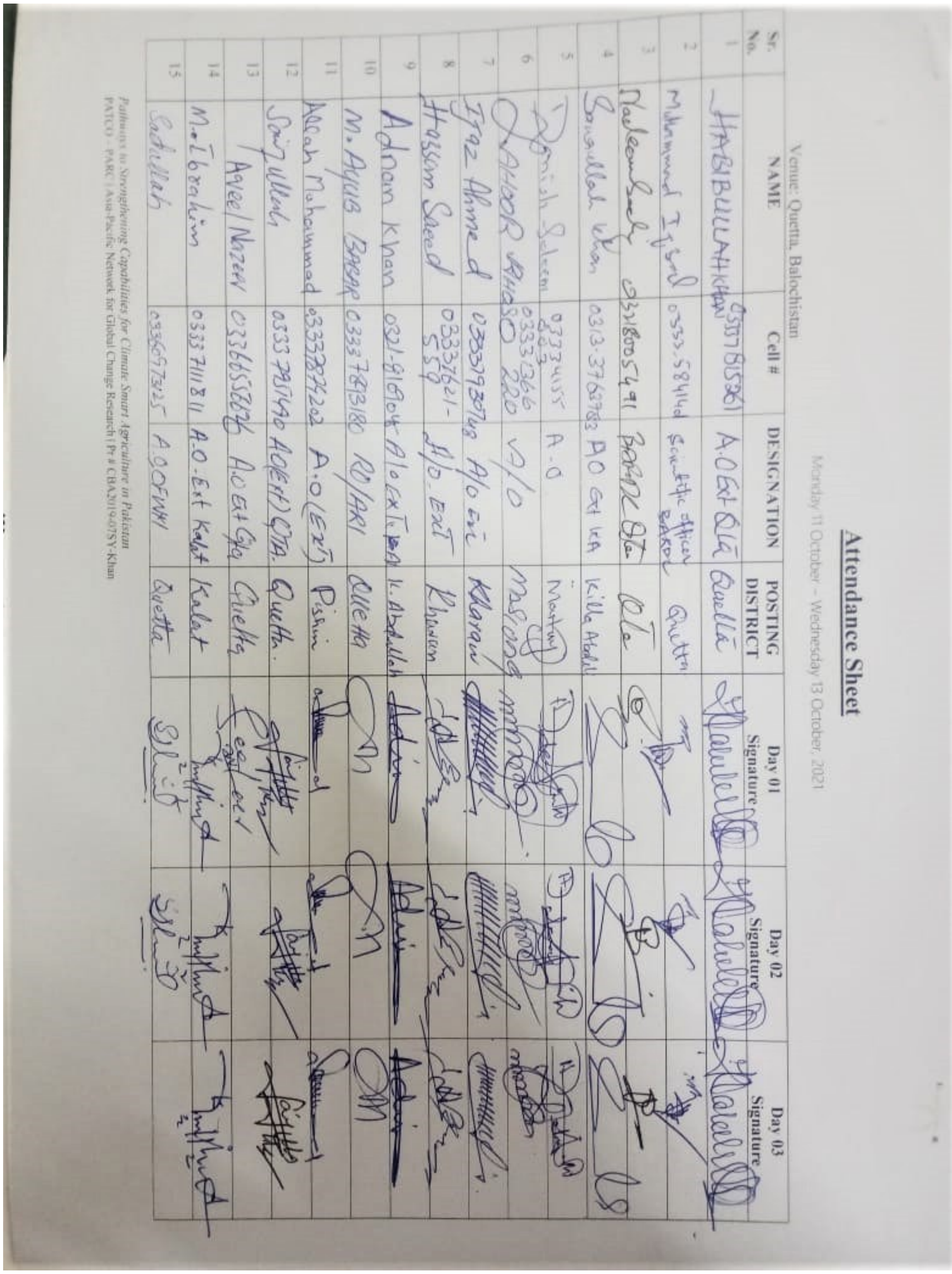
18. Saima Nazir – 03340996103 Dy: Director plant protection (HQ)

19 M. Naveed Ullah 0333/9862113 Director PPCAR)

20. Muneeb Ahmad Khan 0302-3929109 CSA Consultant

Annex 06: Attendance Sheet, CSA Training 02



Attendance Sheet

Monday 11 October – Wednesday 13 October, 2021

Venue: Quetta, Balochistan

Sr. No.	NAME	Cell #	DESIGNATION	POSTING DISTRICT	Day 01 Signature	Day 02 Signature	Day 03 Signature
1	HABIBULLAH KHAN	03337815261	A.O Ext QTA	Quetta	[signature]	[signature]	[signature]
2	Muhammad Iqbal	0333-584144	Scientific officer BARDC	Quetta	[signature]	[signature]	[signature]
3	Nadeem Saeed	03318005491	BARDC QTA	QTA	[signature]	[signature]	[signature]
4	Sanaullah Khan	0313-3763783	A.O Ext KA	Killa Abdullah	[signature]	[signature]	[signature]
5	Danish Saleem	03334155 223	A.O	Mastung	[signature]	[signature]	[signature]
6	ZAHOOR AHMED	03331366 220	A/O	Mastung	[signature]	[signature]	[signature]
7	Ijaz Ahmed	03337930748	A/O Ext	Kharan	[signature]	[signature]	[signature]
8	Hassam Saeed	03337621-559	A/O Ext	Kharan	[signature]	[signature]	[signature]
9	Adnan Khan	0321-819104	A/O Ext	K. Abdullah	[signature]	[signature]	[signature]
10	M. Ayub Babar	03337813180	RO/ARI	Quetta	[signature]	[signature]	[signature]
11	Allah Muhammad	03337874202	A.O (Ext)	Pishin	[signature]	[signature]	[signature]
12	Saifullah	0333 7951490	AO(Ext) QTA.	Quetta.	[signature]	[signature]	[signature]
13	Aqeel Nazeer	03366556674	A.O Ext Qta	Quetta	[signature]		
14	M. Ibrahim	0333 7111811	A.O. Ext Kalat	Kalat	[signature]	[signature]	[signature]
15	Sadullah	03360973125	A.O OFWM	Quetta	[signature]	[signature]	

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